CITY OF TACOMA
ENVIRONMENTAL SERVICES
REQUEST FOR BIDS
TACOMA LANDFILL - DECOMISSION GETS AND GAS PROBES (REBID)
SPECIFICATION NO. ES21-0668F
REQUEST FOR BIDS ES21-0668F
Tacoma Landfill - Decommission GETS And Gas Probes (Rebid)

Submittal Deadline: 11:00 a.m., Pacific Time, Tuesday, October 19, 2021
Submittals must be received by the City’s Procurement and Payables Division prior to 11:00 a.m. Pacific Time.
For electronic submittals, the City of Tacoma will designate the time of receipt recorded by our email, bids@cityoftacoma.org, as the official time of receipt. This clock will be used as the official time of receipt of all parts of electronic bid submittals.

Submittal Delivery: Sealed submittals will be received as follows:

<table>
<thead>
<tr>
<th>By Email:</th>
<th><a href="mailto:bids@cityoftacoma.org">bids@cityoftacoma.org</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum file size: 35 MB. Multiple emails may be sent for each submittal</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>By Carrier:</th>
<th>If possible, please include a flash drive of your full submittal.</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Tacoma Procurement &amp; Payables Division</td>
<td></td>
</tr>
<tr>
<td>Tacoma Public Utilities</td>
<td></td>
</tr>
<tr>
<td>3628 S 35th Street</td>
<td></td>
</tr>
<tr>
<td>Tacoma, WA 98409</td>
<td></td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>In Person:</th>
<th>If possible, please include a flash drive of your full submittal.</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Tacoma Procurement &amp; Payables Division</td>
<td></td>
</tr>
<tr>
<td>Tacoma Public Utilities Administration Building North</td>
<td></td>
</tr>
<tr>
<td>Guard House (east side of main building</td>
<td></td>
</tr>
<tr>
<td>3628 S 35th Street</td>
<td></td>
</tr>
<tr>
<td>Tacoma, WA 98409</td>
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<tr>
<td>Tacoma Public Utilities</td>
<td></td>
</tr>
<tr>
<td>PO Box 11007</td>
<td></td>
</tr>
<tr>
<td>Tacoma, WA 98411-0007</td>
<td></td>
</tr>
</tbody>
</table>

Bid Opening: Held virtually each Tuesday at 11AM. Attend via this link or call 1 (253) 215 8782.
Submittals in response to a RFB will be recorded as received. As soon as possible on the day of submittal deadline, preliminary results will be posted to www.TacomaPurchasing.org.

Solicitation Documents: An electronic copy of the complete solicitation documents may be viewed and obtained by accessing the City of Tacoma Purchasing website at www.TacomaPurchasing.org.

- Register for the Bid Holders List to receive notices of addenda, questions and answers and related updates.
- Click here to see a list of vendors registered for this solicitation.

Pre-Proposal Meeting: A pre-proposal meeting will be held at Commencement Bay Room #101, Center for Urban Waters, 326 East D Street, Tacoma, WA 98421 at 2:00 p.m. on Wednesday, October 6, 2021.
**Project Scope:** This Project Statement of Work (SOW) pertains to decommissioning of 31 landfill gas monitoring probes, 38 groundwater monitoring wells, 1 landfill gas extraction well (CA-18), and 14 groundwater extraction wells (collectively herein termed installations; 84 total) that were installed to support the final remedy and are no longer required for PCC monitoring activities. Decommissioning of the installations falls under the regulatory authority of Ecology, and associated standards are specified in WAC 173-160, Minimum Standards for Construction and Maintenance of Wells (Minimum Standards). However, because the City Landfill portion of the Site remains under EPA’s regulatory authority, and to be consistent with requirements of the CD, the City submitted a decommissioning work plan to EPA for approval under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) authority for permit equivalency. The intention of the work plan is to meet the requirements outlined in WAC 173-160. The SOW also includes rehabilitation and modification of groundwater extraction well W-02R, as well as decommissioning the Landfill’s Groundwater Extraction and Treatment System (GETS) and connecting the system’s existing influent line to the existing discharge piping to the storm sewer. The need to treat GETS influent ceased after 1998, and untreated GETS influent has been discharged at the GETS Outfall to Leach Creek since 2003.

**Estimate:** $593,000.00

**Paid Sick Leave:** The City of Tacoma requires all employers to provide paid sick leave as set forth in Title 18 of the Tacoma Municipal Code. For more information, visit our Minimum Employment Standards Paid Sick Leave webpage.

**Americans with Disabilities Act (ADA Information):** The City of Tacoma, in accordance with Section 504 of the Rehabilitation Act (Section 504) and the Americans with Disabilities Act (ADA), commits to nondiscrimination on the basis of disability, in all of its programs and activities. Specification materials can be made available in an alternate format by emailing Gail Himes at ghimes@cityoftacoma.org, or by calling her collect at 253-591-5785.

**Title VI Information:** “The City of Tacoma” in accordance with provisions of Title VI of the Civil Rights Act of 1964, (78 Stat. 252, 42 U.S.C. sections 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, national origin in consideration of award.

**Additional Information:** Requests for information regarding the specifications may be obtained by contacting Tina Eide, Senior Buyer by email to teide@cityoftacoma.org.

**Protest Policy:** City of Tacoma protest policy, located at www.tacomapurchasing.org, specifies procedures for protests submitted prior to and after submittal deadline.

![Accessibility](https://www.aclu.org/sites/default/files/accessibility.png)

Meeting sites are accessible to persons with disabilities. Reasonable accommodations for persons with disabilities can be arranged with 48 hours advance notice by calling 253-502-8468.
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NOTE: ALL BIDDERS MUST HAVE A COPY OF THE SPECIFICATIONS

REQUEST FOR BIDS

SPECIAL REMINDER TO ALL BIDDERS

SPECIAL NOTICE TO BIDDERS

PART I  BID PROPOSAL AND CONTRACT FORMS

1  Bid Proposal
2  Signature Page
3  Bid Bond
4  Certification Of Compliance With Wage Payment Statutes
5  State Responsibility and Reciprocal Bid Preference Information
6  Contract
7  Payment Bond to the City of Tacoma
8  Performance Bond to the City of Tacoma
9  General Release Form

PART 2  PROJECT DETAILS

PART 3  STATE PREVAILING WAGE RATES, CITY OF TACOMA INSURANCE REQUIREMENTS, and GENERAL PROVISIONS

PART 4  LOCAL EMPLOYMENT AND APPRENTICESHIP TRAINING PROGRAM (LEAP) REGULATIONS FOR PUBLIC WORKS CONTRACTS
SPECIAL REMINDER TO ALL BIDDERS

HEALTH & SAFETY: Be sure to comply with all City of Tacoma health and safety requirements.

1. This project has been deemed to be an essential project by the City of Tacoma and it is anticipated that the contract will be operational during the COVID-19 outbreak. Therefore, the contractor shall complete a health and safety plan describing how the contractor will complete the work while combating the COVID-19 spread (social distancing practices) and what Personal Protective Equipment (PPE) will be in place.

PLEASE NOTE: Be sure you have complied with all specifications and requirements and have signed all required documents.

YOUR ATTENTION IS PARTICULARLY CALLED to the following forms, which must be executed in full before the bid is submitted:

1. **BID PROPOSAL**: The unit prices bid must be shown in the space provided. Check your computations for omissions and errors.

2. **SIGNATURE PAGE**: To be filled in and executed by a duly authorized officer or representative of the bidding entity. If the bidder is a subsidiary or doing business on behalf of another entity, so state, and provide the firm name under which business is hereby transacted.

3. **BID BOND**: The Bid Bond must be executed by the person legally authorized to sign the bid, and must be properly signed by the representatives of the surety company unless the bid is accompanied by a certified check. If Bid Bond is furnished, the form furnished by the City must be followed; no variations from the language thereof will be accepted. The amount of the Bid Bond must be not less than 5% of the total amount bid. If submitting your bid electronically, a scanned version of the original bid bond must accompany your electronic bid submittal. The original bid bond shall be sent to the Contracting Agency and postmarked no later than the day of bid opening. Original bid bonds will be delivered to:

   City of Tacoma Procurement & Payables Division
   Tacoma Public Utilities
   P.O. Box 11007
   Tacoma, WA 98411-0007

4. **CERTIFICATION OF COMPLIANCE WITH WAGE PAYMENT STATUTES**: Bidder shall complete this form in its entirety to ensure compliance with state legislation (SHB 2017).

5. **STATE RESPONSIBILITY AND RECIPROCAL BID PREFERENCE INFORMATION**: Bidder shall complete this form in its entirety to ensure compliance with state legislation (SHB 2010).
POST AWARD FORMS EXECUTED UPON AWARD:

A. CONTRACT: Must be executed by the successful bidder.

B. PAYMENT BOND TO THE CITY OF TACOMA: Must be executed by the successful bidder and his/her surety company.

C. PERFORMANCE BOND TO THE CITY OF TACOMA: Must be executed by the successful bidder and his/her surety company.

D. CERTIFICATE OF INSURANCE: Shall be submitted with all required endorsements.

E. GENERAL RELEASE.

CODE OF ETHICS: The successful bidder agrees that its violation of the City’s Code of Ethics contained in TMC Chapter 1.46 shall constitute a breach of the contract subjecting the contract to termination.
CITY OF TACOMA
FINANCE/PURCHASING DIVISION
SPECIAL NOTICE TO BIDDERS

Public works and improvement projects for the City of Tacoma are subject to Washington state law and Tacoma Municipal Code, including, but not limited to the following:

I. STATE OF WASHINGTON

A. RESPONSIBILITY CRITERIA – STATE OF WASHINGTON

In order to be considered a responsible bidder the bidder must meet the following mandatory state responsibility criteria contained in RCW 39.04.350:

1. Have a current certificate of registration as a contractor in compliance with chapter 18.27 RCW, which must have been in effect at the time of bid submittal;
2. Have a current Washington Unified Business Identifier (UBI) number;
3. If applicable:
   a. Have Industrial Insurance (workers' compensation) coverage for the bidder’s employees working in Washington, as required in Title 51 RCW;
   b. Have a Washington Employment Security Department number, as required in Title 50 RCW;
   c. Have a Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW and;
4. Not be disqualified from bidding on any public works contract under RCW 39.06.010 (unlicensed or unregistered contractors) or 39.12.065(3) (prevailing wage).
5. Have received training on the requirements related to public works and prevailing wage under this chapter and chapter 39.12 RCW and must designate a person or persons to be trained on these requirements. The training must be provided by the department of labor and industries or by a training provider whose curriculum is approved by the department. Bidders that have completed three or more public works projects and have had a valid business license in Washington for three or more years are exempt from this subsection.

B. RECIPROCAL PREFERENCE FOR RESIDENT CONTRACTORS:

Effective March 30, 2012, RCW 39.04.380 imposes a reciprocal preference for resident contractors. Any bid received from a non-resident contractor from a state that provides an in-state percentage bidding preference is subject application of a comparable percentage disadvantage.

A non-resident contractor from a state that provides an in-state percentage bidding preference means a contractor that:

1. Is from a state that provides a percentage bid preference to its resident contractors bidding on public works projects, and
2. Does not have a physical office located in Washington at the time of bidding on the City of Tacoma public works project.

The state of residence for a non-resident contractor is the state in which the contractor was incorporated, or if not a corporation, the state in which the contractor’s business entity was formed.
The City of Tacoma will evaluate all non-resident contractors for an out of state bidder preference. If the state of the non-resident contractor provides an in state contractor preference, a comparable percentage disadvantage will be applied to the non-resident contractor's bid prior to contract award. The responsive and lowest and best responsible bidder after application of any non-resident disadvantage will be awarded the contract.

The reciprocal preference evaluation does not apply to public works procured pursuant to RCW 39.04.155, RCW 39.04.280, federally funded competitive solicitations where such agencies prohibit the application of bid preferences, or any other procurement exempt from competitive bidding.

Bidders must provide the City of Tacoma with their state of incorporation or the state in which the business entity was formed and include whether the bidder has a physical office located in Washington.

The bidder shall submit documentation demonstrating compliance with above criteria on the enclosed State Responsibility and Reciprocal Bidder Information form.

C. SUBCONTRACTOR RESPONSIBILITY

1. The Contractor shall include the language of this subcontractor responsibility section in each of its first tier subcontracts, and shall require each of its subcontractors to include the same language of this section in each of their subcontracts, adjusting only as necessary the terms used for the contracting parties. The requirements of this section apply to all subcontractors regardless of tier.

2. At the time of subcontract execution, the Contractor shall verify that each of its first tier subcontractors meets the following bidder responsibility criteria:

   a. Have a current certificate of registration as a contractor in compliance with chapter 18.27 RCW, which must have been in effect at the time of subcontract bid submittal;

   b. Have a current Washington Unified Business Identifier (UBI) number;

   c. If applicable, have:

      a. Have Industrial Insurance (workers' compensation) coverage for the bidder's employees working in Washington, as required in Title 51 RCW;
      b. A Washington Employment Security Department number, as required in Title 50 RCW;
      c. A Washington Department of Revenue state excise tax registration number, as required in Title 82 RCW;
      d. An electrical contractor license, if required by Chapter 19.28 RCW;
      e. An elevator contractor license, if required by Chapter 70.87 RCW and;

3. Not be disqualified from bidding on any public works contract under RCW 39.06.010 (unlicensed or unregistered contractors) or 39.12.065(3) (prevailing wage).
II. CITY OF TACOMA

A. SUPPLEMENTAL RESPONSIBILITY CRITERIA – CITY OF TACOMA:

In order to be considered a responsible bidder, the prospective bidder shall have all of the following qualifications set forth in Tacoma Municipal Code 1.06.262:

1. Adequate financial resources or the ability to secure such resources;
2. The necessary experience, stability, organization and technical qualifications to perform the proposed contract;
3. The ability to comply with the required performance schedule, taking into consideration all existing business commitments;
4. A satisfactory record of performance, integrity, judgment and skills; and
5. Be otherwise qualified and eligible to receive an award under applicable laws and regulations.

In addition to the mandatory bidder responsibility criteria listed immediately above, the City may, in addition to price, consider any or all of the following criteria contained in Tacoma Municipal Code Chapter 1.06.262 in determining bidder responsibility:

1. The ability, capacity, experience, stability, technical qualifications and skill of the respondent to perform the contract;
2. Whether the respondent can perform the contract within the time specified, without delay or interference;
3. Integrity, reputation, character, judgment, experience, and efficiency of the respondents, including past compliance with the City’s Ethics Code;
4. Quality of performance of previous contracts;
5. Previous and existing compliance with laws and ordinances relating to contracts or services;
6. Sufficiency of the respondent’s financial resources;
7. Quality, availability, and adaptability of the supplies, purchased services or public works to the particular use required;
8. Ability of the respondent to provide future maintenance and service on a timely basis;
9. Payment terms and prompt pay discounts;
10. The number and scope of conditions attached to the submittal;
11. Compliance with all applicable City requirements, including but not limited to the City’s Ethics Code and its Small Business Enterprise and Local Employment and Apprenticeship programs;
12. Other qualification criteria set forth in the specification or advertisement that the appropriate department or division head determines to be in the best interests of the City.

The City may require bidders to furnish information, sworn or certified to be true, to demonstrate compliance with the City responsibility criteria set forth above. If the city manager or director of utilities is not satisfied with the sufficiency of the information provided, or if the prospective respondent does not substantially meet all responsibility requirements, any submittal from such respondent must be disregarded.
B. ADDITIONAL SUPPLEMENTAL CRITERIA – NOT APPLICABLE

C. MODIFICATIONS TO SUPPLEMENTAL CRITERIA

Potential bidders may request modifications to the City’s supplemental criteria by submitting a written request to the Purchasing Division via email to bids@cityoftacoma.org no later than 5:00 p.m. Pacific Time, three days prior to the submittal deadline. Please include the Specification No. and Title when submitting such requests. Requests must include justification for why certain criteria should be modified. Requests received after this date and time will not be considered.

The City will respond to a timely submitted request prior to the bid opening date. Changes to the supplemental criteria, if warranted, will be issued by addendum to the solicitation documents and posted to the City’s website for the attention of all prospective bidders.

D. DETERMINATION OF BIDDER RESPONSIBILITY

If the City determines the bidder does not meet the criteria above and is therefore not a responsible bidder, the City shall notify the bidder in writing with the reasons for its determination. If the bidder disagrees, the bidder may appeal the determination in a manner consistent with the City’s Protest Policy. Appeals are coordinated by the Purchasing Division heard by the Procurement and Payables Division manager for contracts less than or equal to $500,000 and by Contracts and Awards Board for contracts greater than $500,000.
PART 1

BID PROPOSAL AND CONTRACT FORMS
BID PROPOSAL

SPECIFICATION NO. ES21-0668F

Tacoma Landfill - Decommission GETS and Gas Probes (Rebid)

The undersigned hereby certifies that he/she has examined the location and construction details of the work as outlined in the Plans and Specifications for Spec No. ES21-0668F and has read and thoroughly understands the Plans and Specifications and contract governing the work embraced in this improvement and the method by which payment will be made for said work, and hereby proposes to undertake and complete the work embraced in this improvement in accordance with said Plans, Specifications, and contract and at the following schedule of rates and prices:

NOTES:

1. Unit prices of all items, all extensions, and total amount of bid should be shown. Show unit prices in figures only.
2. The notations below the item numbers refer to the specification section where information may be found regarding each contract item. These notations are intended only as a guide and are not warranted to refer to all specification sections where information may be found.

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>ITEM DESCRIPTION</th>
<th>ESTIMATED QUANTITY</th>
<th>UNIT PRICE</th>
<th>TOTAL AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 33 29 01</td>
<td>Landfill Gas Probes Decommissioning</td>
<td>31</td>
<td>Lump Sum</td>
<td>$ ________</td>
</tr>
<tr>
<td>2. 33 29 01</td>
<td>Landfill Gas Extraction Well Decommissioning</td>
<td>1</td>
<td>Lump Sum</td>
<td>$ ________</td>
</tr>
<tr>
<td>3. 33 29 01</td>
<td>Groundwater Monitoring Wells Decommissioning</td>
<td>38</td>
<td>Lump Sum</td>
<td>$ ________</td>
</tr>
<tr>
<td>4. 33 29 01</td>
<td>Groundwater Extraction Wells Decommissioning</td>
<td>14</td>
<td>Lump Sum</td>
<td>$ ________</td>
</tr>
<tr>
<td>5. 02 41 16</td>
<td>GETS Decommissioning</td>
<td>1</td>
<td>Lump Sum</td>
<td>$ ________</td>
</tr>
<tr>
<td>6. 31 23 22</td>
<td>W-02 Rehabilitation and Conversion to Monitoring Well</td>
<td>1</td>
<td>Lump Sum</td>
<td>$ ________</td>
</tr>
</tbody>
</table>

Subtotal (Items 1-6) $ ________

Tax 10.3% $ ________

Total $ ________

Contractor’s Name: ________________________
Specification No. ES21-0668F
SIGNATURE PAGE
CITY OF TACOMA
ENVIRONMENTAL SERVICES

All submittals must be in ink or typewritten, executed by a duly authorized officer or representative of
the bidding/proposing entity, and received and time stamped as directed in the Request for Bids page
near the beginning of the specification. If the bidder/proposer is a subsidiary or doing business on
behalf of another entity, so state, and provide the firm name under which business is hereby transacted.

REQUEST FOR BIDS SPECIFICATION NO. ES21-0668F
Tacoma Landfill - Decommission GETS and Gas Probes (Rebid)

The undersigned bidder/proposer hereby agrees to execute the proposed contract and furnish all
materials, labor, tools, equipment and all other facilities and services in accordance with these
specifications.

The bidder/proposer agrees, by submitting a bid/proposal under these specifications, that in the event
any litigation should arise concerning the submission of bids/proposals or the award of contract under
this specification, Request for Bids, Request for Proposals or Request for Qualifications, the venue of
such action or litigation shall be in the Superior Court of the State of Washington, in and for the County
of Pierce.

Non-Collusion Declaration

The undersigned bidder/proposer hereby certifies under penalty of perjury that this bid/proposal is
genuine and not a sham or collusive bid/proposal, or made in the interests or on behalf of any person or
entity not herein named; and that said bidder/proposer has not directly or indirectly induced or solicited
any contractor or supplier on the above work to put in a sham bid/proposal or any person or entity to
refrain from submitting a bid/proposal; and that said bidder/proposer has not, in any manner, sought by
collusion to secure to itself an advantage over any other contractor(s) or person(s).

Bidder/Proposer’s Registered Name

Signature of Person Authorized to Enter into Contracts for Bidder/Proposer Date

Address

Printed Name and Title

City, State, Zip

(Area Code) Telephone Number / Fax Number

E-Mail Address

State Business License Number
in WA, also known as UBI (Unified Business Identifier) Number

E.I.No. / Federal Social Security Number Used on Quarterly
Federal Tax Return, U.S. Treasury Dept. Form 941

State Contractor’s License Number
(See Ch. 18.27, R.C.W.)

E-Mail Address for Communications

Addendum acknowledgement #1_____ #2_____ #3_____ #4_____ #5_____

THIS PAGE MUST BE SIGNED AND RETURNED WITH SUBMITTAL.
Herewith find deposit in the form of a cashier’s check in the amount of $____________________ which amount is not less than 5-percent of the total bid.

SIGN HERE______________________________

---

**BID BOND**

KNOW ALL MEN BY THESE PRESENTS:

That we,______________________________________, as Principal, and __________________________________________ , as Surety, are held and firmly bound unto the City of Tacoma, as Obligee, in the penal sum of ________________________________ dollars, for the payment of which the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, by these presents.

The condition of this obligation is such that if the Obligee shall make any award to the Principal for

according to the terms of the proposal or bid made by the Principal therefor, and the Principal shall duly make and enter into a contract with the Obligee in accordance with the terms of said proposal or bid and award and shall give bond for faithful performance thereof, with Surety or Sureties approved by the Obligee; or if the Principal shall, in case of failure to do so, pay and forfeit to the Obligee the penal amount of the deposit specified in the call for bids, then this obligation shall be null and void; otherwise it shall be and remain in full force and effect and the Surety shall forthwith pay and forfeit to the Obligee, as penalty and liquidated damages, the amount of this bond.

SIGNED, SEALED AND DATED THIS ____________ DAY OF ________________, 20______.

PRINCIPAL: ________________________________

SURETY: ________________________________

________________________________________

________________________________________

________________________________________

________________________________________

________________________________________

________________________________________

________________________________________

________________________________________

________________________________________

________________________________________

________________________________________

Received return of deposit in the sum of $ ________________________________

________________________________________

________________________________________

Form No. SPEC-090A

Revised: 08/2004
Certification of Compliance with Wage Payment Statutes

The bidder hereby certifies that, within the three-year period immediately preceding the bid solicitation date (September 29, 2021), that the bidder is not a “willful” violator, as defined in RCW 49.48.082, of any provision of chapters 49.46, 49.48, or 49.52 RCW, as determined by a final and binding citation and notice of assessment issued by the Department of Labor and Industries or through a civil judgment entered by a court of limited or general jurisdiction.

I certify under penalty of perjury under the laws of the state of Washington that the foregoing is true and correct.

Bidder

________________________________________
Signature of Authorized Official*

________________________________________
Printed Name

________________________________________
Title

_________________________  __________________________  __________________________
Date  City  State

Check One:
Individual ☐  Partnership ☐  Joint Venture ☐  Corporation ☐

State of Incorporation, or if not a corporation, the state where business entity was formed:

________________________________________

If a co-partnership, give firm name under which business is transacted:

________________________________________

* If a corporation, proposal must be executed in the corporate name by the president or vice-president (or any other corporate officer accompanied by evidence of authority to sign). If a co-partnership, proposal must be executed by a partner.
State Responsibility and Reciprocal Bid Preference Information

Certificate of registration as a contractor (Must be in effect at the time of bid submittal):

Number: ____________________________
Effective Date: ______________________
Expiration Date: ______________________

Current Washington Unified Business Identifier (UBI) Number:
Number: ____________________________

Do you have industrial insurance (workers’ compensation) Coverage nor your employees working in Washington?

☐ Yes ☐ No ☐ Not Applicable

Washington Employment Security Department Number
Number: ____________________________
☐ Not Applicable

Washington Department of Revenue state excise tax Registration number:
Number: ____________________________
☐ Not Applicable

Have you been disqualified from bidding any public works contracts under RCW 39.06.010 or 39.12.065(3)?

☐ Yes ☐ No
If yes, provide an explanation of your disqualification on a separate page.

Do you have a physical office located in the state of Washington?

☐ Yes ☐ No

If incorporated, in what state were you incorporated?

State: _____________ ☐ Not Incorporated

If not incorporated, in what state was your business entity formed?

State: _____________

Have you completed the training required by RCW 39.04.350, or are you on the list of exempt businesses maintained by the Department of Labor and Industries?

☐ Yes ☐ No
CONTRACT

This Contract is made and entered into effective this ___ day of ___, 20__, ("Effective Date") by and between the City of Tacoma, a Municipal Corporation of the State of Washington ("City"), and legal name of Supplier including type of business entity ("Contractor").

That in consideration of the mutual promises and obligations hereinafter set forth the Parties hereto agree as follows:

I. Contractor shall fully execute and diligently and completely perform all work and provide all services and deliverables described herein and in the items listed below each of which are fully incorporated herein and which collectively are referred to as "Contract Documents":

1. Specification No. Enter Spec Number and Enter Spec Title together with all authorized addenda.
2. Contractor's submittal (or specifically described portions thereof) dated Enter Submittal Date submitted in response to Specification No. Enter Spec Number and Enter Spec Title.
3. Describe with specific detail and list separately any other documents that will make up the contract (fee schedule, work schedule, authorized personnel, etc.) or any other additional items mutually intended to be binding upon the parties.

Delete this highlighted sentence, paragraph II and sub-bullets #1 and #2 if there are no additional attachments to the contract (attachments would be things other than a specific, contract, or bonds).

II. In the event of a conflict or inconsistency between the terms and conditions contained in this document entitled Contract and any terms and conditions contained the above referenced Contract Documents the following order of precedence applies with the first listed item being the most controlling and the last listed item the least controlling:

1. Contract
2. List remaining Contract Documents in applicable controlling order.

III. The Contract terminates on xxxxx. (May remove if not applicable]

IV. The total price to be paid by City for Contracts full and complete performance hereunder may not exceed:

$___, plus any applicable taxes.

V. Contractor agrees to accept as full payment hereunder the amounts specified herein and in Contract Documents, and the City agrees to make payments at the times and in the manner and upon the terms and conditions specified. Except as may be otherwise provided herein or in Contract Documents Contractor shall provide and bear the expense of all equipment, work and labor of any sort whatsoever that may be required for the transfer of materials and for constructing and completing the work and providing the services and deliverables required by this Contract.

VI. The City's preferred method of payment is by ePayables (Payment Plus), followed by credit card (aka procurement card), then Electronic Funds Transfer (EFT) by Automated Clearing House (ACH), then check or other cash equivalent. CONTRACTOR may be required to have the capability of accepting the City's ePayables or credit card methods of payment. The City of Tacoma will not accept price changes or pay additional fees when ePayables (Payment Plus) or credit card is used. The City, in its sole discretion, will determine the method of payment for this Contract.

VII. Failure by City to identify a deficiency in the insurance documentation provided by Contractor or failure of City to demand verification of coverage or compliance by Contractor with these insurance requirements shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

VIII. Contractor acknowledges, and by signing this Contract agrees, that the Indemnification provisions set forth in the controlling Contract Documents, including the Industrial Insurance immunity waiver (if applicable), are totally and fully part of this Contract and, within the context of the competitive bidding laws, have been mutually negotiated by the Parties hereto.
IX. Contractor and for its heirs, executors, administrators, successors, and assigns, does hereby agree to the full performance of all the requirements contained herein and in Contract Documents.

X. It is further provided that no liability shall attach to City by reason of entering into this Contract, except as expressly provided herein.

IN WITNESS WHEREOF, the Parties hereto have accepted and executed, as of the Effective Date stated above, which shall be Effective Date for bonding purposes as applicable.

CITY OF TACOMA: CONTRACTOR:
By: By:

(City of Tacoma use only - blank lines are intentional)

Director of Finance: ________________________________

City Attorney (approved as to form): ________________________________

Approved By: ______________________________________

Approved By: ______________________________________

Approved By: ______________________________________

Approved By: ______________________________________

Approved By: ______________________________________

Approved By: ______________________________________

Approved By: ______________________________________

Approved By: ______________________________________
PAYMENT BOND
TO THE CITY OF TACOMA

Resolution No.
Bond No.

That we, the undersigned,
as principal, and _________
as a surety, are jointly and severally held and firmly bound to the CITY OF TACOMA, in the penal sum of,
$________________________, for the payment whereof Contractor and Surety bind themselves, their executors, administrators, legal representatives, successors and assigns, jointly and severally, firmly by these presents.

This obligation is entered into in pursuance of the statutes of the State of Washington, the Ordinances of the City of Tacoma.

WHEREAS, under and pursuant to the City Charter and general ordinances of the City of Tacoma, the said City has or is about to enter with the above bounden principal, a contract, providing for

| Specification No. |
| Specification Title: |
| Contract No. |

(which contract is referenced to herein and is made a part hereof as though attached hereto), and

WHEREAS, the said principal has accepted, the said contract, and undertake to perform the work therein provided for in the manner and within the time set forth.

This statutory payment bond shall become null and void, if and when the Principal, its heirs, executors, administrators, successors, or assigns shall pay all persons in accordance with RCW 39.08, 39.12, and 60.28, including all workers, laborers, mechanics, subcontractors, and materialmen, and all person who shall supply such contractor or subcontractor with provisions and supplies for the carrying on of such work, and all taxes incurred on said Contract under Titles 50 and 51 RCW and all taxes imposed on the Principal under Title 82 RCW; and if such payment obligations have not been fulfilled, this bond shall remain in full force and effect.

The Surety for value received agrees that no change, extension of time, alteration or addition to the terms of the Contract shall in any way affect its obligation on this bond, and waives notice of any changes, extension of time, alteration or addition to the terms of the Contract or the work performed. The Surety agrees that modifications and changes to the terms and conditions of the Contract that increase the total amount to be paid the Principal shall automatically increase the obligation of the Surety on this bond and notice to Surety is not required for such increased obligation.

No suit or action shall be commenced hereunder by any claimant unless claimant shall have given the written notices to the City, and where required, the Contractor, in accordance with RCW 39.08.030.

The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of claims which may be properly filed in accordance with RCW 39.08 whether or not suit is commenced under and against this bond.

If any claimant shall commence suit and obtain judgment against the Surety for recovery hereunder, then the Surety, in addition to such judgment and attorney fees as provided by RCW 39.08.030, shall also pay such costs and attorney fees as may be incurred by the City as a result of such suit. Venue for any action arising out of or in connection with this bond shall be in Pierce County, WA.

Surety companies executing bonds must be authorized to transact business in the State of Washington as surety and named in the current list of “Surety Companies Acceptable in Federal Bonds” as published in the Federal Register by the Audit Staff Bureau of Accounts, U.S. Department of the Treasury.
One original bond shall be executed, and be signed by the parties’ duly authorized officers. This bond will only be accepted if it is accompanied by a fully executed power of attorney for the office executing on behalf of the surety.

Principal: Enter Vendor Legal Name

________________________________________

By: ______________________________________

Surety:

________________________________________

By: ______________________________________

By: ______________________________________

Agent’s Name: ____________________________

Agent’s Address: __________________________
PERFORMANCE BOND
TO THE CITY OF TACOMA

That we, the undersigned, as principal, and ______________________ as a surety, are jointly and severally held and firmly bound to the CITY OF TACOMA, in the penal sum of $________________, for the payment whereof Contractor and Surety bind themselves, their executors, administrators, legal representatives, successors and assigns, jointly and severally, firmly by these presents.

This obligation is entered into in pursuance of the statutes of the State of Washington, the Ordinances of the City of Tacoma.

WHEREAS, under and pursuant to the City Charter and general ordinances of the City of Tacoma, the said City has or is about to enter with the above bounden principal, a contract, providing for

- Specification No.
- Specification Title:
- Contract No.

(which contract is referenced to herein and is made a part hereof as though attached hereto), and

WHEREAS, the said principal has accepted, the said contract, and undertake to perform the work therein provided for in the manner and within the time set forth.

This statutory performance bond shall become null and void, if and when the principal, its heirs, executors, administrators, successors, or assigns shall well and faithfully perform all of the Principal’s obligations under the Contract and fulfill all terms and conditions of all duly authorized modifications, additions and changes to said Contract that may hereafter be made, at the time and in the manner therein specified; and if such performance obligations have not been fulfilled, this bond shall remain in force and effect.

The Surety for value received agrees that no change, extension of time, alteration or addition to the terms of the Contract, the specifications accompanying the Contract, or to the work to be performed under the Contract shall in any way affect its obligation on this bond, and waives notice of any change, extension of time, alteration or addition to the terms of the Contract or the work performed. The Surety agrees that modifications and changes to the terms and conditions of the Contract that increase the total amount to be paid the Principal shall automatically increase the obligation of the Surety on this bond and notice to Surety is not required for such increase.

If the City shall commence suit and obtain judgment against the Surety for recovery hereunder, then the Surety, in addition to such judgement, shall pay all costs and attorney’s fees incurred by the City in enforcement of its rights hereunder. Venue for any action arising out of in in connection with this bond shall be in Pierce County, Washington.

Surety companies executing bonds must be authorized to transact business in the State of Washington as surety and named in the current list of “Surety Companies Acceptable in Federal Bonds” as published in the Federal Register by the Audit Staff Bureau of Accounts, U.S. Department of the Treasury.

One original bond shall be executed, and signed by the parties’ duly authorized officers. This bond will only be accepted if it is accompanied by a fully executed power of attorney for the office executing on behalf of the surety.

Principal: Enter Vendor Legal Name
______________

By: __________________________

Surety:
______________

By: __________________________

Agent’s Name: ____________________

Agent’s Address: ____________________

Form No. SPEC-100A
04/09/2020
GENERAL RELEASE TO THE CITY OF TACOMA

The undersigned, named as the contractor for Project / Spec. # between ___________________________ and the City of Tacoma, (Themselves or Itself) dated ____________________________, 20__, hereby releases the City of Tacoma, its departmental officers and agents from any and all claim or claims whatsoever in any manner whatsoever at any time whatsoever arising out of and/or in connection with and/or relating to said contract, excepting only the equity of the undersigned in the amount now retained by the City of Tacoma under said contract, to-wit the sum of $__________________________.

Signed at Tacoma, Washington this _____ day of ____________, 20__.

____________________________________
Contractor

By ________________________

Title ________________________
PART 2
PROJECT DETAILS
ES21-0668F
PROJECT STATEMENT OF WORK
City of Tacoma – Tacoma Landfill
Decommission GETS and Gas Probes (Rebid)
3110 South Mullen Street, Tacoma, Washington

City of Tacoma, Environmental Services
Tacoma, WA

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I. PROJECT BACKGROUND

The City of Tacoma (City) Landfill is part of the Commencement Bay/South Tacoma Channel Federal Superfund Site (Site) which was placed on the Nation Priorities List (NPL) in 1983 by the U.S. Environmental Protection Agency (EPA). A final remedy to address subsurface contamination from the City Landfill portion of the Site is documented in the 1988 Record of Decision (ROD) issued by the EPA (EPA 1988\(^1\)) with concurrence from the Washington State Department of Ecology\(^2\) (Ecology). Remedial actions have been carried out by the City under a 1991 Consent Decree (CD) (Court 1991\(^3\)) with EPA and Ecology, which included the 1988 ROD as Appendix I. Landfilling at the City Landfill concluded in 2013, and formal closure occurred in April 2015 with EPA’s approval of a final construction submittal. The City Landfill has been in post-closure care (PCC) status since that time. The City is implementing PCC practices documented in the CD and Washington Administrative Code (WAC) 173-351-500 as required by its permit with Tacoma-Pierce County Health Department (TPCHD).

This Project Statement of Work (SOW) pertains to decommissioning of 31 landfill gas monitoring probes, 1 landfill gas extraction well (CA18), 38 groundwater monitoring wells, and 14 groundwater extraction wells (collectively herein termed installations; 84 total) that were installed to support the final remedy and are no longer required for PCC monitoring activities. Decommissioning of the installations falls under the regulatory authority of Ecology, and associated standards are specified in WAC 173-160, Minimum Standards for Construction and Maintenance of Wells (Minimum Standards). However, because the City Landfill portion of the Site remains under EPA’s regulatory authority, and to be consistent with requirements of the CD, the City submitted a decommissioning work plan to EPA for approval under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) authority for permit equivalency. The intention of the work plan is to meet the requirements outlined in WAC 173-160. The SOW also includes rehabilitation and modification of groundwater extraction well W-02, as well as decommissioning the Landfill's Groundwater Extraction and Treatment System (GETS) and connecting the system's existing influent line to the existing discharge piping to the storm sewer. The need to treat GETS influent ceased after 1998, and untreated GETS influent has been discharged at the GETS Outfall to Leach Creek since 2003.

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\(^2\) Ecology’s letter of concurrence is provided as Appendix D of the 1988 ROD.

Upon award of the Work defined in this SOW, the Contractor shall enter into a binding agreement (Contract) with the City of Tacoma (Owner), which shall specify the terms and conditions upon which performance of the Work, specified herein, shall be performed.

This section provides general project requirements that shall be observed by the Contractor during performance of the Work for the duration of the Contract.

**CONDUCT OF WORK**

**Coordination**

Before starting the Work, Contractor shall identify to the Owner and the Owner’s Consultant an authorized representative who shall have complete authority to represent and to act for the Contractor. The authorized representative shall be on-site at all times while the Work is in progress or shall have a designated alternate when not present. The authorized representative shall not be removed from the project without notification to Owner and Owner’s Consultant.

Following the notice to proceed, the Contractor will coordinate a pre-construction conference call or onsite meeting with the Owner and the Owner’s Consultant to discuss schedule, approach, and logistics associated with this SOW. During implementation of the Work, daily tailgate meetings will be led by the Contractor, or their authorized representative, at the start of the work day with the Owner’s Consultant, the Owner (when available), and the Contractor’s designated workers including subcontractors.

Contractor maintains responsibility for coordinating disposal of waste generated during Work to the Landfill’s transfer station (for solid waste), or other appropriate waste facility in coordination with the Owner and the Owner’s Consultant.

Coordination with Landfill staff, impacted private property owners or their representatives, private property tenants, and other contractors unaffiliated with this Work but within the Work area shall be made by Contractor through the Owner or the Owner’s Consultant.

**Work Hours**

Standard work hours are 8:00 a.m. to 5:00 p.m., Monday through Friday. Contractor may propose alternative work schedules; however, the proposed work schedule may not be approved if Owner’s Consultant is not available during the proposed work hours or if granting such approval is beyond the City’s control. Landfill Transfer Center hours are as follows:

- Monday: 9:00 AM to 5:30 PM
- Tuesday through Saturday: 8:00 AM to 6:00 PM
- Sundays: 8:00 AM to 4:45 PM
Regulatory Requirements

Contractor is responsible for determining requirements and complying with local, state, and federal laws, regulations, and permits that govern the Work. The Contractor shall be aware of applicable or relevant and appropriate requirements (ARARs) for the Work, shall determine the relevance of the regulations to executing the Work in this Contract, and shall comply with all applicable requirements of the regulations in performing the Work.

GENERAL ACCESS REQUIREMENTS

The Work area is located both on and off City Landfill property. There are existing access roads to all 84 installation locations and the GETS, therefore construction of temporary roads will not be required as a part of this SOW. Access to onsite installations and the GETS located within the fenced boundary of the City Landfill will be coordinated with the Owner during City Landfill hours of operation defined above under “Conduct of Work.” The City Landfill is located at 3110 S Mullen Street, Tacoma, Washington. Offsite installations are located on other City property, private property, or right-of-way. Specific access considerations are discussed below and included on the Construction Drawings (Attachment 1).

Private Property Access

The Contractor is to outline an anticipated Work schedule for each individual private property location within the Work area. The Owner is to notify property owners with a courtesy letter and oversee that the intent of individual access agreements are fulfilled.

Right-of-way Access

The Owner is responsible for obtaining necessary right-of-way access permits prior to the Contractor beginning work. When installations are located within or near roadways, the Contractor is responsible for traffic control and associated coordination with the City. The Contractor is also responsible for traffic control and associated coordination with the City when performing Work at the GETS.

Other Access Constraints

The Owner or the Owner’s Consultant will coordinate unlocking the appropriate gate(s) when access is required to City property outside of the City Landfill.

Irregular or Non-Routine Access

Access to the Work area located within private-property or City property on an irregular basis and during other than established working hours will require prior approval by the Owner.

Maintenance of Access

To the extent practicable, Contractor shall not obstruct or interfere with access by others
to existing facilities adjacent to the Work area during Work under this Contract.

Construction Laydown Yard and Parking
Temporary storage of Contractor vehicles and equipment, construction materials, and solid waste construction debris pertaining to the Work shall occur where approved by the Owner.

COORDINATION AND COOPERATION WITH OTHER CONTRACTORS AND LANDFILL OPERATIONS STAFF
Other contractors and landfill operations staff may be conducting other work within the Work area. Contractor shall coordinate the Work under this SOW with any other contractors working within the Work area and/or landfill operations staff to minimize conflicts and to maintain a cooperative effort in completion of the Work.

CONSTRUCTION SCHEDULE REQUIREMENTS
Work Flow
The Work shall be planned, scheduled, and performed in accordance with this SOW and Contract. Contractor shall prepare and maintain a construction schedule that meets the following requirements:

- Work will commence upon completion of the City’s bid and procurement process, which is anticipated by __________. The decommissioning work plan was approved by EPA October 13, 2020.
- All Work, including surface restoration at decommissioned installations and GETS, shall be substantially completed by __________. Owner may choose to extend this deadline due to circumstances such as weather or extended EPA review periods.

Potential Schedule Constraints
The following special constraints have been identified as potentially having an impact on the performance of the Work or schedule. It is not intended to be a comprehensive list of constraints that may result from the execution of the Work, but as an aid to the Contractor in development of schedules and in executing the Work. Additional constraints may exist or develop as a result of required Work execution or Contractor’s proposed Work methods or sequence. In any event, Contractor is responsible for compliance with the requirements of the various specification sections and the Work procedures and protection requirements contained herein, and establishing all constraints associated with the Work execution and incorporating them into Work schedules and proposed Work activities.

PROTECTION OF PROPERTY
Contractor shall protect all property within or in the vicinity of the Work area. Contractor shall ensure that property is not removed, damaged, destroyed, or prevented from its normal use unless so designated in the SOW. All property adjacent to the Work area shall be protected including, but not limited to, protection from construction-generated dust, debris, water, and vibration. Property includes land, utilities, landscaping, markers and monuments, monitoring wells, buildings, structures, site and drainage improvements, and
other improvements, whether shown on the Construction Drawings or not. No work shall occur outside the Work area which includes (1) the construction limits necessary to complete the Work included with this SOW for the 84 installation locations shown on the Construction Drawings, decommissioning of the GETS, and rehabilitation/modification of well W-02, and (2) the Owner-designated construction laydown and parking area(s). No work shall be conducted in restricted areas of the City Landfill unless coordinated and approved by the Owner.

Contractor shall notify the public one-call utility notification center and perform a private utility locate at least 48 hours prior to any below-grade excavation work, and shall be responsible for verification of location and depth of utilities in the vicinity of Work, including potholing with an airknife/vactor truck to a depth of at least 1 foot(ft) below planned excavation depth where existing utilities will be crossed, or where trenching or excavating is planned within 3 ft of existing utilities. Contractor shall be responsible for any damages to existing utilities caused by the Contractor’s work, where those utilities have been properly identified by public or private locates or on the Construction Drawings. All utilities that are damaged shall be repaired and restored to their original operation at the Contractor’s expense.

SPILLS AND HAZARDOUS MATERIALS

In the event of a spill or release of a hazardous substance (as designated in 40 Code of Regulations [CFR] 302), pollutant, contaminant, or oil (as governed by the Oil Pollution Act [OPA], 33 USC 2701 et seq.), Contractor shall notify the Owner immediately. Immediate containment actions shall be taken to minimize the effect of any spills or leaks. Cleanup shall be in accordance with applicable federal, state, and local regulations. As directed by the Owner, sampling and testing shall be performed to verify that spills have been cleaned up. Spill cleanup and testing shall be done at no additional cost to the Owner.

RESPONSIBILITIES

In addition to the requirements previously or subsequently indicated in this SOW, the Contractor is responsible for the following:

- Obtaining construction-related permits (excluding right of way access permits) necessary for performance and completion of Work described herein. Additional information regarding permitting requirements is provided below in Item III: GENERAL TASKS, REQUIREMENTS, AND SUBMITTALS.

- Providing all labor, equipment, materials, personnel transportation, supervision, and management required to complete the Work, environmental protection (e.g., spill protection and containment), site control and traffic control, grading, soil handling, erosion and sediment control, hauling and disposal of generated waste, and demolition debris to Owner-designated disposal/recycling facilities.

- Providing qualified and appropriately trained personnel to complete the Work and complying with the requirements described herein and/or required by law. All construction workers that may come in contact with landfill refuse and hazardous materials contained in site groundwater must have current 40-hour HAZWOPER training.
• Providing appropriate personal protective equipment (PPE) for all employees. Contact with contaminated media may occur during construction activities. Contaminated groundwater present within the Work area and waste materials generated during decommissioning, particularly waste from within a previously active Landfill cell, may contain contamination. Therefore, for bidding purposes, assume modified Level “C” PPE (including gloves and eye protection) may be necessary for persons performing decommissioning activities or handling generated waste.

• Appropriately managing stormwater flows, implementing Best Management Practices (BMPs) for environmental and sediment and erosion control protection.

• Maintaining all equipment in good working order. Leaking equipment shall immediately be removed or demobilized from the site unless repairs can be made within 24 hours. Any leaking oil or fuel must be controlled to prevent contamination of soil or surface water.

• Installing appropriate traffic control measures and barricades around Work areas accessible to the public including signs. If necessary, develop traffic control plan for submission to the City and coordinate with the Owner.

• Cooperating with and supporting Owner’s consultants.

• Maintaining spill cleanup supplies such as absorbent pads and booms in appropriate quantities for use at Work areas.

• Maintaining records and noting deviations from the Construction Drawings to aid and assist with preparation of post-construction as-built drawings.

Owner will be responsible for the following:

• Obtaining regulatory approval from EPA to implement the aforementioned decommissioning work plan.

• Providing access to the Work areas (and escorts, as necessary) during normal working hours.

• Providing consultant to conduct construction oversight on behalf of the Owner to ensure compliance with construction provisions and to monitor for potentially hazardous conditions related to site contamination.

• Coordination with and post-construction/decommissioning reporting to the EPA, TPCHD, and Ecology except where otherwise specified otherwise within this SOW (e.g. well decommissioning specifications with regards to driller well reporting).

III. GENERAL TASKS, REQUIREMENTS, AND SUBMITTALS

The following required elements of the project shall be followed or completed prior to performance of field activities:

PERMITTING

Contractor shall be responsible for complying with all applicable permits, authorizations, and approval conditions associated with this SOW, and shall keep the Owner and the Owner’s Consultant informed during the permitting process.
With the exception of right-of-way access permits, Contractor shall apply for and obtain all other necessary and applicable local, state, and federal permits for completion of the Work. Work completed within the area defined in the Consent Decree as the “Site” will not require any federal, state, or local permits (with the exception of right-of-way access permits, as necessary, and notices of intent to drill and well completion reports filed with Ecology). The area defined as the Site is depicted on Attachment 1 site plans. Outside of the area defined as the Site, additional permits may apply. Contractor shall determine what permits are required, apply for permits in a timely manner, diligently pursue securing permits, comply with any stipulations in the permits including coordinating applicable inspections, and pay all applicable and appropriate permit fees to the permitting agency. Note: because this is a City project, the City may waive permit requirements; Contractor to discuss with the Owner.

Contractor may request assistance, as necessary, from the Owner or the Owner’s Consultant, but, in all cases, shall be responsible for obtaining and complying with permits. Contractor to verbally notify the Owner’s Consultant as soon as possible and provide immediate written notification to the Owner’s Consultant in the event that a permit cannot be obtained or will likely be obtained with agency stipulations that significantly affect the performance and cost of the work.

**EROSION AND SEDIMENT CONTROL**

Contractor shall implement and maintain appropriate Temporary Erosion and Sediment Control (TESC) measures and BMPs, as prescribed in the City’s *Stormwater Management Manual* (City of Tacoma 2016¹), and as shown on Construction Drawings in all areas disturbed by construction activities. Contractor shall perform corrective actions, as needed, that are identified to Contractor based on the site inspections performed by the Owner or the Owner’s Consultant. Contractor shall take appropriate measures to prevent track-out of dirt onto public roads. All loads of construction materials or debris shall be covered for transport to or from the Work areas. Upon completion of vegetation clearing or land disturbing work, Contractor shall implement appropriate stabilization measures to prevent erosion of bare dirt left by construction activities.

**HEALTH AND SAFETY**

Work shall be performed in accordance with applicable state and federal occupational health and safety regulations. Contractor shall prepare and comply with a health and safety plan that is at least as stringent as the project health and safety plan.

SUBMITTALS

Submittal Requirements

Two copies of each hard copy submittal, or one electronic copy, will be provided by the Contractor to the Owner and the Owner’s Consultant. All formally furnished submittals shall bear a Contractor’s approval stamp or a certification. The stamp or certification shall be signed by an authorized representative of the Contractor. The Contractor’s stamp or certification on any submittals shall constitute a representation to the Owner and the Owner’s Consultant that the Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers and similar data, or that Contractor assumes full responsibility for doing so, and that Contractor has reviewed or coordinated each submittal with the requirements of the Contract Documents.

Each submittal shall be accompanied by a transmittal letter that describes the items submitted. The transmittal letter shall be clearly labeled “City of Tacoma - Tacoma Landfill, Decommissioning Plan” and shall have a submittal number. The first submittal shall have submittal number 01, and subsequent submittals shall be consecutively numbered. The initial version of the submittal shall be identified as “Revision 0,” and subsequent submittals shall be numbered consecutively starting with “Revision 1.”

All submittals shall be addressed to the Owner’s Consultant at the following address:

Landau Associates
2107 South C Street
Tacoma, WA 98402
Attention: Mr. Ben Lee

Electronic submittals may be sent via email to: blee@landauinc.com.

Submittal Review

After review of each of Contractor’s submittals, the material will be returned to Contractor marked as follows:

A. “No Exceptions Taken.” Accepted subject to its compatibility with future submittals and additional partial submittals for portions of Work not covered in this submittal. Does not constitute approval or deletion of specified or required items not shown in the partial submittal.

B. “Make Corrections Noted” (No Resubmittals Required). Same as Item 1, except that minor corrections as noted shall be made by Contractor.

C. “Amend and Resubmit.” Rejected because of major inconsistencies or errors. Resolve or correct before next submittal.

D. “Rejected-Resubmit.” Submitted material does not conform to the Contract Documents in a major respect (i.e., wrong size, model, capacity, or material).

Within 5 days of receipt of Shop Drawings or manufacturer’s data, the Owner’s Consultant will return one copy of each drawing and/or data sheet, marked to indicate the result of the Consultant’s review.

Copies marked “No Exceptions Taken” or “Make Corrections Noted” authorize the Contractor to proceed with construction covered by those Drawings or data sheets with
corrections, if any, incorporated. No revision in any way shall be made after a Drawing has been marked “No Exceptions Taken” without resubmitting the Drawing for review.

When prints of Drawings have been marked “Amend and Resubmit” or “Rejected-Resubmit,” the Contractor shall make the necessary corrections and submit required copies. Every revision shall be shown by number, date, and subject in a revision block and, in addition, each revised Drawing shall have its latest revision numbers and items clearly indicated by clouding around the revised areas on the Drawing. Drawings submitted without these indications will be considered non-conforming and will be returned to the Contractor without review.

The applicable parts of the requirements specified above for Drawings shall apply equally to design data, catalog cuts, illustrations, printed specifications, draft reports, or any other submittal furnished for review.

**Specific Project Submittals**

The following shall be submitted prior to commencement of construction:

**Health and Safety Plan**

At least 14 calendar days before the construction mobilization, Contractor shall submit a worker Health and Safety Plan conforming to the requirements indicated above.

**Schedule**

Contractor shall submit the construction schedule within 10 calendar days following receipt of notice to proceed.

**Final Site Stabilization Plan**

At least 14 calendar days before mobilization, Contractor shall provide a plan for final site stabilization. Plan shall address the anticipated total areas and locations of site disturbance using the BMPs described in the TESC and the *Stormwater Management Manual*. The Owner will provide written comment or approval prior to scheduled mobilization.

**Equipment/Materials List**

Before beginning onsite work and within 20 days following receipt of notice to proceed, Contractor shall submit a list of materials to the Owner's Consultant for review. The list shall include all items of equipment and material, and the names of the manufacturers and suppliers with whom purchase orders have been placed. Provide sufficient data to precisely identify materials and equipment Contractor proposes to furnish. The list shall include Construction Drawing or Specification references. The Owner's Consultant will attempt to approve or disapprove of proposed materials/equipment within 3 working days of the submittal. Contractor shall resubmit the above requested information for any equipment or materials that are rejected by the Owner's Consultant.
Manufacturer’s Information and Construction Quality Assurance Certification

As indicated in this SOW, Specifications, and Construction Drawings, a dual geomembrane cap system may be present at onsite installation location LW-01 which is proposed for decommissioning. If the dual geomembrane cap system is present, decommissioning of LW-01 will leave a hole in the geomembrane requiring repair during reconstruction of the dual geomembrane cap system. Contractor shall provide a submittal of all manufacturer’s specifications, cut sheets, instructions, any third-party construction quality assurance (CQA) testing results, and certifications for new geomembrane patching material to the Owner’s Consultant for review and approval a minimum of three (3) days prior to scheduled repair. Contractor shall provide an electronic copy of these materials in a single electronic file in PDF format.

Record Drawings

During the progress of the Work, maintain at the site a detailed record of all changes from the layouts, details, or other information shown on the Drawings and on Contractor-furnished drawings and data. Enter the changes on the record drawings promptly, but no greater than on a weekly basis, using red, erasable pencil. Have on file current working record drawings showing all changes, associated construction dates, documentation of the Owner’s approval for changes, and documentation of Contractor authorization to execute changes.

Contractor shall prepare and submit final mark-up of the Drawings indicating as-built dimensions and any other as-built changes to Drawings. The set of Drawings shall be clean except for red pencil used to indicate the as-built changes. Record drawings shall be submitted within 14 days of completion of the work.

Permit Applications

Permit applications, where necessary, shall be prepared and submitted to the appropriate permitting authority in a timely manner and per the project schedule, allowing sufficient lead time for agency review and approval.

Extensions

If the Contractor is unable to meet the submittal deadlines identified above for any reason, Contractor shall request an extension from the Owner and Owner’s Consultant at least 2 working days prior to, and as far in advance of, the deadline as practicable. The request shall identify the reason why an extension is needed and a proposed revised deadline.

PROJECT CLOSEOUT

The Contractor warrants the Work delivered under the contract to be free from defects in material or workmanship, and against damage caused prior to final inspection. Unless otherwise specified, this warranty extends for a period of one (1) year from the date of final acceptance.

The Contractor shall promptly repair or replace all defective or damaged products or materials delivered under the contract.
At the end of Work, Contractor’s tools and equipment must remain on site until Owner/Owner’s Consultant performs final inspection and gives approval for Contractor to demobilize.

Prior to requesting final inspection, the Contractor shall submit to Owner and the Owner’s Consultant written certification that the Work has been thoroughly inspected by Contractor and is complete in accordance with the Contract Documents. A project closeout punchlist may be used by Contractor, Owner, and the Owner’s Consultant.
IV. SCOPE OF WORK

Contractor shall decommission the 84 installations (i.e., landfill gas probes, landfill gas extraction well, groundwater monitoring wells, and groundwater extraction wells) shown on the Construction Drawings and complete associated above-ground extraction well piping abandonment, and dual liner reconstruction as shown on the Construction Drawings. Contractor shall decommission the GETS and connect the existing influent line to the existing discharge piping to the storm sewer, as shown on the GETS Removal Drawings (Attachment 2). Contractor shall also rehabilitate groundwater extraction well W-02 and convert to a monitoring well if video evidence determines the screen is not damaged to an extent that would preclude conversion of the existing well to a monitoring well. In the event that discrepancies between this SOW and the Construction Drawings are identified, the Construction Drawings shall take precedence. The discrepancy shall also be identified to the Owner’s Consultant and/or clarification requested, as needed. A summary of the Scope of Work is presented below.

SUMMARY

Contractor shall be responsible for implementing all Work and provide all materials and equipment needed to complete the Work in accordance with the Construction Drawings, GETS Removal Drawings, and these specifications.

The major elements of the work include, but are not limited to, the following items:

- Removal and abandonment of above-grade piping including installation of blind flanges as directed by the Owner and the Owner’s Consultant, and prior to, decommissioning the following groundwater extraction wells: W-06, W-07, W-08, W-12, W-13, W-14, W-17, W-18, W-19, W-20, W-21, and W-22.
- Investigate if the dual membrane liner system was constructed around well location LW-01, and then proceed with specified decommissioning approach.
- Decommission 84 installations as specified.
- Removing sand from well W-02.
- Video surveying the existing well W-02 to assess the extent of screen damage.
- If screen condition will allow it, installing a 2-inch diameter piezometer within the existing well and filling the annual space with sand and bentonite chips (installing the piezometer within the existing well casing).
- If the dual membrane liner system was constructed around LW-01, include the following:
  1. Deconstruction of dual liner system including pre-deconstruction surveying to determine slopes and elevations, careful excavation and temporary stockpiling of sand and soil layers, and careful cutting of geotextiles by qualified specialist to facilitate subsequent reconstruction efforts post-LW-01 decommissioning.
  2. LW-01 decommissioning by licensed driller.
  3. Reconstruction of dual liner system as specified including any necessary
provisions, careful backfilling and light grading and leveling, subgrade preparation and compaction, geotextile fabrics restoration and specified testing, and surveying to verify restoration of slopes and elevations.

- Removal and disposal of materials comprising the GETS.
- Backfilling trenches, holes, or pits that result from removal of components of the GETS.
- Installing piping to reconnect the existing influent line extraction piping from GETS to the existing discharge piping to the storm sewer.
- Onsite disposal of generated construction debris at landfill transfer station in coordination with the Owner and the Owner’s Consultant.
- Site restoration at installation locations, the GETS, and the construction laydown area.
- Preparation of record drawings to reflect the "as-built" condition.

Contractor shall manage the Owner-specified construction laydown area in such a manner as to prevent access from the public, and implement applicable stormwater best management practices (i.e., prevent sediment tracking, cover materials, etc.). Contractor shall prepare above-grade piping decommissioning prior to commencing installation decommissioning. Owner will be responsible for clearing vegetation around select installations, as described in Attachment 15.
The following sections provide technical specifications for applicable elements of work that supplement or augment the specifications provided in the Construction Drawings.

This part includes the following Sections:

Division 1 - General Provisions
   Section 01 74 23: Site Restoration
   Section 02 41 16: Removal of Structures and Obstructions

Division 2 - Existing Conditions
   Section 31 05 00: Cap Layer System Repair
   Section 31 10 00: Vegetation Clearing at Select Installations

Division 31 - Earthwork
   Section 31 23 22: Groundwater Well Rehabilitation and Modification
   Section 33 29 00: Groundwater Extraction Wellhead Piping Decommissioning

Division 33 - Utilities
   Section 33 29 01: Installation Decommissioning
   Section 33 41 00: General Pipe Installation Requirements

PREPARED ON BEHALF OF: City of Tacoma
                        326 E. D Street
                        Tacoma, WA 98421
SECTION 01 74 23 – SITE RESTORATION

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section describes general site restoration requirements for areas where Work is substantially completed or will not be actively worked for at least 1 week.

1.2 RELATED SECTIONS

A. All.

1.3 REFERENCES

A. Attachment 15 – Well Details

PART 2 – PRODUCTS

Not Applicable to This Section

PART 3 EXECUTION

3.1 FINISHING AND CLEANUP

A. Restore site to pre-construction conditions, where applicable. The entire site shall be cleared of all materials such as construction debris, paper, wood, glass containers, trash, wire, rubble, plastic, fiberglass, and other undesirable items as directed by the Owner’s Consultant. Any soil stockpiles shall be removed or spread where generated, as approved by the Owner’s Consultant.

B. Contractor shall avoid soil compaction in natural areas.

C. The Owner’s Consultant shall be the sole judge of the need to replace damaged/disturbed vegetation. Leave area in a clean and neat condition.

D. Surplus materials, tools, equipment and temporary structures shall be removed by the Contractor. All locations where the Work occurs, as defined in the Construction Drawings and including the construction laydown yard, shall be left clean.

E. Site restoration requirements for individual installations are described in Attachment 15.

END OF SECTION
SECTION 02 41 16 – REMOVAL OF STRUCTURES AND OBSTRUCTIONS

PART I – GENERAL

1.1 DESCRIPTION

A. The Work described in this section includes removing and disposing of, or salvaging, materials comprising the treatment system. The Work also includes reconnecting the extraction system discharge line to the storm sewer discharge line. The Work will be completed in the treatment system area shown on Attachment 2 located in the northwest portion of the Landfill (Work area). Elements of the treatment system are shown on Attachment 2. The Work also includes the backfilling of trenches, holes, or pits that result from removal of components of the treatment system.

B. Protect adjacent construction and assets including landscaped areas, utilities, pavement, concrete structures, manholes, electrical items including poles, automobiles, trucks, equipment, and other items. Contractor shall repair or replace any damages at no cost to the Owner and to the Owners satisfaction.

C. Perform demolition work in close coordination with the Owner.
   1. Consult regularly, on as frequently as a daily basis, with the Owner before scheduling work activities involving demolition.
   2. Request authorization from the Owner prior to undertaking any demolition work activity for which the Contractor shall intend to claim additional compensation, or additional time.

D. Selectively demolish and remove only those existing permanent improvements indicated to be removed on Attachment 2, and as identified in this Section.

1.2 RELATED SECTIONS

A. Section 01 74 23 – Site Restoration

B. Section 33 41 00 – General Pipe Installation Requirements

1.3 REFERENCES

B. Attachment 2 – Groundwater Extraction Treatment System Removal Drawings

1.4 SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner’s on-site operations are uninterrupted.
2. Interruption of utility services.

3. Coordination for shutoff, capping, and continuation of utility services.

4. Locations of temporary traffic control and means of ingress and egress, including for other tenants affected by selective demolition operations.

5. Coordination of Owner’s continuing occupancy of portions of existing facility and of Owner’s partial occupancy of completed Work.

6. Identify dates required for Owner to vacate areas affected.

B. Inventory: After demolition is complete, submit a list of items that have been removed and salvaged.

1.5 QUALITY ASSURANCE

A. Demolition Firm Qualifications: A firm with a minimum of five (5) years specialized experience in demolition work similar in material and extent to that indicated for this Project.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Pre-demolition Conference: Conduct conference at Project Site. Review methods and procedures related to selective demolition including, but not limited to, the following:
   1. Inspect and discuss condition of construction to be selectively demolished.

   2. Review and finalize selective demolition schedule and verify availability of materials, demolition, personnel, equipment, and facilities needed to make progress and avoid delays.

   3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

1.6 HANDLING AND DISPOSAL

A. Delivery, storage, and handling of materials for structure removal may be stored at the Owner-specified construction laydown area. Material piles outside of the construction laydown area shall only be located in areas specified by the Owner and the Owner’s Consultant.

1.7 PROJECT/SITE CONDITIONS
A. Owner will occupy portions of the site immediately adjacent to selective demolition area. Conduct selective demolition so Owner’s operations will not be disrupted.

B. Provide not less than seventy-two (72) hour notice to Owner of approved demolition activities that will affect Owner’s operations.

C. Maintain access to existing drive aisles, parking, and other adjacent occupied or used facilities. Do not close or obstruct drive aisles, parking, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.

D. Owner assumes no responsibility for condition of areas to be selectively demolished. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

PART 2 – PRODUCTS

Not Applicable to This Section

PART 3 – EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. With certain exceptions, Contractor shall raze, remove, and dispose of, all buildings and foundations, structures, fences, and other obstructions that lie wholly or partially within the treatment system area shown on Attachment 2. Any material that is removed as part of the Work, as described in subsections 3.3 through 3.5 herein, will become the property of the Contractor and shall be removed from the project. Material specifically identified on Attachment 2 to not be removed (such as the control building and the horizontal concrete slab underlying the collection tank) shall remain as Owner property.

B. The Contractor shall arrange to dispose of waste at no additional expense to the Owner.

3.2 Examination

A. Prior to construction, Contractor shall:
   1. Verify that utilities have been disconnected and capped.

   2. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

   3. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

   4. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and
measure the nature and extent of conflict. Promptly submit a written report to Owner.

3.3 REMOVAL OF FOUNDATIONS

A. Foundations to be removed are shown on Attachment 2. The areas with foundations include the acid area, air stripper area, and remaining asphalt area. When removing foundations, the Contractor shall:
   1. Remove foundations to a depth of at least 5 feet below finished ground elevation or subgrade elevation, whichever is lower.
   2. Break up basement floors to promote drainage.

3. Fill basements or other cavities left by the removal of structures. The fill shall match the level of surrounding ground. Fill within the slopes of the roadbed shall be compacted to meet the requirements of the Washington State Department of Transportation Standard Specifications, 2021 edition, Section 2-03.3(14)C, Method B, which states the top 2 feet of each embankment shall be compacted to 95 percent of the maximum density as determined by the compaction control tests described in Section 2-03.3(14)D. All material below the 2-foot level shall be compacted to 90 percent of the same maximum density. In the top 2 feet, horizontal layers shall not exceed 4 inches in depth before compaction. No layer below the top 2 feet shall exceed 8 inches in depth before compaction. The Contractor shall use compacting equipment approved by the Engineer. Any embankment inaccessible to large compacting equipment shall be compacted with small mechanical or vibratory compactors. The Engineer may permit the Contractor to increase layer thickness up to 18 inches before compaction, provided:
      i. The layer is more than 2 feet below the top of the embankment,
      ii. An approved vibratory roller is used, and
      iii. The required density is obtained throughout the full depth and width of each layer.

B. The Contractor shall adjust moisture content during compaction to produce a firm, stable and unyielding embankment. The embankment shall be free from pumping and rutting due to excessive moisture and is the Contractor’s responsibility to manage and adjust as necessary.

C. The Owner will consider all costs for drying embankment material to be incidental to other Work, including excessive moisture due to inclement weather. If, however, the Contract includes an aeration item, the Owner will pay for such Work.

D. The Contractor shall repair, at no expense to the Owner, any partial or complete embankment that loses stability because of continued hauling across it. Evidence of lost stability includes pumping, rutting or lateral displacement of
embankment. The Contractor shall also alter hauling equipment or procedures to prevent further damage.

E. In accordance with Section 2-03.3(14)D of the Washington State Department of Transportation Standard Specifications, 2021 edition, maximum density and optimum moisture content shall be determined by one of the compaction and moisture control tests methods:
   1. Materials with less than 30 percent by weight retained on the No. 4 sieve shall be determined using FOP for AASHTO T 99 Method A.

   2. Materials with 30 percent or more by weight retained on the No. 4 sieve and less than 30 percent retained on the ¾-inch sieve shall be determined by WSDOT T 606 or FOP for AASHTO T 180 Method D. The determination of which test procedure to use will be made solely by the Owner.

   3. Materials with 30 percent or more retained on the ¾-inch sieve shall be determined by WSDOT T 606.

F. In place density will be determined using Test Methods FOP for AASHTO T 310 and WSDOT SOP 615.

3.4 REMOVAL OF PORTIONS OF EXISTING CONCRETE

A. Care shall be taken in removing concrete to prevent over-breakage or damage to portions of the existing structure which are to remain. Before concrete removal begins, a saw cut shall be made into the surface of the concrete at the perimeter of the removal limits. The saw cut shall be ¾-inch deep when the steel reinforcement is to remain and may be deeper when the steel reinforcement is removed with the concrete. Concrete shall be completely removed (exposing the deformed surface of the bar) from existing steel reinforcing bars which extend from the existing members and are specified to remain. Steel reinforcing bars that are not designated to remain shall be cut a minimum of 1-inch behind the final surface.

B. The void left by removal of the steel reinforcing bar shall be filled with mortar conforming to Section 9-20.4(2) of the Washington State Department of Transportation Standard Specifications, 2021 edition, which states mortar Type 1 for concrete surface finishing shall be either prepackaged or a Contractor recommended blend of Portland cement Type I/II and fine aggregate.

C. Fine aggregate for Portland cement or blended hydraulic cement mortar shall consist of sand or other inert materials, or combinations thereof, accepted by the Engineer, having hard, strong, durable particles free from adherent coating. Fine aggregate shall be washed thoroughly to remove clay, loam, alkali, organic matter, or other deleterious matter. The amount of deleterious substances in the
washed aggregate shall be tested in accordance with AASHTO M 6 and not exceed the following values:

1. Material finer than No. 200 Sieve: 2.5 percent by weight
2. Clay lumps and friable particles: 3.0 percent by weight
3. Coal and lignite: 0.25 percent by weight
4. Particles of specific gravity less than 2.00: 1.0 percent by weight.

Organic impurities shall be tested in accordance with AASHTO T 21 by the glass color standard procedure and results darker than organic plate no. 3 shall be rejected. A darker color results from AASHTO T 21 may be used provided that when tested for the effect of organic impurities on strength of mortar, the relative strength at 7 days, calculated in accordance with AASHTO T 71, is not less than 95 percent.

D. If the Class 1 concrete surface finishing mortar is a Contractor recommended blend, it shall conform to a 1:2 cement/aggregate ratio.

E. The mortar shall match the color of the existing concrete surface as nearly as practicable. The Contractor shall roughen, clean, and saturate existing concrete surfaces, against which fresh concrete will be placed. When a portion of existing concrete is to be removed without replacement, concrete shall be removed to a clean line with a smooth surface of less than 1/16-inch profile.

3.5 Removal of Pavement, Sidewalks, and Curbs
A. In removing pavement, sidewalks, curbs, and gutters, the Contractor shall:

1. Haul broken-up pieces into the roadway embankment or to some off-project site.

2. Material that is to be incorporated into the embankment shall be broken into pieces not exceeding 18-inches in any dimension, and no part of any piece shall be within 3-feet of the top, side, or end surface of the embankment or any structure.

3. Make a vertical full depth saw cut between any existing pavement, sidewalk, curb, or gutter that is to remain and the portion to be removed. For Portland cement concrete pavement removal, a second vertical full depth relief saw cut offset 12 to 18 inches from and parallel to the initial saw cut is also required, unless the Engineer approves otherwise. For removal of bituminous pavement, asphalt planing equipment may be used in lieu of saw cutting provided that a clean vertical edge remains.

4. Replace at no expense to the Owner any existing pavement designated to remain that is damaged during the removal of other pavement.
3.6 Removal of Groundwater Treatment System and Associated Components

A. The Contractor shall remove the following parts of the treatment system:
   - Centrifugal blowers (2)
   - Transfer pump
   - Acid pump
   - Metering pump
   - Acid tank
   - Reinforced fiberglass acid mixing tank
   - Metal stairs and platform
   - Collection tank
   - Air stripper towers (2) and media
   - Valves
   - Electrical panels
   - Pipe supports
   - Flow meters
   - Shed (10 feet x 15 feet)
   - Chain link fence and gate around acid area (23 feet x 23 feet)
   - Steel lined/Stainless steel piping with corresponding containment piping
   - HDPE piping with corresponding containment piping
   - Steel/HDPE Pipe connections (elbows, tees)
   - Air Stripper Concrete Slab (55 feet x 22 feet)

B. Removal of the treatment system will be performed adjacent to buried wastes and refuse at the Landfill. As these buried materials decompose anaerobically, they generate landfill gas, which normally consists of carbon dioxide (CO₂), methane (CH₄), occasionally hydrogen sulfide (H₂S), and trace quantities of other gases, depending on the composition of the buried materials. Additionally, groundwater at the Landfill had historically been contaminated with low concentrations of volatile organic compounds (the groundwater had been treated by the treatment system but is currently below Safe Drinking Water Act Maximum Contaminant Levels, so the treatment system was taken offline). Hazardous conditions due to landfill gases and used treatment equipment include, but are not limited to: fires, explosions, oxygen deficiency, and toxic environments. Any treatment system equipment that has come in contact with Landfill groundwater has potential for contamination. The treatment system was last operated in 1998; however, potentially contaminated groundwater is still routed from the extraction system through the collection tank and to the storm sewer system, as shown on Attachment 2. The total extraction system discharge is estimated to be less than 70 gallons per minute. Prior to removal of the treatment system and reconnection of the piping, the extraction system will be temporarily turned off by the Owner.

C. Contractor shall perform whatever work is necessary to maintain safe working conditions and be solely and completely responsible for conditions of the job site, including air monitoring and safety of all persons (including employees of the City, Engineer, any site visitors, and Contractor) and property during the
contract period. This requirement applies continuously and is not limited to normal working hours.

D. The Engineer’s review of Contractor’s performance is not intended to include a review or approval of the adequacy of the Contractor’s safety supervisor, the safety program, or any safety measures taken in, on, or near the Work area.

E. Contractor shall provide for the protection of employees and all others from fire, explosion, or asphyxiation caused by any gases encountered during removal of the treatment system.

F. Contractor shall provide, at all times, safe access to the Work area by authorized government officials.

G. Accidents causing death, injuries, or damage must be reported immediately to the Engineer by telephone or messenger. In addition, Contractor shall promptly report in writing to the Engineer all accidents whatsoever arising out of, or in connection with, the performance of the Work, whether on, or adjacent to, the site, giving full details and statements of witnesses.

H. If a claim is made by anyone against Contractor or any subcontractor on account of any accident, Contractor shall promptly report the facts in writing to the Engineer within 24 hours after occurrence, including full details of the claim.

I. The Contractor shall provide all necessary labor, equipment, and materials to remove the existing treatment system and associated components summarized above and as shown on Attachment 2.

J. Contractor shall contact the Engineer at least 48 hours prior to any demolition activities so the Engineer can turn off the existing pumping system that discharges water through the treatment system piping.

K. For piping that is designated above and on Attachment 2 to be removed, Contractor shall remove and properly dispose of the piping to the limits shown on the figures. Contractor may salvage the removed piping at Contractor’s discretion. Contractor shall temporarily cap any remaining piping.

L. Contractor shall protect the existing Control Building, including electrical wiring to and from the building. Any portion of the treatment system that is designated to remain but is damaged by the Contractor shall be repaired or replaced to operating condition at no cost to the Owner.

M. Contractor shall protect the existing concrete slab beneath the collection tank. The slab shall be left in place for the Owner to later reuse. The Contractor shall not damage the concrete slab when removing the collection tank and surrounding parts of the treatment system.
N. Treatment system components, including piping, to be removed may contain residual groundwater from the groundwater extraction system. Contractor shall take care to containerize residual groundwater from treatment system components being removed. Containers for residual groundwater will be supplied by the Owner. The Owner will dispose of containerized residual groundwater.

O. Once piping has been removed, Contractor shall connect the influent line from the extraction system to the existing 12-inch piping connecting to the storm sewer with proposed above-ground piping, as shown on Attachment 2 and as specified in Section 33 41 00 Proposed above-ground piping diameter and materials shall match the existing discharge piping.

P. After the influent line has been reconnected, Contractor shall perform leak testing of the line connections to verify that there are no leaks in the reconnected discharge piping within the footprint of the treatment system area.

3.7 POLLUTION CONTROLS

A. Dust Control:
1. Use water mist, and water spray, to limit spread and propagation of dust.
2. Provide water connections, hoses, tanks, and other equipment necessary to contain dust.
3. Do not allow dust and/or dust control water to contact facility users’ vehicles.

B. Comply with governing environmental-protection regulations. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

C. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

D. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations.

E. Return adjacent areas to the existing condition prior to the commencing of selective demolition operation.

3.8 CLEANING

F. Daily Cleanup:
1. Maintain an orderly work site.
2. Maintain clearly distinguishable work areas.
3. Keep debris, stockpiles, and sorted materials out of areas used for transportation and vehicle movements.
4. Remove contaminated and unsafe materials from the site in an expedient manner and without delay.

5. Remove nails, sharp objects and other hazards to tires and vehicles in a continuous and diligent manner.

3.9 PROTECTION

A. Provide and maintain physical separation barriers to prevent facility users and Solid Waste campus personnel from entering the work area and facility without authorization.

1. Work of this Section will require temporary perimeter fencing to prevent unauthorized persons from gaining access to the facility.

   a. Prior to leaving the facility at the end of each work day, the Contractor shall ensure the facility perimeter fence is maintained continuous and uninterrupted, with no gaps or unrestrained portions sufficiently large for a person to push through.

   b. Provide additional fencing sections on hand to assure sufficient materials are available.

B. Protect adjacent structures and improvements from foreseeable damage associated with the work of this Section.

C. Provide, maintain, and periodically adjust shoring, bracing, or structural supports necessary in the course of demolition.

   1. Prevent unexpected movement.

D. Protect against collapse of structures.

END OF SECTION
SECTION 31 05 00 – CAP LAYER SYSTEM REPAIR EARTHWORK

PART 1 – GENERAL

1.1 DESCRIPTION

This section applies to the composite cap liner system found at installation CA-18. This specification also applies if the dual membrane liner cap layer system is found to be present at and around installation LW-01, per Section 33 29 01 – Installations Decommissioning.

A. Provide excavating, temporary stockpiling with cover, furnishing additional layer fill material (top soil, cover material, sand, and soil bedding) and geomembrane material, backfilling and compaction, geomembrane patching repair, and other associated Work required to (1) remove LW-01 casing where present above the refuse and (2) reconstruct the cap layer system above the refuse per the Construction Drawings (Attachment 1), Section 3.3.12, and supporting sections of the City’s Environmental Operations and Maintenance Plan for the Tacoma Landfill (Attachment 3), and the Tacoma Landfill Stage 1 Closure Specifications (Attachment 4).

B. The Contractor is advised that the construction of this project is being performed within, over and adjacent to buried wastes and refuse. As these buried materials decompose anaerobically, they will generate landfill gas (LFG), which normally consists of carbon dioxide (CO2), methane (CH4), and occasionally hydrogen sulfide (H2S) and other gases, depending on the composition of the buried materials. These gases usually vent to the atmosphere through the cover soil when the geomembrane liner is removed or from broken or cut LFG piping, but may migrate laterally over 1,000 feet to adjacent areas, depending on site and weather conditions.

The Tacoma Landfill has accepted Municipal Solid Waste. The Contractor is advised to review the applicable Washington Administrative Codes (WAC) regulated by Ecology which pertain to “municipal solid waste” definition handling. The Contractors on-site workers shall be familiar with the “Excavating Old Trash” safety training as prepared by the Solid Waste Association of North America (SWANA) or Owner-approved equivalent. Copies of the SWANA training may be obtained from


Notwithstanding the above, the Owner cannot guarantee that toxic or hazardous materials or vapors will not be encountered by the Contractor during the performance of this project Work.

Websites for further information include:

Ecology: http://www.ecy.wa.gov/

1.2 RELATED SECTIONS
   A. Section 33 29 01 – Installations Decommissioning
   B. Section 01 74 23 – Site Restoration

1.3 REFERENCES
   A. Attachment 1 – Construction Drawings
   B. Attachment 3 – 2016 Environmental O&M Plan
   C. Attachment 4 – 1990 Tacoma Landfill Stage 1 Closure Specifications
   D. City of Tacoma Stormwater Management Manual (2016)

1.4 SUBMITTALS
   A. Submit name of supplier and specifications of each type of imported fill material for examination by the Owner and the Owner’s Consultant. Provide materials from same source throughout the work.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Stockpile delivered and excavated material onsite in a manner that will not endanger the Work and that will not obstruct driveways or interfere with Tacoma Landfill operations. Take measures to prevent stormwater pollution including, but not limited to, covering with temporary plastic if stockpile is unused for more than 2 days, coir logs surrounding the stockpiles, and fabric covers over catch basins. Material piles shall only be located in areas specified by the Owner or Owner's Consultant.

   B. Cover system layer material excavated during LW-01 decommissioning shall be kept in material-specific stockpiles in an orderly manner and suitable material shall be reused during reconstruction of the cap system. Stockpile shall be kept at a sufficient distance from the edge of the excavation to prevent material from sloughing or sliding back into the excavation.

   C. Conduct work in a manner that will cause the least interruption to Tacoma Landfill operations.

1.6 COORDINATION
A. Notify the Owner and Owner’s Consultant at least 5 days before starting excavation. Excavation shall not proceed until the Owner’s Consultant has agreed to same.

B. Provide the services of a competent buried utility locating service to identify the location of existing buried utilities within the project site prior to commencing excavation. Mark locations of existing buried utilities and planned location of buried utilities, equipment, and extents of excavation prior to commencing excavation.

C. Protect existing pipes, conduits, poles, wires, well casings, or other apparatus that may affect the work, and protect the same under, over, along or across said Work. In case any of said pipes, conduits, poles, wires, or apparatus should be damaged, they shall be repaired by Contractor to the satisfaction of the Owner’s Consultant, and the expense of such repairs shall be borne by the Contractor. Any damage to existing wells shall be corrected by repair or replacement, by a Washington state licensed well driller approved by Owner's Consultant. Contractor shall bear all expenses reasonably related to the repair or replacement of wells, including, but not limited to, the well drillers services and materials, professional oversight and documentation, and sampling and analysis, if necessary.

1.7 EQUIPMENT ON THE CAP

A. Equipment to be used on the cap to conduct the Work shall be in accordance with Attachment 3 and Attachment 4, and shall be approved by the Owner. The Contractor shall provide equipment specifications for the Owner’s consideration including, but not limited to, equipment ground pressure in pounds per square inch (psi) and weight.

PART 2 – PRODUCTS

2.1 CAP LAYER SYSTEM FILL MATERIAL

A. The cap layer system fill material generally includes top soil, cover material, sand, and soil bedding as shown on the Construction Drawings (Attachment 1). Complete technical specifications for fill materials needed to complete the cap layer system repair are specified in Attachment 3 and Attachment 4.

2.2 GEOSYNTHETICS MATERIAL

A. Technical specifications for the geosynthetics material of the cap layersystem are provided in Attachment 3 and Attachment 4.

2.3 SURFACE REVEGETATION
A. The cap surface is to be revegetated using the following seed mix:

**Grass Mix**

<table>
<thead>
<tr>
<th>Seed Kind (Choose 1)</th>
<th>lbs/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perennial Rye</td>
<td>56</td>
</tr>
<tr>
<td>Manhatten</td>
<td></td>
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<tr>
<td>Pinnfine</td>
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<td>Derby</td>
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<td>Citation</td>
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<td>Chewings Fescue</td>
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<td>Koret</td>
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<tr>
<td>Annual Rye</td>
<td>14</td>
</tr>
<tr>
<td>White Dutch Clover</td>
<td>21</td>
</tr>
</tbody>
</table>

**PART 3 – EXECUTION**

3.1 **PRE-EXCAVATION ACTIVITIES**

A. Contractor to plan for excavation in such a manner that maximizes efforts to preserve and protect the surrounding landfill cap system surface and grades to the extent feasible. If deemed necessary by the Contractor and approved by the Owner, Contractor shall stabilize access from the Tacoma Landfill paved road to the excavation area while preserving and protecting the surrounding landfill cap system surface and any other structures as required by the Owner. Stabilization of access may involve import and placement of gravel surfacing (or larger aggregate, such as shoulder ballast or quarry spalls) to provide firm base for operation and movement of construction equipment and vehicles to protect the underlying geomembrane liners of the cap layer system.

B. Mark planned limits of excavation.

C. Contractor shall preserve and protect the adjacent cap layer system area outside of the Work area, and shall be responsible for restoration to address any damage caused by the Contractor’s operations.

D. Before and during landfill cap system disturbance activities, Contractor shall implement appropriate temporary erosion and stormwater control measures and the best management practices.

3.2 **EXCAVATION, BACKFILLING, COMPACTION, AND GEOMEMBRANE REPAIR**

A. Excavation, backfilling, compaction, and geomembrane repair Work shall be completed as specified in Attachment 3 and Attachment 4.

B. The excavation work zone shall be cleared of all debris. The clearing limits
shall be as marked in the field and shall be kept to the minimum extent needed to accomplish the Work.

C. Excavation limits shall be minimized. The Contractor shall also prevent surface water from entering the excavation.

D. Width and Depth: The excavation shall be of such width to permit workmen to satisfactorily decommission LW-01 and remove the top of casing as specified in this SOW, to repair the cap system, and to provide safe working conditions in accordance with federal, state, and local laws and regulations. Trench safety will be required for excavations deeper than 4 feet and is the sole responsibility of the Contractor. Compliance with Occupational Safety and Health Administration (OSHA) and other applicable regulations is mandatory. Where required to prevent caving of the trench, or by any safety law or regulation such as OSHA, the Contractor shall furnish and install bracing and/or sheeting to protect the excavation. This bracing and/or sheeting shall be removed as trench backfill progresses.

E. Excavation work should occur only during dry weather conditions. The Contractor shall prevent water from entering the excavation.

F. Dust and storm water control shall be maintained during construction.

G. Barricade open excavations to prevent access during nights and weekends and when excavations are not actively being worked.

H. Schedule activities to minimize period during which excavations remain open. No excavation shall remain open for a period longer than 5 calendar days without written approval of the Owner.

I. Compact backfill material layers to density requirements specified in Attachment 3 and Attachment 4. Contractor shall be responsible for any re-compaction and re-testing required due to failed compaction testing.

J. Employ a backfill material placement method that does not disturb or damage existing features or other work.

K. In freezing weather, prior to terminating the work for the day, loose protective material shall be placed on top of the backfill to prevent freezing and shall be removed prior to subsequent work. Backfill shall not be placed on snow, ice or frozen soil.

3.3 DISPOSAL OF EXCAVATED MATERIAL

A. All excavated soil and debris not reused shall be properly disposed of at the Tacoma Landfill’s transfer station with approval from the Owner and the Owner’s Consultant.
B. Submit copies of receipts, weight tickets, and other documentation verifying disposal was completed in accordance with this Section.

3.4 FIELD QUALITY CONTROL

A. Applicable field inspection and testing requirements are specified in Attachment 3 and Attachment 4 and will be performed by the Contractor to the satisfaction of the Owner during the Work.

B. If tests indicate Work does not meet specified requirements, Contractor is to remove work, replace, compact, and retest.

END OF SECTION
SECTION 31 10 00 – VEGETATION CLEARING AT SELECT INSTALLATIONS

PART 1 – GENERAL

1.1 DESCRIPTION
A. The Owner will be responsible for major vegetation clearing at select installations as described in Attachment 15 (Well Details). Minor vegetation removal not described in Attachment 15 will be conducted by the Contractor in accordance with this section.

1.2 RELATED SECTIONS
A. Section 33 29 01 - Installations Decommissioning
B. Section 01 74 23 – Site Restoration

1.3 REFERENCES
A. Attachment 1 – Construction Drawings
B. Attachment 15 – Well Details
C. City of Tacoma Stormwater Management Manual (2016)

1.4 SUBMITTALS
Not Applicable to This Section

1.5 HANDLING AND DISPOSALS
A. Cleared vegetation shall be loaded, hauled, and transported during landfill operating hours to the appropriate Tacoma Landfill onsite disposal location as directed by the Owner and the Owner’s Consultant. Submit copies of receipts, weigh tickets, and other documentation verifying disposal of cleared vegetation in accordance with this paragraph.

B. The Contractor may temporarily stockpile cleared vegetation at the Owner-designated construction laydown yard before transporting the material to the onsite disposal location, and Contractor shall take measures to prevent stormwater pollution, including, but not limited to, covering with temporary plastic if stockpile is unused for more than 2-days, coir logs surrounding the stockpiles, and fabric covers over catch basins.

C. Conduct work in a manner that will cause the least interruption to local business operations and residences. Where local business operations will
be impacted by the work being performed, the Contractor shall sequence construction so that local business operations are maintained.

1.6 COORDINATION

A. Notify the Owner and the Owner’s Consultant at least 5 days before starting vegetation clearing.

B. Protect existing poles, wires, well casings, or other apparatus that may affect the work, and protect the same, under, over, along or across said work. In case any of said poles, wires, or apparatus should be damaged, they shall be repaired by Contractor to the satisfaction of the Owner's Consultant, and the expense of such repairs shall be borne by the Contractor. Any damage to existing wells shall be corrected by repair or replacement, by a Washington state licensed well driller approved by the Owner and Owner’s Consultant. Contractor shall bear all expenses reasonably related to the repair or replacement of wells, including, but not limited to, the well drillers services and materials, professional oversight and documentation, and sampling and analysis, if necessary.

PART 2 – PRODUCTS

Not Applicable to This Section

PART 3 – EXECUTION

3.1 VEGETATION CLEARING

A. Contractor, in coordination with the Owner's Consultant, will flag and inventory diameter (at breast height) and species of trees to be removed. Removal of trees shall be minimized to the extent practicable and only those trees that would otherwise restrict or limit Work shall be removed. The Contractor shall notify the Owner’s Consultant a minimum of five (5) working days in advance of tree inventory.

B. Perform vegetation clearing and disposal of trees, brush, shrubs, and rubbish from installations designated on the Construction Drawings (Attachment 1). Vegetation clearing shall only be performed where necessary to safely and effectively perform installation decommissioning (i.e. enough horizontal and vertical clearance for licensed driller’s equipment). The limits of the vegetation areas to be cleared will be marked with high visibility fencing, silt fencing, flags, stakes, tree markings and/or other suitable methods. The limits of clearing shall be verified by the Owner’s Consultant prior to ground disturbance.

C. Trees, shrubs, and other vegetation designated to remain undisturbed shall be protected from damage.
D. Materials removed during clearing operations shall generally be disposed of as described above under 1.5 Handling and Disposal.

END OF SECTION
SECTION 31 23 22 GROUNDWATER WELL REHABILITATION AND MODIFICATION

PART I – GENERAL

1.1 SCOPE

A. The objective of the work described in this specification section is to rehabilitate existing groundwater extraction well W-02 and convert it to a monitoring well (or piezometer). The location of well W-02 is shown on Attachment 5. Groundwater extraction well W-02 is constructed to a depth of approximately 145 feet below ground surface (bgs) with a 6-inch-diameter PVC casing. Construction details are shown in Attachment 6. A well log for W-02 does not exist, however a typical well log for nearby well W-03 is included as Attachment 7. According to available design specifications, it is thought that the 8- or 10-foot stainless steel well screen was installed from 132.5 to 140.5 (or 142.5) feet bgs and included 0.060-inch slots with an 8/12 sand filter pack. The well screen appears to have been compromised and what appears to be sand has infiltrated the well to approximately 133.1 feet bgs (within about 1 foot of the top of the screen). It is possible that the well screen has become dislocated from the well casing. Down-hole equipment (e.g., pump and discharge pipe) has already been removed from the well. Photographs of the current well surface conditions are included in Attachment 8 and photographs from a video survey conducted on November 3, 2020 are included in Attachment 9. The scope of work includes:

1. Removing sand from the well
2. Video surveying the well to check the extent of screen damage
3. Installing a 2-inch diameter piezometer within the existing well and filling the annual space with sand and bentonite chips, as appropriate to convert the existing well into a monitoring well.
4. Developing the monitoring well to ensure even settlement of sand pack material.
5. The work also includes:
   a. Providing continuous safety and protective measures
   b. Filing of state and local drilling reports
   c. Disposing of sand, water, and development fluids
   d. Performing other work incidental to the project

B. Project Location: The location of well W-02 is shown on Attachment 5.

C. Personnel and Equipment:

1. The Contractor shall employ only competent workmen for the execution of the work and all such work shall be performed under the direct supervision of experienced drillers.
2. The Contractor shall furnish equipment complete with all necessary tools and appurtenances of adequate capacity to complete the work. All equipment to be used for the performance of the work shall comply with all Federal, State and local safety regulations.
3. Down-hole equipment shall be steam cleaned prior to use on the project.

D. Licenses, Permits and Reports: The Contractor shall have filed a Notice of Intent
to drill form and shall possess a valid State of Washington “Resource Protection” contractor’s license. Other federal, state, or local permits are not required for monitoring well construction at this location because it is within the area defined in the Consent Decree as the Site. Contractor shall comply with all State and local laws, ordinances, and rules and regulations relating to the performance of the work and shall file all reports as required by the State and local agencies in connection with the monitoring well construction. Copies of all reports and the original permits and licenses shall be submitted to the Engineer.

1.2 RELATED SECTIONS

A. Section 01 74 23 – Site Restoration

1.3 REFERENCES


B. Attachment 5 – W-02 Location Map

C. Attachment 6 – W-02 Construction Detail

D. Attachment 7 – Nearby Well W-03 Log

E. Attachment 8 – W-02 Well Photographs

F. Attachment 9 – W-02 Video Survey Photographs

1.4 SUBMITTALS

A. Action Submittals
   1. Make, model and capacity of drilling rig.
   2. Copies of all reports, permits and licenses.
   3. Equipment disinfection documentation.
   4. Fluids and sand disposal plans.
   5. Product data for anticipated annular additives.
   6. Product data for the new 2-inch-diameter casing to show compliance with both the physical and chemical properties of the PVC.
   7. Copies of the post-rehabilitation/modification video survey

PART 2 PRODUCTS

2.1 GENERAL

A. Provide tools, accessories, power, lighting, water, other equipment, and experienced personnel necessary to conduct efficient well rehabilitation and video surveying operations at the site.
2.2 BLANK CASING, WELL SCREEN AND CENTRALIZERS

A. Provide 2-inch, Schedule 40, ASTM F480, blank piezometer casing and well screen.
   1. Casing and screen connections shall be flush-threaded conforming to the requirements of ASTM F480.
   2. Casing and screen flush-threaded connections shall be provided with “O” rings.
   3. Casing and screen shall make up in manufacturer-stated lengths, shoulder to shoulder, when assembled.
   4. Casing shall be packaged in boxes to maintain product cleanliness and must be clearly labeled with the manufacturer name and contents.
   5. The screen perforations shall be machine-cut horizontal slots with openings of 0.030 inches.
   6. All blank casing and well screen material shall be new.

B. Furnish adjustable stainless steel casing centralizers that will eliminate off center casing and screen placement during installation. Centralizers shall be equipped with worm gear clamps for quick and secure attachment to the casing and screen.

2.3 BOTTOM PLUG

A. The bottom of the casing string shall be closed with a flush-threaded PVC male plug.

2.4 FILTER PACK MATERIAL

A. Material for the filter gravel/sand pack shall be hard, washed clean of silt, dirt, and foreign matter. Material shall be suitable for use with the piezometer screen slot size. All gravel/sand filter pack material is subject to review by the Engineer prior to use in the packing process.

2.5 BENTONITE PELLETS

A. Bentonite Pellets shall be size-graded clay pellets which exhibit a high swelling capability. The pellets shall be Baroid’s 3/8-inch Holeplug or equivalent.

2.6 CEMENT SEAL

A. Cement shall conform to ASTM C 150, Type I.

B. The material used for the neat cement seal shall be Portland cement mixed with not more 6 gallons of water per 94 pound sack of cement. Up to 5% bentonite, dry weight, clay may be added to the neat cement.

PART 3 EXECUTION

3.1 GENERAL
A. All work shall be performed as specified and in accordance with applicable parts of Washington Administrative Code (WAC), Chapter 173-160, “Minimum Standards for Construction and Maintenance of Wells”. Should the Contractor discover any discrepancies between the Specifications and State requirements, the Contractor shall bring them to the attention of the Engineer immediately.

B. Care shall be taken during all aspects of the work to avoid further damage to the well screen.

3.2 WELL REHABILITATION

A. Contractor shall remove infiltrated sand material from within the well screen of W-02.

3.3 WELL VIDEO SURVEY

A. Contractor shall conduct a video survey of the entire length of the existing well after rehabilitation to evaluate the extent of screen damage. All video equipment must be decontaminated prior to use.

3.4 ABOVE GROUND TANKS

A. The Contractor shall utilize only above ground tanks to manage the properties and/or the production of rehabilitation fluids. Rehabilitation tanks shall be properly equipped and have adequate capacity to meet all rehabilitation and well development requirements.

3.5 WATER FOR DRILLING

A. The Contractor shall pay for and shall construct all facilities necessary to furnish water for his use during well construction and completion. Fire hydrants are available for use onsite, however the Contractor is responsible for coordinating all necessary arrangements and fees associated with hydrant use. The City’s representative may assist with this coordination, as necessary.

3.6 BLANK AND SLOTTED CASING INSTALLATION

A. If the video survey determines the well W-02 screen is not compromised beyond use, the Contractor shall install the blank and slotted piezometer casing within the existing well casing with centralizers attached.

3.7 CENTRALIZERS

A. Attach centralizers to the casing string to hold the casing in the proper position until the gravel and grout cement seal are in place. Place the first set of centralizers immediately below the well screen, place the second set immediately above the well screen, and place another set 10 feet below ground level. The centralizers shall be aligned to allow installation of a temporary tremie pipe to the
bottom of the monitoring well.

3.8 ASSEMBLY INSTALLATION

A. Suspend the blank and slotted casing in tension from the surface by means of a clamp. The bottom of the casing shall be at a sufficient distance above the bottom of the bore hole as to ensure that none of the casing string will be supported from the bottom of the hole.

B. If for any reason the piezometer casing and screen cannot be placed in the correct position, consult with the Engineer regarding resolution. Resolution may possibly include attempting a modified installation, abandoning the well, or installing a new monitoring well. The Engineer shall make the final decision on the resolution course.

C. If any of the piezometer casings or screen should collapse prior to well completion, withdraw them and replace at no additional cost to the Owner.

3.9 STORAGE AND HANDLING OF GRAVEL

A. The gravel/sand filter material shall be delivered to the site in 100-pound bags (or similar) and stored in a protected location to prevent breakage and contamination.

3.10 FILTER GRAVEL PACK

A. Install filter sand pack specified in the annular space between the borehole and the casing and screen through a temporary construction tremie pipe initially located 5 feet from the well's bottom. During the gravel/sand pack installation "sound" or "tag" the top of the material's depth at regular intervals.

B. Record the volume of filter material used. The volume shall not be less than the calculated volume of the annular space between the wall of the bore hole and the casing and screen diameters.

C. A quantity less than the computed volume will be considered as an indication of potential voids and measures shall be taken by the Contractor to eliminate the voids. Significant differences between estimated and actual volume of filter material installed may be grounds for monitoring well rejection.

D. During filter pack placement, agitate the well with a bailer to settle the filter material around the well screen and continue until settling stops.

E. Place a 3-foot-thick bentonite pellet layer between the filter pack material and the surface grout seal to prevent migration of grout into the filter pack material.

3.11 NEAT CEMENT SEAL
A. When installation and settlement of the filter pack and the bentonite pellet layer is complete, fill the annular space between the casing and the borehole with the specified neat cement mix using the temporary tremie pipe. The tremie pipe shall be initially located 5 feet from the bottom of the annular space to be cemented. Once the bottom of the tremie pipe is covered with cement, the tremie pipe shall be removed in a manner that allows the bottom of the tremie pipe to remain covered throughout seal placement. Do not allow cement to free fall into the well annulus.

B. Record the volume of cement used. The volume shall not be less than the calculated volume of the annular space between the wall of the borehole and the casing. Significant differences between estimated and actual volume of cement installed may be grounds for monitoring well rejection.

3.12 WELL DEVELOPMENT

A. No earlier than 24 hours after neat cement placement, the monitoring well shall be bailed for development until the produced groundwater is free of suspended sediment and turbidity values are less than 50 NTU.

B. Initially, bale heavy sediments and other fill material from the well.

C. Develop the well until it is free of suspended sediment and turbidity values are less than 10 NTU or a minimum of 10 casing volumes have been removed.

3.13 FINAL CLEANING

A. Immediately after the well is constructed, the Contractor shall be responsible for cleaning up the site, including removal of all temporary piping, so that the site has been restored to as near the original grade and condition as possible. The Engineer reserves the right to accept or reject any restoration.

END OF SECTION
SECTION 33 29 00 – GROUNDWATER EXTRACTION WELLHEAD PIPING
DECOMMISSIONING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Coordinate with the Owner and Tacoma Landfill operations manager to decommission groundwater effluent piping (effluent piping) from the groundwater extraction wellheads for locations listed and shown on the Construction Drawings.

B. Contractor scope for decommissioning the effluent piping is anticipated to include removal and relocation of any downwell equipment to a location specified by Owner, pre-disassembly handling of residual groundwater, and disassembly of piping from the wellhead to a downstream plumbing location identified by Owner where Contractor can install a blind flange. All decommissioned piping will be left with a blank flange and buried at a location approximately 1.5 feet underground. The Owner will be responsible for de-energizing equipment associated with applicable groundwater extraction wells.

1.2 RELATED SECTIONS

A. Section 33 29 01 - Installations Decommissioning
B. Section 31 23 22 - Groundwater Monitoring Well Rehabilitation

1.3 REFERENCES

A. Attachment 1 – Construction Drawings
B. Attachment 10 – Section From 1993 GETS O&M Plan
C. Attachment 11 – Groundwater Extraction Wellhead Construction Records
D. Attachment 5 – Well Details

1.4 SUBMITTALS

A. Contractor shall provide submittal for proposed blind flange materials for all groundwater extraction well locations shown on the Construction Drawings (Attachment 1) to the Owner and the Owner’s Consultant prior to commencing decommissioning Work. Note: blind flange for one groundwater extraction well location may not work at another location, therefore Contractor will need to inspect and inventory all locations to prepare a complete submittal.
1.5 HANDLING AND DISPOSAL

A. Contractor shall have a secondary containment method in place in the event residual groundwater is encountered during effluent piping disassembly and shall discharge any collected groundwater back down the extraction well casing.

B. Handle and dispose of disassembled and removed effluent piping material as directed by Owner. Owner may choose to keep some instrumentation and otherwise have material disposed of at the transfer station as solid waste.

C. Conduct work in a manner that will cause the least interruption to Tacoma Landfill operations.

1.6 COORDINATION

A. Notify the Owner and the Owner’s Consultant at least 5 days before effluent piping decommissioning.

B. Contractor to coordinate with Owner and Landfill Representative to de-energize the extraction wells and drain any residual groundwater in effluent piping downgradient of the wellhead prior to disassembling effluent piping from the wellhead.

C. Preserve and protect existing structures that may affect the Work. Damage to existing structures shall be repaired by Contractor to the satisfaction of the Owner and Owner’s Consultant, and the expense of such repairs shall be borne by the Contractor.

1.7 EXAMINATION

A. Prior to construction, Contractor shall:
   1. Verify that utilities have been de-energized and disconnected.

   2. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

   3. Inventory and record the condition of items to be removed.

   4. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Owner.

PART 2 – PRODUCTS
2.1 BLIND FLANGES

A. It is anticipated decommissioning will be accomplished by removing effluent piping from the wellhead to a union or existing flange, and that the Contractor will need to furnish blind flanges to be installed. If an alternate approach is deemed necessary by Contractor, the Contractor is to propose their alternative approach to the Owner, the Landfill Representative, and Owner’s Consultant for approval. An alternative approach may require furnishing other appropriate plumbing fixtures to accomplish decommissioning the effluent piping from the wellhead area. See Attachment 10 and 11 for relevant Owner-provided historical construction information for reference information.

PART 3 – EXECUTION

3.1 EFFLUENT PIPING DECOMMISSIONING FROM WELLHEAD

A. Contractor to complete above Part 1 and Part 2 preparatory tasks.

B. Once the system is de-energized and appropriate valves have been closed with Owner and Landfill Representative concurrence, Contractor is to disassemble piping from the wellhead to nearest flange or union, then Contractor is to install an Owner-approved blind flange.

C. Contractor to handle, transport, and dispose of removed features as directed by the Owner.

D. Contractor is to properly abandon and properly terminate the electrical cables underground after decommissioning.

END OF SECTION
SECTION 33 29 01 – INSTALLATIONS DECOMMISSIONING

PART I – GENERAL

1.1 SCOPE

A. The work described in this Section includes decommissioning several well installations (landfill gas probes and groundwater wells) as shown on the Construction Drawings (Attachment 1) and described in this Section. Access limitations may exist at some locations. Attachment 15 includes details of each installation with a detailed map showing the location and access, some location notes, and a series of photos that show the location and surroundings of the well. Some locations will require removal of concrete vaults and surface completions as described in Attachment 15.

B. Well decommissioning shall be conducted by a Washington State licensed well driller (Driller) subcontracted by the Contractor and to be approved by the Owner.

C. Related specification sections are listed below. Construction sequencing between Contractor and Driller should be coordinated to enhance ability for the Driller to implement the Work described in this Section.

D. Existing non-artesian groundwater well LW-01 was installed prior to landfilling activities and is within the northeastern landfill cap area. The Contract will carefully excavate around the well casing in accordance with the Construction Drawings. The Contractor will carefully cut the primary geomembrane, excavate sand to the top of secondary geomembrane, carefully cut the secondary geomembrane, and excavate into the soil bedding in accordance with the Construction Drawings (Attachment 1). Once excavation is complete, the Driller will implement the below decommissioning procedure 3.3 Decommissioning LW-01 if Dual Membrane Liner System is Present. Following the Driller’s decommissioning scope, the Contractor will restore and reconstruct the cap system and ground surface in accordance with Section 31 05 00 Cap Layer System Repair Earthwork, and the Construction Drawings.

E. Existing landfill gas extraction well CA18 is installed in the central area of the landfill. The well is being decommissioned due to damage. An as-built well installation log is not available, but the well is known to consist of one 4-inch diameter schedule 40 PVC casing. The total depth of CA18 is currently unknown but is expected to be no greater than 100 feet. The Contractor is responsible for verifying the depth of the well prior to beginning work. The entire length of the well is within the limits of the buried municipal solid waste, and therefore cannot be over-drilled. The well casing will not be perforated or removed; a variance request from the Minimum Standards for the Construction and Maintenance of Wells in WAC 173-160-460(1)(b) must be
submitted to Ecology by the Contractor. It is not known whether perched leachate will be encountered in the boring. Well CA18 will be decommissioned by pressure grouting the casing via tremmie line. Well CA18 decommissioning work is to be coordinated with and performed under the supervision of the City's Landfill Gas Collection and Control System operator.

F. The Contractor is advised that the construction of this project is being performed within, over and adjacent to buried wastes and refuse. As these buried materials decompose anaerobically, they will generate landfill gas (LFG), which normally consists of carbon dioxide (CO2), methane (CH4), and occasionally hydrogen sulfide (H2S) and other gases, depending on the composition of the buried materials. These gases usually vent to the atmosphere through the cover soil when the geomembrane liner is removed or from broken or cut LFG piping, but may migrate laterally over 1,000 feet to adjacent areas, depending on site and weather conditions. The Tacoma Landfill has accepted Municipal Solid Waste. The Contractor is advised to review the applicable Washington Administrative Codes (WAC) regulated by Ecology which pertain to “municipal solid waste” definition handling. The Contractors on-site workers shall be familiar with the “Excavating Old Trash” safety training as prepared by the Solid Waste Association of North America (SWANA) or Owner-approved equivalent. Copies of the SWANA training may be obtained from http://shop.blueridgeservices.com/Excavating-Old-Trash-DVD-Safety-Training-Series-Excavating-Trash-001.htm Notwithstanding the above, the Owner cannot guarantee that toxic or hazardous materials or vapors will not be encountered by the Contractor during the performance of this project Work. Websites for further information include: WAC: http://apps.leg.wa.gov/wac/ (Title 173-303, 173-340 and 173-350)

1.2 RELATED SECTIONS

A. Section 01 74 23: Site Restoration

B. Section 31 05 00: Cap Layer System Repair Earthwork

C. Section 31 10 00: Vegetation Clearing at Select Installations

D. Section 33 29 00: Groundwater Extraction Wellhead Piping Decommissioning

1.3 REFERENCES

A. Attachment 1 - Construction Drawings

B. Attachment 12 - Landfill Gas Extraction Well CA18 Decommissioning Details

C. Attachment 13 - Gas Probe and Groundwater Well Decommissioning Work Plan
1.4 SUBMITTALS

A. Submit name of supplier and specifications for each type of imported material Driller intends to apply downhole into the borehole of the well installations during decommissioning, for examination by Owner and Owner’s Consultant. Examples include (but are not limited to) grouting materials such as neat cement grout, neat cement, or bentonite slurry. Provide materials from same source throughout the work.

B. If well LW-01 is decommissioned per Section 3.2, Contractor to provide submittals for topsoil, cover material, sand layer, and soil bedding in accordance with Section 01 74 23 Site Restoration.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling of materials for decommissioning may be stored at the Owner-specified construction laydown area. Material piles outside of the construction laydown area shall only be located in areas specified by the Owner and the Owner’s Consultant.

1.6 ACCESS

A. Access to each installation varies as shown on the Drawings and described under Section II General Project Requirements.

1.7 EQUIPMENT ON THE CAP

A. Equipment to be used to conduct decommissioning work where installations require use of the cap surface by the Contractor or its subcontractors shall be approved by the Owner. Contractor shall include equipment specifications including, but not limited to, equipment ground pressure in pounds per square inch (psi) and weight for the Owner’s review. This information shall be provided to the Owner at least five days prior to associated scheduled Work.
PART 2 – PRODUCTS

2.1 PRESSURE GROUTING MATERIAL

A. In accordance with the Gas Probe and Groundwater Well Decommissioning Work Plan (Attachment 13) and the EPA Work Plan Approval Letter (Attachment 14), Driller is to use neat cement grout, neat cement, or Installations Decommissioning bentonite slurry to create a seal in non-artesian groundwater wells, landfill gas extraction well CA18, and landfill gas probe casings that are greater than 18 feet deep to prevent migration of ambient air to the subsurface prior to subsequent decommissioning steps (discussed below under Part 3 – Execution).

B. In accordance with WAC 173-160-381 and WAC 173-160-460, material for pressure grouting may be neat cement grout, neat cement, or bentonite slurry and shall be placed with a tremie tube.

PART 3 – EXECUTION

3.1 NOTICE OF INTENT AND WELL REPORTS

A. Driller shall provide the Washington State Department of Ecology with a notice of intent (NOI) to decommission all well installations and any associated fees at least 72 hours prior to commencing decommissioning in accordance with WAC 173-160-420(9). Other pre-decommissioning coordination details are described under Section II General Project Requirements.

B. Driller shall submit completed well reports for decommissioning well installations to Ecology in accordance with WAC 173-160-420(10). Driller shall also submit the completed well reports to the Owner.

3.2 DECOMMISSIONING NON-ARTESIAN GROUNDWATER WELLS

A. Non-artesian groundwater wells are identified in the Construction Drawings (Attachment 1).

B. Driller shall pressure grout the casing from the bottom up to 18 feet below ground surface using a tremie pipe or equivalent. For locations within City of Tacoma right-of-way, the grout material shall be cement grout or neat cement. For locations outside of City of Tacoma right-of-way, the grout material shall be neat cement grout, neat cement, or bentonite slurry.

C. Subsequent to pressure grouting, the Driller shall over-drill the casing using an auger method while grouting the remaining boring from the top of casing down to 18 feet below ground surface with neat cement grout, neat cement,
or bentonite slurry to create a seal in accordance with WAC 173-160-231.

D. For nested well installations where multiple groundwater well completions or a groundwater well and gas probe completion exist, all completions will be pressure grouted. Note: as shown on the Drawings, the only nested well installation with a monitoring well and gas probe is TL-22A/SPS01W; see Section 3.5 for gas probe decommissioning specifications.

3.3 DECOMMISSIONING LW-01 IF DUAL MEMBRANE LINER IS PRESENT

A. The location of non-artesian groundwater well LW-01 is identified in the Construction Drawings (Attachment 1).

B. In accordance with WAC 173-160-381(1)(a), Driller shall perforate the casing from the bottom to within five feet of the land surface and pressure seal the casing. Perforations shall be at least four equidistant cuts per row, and one row per foot. The perforations must be sufficient to allow sealing material neat cement grout or neat cement, or bentonite slurry to migrate outside the casing and effectively prevent the movement of water. Driller shall apply enough pressure to force the sealing material through the perforations, filling any voids on the outside of the casing. The casing shall be filled completely with neat cement grout, neat cement, or bentonite slurry to within five feet of the land surface, and the remainder of the riser pipe must be removed and disposed of as solid waste.

3.4 DECOMMISSIONING ARTESIAN GROUNDWATER WELLS

A. Artesian groundwater wells are identified in the Construction Drawings (Attachment 1) and include PW-11 and TL-05A,C,D.

B. The Driller shall over-drill the full vertical extent of the casing using an auger method while grouting with neat cement grout, neat cement, or bentonite slurry to create a seal in accordance with WAC 173-160-381.

3.5 DECOMMISSIONING GAS PROBES

A. Gas probes are identified in the Construction Drawings (Attachment 1).

B. For gas probes with a maximum depth less than or equal to 18 feet below ground surface, Driller shall over-drill the full vertical extent of the casing using an auger method while grouting with neat cement grout, neat cement, or bentonite slurry to create a seal in accordance with WAC 173-160-381.

C. For gas probes with a maximum depth greater than 18 feet below ground surface, the Driller shall pressure grout the casing from the bottom of the screen up to 18 feet below ground surface using neat cement grout or neat cement. For well installations where multiple gas probe completions exist (i.e. nested wells), all completions will be pressure grouted. Subsequent to
pressure grouting, the Driller shall over-drill the top 18 feet of probe casing using an auger method while grouting the remaining borehole with neat cement grout, neat cement, or bentonite slurry to create a seal as adapted from WAC 173-160-231.

3.6 DECOMMISSIONING LANDFILL GAS EXTRACTION WELL CA18

A. The location of landfill gas extraction well CA18 is identified in the Landfill Gas Extraction Well CA18 Decommissioning Details (Attachment 12).

B. The driller shall pressure grout the casing. The casing shall not be cut, perforated, overdrilled, or removed.

3.7 WASTE MANAGEMENT AND HANDLING

A. Driller to furnish drums for containing decommissioning derived wastes and equipment necessary for moving the drums throughout the work. Owner to provide temporary laydown yard for Contractor, and Contractor shall deposit all solid waste generated during the work to the Tacoma Landfill transfer station at the direction of the Owner.

3.8 FIELD QUALITY CONTROL

A. The Owner’s Consultant and their designee will conduct construction oversight with the Driller to document pre-decommissioning conditions, decommissioning methods and materials, and post-decommissioning conditions.

B. Work by the Driller will be performed to the satisfaction of the Owner and their Consultant.

END OF SECTION
PART I – GENERAL

1.1 DESCRIPTION

A. The Work includes installing HDPE piping to reconnect the existing GETS influent line extraction piping from the extraction system plant to the existing GETS discharge piping to the storm sewer.

1.2 RELATED SECTIONS

C. Section 01 74 23 – Site Restoration

D. Section 02 41 16 – Removal of Structure and Obstructions

1.3 REFERENCES

C. Attachment 2 – Groundwater Extraction Treatment System Removal Drawings

1.4 SUBMITTALS

Not Applicable to This Section

PART 2 – PRODUCTS

Not Applicable to This Section

PART 3 – EXECUTION

3.10 Trenches

A. The length of trench excavation in advance of pipe laying shall be kept to a minimum. Excavations shall either be closed up at the end of the day or protected.

B. The trench shall be excavated to the depth and grade as staked by the Engineer.

C. In accordance with Section 2-09.4 of the Washington State Department of Transportation Standard Specifications, 2021 edition, the Owner will use the sides of the trench or pit as horizontal limits in measuring excavation. No payment for Structure excavation will be made for material removed (1) more than 1 foot outside the perimeter of any pile cap, footing, or seal; (2) more than 3 feet beyond the Roadway side of a wing wall; (3) more than 1 foot beyond the other sides and end of a wing wall; (4) more than 1 foot outside the perimeter of the soil reinforcement area for geosynthetic and structural earth walls; and (5) more than 4-feet beyond the inside opening of precast reinforced concrete box culverts and precast reinforced concrete split box culverts. For precast reinforced concrete
three sided structures, no payment for Structure excavation will be made for material removed more than 1 foot outside the perimeter of the footing or more than 4 feet beyond the inside opening, whichever is greater.

D. For all pipes, pipe arches, structural plate pipes, and underpasses, the Structure excavation quantity will be calculated based on the following trench widths:
   1. For drain and underdrain pipes, trench width = inside diameter (I.D.) + 12 inches.
   2. For pipes 15 inches and under, trench width = I.D. + 30 inches.
   3. For pipes 18 inches and over, trench width = (1.5 × I.D.) + 18 inches.

E. Trenches must be of sufficient width in the pipe zone to permit proper installation and bedding of the pipe and to provide the required compaction of backfill. Above the top of the pipe zone, Contractor may excavate to any width.

F. All ledgerock, boulders, and stones shall be removed to provide a minimum of 6 inches clearance under all portions of the pipe.

G. Placement of bedding material shall precede the installation of all pipe. This shall include necessary leveling of the native trench bottom or the top of the foundation material as well as placement and compaction of required bedding material to a uniform grade so that the entire length of pipe will be supported on a uniformly dense unyielding foundation.

H. When, after excavating to the foundation level, the material remaining in the trench bottom is determined to be unsuitable by the Engineer, excavation shall be continued to such additional depth and width as required by the Engineer. Unsuitable foundation materials shall be disposed of at an approved site. The trench foundation shall be backfilled to the bottom of the pipe zone with gravel backfill for foundations, gravel backfill for pipe zone bedding, or other suitable material, and compacted to form a uniformly dense, unyielding foundation.

I. All material excavated from trenches and piled adjacent to the trench shall be maintained so that the toe of the slope is at least 2 feet from the edge of the trench. It shall be piled to cause a minimum of inconvenience to public travel, and provision shall be made for merging traffic where necessary. Free access shall be provided to all fire hydrants, water valves, and meters; and clearance shall be left to enable free flow of storm water in gutters, conduits, or natural watercourses.

J. In accordance with Section 9-03.12(3) of the Washington State Department of Transportation Standard Specifications, 2021 edition, gravel backfill for pipe zone bedding shall consist of crushed, processed, or naturally occurring granular material. It shall be free from various types of wood waste or other extraneous or objectionable materials. It shall have such characteristics of size and shape that it will compact and shall meet the following Specifications for grading and quality:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2&quot;</td>
<td>100%</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>100%</td>
</tr>
<tr>
<td>1/4&quot;</td>
<td>100%</td>
</tr>
<tr>
<td>1/8&quot;</td>
<td>100%</td>
</tr>
<tr>
<td>1/16&quot;</td>
<td>100%</td>
</tr>
</tbody>
</table>

K.
L. If, in the opinion of the Engineer, the native granular material is free from wood waste, organic material, and other extraneous or objectionable materials, but otherwise does not conform to the Specifications for grading and Sand Equivalent, it may be used for pipe bedding for rigid pipes, provided the native granular material has a maximum dimension of 1 ½ inches.

M. If any part of the excavated material meets the Specifications of Part 3.1(K) listed above, the Engineer may require that such material, in the quantity required, be selectively removed, stockpiled separately, and used as pipe bedding instead of quantities of gravel backfill for pipe zone bedding. If material so stockpiled becomes contaminated, the Contractor shall furnish suitable material in an amount equal to that lost by contamination at no expense to the Owner. All costs involved in storing, protecting, re-handling, and placing the material shall be included in other items of Work on the project.

N. Excavation for manholes and other Structures connected to the pipelines shall be sufficient to provide a minimum of 12 inches between their surfaces and the sides of the excavation.

O. The Contractor shall furnish, install, and operate all necessary equipment to keep excavations free from water during construction, and shall dewater and dispose of the water so as not to cause injury to public or private property or nuisance to the public.

P. Where pipe is to be placed in a new embankment, the embankment shall be constructed as designated by the Engineer for a distance each side of the pipe location of not less than five times the diameter and to a minimum height equal to ½ of the outside diameter of the pipe. The embankment material shall be compacted to 95 percent of maximum density and the moisture content at the time of compaction shall be between optimum and 3 percentage points below optimum as determined by the Compaction Control.

3.11 Shoring
A. The Contractor shall provide all materials, labor, and equipment necessary to shore trenches to protect the Work, existing property, utilities, pavement, etc., and to provide safe working conditions in the trench. The Contractor may elect to use any combination of shoring and overbreak, tunneling, boring, sliding trench shield, or other method of accomplishing the Work consistent with applicable local, State, or Federal safety codes.
Statement of Work  
Tacoma Landfill – Decommissioning Plan

B. In accordance with Section 2-09.3(3)B of the Washington State Department of Transportation Standard Specifications, 2021 edition, the Contractor may dig open pits or perform extra excavation without shoring or cofferdams, if:
   1. Footings can be placed in dry material away from running water.
   2. The integrity of the completed Structure and its surroundings is not reduced.
   3. Worker safety is ensured as required by law.
   4. The excavation does not disturb the existing pavement or any other adjacent structural elements.

C. If workers enter any trench or other excavation 4 feet or more in depth that does not meet the open pit requirements of Part 3.2(B) listed above, it shall be shored. The Contractor alone shall be responsible for worker safety, and the Owner assumes no responsibility.

D. Upon completing the Work, the Contractor shall remove all shoring unless the Engineer directs otherwise.

E. Shoring to be removed, or moveable trench shields or boxes, shall be located at least 2½ pipe diameters away from metal or thermoplastic pipe if the bottom of the shoring, shield, or box extends below the top of the pipe, unless a satisfactory means of reconsolidating the bedding or side support material disturbed by shoring removal can be demonstrated.

F. Damages resulting from improper shoring or failure to shore shall be the sole responsibility of the Contractor.

3.12 Bedding the Pipe
A. Pipe zone bedding material shall provide uniform support along the entire pipe barrel, without load concentration at joint collars or bells. All adjustment to line and grade shall be made by scraping away or filling in with bedding material under the body of the pipe and not by blocking or wedging. Bedding disturbed by pipe movement, or by removal of shoring movement of a trench shield or box, shall be reconsolidated prior to backfill.

B. Pipe zone bedding shall be placed in loose layers and compacted to 90 percent maximum density. Bedding shall be placed, spread, and compacted before the pipe is installed so that the pipe is uniformly supported along the barrel. Lifts of not more than 6 inches in thickness shall be placed and compacted along the sides of the pipe. Material shall be worked carefully under the pipe haunches and then compacted.

C. If the Engineer determines that the material existing in the bottom of the trench is satisfactory for bedding the pipe, bedding material is not required, provided the existing material is loosened, regraded, and compacted to form a dense, unyielding base.

3.13 Survey Line and Grade
A. Survey line and grade control hubs will be placed in a manner consistent with accepted practices.

B. The Contractor shall transfer line and grade into the trench where they shall be carried by means of a laser beam or taut grade line supported on firmly set batter boards at intervals of not more than 30 feet. Not less than three batter boards shall be in use at one time. Grades shall be constantly checked and in the event the batter boards do not line up, the Work shall be immediately stopped, the Engineer notified, and the cause remedied before proceeding with the Work. Any other procedure shall have the written approval of the Engineer.

3.14 Pipe Laying – General

A. After an accurate grade line has been established, the pipe shall be laid in conformity with the established line and grade in the properly dewatered trench. Mud, silt, gravel, and other foreign material shall be kept out of the pipe and off the jointing surfaces.

B. All pipe laid in the trench to the specified line and grade shall be kept in longitudinal compression until the backfill has been compacted to the crown of the pipe.

C. Pipe shall be laid to a true line and grade at the invert of the pipe and the Contractor shall exercise care in matching pipe joints for concentricity and compatibility. In no case shall two pipes be joined together with ends having the maximum manufacturer’s tolerance. The invert line may vary from the true line and grade within the limits stated to develop uniformity, concentricity, and uniform compression of jointing material provided such variance does not result in a reverse sloping invert. The limit of the variance at the invert shall not exceed plus or minus 0.03 feet at the time of backfill. Checking of the invert elevation of the pipe may be made by calculations from measurements on the top of the pipe.

D. The pipe, unless otherwise approved by the Engineer, shall be laid up grade from point of connection on the existing pipe or from a designated starting point. The pipe shall be installed with the bell end forward or upgrade. When pipe laying is not in progress, the forward end of the pipe shall be kept tightly closed with an approved temporary plug.

E. Where pipe joints must be deflected within the manufacturer’s recommended limits to accommodate required horizontal or vertical curvature, it shall first be joined in straight alignment and then deflected as required. Where pipe joints must be deflected to an amount greater than the manufacturer’s recommended limits to accommodate required horizontal or vertical curvature, the curves shall be achieved with a series of tangents and shop fabricated bends, subject to the approval of the Engineer.

F. Upon final acceptance of the Work, all pipe and appurtenances shall be open, clean, and free draining.

3.15 Pipe Laying – Steel or Aluminum
A. Pipe with riveted or resistance spot welded seams shall be laid in the trench with the outside laps of circumferential joints upgrade and with longitudinal laps positioned other than in the invert, and firmly joined together with approved bands. Aluminum pipe or pipe arch used in cement concrete shall be painted with two coats of paint. The paint shall cover all the surfaces in contact with the cement concrete and extend one inch beyond the point of contact. The aluminum pipe to be painted shall be cleaned with solvent to remove contaminants. After cleaning, the pipe shall be painted with two coats of paint conforming to Federal Specification TT-P-645 (primer, paint, zinc chromate, alkyd vehicle). Aluminized steel pipe will not require painting when placed in Controlled Density Fill (CDF) or when in contact concrete head walls. All costs of cleaning and painting the aluminum surfaces as specified shall be included in the unit Contract price per linear foot for the aluminum pipe or pipe arch.

3.16 Rubber Gasketed Joints
A. The pipe shall be properly aligned before joints are forced home. Sufficient pressure shall be applied in making the joint to ensure that the joint is home, as defined in the standard installation instructions provided by the pipe manufacturer. The Contractor may use any method acceptable to the Engineer for pulling the pipe together, except that driving or ramming by hand or machinery will not be permitted. Any pipe damaged during joining and joint tightening shall be removed and replaced at no expense to the Owner.

B. Care shall be taken to properly align the pipe before joints are entirely forced home. During insertion of the tongue or spigot, the pipe shall be partially supported by hand, sling or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned. Since most gasketed joints tend to creep apart when the end of the pipe is deflected and straightened, such movement shall be held to a minimum once the joint is home.

C. Sufficient restraint shall be applied to the line to ensure that joints once home are held so by compacting backfill material under and alongside the pipe or by other acceptable means. At the end of the work day, the last pipe shall be blocked in such a manner as may be required to prevent creep.

3.17 Plugs and Connections
A. Plugs for pipe branches, stubs, or other open ends which are not to be immediately connected shall be made of an approved material and shall be secured in a place with a joint comparable to the main line joint, or stoppers may be of an integrally cast breakout design.

3.18 Jointing of Dissimilar Pipe
A. Dissimilar pipe shall be jointed by use of a factory-fabricated adapter coupling or a pipe collar.

3.19 Sewer Line Connections
A. Storm and sanitary sewer line connections to trunks, mains, laterals, or side sewers shall be left uncovered until after the Engineer has inspected and approved the Work. After approval of the connection, the trench shall be backfilled as specified.

3.20 Side Sewer Connections

A. Where a storm or sanitary side sewer is larger than the trunk, main, or lateral to which it is to be connected, the connection shall be made only at a standard manhole unless otherwise authorized by the Engineer.

3.21 Backfilling

B. Trenches shall be backfilled as soon after the pipe laying as possible. Pipe zone backfill material shall be clean earth or sand, free from clay, frozen lumps, roots, or moisture in excess of that permitting required compaction. Rocks or lumps larger than 3 inches maximum shall not be used for pipe zone backfill.

C. Pipe zone backfill shall be placed in loose layers and compacted to 90 percent maximum density. Backfill shall be brought up simultaneously on each side of the pipe to the top of the pipe zone. The pipe shall then be covered to the top of the pipe zone and the materials compacted in a manner to avoid damaging or disturbing the completed pipe.

D. Backfill above the pipe zone shall be accomplished in such a manner that the pipe will not be shifted out of position nor damaged by impact or overloading.

E. If pipe is being placed in a new embankment, backfill above the pipe zone shall be placed in accordance with Method B of Section 2-03.3(14)C of the Washington State Department of Transportation Standard Specifications, 2021 edition, which states the top 2 feet of each embankment shall be compacted to 95 percent of the maximum density as determined by the compaction control tests described in Section 2-03.3(14)D. All material below the 2-foot level shall be compacted to 90 percent of the same maximum density. In the top 2 feet, horizontal layers shall not exceed 4 inches in depth before compaction. No layer below the top 2 feet shall exceed 8 inches in depth before compaction. The Contractor shall use compacting equipment approved by the Engineer. Any embankment inaccessible to large compacting equipment shall be compacted with small mechanical or vibratory compactors. The Engineer may permit the Contractor to increase layer thickness up to 18 inches before compaction, provided:
   2. The layer is more than 2 feet below the top of the embankment,
   3. An approved vibratory roller is used, and
   4. The required density is obtained throughout the full depth and width of each layer.

F. The Contractor shall adjust moisture content during compaction to produce a firm, stable and unyielding embankment. The embankment shall be free from pumping and rutting due to excessive moisture and is the Contractor's responsibility to manage and adjust as necessary.
G. The Owner will consider all costs for drying embankment material to be incidental to other Work, including excessive moisture due to inclement weather. If, however, the Contract includes an aeration item, the Owner will pay for such Work.

H. The Contractor shall repair, at no expense to the Owner, any partial or complete embankment that loses stability because of continued hauling across it. Evidence of lost stability includes pumping, rutting or lateral displacement of embankment. The Contractor shall also alter hauling equipment or procedures to prevent further damage.

I. In accordance with Section 2-03.3(14)D of the Washington State Department of Transportation Standard Specifications, 2021 edition, maximum density and optimum moisture content shall be determined by one of the compaction and moisture control tests methods:
   1. Materials with less than 30 percent by weight retained on the No. 4 sieve shall be determined using FOP for AASHTO T 99 Method A.

   2. Materials with 30 percent or more by weight retained on the No. 4 sieve and less than 30 percent retained on the ¾-inch sieve shall be determined by WSDOT T 606 or FOP for AASHTO T 180 Method D. The determination of which test procedure to use will be made solely by the Owner.

   3. Materials with 30 percent or more retained on the ¾-inch sieve shall be determined by WSDOT T 606.

J. In place density will be determined using Test Methods FOP for AASHTO T 310 and WSDOT SOP 615.

K. If pipe is being placed under existing paved areas, or Roadways, backfill above the pipe zone shall be placed in horizontal layers no more than 6 inches thick and compacted to 95 percent maximum density. If pipe is being placed in non-traffic areas, backfill above the pipe zone shall be placed in horizontal layers no more than 6 inches thick and shall be compacted to 85 percent maximum density. Material excavated from the trench shall be used for backfill above the pipe zone, except that organic material, frozen lumps, wood, rocks, or pavement chunks larger than 6 inches in maximum dimension shall not be used. Materials determined by the Engineer to be unsuitable for backfill at the time of excavation shall be removed and replaced with imported backfill material.

L. Backfilling of trenches in the vicinity of catch basins, manholes, or other appurtenances will not be permitted until the cement in the masonry has become thoroughly hardened.

M. When it is required that a blanket of select material or bank run gravel is to be placed on top of the native backfill, the backfill shall be placed to the elevations specified by the Engineer. Compaction of the native material shall be as required by the Owner and shall be performed prior to placing the select material. Surface material shall be loosened to whatever depth is required to prevent bridging of the top layer but shall in no case be less than 18 inches.
N. The Contractor shall not operate tractors or other heavy equipment over the top of the pipe until the backfill has reached a height of 2 feet above the top of the pipe.

3.22 Plugging Existing Pipe
A. Where designated by the Engineer, existing pipes shall be plugged on the inlet end for a distance of 2 diameters with commercial concrete. Care shall be used in placing the concrete in the pipe to see that the opening of the pipe is completely filled and thoroughly plugged.

3.23 Measurement
A. In accordance with Section 2-09.4 of the Washington State Department of Transportation Standard Specifications, 2021 edition, excavated materials will be measured in their original position by the cubic yard. The Owner will measure and pay for only the material excavated from inside the limits this section defines. If the Contractor excavates outside these limits or performs extra excavation, it shall be considered for the Contractor’s benefit and shall be included in the cost of other Bid items.

B. Horizontal Limits – The Owner will use the sides of the trench or pit as horizontal limits in measuring excavation. No payment for Structure excavation will be made for material removed (1) more than 1 foot outside the perimeter of any pile cap, footing, or seal; (2) more than 3 feet beyond the Roadway side of a wing wall; (3) more than 1 foot beyond the other sides and end of a wing wall; (4) more than 1 foot outside the perimeter of the soil reinforcement area for geosynthetic and structural earth walls; and (5) more than 4-feet beyond the inside opening of precast reinforced concrete box culverts and precast reinforced concrete split box culverts. For precast reinforced concrete three sided structures, no payment for Structure excavation will be made for material removed more than 1 foot outside the perimeter of the footing or more than 4 feet beyond the inside opening, whichever is greater.

C. Lower Limits – For a pile cap, footing, or seal, the bottom elevation set by the Engineer will serve as the lower limit in measuring Structure excavation. For a wing wall, the lower limit will follow a line parallel to the bottom and 1 foot below it. Any swell from pile driving will be excluded from excavation quantities. For pipelines, the lower limit in measuring structure excavation will be the foundation level as directed by the Engineer.

D. Upper Limits – The top surface of the ground or streambed as the Work begins will be the upper limit for measuring excavation. The Engineer may order the Contractor to partially build the embankment before placing pipe. In this case, the upper limit for measurement will be not more than 4 feet above the invert of the pipe. For a structural plate pipe, arch, or box, the upper limit will be the top of the embankment at the time of installation as specified in Section 6-20.

E. Gravel backfill, except when used as bedding for culvert, storm sewer, sanitary sewer, manholes, and catch basins, will be measured by the cubic yard, including haul.
F. Shoring or Extra Excavation – No specific unit of measurement shall apply to the lump sum item of shoring or extra excavation Class A. Shoring or extra excavation Class B will be measured by the square foot as follows: The area for payment will be one vertical plane measured along the centerline of the trench, including Structures. Measurement will be made from the existing ground line to the bottom of the excavation and for the length of the Work actually performed. If the Contract includes a pay item for grading to remove materials, the upper limit for measurement will be the neat lines of the grading section. The bottom elevation for measurement will be established by the Engineer. Controlled density fill will be measured by the cubic yard for the quantity of material placed in accordance with the producer’s invoice.

G. Plugging pipes will be measured per each, for each plug installed, for pipe diameters up to and including 36 inches. The concrete for plugging pipes in excess of 36 inches in diameter will be measured by the cubic yard. Computations for corrugated metal pipes will be based on the nominal diameter.

H. In accordance with Section 2-03.4 of the Washington State Department of Transportation Standard Specifications, 2021 edition, roadway excavation, channel excavation, ditch excavation, unsuitable foundation excavation, and common borrow items will be measured by the cubic yard. All excavated material will be measured in the position it occupied before the excavation was performed. An original ground measurement will be taken using cross-section or digital terrain modeling survey techniques. Slope/ground intercept points defining the limits of the measurement will be as staked. For unsuitable foundation excavation and common borrow items, the original ground will be compared with a survey of the excavation area taken after the Work is completed. When the Owner requires excavated material to be stockpiled, re-excavated and moved again, a second measurement will be made, adding quantity for the same item used in the original excavation. The second measurement will be a comparison of the original cross-section of the stockpile with a cross-section of the stockpile area after the second excavation is completed.

END OF SECTION
ATTACHMENT 1

CONSTRUCTION DRAWINGS
GENERAL CONSTRUCTION NOTES:
1. All workmanship and materials shall be in accordance with the City of Tacoma standards and the most current edition of the state of Washington standard specifications for road, bridge and municipal construction (Washington Standard Specifications).
2. If conflicts with existing utilities arise during construction, the contractor shall notify the owner and the engineer. Any changes required shall be approved by the engineer prior to commencement of related construction on the project.
3. Approval of these plans does not constitute an approval of any other construction (e.g. domestic water, storm drain pipe, sewer drain pipe, gas, electrical, etc.).
4. Before any construction or development activity, a pre-construction meeting must be held between the owner, the consultant, and the contractor.
5. A copy of the approved plans must be on the job site whenever construction is in progress.
6. The contractor shall be responsible for providing adequate safeguards, safety devices, protective equipment, flaggers, and any other needed actions to protect the life, health, and safety of the public and to prevent damage to existing property during the course of work covered by the contract. Section 1.07.25 of the Washington Standard Specifications shall apply in its entirety. Any traffic control affecting city or state roadways shall have a traffic control plan prepared by the contractor and submitted to / approved by the proper authorities having jurisdiction.
7. This project site contains overhead power lines. Not all power line locations on the site have been identified on these plans. Therefore any activity on the site in relation to work specified on these plans shall be done with precaution to avoid contact with overhead power.

TEMPORARY EROSION/SEDIMENT CONTROL NOTES
1. During the course of work, the contractor shall address any changes or new conditions that may be created by the contractor’s activities and provide appropriate临时 erosion control measures that may be necessary to protect adjacent property at no additional cost to the owner.
2. TESC measures shall be constructed prior to or in conjunction with all clearing and grubbing activities. In such a manner as to minimize that sediment laden water will reach existing and adjacent properties, and/or violate applicable water quality standards.
3. The contractor shall maintain a fully stocked spill kit on site at all times.
4. All TESC BMPs shall be maintained in a satisfactory condition until such time that cleaning and grubbing is completed. Permanent drainage facilities, if operable, and the potential for erosion has passed.
5. The public right-of-way shall be kept clean. Tracking of mud and debris from the site will not be allowed. Failure to comply with this condition will result in all work on the site being stopped until the issue is corrected, at no cost to the owner.
6. The Washington State Clean Air Act requires the use of all known, available, and reasonable means of controlling air pollution, including dust. Dust can be controlled by wetting exposed soils and installing and maintaining rock or gravel cover. This recommendation is intended to protect the air pollution and the potential for erosion has passed.
7. The contractor shall implement linear run-on controls to prevent water from entering the work area.
8. Portable sanitary facilities if used shall be located at least 25 feet from any storm water, wastewater, or water body and shall be serviced regularly as needed.
9. Stationary equipment (e.g. generators, light stands) containing any amount of fuels and/or oils shall be equipped with secondary containment.

DATUM:
Existing ground contours shown on these plans are provided by City of Tacoma.
Vertical Datum is City of Tacoma Public Works Department Datum (equivalent N.G.V.D. 29 plus 14.0 feet)
Horizontal Datum is Washington State Plane Coordinate System, South Zone, N.A.D. 27.

EQUATIONS TO OTHER DATUMS
NAVD 88 = NGVD 29 Minus 3.47 feet

COORDINATE SYSTEM:
WASHINGTON DEPARTMENT OF TRANSPORTATION
COORDINATE SYSTEM, SOUTH ZONE, N.A.D. 27.

VERTICAL DATUM:
CITY OF TACOMA PUBLIC WORKS
VERTICAL DATUM IS CITY OF TACOMA PUBLIC WORKS DEPARTMENT DATUM (EQUIL. N.G.V.D. 29 PLUS 14.0 FEET)

HORIZONTAL DATUM IS WASHINGTON STATE PLANE COORDINATE SYSTEM, SOUTH ZONE, N.A.D. 27.
NOTES
1. DECOMMISSIONING METHODS ARE OUTLINED IN THE SPECIFICATIONS.
2. LOCATIONS THAT REQUIRE REMOVAL AND ABANDONMENT OF ABOVE GRADE PIPING PRIOR TO DECOMMISSIONING INCLUDE: W-06; W-07; W-08; W-12; W-13; W-14; W-17; W-20; W-21; W-22; W-23; W-25; W-32; AND W-37.
3. ADDITIONAL DETAILS PERTAINING TO SITE ACCESS PERMISSIONS, ACCESS CONSTRAINTS, INSTALLATION CONSTRUCTION DETAILS, AND ADDITIONAL INFORMATION ARE INCLUDED AS C3.0, C4.0, AND C5.0.
4. DETAILS REGARDING DECOMMISSIONING LANDFILL GAS EXTRACTION WELL CA-18 ARE FOUND IN ATTACHMENT 12 OF THE SPECIFICATIONS PACKAGE.

Site boundary for permitting purposes defined by red polygon
NOTES

1. DECOMMISSIONING METHODS ARE OUTLINED IN THE SPECIFICATIONS.

2. ADDITIONAL DETAILS PERTAINING TO SITE ACCESS PERMISISON, ACCESS CONSTRAINTS, INSTALLATION CONSTRUCTION DETAILS, AND ADDITIONAL INFORMATION ARE INCLUDED AS C3.0, C4.0, AND C5.0.
<table>
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<th>ID</th>
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**Note:** Details regarding decommissioning landfill gas extraction well CA-18 are found in Attachment 12 of the specifications package.
### Monitoring Wells

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**Notes:**
- a = information not known
- [a] Decommissioning method for 2020-1 through 2020-10 is n/a; 2020-11 through 2020-13 are as decommissioned, as opposed to their replacements (2020-14 and 2020-15) which are still active and extracting groundwater.
- [b] 2020-14 and 2020-15 are to be decommissioned, as opposed to their replacements (2020-16 and 2020-17) which are still active and extracting groundwater.

### Extraction Wells

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### Reference Table for Onsite Groundwater Well Locations

**Notes:**
- [c] Decommissioning method for 2020-16 through 2020-25 is n/a; 2020-26 is as decommissioned, as opposed to its replacement (2020-27) which is still active and extracting groundwater.

### Decommissioning Methods

- Modified pressure grout at completion up to 50 ft NAD, overfill above to 50 ft NAD, and grout remaining borehole.
- Grout completed grout.
- Abbreviations and Acronyms:
  - POE = Pump of Compliance
  - PVC = Polyvinyl Chloride
  - SSW = Stainless Steel

### References

- City of Tacoma
- Environmental Services Department
- Tacoma Landfill
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<th>ID</th>
<th>Decontamination Method</th>
<th>Type</th>
<th>Well Depth (ft)</th>
<th>Well Diameter (in)</th>
<th>Wall Coating Material</th>
<th>Wall Screen Material</th>
<th>Annular Seal Material</th>
<th>Existing Surface Completion</th>
<th>Final Surface Completion</th>
<th>Pump</th>
<th>Latitude</th>
<th>Longitude</th>
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**Notes:**
- Information is unknown
- All wells installed in the table are monitoring wells
- All wells installed in the table are protection wells
- All wells listed in the table are protection wells
- All wells listed in the table are protection wells
- All wells listed in the table are protection wells
- All wells listed in the table are protection wells
- All wells listed in the table are protection wells

**Decontamination Methods:**
- Hydrostatic test on all completions up to 20 ft. lbs., reflected down to 10 ft. lbs., and good remaining borehole.
- Standards: composite standard

**Interpretations and Anomalies:**
- For depth
- Bgs = below ground surface
- H20 = in water
- Mls = not applicable
- PVC = Polyvinyl Chloride
- Sh = Shale

**Environmental Services Department**
CITY OF TACOMA
TACOMA LANDFILL
2020 WELL INSTALLATIONS DECOMMISSIONING PLAN
REFERENCE TABLE FOR OFFSITE GROUNDWATER WELL LOCATIONS
C5.0
**Detail Notes**

1. **Cap Layer System:** Estimated based on reference drawings for nearby locations.
2. Contractor to conduct a careful excavation to verify cap layer system at LW-01 down to top of primary geomembrane (if present) or a maximum of 10 ft below grade to verify absence of dual membrane liner system.
3. Contractor to separately stockpile excavated topsoil, cover material, sand layer, and soil bedding for reuse.
4. Driller to decommission LW-01.
5. If dual membrane liner system is present, contractor to furnish cap system materials to fill removed casing cavity to match surrounding layers and to weld geomembrane perforation.
6. Contractor to reconstruct and restore cap layer system to match pre-existing conditions.

**WELL LW-01 AND CAP LAYER SYSTEM DETAIL**

- **Level:** 6.5'
- **Above Grade:** 5.5'
- **Topsoil:** 6" thick
- **Cover Material:** 18" thick
- **Sand Layer:** 12" thick
- **Soil Bedding:** 12" thick
- **Refuse:**
- **Vertical Datum:** N.G.V.D. '88
- **Horizontal Datum:** N.A.D. '83/91

**Refuse Layer:**
- **Approx. Extent of Casing to Be Removed:**
- **Approx. Top of Casing Perforation and Well Seal:**
ATTACHMENT 2

Groundwater Extraction Treatment System Removal Drawings
TO REMOVE
TO REMAIN
NO LONGER EXISTING

PROPOSED PIPING, BELOWGROUND

Note: Figure modified from BV
Influent line from extraction system

Collection tank rests on concrete slab. Collection tank to be removed; concrete slab to be salvaged for owner.

Groundwater is currently routed from collection tank directly to storm sewer; bypasses treatment system.

Remove and dispose of all parts of the treatment system except:
- Concrete slab beneath collection tank
- Existing 12-inch piping connecting to storm sewer
- Control building

Legend:
- Manually operated valve
- Centrifugal pump or blower
- Motor operated valve
- Flowmeter

Existing 12-inch pipe connecting to storm sewer

Proposed HDPE piping

Disconnected line

City of Tacoma Tacoma Landfill

Extraction/Treatment Design Report

Figure 6-1

Note: This figure was adapted from BV
REMOVE AND DISPOSE OF ALL PARTS OF TREATMENT SYSTEM AND PARTS UNDERLYING TREATMENT SYSTEM (INCLUDING FOUNDATIONS), EXCEPT THE CONCRETE SLAB UNDERLYING THE COLLECTION TANK; REMAIN FOR OWNER REUSE.

Note: This figure was adapted from BV
1. Collection tank effluent line to storm sewer. Blue structure in background is Control Building (to remain).

2. Collection tank and influent line from extraction system.
3. GETS air strippers and acid area to be decommissioned

4. GETS piping to be decommissioned.
ATTACHMENT 3

2016 Environmental O&M Plan
Environmental Operations and Maintenance Plan
Tacoma Landfill
Tacoma, Washington

March 11, 2016

Prepared for
City of Tacoma
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1.0 INTRODUCTION

The City of Tacoma (City) is required to operate and maintain environmental control systems at the Tacoma Landfill (Landfill) during the post-closure care (PCC) period. This 2016 Environmental Operations and Maintenance (O&M) Plan outlines procedures for O&M of three of these systems: landfill cap, gas condensate collection system, and Central Area leachate collection system.

The Landfill is located at 3510 South Mullen Street in Tacoma, Washington. The City Solid Waste Management Division (SWM) has operated the Landfill as a sanitary landfill since 1960. SWM currently operates the Landfill under a permit with the Tacoma-Pierce County Health Department (TPCHD) in accordance with provisions of Washington Administrative Code (WAC) 173-304 and WAC 173-351.

Due to soil and groundwater contamination, the Landfill was placed on the National Priorities List in 1983 by the U.S. Environmental Protection Agency (EPA). A final remedy to address landfill contamination is documented in a 1988 record of decision (EPA 1988) issued by the EPA. Remedial actions have been carried out by the City under a 1991 Consent Decree (CD; U.S. District Court 1991) with EPA and the Washington State Department of Ecology (Ecology). The final remedy is essentially complete and the Landfill is considered to be effectively closed as of November 2013. Environmental control systems required for PCC are part of the final remedy. The City is beginning to implement PCC practices documented in the CD and required by its permit with TPCHD. A vicinity map showing the Landfill location is provided on Figure 1-1.

O&M requirements in this plan are prepared in accordance with the Section 7.7 of the CD Scope of Work (SOW) and are intended to meet the PCC requirements of WAC 173-351 (Criteria for Municipal Solid Waste Landfills) and WAC 173-304 (Minimum Functional Standards for Solid Waste Handling). This plan is also intended to meet recommendations of the Fourth Five-Year Review Report (EPA 2013) to update the Landfill O&M plan as part of PCC. Each component of remedial action and PCC at the Landfill is submitted to EPA, Ecology and TPCHD, herein referred to as the agencies, for approval.

1.1 BACKGROUND

The original O&M Plan (Black & Veatch 1992) was prepared in 1992 as an amendment to the Interim O&M Plan (Black & Veatch 1989) in accordance with the CD SOW. This Environmental O&M Plan supersedes both previously prepared plans upon approval by the agencies.

The Landfill began operations in 1960. It operated as a sanitary landfill with no open burning or dumping serving the population of Tacoma. At its peak operation, the Landfill served a population of approximately 210,000 residents of Tacoma and surrounding communities in western Pierce County. The permitted portion of the Landfill covers approximately 190 acres. Most of the permitted portions of the Landfill were constructed without a bottom liner. These older portions of the Landfill were fully closed in accordance with WAC 173-304 in 1990 and 1991. These areas consist of Stage 1 (54 acres),
Stage 2 (62 acres), and the Public Receiving Facility Asphalt Cap (3.5 acres). Additionally, the East Perimeter Extension was constructed in 2007 (1.1 acres). This extension went down the eastern slope of the Landfill near the stormwater pond and comprised 60-mil high-density polyethylene (HDPE) liner system. Stage 1 and Stage 2 have a dual HDPE liner system with an intervening leak detection layer. The Public Receiving Area has a single membrane liner. The Central Area was constructed with a full bottom liner consisting of two, 60-mil HDPE textured geomembranes, which is why a composite HDPE layer without a leak detection system is specified for this cap system. The location of the Central Area, Stage 1, Stage 2, and the asphalt cap area are shown on Figure 1-2.

The final cover has been installed on all areas of the Landfill as of 2013 and no subsequent filling operations have occurred. However, the Landfill continues to house the Recovery and Transfer Center. This transfer center operates on top of the closed Landfill and receives approximately 750 tons of municipal solid waste each day. The received waste is compacted and sent to an off-site landfill for final disposal.

1.2 OBJECTIVES

The objectives of the Environmental O&M Plan are:

- To document the current operational procedures for the three environmental systems addressed in this plan (landfill cap, gas condensate collection system, and Central Area Leachate collection system)
- To specify a regular inspection program for the three environmental systems
- To specify maintenance and repair procedures for the three environmental systems.
2.0 GENERAL INFORMATION

The City SWM is responsible for coordinating all actions and implementing procedures mandated by this Environmental O&M Plan for the landfill cap, gas condensate collection system, and the Central Area Leachate collection system. The agencies shall provide oversight as required by the CD SOW and solid waste permit, and will review and approve any subsequent changes.

In the event that repairs to any of the systems covered by this plan are deemed necessary, or when inspection observations indicate potential problems with the system, the City will report to the agencies within 72 hours or when a complete assessment has been made of the situation, whichever comes first.

2.1 PERSONNEL REQUIREMENTS

In general, the following personnel will be required for operation of PCC systems at the Landfill:

- Professional Engineer licensed for practice by the state of Washington
- Licensed Hydrogeologist licensed for practice by the state of Washington
- System and engineering technicians trained for the systems they are inspecting, maintaining, or operating.

Descriptions of each of the PCC systems include additional personnel requirements for those systems.

2.2 GENERAL SAFETY AND TRAINING

The Post-Closure Plan (LAI 2016) contains information on general safety, safety training, and emergency response for the closed Landfill. Additionally, the City Recovery and Transfer Center Operations Plan (City of Tacoma 2015) contains operations and procedures for general safety and emergency response for the transfer station.

Special safety requirements specific to the O&M of the landfill cap, gas condensate collection system, or the Central Area leachate collection system are briefly discussed in the corresponding O&M sections of this plan. The Recovery and Transfer Center supervisor is responsible to ensure all safety requirements are fulfilled.

2.3 DISPOSAL PROCEDURES

Repairs or other construction work associated with the landfill cap, gas condensate collection system, and Central Area Leachate collection system at the Landfill may result in demolition debris and waste excavations. Any material excavated that contains refuse will be first visually checked for dangerous waste or hazardous materials. Also during excavation, field monitoring will be conducted in an effort to determine the presence of landfill gas (LFG) or other organic vapors. City staff or its appointees will monitor continuously for vapors at the surface of the excavated refuse, using a properly calibrated infrared detector, combustible gas indicator, flame ionization detector, or an equivalent instrument.
capable of detecting methane gas at concentrations of 0.5-100.0 percent by volume in the air. If
dangerous waste appears to be present, procedures will be followed for designating, and if necessary,
handling and disposal in accordance with Dangerous Waste Regulations (WAC 173-303). All non-
dangerous waste excavated material will be transported to the onsite transfer station for disposal at
an offsite landfill.

2.4 DOCUMENTATION

General inspection, maintenance, and repair log forms have been prepared and are included in
Appendix A. These forms will be used for inspection of the landfill cap and the condensate and
leachate collection systems. A standard Emergency Reporting Log is also included in Appendix A for
reporting emergency response procedures. A summary report of O&M inspections will be submitted
annually to the agencies for review.
3.0 LANDFILL CAP

The landfill cap is the primary remedial measure taken to control leachate production at the Landfill. In order to be fully effective, the cap must be maintained in good condition. The CD SOW specifically requires that the O&M plan for the landfill cap address the following:

- Repair procedures for cracks;
- Elimination of surface ponding problems;
- Correction of localized subsidence and settlement;
- Control methods for surface erosion and runoff; and
- Drainage channel and eroded surfaces repair procedures.

This section details landfill cap inspections, emergency repair procedures, and reporting requirements. The discussion includes problems associated with animals, vegetation, grounds keeping, litter control, and odor.

3.1 LANDFILL CAP DESCRIPTION

The landfill cap is designed to minimize surface water infiltration into the Landfill. Three types of caps are utilized at the Landfill: a dual membrane cap, a composite liner cap, and an asphalt cap.

The dual membrane cap exists over portions of the Landfill where there is no bottom liner. The cap includes a leak detection drainage layer between two HDPE liners. A cross section of the dual membrane capping system is presented on Figure 3-1. This capping system consists of the following layers (top to bottom) over the refuse:

- Surface vegetation
- Topsoil: 6-inch thickness
- Cover soil: 18-inch thickness
- Geotextile filter fabric: 6-ounce per square yard minimum
- Polyethylene drainage net: 200-mil thickness
- Primary HDPE geomembrane: 60-mil thickness
- Sand drainage layer: 12-inch thickness
- Secondary HDPE geomembrane: 60-mil thickness
- Bedding Soil: 3/4-inch minus soil, 12-inch thickness.

The composite liner exists over the Central Area where a bottom liner was constructed. The cap includes a composite liner consisting of a drainage layer underlain by HDPE and a geosynthetic clay liner. A cross section of the composite liner is presented on Figure 3-2. This capping system consists of the following layers (top to bottom) over the refuse:

- Surface vegetation
- Topsoil: 6-inch thickness
- Cover soil: 18-inch thickness
- Geocomposite drainage layer: 200-mil thickness
- HDPE geomembrane: 60-mil thickness
- Geosynthetic Clay Liner
- Sand drainage layer: 2-inch thickness
- Bedding Soil/Intermediate Cover: depth varies.

The asphalt cap exists over the public receiving area located northeast of the Central Area. There are two types of asphalt cap: the original installed asphalt cap and the retrofitted cap installed during the 2010 Recovery and Transfer Center construction. The cap includes an HDPE liner sandwiched between two, 1-foot (ft) sand bedding layers. A cross section of the asphalt cap is presented in Figure 3-3. This capping system consists of the following layers (top to bottom) over the refuse:

- Low permeability asphalt wearing surface: 3-inch thickness
- Crushed surfacing top course: 2-inch thickness
- Crushed surfacing base course: 6-inch thickness
- Sand bedding layer: 12-inch thickness
- HDPE geomembrane: 60 mil thickness
- Geogrid base reinforcement
- Sand bedding layer: 12-inch thickness

All three capping systems divert stormwater drainage away from the refuse. Grading of the cap systems is designed to divert surface stormwater into drainage channels. The grading of the cap generally encourages percolated surface water within any drainage layer to drain to the periphery of the Landfill. Additionally, the dual membrane cap has a leak detection layer that is designed as a redundant system to convey stormwater laterally to the edge of the cap system.

Drainage channels exist on the periphery of the Landfill and they convey surface water to off-site storm sewers or on-site stormwater structures (i.e., detention ponds). These channels exist as both below grade pipes and above grade open channels. Additionally, in areas of depression, French drains are proposed to convey stormwater out of the depression and to the stormwater conveyance system. Construction of these French drains started in 2015 and are scheduled for completion in 2016.

### 3.2 CAP INSPECTION PROGRAM

As the cap is the primary method for leachate control, it is important to maintain the cap integrity throughout the Landfill. This plan presents a comprehensive inspection program that will be followed during the PCC period.
3.2.1 INSPECTION SCHEDULE

The cap shall be visually inspected quarterly by qualified SWM staff and annually inspected by a professional engineer licensed in the state of Washington. Additional inspections will occur after a major storm event, any event that exceeds 3.5 inches in 24 hours (25-year design storm). The additional inspection will occur within 2 days after a major storm and will be conducted by qualified SWM staff.

3.2.2 INSPECTION ITEMS

The dual membrane and composite liner cap will be inspected for the following items:

- Cracking of deterioration of the cover material
- Inadequate protective vegetation
- Access road damage
- Damage to detention basins
- Drainage to channel blocking or erosion
- Drainage channel erosion
- Drainage from secondary drainage pipes in the catch basins
- French drain operations
- Penetration point failures
- Damage to berms
- Ponding
- Local subsidence
- Burrowing animals
- Volunteer vegetation
- Stormwater erosion
- Odor problems
- Trash or litter
- Unauthorized human activity
- Other activity or conditions that adversely affect the integrity of the landfill cap or liner system.

The asphalt cap will be inspected for the following items:

- Cracks in the asphalt
- Chuckholes or broken asphalt
- Subsidence
• Uneven or excessive wear
• Asphalt bleeding—where asphaltic liquid accumulates on the surface resulting in a shiny film.

In addition to the above items, the following items that help maintain the integrity of the landfill capping system will be regularly checked:

• Security gates
• Fencing
• Locks on groundwater wells
• Fire extinguishers
• Emergency information
• Access/parking areas.

3.2.3 SURVEY

Surveys will be conducted every 5 years, or more often at the SWM engineering staff’s discretion to detect subsidence that may have occurred. The City initiated repair of cap subsidence areas during the fall of 2015; construction is scheduled for completion in the summer of 2016. After these repairs are completed, the City will conduct a survey to establish baseline conditions. Ground based topographic survey will be used. Subsequent surveys will be compared to the baseline survey to evaluate subsidence. The same datum, survey intervals and grid sizes will be used for all subsequent surveys. During each survey, measurements will be taken on all settlement plates, these plates exist at the White Goods Facility, and the Urban Tree Nursery. Settlement plates will also be installed as part of the proposed Metro Parks Greenhouse project. Settlement plate elevations will be surveyed individually every 5 years. A final survey will be completed at the termination of the PCC period in accordance with WAC 173-351-500(2).

3.2.4 LEAK DETECTION

With the exception of the Central area; all of the landfill cap areas have a leak detection layer. The leak detection layers are fitted with underdrain pipes that capture water in the leak detection layer and gravity drain to a catch basin. The underdrain pipes in the catch basin are fitted with a manual valve. Water that may accumulate within the leak detection layer will collect within the underdrain pipes until the valves are opened at the catch basins. Figure 1-2 shows the location of each of the leak detection catch basins.

The leak detection manholes will be inspected quarterly by qualified SWM staff or their representatives. The inspection shall involve opening the valve in the manhole and recording the amount of liquid that drains from the valve. The Giroud leakage equation prescribed in the U.S. EPA Technical Manual (1993) allows for a leakage rate of 0.1 gallons per day per acre (gpd/acre). This assumes a maximum of four defects per acre, with each defect having an area of 2 square
centimeters. This also assumes good contact with the geosynthetic clay liner membrane and maximum head of 12 inches of water on the cap.

The amount of observable liquid in each catch basin should be divided by the number of days since last collection and by the number of acres that serve the catch basin. If this number is greater than 0.1 gpd/acre then the cap should be examined for potential areas of leaks and repaired in accordance with section 3.3.12. If there are no obvious signs of leaks observed from the surface, a non-destructive test such as electrical resistivity testing may be used to determine location of the leaks.

### 3.2.5 ASPHALT PAN LYSIMETER

In lieu of leak detection catch basins, the asphalt cap contains one pan lysimeter used to detect leakage of the asphalt cap. Originally, there were three pan lysimeters for the asphalt cap; however, during the 2010 construction of the Recovery and Transfer Center, a portion of the asphalt cap was replaced and the two of the pan lysimeters were removed. Figure 1-2 shows the location of the remaining pan lysimeter.

The pan lysimeter will be inspected annually for leaks. The amount of liquid found in the lysimeter will be recorded. Based on the amount of liquid present, an estimate of the permeability of the asphalt will be calculated and compared to the minimum permeability of the asphalt \[1 \times 10^{-10} \text{ centimeters per second (cm/sec)}\]. If the asphalt permeability is estimated to be above the minimum permeability, then the asphalt should be inspected for damage and the cap should be repaired in accordance with section 3.3.13.

### 3.3 MAINTENANCE PROCEDURES

In the event that damage to the landfill cap is identified, an assessment of the situation will be made in attempt to determine the location, extent, and urgency of the repair required. The SWM staff will then contact the agencies with a proposed approach for approval.

### 3.3.1 CONTRACT PROCEDURES

The City will follow its contract and procurement procedures to hire engineering firms to design cap repairs and hire contractors to perform the cap repairs. The following sequence will be followed:

1. The SWM engineering staff will prepare or procure professional services to identify, design, and prepare bid plans, specifications and construction quality assurance (CQA) documentation (collectively referred to as construction documents) for work on the landfill cap. The documents will be prepared to match the previous construction documents for landfill closure and as outlined in this section.

2. Construction documents will be submitted to the Landfill agencies for review and approval.

3. The project shall be advertised for bid. Bid submittal will be required within 3 weeks of advertisement.
4. The bids shall be evaluated by the City and the contract shall be awarded.
5. Repairs shall be performed with CQA oversight.
6. Once complete, a construction report documenting as-built conditions shall be produced, provided to agencies, and records will be kept at the SWM offices at the Landfill.

3.3.2 ABANDONED MONITORING OR CONTROL APPARATUS

In some areas, there are monitoring wells or extraction wells that protrude through the landfill cap. All monitoring and extraction wells currently in existence at the Landfill were constructed in accordance with WAC 173-160. These wells shall be decommissioned, if necessary, in accordance with WAC 173-160-460, which provides procedures for decommissioning wells. Well decommissioning shall include pressure grouting through the perforated section of the well casing, and the remainder of the casing filled with cement grout, concrete, puddled clay, or bentonite. In the event that the abandoned device is removed, the removal and cap repair will be performed in accordance with the procedures outlined in Section 3.3.12 of the document.

3.3.3 PENETRATION POINTS

Cap penetrations such as monitoring wells, manholes, etc. will be inspected for damage and will be repaired as required. Cap penetrations will be inspected by looking for evidence of cap subsidence around the penetration at the ground surface. If subsidence is noted, cover materials will be excavated to expose the geomembrane penetration. After excavating the area, the structure and geomembrane seal (boot) will be inspected to determine the failure. The penetration point will then be repaired, and the cap replaced as outlined in Section 3.3.12 of this document.

3.3.4 CRACK REPAIR PROCEDURES

The SWM engineering staff will be notified when surface cracks in the landfill cap are observed. Steps to correct the problem will begin immediately to prevent further cracking. Surface cracking in the landfill cap cover soil may be a result of local subsidence associated with settlement, or erosion caused by surface runoff. The following repair procedures will be used:

1. The SWM engineering staff shall determine the cause and extent of cracking and establish the boundary of the area in need of repair.
2. The landfill cap topsoil and cover material will be excavated to a depth determined by the SWM engineer. This should not exceed the top layer of the geomembrane. If it is determined that the extent of cracking has damaged the top layer of the landfill cap geomembrane, procedures for repairing the cap outlined in Section 3.3.12 of this document will be followed.
3. The cover material if excavated will then be replaced over the cap system. The material to be used shall be 3/4-inch minus pit run sand. The SWM engineer will determine the number of lifts required. The cover material will be compacted to a depth concurrent with the cover material adjacent to the excavated area. Cover material shall be compacted to 90 percent of the maximum density as determined by ASTM International (ASTM) D698 (Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort).
4. Topsoil Type C which meets the requirements of Section 8-02.3(4) C of the Washington State Department of Transportation (WSDOT) Standard Specifications shall then be placed on top of the cover material to match the adjacent area (WSDOT 2015).

5. The area shall be re-vegetated by hydroteeding, or if sufficiently small, the area may be seeded by hand.

3.3.5 PONDING OR LOCAL SUBSIDENCE/SETTLEMENT

Depressions may form in the landfill cap due to naturally occurring subsidence. This type of settlement will not adversely affect the landfill cap provided:

- The depression does not affect surface water drainage (ponding does not occur).
- Strain in the geomembrane does not exceed 6 percent (Peggs 2010).

For the calculation of the biaxial strain at the Landfill, an allowable strain limit of 6 percent has been selected. Biaxial strain calculations are presented in Appendix B. A simple graphical representation of the biaxial strain calculations is presented on Figure 3-4. Figure 3-4 may be used to assess the level of strain in the liner under different subsidence conditions.

A variety of subsidence conditions can occur. For the purposes of cap maintenance, subsidence conditions have been categorized into four classes as follows:

- Subsidence resulting in biaxial strain less than 6 percent
  - Without ponding Class 1
  - With ponding Class 2
- Subsidence resulting in biaxial strain equal to or exceeding 6 percent
  - Without ponding Class 3
  - With ponding Class 4

In areas where subsidence has occurred, the following procedures will be followed:

1. The SWM engineer will determine if ponding is occurring. If ponding is occurring, the SWM engineer will arrange for immediate removal of the water and establish a means to prevent additional ponding from occurring while repairs are being made.

2. The SWM engineer will determine the level of strain in the geomembranes. In areas where ponding had previously occurred, and had been identified and repaired as a Class 2 subsidence, the SWM engineer will calculate the strain resulting from the cumulative settlements.

3. The subsidence will be classified according to the system described above and repaired accordingly:

   Class 1: No repairs are required. The area should be monitored for any additional subsidence, which may occur.

   Class 2: A gravity drain line will be installed from the depression bottom such that water will no longer pond in the depression. The depression may be partially filled with soil meeting the requirements for cover material in the Stage 2 Specifications
(BVWST 1991) to establish landscaping grades. Grading of depressions, including partially filled gravity drain lines, will be evaluated on a case by case basis and will include consultation with the agencies. The evaluation will include surcharge stress analysis on the liner. A survey monument will be placed in each corrected depression to monitor future settlements in these repaired areas. Additional settlement will be documented during annual inspection reports to verify that cumulative strain remains less than 6 percent. Strains exceeding 6 percent will require additional corrective measures as required for a Class 3 or 4 subsidence.

**Class 3:** Repair work shall proceed as described in Section 3.3.12 of this document with the following exception:

Step 9 shall be worded as follows: After exposing the waste layer, fill the depression or localized subsidence with 3/4-inch minus pit run sand. Raise the lower membrane to match the slope of the surrounding lower membrane that was not affected by the localized subsidence. The 6 inches of fill directly beneath the lower membrane must consist of bedding soil that meets Section 9-03.13 of the Standard Specifications (WSDOT 2015). Both the bedding soil and the 3/4-inch minus pit run sand shall be compacted to 90 percent of maximum density at the optimum moisture content as determined by ASTM D698.

**Class 4:** The area will be inspected to determine if drainage problems are causing the ponding to occur. Any problems in local drainage will be corrected along with the repair of the area. Repair of the settlement will then proceed as described for Class 3 subsidence.

To ensure continued monitoring of Class 1 and 2 subsidences, a permanent record mapping out all identified areas of subsidence will be maintained. This map will be updated by SWM personnel during the annual landfill cap inspections. The SWM engineering staff will be advised of increased areas of settlement.

### 3.3.6 DRAINAGE CHANNELS, FRENCH DRAINS, AND ERODED SURFACE REPAIR

Open drainage channels that need repair will first be emptied of standing water and debris. Any eroded surface that needs repair will be cleared of any debris. For major repairs that involve more than just clearing debris and minor erosion, a professional engineer will be consulted to make an analysis of the extent of damage and direct the repair work accordingly.

Below-grade piped drainage channels that are no longer conveying water will be video surveyed to determine if there is a blockage or damaged pipe. Any blocked or damaged pipe will be repaired. In the event that the repair involves more than unclogging blocked drains, a professional engineer will be consulted to make an analysis of the extent of the damage and direct repair work accordingly.

French drains that are no longer effectively working to drain Landfill subsidence areas will first be pumped of standing water. If possible, video survey will be used to determine if there is a blockage or damaged pipe. Excavation may be needed to determine if the drain is damaged or clogged. In the
event that the repair involves more than unclogging blocked drains, a professional engineer will be consulted to make an analysis of the extent of the damage and direct repair work accordingly.

In general, eroded material will be replaced, the design slope of the channel or eroded surface shall be maintained and any destroyed vegetation will be reseeded or replaced. If the repairs to the drainage channel or eroded surface affect the cap, SWM engineers will assess the extent and direct repairs accordingly. Any repairs will follow the steps presented in Section 3.3.12 in this document.

3.3.7 BURROWING ANIMALS

Burrowing animals can pose a threat to synthetic cap materials. In addition, animal tunnels can act as surface water collectors. If, during normal Landfill inspections, evidence of burrowing animals in the cap cover are noted, the SWM personnel will contact the TPCHD to determine the appropriate method to eradicate the animals. A state licensed pest control operator may be consulted to eradicate vectors if Landfill control measures are unsuccessful. Humane traps will be the preferred method.

3.3.8 VEGETATION

Vegetation with grasses is critical for controlling erosion and must be properly maintained. Volunteer vegetation, such as trees or shrubs, with potentially deep roots that may penetrate the synthetic materials will be removed. The grass vegetation must be maintained with complete and healthy growth throughout the cap and drainage system. Areas of dead vegetation may indicate problems (such as gas leak or other unauthorized human activity) and should be thoroughly investigated. Topsoil will be replaced and seeded on any eroded areas. If the initial hydroseeding is unsuccessful, the hydroseeding will be repeated. On slopes, placement of jute mats or mulch may be required prior to seeding.

3.3.9 GROUNDSKEEPING

The vegetative cap shall be maintained by mowing annually. Additional mowing may be required on an as-needed basis. The cut material will be left on the cap as mulch.

3.3.10 LITTER CONTROL

The landfill cap and drainage trenches shall be cleaned of trash, windblown litter, excess vegetation, and other objects that impede the normal operation of the cap or drainage ditches. The drainage ditches will be cleared of litter or other obstructions at least on a quarterly basis.

3.3.11 ODOR

The presence of LFG odor or leachate odor may indicate a damaged area in the cap and will be investigated immediately. If the cap is not damaged, other potential odor sources will be investigated. The potential sources include possible damage to the LFG collection system, monitoring wells, gas probes, leachate collection system, or from temporary excavation in waste required for repairs.
3.3.12 DUAL MEMBRANE CAP AND COMPOSITE CAP REPAIR PROCEDURES

In the event that cap damage is found during an inspection, the SWM Division Manager will be notified immediately and repairs to the cap will begin as soon as possible following regulatory approval from the agencies. The location and extent of repair will be determined by SWM staff, and the following repair procedures will be followed:

1. The cap will be approached using access roads. If necessary, light vehicles may drive on the cap surface, or temporary access roads can be built.

2. The cover material will be excavated to expose the top layer of membrane, in order to access the area requiring repair. Care will be taken by the excavator to minimize disruption of the membrane system. Excavation of material nearest the geomembrane will be accomplished by hand to minimize the potential for damage.

3. Membrane cap system removal and replacement will be supervised by the SWM engineering staff or their designee. Soil above the geomembranes should be segregated and stockpiled near the repair excavation for re-use.

4. The top membrane, geotextile, and drainage net will be cut and the section over, or around, the area to be repaired will be removed.

5. The sand layer will be removed to expose the lower membrane.

6. The lower membrane will be removed, if necessary. Any device or utility in need of maintenance will be repaired or replaced as necessary and tested to ensure that the repair work is sound. The repair crew will take care not to damage the remaining cap during repair work.

7. Any material excavated in the area of the repair work below the lower geomembrane will be disposed of in accordance with Section 2.4 of this document.

8. If the lower membrane has been removed, then the exposed area will be backfilled to approximately 6 inches below the elevation of the lower membrane with 3/4-inch minus pit run sand. This material shall be compacted to 90 percent of the maximum density as determined by ASTM D698.

9. The Contractor will then place the soil bedding layer, which is a 6-inch compacted depth lift of sand that meets Section 9-03.13 of the Standard Specifications (WSDOT 2015). The material shall be compacted to 90 percent of the maximum density at the optimum moisture content as determined by ASTM D698.

10. The Contractor will increase the size of the excavated area and cut the membrane back as necessary to ensure that the lower membrane is well bedded throughout the repair area. The Contractor will leave approximately 1 ft of exposed membrane around the perimeter of the repair area for seaming.

11. The existing geomembrane will be cleaned as necessary to remove dirt, dust, and other foreign material. Soap and water will be used to clean the liner. In some instances, steam cleaning may be required to adequately clean the liner.

12. The new membrane material will be placed, seamed, and tested by the Contractor in accordance with the specifications prepared for the repair as described in Section 3.3.14 of this document.
13. Once the lower membrane has been tested and approved, a 12-inch compacted depth lift of sand that meets the requirements of Section 9-03.13 of the Standard Specifications will be installed (WSDOT 2015). Sand bedding will be compacted to 90 percent of the maximum density as determined by ASTM D698.

14. Again, the Contractor will increase the size of the excavated area and cut the membrane back as necessary to ensure that the upper membrane system is well bedded throughout the repair area. They will leave approximately 1 ft of exposed membrane around the perimeter of the repair area for seaming of the liner and connection/seaming of the drainage net and geotextile.

15. The new membrane material will be placed, seamed, and tested by the Contractor in accordance with specifications prepared by the City as described in Section 3.3.14 of this document.

16. Once the upper membrane has been tested and approved, new drainage net material will be placed and tied to the exposed edge of the existing net.

17. New geotextile material will then be sewed to the edge of the existing geotextile.

18. Cover material will then be placed in two lifts over the cap system. The material to be used shall be 3/4-inch minus pit run sand. The lower lift will be 12 inches compacted depth, and the upper lift will be 6 inches compacted depth. Cover material will be compacted to 90 percent of the maximum density as determined by ASTM D698.

19. Topsoil, which is similar in composition to the existing landfill cap topsoil, will then be placed on top of the cover material to match the adjacent area.

20. The area will be re-vegetated by hydrosheeding, or if sufficiently small, the area may be seeded by hand.

Landfill cap repairs should match the materials presented in the design drawings and specifications for Tacoma Landfill Stage 1 and 2 Closure Specifications (BVWST 1990, 1991) or the Tacoma Landfill Stage 3 Closure Specifications (City of Tacoma 2011) depending on the location of the repair.

3.3.13 ASPHALT CAP REPAIR PROCEDURES

In the event that the asphalt portion of the cap is damaged, the SWM Division Manager will be notified and repairs to the cap will begin as soon as possible following regulatory approval from the agencies. Damage may be caused by surface cracking, uneven or excessive wear, or subsidence. The following guidelines and specifications for repair of damage will be used:

1. The SWM engineering staff shall determine the cause and extent of damage, and establish the boundaries of the area in need of repair.

2. The asphalt will be cut on the boundaries of the damaged area, and the asphalt, crushed surfacing top course, crushed surfacing base course, and sand drainage layer will be removed to expose the HDPE geomembrane, as required to access the damaged area or utility. Care will be taken by the excavator to minimize disruption of the membrane system in place. Excavation of material nearest the geomembrane will be accomplished by hand to minimize the potential for damage. The geomembrane will be inspected to determine whether it is damaged.
3. If repair of the geomembrane is required, membrane cap system removal and replacement will be supervised by SWM engineering staff.

4. The membrane (and geogrid, where applicable) will be cut and the damaged section will be removed.

5. The subgrade or utility in need of maintenance will be repaired or replaced as necessary and tested to ensure that the repair work is sound. The repair crew will take care not to damage the remaining cap during the repair work.

6. Any material excavated in the area of the repair work will be disposed of offsite in accordance with section 2.4.

7. The exposed area will be backfilled to approximately 12 inches below the excavation of the lower membrane with 3/4-inch minus pit run sand.

8. The Contractor will then place the sand bedding layer, which is a 12-inch compacted depth lift of sand graded in accordance with Section 9-03.13 of the Standard Specifications (WSDOT 2015). The material will be compacted to 90 percent of the maximum density as determined by ASM D698.

9. The Contractor will increase the size of the excavated area and cut the membrane back as necessary to ensure that the membrane is well bedded throughout the repair area. The Contractor will leave approximately 1 ft of exposed membrane around the perimeter of the repair area for seaming.

10. The new membrane material will be placed, seamed, and tested by the Contractor in accordance with the specifications prepared by the City as described in Section 3.3.14 Geogrid will be placed, where required, in accordance with the specifications prepared by the City.

11. Once the membrane has been tested and approved, a 12-inch, compacted depth lift of sand which meets the requirements of Section 9-03.13 of the Standard Specifications will be installed (WSDOT 2015). This sand drainage layer will be compacted to 90 percent of the maximum density as determined by ASTM D698.

12. Paving subgrade material will then be placed. The material to be used shall be 6-inch compacted depth of crushed surfacing base course and 2-inch compacted depth of crushed surfacing top course graded in accordance with Section 9-03.9(3) of the Standard Specifications (WSDOT 2015).

13. Low permeability asphalt will then be placed in a single, 3-inch compacted depth lift. The asphalt shall meet the specifications in Table 3-1 (below) and be reinstalled in accordance with the original construction specifications. Permeability testing should be completed in accordance with ASTM PS 129-01.

14. The asphalt will then be sealed with emulsified asphalt, STE-1, at a rate of 0.25 gallons per square yard. The meet lines between the existing asphalt and the asphalt patch will be sealed with tar.

Material selection for repair should be in general accordance with the original design and specifications for the Public Receiving Facility project (Ebasco Services Inc. 1988).
Table 3-1. Low Permeability Asphalt Specifications

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8 inch</td>
<td>100 +/- 0%</td>
</tr>
<tr>
<td>1/2 inch</td>
<td>96 +/- 5%</td>
</tr>
<tr>
<td>3/8 inch</td>
<td>82 +/- 5%</td>
</tr>
<tr>
<td>1/4 inch</td>
<td>67 +/- 5%</td>
</tr>
<tr>
<td>#10</td>
<td>39 +/- 4%</td>
</tr>
<tr>
<td>#40</td>
<td>19 +/- 4%</td>
</tr>
<tr>
<td>#80</td>
<td>8 +/- 2%</td>
</tr>
<tr>
<td>#200</td>
<td>5 +/- 1%</td>
</tr>
</tbody>
</table>

| Asphalt Content | 6.0% +/- 0.3% |
| Asphalt Type    | Superpave PG   |
| Mixing Temperature | 280°F      |
| Aggregate Blend     | 88% 5/8 inch   |
|                     | 12% blend sand |
| Minimum Permeability | 1x10^-10 cm/sec |

3.3.14 HIGH-DENSITY POLYETHYLENE GEOMEMBRANE TESTING PROCEDURES

Along with observance of the welding parameters, continuous vacuum box testing on all extruded welds will be carried out as product quality control. Tests for patches or required sections will be performed as described in the Construction Quality Assurance (LAI 2015a) associated with liner repairs to be completed in 2015. Test results of the seam testing will be submitted to the SWM engineering staff.

If the samples prove defective, the Contractor will conduct additional testing to determine the extent of the defect. The Contractor will make any repairs required to bring the defective areas in compliance with these specifications. It is the Contractor’s obligation to forward all weld seam reports, labeled with the weld seam number as noted on the installation chart, to the SWM engineering staff for final approval. Any faulty spots will be repaired by one of the two methods previously specified, and the repaired sections subjected to thorough visual inspection testing and vacuum box testing.
3.3.15 UTILITIES MAINTENANCE

The SWM developed a draft Utilities Management Plan (Black and Veatch 1990) as required by the CD SOW Section 3.5.7. This plan outlined maintenance procedures that assure the integrity of both the utility structures and landfill cap system. City-owned and maintained utilities on or around the Landfill include power lines, water lines, storm sewers, and sanitary sewers. Private entities maintain data and communication lines around and on the Landfill. The draft Utilities Management Plan is considered out of date. The City currently documents the location of utilities on its govME.com website. This website, this O&M Plan, and applicable provisions of the Tacoma Municipal Code will serve as an updated utilities management plan during PCC.

3.3.15.1 Responsibility

City utility divisions or companies responsible for the operation of the utilities will coordinate with the SWM before conducting any activities that may affect the landfill cap or any of the PCC systems. This includes installation, inspections, and routine maintenance operations.

3.3.15.2 Utility Repair Procedures

It is possible that utility repairs will be required on an emergency basis, (such as a ruptured water main). If this is the case, the servicing utility will notify the SWM Division Manager, who will in turn notify the agencies. The servicing utility will then begin repairs immediately. The servicing utility will:

1. Determine the extent of the repair procedure.
2. The servicing utility may drive light vehicles on the landfill cap, if the area to be repaired is not readily accessible via existing roads. If heavy construction equipment is required, the SWM engineering staff will determine if temporary access roads need to be constructed to provide access.
3. The servicing utility will excavate through the topsoil and cover material to expose the top layer of the membrane, to access the damaged utility. Care will be taken by the excavator to minimize disruption of the membrane system in place.
4. The SWM engineering staff will establish the limits of membrane cap system removal and replacement.
5. The top membrane, geotextile and drainage net will then be cut and the section over (or around in the case of a power pole) the utility will be removed.
6. The sand layer will be removed to expose the lower membrane.
7. The lower membrane will be cut and the section over (or around) the utility will be removed.
8. Material excavated will be disposed of according to Section 2.3 of this document.

When the trench or other exposed area has been backfilled, the repair area shall be temporarily covered with plastic sheeting and sandbagged to provide temporary protection of the area until more permanent repairs to the landfill cap can be made.
As soon as the SWM is notified that emergency repairs are to take place, the procedures outlined in Section 3.3.12 or Section 3.3.13 will be followed accordingly.

### 3.4 EMERGENCY REPAIR PROCEDURES

Ponded water on the landfill cap create stresses which result in strain in the cap synthetic material. If ponding rapidly develops so that significant damage will occur before normal response procedures can be initiated, SWM staff will establish an emergency pumping station to drain the area. The City has several portable pumps capable of performing this work. The water will be pumped from the ponding location to a place where it can naturally drain into a drainage trench. Care shall be taken at the pump outlet to prevent local erosion damage. Prevention of ponding in the low area will be accomplished by continued pumping, diversion of the flows entering the low area through the use of sandbags, or by other methods until the cap can be repaired by normal repair procedures.

If excessive erosion occurs, SWM engineering staff will determine the extent of the damage and initiate repairs. Additionally, the engineering staff will determine the type of control structures necessary to control subsequent surface water erosion.

### 3.5 DOCUMENTATION REQUIREMENTS

A report will be filed following each inspection. All reports will be entered electronically and saved in the SWM electronic file system. Each inspection report will detail:

- Individual performing inspections.
- Date performed.
- Nature of inspection (quarterly, annual, severe storm, etc.).
- Condition of cap, swales, access roads, etc.
- Recommended maintenance procedures.

In the event that maintenance procedures are required for the cap or appurtenances, or if maintenance on another system involves the landfill cap, then a report will be filed detailing the nature of the work, the time period involved, the contractor or individual(s) doing the work, and other pertinent information. These reports will be maintained by the SWM for the duration of the PCC period. An O&M report that contains results of cap inspections will be submitted as part of an annual report submittal to the agencies.
4.0 CONDENSATE COLLECTION SYSTEM

This section describes the gas condensate collection system and outlines the O&M procedures to be followed during PCC. This discussion includes inspection procedures and emergency maintenance procedures.

LFG is extracted via the gas extraction system consisting of vertical wells, horizontal collectors, and a flare and blower system. As the warm, moist LFG is transported through the cooler head pipes, condensate forms. Condensate collection pipes have been installed at low points throughout the LFG collection system, often these points are below ground. Condensate can restrict the gas flow by collecting in low points in the gas manifold. The purpose of the condensate collection system is to drain the condensate from these low points in the gas manifold. The “vacuum drain” method is used to accomplish this.

4.1 SYSTEM DESCRIPTION

The condensate collection system is divided into four collection areas. Each collection area has a condensate tank, vacuum pump, and condensate pump. The condensate is collected from the LFG extraction system at the low points. Low points contain vacuum valves. The condensate is extracted from the vacuum valve and then conveyed to condensate tank through the condensate collection manifold.

The four areas, West (M4), North, South, and Main (east), are manually operated and monitored by SWM staff. Each area contains a small structure, either a shed or in the south area, a vault, that houses the pumps and valves. The condensate gas is extracted through a counter vacuum system. The vacuum pump located within structure applies a suction force on the LFG manifold system that counters the vacuum applied by the LFG blowers. The pressure differential allows the vacuum valve stations to drain the condensate from the LFG manifold and into the condensate manifold. Condensate that is drained from the vacuum valve stations enters the condensate manifold where gravity and the condensate pumps convey the condensate to the collection tanks.

When the tanks in the four areas reach capacity, the SWM staff use the condensate pumps to convey the condensate to the pH dosing tank located at the north end of the Central Area. After a pH adjustment1, the condensate is gravity drained into the sanitary sewer via a 2-inch HDPE line to the leachate collection manhole. Figure 5-2 (Section 5) shows the approximate location of the four condensate collection structures and the dosing tank. Note that at two locations, low points in the condensate line drain directly by gravity to the leachate collection manifold.

The condensate collection manifold is constructed with 2-inch HDPE lines. These lines are mostly located below grade at least 6 inches. This is to prevent damage to the manifold during freezing.

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1 Per the Draft Leachate and Condensate Management Plan (LAI 2015c), pH adjustment is no longer required.
temperatures. Condensate cleanout structures are placed at regular intervals throughout the manifold.

4.2 INSPECTION AND MAINTENANCE RESPONSIBILITY

SWM staff are responsible for operating, inspecting, and maintaining the condensate collection system at the Landfill.

4.3 PERSONNEL REQUIREMENTS

A part-time technician or engineer will be needed to operate, inspect, and maintain the condensate system. This technician or engineer should have a working knowledge of the condensate collection system operation and have a basic understanding of health and safety requirements of working with condensate and LFG.

4.4 SAFETY REQUIREMENTS

The condensate is sampled annually in accordance with the Leachate and Condensate Management Plan (LAI 2016). This analysis has characterized the condensate. Over the last 5-year period, 2008 to 2012, volatile organic compounds (VOCs) were detected most frequently. Constituents detected included those related to petroleum hydrocarbons (toluene, xylene, ethylbenzene) and chlorinated hydrocarbons (methyl chloride, 1,2-dichloroethene, and trichloroethene). Additional VOCs were also detected.

The chemical composition of the condensate may pose a risk to field personnel through skin contact. Direct skin contact with condensate will be prevented. During sampling, inspection, and maintenance of the condensate and LFG systems in which there may be direct skin contact with condensate, field staff will wear chemical resistant boots, coveralls, gloves, and eye protection. Field personnel will additionally refrain from eating and smoking while working with the condensate and LFG collection systems. In the event that condensate comes in contact with skin, the affected areas will be immediately rinsed with water.

4.5 OPERATION

The condensate collection system is manually operated; the LFG extraction system is constantly under vacuum pressure and operates 24 hours a day, 7 days a week. The counter suction condensate collection system is manually turned on when needed as determined by the SWM staff, this occurs about once a week but could be modified depending on the system needs. The following procedure is used to collect the condensate:

1. The LFG extraction system will be checked to verify that it is running.
2. The vacuum pump will be started and the vacuum set to 20 percent greater than the vacuum in the LFG manifold as measured at a point nearest the blowers.
3. Suction and discharge valves will be opened on the condensate pump.

4. Condensate pumps will be turned on (they may not start, depending on the liquid level in the condensate collection tanks).

5. At the vacuum valve station furthest from the condensate tank it serves, the vacuum will be monitored until it exceeds that of the gas manifold system.

6. All gas vacuum valves will be opened until all built up condensate at the vacuum valve station is extracted.

7. After condensate is extracted, the vacuum valves will be closed.

8. The vacuum pump and condensate pumps will be turned off.

9. The liquid level of condensate in the tanks will be checked.

10. If the liquid level in the condensate tanks is near full, the condensate pump will be switched to pump the condensate to the pH dosing tank.

11. Once at the pH dosing tank, the condensate will be released into the sanitary sewer manhole on a regular schedule determined by the technician.

4.5.1 POTENTIAL PROBLEMS

The following items are typical problems that could occur with the condensate collection system:

- Uneven landfill settlement resulting in formation of low areas in the condensate manifold
- Vacuum pump malfunction
- Condensate pump malfunction
- Leak or hold in condensate manifold.

Methods of detecting the above problems are discussed in Section 4.7, Inspection Procedures. Methods of resolving or repairing these problems are discussed in Section 4.8, Maintenance Procedures.

4.5.2 ALTERNATE OPERATION

Due to the nature of the condensate collection system, there is only one mode of alternate operation. If the vacuum pump malfunctions, the system may be operated using the vacuum generated by the motor blowers. This is accomplished by running a temporary vacuum jumper between the LFG manifold and the vacuum lines running to the condensate collection tanks. Since the condensate collection system will be more efficient when the full vacuum from the vacuum pump is used, the system should be repaired as soon as possible when a problem occurs.

4.6 INSPECTION SCHEDULE

The condensate collection system shall be inspected quarterly by SWM staff familiar with the both the condensate collection system and the LFG extraction system. Operators will informally inspect the condensate system during operation and make notes of any pressure related anomalies.
4.7 INSPECTION PROCEDURES

Inspection of the condensate collection system consists of checking the aboveground portions of the system. This consists of checking all cleanout blind flanges and clean out caps for alignment and seal, and making sure all pumps are operating. All blind flanges should be inspected. If a “hissing” sound is noticed, the flange alignment and seal will be checked for damage to the HDPE pipe. The vacuum and condensate pumps will be inspected to make sure the circuit breaker has not been tripped. The pumps will additionally be inspected to ensure no alarms or hissing sounds are present during operation.

The condensate manifold should be checked for leaks. This can be accomplished by running the vacuum pump at a known suction and checking the pressure differential at various valves throughout the line. If a large pressure differential is detected between valve stations, it can be assumed there is a leak. In the event that the vacuum pump is not able to maintain vacuum across the system, a major leak has occurred. The approximate location can be found by checking the pressure at surrounding valve stations. A pressure differential can also indicate a low point or sag in the condensate collection manifold. These low points are likely cause by uneven settlement and can trap condensate within the line.

4.8 MAINTENANCE PROCEDURES

For both vacuum and condensate pumps, manufacturer recommendations for maintenance will be followed. Additionally, the manufacturer’s literature will be followed for all repairs. If malfunctioning pumps cannot be repaired, they will be replaced.

If hissing or air leaks is noticed at a blind flange or cleanout cap within the condensate manifold, the flange or cap will be removed, cleaned, and replaced. If this does not fix the leak, the gasket, flange, or cap will be replaced.

If leaks, breaks, or low points are found in the condensate manifold the line will be repaired. The leak, break, or low point will first be located; this is accomplished by running the vacuum pump and checking the pressure differential at the valve stations. Once the general area of the leak is located, the condensate system will be shut down and the lines bled by opening valve stations surrounding the leak. The damaged pipe section will be excavated if necessary, cut utilizing a handsaw, and the pipe replaced. Safety protocols will be observed during this procedure.

4.9 EMERGENCY MAINTENANCE PROCEDURES

In the event of a condensate leak, the SWM engineering staff will be notified and the following steps will be taken to minimize exposure to the condensate and contain the spill:

1. The leak area will be located as described in Section 4.8 of this document.
2. Any free flowing condensate will be contained by using berms or absorbent pads. All soil or absorbent pads saturated with condensate will be removed and appropriately disposed of promptly by appropriate means to reduce the risk to personnel from contact with condensate.

3. The leak will be repaired as described in Section 4.8

4. All repairs to the condensate collection system will be inspected after 24 hours of system operation.

4.10 **SAMPLING AND ANALYSIS**

The condensate will be sampled and analyzed in accordance with the Leachate and Condensate Management Plan (LAI 2016). This plan will also be utilized to determine condensate flow rates.

4.11 **DOCUMENTATION REQUIREMENTS**

A report will be filed following each formal quarterly inspection. All reports will be entered electronically and saved in the SWM electronic file system. Each inspection report will detail:

- Individual performing inspections
- Date performed
- Systems checked (i.e., condensate manifolds, condensate pumps, vacuum pumps, blind flanges)
- Recommended maintenance procedures.

In the event that any maintenance procedures are required as a result of the inspection, or as a result of an informal inspection during operation, a report will be filed detailing the nature of the work, the time period involved, the contractor or individual(s) doing the work, additional work that will need to be completed, and other pertinent information. These reports will be maintained by the SWM for the duration of PCC. Documentation of the environmental sampling, analysis, and flow rates will be maintained in accordance with Leachate and Condensate Management Plan (LAI 2016). An O&M report that contains results of condensate system inspections will be submitted as part of an annual report submittal to the agencies.
5.0  CENTRAL AREA LEACHATE COLLECTION SYSTEM

The Central Area is the only section of the Landfill with a bottom liner and leachate collection system. The final portion of the Central Area cap was completed in November 2013. This area of the Landfill is the last portion of the Landfill to enter PCC. This section describes the leachate collection system and provides guidance for the O&M activities during PCC as required by the CD SOW. Also, discussed within this section are personnel and safety requirements in handling leachate. The Leachate and Condensate Management Plan (LAI 2016) addresses sampling and reporting procedures, additionally it addresses post-closure care requirements put forth in WAC 173-351-500(2).

5.1  SYSTEM DESCRIPTION

The Central Area leachate collection system consists of two systems: the primary leachate collection and removal system and the secondary leachate detection and removal system. A toe drain system exists beneath the Central Area bottom liner. Figure 5-1 shows a cross section view of the two leachate collection systems; Figure 5-2 shows the approximate locations of the leachate collection systems and the toe drain system.

The primary system comprises a drainage layer overlying an HDPE barrier layer. The drainage layer consists of a highly transmissive geonet covered with a nonwoven geotextile. Leachate flows through the geonet to a perforated HDPE collection pipe that runs south to north through the center of the Central Area. The drainage layer and collection pipe are constructed at a grade of at least 2 percent to facilitate gravity drainage of the leachate. The collection pipe discharges into a leachate collection manhole at the north end of the Central Area that ultimately discharges to the City's sanitary sewer line for treatment at the City's Central Treatment Plant. In 1996, a camera inspection of the leachate collection line was performed. The inspection determined that the line had collapsed approximately 120 ft south of the leachate collection manhole. However, the inspection also concluded that leachate was flowing around the collapsed portion of the line in the gravel bedding material and the system was operating as designed. The bedding material is up to about 17 inches thick based on liner drawing details shown on Figure 5-1.

The secondary system is below the primary system and is virtually identical to the primary system. For easy verification and monitoring of flow in the leak detection system, the secondary system collection pipe discharges into a separate manhole, which also ultimately discharges to the City's sanitary sewer line.

The toe drain leachate collection system consists of a 6-inch pipe installed at the junction of the bottom liner and the sidewall liner in the adjacent eastern refuse. The purpose of the toe drain is to prevent leachate pressure build up along the sidewall of the Central Area.

All of the leachate collection pipes were constructed with a minimum 2 percent gradient to allow for gravity drainage from south to north. The pipes are constructed of perforated HDPE to allow for
The primary leachate collection pipe that transverses the center line of the Central Area has a cleanout location on the south side of the Central Area. This cleanout consists of a solid HDPE pipe that extends vertically through the waste and the final capping system. The approximate location of this structure is shown on Figure 5-2.

5.2 INSPECTION, MAINTENANCE, SAMPLING RESPONSIBILITY AND PERSONNEL

The system is designed to drain via gravity thus operates relatively passively. The SWM staff will be responsible for inspection, maintenance, and sampling of the system. This can be performed by SWM staff familiar with leachate collection system operations and understanding of the potential health hazards associated with leachate.

5.3 INSPECTION AND MAINTENANCE SCHEDULE

The leachate collection systems should be inspected by SWM staff on a quarterly basis. A full camera line inspection of the leachate collection line will be conducted once every five years. Maintenance of the line should be performed annually or on an as-needed basis.

5.4 SAFETY REQUIREMENTS

The leachate is sampled regularly in accordance with the Leachate and Condensate Management Plan (LAI 2016). Characterization data from the period, 2008 to 2012 shows a variety of chemicals in the leachate. These chemicals include VOCs, semi-volatile organic compounds, and metals. Additionally the leachate has high levels of total suspended solids, total dissolved solids, and biological oxygen demand. Since the completion of the final capping system on the Central Area, it is anticipated that the quantity of leachate will decrease; this may result in a slight increase in concentration of chemicals within the leachate.

The chemical composition of leachate may pose a risk to field personnel through skin contact. It is recommended that exposure to leachate through direct skin contact be prevented. During sampling, inspection, and maintenance field tasks that involve direct contact with leachate, field staff will wear chemical resistant boots, coveralls, gloves, and eye protection. Field staff will additionally refrain from eating and smoking while working directly with leachate. In the event that leachate comes in contact with skin, the affected areas will be immediately rinsed with water.
5.5 INSPECTION PROCEDURES

The leachate collection and leak detection systems will be inspected quarterly for malfunctions. Inspection of the leachate collection system will consist of an examination of leachate production records, observation of flow in both collection and detection system, and monitoring of leachate content.

Leachate flow data will be collected in accordance with procedures detailed in the Leachate and Condensate Management Plan (LAI 2016). This plan details the procedures for monitoring flow rates and estimating leachate production rates. In addition, the plan details the procedures for collecting samples for chemical composition analysis.

With the final Central Area cap in place, precipitation should no longer affect the leachate production rates. The leachate production rates should become more stable as time progresses. The leachate production rate is likely to decrease as waste that was previously saturated decomposes and dries; this may slightly concentrate the chemical composition of the leachate stream. A sharp increase in the leachate production rate may indicate a leak in the capping system. A sharp decrease in production may indicate a clogged collection line requiring maintenance.

The inspector should also monitor the chemical composition and analytical data of the leachate. Sudden increases in any analyte may be an indicator of biological growth. High solids composition may be indicative of clogging within the system.

Additionally, the inspector will examine the state of the cleanout structure and manhole structure. This inspection will note any signs of deterioration of piping or crumbling of concrete.

At a minimum of every 5 years, a full line camera inspection of the leachate collection system will be conducted. The integrity of the collection pipe will be examined during this inspection. Any noted pipe deformation, crushing, or clogging will be noted. If the integrity of the collection system has been impaired, maintenance or repair will be required.

5.6 MAINTENANCE PROCEDURES

Regular maintenance of the leachate collection system includes an annual cleaning of the pipes and manholes. Additional cleaning on an as-needed basis is required if an indication of significantly restricted flow is present. To prevent excessive biological, mineral, or sediment accumulation, a sewer line cleaning device may be used to scour the interior wall of the pipe. Cleanout and manholes provide access to the collection pipes and the conveyance pipes between the manholes. Following any cleaning operations, all equipment will be decontaminated prior to removal from the site. The location of the cleanout and manholes are shown on Figure 5-2.

High pressure water flushing equipment may be also used to clean pipes and manholes. Oxidants such as hydrogen peroxide may be added to the water to help remove clogs caused by biological growth. If
excessive mineralization is suspected of clogging the drainage system, proper flow can be restored by flushing with a slightly acidic chemical solution. These procedures must be used with caution because the addition of water to the Landfill can cause increased subsidence.

### 5.7 EMERGENCY REPAIR PROCEDURES

There are no foreseen emergency situations involving the leachate collection system. Associated problems such as penetration point failure or cracks in the landfill cap have been discussed in previous sections.

### 5.8 SAMPLING AND ANALYSIS

The leachate will be sampled and monitored in accordance with the Leachate and Condensate Management Plan (LAI 2016). This plan includes the requirements of WAC 173-351-500(2) and details the record keeping necessary for achieving functional stability as defined in the regulation. If malfunctions or leaks are observed during sampling or monitoring, they will immediately be reported to SWM engineering staff.

### 5.9 DOCUMENTATION REQUIREMENTS

Documentation requirements of the leachate quantities and composition are provided in the Leachate and Condensate Management Plan. Additionally, a report will be prepared following quarterly inspections or any maintenance procedures completed on the leachate collection system. All reports will be entered electronically and saved in the SWM electronic file system for the duration of PCC. An O&M report that contains results of leachate system inspections will be submitted as part of an annual report submittal to the agencies.

ALB/EFW/jrc
6.0 REFERENCES


Tacoma, City of 2011. Tacoma Landfill Stage 3 Closure Specifications. April.


Environmental Operations and Maintenance Plan
City of Tacoma Landfill
Tacoma, Washington

Landfill Cap Areas

Note
1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Legend
- Settlement Plate
- W7 Leak Detection Catchbasin
- Pan Lysimeter
- Fence Line
- Cap Line
- Road Extents
- 2010 Asphalt Cap
- Original Asphalt Cap
- Composite Cap
- Dual Membrane Cap

Source: © Bing Maps, City of Tacoma, 2014
PHASE I/II

HYDROSEEDED SURFACE VEGETATION

6" TOPSOIL

18" COVER MATERIAL

COMPOSITE LINER: FILTER FABRIC, DRAINAGE NET, GEOMEMBRANE (60 MIL HDPE)

12" SAND LAYER

12" MIN. SOIL BEDDING

GEOMEMBRANE (60 MIL HDPE)

REFUSE

Source: City of Tacoma Operations and Maintenance Plan, 1992
CENTRAL AREA

HYDROSEEDED SURFACE VEGETATION

6" TOPSOIL

18" COVER MATERIAL

GEOMEMBRANE (60 MIL HDPE)

BEDDING SOIL/INTERMEDIATE COVER

REFUSE

GEOCOMPOSITE DRAINAGE LAYER

GEOSYNTHETIC CLAY LINER (GCL)

2" SAND LAYER

Source: City of Tacoma Operations and Maintenance Plan, 1992
Geomembrane Strain Due to Depression

- STRAIN > 6%
- STRAIN = 6%
- STRAIN < 6%
8" DIA LEAK DETECTION PIPE (PREFORATIONS LOCATED AS INDICATED)

SLOPE 2%

WASTE

PROTECTIVE SOIL COVER

8" DIA LEACHATE COLLECTION PIPE

HDPE

60 MIL HDPE LINER

DRAINAGE NET

GRAVEL

1'-4"

Source: City of Tacoma Landfill L & C Management Plan, 1992

Figure 5-1
Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Legend

- Leachate Collection Pipe
- Perforated PVC Toe Drain
- Condensate Line (Gravity Drain)
- Condensate Flow Direction
- Liner Extent
- Bottom/Side Liner Intersection
- 2" PVC Condensate Line
- 2" Condensate Flow Direction (Force Main)
- Collection Tank


Environmental Operations and Maintenance Plan
City of Tacoma Landfill
Tacoma, Washington

Leachate and Condensate Conveyance System

Figure 5-2
Manhole Configuration

Source: City of Tacoma Landfill L & C Management Plan, 1992
TACOMA LANDFILL
ENVIRONMENTAL OPERATIONS AND MAINTENANCE PLAN
CONDENSATE COLLECTION SYSTEM INSPECTION FORM

Date/Time:  

Inspector’s Name:  

Inspection Items:
1. Cleanout Blind Flanges (no signs of hissing)  □ Yes  □ No
2. Cleanout Caps (proper alignment and seal)  □ Yes  □ No
3. Valve Stations (working in good condition with no signs of leaking)  □ Yes  □ No
4. Above Ground Condensate Manifold (good condition no visible signs of leaking)  □ Yes  □ No
5. Vacuum Pumps (working with no leaks)  □ Yes  □ No
6. Condensate Pumps (working with no leaks)  □ Yes  □ No
7. Condensate Manifold Pressure (check pressure differential across system for signs of leaks/low points)  □ Yes  □ No

Observations:  

Repairs/Corrective Actions:  

Inspector’s Signature:  

3/30/15  Y:\094\089.010 5 Y\30\O&M Plan\Documentation Forms\Condensate Collection System Inspection Form.docx
Date/Time of Emergency: ____________________________________________

Name of Individual Contact: __________________________________________

Description of Emergency: ____________________________________________

Description of Probably Cause(s): ______________________________________

Remedial Action Taken: ________________________________________________

Further Actions Required: ______________________________________________

Recommendation for Prevention of Recurrence: _____________________________
**TACOMA LANDFILL**  
**ENVIRONMENTAL OPERATIONS AND MAINTENANCE PLAN**  
**LANDFILL CAP INSPECTION FORM**

Date/Time:  

Inspector’s Name:  

**Inspection Items:**

<table>
<thead>
<tr>
<th>Inspection Item</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cracking of deterioration of the cover material</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access road damage</td>
<td></td>
<td></td>
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<tr>
<td>Drainage to channel blocking or erosion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drainage from secondary drainage pipes in the catch basins</td>
<td></td>
<td></td>
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<tr>
<td>Penetration point failures</td>
<td></td>
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<tr>
<td>Ponding</td>
<td></td>
<td></td>
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<tr>
<td>Burrowing animals</td>
<td></td>
<td></td>
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<tr>
<td>Stormwater erosion</td>
<td></td>
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<tr>
<td>Trash or litter</td>
<td></td>
<td></td>
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<tr>
<td>Other activity or conditions that adversely affect the integrity of the landfill cap or liner system.</td>
<td></td>
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<tr>
<td>Chuckholes or broken asphalt</td>
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<tr>
<td>Uneven or excessive wear</td>
<td></td>
<td></td>
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<tr>
<td>Security gates</td>
<td></td>
<td></td>
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<tr>
<td>Locks on groundwater wells</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency information</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Inadequate protective vegetation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Damage to detention basins</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Drainage channel erosion</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>French drain operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Damage to berms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local subsidence</td>
<td></td>
<td></td>
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<tr>
<td>Volunteer vegetation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Odor problems</td>
<td></td>
<td></td>
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<tr>
<td>Unauthorized human activity</td>
<td></td>
<td></td>
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<tr>
<td>Cracks in the asphalt</td>
<td></td>
<td></td>
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<tr>
<td>Subsidence</td>
<td></td>
<td></td>
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<tr>
<td>Bleeding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Security gates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fencing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire extinguishers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access/Parking areas</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TACOMA LANDFILL
ENVIRONMENTAL OPERATIONS AND MAINTENANCE PLAN
LANDFILL CAP INSPECTION FORM

Observations: ____________________________________________________________
________________________________________________________
________________________________________________________
________________________________________________________

Repairs/Corrective Actions: ______________________________________________
________________________________________________________
________________________________________________________
________________________________________________________

Inspector’s Signature: ____________________________________________________
TACOMA LANDFILL
ENVIRONMENTAL OPERATIONS AND MAINTENANCE PLAN
LEACHATE COLLECTION SYSTEM INSPECTION FORM

Date/Time: ____________________________________________

Inspector’s Name: ______________________________________

Inspection Items:

Collection Manholes (Good Condition) Leachate Cleanout Structure (Good Condition)
☐ Yes ☐ No ☐ Yes ☐ No

Changes in Flow Data Changes in Chemical Composition
☐ Yes ☐ No ☐ Yes ☐ No

Observations: __________________________________________

________________________________________________________________________

Repairs/Corrective Actions: _____________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Inspector’s Signature: _____________________________________________
Date/Time of Maintenance: ________________________________

System/Location: ________________________________________

Technician: ____________________________________________

Description of Maintenance Performed: ________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

Recommendations for Future Maintenance: ________________________________
_________________________________________________________________
_________________________________________________________________
APPENDIX B

Calculations to Determine Maximum Biaxial Strain
Need:
1. Determine strain in liner due to the formation of a parabolic depression
2. Present results in a table and a curve

Information:
* Use 6% strain as a limit
* Strain is determined by calculating the change in area due to the formation of a depression
* Sketch:

Calculations:
1) Strain:
   * The strain ($\varepsilon$) can be determined by taking the ratio of the change in area ($\Delta A$) to the original area ($A_0$)
   $$\varepsilon = \frac{\Delta A}{A_0} = \frac{A_p - A_0}{A_0}$$
   Where $A_p$ is the area of the parabolic (stretched) surface
   and $A_0$ is the original surface area
2) Original Surface Area:
   $$A = \pi b^2$$
3) Stretched area:
   * This can be calculated by rotating the equation for a parabola around the y-axis and then integrating from $x=0$ to $x=d$

General: $y^2 = 4cx$
when $y = b$ or $-b$, $x=d$
$y=0, x=0$

$\therefore b^2 = 4cd$
$c = b^2/4d$
$\therefore y^2 = (b^2/d)x$
* Integral calculus

\[
A_P = 2\pi \int_0^d f(y)(1 + (f'(y)^2)^{1/2}) \, dx
\]

where \( f(y) = (b^2/d)^{0.5} \)

\( f'(y) = (b^2/d)^{0.5}(1/(2x^{0.5})) \)

Let \( a = b^2/d \)

Then

\[
f(y) = (ax)^{0.5}
\]

\[
f'(y) = a^{0.5} / (2x^{0.5})
\]

plugging this into the integral

\[
A_P = 2\pi \int_0^d f(y)(1 + (f'(y)^2)^{1/2}) \, dx
\]

and then simplifying

\[
A_P = 2\pi a^{0.5} \int_0^d x^{1/2} \, dx
\]

The solution to the integral yields this equation, which can be broken up into 3 parts:

\[
A_P = \frac{4\pi a^{0.5}}{3} \left[ \left( d + \frac{a}{4} \right)^{1.5} - \left( \frac{a}{4} \right)^{1.5} \right]
\]

Part 1 \quad Part 2 \quad Part 3

Recall that \( a = b^2/d \)

4) The integral solution was then used to determine a range of geometries that result in a 6% strain
ATTACHMENT 4

1990 Tacoma Landfill Stage 1 Closure Specifications
Stage 1 North Closure Specifications (original)
WORK ORDER NO. AU6506

TABLE OF CONTENTS

NOTE: ALL BIDDERS MUST HAVE A COPY OF THE SPECIFICATIONS AND THE BID SUBMITTAL PACKAGE

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2) Proposal Signature Sheet
3) Bid Bond
4) Non-Collusion Affidavit
5) Contract
6) Performance Bond
7) General Release Form

PART II STATE AMENDMENTS TO THE STANDARD SPECIFICATIONS

PART III SPECIAL PROVISIONS

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2) Exhibit A
3) Construction Quality Assurance Plan

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2.00 Project Requirements
3.00 Submittals
4.00 Temporary Facilities
5.00 Drawings
6.00 Earthwork
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8.00 Geosynthetics
9.00 Landfill Gas Collection System
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PART IV  CITY OF TACOMA AFFIRMATIVE ACTION - MINORITY AND WOMEN'S BUSINESS ENTERPRISES - EQUAL OPPORTUNITY REGULATIONS

PART V  STATE PREVAILING WAGE RATES

BID SUBMITTAL PACKAGE

TITLE SHEET

CALL FOR BIDS

1) Proposal  
2) Proposal Signature Sheet  
3) Bid Bond  
4) Non-Collusion Affidavit  
5) City of Tacoma - Contractor’s Contact Report  
6) City of Tacoma - Contractor’s Pre-Work Form

SPECIAL NOTE

The Proposal and Contract forms have been included in both the Specifications Book and the Bid Submittal Package. The forms in the Specifications Book are for informational purposes only and need not be completed or submitted with the Bid. All forms in the Bid Submittal Package must be completed and submitted with the Bid.
PART II

STATE AMENDMENTS TO THE STANDARD SPECIFICATIONS
INTRODUCTION

The following Amendments and Special Provisions shall be used in conjunction with the 1988 Standard Specifications for Road, Bridge, and Municipal Construction adopted in January, 1988.

AMENDMENTS TO THE STANDARD SPECIFICATIONS

The following Amendments to the Standard Specifications are made a part of this contract and supersede any conflicting provisions of the Standard Specifications. For informational purposes, the date following each Amendment title indicates the implementation date of the Amendment or the latest date of revision.

Each Amendment contains all current revisions to the applicable section of the Standard Specifications and may include references which do not apply to this particular project.
2-01.2 Disposal of Usable Material and Debris

This section is supplemented with the following:

Disposal of debris in a Contractor provided waste site shall meet the requirements of Section 2-03.3(7)C.
SECTION 2-02, REMOVAL OF STRUCTURES AND OBSTRUCTIONS

April 11, 1988

2-02.3(1) General Requirements

The last paragraph is revised to read:

The Contractor may dispose of waste material in State-owned sites if the Special Provisions or the Engineer permit it. Otherwise, the contractor shall arrange to dispose of waste at no expense to the State and any such disposal shall meet the requirements of Section 2-03.3(7)C.
SECTION 2-03, ROADWAY EXCAVATION AND EMBANKMENT

December 26, 1989

2-03.3(3) Excavation Below Grade

The second sentence of the second paragraph is revised to read:

The Contractor shall save the finer free draining material from excavations or borrow pits to use in backfilling the top 6 inches of the subgrade.

2-03.3(7) Disposal of Surplus Material

This section is revised to read:

2-03.3(7) Disposal of Surplus Material

2-03.3(7)A General

The Contractor shall haul all excavation to the nearest embankment, unless the Engineer declares the hauling distance to be too great. If excavation yields more material than needed for nearby embankments, the Contractor shall dispose of the excess in keeping with the Special Provisions or as the Engineer directs.

2-03.3(7)B Haul

When the contract includes a payment item for haul, the State will pay as follows for hauling excess excavation to a disposal site:

1. If the State provides a site, but the Contractor chooses to haul elsewhere, the State will pay for all actual mileage up to but not exceeding the mileage that would have been necessary using the State site.

2. If the State does not provide a site, the State will pay for all actual mileage up to but not exceeding the mileage necessary to haul to a site 1 mile from the project limits.

2-03.3(7)C Contractor Provided Disposal Site

If the State provides no waste site, but requires disposal of excess excavation or other materials, the Contractor shall arrange for disposal at no expense to the State, except as provided in Section 2-03.3(7)B Item 2.

The Contractor shall acquire all permits and approvals required for the use of the disposal site. The cost of any such permits and approvals shall be included in the bid prices for other work.

The Contractor shall, if requested by the Engineer, provide the Engineer the location of all disposal sites to be used and also provide copies of the permits and approvals for such disposal sites.

Disposal of excess material within a wetland area will not be allowed without a Section 404 permit issued by the U.S. Corps of Engineers, and approval by the local agency with jurisdiction over the wetlands. Wetlands
are defined as those areas inundated or saturated by ground or surface
water at a frequency and duration sufficient to support, and that under
normal circumstances do support, a prevalence of vegetation typically
adapted for life in saturated soil conditions. Wetlands generally include
swamps, marshes, bogs, and similar areas.

The Contractor shall protect, indemnify and save harmless the State from
any damages that may arise from the contractor’s activities in making
these arrangements. Such indemnity shall be in accordance with RCW
4.24.115 as amended by CH. 305, Laws of 1986. Any action required to
satisfy any permit and/or any approval requirements in a Contractor
provided disposal site shall be performed by the Contractor at no additional
expense to the State.

Reclamation of a Contractor-supplied waste site must conform to the
requirements of Section 3-03.

2-03.3(14)A Rock Embankment Construction
The first sentence of the ninth paragraph is revised to read:

When practical, and as approved by the Engineer, the Contractor shall
save the finer free draining material from excavations or borrow pits for use
in topping rock fills.

2-03.3(14)C Compacting Earth Embankments
The first sentence of the twelfth paragraph is revised to read:

Under Method B, the moisture content of the material shall not exceed 3
percent above the optimum determined by the tests described in Section 2-
03.3(14)D.

2-03.3(14)l Embankments at Bridge and Trestle Ends
The first sentence of the first paragraph is revised to read:

This work consists of filling around the ends of trestles and bridges, the
area defined in Section 1-01.2.
SECTION 2-09, STRUCTURE EXCAVATION
April 9, 1990

2-09.3(1)D Disposal of Excavated Material

The second paragraph is supplemented with the following:

Any such disposal shall meet the requirements of Section 2-03.3(7)C.

2-09.3(1)E Backfilling

Item No. 1, of the fifth paragraph is revised to read as follows:

1. Backfill supporting roadbed, roadway embankments, or structures placed in horizontal layers no more than 6 inches thick with each layer compacted to 95 percent of the maximum density determined by the Compaction Control Test, Section 2-03.3(14)D.

2-09.3(3)D Shoring, Cribbing and Cofferdams

The first paragraph is revised to read:

The Contractor shall provide plans showing proposed methods and construction details of shoring, cribbing, or cofferdams in accordance with Sections 6-01.9 and 6-02.3(16). The Contractor shall remain responsible for satisfactory results.

2-09.3(4) Construction Requirements, Structure Excavation, Class B

This section is revised as follows:

Delete the third and fourth sentence of the third paragraph.

2-09.4 Measurement

This section is supplemented with the following:

Shoring and Cribbing or extra excavation Class B will be measured by the square foot as follows:

Where the trench is excavated to a depth of 4 feet or more and shoring and cribbing is constructed or the earth faces are excavated to the slope of repose provided it is 3/4 to 1 or flatter as required to meet safety regulations, the area for payment will be measured on each side of the trench or excavation where such work is performed. Measurement will be made from the existing ground line or from the neat lines of a designated grading section at the outer limit defined for payment for structure excavation to the bottom of the excavation and for the length of the work actually performed. The bottom elevation for measurement will be the bottom of the excavation as shown in the plans or as otherwise established by the Engineer.

2-09.5 Payment

This section is supplemented with the following:
7. "Shoring and Cribbing or Extra Excavation Class B", per square foot.

The unit contract price per square foot shall be full pay for the construction and removal of shoring and cribbing. The unit contract price per square foot shall be full pay for all excavation, backfill, compaction, and other work required when extra excavation is used in lieu of constructing shoring and cribbing. If select backfill material is required for backfilling within the limits of the structure excavation, it shall also be required as backfill material for the extra excavation at the Contractor's expense.

If there is no bid item for shoring and cribbing or extra excavation Class B on a square foot basis and the nature of the excavation is such that shoring and cribbing or extra excavation is required as determined by the Engineer, payment to the Contractor for the work will be made in accordance with Section 1-04.4.
SECTION 5-04, ASPHALT CONCRETE PAVEMENT
February 26, 1990

5-04.2 Materials

The list of materials and references is supplemented with the following:

- Recycling Agent..............9-02.1(5)

5-04.3(1)A Requirements For All Plants

This section is supplemented with the following:

11. Burner Fuel. The plant burner fuel shall be restricted to the use of propane, butane, natural gas, methane, coal, No. 1 or No. 2 fuel oil, or other acceptable burner fuel as determined by the Engineer.

5-04.3(3) Asphalt Pavers

The sixth paragraph is supplemented by the following:

- These areas, as determined by the Engineer, may include, but are not limited to, gore areas, road approaches, left-turn channelizations, and tapers.

5-04.3(10)B Control

The third paragraph is revised to read:

- Cores may be used as an alternate to the nuclear density gauge tests. When cores are taken by the State at the request of the Contractor, they shall be requested by noon of the next workday after paving. The State shall be reimbursed for the coring expenses at the rate of $75 per core when the core indicates the acceptable level of compaction within a lot has not been achieved.

The first sentence of the fifth paragraph is revised to read:

- Asphalt concrete Classes B, E, F, and G constructed under conditions other than listed above shall be compacted on the basis of a test point evaluation of the compaction train.

5-04.3(13) Surface Smoothness

The following paragraph is inserted after the fifth paragraph:

- When portland cement concrete pavement is placed on asphalt concrete pavement, the surface tolerance of the asphalt concrete pavement shall be such that no elevation lies above the plan grade minus the specified plan depth of portland cement concrete pavement. Prior to placing the portland cement concrete pavement, any such irregularities shall be brought to the required tolerance by grinding or other means approved by the Engineer, at no expense to the State.

5-04.3(17) Paving Under Traffic
The second and third sentences of the fourth paragraph are revised to read:

Temporary striping shall consist of placing strips of pavement marking tape, a minimum of 4 feet in length, on the lane separation line to delineate the path of travel for vehicles. Intervals between marking strips shall be a maximum of 36 feet.
SECTION 6-02, CONCRETE STRUCTURES

April 9, 1990

6-02.2 Materials

The section reference for Elastomeric Bearing Pads is revised from 9-06.31 to 9-31.

6-02.3(1) Classification Of Structural Concrete

This section is revised to read:

The class of concrete to be used shall be as noted in the Plans and these Specifications. The numerical class of concrete defines the specified compressive strength at 28 days.

<table>
<thead>
<tr>
<th>Class of Concrete</th>
<th>Generally Used In</th>
</tr>
</thead>
<tbody>
<tr>
<td>6000</td>
<td>Special structural applications</td>
</tr>
<tr>
<td>5000</td>
<td>Thin and heavily reinforced members; Bridge decks, cast-in-place beams, girders, and columns.</td>
</tr>
<tr>
<td>4000</td>
<td>General use; traffic and pedestrian barriers, approach slabs, bridge footings, box culverts, wing walls, and retaining walls.</td>
</tr>
<tr>
<td>4000W</td>
<td>Underwater placement; shafts and seals.</td>
</tr>
<tr>
<td>3000LS</td>
<td>Low shrink concrete for closure pours and applications where shrinkage needs to be minimized.</td>
</tr>
<tr>
<td>4000LS</td>
<td></td>
</tr>
<tr>
<td>5000LS</td>
<td></td>
</tr>
<tr>
<td>6000LS</td>
<td></td>
</tr>
<tr>
<td>3000</td>
<td>Large sections with light to nominal reinforcing, retaining walls, mass pours, sidewalks, curbs and gutters; and non structural concrete.</td>
</tr>
</tbody>
</table>

COMMERCIAL Guardrail anchors, luminaire bases, curbs and gutters.

The Contractor may request, in writing, permission to use a class of concrete with a higher compressive strength than specified. The substituted concrete shall be evaluated for quality determination, statistical analysis, and acceptance based on the specified class of concrete. The Engineer will respond in writing. The Contractor shall bear any added costs that result from the change.

6-02.3(2) Proportioning Materials

This section is revised to read:

The total Chloride ion (Cl-) content of the mixed concrete shall not exceed 0.06 percent of cementitious material for prestressed concrete nor 0.10
percent of cementitious material for reinforced concrete. Cementitious material shall be the weight of cement plus fly ash, if used.

Concrete for bridge decks, bridge approach slabs, and for State-provided mixes shall use only Class 1 fine aggregate. Concrete for slip-formed barrier may use Class 1 or 2 fine aggregate.

Unless otherwise specified, the Contractor shall use Type II portland cement in all concrete.

The use of fly ash for all classes of concrete other than for State-provided mixes is optional. Fly ash, if used, shall not exceed 25 percent by weight of the total cementitious material in the concrete mix. The water to cement ratio shall be calculated on the total cementitious material.

As an alternative to the use of cement and fly ash as separate components, a blended hydraulic cement, Type IP(MS) or Type I (PM) (MS)), may be used. The blended cement shall be produced such that the maximum fly ash content of the cementitious material is 25 percent.

6-02.3(2)A Measuring Materials

This section is revised to read:

6-02.3(2)A Contractor Provided Mix Design

The Contractor shall provide a mix design for concrete Class 5000, 6000, 5000LS and 6000LS. For all other classes of concrete, the Contractor may provide an alternate mix design to the State Specified mix design.

For concrete Class 3000LS, 4000LS, 5000LS, 5000LS, or underwater placement, the maximum water cement ratio shall be 0.38.

The Contractor’s submittal for approval of a mix design shall include the mix proportions per cubic yard and the proposed sources for all the mix ingredients. Mix designs submitted by the Contractor shall include test data confirming that concrete made in accordance with the proposed mix design will meet the requirements of these Specifications. Test data shall be from an independent testing lab or from a commercial concrete producer’s lab. If the test data is developed at a producer’s lab, the Engineer or a representative may witness all testing.

The Contractor shall provide a unique identification for each mix design. Approval of a mix design from a previous Department project may be made by reference to the mix design identification and based on accumulated performance data from testing by the State or from an independent testing lab. Data for consideration shall include recent performance data less than one year old.

Fine aggregate shall conform to Section 9-03.1(2) Class 1 or Class 2. Fine aggregate gradation will be approved with the proposed mix design.

Coarse aggregate shall conform to Section 9-03.1(3), Grading No. 2 or 5, or to Section 9-03.1(4). The nominal maximum size aggregate shall be 3.4 inch for Classes 4000, 5000, 6000 and 3000LS, 4000LS, 5000LS, and
6000LS and 1-1/2 inch for Classes 4000W and 3000. The coarse aggregate gradation shall be submitted for approval with the proposed mix design.

The Contractor shall design the concrete mix to meet the required average compressive strength equal to 1.34 times the specified compressive strength for concrete plants with a coefficient of variation (CV) of 20 percent. For concrete plants with a CV other than 20 percent, the required average strength shall be:

\[
f'_{cr} = \frac{1}{(1 - 1.28V)} f'_c
\]

where \( f'_{cr} \) = required average compressive strength at 28 days
\( f'_c \) = specified compressive strength at 28 days
\( V \) = coefficient of variation (CV) expressed as a decimal i.e. CV = 20% \( V = 0.20 \)

A CV of 20 percent will be used unless the concrete supplier can justify a lower value.

For approval of the Contractor's mix design, the attainment of the required average compressive strength at 28 days will be determined from the results of testing five 6-inch by 12-inch cylinders tested in accordance with WSDOT test Methods 801 and 811.

To establish a CV for a concrete plant, the result of at least 30 consecutive compression tests will be required except as noted below. The cylinders will be 6-inch by 12-inch test specimens and will be made, handled, and stored in accordance with WSDOT test method 809 (Method 1) and tested in accordance with WSDOT test methods 801 and 811. Each set of two cylinders will be produced from separate batches of production concrete. The equipment used for the production concrete shall be the same as that used for the proposed class of concrete.

If the Contractor's concrete production facility does not have a sufficient number of compressive test results to meet the 30-test requirement, but does have test records for 15 to 29 consecutive tests, the CV calculated from these available tests may be used if, after calculation, the CV value is first multiplied by the appropriate factor given in the following table:

<table>
<thead>
<tr>
<th>Number of tests</th>
<th>Factor for increasing CV</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>1.16</td>
</tr>
<tr>
<td>20</td>
<td>1.08</td>
</tr>
<tr>
<td>25</td>
<td>1.03</td>
</tr>
<tr>
<td>30 or more</td>
<td>1.00</td>
</tr>
</tbody>
</table>

* Interpolate linearly for intermediate number of test.

The following two new sections are added:

6-02.3(2)B Commercial Concrete
Where concrete Class 3000 is specified for luminaire bases, sign foundations, guardrail anchors, culvert headwalls, sidewalks, curbs, and gutters the Contractor may use commercial concrete. Commercial class concrete shall not be used for bridges, retaining walls, or box culverts.

Commercial class concrete shall conform to the following:

Specified Compressive Strength at 28 days, minimum 3000 psi

Cementitious Material, Pounds per Cubic Yard, minimum 500 pounds
(Not more than 25% of cementitious material may be fly ash.)

Coarse Aggregate Maximum Size 1-1/2 inch

Fine Aggregate Class 1 or 2

For commercial concrete, the Contractor may use mobile mixers that measure material by volume.

6-02.3(2)C State-Provided Mix Designs

The specified compressive strength at 28 days and mix proportions for the State-provided mix designs are listed below. The Contractor shall not exceed the specified water cement ratio.

<table>
<thead>
<tr>
<th>Class Of Concrete</th>
<th>4000</th>
<th>3000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specified Compressive Strength at 28 days, minimum psi.</td>
<td>4000</td>
<td>3000</td>
</tr>
<tr>
<td>Cement, pounds per cubic yard minimum pounds.</td>
<td>660</td>
<td>540</td>
</tr>
<tr>
<td>Water/cement by weight, maximum</td>
<td>0.44</td>
<td>0.50</td>
</tr>
<tr>
<td>Coarse Aggregate, pounds per cubic yard (SSD Basis)</td>
<td>1900</td>
<td>1900</td>
</tr>
<tr>
<td>Fine Aggregate, pounds per cubic yard (SSD Basis)</td>
<td>1205</td>
<td>1335</td>
</tr>
</tbody>
</table>

1. No entrained air content, entrapped air only.

2. Reduced water/cement ratio applies to concrete for underwater placement (4000W) or low shrink concrete (LS) requirements. Use of a water reducing admixture is mandatory for these applications. Increase coarse and fine aggregate weights to adjust the yield.
6-02.3(3) Admixtures

This section is revised to read:

Concrete admixtures shall be added to the concrete mix at the time of batching the concrete or in accordance with the manufacturer's written procedure and as approved by the Engineer. A copy of the manufacturer's written procedure shall be furnished to the Engineer prior to use of any admixture. Admixtures from different manufacturers shall not be used together unless the Contractor provides written documentation verifying that the admixtures are compatible in combination with all other ingredients of the concrete. Any deviations from the manufacturer's written procedures shall be submitted to the Engineer for approval. Admixtures shall not be added to the concrete with the modified procedures until the Engineer has approved them in writing.

6-02.3(3)A Air-Entrained Concrete

This section is revised to read:

All cast-in-place concrete placed above the finished ground line, shall be air-entrained to a target value of 5 percent. The Contractor may elect to use air-entrainment for concrete below the finished ground line.

6-02.3(3)B Water-Reducing Admixture

This section is revised to read:

Concrete used in all underwater placement, bridge roadway slabs, traffic and pedestrian barriers and all low shrink concrete shall include a water-reducing admixture. For these uses, the Contractor shall add water reducer within the manufacturer's recommended dose range as approved by the Engineer.

The Contractor may use a set retarding admixture or a combination water reducer and retardant admixture with the Engineer's approval.

The following new section is added:

6-02.3(3)C High-Range Water Reducing Admixture

A high-range water reducer (superplasticizer) may be used in all Contractor-provided mix designs, with the Engineer's approval.

6-02.3(4) Mixing Concrete

This section is revised to read:

Aggregate weights listed are based on a specific gravity of 2.67. The Engineer will adjust aggregate proportions for the specific gravity of the aggregates used.

If the Contractor wants to use fly ash as a constituent of the concrete, all the requirements for a Contractor-provided mix design shall be met.
6-02.3(4) Ready-Mix Concrete

Except for hand-mixed concrete, all concrete shall be batched in a pre-qualified manual, semi-automatic, or automatic plant. If the plant has not been pre-qualified, the Contractor shall provide written notification to the Engineer two weeks prior to anticipated use of the batch plant to allow for the necessary pre-qualification inspection.

Before producing concrete, the Contractor shall secure approval of source for the cement, aggregates, and admixtures, and the name and location of the concrete batch plant. For Contractor-provided mix designs, the Contractor shall submit a proposed mix design along with test data confirming concrete made in accordance with this mix design will meet the specified requirements.

6-02.3(4)(A) Machine Mixing

This section is revised to read:

6-02.3(4)(A) Qualification of Concrete Suppliers

All concrete shall be supplied from concrete batch plants that have been pre-qualified. The qualification shall consist of an annual certification inspection of the concrete batch plant facilities and delivery equipment. The certification inspection will be conducted by the State. The concrete batching equipment and delivery equipment shall meet all the requirements as stated in the WSDOT Manual for Inspection and Certification of Concrete Production Facilities.

For central-mixed concrete, the mixer shall be equipped with a timer that prevents the batch from discharging until the batch has been mixed for the prescribed mixing time. A mixing time of one minute will be required after all materials and water have been introduced into the drum. Shorter mixing time may be allowed if the mixer performance is tested in accordance with Designation 26, Variability of Constituents in Concrete, Concrete Manual, U.S. Department of the Interior (ASTM C94-86b Annex A1 Concrete Uniformity Requirements). Tests shall be conducted by an independent testing lab or by a commercial concrete producer's lab. If the tests are performed by a producer's lab, the Engineer or a representative will witness all testing.

For shrink-mixed concrete, the mixing time in the stationary mixer shall not be less than 30 seconds or until the ingredients have been thoroughly blended.

For transit-mixed or shrink-mixed concrete, the mixing time in the transit mixer shall be a minimum of 70 revolutions at the mixing speed designated by the manufacturer of the mixer. Following mixing, the concrete in the transit mixer may be agitated at the manufacturer's designated agitation speed. A maximum of 320 revolutions (total of mixing and agitation) will be permitted prior to discharge.

All transit-mixers shall be equipped with an operational revolution counter and a functional device for measurement of water added. All mixing drums shall be free of concrete buildup and the mixing blades shall meet the...
minimum specifications of the drum manufacturer. A copy of the manufacturer's blade dimensions and configuration shall be on file at the concrete producer's office. A clearly visible metal data plate (or plates) attached to each mixer and agitator shall display: (1) the maximum concrete capacity of the drum or container for mixing and agitating, and (2) the rotation speed of the drum or blades for both the agitation and mixing speeds. Mixers and agitators shall always operate within the capacity and speed-of-rotation limits set by the manufacturer. Any mixer, when fully loaded, shall mix the ingredients into a uniform mass within the required time. Any agitator when fully loaded, shall keep the concrete uniformly mixed. All mixers and agitators shall be capable of discharging the concrete at a steady rate. Only these transit-mixers which meet the above requirements will be allowed to deliver concrete to any state project covered by these Specifications.

The batch of concrete shall be discharged at the project site no more than 1-1/2 hours after the cement is added to the concrete mixture. The discharge time may be extended to 1-3/4 hours if the concrete temperature is less than 75 degrees F. When ambient conditions are such that the concrete may experience an accelerated initial set, the Engineer may require a shorter delivery time.

In transit-mixing, mixing shall begin within 30 seconds after the cement is added to the aggregates.

Central-mixed concrete, transported by truck mixer/agitator, shall not undergo more than 250 revolutions of the drum or blades before beginning discharging. To remain below this limit, the supplier may agitate the concrete intermittently within the prescribed time limit. When water or admixtures are added after the load is initially mixed, an additional 30 revolutions will be required at the recommended mixing speed.

For each project, at least biannually, or as required, the Engineer will examine mixers and agitators to check for any buildup of hardened concrete or worn blades. If this examination reveals a problem, or if the Engineer wishes to test the quality of the concrete, slump tests may be performed with samples taken at approximately the 1/4 and 3/4 points as the batch is discharged. If the two slumps differ by more than one-half the target slump value, the equipment shall not be used until the faulty condition is corrected. However, the equipment may continue in use if longer mixing times or smaller loads produce batches that pass the slump uniformity tests.

All concrete production facilities will be subject to verification inspections at the discretion of the Engineer. Verification inspections are a check for: current scale certifications; accuracy of water metering devices; accuracy of the batching process; and verification of coarse aggregate quality for Contractor-provided mix designs.

If the concrete producer batch plant or delivery equipment fails to pass the verification inspection, the following actions will be taken:

1. For the first violation, a written warning will be provided.
2. For the second violation, the Engineer will give written notification and the State will accept the concrete with a price reduction equal to 15 percent of the invoice cost of the concrete that is supplied from the point of the infraction until the deficient condition is corrected.

3. For the third violation, the concrete supplier is suspended from providing concrete until all such deficiencies causing the violation have been permanently corrected and the plant and equipment have been reinspected and meets all the pre-qualification requirements.

4. For the fourth violation, the concrete supplier shall be disqualified from supplying concrete for one year from the date of disqualification. At the end of the suspension period the concrete supplier may request that the facilities be inspected for pre-qualification.

6-02.3(4)C Ready-Mixed Concrete

This section is revised to read:

6-02.3(4)C Consistency

The target slump for vibrated concrete shall be:

1. 2-1/2 inches for concrete placed in bridge approach slabs and bridge decks.
2. 3 inches for footings and box girder bottom slabs.
3. 4 inches for all other concrete.

The target slump for non-vibrated concrete shall be 6 inches.

Based on the Contractor's written request and as approved by the Engineer, the target slump may be reduced.

If the Contractor is unable to provide a concrete with a workable consistency, a water reducing admixture in State-provided mixes may be used provided the batch meets the slump limit and complies with the proportions required in Section 6-02.3(2) for State-provided mix designs.

Slump target value for Class 4000W concrete, concrete for underwater placement, shall be 8-1/2 inches.

When a high-range water reducer is used, the target slump for vibrated concrete may be increased 2 inches while the concrete is affected by the admixture.

6-02.3(5) Consistency

This section is revised to read:

6-02.3(5) Acceptance of Concrete
The concrete producer shall provide a Certificate of Compliance for each truckload of concrete. The Certificate of Compliance shall include:

- Manufacturer Plant (Batching Facility)
- WSDOT Contract No.
- Name of WSDOT Contractor (Prime Contractor)
- Date
- Time Batched
- Truck No.
- Initial Revolution Counter Reading
- Quantity (Quantity batched this load)
- Type of concrete either by class or producer design mix no.
- Cement - Producer, Type, and Mill Certification No.
- Fly Ash (if used) Brand and Type
- Approved aggregate gradation designation
- Target weights per cubic yard and actual batched weights for:
  - Cement
  - Fly Ash (if used)
  - Coarse Concrete Aggregate (each size)
  - Fine Concrete Aggregate
  - Water (including free moisture in aggregates)
  - Admixtures brand, quantity per/100 wt., and total quantity batched
  - Air-Entraining Admixture
  - Water Reducing Admixture
  - Other Admixture

A copy of the applicable cement mill certificate shall be provided daily with the first load of concrete using the cement from the identified shipment. The Certificate of Compliance shall be signed by a responsible representative of the concrete producer, other than the driver, affirming the accuracy of the information provided. In lieu of providing a machine produced record containing all of the above information, the concrete producer may use the State-provided printed forms, which will be completed for each load of concrete delivered to the project.

Acceptance testing will be performed by the State in accordance with WSDOT Standard Test Methods as set forth in the WSDOT Laboratory Manual. WSDOT Standard Test Methods intended for use with this specification are:

- 801 Method of Test for Compressive Strength of Molded Cylinders
- 803 Method of Sampling Fresh Concrete
- 804 Method of Test for Slump of Portland Cement Concrete
- 805 Method of Test for Determination of Percent of Entrained Air in Portland Cement Concrete
- 806 Method of Test for Weight Per Cubic Foot and Cement Factor of Concrete
- 809 Method of Making, Handling, and Storing Concrete Compressive Test Specimens in the Field
- 811 Method of Capping Cylindrical Concrete Specimens

The first load of each placement will be evaluated for quality determination by means of slump, entrained air, yield when required, and compressive strength cylinders. Additional loads shall not be placed until the test results for slump and, if applicable, entrained air have been completed.
shall also be tested whenever there is a visual change in the mix and as
required by the strength testing schedule herein specified. Concrete
properties shall be determined from concrete as delivered to the project
and as approved by the Contractor for placement.

Concrete shall be sampled as specified in Section 6-02.3(6)D. For the
initial quality determination testing and all subsequent testing where a
placement system modifies the concrete properties, the test values may be
adjusted based on a Contractor's request. The Contractor shall provide the
test values to adjust the test values, along with a request to perform the initial
quality determination tests at other than the point of placement as provided
in Section 6-02.3(6)D. In case of questions concerning the Contractor's
supplied adjustment values, a test confirming the accuracy of these values
shall be performed in accordance with WSDOT test method 803.

The water cement ratio shall be determined from the certified proportions of
the mix, adjusting for on the job additions made prior to acceptance testing.
The water cement ratio shall not exceed the proportions approved for the
Contractor-provided mix design. No water may be added to a load of
cement after acceptance testing or after placement has begun, except for
concrete used in slip-forming. For slip-formed concrete, water may be
added during placement but shall not exceed the maximum water cement
ratio in the mix design, and shall meet the requirements for mixing as
described in Section 6-02.3(4)C. If water is added, an air and slump test
shall be taken and entered into the quality level determination for the class
of concrete.

A slump, air, and compressive strength acceptance test will be conducted
by the State in conformance to the following schedule:

<table>
<thead>
<tr>
<th>Daily Production for each class of concrete (Cubic Yards)</th>
<th>Frequency of Sampling and Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 50</td>
<td>1</td>
</tr>
<tr>
<td>over 50 to 100</td>
<td></td>
</tr>
<tr>
<td>over 100</td>
<td>2 plus 1 per 100 cu.yd. or fraction thereof.</td>
</tr>
</tbody>
</table>

Whenever a slump, temperature, or air content test is outside the
acceptance limits, the next available load will be tested before placement.
No further placement will be allowed until corrective action and further
testing indicates acceptable materials are being provided. Testing of the
subsequent loads may return to specified frequency when the test results
from two successive loads meet the acceptance limits.

The acceptance limits for slump shall be the target value ± 1-1/2 inches,
except that for commercial concrete the maximum slump shall be 4 inches
for vibrated concrete and 7 inches for non-vibrated concrete.

The acceptance limits for entrained air shall be the target value ± 1-1/2
percent, except that for commercial concrete the minimum entrained air
content shall be 4-1/2 percent for above ground applications.

The Contractor may observe any of the sampling or testing performed by
the Engineer. If the Contractor observes a deviation from the specified
sampling or testing procedures, the Contractor shall verbally describe the
deviations observed to the Engineer’s designated representative or alternate immediately, and confirm any deviations observed to the Engineer in writing within 24 hours.

Concrete made with a Contractor-provided mix design will be accepted based on conformance to the requirement for slump, temperature, entrained air content for concrete used above finished ground line, and the specified compressive strength at 28 days as tested and determined by the State.

Commercial class concrete will be accepted by a Certificate of Compliance issued by the concrete producer. The State will conduct acceptance tests confirming that the concrete meets the specified slump, temperature, entrained air content when concrete is used above finished groundline, and specified compressive strength at 28 days.

Acceptance of concrete made in accordance with a State-provided concrete mix shall be based on compliance with the specified proportions, and requirements for slump, temperature, and entrained air content meeting the specified values. Tests for the 28-day compressive strength will be performed by the State for informational purpose only.

The following 5 new sections are added:

6-02.3(5)A Statistical Evaluation Of Concrete

Slump and air content will be statistically evaluated for determination of the quality level of Contractor-provided mixes and State-provided mixes in accordance with Section 1-06.2(1). Commercial concrete will not be subject to statistical evaluation for slump and entrained air content. Tolerance limits for evaluating quality level will be ± 3/4 inch for slump and ± 0.8 percent for air content applied to the specified target value. These tolerance limits constitute the allowable limits as described in Section 1-06.2(1).

Each lot of concrete shall consist of all the concrete at a given class produced for the contract and further separated as to the specified requirement for entrained air. Within the lot, sublots shall be established for evaluation of slump and air content. Sublots shall be determined by the requirement for compressive strength tests elsewhere described.

For a lot of concrete with more than one target value for any constituent, statistical evaluation shall be based on the greatest target value. All test values being evaluated for a lower target value shall be increased by the difference between the respective target value and the largest target value.

After three sublots have been produced, the Engineer will make available to the Contractor a copy of the results of all the acceptance testing performed in the field by 7:00 AM the morning of the next working day after sampling. The Engineer will also make available the CPF of the completed sublots by noon of the next working day.

6-02.3(5)B Required Corrective Action
Concrete placement operations shall be shut down whenever the Composite Pay Factor for a lot in progress:

1. Drops below 1.0000 and the Contractor is taking no corrective action, or
2. Is less than 0.9000.

The placement operations shall not resume until such time as the Engineer is satisfied that specification material can be produced.

An entire lot with a Composite Pay Factor of less than 0.8500 will be rejected.

The designated percentage reduction as defined in Section 1-06.2(1) under Financial Incentive Paragraph 1 item 3, shall be 10 percent.

6-02.3(5)c. Rejecting Concrete

Rejection by Contractor - The Contractor may, prior to sampling, elect to remove any defective material and replace it with new material at the Contractor's expense. Any such new material will be sampled, tested, and evaluated for acceptance.

Rejection Without Testing - The Engineer, prior to sampling, may reject any batch or load of concrete that appears defective in composition or slump. Material rejected before placement shall not be incorporated in the structure.

Compensation - No payment will be made for the rejected materials or the removal of any materials unless the Contractor requests that the rejected material be tested. If the Contractor elects to have the rejected material tested, a minimum of three representative samples will be obtained and tested for slump. Compensation for the material will be based on conformance with the statistical acceptance, except that if the Composite Pay Factor for the slump of the rejected material is less than 0.9000, no payment will be made for any removal cost of the rejected material, and in addition, the cost for obtaining and testing the samples shall be borne by the Contractor. However, if the Composite Pay Factor for the rejected material is equal to or greater than 0.9000, the cost for sampling and testing will be borne by the State. For the rejected material the basis of compensation will be the invoice cost of the ready mix concrete plus ten percent.

6-02.3(5)d. Concrete With Non-Conforming Strength

Concrete produced in accordance with a Contractor-provided mix design or commercial concrete, which fails to meet the specified compressive strength at 28 days will be evaluated by comparison of the compressive test strength (f'_c) with the specified compressive strength (f'c) as follows:

1. If (f'_c - f'c) is less than 60 psi, the concrete will be accepted as being in conformance and no payment adjustment shall apply.
2. If the (f'_c - f'c) value is between 60 and 500 psi the Engineer
a. May require corrective action at no additional expense to the State; or
b. May accept the concrete with a calculated payment adjustment.

3. If the \( f'c - fc \) value is greater than 500 psi, the Engineer will:
   a. Require the complete removal and replacement with concrete meeting the specifications at no additional expense to the State; or
   b. Require corrective action at no additional expense to the State; or
   c. Accept the concrete where the finished product is found to be acceptable for the intended purpose, with a calculated payment adjustment.

Where found acceptable without corrective action, the quantity of concrete represented by an acceptance test that fails to meet the specified compressive strength will be subject to the following payment adjustment.

\[
\text{Payment Adjustment} = 0.0005 \times (f'c - fc) \times \text{U.P.}
\]

where \( f'c \) = specified compressive strength at 28 days
\( fc \) = compressive strength at 28 days as determined by WSDOT test methods.
\( \text{U.P.} \) = unit contract price per cubic yard for the class of concrete involved. Where these Specifications designate payment for the item on a lump sum basis, the unit price of concrete shall be taken as $300.00 per cubic yard for concrete Class 4000, 5000, and 6000. For concrete Class 3000 and commercial concrete the unit price for concrete shall be $150.00 per cubic yard.

6-02.3(5)E Quality Incentive Compensation for Concrete

A maximum of 5 percent incentive payment is possible for any concrete lot being statistically evaluated for the constituents of slump and entrained air content. The price adjustment factor for these two constituents shall be 0.40 for slump and 0.60 for air content. A maximum of 2 percent incentive payment is possible for concrete evaluated for slump only. For purposes of incentive price adjustment the base price for concrete shall be the invoice cost of the ready mix concrete plus 100 percent. No negative incentive payments shall be assessed for CPF less than 1.000 other than corrective action required by Section 6-02.3(5)B.

For each lot of concrete produced under Statistical Acceptance for slump and air content if applicable, a Quality Incentive Factor (QIF) will be determined. The QIF equals the difference between the Composite and unity with regard to sign. The Quality Incentive Price Adjustment will be calculated as the product of the QIF, the quantity of concrete in the lot in cubic yards, and the base price per cubic yard of concrete as defined above.

6-02.3(6) Placing Concrete
The first paragraph is revised to read:

The Contractor shall not place concrete:

1. On frozen or ice-coated ground or subgrade;
2. Against or on ice-coated forms, reinforcing steel, structural steel, conduits, precast members, or construction joints;
3. Under rainy conditions; placing of concrete shall be stopped before the quantity of surface water is sufficient to affect or damage surface mortar quality or cause a flow or wash of the concrete surface;
4. In any foundation until the Engineer has approved its depth and character;
5. In any form until the Engineer has approved it and the placement of any reinforcing in it;
6. In any work area when vibrations from nearby work may harm the concrete's initial set or strength.

6-02.3(6)A Weather and Temperature Limits to Protect Concrete

The first and second sentences of the tenth paragraph are revised to read:

Any concrete placed in air temperatures below 35 degrees F shall be immediately surrounded with a heated enclosure. Air temperature within the enclosure shall be maintained between 50 and 90 degrees F and the relative humidity shall be above 80 percent. These conditions shall be maintained for a minimum of seven days or for the cure period required by Section 6-02.3(11), whichever is longer.

6-02.3(9) Vibration of Concrete

Items 3 and 4 in the second paragraph are revised to read:

3. Insert the vibrator slowly to a depth that will effectively vibrate the full depth of each layer, penetrating into the previous layer on multilayer pours;
4. Protect partially hardened concrete (i.e., non-plastic - which prevents vibrator penetration when only its own weight is applied) by preventing the vibrator from penetrating it or making direct contact with steel that extends into it.

6-02.3(10) Roadway Slabs

The first sentence of the 22nd paragraph of this section (on page 220) is revised to read:

If the plans call for an overlay (to be constructed under the same contract) such as asphalt concrete, latex modified concrete, epoxy concrete, or similar, the Contractor shall produce the final finish by dragging a strip of damp, seamless burlap lengthwise over the full width of the slab or by brooming it lightly.

6-02.3(11)A Curing and Finishing Concrete Traffic and Pedestrian Barrier
The fifth paragraph is revised to read:

After the ten-day curing period, the Contractor shall remove from the barrier all form-release agent, mud, dust, and other foreign substances in either of two ways: (1) by light sandblasting and washing with water, or (2) by spraying with a high-pressure water jet. The water jet equipment shall use clean fresh water and shall produce (at the nozzle) at least 1500 psi with a discharge of at least three gpm. The water jet nozzle shall have a 25-degree tip and shall be held no more than nine inches from the surface being washed.

Number 3 under Item A of the ninth paragraph is revised to read:

3. After the ten-day curing period, remove the curing compound completely by light sandblasting or by spraying with a high-pressure water jet to produce an even surface appearance. The water jet equipment shall use clean fresh water and shall produce (at the nozzle) at least 2500 psi with a discharge of at least 4 gpm. The water jet nozzle shall have a 25-degree tip and shall be held no more than nine inches from the surface being cleaned.

6-02.3(12) Construction Joints

The second sentence of the third paragraph is revised to read:

The groves shall be at least 1/2-inch wide, from 1/4-inch to 1/2-inch deep, and spaced at 1/2-inch to 1-inch centers.

6-02.3(16) Plans for Falsework and Forms

The fourth paragraph is deleted.

The third sentence of the seventh paragraph is revised to read:

The Contractor shall furnish copies of the design calculations to the Bridge and Structures Engineer for examination as a condition for approval.

6-02.3(16)A Non-preapproved Falsework and Forming Plans

The first paragraph is revised to read:

In addition to the copies required in Section 6-02.3(16), for non-preapproved plans the Contractor shall send six copies of all falsework plans and all forming plans, and two copies of their respective design calculations, to the Bridge and Structures Engineer, Department of Transportation, Transportation Building, Olympia, WA 98504.

6-02.3(16)B Preapproved Forming Plans

The first sentence of the first paragraph is revised to read:

To streamline the plan approval process, the Contractor may request preapproval on form plans for abutments, wingwalls, diaphragms, retaining walls, columns, girders and beams, box culverts, railings, and bulkheads.
The first sentence of the second paragraph is revised to read:

To apply for preapproval, the Contractor shall submit one reproducible drawing for each plan sheet and two copies of the design calculations to the Bridges and Structures Engineer, Department of Transportation, Transportation Building, Olympia, WA 98504.

6-02.3(17)A Caps, Piling, Posts, and Mudsills

The first paragraph is supplemented with the following:

When using piling to support the falsework, the Contractor's falsework plans shall specify the minimum required bearing and penetration for the piling.

6-02.3(17)C Bracing

The fifth paragraph is revised to read:

On prestressed girder spans, the Contractor shall install X-bracing between girders at each end and midspan to prevent lateral movement or rotation. This bracing shall be placed immediately after erection of the girders. The bracing shall not be removed until the diaphragms or roadway slab are cast and cured for a minimum of 24 hours.

This section is supplemented with the following:

Roadway deck forming systems may require bracing, strutting, or ties between girders for the girder to adequately support the form loading. When braces, struts, or ties are required, they shall be designed and detailed by the Contractor and shall be shown on the falsework/formwork plans submitted to the Engineer for approval. These braces, struts, and ties shall be furnished and installed by the Contractor at no additional cost to the State.

6-02.3(17)G Slab forms on Steel Spans

The subtitle of this section is revised to read:

6-02.3(17)G Concrete Forms on Steel Spans

The first sentence of the first paragraph is revised to read:

Concrete forms on all steel structures shall be removable and shall not remain in place.

6-02.3(17)J Removal of Falsework and Forms

The first sentence of the fourth paragraph is revised to read:

The Contractor may remove side forms, traffic barrier forms, and pedestrian barrier forms after 24 hours if these forms are made of steel or dense plywood, an approved water reducing additive is used, and the concrete reaches 1,400 psi before form removal.

The second sentence of the fourth paragraph is deleted.
The ninth paragraph is revised to read:

On concrete box girder structures, the forms supporting the roadway slab shall rest on ledgers or similar supports without being shored to, or supported on, the bottom slab. These form supports shall be fastened as near as possible to the top of the web walls. Unless the plans call for their removal, the roadway slab interior forms for concrete box girder structures may be left in place.

The last sentence of the tenth paragraph is revised to read:

The forms inside of hollow piers, girders, abutments, etc., shall be removed through the openings shown in the Plans.

The following new section is added:

6-02.3(17)K Early Concrete Test Cylinder Breaks

The fabrication, curing, and testing of the early cylinders shall be the responsibility of the Contractor. The Contractor shall retain an independent testing laboratory to perform this work.

The concrete cylinders shall be molded in accordance with WSDOT Test Method 809 from concrete last placed in the forms and representative of the quality of concrete placed in that pour.

The cylinders shall be cured in accordance with WSDOT Test Method 809, method 2. The Engineer may approve the use of cure boxes meeting the requirements of this test method. Special cure boxes to enhance cylinder strength will not be allowed.

The concrete cylinders shall be tested for compressive strength in accordance with WSDOT Test Method 801. The number of early cylinder breaks shall be in accordance with the Contractor's need and as approved by the Engineer.

The Contractor shall furnish the Engineer with all test results. The test results will be reviewed and approved before any forms are removed. The Contractor shall not remove forms without the approval of the Engineer.

Test laboratories used for this work shall be approved by the Engineer.

All costs in connection with furnishing cylinder molds, fabrication, curing, and testing of early cylinders shall be included in the unit contract prices for the various bid items of work involved.

6-02.3(18) Placing Anchor Bolts

Items 2, 3, and 4 are revised to read:

2. If the bolts are set in drilled holes, hole diameter shall exceed bolt diameter by at least 1 inch. Grouting shall comply with Section 6-02.3(20) as amended.
3. If the bolts are set in pipe, grouting shall comply with Section 6-02.3(20) as amended.
4. If freezing weather occurs before bolts can be grouted into sleeves or holes, they shall be filled with an approved antifreeze solution (non evaporating).

6-02.3(19) Elastomeric Bearing Pads

This section is deleted in its entirety and replaced with the following heading:

6-02.3(19) Bridge Bearings

The following two new sections are added:

6-02.3(19)A Elastomeric Bearing Pads

The Contractor shall use rubber cement to bond the lower contact surface of elastomeric bearing pads to the structure.

6-02.3(19)B Bridge Bearing Assemblies

For all fixed, sliding, or rolling bearings, the Contractor shall:
1. Machine all sliding and rolling surfaces true, smooth, and parallel to the movement of the bearing;
2. Polish all sliding surfaces;
3. Anchor expansion bearings securely, setting them true to line and grade;
4. Coat all sliding surfaces thoroughly with oil and graphite just before placing them into position; and
5. Avoid placing concrete in such a way that it might interfere with the free action of any sliding or rolling surface.

Grout placement under steel bearings shall comply with Section 6-02.3(20) as amended.

6-02.3(20) Steel Expansion Bearings

This section is revised in its entirety as follows:

6-02.3(20) Grout for Anchor Bolts and Bridge Bearings

Grout shall be a prepackaged grout, mixed, placed, and cured as recommended by the manufacturer, or the grout shall be produced using Type II portland cement, fine aggregate Class 1, and water, in accordance with these Specifications.

Grout shall meet the following requirements:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Compressive Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Method</td>
<td>AASHTO T 106</td>
</tr>
<tr>
<td>Values</td>
<td>4,000 psi @ 7 days</td>
</tr>
</tbody>
</table>

Grout shall be a workable mix with flowability suitable for the intended application.
If the Contractor elects to use a prepackaged grout, a material sample and laboratory test data from an independent testing laboratory shall be submitted to the Engineer for approval with the request for approval of material sources.

If the Contractor elects to use a grout consisting of Type II portland cement, fine aggregate Class 1, and water, the mix proportions and laboratory test data from an independent test laboratory shall be submitted to the Engineer for approval with the request for approval of material sources.

The Contractor shall receive approval from the Engineer before using the grout.

Before placing grout, the concrete on which it is to be placed shall be thoroughly cleaned, roughened, and wetted with water to ensure proper bonding. The grout pad shall be kept continuously wet with water until a strength of 2,000 psi is attained.

Before placing grout into anchor bolt sleeves or holes, the cavity shall be thoroughly cleaned and wetted to ensure proper bonding.

To grout bridge bearing masonry plates, the Contractor shall:

1. Build a form approximately 4 inches high with sides 4 inches outside the base of each masonry plate;
2. Fill each form to the top with grout;
3. Work grout under all parts of each masonry plate;
4. Remove each form after the grout has hardened;
5. Remove the grout outside each masonry plate to the base of the masonry plate;
6. Bevel off the grout neatly to the top of the masonry; and
7. Place no additional load on the masonry plate until the grout has set at least 72 hours.

After all grout under the masonry plate and in the anchor bolt cavities has attained a minimum strength of 4,000 psi, the anchor bolt nuts shall be tightened to snug-tight. "Snug-tight" means either the tightness reached by (1) a few blows from an impact wrench, or (2) the full effort of a man using a spud wrench. Once the nut is snug-tight the anchor bolt threads shall be burled just enough to prevent loosening of the nut.

6-02.3(23) Opening to Traffic

The first sentence of the first paragraph is revised to read:

Bridges with a roadway slab made of portland cement concrete shall remain closed to all traffic, including construction equipment, until the concrete has attained the minimum ultimate strength.

The following paragraph is added after the first paragraph:

For load restrictions on bridges under construction, refer to Section 6-01.6.

6-02.3(24)A Field Bending
This section is revised in its entirety by the following:

If the Plans call for field bending of steel reinforcing bars, the Contractor shall bend them in keeping with the structure configuration and the Plans.

Bending steel reinforcing bars partly embedded in concrete shall not be done until the Engineer has given written approval of the field-bending plan from the Contractor. Approval for such bending will be given only for bars smaller than Size No. 14.

Field Bending shall not be done:

1. On bars Size No. 14 and 18,
2. When air temperature is lower than 45 degrees F,
3. By means of hammer blows or pipe sleeves, or
4. While the bar temperature is in the range of 400 to 700 degrees F.

In field-bending steel reinforcing bars, the Contractor shall:

1. Make the bend gradually;
2. Apply heat as described in Tables 2 and 3 for bending bar Sizes No. 7 through No. 11 and for bending bars Sizes No. 6 and smaller when the bars have been previously bent. Previously unbent bars of Sizes No. 6 and smaller may be bent without heating;
3. Use a bending tool equipped with a bending diameter as listed in Table 1;
4. Limit any bend to these maximums: 135 degrees for bars smaller than Size No. 9, and 90 degrees for bars Size No. 9 through No. 11; and
5. Straighten by moving a hickey bar (if used) progressively around the bend.

In applying heat for field-bending steel reinforcing bars, the Contractor shall:

1. Use a method that will avoid damage to the concrete;
2. Insulate the concrete within 6 inches of the heated bar area;
3. Ensure by means of temperature-indicating crayons, or other suitable means, that the steel temperature never exceeds the maximum temperature shown below;
4. Maintain the steel temperature within the required range shown below during the entire bending process;
5. Apply two heat tips simultaneously at opposite sides of bars larger than Size No. 6 to assure a uniform temperature throughout the
thickness of the bar. For Size No. 6 and smaller bars, apply two heat tips, if necessary;

6. Apply the heat for a long enough time that within the bend area the entire thickness of the bar, including its center, reaches the required temperature;

7. Bend immediately after the required temperature has been reached;

8. Heat at least as much of the bar as indicated in Table 3;

9. Locate the heated section of the bar to include the entire bending length; and

10. Never cool bars artificially with water, forced air, or other means.

**TABLE 1**

<table>
<thead>
<tr>
<th>Bar Size</th>
<th>Bend Diameter/Bar Diameter Ratio Heat Not Applied</th>
<th>Heat Applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 4</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>No. 5, No. 6</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>No. 7, No. 8, No. 9</td>
<td>Not Permitted</td>
<td>8</td>
</tr>
<tr>
<td>No. 10, No. 11</td>
<td>Not Permitted</td>
<td>10</td>
</tr>
</tbody>
</table>

**TABLE 2**

<table>
<thead>
<tr>
<th>Bar Size</th>
<th>Temperature (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td>No. 4, No. 5, No. 6</td>
<td>1,100</td>
</tr>
<tr>
<td>No. 7, No. 8, No. 9</td>
<td>1,150</td>
</tr>
<tr>
<td>No. 10, No. 11</td>
<td>1,200</td>
</tr>
</tbody>
</table>

**TABLE 3**

<table>
<thead>
<tr>
<th>Bar Size</th>
<th>Bend Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 4 thru No. 8</td>
<td>45°</td>
</tr>
<tr>
<td></td>
<td>90°</td>
</tr>
<tr>
<td></td>
<td>135°</td>
</tr>
<tr>
<td></td>
<td>8d</td>
</tr>
<tr>
<td></td>
<td>12d</td>
</tr>
<tr>
<td></td>
<td>Not Permitted</td>
</tr>
<tr>
<td>No. 9</td>
<td>8d</td>
</tr>
<tr>
<td></td>
<td>12d</td>
</tr>
<tr>
<td></td>
<td>Not Permitted</td>
</tr>
<tr>
<td>No. 10, No. 11</td>
<td>9d</td>
</tr>
<tr>
<td></td>
<td>14d</td>
</tr>
<tr>
<td></td>
<td>Not Permitted</td>
</tr>
</tbody>
</table>

6-02.3(24)C Placing and Fastening

The fourth paragraph is replaced with the following two paragraphs:

For slip-formed concrete, the reinforcing steel bars shall be tied at all intersections and crossbraced to keep the cage from moving during concrete placement. Crossbracing shall be with additional reinforcing steel. Crossbracing shall be placed both longitudinally and transversely.
After reinforcing steel bars are placed in a traffic or pedestrian barrier and prior to slip-form concrete placement, the Contractor shall check clearances and reinforcing steel bar placement. This check shall be accomplished by using a template or by operating the slip-form machine over the entire length of the traffic or pedestrian barrier. All clearance and reinforcing steel bar placement deficiencies shall be corrected by the Contractor before slip-form concrete placement.

6-02.3(24)E Welding Reinforcing Steel

This section is revised to read:

Welding of steel reinforcing bars shall conform to the requirements of the Special Provisions, Plans, and these Specifications.

When welding is required, steel reinforcing bars shall be supplied that are suitable for welding. Steel which is to be welded shall have a maximum carbon equivalent of 0.65 percent. The carbon equivalent shall be determined by the following formula:

\[ CE = \% C + \% \text{Mn}/6 + \% \text{Cu}/40 + \% \text{Ni}/20 + \% \text{Cr}/10 - \% \text{Mo}/50 - \% \text{V}/10 \]

In addition, carbon shall not exceed 0.45 percent nor manganese 1.30 percent.

Before any welding begins, the Contractor shall obtain the Engineer's approval of a written welding procedure for each type of welded splice to be used, including the procedure specifications and joint details. The procedure specifications shall specify: material specification; manual or machine; position of weld; filler metal specification and classification; shielding gas; single or multiple pass; single or multiple arc; either shielded metal arc, flux cored arc or gas metal arc welding process; preheat and interpass temperature; welding current; polarity; and root treatment. The welding procedure shall specify welding sequence, pass number, electrode size, welding current amperes and voltage for each joint detail. All the aforementioned information shall be contained on a form that specifies the procedure number, revision number, and the Contractor. The form shall be signed and dated.

Electrodes for manual shielded metal arc welding (SMAW) of Grade 60 steel reinforcing bars shall conform to the requirements of AWS A5.5 of the low hydrogen E90 series.

Solid and composite electrodes for gas metal arc welding (GMAW) and flux-cored arc welding (FCAW) of Grade 60 steel reinforcing bar shall conform to the requirements of AWS A5.28, ER90S and AWS A5.29, E90T respectively. The Contractor shall demonstrate that each combination of electrode and shielding proposed for use will produce the following mechanical properties:

<table>
<thead>
<tr>
<th>Electrode Type</th>
<th>Tensile Strength</th>
<th>Yield Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCAW Grade E90T</td>
<td>90,000 psi</td>
<td>78,000 psi</td>
</tr>
</tbody>
</table>
Elongation in 2 inches 17%

Compliance may be verified from manufacturer's certified test reports, or from actual testing of weld specimens.

All welding shall be protected from air currents, drafts, and precipitation to prevent loss of heat or loss of arc shielding. Short circuiting transfer with gas metal arc welding will not be allowed. Slugging of welds will not be allowed. No field welding of reinforcing bars will be permitted when the ambient temperature is below 32 degrees F.

The minimum preheat and interpass temperature for welding Grade 60 reinforcing bars shall be 400 degrees F. Preheating shall be applied to the reinforcing bars and other splice members within 6 inches of the weld, unless limited by the available lengths of the bars or splice member.

Generally, postheating of welded splices is only required for direct butt welded splices of Grade 60 bars of size No. 9 or larger and shall be done immediately after welding before the splice has cooled to 700 degrees F. Postheating shall be not less than 800 degrees F nor more than 1,000 degrees F and held at this temperature for not less than 10 minutes before allowing the splice to cool naturally to ambient temperature.

Weld joint and welder qualifications shall be made by the following procedures. The joint qualification and welder qualification shall be according to the following tests.

Under supervision of the State Materials and Fabrication Inspector, the welder shall weld three test joints of the largest size reinforcing bar to be weld spliced. Two of the test welds shall be test loaded to no less than 125 percent of the minimum specified yield strength of the bar. The remaining test weld shall be mechanically cut perpendicular to the direction of welding and macroetched. Indirect butt splices shall be cut mechanically at two locations to provide a transverse cross section of each of the bars spliced in the test assembly. The sections shall show the full cross section of the weldment, the root of the weld, and any reinforcement. The etched cross section shall have complete penetration and complete fusion with the base metal and between successive passes in the weld. Groove welds of direct butt splices and flare-groove welds shall not have reinforcement exceeding 1/8 inch in height measured from the main body of the bar and shall have a gradual transition to the base metal surface. No cracks will be allowed in either the weld metal or heat-affected zone. All craters shall be filled to the full cross section of the weld. Weld metal shall be free from overlap. Undercutting deeper than 1/32 inch will not be allowed except at points where welds intersect the raised pattern of deformations where undercutting less than 1/16 inch deep will be acceptable. The sum of diameters of piping porosity in groove welds shall not exceed 1/8 inch in any linear inch of weld or exceed 9/16 inch in any 6 inch length of weld. Corrections to welds with shielded metal arc, gas metal arc, or flux-cored arc welding processes shall be made in accordance with Engineer's approval.

A welder qualified in the vertical position shall then be qualified for the horizontal and flat positions. A welder qualified for the horizontal position shall then be qualified for the flat position but not the vertical position. A welder qualified in the flat position shall be qualified for the flat position only.
Welders qualified for direct butt splice groove welds are qualified for indirect butt splice groove welds and fillet welds. A welder qualified for indirect butt splice grooved welds is not qualified for direct butt splice welds. The welder qualifications shall remain in effect indefinitely unless (1) the welder is not engaged in a given process of welding for which he/she is qualified for a period exceeding six months, or (2) there is some specific reason to question a welder’s ability.

Weld joint geometry shall be as shown in the Plans and these Specifications. Welding machines shall be D.C current, reverse polarity and in good working condition.

The Contractor is responsible for using a welding sequence that will limit the alignment distortion of the bars due to the effects of welding. The maximum out-of-line permitted will be 1/4 inch from a 3.5 foot straight edge centered on the weld and in line with the bar.

The following procedure for welding steel reinforcing bars is recommended.

Sheared bar ends shall be burned or sawed off a minimum of 1/2 inch to completely remove the ruptured portion of the steel shear area prior to welding butt splices. Surfaces to be welded shall be smooth, uniform, and free from fins, tears, cracks, and other defects. Surfaces to be welded and surfaces adjacent to a weld shall also be free from loose or thick scale, slag, rust, moisture, grease, paint, epoxy covering, or other foreign materials. All tack welds shall be within the area of the final weld. No other tack weld will be permitted. Double bevel groove welds require chipping, grinding, or gouging to sound metal at the root of the weld before welding the other side. Progression of vertical welding shall be upward. The ground wire from the welding machine shall be clamped to the bar being welded.

Should the Contractor elect to use a procedure which differs in any way from the procedure recommended, the Contractor shall submit the changes, in writing, to the Engineer for approval. Approved weld procedures shall be strictly followed.

6-02.3(24)F Mechanical Butt Splices

This subtitle is revised to read:

6-02.3(24)F Mechanical Splices

The first sentence of the first paragraph of this section is revised to read:

The Contractor shall form mechanical splices with an Engineer-approved system using sleeve filler metal, threaded coupling, or another method that complies with this section.

In the fourth paragraph, the first sentence under Item 1 is revised to read:

Tension splices shall develop at least 130 percent of the yield tensile strength specified for the unspliced bar.

The fourth paragraph is supplemented with the following:
3. Maximum allowable bar size
   a. Mechanical butt splice No. 14 bar.
   b. Mechanical lap splice No. 6 bar.

The second sentence of the seventh paragraph is revised to read:

The operator shall prepare six test splices (three vertical, three horizontal) using bars having the same AASHTO Designation and size (maximum) as those to be used in the work.

6-02.3(24)G Job Control Tests

The first sentence in the paragraph is revised to read:

As the work progresses, the Engineer may require the Contractor to provide a sample splice (thermal or mechanical) to be used in a job control test.

6-02.3(25)A Bulb Tee Girder Flange Connection

This section is revised to read:

On bulb tee girders, camber shall be equalized before adjacent girders are weld-tied and before keyways are filled. Keyways between tee girders shall be filled flush with the surrounding surfaces with grout. This grout shall have reached a compressive strength of 3,000 psi before the equalizing equipment is removed. Compressive strength will be determined by fabricating cubes in accordance with WSDOT Test Method 813 and testing in accordance with AASHTO Test T 106.

Welding grounds shall be attached directly to the steel plates being welded when welding the weld-ties on bulb tee girders.

Only after the grout in the keyways has reached 3,000 psi and after girders have been weld-tied will construction equipment (other than equalizing apparatus) be allowed on the deck.

6-02.3(25)B Protection of Exposed Reinforcement

The first sentence of the second paragraph is revised to read:

When a girder is removed from its casting bed, all bars and strands projecting from the girder shall be cleaned and painted with a minimum dry film thickness of 1 mil of paint Formula No. A-9-73.

6-02.3(25)C Casting and Shop Plans

The second sentence of the first paragraph is revised to read:

Deviations from prestressing details shown in the Plans will not be permitted, except as specified.

The last sentence in the fifth paragraph is revised to read:
3. Be located more than 3 inches from the outside edge of the top flange on Series 4 through 10 girders (more than 6 inches for Series 14 girders).

This section is supplemented with the following:

The Contractor, at his option, may furnish prestressed concrete girders Series 14 with minor dimension differences from those shown in the Plans. The dimensions that may be changed are the 2-5/8 inch top flange taper which may be reduced to 1-5/8 inch and the 5-inch web width which may be increased to 6 inches. Other dimensions of the girder shall be adjusted as necessary to accommodate the above mentioned changes. The overall height and width of the girder shall remain unchanged.

If the Contractor elects to provide a Series 14 girder with minor dimension differences as specified, shop plans along with supporting design calculations shall be submitted to the Engineer for approval prior to girder fabrication. The girder shall be designed for at least the same load carrying capacity as the girder shown in the Plans. The amount of mild steel reinforcement shall be the same as that shown in the Plans.

6-02.3(25)E Prestressing

The first paragraph is revised to read:

If the Plans require 1/2-inch strands, each strand shall have an initial tensile force of 31,000 pounds.

6-02.3(25)G Handling and Storage

The first paragraph is revised to read:

During handling, each girder shall always be kept plumb and upright. It shall be lifted only by the lifting strands at either end. Girders shall be braced laterally to prevent tipping or buckling.

The fourth sentence of the second paragraph is deleted.

The third paragraph is revised to read:

If the Contractor wishes to deviate from these handling and bracing requirements, the vertical pickup, or the pickup location, the proposed method shall be analyzed by the Contractor's engineers and submitted with the supporting calculations to the Engineer for approval. The Contractor's analysis shall conform to Articles 5.2 and 5.3 of the P.C.I. Design Handbook, Precast and Prestressed Concrete, Third Edition, or other approved methods. The Contractor's calculations must verify that the concrete stresses in the prestressed girder do not exceed those listed in Section 6-02.3(25)J.

6-02.3(25)K Strength

The first paragraph is supplemented with the following:
When two or more girders are cast in a continuous line and in a continuous pour, a single set of test cylinders may represent all girders provided the fabricator demonstrates uniformity of casting and curing to the satisfaction of the Engineer.

The following is inserted between the first and second sentence of the fourth paragraph:

If the fabricator casts cylinders to represent more than one girder, all girders in that line shall be cored.

The second, third, and fourth sentences of the fourth paragraph are revised to read:

These cores shall measure 4 inches in diameter by 5 inches high and shall be removed from just below the top flange, one approximately 3 feet to the left and the other approximately 3 feet to the right of the midpoints of the girders.

The fifth paragraph is revised to read:

The Contractor shall coat all cored holes with a Type II epoxy and fill the holes with an approved patching mix before release of the prestressing steel. The epoxy shall meet the requirements of Section 9-26.

6-02.3(25)L Bulb Tee Girder Depth

This section is revised to read:

6-02.3(25)L Bulb Tee Girder Dimensions

The Contractor may alter bulb tee girder dimensions as specified, from that shown in the plans if:

1. The girder has the same or higher load carrying capacity (using current AASHTO Design Specification);
2. The Engineer approves, before the girder is made, complete design calculations for the girder;
3. The Contractor adjusts substructures to yield the same top of roadway elevation shown in the Plans;
4. The depth of the girder is not increased by more than 2 inches and is not decreased;
5. The web thickness is not increased by more than 1 inch and is not decreased;
6. The top flange minimum thickness of the girder is not increased by more than 2 inches, providing the top flange taper depth is decreased a corresponding amount;
7. The top flange taper depth is not increased by more than 1 inch.
8. The bottom flange width is not increased by more than 2 inches.

6-02.3(26)A Shop Drawings

The second sentence of the second paragraph is revised to read:
The shop drawings shall follow the design conditions shown in the plans unless the Engineer permits equally effective variations.

The first sentence of the third paragraph is revised to read:

In addition, the shop drawings shall show:

Item 3 of the third paragraph is revised to read:

Separate stress and elongation calculations shall be submitted for each tendon if the difference in tendon elongations exceeds 2 percent.

After the third paragraph, add the following paragraphs:

Couplings or splices will not be permitted in prestressing strands. Couplings or splices in bar tendons are subject to the Engineer’s approval.

Friction losses in post-tensioning steel shall be based on wobble and curvature coefficients determined by the post-tensioning system supplier and shall be verified during the stressing operations at the job site. The values of these coefficients assumed for design are shown in the Plans.

The Contractor shall determine all points of interference between the mild steel reinforcement and the paths of the post-tensioning tendons. Details to resolve interferences shall be submitted with the shop plans for approval. Where reinforcing bar placement conflicts with post-tensioning tendon placement, the tendon profile shown in the Plans shall be maintained. Mild steel reinforcement for post-tensioning anchorage zones shall not be fabricated until after the post-tensioning shop plans have been approved by the Engineer.

In the last sentence of the sixth paragraph, the Section reference is revised to read Section 6-01.9.

6-02.3(26)B Anchorages

This section is revised to read:

Post-tensioning reinforcement shall be secured at each end by means of an approved anchorage device which shall be of such a nature that it will not kink, neck down, or otherwise damage the post-tensioning reinforcement. The anchorage assembly shall be grouted to the Engineer’s satisfaction.

The structure shall be reinforced with steel reinforcing bars in the vicinity of the anchorage device. This reinforcement is categorized into two zones. The first or local zone is the anchorage region that closely surrounds the specific anchorage device. The second or general zone is the portion of the anchorage region more remote from the immediate anchorage device.

The steel reinforcing bars required locally for the concrete confinement immediately around the anchorage device (first or local zone) shall be calculated by the post-tensioning system supplier and shall be shown in the shop plans. The calculations shall be submitted with the shop plans. The first or local zone steel reinforcing bars shall be furnished and installed by the Contractor, at no additional cost to the State, in addition to the structural...
reinforcement required by the Plans. The steel reinforcing bars required in
the second or general zone shall be as shown in the Plans and are
included in the appropriate bid items.

The Contractor shall submit details, certified test reports and/or supporting
calculations, as specified below, which verify the structural adequacy of the
anchorage devices for approval by the Engineer. This requirement does
not apply where the anchorage devices have been previously approved by
WSDOT for the same structure configuration. The Contractor shall also
submit any necessary changes to the contract Plans. The test report shall
specify all pertinent test data. Dead ended anchorages will not be
permitted. Dead ended anchorages are defined as anchorages that cannot
be accessed during the stressing operations.

The Contractor's proposed anchorage devices shall meet the requirements
listed in A or B below:

A. Bearing Type Anchorage:

1. The computed average bearing stress on the concrete directly
beneath bearing plates shall not exceed either of the following:

   a. At service load (after all losses) -

\[
\text{f}_{cp} = 0.6 \, f'c \left( \frac{A'b}{Ab} \right) \text{t}
\]

but not greater than 1.25 \( f'c \).

   b. At jacking load (before seating) -

\[
\text{f}_{cp} = 0.8 \, f'ci \left( \frac{A'b}{Ab} - 0.2 \right) \text{t}
\]

but not greater than 1.25 \( f'ci \) for longitudinal
tendons anchored in the webs and not greater
than 1.00 \( f'ci \) for transverse
tendons anchored in the deck slab, where:

\[
\text{f}_{cp} = \text{permissible compressive concrete stress},
\]

\[
f'c = \text{compressive strength of concrete},
\]

\[
f'ci = \text{compressive strength of concrete at time of}
\]

initial prestress.

\[
A'b = \text{Maximum area of the portion of the concrete}
\]

anchorage surface that is geometrically similar to
and concentric with the area of the anchorage
(excluding openings).

\[
Ab = \text{bearing area of the anchorage excluding openings.}
\]

2. The computed bending stresses in the distribution plate induced by
the pull of the prestressing steel shall not exceed 90 percent of the
yield point of the material when 95 percent of the ultimate strength
of the post-tensioning reinforcement is applied. The bending
stresses in the distribution plate shall be computed in accordance
with the procedure described in the article titled "Simplified Bearing
Plate Computations for Post-tensioning Anchorages" published in the July-August 1975 edition of the PCI Journal, and these calculations shall be submitted with the shop plans for approval.

3. Materials and workmanship shall conform to the applicable requirements of Sections 5-03 and 9-06.

B. Other Anchorage Assemblies:

Other anchorage assemblies shall be defined as an assembly that does not meet the requirements of item A-1 above for bearing type anchorages. The adequacy of other anchorage assemblies shall be demonstrated by tests representing actual job site conditions. The tests shall be certified and meet the following requirements:

1. The concrete test block shall have a cross-section equal to twice the minimum edge distance of center line of tendon to the face of concrete in the actual structure in one direction and equal to the minimum spacing of the anchorages plus 3 inches in the other direction. The length of the concrete test block shall be at least three times the largest cross-section dimension.

2. The reinforcement in the test block behind the anchorage for a distance equal to the largest of the two cross-sectional dimensions of the anchorage shall simulate the actual reinforcement used in the structure. For the remaining length of the test block, the reinforcement may be increased as required to prevent failure in that portion.

3. Concrete strength at the time of testing shall not exceed 85 percent of the minimum concrete strength at the time of post-tensioning as specified in the Plans. The concrete strength shall be determined in accordance with procedures as outlined in ASTM C 1074, Estimating Concrete Strength by the Maturity Method.

4. The test shall be comprised of three anchorages separately tested or tested together in one test block.

5. Anchorages shall be capable of developing 95 percent of the ultimate strength of the post-tensioning reinforcement without measurable permanent distortion of the assembly and without concrete failure in the test block. Measurable permanent distortion is defined as a distortion across the face of the assembly of 0.01 inch or more using the original plane as a reference and is measured after the test loading is released. The test block shall be acceptable with regard to concrete failure if the following criteria are satisfied:

a. No concrete cracks with a load of 40 percent of the ultimate strength of the post-tensioning reinforcement.

b. Width of concrete cracks with a test load of 70 percent of the ultimate strength of the post-tensioning reinforcement does not exceed 0.005 inch.
After loading to 95 percent of the ultimate strength of the post-tensioning reinforcement and releasing the test load, the width of concrete cracks does not exceed 0.015 inch.

6. Materials and workmanship shall conform to the applicable requirements of Sections 6-03 and 9-06.

Before installing the anchorage device, the Contractor shall submit a Manufacturer’s Certificate of Compliance for the anchorage device in accordance with Section 1-06.3.

6-02.3(26)C Metal Conduit

The second sentence of the first paragraph is revised to read:

This conduit shall maintain the required profile within a placement tolerance of ± 1/4 inch for longitudinal tendons and ± 1/8 inch for transverse slab tendons, during all phases of the work.

Starting with the second sentence, the fourth paragraph is revised to read:

Vents and drains shall be 1/2-inch minimum diameter standard steel or polyethylene pipe. Vents shall point upward and remain closed until grouting begins. Drains shall point downward and remain open until grouting begins. Ends of steel vents and drains shall be removed 1 inch inside the concrete surface after grouting has been completed; polyethylene vents and drains may be left flush to the surface unless otherwise directed by the Engineer. Conduit vents are not required for transverse post-tensioning ducts in the roadway slab unless specified in the Plans.

6-02.3(26)E Tensioning

In the fifth paragraph, Items 2 and 3 are revised to read:

2. Maximum tensile stress during jacking: 79 percent of the specified minimum ultimate tensile strength of the steel.

3. Maximum initial stress at anchorage after seating: 70 percent of the specified minimum ultimate tensile strength of the steel.

The seventh paragraph is revised to read:

As tensioning proceeds, the Engineer will be recording the applied load, tendon elongation, and anchorage seating values.

Add the following at the end of the last paragraph:

The prestressing strands shall be cut a minimum of 1 inch from the face of the anchorage device.

6-02.3(26)F Grouting

The third sentence in the first paragraph is revised to read:
Concrete for Precast Units

Concrete for precast non-prestressed units shall meet all the requirements for a Contractor-provided mix design and the following acceptance limits:

- The water reducing admixture shall be limited to AASHTO M 194 Type A or D and shall not contain ingredients that may corrode steel (that is chlorides, fluorides, sulfates, or nitrates). Fly ash may be used at the option of the Contractor.

- The grout shall consist of portland cement, water, and a water reducing admixture and shall be mixed in the following proportions:
  
  | Portland Cement Type II | 1 Sack |
  | Water                   | 4.5 Gallons Maximum |
  | Water reducing Admixture| Manufacturer's Recommendation |
  | Fly Ash (Optional)      | 20 Pounds Maximum |

- The water reducing admixture shall be limited to AASHTO M 194 Type A or D and shall not contain ingredients that may corrode steel (that is chlorides, fluorides, sulfates, or nitrates). Fly ash may be used at the option of the Contractor.

- The Contractor shall proportion the mix to produce a grout with a flow of 15 to 20 seconds as determined by ASTM C 939, Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method). The grout ejected from the end vent shall have a minimum flow of 15 seconds.

- The grout mix shall be injected within 30 minutes after the water is added to the cement. Temperature of the surrounding concrete shall be at least 35°F from the time the grout injecting begins until 2 inch cubes of the grout have a compressive strength of 800 psi. Cubes shall be made in accordance with WSDOT test method 813 and stored in accordance with method 2 of WSDOT test method 809. If ambient conditions are such that the surrounding concrete temperature may fall below 35°F, the Contractor shall provide a heat source and protective covering for the structure to keep the temperature of the surrounding concrete above 35°F. Grout temperature shall not exceed 90°F during mixing and pumping. If conditions are such that the temperature of the grout mix may exceed 90°F, the Contractor will make necessary provisions, such as cooling the mix water and/or dry ingredients, to ensure that the temperature of the grout mix does not exceed 90°F.

- The following new section is added:

6-02.3(27) Concrete for Precast Units

Concrete for precast non-prestressed units shall meet all the requirements for a Contractor-provided mix design and the following acceptance limits:
Precast units shall not be shipped until the concrete has reached the specified design strength as determined by testing cylinders made from the same concrete as the precast units. The cylinders shall be made, handled, and stored in accordance with WSDOT test method 809 Method 2 and compression tested in accordance with WSDOT test methods 801 and 811.

If the design strength of the precast concrete is 4000 psi or less, the Contractor may use State-provided mix design Class 4000 with air. Precast concrete shall not be subject to statistical evaluation.

Precast units shall not be removed from forms until the concrete has attained a minimum compressive strength of 70% of the specified design strength as verified by rebound number determined in accordance with ASTM C 805.

Precast units shall not be shipped until the concrete has reached the specified design strength as determined by testing cylinders made from the same concrete as the precast units. The cylinders shall be made, handled, and stored in accordance with WSDOT test method 809 Method 2 and compression tested in accordance with WSDOT test methods 801 and 811.

6-02.4 Measurement

The first paragraph is revised to read:

Except as noted below, all classes of concrete shall be measured in place by the cubic yard to the neat lines of the structure as shown in the Plans.

6-02.5 Payment

This section is supplemented with the following:

9. "Deficient Strength Conc. Price Adjustment".

"Deficient Strength Conc. Price Adjustment" will be calculated and paid for as described in Section 6-02.3(5)D. For the purpose of providing a common proposal for all bidders, the State has entered an amount for the item "Deficient Strength Conc. Price Adjustment" in the bid proposal that covers all applicable classes of concrete to become a part of the total bid by the Contractor.

10. "Quality Incentive Conc. Price Adjustment".

"Quality Incentive Conc. Price Adjustment" will be calculated and paid for as described in Section 6-02.3(5)E. For the purpose of providing a common proposal for all bidders, the State has estimated the amount for "Quality Incentive Conc. Price Adjustment" and has entered the amount in the bid proposal that covers all applicable classes of concrete to become a part of the total bid by the Contractor.
7-01.2 Materials

The first paragraph listing is supplemented by the addition of the following:

- Corrugated Polyethylene (PE) Drain Pipe, 12-inch thru 24-inch diameter maximum ........................................... 9-05.1(7)

- Perforated Corrugated Polyethylene (PE) Underdrain Pipe, 12-inch thru 24-inch diameter maximum ........................................... 9-05.2(8)
SECTION 7-02, CULVERTS
February 26, 1990

7-02.3(1) Placing Culvert Pipe - General

This section is supplemented with the following:

Any shoring and cribbing or extra excavation required shall meet the requirements of Section 2-09.3.

The following new section is added:

7-02.3(6) Safety Bars for Culvert Pipe

When shown in the Plans, safety bars for culvert pipe shall be constructed in accordance with the Standard Plans and shall meet the requirements of Section 9-05.18.

7-02.4 Measurement

This section is supplemented with the following:

Shoring and cribbing or extra excavation will be measured as specified in Section 2-09.4.

The length of safety bars for culvert pipe will be the number of linear feet of each safety bar installed.

Tapered end section with safety bars will be measured by the unit per each.

7-02.5 Payment

This section is supplemented with the following:

21. "Shoring and Cribbing or Extra Excavation Class B", per square foot.

The unit contract price per square foot for "Shoring and Cribbing or Extra Excavation Class B", shall be full pay for the work as specified in Section 2-09.5.

22. "Safety Bars for Culvert Pipe Type ....", per linear foot.

The unit contract price per linear foot for "Safety Bars for Culvert Pipe Type ...." shall be full pay for all sockets, labor, tools, materials, and equipment necessary to fabricate, furnish, and install the safety bars. The work and materials to construct the headwalls will be paid for separately.

23. "Tapered End Section With Safety Bars .... In. Diam.", per each.

The unit contract price per each for "Tapered End Section with Safety Bars .... In. Diam." shall be full pay for all labor, tools, materials, and equipment necessary to fabricate, furnish, and install the end section.
SECTION 7-04, STORM SEWERS

May 23, 1988

7-04.4 Measurement

The section is supplemented with the following:

Shoring and cribbing or extra excavation will be measured as specified in Section 2-09.4.

7-04.5 Payment

This section is supplemented with the following:

9. "Shoring and Cribbing or Extra Excavation Class B", per square foot.

The unit contract price per square foot for "Shoring and Cribbing or Extra Excavation Class B", shall be full pay for the work as specified in Section 2-09.5.
SECTION 7-05, MANHOLES, GRATE INLETS, DROP INLETS, AND CATCH BASINS

January 30, 1989

7-05.3 Construction Requirements

This section is supplemented with the following:

Any shoring and cribbing or extra excavation required shall meet the requirements of Section 2-09.3.

7-05.4 Measurement

The second sentence of the first paragraph is revised to read:

Measurement of manhole heights for payment purposes will be the distance from the flow line of the outlet pipe to the top of the manhole ring.

This section is supplemented with the following:

Shoring and cribbing or extra excavation will be measured as specified in Section 2-09.4.

7-05.5 Payment

This section is supplemented with the following:

14. "Shoring and Cribbing or Extra Excavation Class B", per square foot.

The unit contract price per square foot for "Shoring and Cribbing or Extra Excavation Class B", shall be full pay for the work as specified in Section 2-09.5.
8-20.1(1) Regulations and Code

The fifth paragraph is revised to read:

Safe wiring labels normally required by the Department of Labor and Industries will not be required on electrical work within the rights-of-way of State Highways as allowed in RCW 19.28.350.

8-20.3(12) Painting

The second paragraph is revised to read:

Prior to painting, all galvanized surfaces shall be treated as specified in Section 6-07.3(4).

8-20.3(14)C Induction Loop Vehicle Detectors

The first sentence of item 9 is revised to read:

Sawcut sealant shall conform to ASTM D 312 Type 4.

8-20.3(15) Vacant, is revised to read:

8-20.3(15) Grout

Grout shall conform to the requirements of Section 6-03.3(36).
SECTION 9-05, DRAINAGE STRUCTURES, CULVERTS, AND CONDUITS

April 11, 1988

9-05.1 Drain Pipe

The following subsection is added:

9-05.1(7) Corrugated Polyethylene Drain Pipe

Corrugated polyethylene drain pipe, 12-inch thru 24-inch diameter maximum, shall meet the minimum requirements of AASHTO M 294.

9-05.2 Underdrain Pipe

The following subsection is added:

9-05.2(8) Perforated Corrugated Polyethylene Underdrain Pipe

Perforated corrugated polyethylene underdrain pipe, 12-inch thru 24-inch diameter maximum, shall meet the minimum requirements of AASHTO M 294. Perforations shall be in accordance with AASHTO M 252.

9-05.9 Steel Spiral Rib Storm Sewer Pipe

This Section is revised to read:

Steel spiral rib storm sewer pipe shall be manufactured of metallic coated (aluminized or galvanized) corrugated steel and inspected in conformance with Section 9-05.4. The size, coating, and metal shall be as shown in the Plans or in the Specifications.

The manufacturer of spiral rib storm sewer pipe shall furnish to the Engineer a certificate of compliance stating that the materials furnished comply in all respects with these Specifications. The Engineer may require additional information or tests to be performed by the Contractor, at no expense to the State.

Unless otherwise specified, spiral rib storm sewer pipe shall be furnished with pipe ends cut perpendicular to the longitudinal axis of the pipe. Pipe ends shall be cut evenly. Spiral rib pipe shall be fabricated either by using a continuous helical lock seam with a seam gasket or a continuous helical welded seam paralleling the rib.

For spiral rib storm sewer pipe, helical ribs shall project outwardly from the smooth pipe wall and shall be fabricated from a single thickness of material. The ribs shall be essentially rectangular and shall be 3/4 inch plus two times the wall thickness (2t) plus or minus 1/8 inch (measured outside to outside) and a minimum of 0.95 inch high (measured as the minimum vertical distance from the outside of pipe wall immediately adjacent to the lockseam or stiffener to the top surface of rib). The maximum spacing of the ribs shall be 11.75 inches center to center (measured normal to the direction of the ribs). The radius of bend of the metal at the corners of the ribs shall be a minimum of 0.10 inch and a maximum of 0.17 inch. If the sheet between adjacent ribs does not contain
a lockseam. a stiffener shall be included midway between ribs, having a
nominal radius of 0.25 inch and a minimum height of 0.20 inch toward the
outside of the pipe. Pipe shall be fabricated with ends that can be
effectively jointed with coupling bands.

When required, spiral rib or narrow pitch spiral rib pipe shall be bituminous
treated or paved. The bituminous treatment for spiral rib pipe shall
conform to the requirements of Sections 9-05.4(3) and 905.4(4).

For narrow pitch spiral rib sewer pipe, the helical ribs shall project
outwardly from the smooth pipe wall and shall be fabricated from a single
thickness of material. The ribs shall be .375 inch ± 1/8 inch wide
(measured outside to outside) and a minimum of .4375 inch high
(measured as the minimum vertical distance from the outside of pipe wall
to top surface of the rib). The maximum spacing of ribs shall be 4.80
inches center to center (measured normal to the direction of the ribs). The
radius of bend of the metal at the corners of the ribs shall be 0.0625 inch
with an allowable tolerance of ± 10 percent.

9-05.9(1) Continuous Lock Seam Pipe

Pipes fabricated with continuous helical seam parallel to the rib may be
used for full circle pipe. The lock seam shall be formed in the flat between
ribs and shall conform to Sections 7.5.1 through 7.5.3 of AASHTO M 36.

For narrow pitch spiral rib storm sewer pipe, the lap width specified in
Section 7.5.1 shall be 1/4 inch.

For use in applications without bituminous treatment, the continuous
lockseam must be qualified by tests conducted by the Headquarters
Materials Laboratory.

9-05.9(1)A Basis for Acceptance

The basis for acceptance will be a qualification test, conducted by the
Headquarters Materials Laboratory, for each manufacturer of helically
corrugated, gasketed spiral rib, or narrow pitch spiral rib lock seam steel
pipe. Only those specific pipe sizes and gasket materials approved under
the qualification test will be accepted.

Continuous lock seam pipe shall be sampled and tested in accordance
with AASHTO T 249.

9-05.9(2) Continuous Welded Seam Pipe

Pipes fabricated with a continuous helical welded seam parallel to the ribs
may be used for full circle pipe. The welding process for galvanized steel
pipe shall be so controlled that the combined width of the weld and
adjacent spelter coating burned by the welding does not exceed three
times the thickness of the metal. If spelter is burned outside these limits,
the weld and burned spelter shall be treated as required below. Testing for
welded seam quality control shall conform to AASHTO T 421. Welded pipe
fabricated from aluminized steel pipe shall have the coating of the welded
area repaired by flame-sprayed metalizing inside and out after welding.
Repair of Damaged Galvanizing: When the galvanized (zinc coated) surface has been burned by gas or arc welding, all surfaces of the welded connections shall be thoroughly cleaned by wire brushing and all traces of the welding flux and loose or cracked galvanizing removed, after which the areas shall be repaired by flame-spray metalizing both inside and out.

9-05.9(3) Coupling Bands

Coupling bands shall be of the same material as the pipe. Coupling bands and gaskets shall conform to Section 9-05.10(1).

9-05.10 Steel Storm Sewer Pipe

This Section is revised to read:

Steel storm sewer pipe shall conform to the requirements of Section 9-05.4 for steel culvert pipe, except that protective coating shall be Treatment 5, and be constructed of either helically corrugated lock seam or helically corrugated continuous welded steel pipe. When gasketed helically corrugated lock seam steel pipe is called for, Treatment 5 is not required. Welded seam aluminum coated (aluminized) steel pipe shall require metalized aluminum coating inside and out following welding and shall not require Treatment 5.

9-05.10(1) Coupling Bands

This Section is revised to read:

Coupling bands for storm sewer pipe shall conform to the details shown in the Standard Plan and to these Specifications:

Bands shall be made of the same base metal as the pipe and may be two nominal thicknesses lighter than used for the pipe but not thicker than 0.109 inch or lighter than 0.064 inch. Corrugations on the bands shall be the same size and shape as those on the pipe to be connected. Steel bolts and nuts shall meet the requirements of ASTM A 307, and galvanized in accordance with AASHTO M 232. Welds shall develop the full strength of the parent metal.

Type F bands may be used as an alternate to all other types shown for steel storm sewer pipe sizes 12 inches in diameter to 84 inches in diameter inclusive, provided that two annular corrugations are formed on each pipe end to be joined. The end corrugation shall be 2 inches by 1/2 inch and the inside adjacent corrugation shall be 2-2/3 inches by 1/2 inch.

When annular corrugated bands are used to connect lock-seam helically corrugated pipes, the seam shall be welded at the pipe ends prior to recorrugating to prevent unraveling of the seam.

Coupling bands shall be made by the same manufacturer as the steel storm sewer pipe selected for installation.

9-05.15(1) Manhole Ring and Cover
The first paragraph is revised to read:

Castings for manhole rings and covers shall be gray iron castings conforming to the requirements of AASHTO M 105, Class 30.

9-05.17 Aluminum Spiral Rib Storm Sewer Pipe

This Section is revised to read:

Aluminum spiral rib storm sewer pipe shall be manufactured of corrugated aluminum and inspected in conformance with Section 9-05.5. The size, coating, and metal shall be as shown in the Plans or in the Specifications.

The manufacturer of spiral rib storm sewer pipe shall furnish to the Engineer a certificate of compliance stating that the materials furnished comply in all respects with these Specifications. The Engineer may require additional information or tests to be performed by the Contractor, at no expense to the State.

Unless otherwise specified, spiral rib storm sewer pipe shall be furnished with pipe ends cut perpendicular to the longitudinal axis of the pipe. Pipe ends shall be cut evenly. Spiral rib pipe shall be fabricated by using a continuous helical lock seam with a seam gasket.

For spiral rib storm sewer pipe, helical ribs shall project outwardly from the smooth pipe wall and shall be fabricated from a single thickness of material. The ribs shall be 3/4 inch wide by 3/4 inch deep with a nominal spacing of 7-1/2 inches center to center. Pipe shall be fabricated with ends that can be effectively jointed with coupling bands.

For narrow pitch spiral rib storm sewer pipe, helical ribs shall project outwardly from the smooth pipe wall and shall be fabricated from a single thickness of material. The ribs shall be 0.375 inch ± 1/8 inch wide (measured outside to outside) and a minimum of 0.4375 inch high (measured as the minimum vertical distance from the outside of pipe wall to top surface of the rib). The maximum spacing of ribs shall be 4.80 inches center to center (measured normal to the direction of the ribs). The radius of bend of the metal at the corners of the ribs shall be 0.0625 inch with an allowable tolerance of ± 10 percent.

For wide pitch spiral rib storm sewer pipe, helical ribs shall project outwardly from the smooth pipe wall and shall be fabricated from a single thickness of material. The ribs shall be 3/4 inch ± 1/8 inch wide (measured outside to outside) and a minimum of 0.95 inch high (measured as the minimum vertical distance from the outside of pipe wall to top surface of the rib). The maximum spacing of ribs shall be 11.75 inches center to center (measured normal to the direction of the ribs). The radius of bend of the metal at the corners of the ribs shall be 0.0625 inch with an allowable tolerance of ± 10 percent.

9-05.17(1) Continuous Lock Seam Pipe

Pipes fabricated with continuous helical seam parallel to the rib may be used for full circle pipe. The lock seam shall be formed in the flat between ribs and shall conform to Section 13.2.1 through 13.2.5 of AASHTO M 196.
For narrow pitch spiral rib storm sewer pipe, the seam lap width specified in Section 13.2.1 shall be 1/4 inch. The continuous lock seam must be qualified by tests conducted by the Headquarters Materials Laboratory.

9-05.17(1) A Basis for Acceptance

The basis for acceptance will be a qualification test, conducted by the Headquarters Materials Laboratory, for each manufacturer of helically corrugated, spiral rib, narrow pitch spiral rib, or wide pitch spiral rib lock seam pipe. Only those specific pipe sizes and gasket materials, if any approved under the qualification test, will be accepted.

Continuous lock seam pipe shall be sampled and tested in accordance with AASHTO T 249.

9-05.17(2) Coupling Bands

Coupling bands shall be of the same material as the pipe. Coupling bands and gaskets shall conform to Section 9-05.10(1).
SECTION 9-07, REINFORCING STEEL
July 24, 1989

9-07.2 Deformed Steel Bars

The first paragraph is revised to read:

Deformed steel bars for concrete reinforcement shall conform to the requirements of AASHTO M 31 Deformed and Plain Billet Steel Bars for Concrete Reinforcement, Grade 60, or ASTM A-706, Low-Alloy Steel. Deformed Bars for Concrete Reinforcement. However, in computing the ultimate unit tensile stress from test data, the area may be corrected for weight per linear foot of the bar within the weight tolerances listed. No such correction for weight shall be used in calculating the yield stress; the nominal area of the bar, as given in Table 1 of AASHTO M 31 or ASTM A-706, shall be used in this computation.

9-07.3 Epoxy-Coated Steel Reinforcing Bars

Item 1 of the first paragraph is revised to read:

1. The list of steel reinforcing bars acceptable for epoxy coating shall include ASTM A-706.

9-07.10 Prestressing Reinforcement

The second paragraph is revised to read:

Prestressed reinforcement shall be mill bright high-tensile-strength seven wire low-relaxation strand conforming to the requirements of AASHTO M 203, Grade 270.

The third paragraph is deleted.
9-23.6 Air-Entraining and Chemical Admixtures

This section is revised to read:

9-23.6 Admixture for Concrete

Admixtures for use in concrete shall meet the following specifications:

<table>
<thead>
<tr>
<th>Admixture</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air entraining</td>
<td>AASHTO M 154</td>
</tr>
<tr>
<td>Water Reducing</td>
<td>AASHTO M 194 Type A</td>
</tr>
<tr>
<td>Set Retarding</td>
<td>AASHTO M 194 Type B</td>
</tr>
<tr>
<td>Water Reducing/</td>
<td>AASHTO M 194 Type D</td>
</tr>
<tr>
<td>Set Retarding</td>
<td></td>
</tr>
<tr>
<td>High Range Water Reducing</td>
<td>AASHTO M 194 Type F</td>
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<tr>
<td></td>
<td>and G</td>
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<tr>
<td></td>
<td>ASTM C 494 Type F</td>
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<td></td>
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</tbody>
</table>

In addition to the above specifications, admixtures proposed for use shall contain less than one percent Cl- by weight of admixture.

Acceptance of admixtures will be based on Manufacturer's Certificate of Compliance. If required by the Engineer, admixtures shall be sampled and tested before they are used.

9-23.7 Air-Entraining and Chemical Admixtures for Precast Prestressed Concrete.

The second sentence of the first paragraph is revised to read:

Acceptance will be on the basis of a Manufacturer's Certification of Compliance.

The fourth paragraph is revised to read:

Acceptance will be on the basis of a Manufacturer's Certification of Compliance.

9-23.9 Fly Ash

This section is revised to read:

Fly ash shall conform to the requirements of AASHTO M 295 Class C or F with optional chemical requirements as set forth in Table 1 and optional physical requirements as set forth in Table 2A and with a further limitation that the loss on ignition shall be a maximum of 1.5 percent.
PART III

SPECIAL PROVISIONS
SUPPLEMENTARY SPECIAL PROVISIONS

SSP-1  Owner

Owner is the City of Tacoma, Washington. All notices, letters, and other communication directed to Owner shall be addressed and delivered to Ms. Mary Lynn, City of Tacoma Refuse Facility, 3510 South Mullen Street, Tacoma, Washington 98409.

SSP-2  Consultant

All duties and responsibilities assigned to Consultant in the Contract Documents, with the corresponding rights and authority, will be assumed by B&V Waste Science and Technology Corp., 3600 Port of Tacoma Road East, Suite 304, Tacoma, Washington 98424-1046, and their duly authorized agents.

SSP-3  Engineer

Engineer is the City of Tacoma Director of Public Works and/or his assignees and agents.

SSP-4  CQA Officer

CQA Officer is the City of Tacoma Director of Public Works and/or his assignees and agents.

SSP-5  Contractor

Contractor refers to an individual, partnership, firm, corporation, or joint venture contracting with the City of Tacoma to do the prescribed work. The term contractor shall also include all subcontractors and vendors to the contractor.

SSP-6  Resident Project Representative

Consultant may furnish a Resident Project Representative and assistants to aid Consultant in carrying out his responsibilities at the site. The duties, responsibilities, and limitations of authority of the Resident Project Representative are set forth in Exhibit A attached to these Supplementary Special Provisions.

SSP-7  Limitation of Consultant's Authority

Neither Consultant's authority to act under this article or elsewhere in the Contract Documents nor any decision made by him in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility of Consultant to Contractor, any Subcontractor, any material man, fabricator, supplier, or any of their agents or employees or any other person performing any of the Work.
Consultant will not be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, and he will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

Consultant will not be responsible for the acts or omissions of Contractor, or any Subcontractors, or any of his or their agents or employees or any other person at the site or otherwise performing any of the Work.

SSP-8  **Indemnification of Consultant**

Consultant shall be indemnified by the Contractor to the same extent as Owner under Section 1-07.14 of the 1988 APWA Amendments to Division 1.

SSP-9  **Order Of Precedence**

The specifications included or referenced herein shall supersede any conflicting specifications in the following order with the first item superseding all others and so on:

1. Construction Quality Assurance Plan
2. Special Provisions
4. 1988 City of Tacoma Amendments and Standard Plans
5. 1988 APWA Amendments to Division 1
6. State Amendments to the Standard Specifications (applicable amendments are included in these contract documents).

SSP-10  **Underground Installations**

Existing underground installations are indicated on the drawings only to the extent such information was made available to or discovered by Consultant in preparing the drawings. There is no guarantee as to the accuracy or completeness of such information, and all responsibility for field verification of accuracy and completeness thereof shall expressly be the responsibility of the Contractor. See also Section 1.09 of the Special Provisions.
Contractor shall be responsible for discovery, field verification, protection, and maintenance of existing underground installations, in advance of excavating or trenching, by contacting all local utilities and by prospecting.
EXHIBIT A

DUTIES, RESPONSIBILITIES AND LIMITATIONS OF AUTHORITY
OF RESIDENT PROJECT REPRESENTATIVE

A. General

Resident Project Representative is Consultant's Agent, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding his actions. Resident Project Representative's dealing in matters pertaining to the on-site Work shall in general be only with Engineer and Contractor, and dealings with subcontractors shall only be through or with the full knowledge of Contractor. Written communication with Owner will be only through or as directed by Engineer.

B. Duties and Responsibilities

Resident Project Representative will:

1. Schedules: Review schedule of values prepared by Contractor and consult with Engineer concerning their acceptability.

2. Conferences: Attend preconstruction conferences, progress meetings, job conferences, and other project-related meetings.

3. Shop Drawings and Samples: Advise Engineer immediately of the commencement of any work requiring a Shop Drawing or sample submission if the submission has not been accepted by Engineer.

4. Review of Work, Rejection of Defective Work, Inspections and Tests:

   a. Conduct on-site observations of the Work in progress to assist Engineer in determining if the Work is proceeding in accordance with the Contract Documents and that completed Work will conform to the Contract Documents.

   b. Report to Engineer and Consultant whenever he believes that any Work is unsatisfactory, faulty or defective or does not conform to the Contract Documents, or does not meet the requirements of any inspections, tests or approval required to be made or has been damaged prior to final payment; and advise Engineer when he believes Work should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.

(STAGE 1 NORTH CLOSURE) (TACOMA LANDFILL) EA-1
c. Verify that tests are conducted as required by the Contract Documents and in presence of the required personnel, and that Contractor maintains adequate records thereof; observe, record and report to Engineer appropriate details relative to the test procedures.

5. Modifications: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report them with recommendation to Engineer and Consultant.

6. Records:
   a. Keep a diary or log book, recording hours on the job site, weather conditions, data relative to questions of extras or deductions, list of visiting officials and representatives of manufacturers, fabricators, suppliers and distributors, daily activities, decisions, observations in general and specific observations in more detail as in the case of observing test procedures. Send copies to Engineer.
   b. Record names, addresses and telephone numbers of all Contractors, subcontractors and major suppliers of materials and equipment.
   c. Maintain a pictorial record of work progress, problems, and corrective measures.

7. Reports:
   a. Consult with Engineer in advance of scheduled major tests, inspections or start of important phases of the work.
   b. Report immediately to Engineer upon the occurrence of any accident.

8. Completion:
   a. Conduct final inspection in the company of Engineer, Owner, and Contractor and prepare a final list of items to be completed or corrected.
   b. Verify that all items on final list have been completed or corrected and make recommendations to Engineer concerning acceptance.

C. Limitations of Authority

Except upon written instructions of Consultant, Resident Project Representative:

1. Shall not authorize any deviation from the Contract Documents or approve and substitute materials or equipment.
2. Shall not exceed limitations on Consultant authority as set forth in the Contract Documents.

3. Shall not undertake any of the responsibilities of Contractor, subcontractors or Contractor's superintendent, or expedite the Work.

4. Shall not advise on or issue directions to the Contractor relative to any aspect of the means, methods, techniques, sequences or procedures of construction unless such is specifically called for in the Contract Documents.

5. Shall not advise on or issue directions to the Contractor as to safety precautions and programs in connection with the Work.

6. Shall not participate in specialized field or laboratory tests.
TACOMA LANDFILL CAP
STAGE ONE NORTH CLOSURE
CONSTRUCTION QUALITY ASSURANCE PLAN
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1.0 RESPONSIBILITY AND AUTHORITY

1.1 RESPONSIBILITY OF ORGANIZATIONS INVOLVED IN CONSTRUCTION QUALITY ASSURANCE

1.1.1 Owner

Owner is the City of Tacoma, Washington. All notices, letters, and other communication directed to Owner shall be addressed and delivered to Mr. Bob Davis, City of Tacoma Construction Division, 747 Market Street, Suite 332, Tacoma, Washington 98402.

The City as owner of this facility will be responsible for the operation and closure of the landfill. This responsibility includes complying with appropriate Washington Department of Ecology Regulations, including WAC 173-304, relevant Federal regulations, and Consent Decree requirements. The City is responsible for the submission and implementation of the Construction Quality Assurance (CQA) Plan and must also provide documentation that the facility was constructed as designed. This CQA plan has been prepared to comply with the requirements of the Consent Decree for the Tacoma Landfill Remediation.

The City has authority to select and dismiss organizations charged with design, CQA, and construction activities. The City also has authority to accept or reject design plans and specifications, CQA plans, and the materials and workmanship of the Contractor.

1.1.2 Consultant

All duties and responsibilities assigned to Consultant in the Contract Documents, with the corresponding rights and authority, will be assumed by B&W Waste Science and Technology Corp. (BVWST), 3600 Port of Tacoma Road East, Suite 304, Tacoma, Washington 98424-1046, and their duly authorized agents.

BVWST is primarily responsible for designing the landfill closure to meet applicable state and federal regulations. BVWST will periodically
review CQA documentation. BVWST will also develop corrective measures where required.

1.1.3 **Oversight Agency**

The Environmental Protection Agency (EPA) and Department of Ecology (Ecology) are providing oversight for this project. In addition, the Tacoma-Pierce County Health Department (TPCHD) as the Tacoma Landfill permitting agency, is also providing oversight for this project. These oversight agencies will have the authority to review, and accept or reject, any design revisions or requests for variance that are submitted by the Owner. These agencies along with the Engineer and the Consultant, will be reviewing all submittals for accuracy and compliance with specifications. Oversight agencies will have the responsibility and authority to review all CQA documentation during or after construction to confirm that the approved CQA plan was followed and that the facility was constructed as specified in the design.

1.1.4 **Engineer**

Engineer is the City of Tacoma Director of Public Works and/or his assignees and agents.

1.1.5 **CQA Officer**

CQA Officer is the City of Tacoma Director of Public Works and/or his assignees and agents. The CQA Officer may appoint inspection personnel to facilitate implementation of the CQA Plan.

1.1.6 **Contractor**

Contractor refers to an individual, partnership, firm, corporation, or joint venture contracting with the City of Tacoma to do the prescribed work. The term Contractor shall also include all subcontractors and vendors to the Contractor.
1.1.7 **Resident Project Representative**

Consultant may furnish a Resident Project Representative and assistants at the request of the Owner or Engineer to aid in carrying out the Consultant's responsibilities at the site. Resident Project Representative, whether the Consultant's agent or a City of Tacoma agent, will act as directed by and under the supervision of Engineer or CQA Officer.

The duties, responsibilities, and limitations of authority of the Resident Project Representative are set forth in Exhibit A attached to these Supplementary Special Provisions of the Specifications.

The Resident Project Representative will serve as part of the CQA personnel and will observe testing and sampling procedures as required by the CQA Officer.

1.2 **MEETINGS**

Periodic meetings will be held between the Owner, Contractor, Engineer, and Consultant. Attendees shall also include personnel from the EPA, Ecology, and TPCHD. These meetings will be held as outlined below:

1.2.1 **Preconstruction CQA Meeting**

The purpose of this meeting will be to resolve any remaining uncertainties regarding the project design, the CQA Plan, or other issues pertaining to the project and to anticipate any items which may cause difficulties or delay the project. Any changes to the project shall meet EPA and Ecology's approval. Of primary importance will be discussion of the CQA Plan. Other items which should be addressed at this meeting include the following:

- Procedures for observation, testing, and sampling.
- Procedures for handling substandard construction, retesting, and repairs.
- Lines of communication and authority.
- Documentation and reporting procedures.
- Synthetic membrane panel layouts.
- Quality control procedures.
1. Responsibilities of each party.
2. Procedures for transmittal, review, and distribution of Contractor's submittals.
3. Procedures for processing applications for payment.
5. Critical Work Sequencing
7. Use of premises, offices and storage areas, security, housekeeping, and Owner's needs.
8. Major deliveries and priorities.
9. Site conditions, storage areas, facilities, etc., in conjunction with a site tour.
10. Site security and health and safety requirements.
11. Project schedule.

The Owner or Engineer will arrange to have the meetings minutes taken and distributed to the attendees. Prior notification of any additional meetings shall be provided to EPA, Ecology, and TFCHD for their consideration to attend.

1.2.2 Progress Meetings

Progress meetings are held to promote good communication of project status, problems, and problem resolution between the various parties at the site. Progress meetings will be held as described below.

1.2.2.1 Informal Progress Meetings. Informal progress meetings will be held daily between the Contractor and the CQA Officer or his designated alternate to discuss the previous day's work, any problems encountered and their resolution, and current work.

1.2.2.2 Formal Progress Meetings. Formal progress meetings will be held on a biweekly basis, at a minimum. Formal progress meetings may be held at other times at the request of the Engineer or the CQA Officer; or as the progress of work requires it. Contractor, Engineer, CQA Officer, Consultant, and all subcontractors active on the site shall be represented at the meeting. The Contractor may, at his discretion, request attendance
by representatives of his suppliers, manufacturers, and other subcontractors. EPA, DOE, and TPCHD will also be invited to attend these meetings.

Engineer shall preside at the meetings and provide for preparation and distribution of the minutes. The purpose of these meetings will be to review the progress of the Work, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop.
2.0 PRECONSTRUCTION INSPECTIONS

This section describes the preliminary onsite inspection activities required to ensure that the bedding soil, sand drainage layer, synthetic cover components and cover soil, the gas collection system, and the gas condensate collection system satisfy the specifications.

2.1 PRECONSTRUCTION INSPECTIONS OF IMPORTED SOIL COMPONENTS

Any imported soil to be used in the sand layer, the soil bedding layer, the protective cover material layer, or as topsoil shall be inspected at the source by the Engineer prior to delivery to the site. The Engineer shall collect sufficient samples as he determines to be representative of the source. These samples will be tested by grain size analysis (ASTM:D422, excluding hydrometer analysis). Test results shall be within the limits defined in Section 6.00 of the specifications. These tests performed by the Engineer are in addition to the material testing required to be performed by the Contractor in Section 6.16 of these specifications.

2.2 PRECONSTRUCTION INSPECTIONS OF SYNTHETIC MEMBRANE SYSTEM

2.2.1 Raw Material

The raw material of the synthetic membrane shall be first quality polyethylene resin and as specified in Section 8.03(A) of the Specifications. Quality control testing as required by Section 8.03(A) shall be carried out to demonstrate that the product meets this specification.

Prior to synthetic membrane installation, the CQA Officer shall be provided with the following information:

- The origin (resin supplier's name, resin production plant), identification (brand name, number) and production date of the resin.
o A sample of the finished liner from each raw material batch (identified by lot number) which shall be retained for future reference. Appropriate documentation shall be included with each sample.

o A copy of the quality control certificates issued by the resin supplier noting results of density and melt index tests.

o Reports on the tests conducted to verify the quality of the resin used to manufacture the synthetic membrane rolls.

o Reports on the tests conducted to verify the quality of the sheet.

Prior to installation of the geosynthetic drainage net and filter fabric, the CQA Officer shall be provided with reports on the tests conducted to verify the materials meet the requirements of Sections 8.03(B) and 8.04(b) for the drainage net and Section 8.04(c) for the filter fabric.

2.2.2 Synthetic Membrane Manufacturing

Before installing the synthetic membrane or membrane/geonet composite the Contractor shall provide the CQA Officer with the following:

o A properties sheet including, at a minimum, all specified properties measured using the test methods prescribed in the specifications.

o Descriptions of the base polymers which comprise the synthetic membrane.

o The sampling procedure and results of testing.

o A certification that values given in the properties sheet are guaranteed by the synthetic membrane manufacturer.

The CQA Officer or his designated alternate shall verify that:

o The property values certified by the synthetic membrane manufacturer meet all of the specifications.

o The measurements of properties by the synthetic membrane manufacturer are properly documented, and that the test methods used are acceptable.
2.2.3 Synthetic Membrane Rolls

After receipt of material, Contractor shall provide Engineer with one quality control certificate for every two rolls of synthetic membrane provided. Each quality control certificate shall be signed by the CQA Officer. The quality control certificates shall include: roll numbers, identification, and results of quality control tests. As a minimum, test results shall be given for thickness, tensile strength, and tear resistance, evaluated in accordance with ASTM test methods.

2.2.4 Transportation and Handling

Transportation of the synthetic cap system components will be performed by Contractor or other party. Material, when off-loaded, shall be placed on a smooth surface free of rocks or any other protrusions which may damage the material. Contractor shall provide handling equipment that does not pose any risk of damage to the synthetic components during unloading and transporting activities. During shipment the synthetic membrane will be protected from abrasions or other damage with a suitable covering material.

As a minimum each roll or pallet of membrane material shall be clearly marked with the following:

- Name of manufacturer.
- Product type.
- Product thickness.
- Manufacturing batch code.
- Date of manufacture.
- Length and width of section.
- Panel number or placement location according to layout pattern.
- Direction for unrolling or unfolding the liner.

Each roll of drainage net and filter fabric shall be clearly marked with the following:

- Name of manufacturer.
- Product Type.
During unloading CQA Officer or his designee will check the actual number of rolls or pallets of material against the invoices or bills of lading. CQA Officer shall initial the invoices or bills of lading when satisfied as to their accuracy. Contractor shall be responsible for providing equipment suitable for unloading and transporting the membrane material to the designated storage areas.

Prior to storing the synthetic materials, each roll or pallet will be inspected for damage. At a minimum, the following items will be evaluated:

- Tears from handling, equipment or poor packaging.
- Punctures.
- Crumpling or tearing.
- Binding together of adjacent membrane layers due to excess heat.
- Warping or deformation caused by excessive heat.
- Any damage due to exposure or temperature extremes.

Upon arrival at the site, CQA Officer and Contractor shall conduct a surface observation of all rolls for defects and damage. This inspection shall be conducted without unrolling rolls unless defects or damages are found or suspected. If damage to a crate or roll cover is found, careful examination of the underlying material by CQA inspection personnel is required. If damage is found, CQA inspection personnel will carefully examine the entire shipment for damage.

2.2.5 Membrane Storage

Engineer shall make every effort to provide storage space in a location (or several locations) such that onsite transportation and handling are minimized. Storage areas, however, are very limited onsite due to landfill operations and construction activities. The Contractor shall coordinate with the Engineer to secure storage areas. Wherever possible, storage spaces shall be located at points such that they are easily accessed from the main roads at the landfill site. Storage space
should be adjacent to the area to be capped, if at all possible, and be protected against theft, vandalism, and passage of vehicles. All synthetic membrane shall be covered with plastic and placed on plastic while being stored in order to minimize exposure to dust, heavy winds, temperature extremes, and UV light.

2.2.6 Field Panel Identification

A field panel is the unit area of synthetic membrane which is to be seamed in the field; i.e., a field panel is a roll or a portion of roll cut in the field.

At the time of installation, the Contractor shall give each field panel an "identification code" (number or letter-number) consistent with the layout plan. The field panel identification code shall be as simple and logical as possible, and must be approved by the CQA Officer. All field panels and their identification codes shall be clearly marked on the drawings to document conformance or changes from the layout plan.

2.2.7 Quality Control Manuals

Thirty days prior to delivery of liner material to the site, the Contractor shall submit to the Engineer a quality control manual from the liner manufacturer and the lining Contractor. The quality control manuals shall include the manufacturer's and installer's quality control procedures, tests, inspection personnel, and documentation.

2.3 PRECONSTRUCTION INSPECTIONS FOR THE GAS COLLECTION SYSTEM

2.3.1 Gas Collection Material

The material used for construction of the gas collection system shall be of the quality defined by Section 9.00 of the specifications.

Prior to gas collection system installation, the CQA officer shall record the properties of the material supplied and their origin and verify that the properties of the gas collection material supplied meet all properties required in the plans and specifications.
2.3.2 **Transportation and Handling**

Transportation of the materials for the gas collection system will be performed by the Contractor or other party. During shipment, the material will be protected from any sharp objects or other damaging conditions by using a suitable covering material.

When off-loading material, the Contractor shall ensure that it is not damaged by use of any handling equipment. The Contractor shall be responsible for providing the equipment for unloading and transporting the material.

All material invoices or bills of lading shall be checked and initialed by the CQA officer or his designee upon his satisfaction of their accuracy.

Prior to storage, the CQA Officer or his designee shall inspect gas collection system materials for the following items.
- Cuts or gouges from handling equipment or poor packaging.
- Curvature or deterioration due to thermal expansion or sunlight.

2.3.3 **Gas Collection Material Storage**

Engineer shall make every effort to provide storage space in a location (or several locations such that onsite transportation and handling are minimized. Storage spaces shall be located at points such that they are easily accessed from the main roads. Storage shall be such that materials are protected from damage, theft, harmful weather effects, or vandalism.

2.4 **PRECONSTRUCTION INSPECTIONS FOR THE GAS CONDENSATE COLLECTION SYSTEM**

2.4.1 **Gas Condensate Collection Material**

All gas condensate collection system materials will be visually inspected for conformance to the plans and specifications. To achieve this, CQA Officer or his designee shall verify and record the following:
Observations and measurements that the materials delivered conform to the requirements of Sections 10.03 and 10.04 of the specifications.

Observations and tests to verify that the embedment materials conform to Sections 10.04(A) and of the specifications.

Properties of the materials supplied and their origin.

2.4.2 Transportation and Handling

Transportation of the materials for the gas condensate collection system will be performed by the Contractor or other party. During shipment, the material will be protected from any sharp objects or other damaging conditions by using a suitable covering material.

When off-loading material, the Contractor shall use handling equipment that will not damage the material. The Contractor shall be responsible for providing the equipment for unloading and transporting the material.

All material invoices or bills of lading shall be checked and initialed by the CQA officer or his designee upon his satisfaction of their accuracy.

Prior to storage, the CQA Officer or his designee shall inspect gas condensate collection system materials for the following items:

- Cuts or gouges from handling equipment or poor packaging.
- Curvature or deterioration due to thermal expansion or sunlight.

2.4.3 Gas Condensate Collection Material Storage

Engineer shall make every effort to provide storage space in a location, or several locations, such that onsite transportation and handling of gas condensate collection material is minimized. Storage spaces shall be located at points such that they are easily accessed from the main roads. Storage shall be such that materials are protected from damage, theft, harmful weather effects, or vandalism.
3.0 CONSTRUCTION INSPECTIONS

This section describes the inspection activities required to verify proper construction of the following: (1) synthetic and soil components; (2) gas collection system; and (3) gas condensate collection system.

3.1 INSTALLATION OF SYNTHETIC AND SOIL COMPONENTS

3.1.1 Soil Bedding

Synthetic membrane shall not be placed on soil bedding which has not been previously inspected and accepted by the CQA officer. The following construction activities and inspections shall be conducted to verify that the subgrade and overlying bedding soil conform to Sections 6.08 and 6.09 of the specifications.

The following procedures shall be followed when placing soil bedding:

- Bedding soil shall be placed atop the existing subgrade which is exposed after excavation of overburden material and after proofrolling has been accomplished and any soft or yielding areas have been repaired. Proofrolling shall consist of slowly driving a smooth drum vibrating roller (Dynapac CA25B or equal) across the surface, making sufficient passes to fully cover the surface. Proofrolling shall be accomplished to yield a firm and nonyielding surface. Any soft or yielding areas disclosed by proofrolling shall be excavated and replaced in accordance with Section 6.08 of the specifications. Following placement of each lift of soil, the repaired area shall then be re-proofrolled to verify a firm and nonyielding surface.

- Upon the CQA officer's approval of the subgrade, the 12-inch bedding layer shall be placed over the firm surface. The bedding layer shall be placed in two lifts, approximately six inches in compacted thickness. The lift thickness shall be measured by the CQA officer by probing with a marked steel rod.
down to the original surface. Hand probing of the lift depth shall be accomplished on at least a 50-foot grid spacing across the layer.

- The upper 6 inches of the bedding layer shall be free of individual rocks or soil clods larger than 3/4-inch in diameter. The gradation of the upper 6 inches shall be verified by visual inspection of the surface, and by performing grain size distribution analyses (ASTM:D 422, excluding hydrometer analysis). Gradation shall be measured at least once for every 62,500 square feet across the lift. The oversized rocks shall be removed by the Contractor or the deficient soil removed within the area identified by the CQA officer. Deficient soil shall be replaced with a soil meeting the required specifications, Section 6.09.

- The entire area shall be proofrolled using a smooth drum vibratory roller (Dynapac CA-25B or equal) to establish a firm and nonyielding surface. The roller shall be driven at slow speeds across the surface, making sufficient passes for the tracks to completely cover the ground surface. Proofrolling shall be visually inspected across the entire area by the CQA officer. Any soft or yielding areas disclosed by proofrolling shall be removed and replaced in accordance with Section 6.09 of the specifications.

- Following installation, the surface slope of this layer shall be surveyed by the City to ensure that the design slope is achieved. The Engineer shall approve the slope based on his verification that the slope is of the line and grade shown on the design drawings (Sheets 4 and 5).

3.1.2 Sand Bedding

A 12-inch layer of sand bedding shall be placed between the two synthetic membrane layers. The sand shall be placed in a single, 12-inch lift, so as to protect the underlying synthetic membrane. The loose lift
thickness shall be measured by the CQA officer by probing with ruler down to the underlying synthetic membrane layer. Hand probing of the lift depth shall be accomplished on at least a 50-foot grid spacing across the layer.

The sand shall be of a quality as defined in Section 6.10 of the specifications. The gradation of the sand shall be measured by grain size analysis (ASTM:D 422, excluding hydrometer analysis). Gradation shall be measured at least once for every 62,500 square feet across each lift.

The CQA Officer or inspection personnel shall closely monitor the placement of the sand layer to detect any visual damage caused by the construction equipment on the underlying membrane. Any damage detected shall be repaired by the Contractor. If the CQA Officer deems it to be necessary, the surface slope of the installed bedding layer shall be surveyed by the City, to confirm that the design slope is achieved.

3.1.3 Synthetic Membrane Construction Inspections
3.1.3.1 Field Panel Placement. Field panels shall be installed at the locations indicated in the layout plan or as modified by the Contractor and CQA personnel based upon existing site conditions. Any changes in the panel layout will be brought to the attention of EPA, Ecology and TPCHD. Field panels shall be installed according to Section 8.06(A)(3) of the specifications. Contractor shall verify the following, and inform CQA officer if the conditions are not fulfilled:

- Proper liner placement.
- The synthetic membrane is not damaged by equipment, handling, trafficking, excessive heat, leakage of hydrocarbon products, or other means.
- The prepared surface underlying the synthetic membrane has not deteriorated since previous acceptance and is acceptable immediately prior to synthetic membrane or membrane/geonet composite placement.
o All personnel while working on the synthetic membrane do not smoke, wear shoes other than soft-soled, or engage in other activities which could damage the synthetic membrane.

o The method used to unroll the panels does not cause scratches or crimps in the synthetic membrane and does not damage the supporting soil.

o The method used to place the panels minimizes wrinkles (especially differential wrinkles between adjacent panels).

o Adequate temporary loading and/or anchoring (e.g., sand bags, tires), not likely to damage the synthetic membrane has been placed to prevent uplift by wind. In case of high winds, continuous loading, e.g., by adjacent sand bags or soil, is recommended along edges of panels to minimize risk of wind flow under the panels.

o Direct contact with the synthetic membrane is minimized; i.e., the synthetic membrane is protected by geotextiles or sand bedding, extra synthetic membrane, or other suitable materials in areas where any traffic may be expected. Sudden braking or sharp turns in vehicles will not be permitted.

CQA inspection personnel will perform inspection activities and provide documentation for the following:

o Checking delivery tickets and quality control documentation to verify that the membrane rolls received onsite meet the project specifications. Identifying labels from each roll will be taken and saved for future reference. Further, the position of each roll of material will be noted on a final installation drawing. This document can be used as future reference should problems occur. As an additional check to verify the quality of the product being delivered, a sample will be taken from the roll, "fingerprinted," and that fingerprint will be compared with the fingerprint of the product originally contracted for. If these fingerprints are different, the material will be rejected.

o That the field panel placement plans were followed.
o That the weather conditions (i.e., temperature, humidity, precipitation, and wind) are acceptable for membrane placement and seaming. Refer to Specifications, Section 8.06(A)(5), for detailed information.

o That placement in the anchor trenches is as specified in the design drawings.

o That all designed membrane connections are installed as specified.

o That the required overlaps of adjacent synthetic membrane sheets are achieved, that proper temporary anchorage is used, that specified temporary and final seaming materials/techniques are used, and that the synthetic membrane is placed in a relaxed (nonstressed) state.

As each synthetic membrane panel is placed, it will be visually inspected for tears, punctures, and thin spots. To accomplish this, the panels will be traversed by CQA inspection personnel in such a way that the entire surface is inspected.

CQA Officer shall inspect each panel after placement and prior to seaming for damage. CQA Officer will discuss areas of concern with the Contractor. Based upon this discussion, the Contractor shall advise the CQA Officer which panels or portions of panels should be repaired or accepted. The CQA Officer shall then mark damaged panels or portions of damaged panels which have been rejected and record their removal from the work area. Repairs shall be made as required by Section 8.06(A)(5) of the specifications.

If the weather becomes unacceptable for installation of the membrane, the CQA Officer will stop the synthetic membrane installation until conditions again become favorable, thus minimizing the potential for unacceptable installation. Unacceptable weather is defined in Section 8.06(A)(5) of the specifications.

3.1.3.2 Seaming. All seaming shall be performed in accordance with Section 8.06(A)(5) of the specifications. Before commencing installation Contractor shall submit to the CQA Officer the proposed panel layout.
drawings. The proposed panel layout drawings will be tentative and may be modified with Engineers prior approval. A seam number system compatible with the panel number system shall be agreed to at the Preconstruction Meeting.

Seams should be oriented parallel to the line of maximum slope, i.e., oriented along, not across, the slope. In corners and odd-shaped geometric locations, the number of seams should be minimized. No horizontal seam should be less than 5 feet from the toe of the slope or areas of potential stress concentrations unless otherwise authorized.

During the seaming process the Contractor shall:

- Perform all hot wedge seaming operations in accordance with Section 8.06(A)(5) of the specifications.
- Log apparatus temperatures, ambient temperatures, and synthetic membrane surface temperatures at the intervals specified in Section 8.06(A)(5) of the specifications.
- Overlap the membrane as wrinkle-free as possible about 2 to 4 inches over the adjoining membrane.
- Place weights (sandbags or tire carcasses) at both ends of a membrane panel and in the center of the seam to prevent panel movement. The weights should be removed and repositioned as seaming progresses.
- Place a smooth insulating plate or fabric beneath the hot welding apparatus after usage.
- Protect the synthetic membrane from damage in areas where trafficking is expected.

Inspection activities that will be performed and documented by CQA inspection personnel include the following:

- Verify that the area to be seamed is free from dirt, dust, and moisture.
- Verify that seaming materials and equipment are as specified.
- Verify that seaming takes place on a firm foundation.
- Observe weather conditions to ensure that they meet with those required in the specifications.
o Obtain measurements of temperature, pressure, and speed of seaming to ensure that they are in accordance with the manufacturer's recommendations, based on ambient conditions. Gages and dials should be checked and recorded periodically during seaming operations.

o Verify that the membrane is not damaged by any activities of personnel during the seaming process.

o Record time between seaming and reporting of seam testing results to verify that it is as specified. The results of seam tests shall be reported to the CQA Officer within 24 hours of the time the seam was made.

o Test seams. Each seamer apparatus in use shall make one test seam at the start of each shift and at each subsequent four hour interval. The test seam shall be peal and shear tested.

As field seams are completed the following tests and operations will be performed by Contractor:

o Nondestructive tests will be performed on 100 percent of all synthetic membrane seams made in the field using an appropriate test method from Section 8.06(A)(7) of the specifications. Failed seams shall be recorded as to location and seaming crew. The data shall be reviewed for possible patterns. Repairs shall be made in accordance with approved techniques and retested to verify their integrity.

o Spark tests will not be permitted.

o Destructive seam tests will be performed along every 400 feet of seam. Peel tests will be conducted in accordance with ASTM D413-82. Shear tests will be conducted in accordance with ASTM D3083-76. These tests must also be conducted at seaming start up, after personnel shift change, and prior to utilizing new equipment. Any additional test locations that may be necessary shall be conducted at CQA Officer's discretion. These locations may be based on suspicion of seam contamination by dirt or moisture, change in seaming materials, increase in number of
failed destructive tests, or other causes which could result in defective seams. Peel and shear tests will also be performed by an independent testing lab at the expense of the City for result verification.

- Destructive seam samples must be large enough for: (1) the installer to test in the laboratory; (2) an independent laboratory evaluation; and (3) to be archived by the Owner. Proper documentation shall be recorded and submitted with each seam sample as to location, time, crew, and seaming techniques.

- Laboratory testing should be performed in accordance with design specifications with predetermined pass/fail values.

- Seams failing the destructive tests will be retested at least 10 feet from the failed location. If the seam passes at the retested locations the seam between these points will be reconstructed by Contractor. If the seam fails, the process will be repeated until all defective seams are repaired.

- Repairs will be performed as soon as possible and in accordance with the plans and specifications. Each repair will be performed with extrusion welding techniques and nondestructively tested. Documentation of all repairs, including location, type, and repair method used will be made. Boot seams shall also be performed using extraction welding techniques. CQA Officer shall ensure that the following has been performed during all extrusion extrusion welding:

  - Apparatus temperatures, extrudate temperatures, ambient temperatures, and synthetic membrane surface temperatures are logged.

  - Verify that the barrel of the extrusion welder is purged of all heat-degraded extrudate prior to beginning a seam.

  - Ensure that other details as described for hot wedge welding have been accomplished.

Welding shall not take place during rain, in the presence of excessive moisture (dew or fog), in an area of ponded water, in the
presence of strong winds (unless wind barriers are provided), or when temperatures are below the specification values (Section 8.06(A)(5)).

3.1.3.3 Connection Between Public Receiving Facility and Stage 1 - North Membranes. Excavation to expose the Public Receiving Facility anchor trench shall be performed in accordance with Section 6.17 of the specifications. The Public Receiving Facility anchor trench currently is staked and covered with plywood. Any damage to the Public Receiving Facility membrane shall be promptly repaired by the Contractor. The connection welds shall be made in accordance with the seaming requirements in Section 3.1.3.2 this plan and Section 8.06(A)(5) of the specifications.

3.1.3.4 Anchor Trench System. The anchor trench shall be excavated by the Contractor or his subcontractor, according to the plans provided before placing the synthetic membrane.

CQA Officer shall perform inspection activities to verify the following:

- That anchor trenches are installed as shown on the Drawings.
- Proper location of anchor trench.
- Anchor trench corners are slightly rounded so that sharp bends in the synthetic membrane material are avoided.
- No loose soil remains under the synthetic membrane in the anchor trench.
- The HDPE membrane is installed over the base of the anchor trench for development of adequate anchorage and that soil must be installed on top of the synthetic membrane.
- That anchor trench systems are complete.

3.1.3.5 Synthetic Membrane Penetrations

Liner penetrations shall be verified for appropriate clamp and caulking use, for appropriate material, and for good seaming.

CQA inspection personnel must verify that the seals around such penetrations are of sufficient strength and are impermeable to infiltrating precipitation. Specific inspections to be made on all seals include:

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o Observations that the materials (i.e., pipe boots and sealing compounds) are as specified.

o Observations that the sealing systems (i.e., pipe boots) are installed as specified (are leak free) and in the proper locations.

o Observations that equipment used for construction of the penetration does not damage the synthetic membrane.

o Observations and visual inspections to verify that all seals are complete and there are no gaps present.

3.1.3.6 **Drainage Ditches**. The drainage ditches shall be excavated by the Contractor or his Subcontractor, according to the detailed drawings provided. Drainage ditches shall be excavated prior to synthetic membrane placement and inspected by the CQA Officer to verify the following:

- The dimensions of drainage ditch are as specified on the detailed drawings.
- The grade of the ditch floor is as specified.
- That the ditch does not intersect any well heads, utility poles, or fences.

After installation of the cap, the drainage ditches shall be inspected by the CQA Officer to verify proper construction.

3.1.4 **Drainage Net Construction Inspections**

Prior to installation, drainage nets shall be checked by CQA inspection personnel to verify that these materials conform to Section 8.04(B) of the specifications and have not been damaged in transport or storage. All inspection and testing procedures for the synthetic membrane shall be completed and any deficiencies corrected prior to placement of the drainage net.

CQA inspection personnel shall perform the following inspections during installation:

- Verify that drainage net is adequately secured with sandbags.
- Inspect drainage net for wrinkles and folds.
- Verify that the drainage net is not damaged in any way during installation.
- Verify that the drainage net is placed according to the placement plan.
- Observations to ensure that weather conditions are appropriate for drainage net placement. Exposure to rain or sunlight during and after installation shall be minimized by expedient placement of cover material.

3.1.5 Geotextile Fabric Construction Inspections

Prior to installation, the geotextile fabrics should be checked by CQA personnel to verify that these materials conform to Section 8.04(C) of the specifications and have not been damaged in transport or storage. All inspection and testing procedures for the drainage net shall be completed and any deficiencies corrected prior to placement of the geotextile.

CQA inspection personnel shall perform the following inspections during installation:
- Inspect geotextile fabric for wrinkles and folds.
- Verify that the geotextile fabric is not damaged in any way during installation.
- Verify that the geotextile is placed according to the placement plan.
- Verify that the surface on which the geotextile is to be placed is at the proper slope and grade.
- That weather conditions are appropriate for geotextile placement and that exposure to rain or direct sunlight during and after installation is minimized by expedient placement of protective cover material.

3.1.6 Cover Material

Upon completion of the geotextile fabric installation and before placement of cover material, the composite geosynthetic cover system will undergo a thorough visual inspection for damage. If damaged areas are
located they will be marked, repaired, and tested in accordance with Section 8.06(A)(3) and 8.06(A)(5) of the specifications. Cover material soil shall be placed over the geotextile fabric as soon as possible after the geosynthetic cover installation is completed and the work has been accepted by the CQA Officer.

As a minimum, the following inspection activities will be conducted:

- Observations and tests as outlined in Section 6.11 and 6.16 of the specifications to verify that the cover material meets the specified requirements.
- Visual inspection to verify that the cover material is free from objects which could damage the geosynthetic cover system.
- Observations that the equipment placing the cover material does not operate directly on the synthetic membrane and does not damage the membrane. The initial lift of cover soil shall be a minimum of 12 inches in order to protect the geomembrane.
- Observations that the cover material is placed so as to minimize wrinkles in the geosynthetic cover system.
- Measurements to verify that the required thickness of protective cover material is installed. Measurements can be made with a marked staff; however, CQA inspection personnel must not damage the underlying synthetic layers in any way.
- Verify that the cover material is at the proper slope and grade.

3.1.7 **Topsoil**

Six inches of loamy topsoil shall be placed over the protective cover soil. This layer functions to protect the underlying layers from mechanical and/or frost damage, and (in conjunction with a vegetative cover) to protect against erosion. As a minimum, the following inspection activities will be conducted:

- Observations and tests as outlined in Section 14.03(A) of the specifications to verify that the topsoil meets the specified requirements.
- Verifying that no deleterious or other unspecified materials are included in the topsoil.
- Verify that the placement procedure does not overly compact the soil.
- Observations and measurements to verify that the soil is of the specified thickness and proper slope.
- Verify that construction equipment does not damage any protrusions on the ground surface.

### 3.1.8 Topsoil Seeding

Seeding shall be applied to the topsoil cover in accordance with Section 14.00 of the specifications upon verification of the following by the CQA officer or inspection personnel:

- That the slope of the topsoil cover meets the design requirements.
- That the application rate of soil additives is as specified in Section 14.03 of the Specifications.
- That all vents and standpipes or any other penetrations through the cover have not been damaged by the application process.

CQA inspection personnel shall allow Contractor seeding only during the designated period and when the weather conditions are favorable. Seeding shall not take place during high wind or rain, or if the soil is frozen.

### 3.2 GAS COLLECTION SYSTEM CONSTRUCTION INSPECTIONS

#### 3.2.1 Gas Collection Pipe Installation

The gas collection pipes shall be installed according to the pipe manufacturer's recommendations and the contract documents. Inspections will be performed to verify the following:

- That the pipe material and size conforms to Section 9.04, 9.05 and 9.06 of the specifications.
o That the pipes are placed at the specific locations and in the specified configurations.

o That the pipe is installed in accordance with Sections 9.05(D) and 9.06(E) of the specifications.

o That no obstructions or debris are left in the pipe prior to connection.

o That the pipe is cut, cleaned, primed, and joined in accordance with the manufacturers recommendations, the Drawings, and Sections 9.05(D), and 9.06(E) of the specifications.

3.2.2 Pipe Support Structures

In areas where it is necessary to raise the gas collection pipes above the ground in order to maintain grade, support structures shall be used to brace the gas collection pipe.

The CQA Officer shall verify that the pipe is placed on the support structure in such a way that no undue stresses are induced upon it.

3.3 GAS CONDENSATE COLLECTION SYSTEM CONSTRUCTION INSPECTIONS

3.3.1 Trenching

During the trenching process, inspections shall be made to confirm that the location, depth, and width of the trenches conform to the plans and the Standard specifications.

3.3.2 Gas Condensate Collection Pipe Installation

The gas condensate collection pipes will be installed according to the pipe manufacturer's recommendations and the contract documents. Inspections shall be performed to verify the following:

o That the pipe size and material conforms to Section 10.03(A) of the specifications.

o That the pipes are placed at the specified locations and in the specified configurations.
That the pipe is installed in accordance with Section 10.03(B) and 10.04(B) of the specifications.

That no obstructions or debris are left in the pipe prior to connection.

That the pipe is cut, cleaned, primed, and joined in accordance with the manufacturer's recommendations, the Drawings, and Sections 10.03(B) and 10.04(B) of the specifications.

3.3.3 Backfill Placement

Visual inspections will be performed of the gas condensate collection system prior to final backfill to verify that the condensate collection system was installed as designed and specified. To avoid damage to the condensate collection piping, the following inspections will be made:

- The clearance between the pipe and the trench walls will be checked to verify adequacy.
- The backfill material will be inspected for conformity to Sections 10.04(A) of the specifications.
- The backfill placement will be observed to verify that placement procedures do not damage the pipe, change its configuration, or cause separation of pipe joints.

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4.0 POSTCONSTRUCTION INSPECTIONS

4.1 SYNTHETIC CAP COMPONENTS

CQA inspection personnel will make a visual check of the completed cover for compliance with the specified design. Postconstruction inspection of the synthetic cover system will include observations of slopes, protective cover thickness, any depressions, and trench backfill areas. Any deficiencies will be noted and corrected. Inspection of the cover will continue until a vegetation cover has been established. Grass and ground cover will be evaluated once a month by a qualified specialist during the first four to six months following germination, with corrective measures being taken as required. Inspections of the cover will continue as part of the landfill cap maintenance program.

4.2 GAS COLLECTION SYSTEM

A visual inspection will be performed by the CQA officer to verify that all requirements have been met for the gas collection system installation upon completion of construction activities. Proper operation of the gas collection system shall also be verified by the CQA officer.

4.3 GAS CONDENSATE COLLECTION SYSTEM

A visual inspection will be performed of the backfilled trenches in which the condensate collection system was installed to verify that the desired grades are achieved, that no pipe is exposed, and that settlement has not occurred. The CQA officer shall verify that the gas condensate collection system is properly functioning.
5.0 SAMPLING STRATEGY

The quality of a material or construction process is estimated from the observed or measured quality of a representative sample. Guidance on judgmental sampling and testing to be conducted during installation to the Tacoma Landfill cap is included in this section.

5.1 SAMPLING BASIS

Sampling methods and testing frequency will be based on judgmental sampling rather than a probabilistic basis. Judgmental sampling refers to a sampling strategy where decisions concerning sample size, selection scheme and/or locations are based on other than probabilistic considerations. The objective is to select typical sample elements that represent a whole process or to identify zones of suspected poor quality. Selection of the sampling location(s) will be the responsibility of the CQA Officer or his designated alternate.

Two considerations need to be addressed during the selection of sampling locations. First, the CQA Officer must select sample locations that are representative of the quality of the work as a whole, so that the inspection results will accurately reflect the as-built conditions. In addition, samples should be located in regions of questionable construction quality to identify work that does not meet design specifications. Examples of sampling strategies, particularly for sampling and testing of materials, can be found in standard specifications, such as AASHTO (1983) and ASTM (1985b).

The following items will be summarized into site-specific checklists and data sheets so that details are not overlooked.

- Decisions made regarding approval of material or of work, and/or corrective actions to be taken in instances of substandard quality.
o Unique identifying sheet numbers for inspection data sheets and/or problem reporting and corrective measures reports used to substantiate the decisions described in the preceding item.

o Signature of the CQA Officer or the designated alternate.

Testing frequency for the judgmental sampling scheme is set to produce a fixed proportion of the population (such as 10 percent) or to yield a prespecified sample size per specified unit of time, distance, area, or volume (e.g., taking samples of liner seams on a per linear foot basis). The sample proportions or sizes included in the specifications have been established on the basis of judgment and experience from similar construction projects. Sampling schemes are used to specify minimum sampling frequencies. These frequencies will be increased to identify potential problem areas where additional tests should be made. Samples will be located where CQA inspection personnel have reason to doubt the quality of materials or workmanship.

5.2 SELECTION OF SAMPLE SIZE

The judgmental method depends primarily on the intuition of the specifier, based on engineering and materials evaluation experience. For example, the sample size for a destructive seam test shall be as required by the testing laboratory, but in no case shall be less than 1 ft x 4 ft. Sample size for sieve analysis of soil shall be of a size to sufficiently represent the soil as a single unit.

5.3 CORRECTIVE MEASURES

When material or work is rejected because observations or tests indicate that it does not meet the design specifications, corrective measures will be implemented. For material subject to 100 percent inspection, substandard material will be rejected. When workmanship subject to 100 percent inspection is rejected (e.g., synthetic membrane seams), it will be redone until it meets specifications. For material or workmanship subject to judgmental methods, which are in question because of CQA inspection personnel observations or test results,
additional testing of the component is necessary prior to rejecting the block of work and specifying corrective measures. This additional testing can help determine the cause of the problem so that it can be avoided in the future. It also will define the extent of the problem so that adequate corrective measures can be initiated. Regardless of the means of correcting the deficiency, CQA inspection personnel will inspect the correction to ensure that the specified design has been met.
6.0 DOCUMENTATION

The ultimate value of the CQA Plan depends to a large extent on recognizing the construction activities that should be inspected and providing personnel to complete the responsibilities as identified in this CQA Plan. The CQA Officer will document, through required descriptive remarks, data sheets, and signed checklists, that the inspection activities have been accomplished.

6.1 DAILY RECORD KEEPING

Standard daily reporting procedures include preparation of a summary report with supporting inspection data sheets and, when appropriate, problem identification and corrective measures reports.

6.1.1 Daily Summary Report

A summary report will be prepared daily by the CQA Officer or designated alternate. This report will provide the chronologic framework for identifying and recording all other reports. At a minimum, the summary reports will include the following information:

- Unique identifying sheet number for cross-referencing and document control.
- Date, project name, location, and other identification.
- Data on weather conditions.
- Reports on any meetings held and their results.
- Unit processes and locations of construction under way during the timeframe of the daily summary report.
- Equipment and personnel being used in each unit process, including subcontractors.
- Descriptions of areas or units of work being inspected and documented.
- Description of offsite materials received, including any quality verifications (vendor certification) documentation.
o Calibration, or recalibrations of test equipment, including actions taken as a result of recalibration.

o Unique identifying sheet numbers of inspection data sheets and/or problem reporting and corrective measures reports used to substantiate decisions and/or corrective actions.

o Signature of the CQA officer.

6.1.2 Inspection Data Sheets

All observations, field tests, and laboratory tests will be recorded on an inspection data sheet. Required data to be addressed for most of the standardized test methods are included in the pertinent AASHTO (1983) and ASTM (1985a) Standards.

Because of their highly specific nature, no standard format to record observation is given for data sheets. Recorded observations may take the form of notes, charts, sketches, photographs, or any combination of these. Where possible, a checklist will be developed and used to ensure that no pertinent factors of a specific observation are overlooked. At a minimum, the inspection data sheets will include the following information:

- Unique identifying sheet number for cross-referencing and document control.
- Description or title of the inspection activity.
- Location of the inspection activity or location from which the sample increment was obtained.
- Type of inspection activity procedure used (referenced to standard method when appropriate).
- Recorded observation or test data, with all necessary calculations.
- Results of the inspection activity; comparison with specification requirements.
- Personnel involved in the inspection activity.
- Signature of the CQA Officer or his designated alternate.
6.1.3 Problem Identification and Corrective Measures Reports

Problem identification and corrective measures reports will be cross-referenced to the specific inspection data sheets which identified the problem. At a minimum, the reports will include the following information:

- Unique identifying sheet number for cross-referencing and document control.
- Detailed description of the problem.
- Location of the problem.
- Probable cause of the problem.
- How and when the problem was located (reference to inspection data sheets).
- Estimate of how long the problem or incorrect procedure has existed.
- Specific method used to correct the problem.
- Documentation of correction.
- Final results.
- Suggested methods to prevent similar problems.
- Signature of the CQA Officer or his designated alternate.

In some cases, not all of the above information will be available or obtainable. However, when available, efforts to document problems could help to avoid similar problems in the future.

Upon receiving the CQA Officer's written concurrence, copies of the report will be sent to the Owner for comments and acceptance. These reports will not be submitted to the permitting agency at that time unless they have been specifically requested and the request has been approved by the Owner. However, a summary of all data sheets and reports may be required by the permitting agency upon completion of construction.

6.2 PHOTOGRAPHIC REPORTING DATA SHEETS

Photographic reporting data sheets will be cross-referenced or appended to inspection data sheets and/or problem identification and corrective measures reports. At a minimum, photographic reporting data sheets will include the following information:
A unique identifying number on data sheets and photographs for cross-referencing and document control.

The date, time, and location where the photograph was taken and weather conditions.

The size, scale, and orientation of the subject matter photographed.

When possible a recognizable object (i.e., a person, shovel, etc.) will be included in the photo to give scale and perspective.

Location and description of the work.

The purpose of the photograph.

Signature of the photographer and the CQA Officer or his designated alternate.

These photographs will serve as a pictorial record of work progress, problems, and corrective measures. They will be kept in a permanent protective file in the order in which they were taken. The file will contain color prints; negatives will be stored in order in a separate file.

6.3 ACCEPTANCE OF COMPLETED COMPONENTS

All daily inspection summary reports, inspection data sheets, and problem identification and corrective measures reports will be reviewed by the CQA Officer. The documentation will be evaluated and analyzed for internal consistency and for consistency with similar work. Timely review of these documents will permit errors, inconsistencies, and other problems to be detected and corrected as they occur, when corrective measures are easiest to implement.

The above information will be assembled and summarized into periodic Acceptance Reports. The reports will indicate that the materials and construction processes comply with the specified design. These reports will be included in project records, which will be kept on file with Owner and Consultant, and, if requested, submitted to Washington Department of Ecology (Ecology), EPA, and TPCHD.
6.4 FINAL DOCUMENTATION

At the completion of the project, Owner will submit a final report to the regulatory agencies. This report will include all of the daily inspection summary reports, inspection data sheets, problem identification and corrective measures reports, photographic reporting data sheets, acceptance reports, deviations from design and material specifications (with justifying documentation), and as built drawings. This document will be certified correct and included as part of the CQA Plan documentation.

6.4.1 Responsibility and Authority

The final documentation will reemphasize that areas of responsibility and lines of authority were clearly defined, understood, and accepted by all parties involved in the project. Signatures of Owner, CQA Officer, and Contractor will be included as confirmation that each party understood and accepted the areas of responsibility, lines of authority, and performed their function(s) in accordance with the CQA Plan.

6.4.2 Relationship to Oversight Agencies

Final documentation submitted to the regulatory agencies as part of the CQA Plan documentation does not sanction the CQA Plan as a guarantee of facility construction and performance. Rather, the primary purpose of the final documentation is to improve confidence in the constructed facility through written evidence that the CQA Plan was implemented as proposed and that the construction proceeded in accordance with design criteria, plans, and specifications.

6.5 DOCUMENT CONTROL

The CQA Plan and all CQA documentation will be maintained under a document control procedure. This indexing procedure will provide for convenient replacement of pages in the CQA Plan, thereby not requiring a revision to the entire document, and will identify the revision status of the CQA documents. The indexing procedure will also enable the CQA
documents to be organized in terms of their relationship to each other, the CQA Plan, and location of the materials and/or workmanship that they represent.

For CQA documentation, a control scheme will be used to organize and index all CQA documents. This scheme will be designed to allow easy access to all CQA documents and will enable a reviewer to identify and retrieve original data sheets for any completed block of work or facility component. This will require a unique identifying number of each CQA record and an indexing scheme to relate summary reports to the original inspection data sheets. For example, each daily summary report will clearly identify the inspection data sheets upon which it is based. Problem identification and corrective measures reports will also identify the pertinent inspection data sheets that identified substandard materials or workmanship, and inspection data sheets that document construction quality after implementation of the corrective measures.

6.6 STORAGE OF RECORDS

During the construction of the landfill cap, the CQA Officer will be responsible for all facility CQA documents. This includes the CQA Officer's copy of the design criteria, plans and specifications, the CQA Plan, and the originals of all the data sheets and reports. Duplicate records should be maintained at another location to avoid loss of this information if the originals are destroyed.

Once facility construction is complete, the document originals will be stored by Owner in a manner that will allow for easy access while still protecting them from any damage. All documentation will be maintained through the operating and post-closure monitoring periods of the facility.
1.00 GENERAL SPECIFICATIONS

1.01 General

The following special provisions are to be used in conjunction with the "1988 Standard Specifications for Road, Bridge and Municipal Construction" and "Standard Plans for Road Bridge & Municipal Construction" as prepared by the Washington State Department of Transportation (WSDOT) and the Washington State Chapter of American Public Works Association (APWA); "1988 APWA Amendments to Division One," and the "1988 City of Tacoma Amendment." The APWA and City of Tacoma Amendments are available at no charge at the Tacoma Municipal Building, Construction Division. State Standard Specifications are available through WSDOT, by mail at Pre-Contract Section, Mail Stop KF01, Olympia, WA 98504, or by phoning (206) 753-7252.

The Specifications included or referenced herein shall supersede any conflicting specifications in the following order of precedence with the Special Provisions superseding all others and so forth:

1. Construction Quality Assurance Plan
2. Special Provisions
4. 1988 City of Tacoma Amendments and Standard Plans
5. 1988 APWA Amendments to Division One
6. State Amendments to the Standard Specifications (applicable amendments are included in these contract documents)

1.02 Scope of Work

The work to be performed under these contract documents consists of installing a cap over the Stage 1 North area of the Tacoma Landfill. The work shall include earthwork, and the installation of two layers of high-density polyethylene cap, modifications to the landfill gas collection system, installation of a condensate collection system, and access road construction.
1.03 Date of Commencement and Completion

A. Project Commencement

Time is of the essence of the contract; therefore, work shall commence within ten (10) calendar days of the Contractor's receipt of the written "Notice to Proceed," and work shall be completed within 120 working days thereafter. If the Contractor elects to start work prior to the expiration of the ten (10) calendar days waiting period from the date of receipt of the official notice to proceed, no working days will be charged during this period.

The Contractor is hereby advised that the City of Tacoma will issue the "Notice to Proceed" immediately upon execution of the contract documents.

Following is an anticipated schedule of events:

- June 26, 1990 - Open Bids
- June 29, 1990 - Board of Contracts & Awards
- July 3, 1990 - Award by City Council
- July 18, 1990 - Issuance of Notice to Proceed
- July 30, 1990 - Commence Working Days

1.04 Working Hours

The Contractor may work only during the hours specified below unless otherwise approved by the Engineer.

7 days/week 8:00 a.m. - 6:00 p.m.

All overtime charges incurred during this project shall be the Contractor’s responsibility. Only Monday through Friday shall be counted as working days on this project. It shall be the Contractor’s option as to whether or not to work weekends.

1.05 Venue Provision

In the event that any litigation should arise concerning the construction or interpretation of any of the terms of this contract, the venue of such action or litigation shall be in the Superior Court of the State of Washington in and for the County of Pierce.
1.06 **General Release Form**

Before final payment is made on this contract, the Contractor will be required to execute a General Release to the City of Tacoma on the form set forth in these contract documents. Please forward the executed form to the Public Works Department, 747 Market Street, Room 444, Tacoma, WA 98402, Attention: Contract Desk.

1.07 **Protection of Existing Improvements**

The Contractor shall protect all buildings and all other existing improvements not provided for in the proposal or Special Provisions. The cost of all labor, equipment, and materials required for the protection or replacement of said items shall be incidental to the cost of this project.

1.08 **Coordination With Utilities**

The Contractor shall coordinate his work with all utilities and other organizations which have to adjust or revise their facilities within the project area. These include but are not limited to:

A. City of Tacoma Light Division
B. City of Tacoma Water Division
C. City of Tacoma Traffic Engineering Division
D. Washington Natural Gas Company

1.09 **Existing Utility and Facilities**

The Engineer has contacted private and public utilities and has shown on the Plans only those utilities within the project limits indicated as existing by the various utilities.

It shall be the Contractor’s responsibility to locate or have located in the field all existing underground utilities. Existing utilities shown on the drawings are not necessarily all utilities in the area and are only a guide. Exact locations must be determined in the field.

Once the utilities have been located, it shall be the Contractor’s responsibility to maintain locations throughout the duration of the contract.
If the Contractor damages a utility which has been properly located, the Contractor shall be responsible for all costs associated with the repair. Should the Contractor accidentally damage an underground facility which is incorrectly located by the utility, then the damage shall be repaired at no cost to the Contractor by the utility. The Contractor shall have no claim for additional compensation or time against this contract due to improper location of utilities. Any damages resulting from incorrectly located utilities (by said utility) shall be the responsibility of such utility.

1.10 One Call-Underground Locate

Paragraph 5 of Section 1-07.17(1) of the WSDOT/APWA Standard Specifications as amended by APWA Supplement No. 1 shall be supplemented by the following:

Paragraph five:

For notification of underground utilities in this regard, the Contractor is encouraged to utilize the "One Call System," telephone 1-800-424-5555. The following utilities are included in the "One Call System":

A. City of Tacoma
   1. City Light
   2. City Water

B. Pacific Northwest Bell

C. Washington Natural Gas

D. Puget Sound Power and Light

E. Traffic Signal/Street Light

The following shall be notified 48 hours before commencing construction:

A. City of Tacoma
   1. Fire Alarm Telephone No. 591-5722

B. TCI Cable Telephone No. 383-3961

If a sewer line or side sewer line is encountered while working within the City of Tacoma, the Contractor shall contact the City's Construction Inspector or the Construction Division at 591-5760.
1.11 **Cleanup**

All costs for labor, equipment and material to return the job site to a finished condition satisfactory to the Engineer shall be incidental to the contract unit price for "Final Cleanup, at Per Lump Sum" as listed in the proposal.

1.12 **Overhead Clearance**

It shall be the Contractor's responsibility to inspect the job site to familiarize himself with the limited overhead clearance.

1.13 **Existing Ditches and Water Courses**

If during construction it is found that any existing ditches or water courses along the project become interrupted or clogged through the Contractor's negligence, it shall be the responsibility of the Contractor to grade out the existing ditches or provide new ditches to maintain a good run-off capability.

Payment for all labor, equipment and materials required to complete the above described work shall be incidental to the contract.

1.14 **State Wage Rates**

In accordance with Section 1-07.9(1) of the "1988 Amendments to Division One of the Standard Specifications," no workman, laborer or mechanic employed in the performance of any part of this contract will be paid less than the "prevailing rate of wage" as determined by the Industrial Statistician of the Department of Labor and Industries. The schedule of the prevailing wage rates for the locality or localities where this contract will be performed is included in Part V of these Special Provisions.

1.15 **Required Documents**

A. The first paragraph of Section 1-07.95(5) of the "1988 APWA Amendments to Division One" is hereby modified by addition of the following:

"Weekly certified payrolls shall be submitted by the contractor to the engineer for the contractor and all subcontractors or agents."
B. The second sentence of the third paragraph of Section 1-07.9(5) of the "1988 APWA Amendments to Division One" is hereby revised to read as follows:

"A fee of $25.00, for contracts in excess of $2,500.00; or $12.50, for contracts of $2,500.00 or less, per each "Statement of Intent to Pay Prevailing Wages" and "Affidavit of Wages Paid" is required to accompany each form submitted to the Department of Labor and Industries."


A. General Provisions

The following Non-Federal Labor Standards Provisions, including the following provisions concerning maximum hours of work, minimum rates of pay, and overtime compensation, with respect to the categories and classifications of employees hereinafter mentioned are included in this contract pursuant to the requirements of applicable State or local laws, but the inclusions of such provisions shall not be construed to relieve the Contractor or any subcontractor from the pertinent requirements of any corresponding Federal Labor Standards Provisions of this contract. The limitations, if any, in these Non-Federal Labor Standards Provisions upon the hours per day, per week or per month which employees engaged on the work covered by this contract may be required or permitted to work thereon shall not be exceeded.

B. Payment of State Prevailing Wages - RCW Chapter 39.12

No workman, laborer or mechanic employed in the performance of any part of this contract shall be paid less than the prevailing "rate of wage" as determined by the industrial statistician of the Department of Labor and Industries. The schedule of the prevailing wage rates for the locality or localities where this contract will be performed is by reference made a part of this contract as though fully set forth herein. In the event such minimum rates of pay as determined by the Industrial Statistician pursuant to RCW 39.12 are higher than the minimum rates of pay required by or set forth in the Federal Labor Standards Provisions of this contract for corresponding classifications, the minimum rate of pay shall be deemed for the purposes of this contract to be the applicable minimum rates of pay for such classifications as determined by the State Industrial Statistician pursuant to RCW 39.12.
C. Prevailing Wages Disputes

Pursuant to RCW 39.12.060 in case any dispute arises as to what are the prevailing rates of wages for work of a similar nature and such dispute cannot be adjusted by the parties in interest including labor and management representatives, the matter shall be referred for arbitration to the Director of the Department of Labor and Industries of the State and his decision therein shall be final and conclusive and binding on all parties involved in the dispute.

D. Other Stipulations

1. The Contractor shall comply with all the provisions of the State of Washington and Ordinances of the City of Tacoma relating to the employment of labor. No laborer, workman or mechanic in the contractor's employ or in the employ of any subcontractor, if such is employed, or other person doing or contracting to do the whole or a part of the work contemplated hereunder shall be required or permitted to labor more than eight (8) hours in any one day, or forty (40) hours in any one week, except in cases of extraordinary emergency, in which event the person or persons so employed for excessive hours shall receive at least time and a half for all overtime in excess of eight (8) hours a day, and for work performed on Saturdays and on legal holidays, provided, however, that nothing herein contained shall apply to any labor performed in the manufacture or fabrication of any material manufactured or fabricated in any plant or place other than the place where the main contract is to be performed. This contract may be canceled by the Local Public Agency if the work performed is not in compliance with Chapter 10.16 of the Official Code of the City of Tacoma.

2. If the Contractor fails, neglects or refuses to make prompt payment of any claim for labor or services furnished to Contractor or to a subcontractor or any person in connection with this contract as such claim becomes due, the Local Public Agency may pay such claim to the person furnishing labor or services and charge the amount of the payment against the funds due to become due the Contractor by reason of this contract, and such payment shall not relieve the Contractor or the Contractor's surety from the obligations of either with respect to any unpaid claims.
3. The Contractor shall make payment as due to all persons supplying to the Contractor labor or materials for the prosecution of the work provided for in this contract, shall pay all contributions or amounts due to the State Industrial Accident Fund, the State Unemployment Compensation Trust Fund, and the State Tax Commission in consequence of work under this contract, and shall not permit any lien or claims to be filed or prosecuted against the Local Public Agency on account of any labor or material furnished.

1.17 Additional Work

In certain circumstances the Contractor will be required to perform additional work. Where the work to be performed is not attributed to Contractor's negligence, carelessness, or failure to install permanent controls it shall be paid for in accordance with the unit contract price or by force account.

Such additional work which does not differ from specified contract work shall be measured and paid for at the unit contract prices.

Such additional work not covered by contract items will be paid for on a force account basis in accordance with Section 1-09.6 of the 1988 APWA Amendments to Division One of the Standard Specifications. For the purpose of providing a common proposal for all bidders and for that purpose only the City has estimated the Cost of "Force Account Work," and has arbitrarily entered the amount in the bid proposal to become a part of the total bid by the Contractor.

Force account dollars listed by the City shall not be included in the calculation of the M/WBE participation goal amounts. The percentage goal shall be computed using the total bid amount prior to the addition of the force account. The Contractor shall not include any M/WBE participation toward the Force Account amount for the purposes of this bid. However, should additional work covered by force accounts be performed, Section II E 4 of the Instructions for Construction Contractors, City of Tacoma Affirmative Action - Minority and Women's Business Enterprise - Equal Employment Opportunity Regulations will apply.
1.18 **Contact Person**

For further information relating to these Specifications please contact:

A. Prior to Contract Award: Mary Lynn, Public Works Department, Refuse Utility Division, 591-5543;

B. After Contract Award: Arden Roberts, Public Works Department, Construction Division, 591-5765.

1.19 **Pre-Bid Conference**

A pre-bid conference will be held at the Refuse Utility Office at the Tacoma Landfill (3510 South Mullen Street) at 2:00 p.m. on Monday, June 18, 1990. The purpose of this conference is to answer questions regarding the M/WBE and EEO requirements included in this contract, and technical questions concerning the project. Prospective bidders are urged to attend.

1.20 **M/WBE Requirements**

The Minority Business Enterprise (MBE) and Women's Business Enterprise (WBE) subcontracting goals established in the City of Tacoma M/WBE Regulations, included as Section IV of these Specifications, are applicable to this project. Because of the nature of this project, the subcontracting percentages will be evaluated against the submitted total base bid less the bid price of Bid Item Nos. 37 & 38 "Primary Cap, Materials, 60 Mil HDPE Synthetic Membrane, at Per Square Yard", and "Secondary Cap System, Materials, 60 Mil HDPE Synthetic Membrane, Drainage Net, and Geotextile, at Per Square Yard". If you have any questions regarding the M/WBE requirements on the project, please contact Del Ramos of the Contract Compliance Office, at (206) 591-5829.

1.21 **Overloaded Hauling Vehicles**

The following shall be added to Section 1.07.7 of the WSDOT/APWA Standard Specifications:

"Where overloaded hauling vehicles are observed, the material receiver at the job site shall compare the actual gross weight recorded on the scale ticket with the legal gross weight displayed on the side of the truck. If the truck is overloaded, the material receiver shall draw a line through the actual gross weight and actual net weight and shall record the legal gross weight and revised net weight immediately adjacent. Payment shall be based on the revised net weight."
2.00 PROJECT REQUIREMENTS

2.01 General Description of Work

The work to be performed under these contract documents consists of installing a cap over the Stage 1 Area at the Tacoma Landfill. The work shall include earthwork; and the installation of a double layer, high density polyethylene cap, modifications to the landfill gas collection system, installation of a condensate collection system, and access road construction. This work is being performed in accordance with Washington State's Minimum Functional Standards for Solid Waste Handling (WAC 173-304), and the requirements of the Tacoma Landfill Consent Decree.

Unless otherwise noted, all testing, documentation, and all other work required in the Construction Quality Assurance (CQA) Plan shall be performed by the Contractor and all costs incurred shall be considered incidental to the contract.

2.02 Site Information

The Tacoma Landfill is a City owned, municipal waste landfill, operated and controlled by the Refuse Utility Division of the City of Tacoma Public Works Department.

The landfill is part of the South Tacoma Channel site which is on the U.S. Environmental Protection Agency's National Priority List of uncontrolled hazardous waste sites requiring response under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Information on the characterization of the Tacoma landfill may be obtained by reviewing the "Remedial Investigation Report - Tacoma Landfill - Tacoma, Washington". Information on specific remedial actions required at the Tacoma Landfill is available in the Tacoma Landfill Consent Decree. The documents are available for review at the Tacoma Landfill office building. To set up an appointment to review the report or the Consent Decree, contact Ms. Mary Lynn, (206)591-5543.

Following award of this contract, the Owner will provide to the Contractor a copy of the Consent Decree. The Contractor shall be required to provide a copy of the Consent Decree to each subcontractor working on the site. The Contractor and all subcontractors will be required to perform all work on this project in accordance with the Consent Decree. A Construction Quality Assurance Plan is included in these specifications and must be followed throughout the course of this project.
2.03 Reference Documents


2.04 Safety and Health Requirements for Hazardous Waste Operations

A. SAFETY AND HEALTH LAWS AND REGULATIONS, REQUIREMENTS FOR HAZARDOUS WASTE OPERATIONS

For all work conducted on the Tacoma Landfill Site, the Contractor shall ensure compliance with all safety and health provisions for hazardous waste operations including applicable requirements of the Federal Occupational Safety and Health Act of 1970 (OSHA), as amended including OSHA 29 CFR Part 1910 Hazardous Waste Operation and Emergency Response; Interim Final Rule, and with the Washington Industrial Safety and Health Act of 1973 (WISHA), WISHA General Occupational Health Standards (Chapter 296-62 WAC), Part P: Hazardous Waste Operations & Emergency Response (WAC 296-62-300), as amended, and all other applicable federal, state, county, and local laws, ordinances, codes, the requirements set forth herein, and any regulations that may be specified in other parts of this Contract. If any of these requirements are in conflict, the more stringent requirement shall apply. The Contractor's failure to be thoroughly familiarized with the aforementioned safety and health provisions shall not relieve the Contractor of responsibility for full compliance with the obligations and requirements set further therein.

B. PRESENT SITE CHARACTERIZATION

The exact nature of materials and wastes disposed of at the Tacoma Landfill Site is unknown. The possibility exists of encountering gases and/or other substances during the work that may be potentially hazardous to the safety and health of personnel, especially those working in the vicinity of open excavations and pipes venting gases. Information on the types, quantities, and concentrations of contaminants found at the Tacoma Landfill can be found in Remedial Investigation Report referenced above, and should be considered when preparing the safety and health program. The information in the Remedial Investigation Report represents only the substances and gases identified to date. Since other substances and gases may be present and may be found during work pursuant to the Contract, the Contractor shall consider the possibility of encountering other substances in preparing the Site Safety and Health Program. The Contractor is solely and completely responsible for meeting all applicable laws, regulations for hazardous waste.
operations, employee safety and health during the work performed at the Tacoma Landfill site under this contract. The Contractor shall provide all personnel working on the project with required orientation and training on the potential hazards anticipated and the appropriate use of safety equipment.

C. CONTRACTOR'S RESPONSIBILITY FOR SAFETY AND HEALTH FOR HAZARDOUS WASTE OPERATIONS

The Contractor shall have sole responsibility for the safety, efficiency, and adequacy of the Contractor's equipment and methods, and for any damage or injury resulting from their failure, or improper maintenance, use, or operation. The Contractor shall be solely and completely responsible for the conditions at the Tacoma Landfill Site, including safety and health of all authorized persons and property in performance of the Work. This requirement shall apply continuously and not be limited to normal working hours. The required or implied duty of the Engineer to conduct construction review of the Contractor's performance shall be intended to include review of the Contractor's proposed safety and health measures in, on, or near the Tacoma Landfill Site, and does not relieve the Contractor of responsibility for compliance with applicable laws, regulations and requirements.

The Contractor shall observe and comply with all applicable laws, regulations and requirements of this section. Such information, interpretation, or representation of laws, regulations or ordinances referenced in the Contract Document shall not take precedence over the laws, regulation or ordinance itself, nor relieve the Contractor of responsibility for determining the true current construction and content of such laws, regulations and ordinances.

The Contractor shall appoint a Site Safety and Health Officer who has experience in industrial hygiene, such as an Industrial Hygienist certified by the American Industrial Hygiene Association or approved equal and who is qualified by experience and training in hazardous waste operations in accordance with the applicable laws, regulations and requirements of this Section. The Site Safety and Health Officer shall be qualified and authorized to monitor, supervise and enforce compliance with the Site Safety and Health Program and Plan. A resume of the Site Safety and Health Officer's qualifications shall be submitted to the Engineer for review within 5 days of receiving the Notice to Proceed. The Site Safety and Health Officer shall be on site at all times when work operations involve excavation of refuse, work with landfill gas or condensate systems, or at other times when the potential for encountering hazardous substances exists.

(STAGE 1 NORTH CLOSURE) 2-3
(TACOMA LANDFILL)
The Contractor shall be solely responsible for the detection of contaminated gases, soils, or groundwater encountered during contact work at the Tacoma Landfill Site. The Contractor shall provide for the protection of the safety and health of all workers and other authorized persons, including the Engineer, Owner, etc., at the job site from exposure to potentially hazardous substances.

The Contractor shall be responsible for ensuring that all necessary monitoring equipment, protective clothing, and other supplies and equipment up to the appropriate Level of protection as defined by WISHA, OSHA, and other applicable guidelines are available to implement the plan. No work shall take place in areas where hazardous substances may potentially be present unless the Site Safety and Health Officer is present and monitoring site conditions.

The Contractor, through the Site Safety and Health Officer, shall not permit any employee, in the performance of the Contract, to work under conditions which are hazardous to the employee. Should violations of the safety and health requirements be called to the Site Safety and Health Officer's attention by the Engineer or any authorized representative of a regulatory agency, the Contractor shall immediately correct the identified conditions.

In the event the Contract fails or refuses to promptly comply with any compliance directive, the Engineer may issue an order to stop all or any part of the work. When compliance with the directive issue is accomplished, an Order to resume work will be issued. The Contractor shall not be entitled to any extension of the time or any claim for damage or to any additional compensation for either the directive or the work suspension order. Failure of the Engineer to order discontinuance of any or all of the Contractor's operations shall not relieve the Contractor of responsibility for safety.

The Contractor shall maintain in a manner acceptable to the Engineer an accurate record of, and shall report to the Engineer all cases of death, occupational diseases, or traumatic injury to employees or the public incident to the performance of work under this contract. Records to be kept by the Site Safety and Health Officer shall include as a minimum: daily log; all gas analyses; reports of variances in conditions; report of any illnesses, disease, injury, pulmonary disorder or death to any person on the site.

The Site Safety and Health Officer shall immediately notify the Engineer of any emergency as soon as possible following the incident.
D. SAFETY AND HEALTH PROGRAM FOR HAZARDOUS WASTE OPERATIONS

1. General

The Contractor shall develop and implement for the duration of the work at the Tacoma Landfill Site a safety and health program for hazardous waste operations for its employees that is in compliance with the laws, regulations, and requirements. The program shall incorporate the requirements applicable laws, regulations, and requirements as well as, the following items for its employees involved in hazardous waste operations. The items include, as a minimum:

(1) Site Characterization and Analysis.
(2) Site Control.
(3) Training.
(4) Medical Surveillance.
(5) Engineering controls, work practices and personal protective equipment.
(6) Monitoring.
(7) Information Program.
(8) Material Handling.
(9) Decontamination.
(10) Emergency Action Plan (WAC 296-62-3110 & WAC 296-23-567[1]).
(11) Illumination.
(12) Sanitation.
(13) Site Excavation.
(14) Contractors and Sub-Contractors.

In the event the Safety and Health Program is determined by the Engineer or a regulatory agency to be inadequate to protect the employees and the public, then such plan shall be modified to meet the requirements of the Engineer or those regulatory agencies.

2. Monitoring for Hazardous Waste Operations

As part of the safety and health program, the Contractor shall perform monitoring so that employees are not exposed to levels which exceed established Permissible Exposure Limits for hazardous substances.

Identification of areas of potentially hazardous substances shall be made through observations and through a continuous ongoing monitoring program designed to detect contaminated air, soil, surface water and groundwater. The Contractor shall develop a monitoring program in accordance with
requirements outlined in these Contract specifications that will provide the City with certain information, as specified herein, that is needed to identify these potentially contaminated areas as well as to provide information necessary to comply with relevant worker safety and health regulations. The Contractor shall require all workers to report any observations of potentially hazardous substances and odors. Such observations will be reported to the contractor's Onsite Monitor who shall be qualified and responsible for conducting a regular monitoring program and to the Site Safety and Health Officer.

The Contractor shall develop and submit to the Engineer a monitoring program, within 5 days after receiving the notice to proceed, that will provide for detection of the presence of potentially hazardous substances during excavation operations. The program shall include, at a minimum, the following elements:

1. Instruction of workers in observing and reporting potentially hazardous substances such as refuse, oil sheen or color on soils or water, and oily or chemical odors.

2. Monitoring of excavated material within the landfill area using a portable direct-reading instruments, such as a photoionization detector (PID), or an approved equivalent to detect the presence of nonmethane organic vapors which could indicate chemical contamination. Monitoring devices shall be capable of detecting 0.1 ppm benzene and shall be calibrated daily by qualified personnel.

3. Monitoring with a combustible Gas Indicator such as a MSA Model 361, or an approved equivalent with both audible and visual alarms continuously during operations where the soil surface is being disturbed or when work is being performed below ground level. Calibrate the instrument with 0.75 percent Pentane/15 percent Oxygen/50 percent LEL prior to use. Set the audible alarm at 20 percent LEL for methane.

The MSA 361, or equivalent shall have capabilities of measuring percent oxygen on a continuous basis. Set both the audible and visual alarm of the MSA's Oxygen Concentration Meter at 19.5 percent. In addition to the combustible gas and oxygen detection meters, the MSA 361 or equivalent shall have a hydrogen sulfide concentration detector. Set the alarms at 10 ppm.
(4) Monitoring with Draeger colorometric Indicator Tubes when the meters indicated above detect unusual or alarm level concentrations of gas. The tubes come in a wide variety of chemicals and concentration combinations. Due to the difficulty of using a direct reading instrument to differentiate between compounds which have the same boiling temperature or flammability range, the Contractor shall use direct reading Draeger Tubes as required.

(5) Development of action levels for work safety when potential contamination is detected by monitoring equipment.

(6) Development of an emergency medical care and treatment plan.

(7) Submittal of copies of all monitoring records to the Engineer on a weekly basis.

Information concerning the landfill gas and its constituents is available in the Tacoma Landfill Remedial Investigation report. This information may be useful when developing the monitoring program.

During construction, the Contractor's soil and gas monitoring shall consist of inspection for visual abnormalities, odors, and gases using a photoionization detector (PID) and a combustible gas meter. The visual and odor inspection will be an ongoing responsibility of all the Contractor's employees. In addition the air quality will be monitored continuously for all trench excavation, suspect soil, and areas identified as known refuse soils. The meters shall be calibrated daily.

In addition to the minimal requirements outlined herein, the Contractor shall fully comply with the laws, regulations, and requirements of this Section relating to worker safety and health and the potential presence of contaminated air, soil, and/or water.

3. Site Safety and Health Plan for Hazardous Waste Operations

The Contractor shall develop and maintain for the duration of work activities at the Tacoma Landfill Site, a written site specific Safety and Health Plan for hazardous waste operations as part of the informational program that will effectively incorporate and implement all applicable requirements. The Site Safety and Health Plan shall be submitted by the Contractor to the Engineer within 5 days.
after receiving the Notice to Proceed. The Contractor shall appoint a Site Safety and Health Officer who is qualified in accordance with Section 2.04(c) and authorized to monitor, supervise, and enforce compliance with the Site Safety and Health Program and Plan. The Site Safety and Health Plan shall be available on the site for inspection by employees, their representative, Engineer and regulatory personnel.

The Site Safety and Health Plan for work activities at the Tacoma Landfill Site shall, at a minimum, include the following considerations:

1. Names of key personnel and alternates responsible for site safety and health and appointment of a Site Safety and Health Officer.
2. Safety and Health risk analysis for each site task and operation.
3. Employee training assignment.
4. Personal protective equipment to be used by employees for each of the site tasks and operations being conducted.
5. Medical surveillance requirements.
6. Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used. Methods of maintenance and calibration of monitoring and sampling equipment to be used.
7. Site control measures.
8. Decontamination procedures.
9. Site's standard operating procedures.
10. Emergency action plan including the necessary personal protective equipment and other equipment.
11. Confined space entry procedures.

4. Notification and Suspension

In the event the Contractor's monitoring program detects the presence of a potentially hazardous substance at concentrations at or above Established Permissible Exposure Limits, the Contractor shall immediately notify the Engineer. Following such notification by the Contractor, the Engineer shall notify the various governmental and regulatory agencies concerned with the presence of potentially hazardous substances. Depending upon the type of problem identified, the Engineer may recommend suspension of the work in the vicinity of the material discovery.
Following completion of any further testing necessary to determine the nature of the material, the Contractor, after consultation with the Engineer, will decide the manner in which the substance will be handled and disposed of and the actual procedures to be used in resuming the work. If appropriate, the Site Safety and Health Plan will be revised to reflect changes necessitated by the discovery of hazards not previously addressed by the Plan.

Although the actual procedures used in resuming the work shall depend upon the nature and extent of the potentially hazardous substance, the following alternatives of operation are possible:

1. Contractor to resume work as before the suspension.
2. Contractor to move work operations to another portion of the site until measures to eliminate any hazardous conditions can be effected.
3. The Engineer will direct the Contractor to dispose of the excavated refuse material at locations determined by the Engineer or at other appropriate and approved sites.

If suspect air, soils, and/or water is identified by the monitoring program and construction activity is terminated at the suspect location by the owner and the Contractor cannot move his operation to another portion of the work, the Contractor shall be compensated for idle time of all equipment in actual use at the time of the potentially hazardous substance identification at the potentially hazardous substance location. The contractor shall be compensated in accordance with Section 1-09.6 for those hours or days the equipment is idled until a determination of the condition is made. No compensation will be made for labor, overhead, profit and/or any other general expense. The Contractor shall maintain records in such a manner as to provide the owner with as daily report sheet itemizing the equipment rental (size, type and identification number). Said daily report sheets shall be signed by the Contractor or an authorized agent of the Contractor.

5. Corrective Actions

Appropriate corrective actions are dependent upon the nature and extent of the contamination identified, and will be determined on a case-by-case basis by the contractor, the Engineer and the agencies.
E. MEASUREMENT AND PAYMENT

The contract unit price for "Health and Safety Plan, at Per Lump Sum" as listed in the proposal shall be considered full compensation for all labor, equipment, and materials costs associated with preparation of the Health and Safety Plan, including all costs for abiding by that plan, except as otherwise provided for herein. The Contractor shall submit a Site Safety and Health Plan within 10 days after receiving Notice to Proceed. This lump sum bid shall include all cost for training of employees and all other labor equipment and materials required to assure compliance with the plan throughout the duration of the project. Payment shall be based upon invoice submittal for services provided or equipment and materials used.

The costs for medical surveillance exams shall be considered incidental to the cost of "Site Safety and Health Plan". Each medical surveillance exam shall consist of a baseline medical exam to be performed before the work begins, and an exit medical exam to be performed within one month of project completion. The exams shall be performed in accordance with OSHA requirements. The Contractor shall provide a list of all employees receiving the exams and the list shall be certified by the Site Safety and Health Officer.

The contract unit price for "Site Monitoring, at Per Working Hour" shall be considered full compensation for all labor, equipment, and materials costs associated with providing air monitoring as described herein, as outlined in the Contractor's Health and Safety Plan, and as approved by the Engineer.

The contract unit price for "Upgrade to Level B Personal Protective Equipment at per Man Hour" shall include all costs for labor, equipment, and materials required to provide personal protective equipment at Level B, as determined necessary and required by the Site Safety and Health Officer for safe work performance. The equipment shall meet the requirements of WISHA 296-62-3060, Hazardous Waste Operations and Emergency Response. The unit contract price shall also include all costs for a decrease in productivity resulting from the use of the Level B protection. Any work necessary to comply with the requirements of Section 1-07.30, but not specifically listed as a contract bid item in the bid form and payment is not otherwise provided, shall be incidental to the Safety and Health Requirements for Hazardous Waste Operations, and all costs therefore will be considered as incidental to the lump sum bid item for mobilization.
2.05 Work by Owner

Owner shall perform certain activities in connection with the Project with his own personnel as follows:

- Site Surveying - Stage 1 North area will be surveyed before the Contractor begins work and as necessary to establish grading and for alignment of roadways and drainage swales. An additional survey will be conducted when construction is completed for use in developing the "as built" drawings. Additional control points will also be set by the Owner's surveyors as required. The City will also perform surveys required for installation of storm sewer facilities and gas and condensate systems.

- Grading of Stage 1 North of Tacoma Landfill - The site survey referenced above will provide the contractor information regarding the pre-construction elevations in the area. Variations from the final grading plan shown on the Drawings may be allowed, at the direction of the Engineer, to avoid unnecessary cutting or filling. Any variations shall meet the requirements of the MFS and the Consent Decree, i.e., maximum allowable slope is 33 percent and minimum allowable slope is 2 percent.

2.06 Equivalent Materials and Equipment

Whenever a material or article is specified or described by using the name of a proprietary product or the name of a particular manufacturer or vendor, the specified item mentioned shall be understood as establishing the type, function, and quality desired. Other manufacturers' products will be accepted provided sufficient information is submitted to allow Engineer to determine that the products proposed are equivalent to those named. Such items shall be submitted to the Engineer for review by the procedure set forth in the submittals section.

2.07 Estimated Quantities

All quantities stipulated in the proposal or other contract documents are approximate and are to be used only:

a. As a basis for estimating the probable cost of the work; and

b. For the purpose of comparing the bids submitted for the work.
The actual amounts of work done and material furnished under unit price items may differ from the estimated quantities. The basis of payment for work and materials will be the actual quantity of work done and materials furnished. Increased or decreased quantities in excess of 25-percent of the original contract amount or of a major bid item will be paid for as provided in Section 1-04.6 of the State Standard Specifications as amended by the APWA Amendments to Division One.

Unless otherwise indicated on the plans, specified in the special provisions, or directed by the Engineer, all materials used on this project shall be new.

2.08 Preparation for Shipment

All materials shall be suitably packaged to facilitate handling and protect against damage during transit and storage.

Each item, package, or bundle of material shall be tagged or marked as identified in the delivery schedule or on the shop drawings. Complete packing lists and bills of material shall be included with each shipment. Specific requirements for protection of geosynthetic materials are discussed in the Construction Quality Assurance (CQA) plan, Section 2.2.4.

2.09 Land for Construction Purposes

Contractor will be permitted to use available land belonging to Owner, on or near the site of the Work, for construction purposes and for the storage of materials and equipment. The location and extent of the areas so used are shown on the site plan and shall be used as instructed by Engineer.

Contractor shall immediately move stored material or equipment if any occasion arises, as determined by Owner, requiring access to the storage area. Materials or equipment shall not be placed on the property of Owner until Owner has agreed to the location to be used for storage.

2.10 Onsite Haul Roads and Road Crossings of Gas Manifold

The contractor shall be responsible for onsite haul roads necessary for construction operations. A minimum distance of 10 feet shall be established between equipment traveling on haul roads and site facilities such as gas control wells, gas manifold pipes, gas monitoring probes, leachate monitoring probes, groundwater monitoring probes, motor blowers, flares, guy-wires, and power poles.
All gas control system wells, manifold, blower, etc., shall be kept in service, except as allowed in phasing schedule. Where the Contractor constructs haul roads across gas system manifolds, the Contractor shall protect the manifold at each temporary road crossing with a casing pipe of inside diameter of at least 6 inches larger than the manifold pipe, and of adequate strength and length to protect the manifold from damage by all equipment onsite. No changes in the manifold pipe grade and alignment will be allowed for temporary road crossings. Temporary road crossings are defined as those which the contractor installs in conjunction with his onsite haul roads, excluding any Permanent Road Crossings shown on the Drawings or described in the specifications. Ductile iron pipe of various sizes are available at the Refuse Utility for use in all road crossings.

The Contractor shall install the casing pipe, cut the manifold, and re-connect it through the casing pipe before the end of that working day. The Contractor shall be responsible for building any approach ramps and cover over the casing pipe as required for the Contractor's operations. The Contractor shall examine any existing road crossings and improve any that are not adequate for the Contractor's operations as described. The Contractor shall be responsible for maintenance of all roads and road crossings within the construction area. The Contractor shall, within two hours of notification of a damaged road crossing, begin repairs, and shall complete repairs within eight hours after notification. In areas to be filled or lined with flexible membrane liner, the Contractor shall remove all temporary road crossings in that area prior to placing fill. Prior to laying the flexible membrane liner, any temporary road crossings not requested by the City to remain in place shall be removed by the Contractor and the crossing area restored to final grade.

All labor, equipment, and material costs associated with construction and removal of all temporary road crossing shall be considered incidental to the contract. Any damage to existing header lines or wells will be repaired by the Contractor during the same working day or City crews will repair the damaged line or well and will charge the Contractor for this work.

2.11 Lines and Grades

All Work shall be done to the lines, grades, and elevations indicated on the drawings or staked in the field.
Basic horizontal and vertical control points will be established or designated, and all other staking considered necessary by Engineer will be done by owner except as specified herein. After the City has provided construction staking, the Contractor shall provide labor and equipment to protect and maintain all staking for alignment and grade of the gas collection pipes and storm sewer pipes, including subsurface drainage pipes.

Contractor shall keep Engineer informed, a reasonable time in advance, of the times and places at which he wishes to do work, so that lines and grades may be furnished and measurements for record and payment may be made with minimum inconvenience to Engineer and minimum delay to Contractor.

Notification of work schedules shall be in accordance with the requirements in Section 3.01, Construction Schedule Submittals.

2.12 Unfavorable Construction Conditions

During unfavorable weather, wet ground, or other unsuitable construction conditions, the Contractor shall confine his operations to Work which will not be affected adversely by such conditions. No portion of the Work shall be constructed under conditions which would affect adversely the quality or efficiency thereof, unless special means or precautions are taken by Contractor to perform the work in a proper and satisfactory manner. No welding shall be performed on wet geomembrane material. Specific weather conditions for installation and welding of the geomembrane materials are outlined in Section 8.06(A)5.

2.13 Coordination of All Work

The Tacoma Landfill is open and receives waste seven (7) days per week from 8:00 a.m. to 6:00 p.m. The landfill is open to the general public and will receive between 600 to 1300 vehicles on any given day. Landfilling operations will be continuing at the landfill during the construction period. The contractor shall schedule and conduct all work to minimize interference with daily landfilling operation. Site access locations must be approved by the Engineer. Access to this project will be from the North on Mullen Street which is also the public access road to the landfill. As discussed in Section 4.06, the Contractor shall furnish all flagging and furnish and maintain all temporary traffic control signs and devices necessary to control traffic and protect the public during construction operations.
The City will also have other construction projects occurring at the landfill concurrently with this project. The contractor shall coordinate his work, if or when necessary, with the Engineer to minimize any interference between projects. Other projects possibly occurring concurrently with the cap installation include: Central Area Liner Extension, Public Receiving Facility Construction, the Groundwater Treatment Pilot Study, Landfill Closure - South End, and storm sewer installations.

In addition, the City will be installing several new gas extraction wells within the project area. It is projected that this work will be completed prior to initiation of this contract. There is, however, a potential that work will not be completed before this contract starts. If this occurs, the Contractor shall coordinate his work with the Engineer to minimize interference between project.

2.14 Mobilization

Measurement and payment for Mobilization shall be as specified in the State Standard Specifications Section 1-09.7 as amended by APWA.

2.15 Vehicle Washing Requirements

Before leaving the landfill site, material hauling equipment shall be washed as necessary to remove materials clinging to the equipment. The City's wash rack will not be available for this purpose. The Contractor shall provide the necessary personnel, equipment and water to perform the washing. The Contractor shall be responsible for all cleaning of roadways and storm/sanitary sewers required due to material from any hauling equipment.

All labor, equipment and materials costs associated with washing the vehicles or cleaning the roadways and/or sewers shall be considered incidental to the contract.

2.16 Cleaning Up

Contractor shall keep the premises free at all times from accumulations of waste materials and rubbish. Contractor shall provide adequate trash receptacles about the site, and shall promptly empty the containers when filled. Waste material resulting from activities related to this project can be disposed at the working face at the landfill at no charge to the Contractor. Wastes generated during the course of the Work which are not normally accepted at the landfill shall be disposed of offsite at a suitable facility at the Contractor's expense.
Wastes shall not be buried on any other areas of the site without the written permission of the Owner. Wastes shall not be burned on the site or disposed of into storm drains, sanitary sewers, streams, or waterways. All wastes shall be removed from the site and disposed of in a manner complying with local ordinances and anti-pollution laws.

Volatile wastes shall be properly stored in covered metal containers and removed daily.

Adequate cleanup will be a condition for recommendation of payment applications. However, payment for "Final Clean Up, at Per Lump Sum" will be at the end of the job when final cleanup is completed.

2.17 Final Cleanup

All costs for labor, equipment and materials to return the job site to a finished condition satisfactory to the Engineer shall be considered incidental to the contract price for "Final Clean-up, at per Lump Sum" as listed in the proposal. Payment for this bid item shall be made at the end of the job when final cleanup is completed.

2.18 Daily Cover of Exposed Wastes

Wastes exposed during construction activities shall be covered with an adequate native soil bedding material at the end of each day so as to satisfy the MFS requirements of WAC 173-304-460(4)(d). If any wastes are left uncovered by the Contractor at the end of the day, the City will cover the wastes and will charge the Contractor for this work.

2.19 Erosion Control Plan

Prior to commencing construction, the Contractor shall submit an Erosion Control Plan for review by the Owner. This plan shall discuss measures to be taken to prevent and/or correct any soil erosion, as specified in Section 4.13, Erosion Control. Submittal of this plan shall be made in accordance with Section 3.00 of this specification.

The Erosion Control Plan shall outline measures to be utilized during construction to mitigate soil erosion. The Plan shall discuss the use of rock check dams, silt fences, and temporary swales, as necessary. At a minimum the Contractor shall provide and install silt fence on the downslope portions of the
perimeter of the project area, as directed by the Engineer. The contract unit price for "Silt Fence, installed, at Per Linear Foot" shall be considered full compensation for providing and installing silt fence as shown on the attached sketch, where directed by the Engineer. Aside from this requirement, all measures required for erosion control shall be the responsibility of the Contractor, and shall be incidental to the lump sum price bid. The Plan shall include site maps indicating the locations and types of erosion control devices to be utilized. Section 4.12, Temporary Drainage Provisions, further describes the drainage facilities necessary. Payment for "Erosion Control Plan, at per Lump Sum", shall include the costs for preparation of the Erosion Control Plan and installation and maintenance of the measures it stipulates. Silt Fence will be paid for at the linear foot, installed. Fifty percent of the payment for this bid item, less the required retainage, shall be made upon approval of the plan, and the remainder of this bid item shall be made at the conclusion of the project.

2.20 Diversion of Uncontaminated Water.

Storm water shall be diverted around the active project area to prevent pickup of silt. This may be accomplished by pumping; improving ditches; lining channels or placing metal, plastic or concrete gravity pipe; constructing berms, culverts, etc., to control surface water; or constructing settling basins or energy dissipaters to control downstream flows. All costs associated with compliance with this specification shall be considered incidental to the lump sum price for "Erosion Control Plan".

2.21 Intercepting Ground Water.

Surfacing ground water or ponded water shall be intercepted and routed around the construction site to prevent silt erosion by the use of gravel trenches, French drain tiles, well points, or interceptor ditches. The Contractor shall provide means of controlling underground water which may be encountered during construction. All costs associated with compliance with this specification shall be considered incidental to the lump sum price for "Erosion Control Plan".

2.22 Reference Standards

Reference to the standards of any technical society, organization, or association, or to codes of local or state authorities, shall mean the latest standard, code, specification, or tentative standard adopted and published at the date of receipt of bids, unless specifically stated otherwise.
NOTE:
SILT FENCE PLACED 1'-0"
INSIDE CONSTRUCTION
LIMITS WHERE APPLICABLE

FILTER FABRIC (SILT FENCE)
36" wide rolls. Use staples
or wire rings to attach
filter fabric to wire fabric

6" x 6" x 14 GA. WIRE
FABRIC OR EQUIVALENT

BURY BOTTOM OF FILTER
FABRIC IN 8" x 6" TRENCH

2" x 4" WOOD POST

10' MAX

FILTER FABRIC
(MIRAI 100X OR EQUAL)

WIRE FABRIC OR
EQUIVALENT

NATIVE MATERIAL BACKFILL
OVER FILTER FABRIC
(6" MIN DEPTH)

NTS

CITY OF TACOMA
TACOMA LANDFILL

STAGE ONE CLOSURE
SPECIFICATIONS

FIGURE 2-1

SILT FENCE
2.23 Abbreviations and Symbols

Abbreviations used in the Contract Documents are defined as follows:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AASHTO</td>
<td>American Association of State Highway and Transportation Officials</td>
</tr>
<tr>
<td>ACI</td>
<td>American Concrete Institute</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards Institute</td>
</tr>
<tr>
<td>APWA</td>
<td>American Public Works Association</td>
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<tr>
<td>ASTM</td>
<td>American Society for Testing and Materials</td>
</tr>
<tr>
<td>PS</td>
<td>Product Standard</td>
</tr>
<tr>
<td>WSDOT</td>
<td>Washington State Department of Transportation</td>
</tr>
</tbody>
</table>

2.24 Preconstruction Conference

Prior to the commencement of Work at the site, a preconstruction conference will be held at a mutually agreed time and place. The conference shall be attended by:

- Contractor and his superintendent.
- Principal Subcontractors.
- Representatives of principal suppliers and manufacturers as appropriate.
- Resident Project Representative.
- Representatives of Owner.
- Governmental representatives (EPA, DOE, TPCHD)
- Others as requested by Contractor, Owner, or Engineer.

Unless previously submitted to Engineer, Contractor shall bring to the conference a tentative schedule for each of the following:

- Progress.
- Procurement.
- Shop Drawings and other submittals.
The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda will include:

- Discuss procedures for observation, testing, and sampling.
- Discuss procedures for handling substandard construction, retesting, and repairs.
- Establish lines of communication and authority.
- Review documentation and reporting procedures.
- Review synthetic membrane panel layouts.
- Discuss quality control procedures.
- Outline responsibilities of each party.
- Procedures for transmittal, review, and distribution of Contractor's submittals.
- Procedures for processing applications for payment.
- Maintaining record documents.
- Critical Work Sequencing.
- Field Decisions and Change Orders.
- Use of premises, offices and storage areas, security, housekeeping, and Owner's needs.
- Major deliveries and priorities.
- Conduct site tour to familiarize all parties with site conditions, storage areas, facilities, etc.
- Review site security and health and safety requirements.
- Discuss and finalize project schedule.

Owner or Engineer will preside at the conference and will arrange for keeping the minutes and distributing the minutes to all persons in attendance.
2.25 **Progress Meetings**

Contractor shall schedule and hold regular progress meetings at least biweekly and at other times as requested by Engineer or required by progress of the Work. Contractor, Engineer, Consultant, and all Subcontractors active on the site shall be represented at each meeting. Contractor may, at his discretion, request attendance by representatives of his suppliers, manufacturers, and other Subcontractors. EPA, DOE, and TPCHD will also be invited to attend these meetings.

Engineer shall preside at the meetings and provide for keeping and distribution of the minutes. The purpose of the meetings will be to review the progress of the Work, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop.

2.26 **As-Built Drawings**

The Contractor is required to submit as built drawings as reproducible mylars. These as-built drawings shall show actual construction including measured horizontal and vertical locations of underground utilities, gas lines, condensate lines, and appurtenances, and measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the work. Show field changes of dimension and detail. Record drawings shall be stamped "as-built". All costs associated with preparation and submittal of the as-built drawings shall be considered incidental to the contract.

(STAGE 1 NORTH CLOSURE) 2-20
(TACOMA LANDFILL)
3.00 SUBMITTALS

3.01 Construction Schedule

Before Work is started, Contractor shall submit to Engineer or CQA Officer for review a schedule of the proposed construction operations. The construction schedule shall indicate the sequence of the Work, the time of starting and completion of each part, the installation date for each major item, and the time for making connections to existing piping, structures, or facilities.

The schedule shall be revised as necessary to reflect changes in the progress of the Work. Refer to Section 1-08.9 of the State Standard Specifications as amended by APWA which discusses liquidated damages for work not completed on time.

3.02 Progress Reports

A progress report shall be furnished to Engineer with each application for progress payment. If the Work falls behind schedule, Contractor shall submit additional progress reports at such intervals as Engineer may request.

Each progress report shall include sufficient narrative to describe current and anticipated delaying factors, their effect on the construction schedule, and proposed corrective actions. Any Work reported complete, but which is not readily apparent to Engineer, must be substantiated with satisfactory evidence.

Each progress report shall also include three prints of the accepted graphic schedule marked to indicate actual progress.

3.03 Shop Drawings and Engineering Data

Engineering data covering all materials which will become a permanent part of the Work under this contract shall be submitted to Engineer for distribution to the Consultant and the Agencies. The Engineer, Consultant and the Agencies will review each shop drawing submittal and provide comments to the Contractor. These data shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and operation of component materials and devices; the external connections, anchorages, and supports required; performance characteristics; and dimensions needed for installation and correlation with other materials.
All submittals, regardless of origin, shall be stamped with the approval of Contractor and identified with the name and number of this contract, Contractor's name, and references to applicable specification paragraphs and contract drawings. Each submittal shall indicate the intended use of the item in the Work. When catalog pages are submitted, applicable items shall be clearly identified. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data.

Contractor's stamp of approval is a representation to Owner, Engineer, and Consultant that Contractor accepts full responsibility for determining and verifying all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data, and that he has reviewed or coordinated each submittal with the requirements of the Work and the Contract Documents.

All deviations from the Contract Documents shall be identified on each submittal and shall be tabulated in Contractor's letter of transmittal. Such submittals shall, as pertinent to the deviation, indicate essential details of all changes proposed by Contractor (including modifications to other facilities that may be a result of the deviation).

Contractor shall accept full responsibility for the completeness of each submission, and, in the case of a resubmission, shall verify that all exceptions previously noted by Engineer have been taken into account. In the event that more than one resubmission is required because of failure of Contractor to account for exceptions previously noted, Contractor shall reimburse Owner for the charges of Consultant for review of the additional resubmissions.

Resubmittals shall be made within 14 days of the date of the letter returning the material to be modified or corrected, unless within 7 days the Contractor submits an acceptable request for an extension of the stipulated time period, listing the reasons the resubmittal cannot be completed within that time.

Any need for more than one resubmission, or any other delay in obtaining Engineer's review of submittals, will not entitle Contractor to extension of the Contract Time unless delay of the Work is directly caused by a change in the Work authorized by a Change Order or by failure of Engineer to return any submittal within 14 days after its receipt in Engineer's office.

Contractor's letter of resubmittal shall list the date of his original submittal letter, the date of the Engineer's letter returning the submittal, and the dates of submission and return of any previous resubmittals.
Engineer's review of drawings and data submitted by Contractor will cover only general conformity to the drawings and specifications, external connections, and dimensions which affect the layout. Engineer's review does not indicate a thorough review of all dimensions, quantities, and details of the material or item shown. Engineer's review of submittals shall not relieve Contractor from responsibility for errors, omissions, or deviations, nor responsibility for compliance with the Contract Documents.

Eight copies (or one reproducible copy) of each drawing and necessary data shall be submitted to Engineer. Engineer will not accept submittals from anyone but Contractor. Submittals shall be consecutively numbered in direct sequence of submittal and without division by subcontracts or trades. Resubmittals shall bear the number of the first submittal followed by a letter (A, B, etc.,) to indicate the sequence of the resubmittal.

When the drawings and data are returned marked REJECTED - SEE REMARKS or AMEND AND RESUBMIT, the corrections shall be made as noted thereon and as instructed by Engineer and eight corrected copies (or one corrected reproducible copy) resubmitted to the Engineer.

When corrected copies are resubmitted, Contractor shall in writing direct specific attention to all revisions and shall list separately any revisions made other than those called for by Engineer on previous submissions.

When the drawings and data are returned marked REVIEWED WITH COMMENTS or REVIEWED, no additional copies need be furnished.
4.00 TEMPORARY FACILITIES

4.01 Office at Site of Work

During the performance of this contract, Contractor shall maintain a suitable office at or near the site of the Work which shall be the headquarters of his representative authorized to receive drawings, instructions, or other communication or articles. Any communication given to the said representative or delivered at Contractor's office at the site of the Work in his absence shall be deemed to have been delivered to Contractor.

Copies of the drawings, specifications, and other Contract Documents shall be kept at Contractor's office at the site of the Work and available for use at all times.

The Resident Project Representative and Engineer will have offices at the site provided by the Owner.

4.02 Water

Water in reasonable amounts for proper completion of the Work will be furnished at one of the existing hydrants indicated on the Drawings without charge to Contractor. Other hydrants are available for use in the area around the landfill, and their use shall be coordinated with the Landfill Supervisor. This shall include water for use in dust control and maintaining optimum moisture content of soils during construction. Contractor shall furnish necessary pipe, hose, nozzles, and tools and shall perform all necessary labor. Contractor shall make arrangements with the City Water Department (who will fix the time, rate, and duration of each withdrawal from the distribution system) as to the amount of water required and the time when the water will be needed. Unnecessary waste of water will not be tolerated. Special hydrant wrenches shall be used for opening and closing fire hydrants. In no case shall pipe wrenches be used for this purpose.

4.03 Power

Contractor shall provide all power for heating, lighting, operation of Contractor's equipment, or for any other use by Contractor.

4.04 Telephone Service

Contractor shall make all necessary arrangements and pay all installation charges for telephone lines in his office at the site and shall provide all telephone instruments for use by Contractor.
4.05 **Sanitary Facilities**

Contractor shall furnish temporary sanitary facilities at the site, as provided herein, for the needs of all construction workers and others performing work or furnishing services on the Project.

Sanitary facilities shall be of reasonable capacity, properly maintained throughout the construction period, and obscured from public view to the greatest practical extent. At least one toilet will be furnished for each 10 men. Contractor shall enforce the use of such sanitary facilities by all personnel at the site.

4.06 **Maintenance of Traffic**

Contractor shall enter the landfill using the Mullen Street entrance on the north side of the landfill unless otherwise authorized by the Engineer. Access to the Stage 1 areas shall be coordinated with and directed by the Engineer or his designee. Contractor shall conduct his Work to interfere as little as possible with landfill operations and other construction projects taking place onsite.

The Contractor shall furnish all flagging and furnish and maintain all temporary traffic control signs and devices necessary to control traffic and protect the public during construction operations. Traffic control signs and devices shall conform to the requirements of the Manual on Uniform Traffic Control Devices.

All costs associated with providing and maintaining temporary traffic control shall be considered incidental to the contract.

4.07 **Fences**

All existing fences within the construction area shall be maintained by Contractor until completion of the Work, with the exception of those fences to be removed as shown on the drawings. Fences which must be removed shall be left in place as long as possible and replaced or relocated as soon as possible to minimize the time that the site is left unsecured. Requirements for removal and relocation of fencing is covered in Section 13.00 of these specifications. Fences which interfere with construction operations shall not be relocated or dismantled until written permission is obtained from the Owner and the period the fence may be left relocated or dismantled has been agreed upon.

The Contractor shall restore all fences to their original or to a better condition and to their original location, or as shown on the Drawings, or as directed by the Engineer.
Protection of Public and Private Property

Contractor shall protect, shore, brace, support, and maintain all above and below ground pipes, conduits, drains, and other construction uncovered or otherwise affected by his construction operations. The Contractor will be held responsible for any damage to existing structures, work, material or equipment because of his operations, and shall repair or replace any damaged structures, work, materials, or equipment to the satisfaction of, and at no additional cost to the Owner. All utility poles, guy wires, fences, and other surface structures affected by construction operations, shall be protected to the greatest extent possible, and if damaged, shall be restored to their original or to a better condition. Any damage to the landfill gas collection system shall be repaired during the same working day, or the City will provide for the repairs to take place and will bill the Contractor for this work. All replacements of damaged fixtures shall be made with new materials unless otherwise authorized by the Engineer.

The Contractor shall not move or remove any portion of the landfill gas collection system unless authorized by the Engineer. If any damage occurs to the gas collection system during the course of the work, the Contractor shall IMMEDIATELY NOTIFY THE ENGINEER. All work involving the landfill gas extraction system shall be coordinated with the Engineer and the operator of the system. Cap construction shall be in accordance with the landfill gas extraction system phasing plan (Attachment B). The City's landfill gas operator will be monitoring the gas system throughout the course of this project. In the event of evidence of gas migration during construction, the landfill gas operator may require that specific gas extraction wells that have been shut down to allow cap construction be hooked back up to correct the problem. If this becomes necessary, the reconnection must occur within the same work day as notification. All costs associated with reconnection of the well shall be considered incidental to the contract unit price for "__-Inch Diameter, ADS Temporary Gas Piping, at-Per Linear Foot" as listed in the proposal.

Contractor shall be responsible for all damage to streets, roads, highways, shoulders, ditches, embankments, culverts, bridges, and other public or private property, regardless of location or character, which may be caused by transporting equipment, materials, or personnel to or from the Work or any part or site thereof, whether by him or his Subcontractors. Contractor shall make satisfactory and acceptable arrangements with the Owner of, or the agency or authority having jurisdiction over, the damaged property concerning its repair or replacement or payment of costs incurred in connection with the damage.
All fire hydrants and water control valves shall be kept free from obstruction and available for use at all times.

All costs for providing such protection to existing public and private property shall be considered incidental to the contract.

4.09 Access Roads

Contractor shall establish and maintain temporary access roads to various parts of the site as required to complete the Project. Such roads shall be available for the use of all others performing work or furnishing services in connection with the Project. The construction of these roads shall be in accordance with Section 2.10 of these specifications.

4.10 Parking

Contractor shall provide and maintain suitable parking areas for the use of all construction workers and others performing work or furnishing services in connection with the Project, as required to avoid any need for parking personal vehicles where they may interfere with public traffic, Owner's operations, or construction activities.

4.11 Dust Control

Contractor shall take reasonable measures as directed by the Engineer to prevent unnecessary dust. Earth surfaces subject to dusting shall be kept moist with water. Dusty materials in piles or in transit shall be covered or wetted to prevent blowing. All work and water costs for dust control shall be considered incidental to the contract.

All labor, equipment and materials costs associated with providing dust control shall be considered incidental to the contract.

4.12 Temporary Drainage Provisions

Contractor shall provide for the drainage of storm water and such water as may be applied or discharged on the site in performance of the Work. Drainage facilities shall be adequate to prevent damage to the Work, the site, and adjacent property. The Erosion Control Plan (Section 2.19) shall outline the temporary drainage facilities to be used.

Existing drainage channels and conduits shall be cleaned, enlarged, or supplemented as necessary to carry all increased runoff attributable to Contractor's operations. Dikes shall be constructed as necessary to divert increased runoff from entering adjacent areas (except in natural channels), to protect
Owner's facilities and the Work, and to direct water to drainage
channels or conduits. All costs associated with providing for
drainage of storm and other water as described herein shall be
considered incidental to the lump sum price for "Erosion Control
Plan."

4.13 Erosion Control

The Contractor shall be responsible for all erosion control
measures within the limits of construction, from the time Notice
to Proceed is received until final construction approval.

Contractor shall prevent erosion of soil on the site and
adjacent property resulting from his construction activities.

Effective measures shall be initiated prior to the commencement
of clearing, grading, excavation, or other operations that will
disturb the natural protection. Measures to be used shall be
outlined in the Erosion Control Plan, as required by Section
2.19.

Work shall be scheduled to expose areas subject to erosion for
the shortest possible time, and natural vegetation preserved to
the greatest extent practicable. At a minimum, the Contractor
shall provide silt fence on the downslope portions of the
perimeter of the project area, as directed by the Engineer. The
contract unit price for "Silt Fence, Installed, at Per Linear
Foot" shall be considered full compensation for all labor,
equipment and materials costs associated with providing and
installing the silt fence where directed by the Engineer. Aside
from this requirement, all measures required for erosion control
shall be the responsibility of the Contractor, and all costs
shall be considered incidental to the contract unit price for
"Erosion Control Plan, at Per Lump Sum" as listed in the
proposal.

4.14 Pollution Control

Contractor shall prevent the pollution of drains and
watercourses by sanitary wastes, sediment, debris, and other
substances resulting from construction activities. No sanitary
wastes will be permitted to enter any drain or watercourse other
than sanitary sewers. No sediment, debris, or other substance
will be permitted to enter sanitary sewers and reasonable
measures will be taken to prevent such materials from entering
any drain or watercourse. The Contractor shall be responsible
for cleaning any ditches, culverts, catch basins, manholes and
sewers in the project area at the end of the project which
contain sediment and debris. All costs associated with cleaning
these sewer facilities shall be considered incidental to the
contract.
5.00 DRAWINGS

5.01 Scope
This section lists the Drawings which cover the Work.

5.02 Drawing List
Drawing titles are as follows:

<table>
<thead>
<tr>
<th>Sheet Number</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TITLE SHEET</td>
</tr>
<tr>
<td>2</td>
<td>LEGEND, ABBREVIATIONS, NOTES</td>
</tr>
<tr>
<td>3</td>
<td>TACOMA LANDFILL SITE PLAN</td>
</tr>
<tr>
<td>4</td>
<td>GRADING PLAN - NORTH END</td>
</tr>
<tr>
<td>5</td>
<td>GRADING PLAN - SOUTH END</td>
</tr>
<tr>
<td>6</td>
<td>GAS/CONDENSATE COLLECTION SYSTEM - NORTH END</td>
</tr>
<tr>
<td>7</td>
<td>GAS/CONDENSATE COLLECTION SYSTEM - SOUTH END</td>
</tr>
<tr>
<td>8</td>
<td>ROAD PROFILES</td>
</tr>
<tr>
<td>9</td>
<td>CROSS SECTIONS</td>
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<td>CROSS SECTIONS</td>
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<tr>
<td>18</td>
<td>GRADING, DRAINAGE AND COVER DETAILS</td>
</tr>
<tr>
<td>19</td>
<td>GRADING, DRAINAGE AND COVER DETAILS</td>
</tr>
<tr>
<td>20</td>
<td>LINER CONNECTION DETAILS</td>
</tr>
<tr>
<td>21</td>
<td>GAS COLLECTION DETAILS</td>
</tr>
</tbody>
</table>

(STAGE 1 NORTH CLOSURE)  
(TACOMA LANDFILL)
<table>
<thead>
<tr>
<th>Sheet Number</th>
<th>Title</th>
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<tr>
<td>22</td>
<td>GAS COLLECTION DETAILS</td>
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<td>GAS COLLECTION DETAILS</td>
</tr>
<tr>
<td>24</td>
<td>GAS COLLECTION DETAILS</td>
</tr>
<tr>
<td>25</td>
<td>CONDENSATE COLLECTION DETAILS</td>
</tr>
<tr>
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<td>CONDENSATE COLLECTION DETAILS</td>
</tr>
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<td>27</td>
<td>CONDENSATE COLLECTION DETAILS</td>
</tr>
<tr>
<td>28</td>
<td>CONDENSATE VACUUM PUMP STATION DETAILS</td>
</tr>
<tr>
<td>29</td>
<td>ELECTRICAL SITE PLAN, LEGEND, AND DETAIL</td>
</tr>
<tr>
<td>30</td>
<td>VACUUM PUMP AND COLLECTION STATIONS</td>
</tr>
<tr>
<td>31</td>
<td>ONE-LINE DIAGRAM AND CONTROL PANELS</td>
</tr>
</tbody>
</table>

In addition, each sheet has the following general title:

CITY OF TACOMA
DEPARTMENT OF PUBLIC WORKS
STAGE ONE-NORTH CLOSURE
TACOMA LANDFILL
WORK ORDER NO. AU 6506
1990

The drawings listed above are supplemented by drawings listed in the Table of Contents which are bound herein, and by Contractor's submittals as required by the Contract Documents.
6.00 EARTHWORK

6.01 Scope

The earthwork requirements for this project include excavation, soil bedding installation, final subgrade preparation, sand drainage layer installation, transportation and stockpiling of materials, cover material installation and access road relocation.

6.02 Clearing and Grubbing

All shrubs, vegetation, large rocks (i.e. larger than one-man rocks), etc. which are within the limits of the areas to be excavated, areas to be sloped, or areas to be prepared for cap installation shall be removed by the Contractor. The cost of all labor, equipment and materials required to remove and dispose of this debris, as stated above, shall be considered incidental to the contract unit price for "Clearing and Grubbing, at per Lump Sum" as listed in the proposal. All vegetation material, with the exception of large stumps, can be disposed of at the landfill, as directed by the Engineer, at no charge to the Contractor. All costs associated with loading the vegetative material and hauling it to the working face of the landfill shall be considered incidental to the contract unit price for "Clearing and Grubbing, at per Lump Sum" as listed in the proposal. Large rocks shall be stockpiled where shown on the plans or directed by the Engineer.

6.03 Classification of Excavated Materials

Excavated material will be identified by the Engineer in order to determine whether it may be useful for the cap installation. Excavation and trenching work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the contract work, regardless of the type, character, composition, or condition thereof. Haul of on-site materials, including, but not limited to, excavated soils, unsuitable materials, refuse, clearing debris, etc. shall be defined as haul anywhere within the property limits of the Tacoma Landfill, as directed by the Engineer.

6.04 Blasting

Blasting or other use of explosives for excavation will not be permitted.
6.05 Moisture Conditioning of Soils

Moisture conditioning of soils, when required, shall be completed during placement or at the stockpile at the Contractor's discretion. The Contractor shall submit test results for each material, which show the range of moisture content acceptable in order to achieve the required densities, to the CQA Officer for approval. The Contractor shall also submit:

1. Procedures for aerating or applying water to the surficial material (6 inches to a foot) in place or to the stockpile;

2. Methods to be employed to ensure that moisture level in place is maintained, once the desired moisture content has been achieved.

All costs associated with moisture conditioning shall be considered incidental to the contract unit price for the type of material being placed.

6.06 Stabilization

Landfill cap subgrades and trench bottoms shall be firm, dense, and thoroughly compacted and consolidated; shall be free from mud and muck; and shall be sufficiently stable to remain firm and intact under the feet of the workmen.

Soil bedding subgrades or trench bottoms which are otherwise solid, but which become mucky on top due to construction operations, shall be reinforced with bank run gravel, meeting the requirements of Section 6.15 of these specifications, as directed by the Engineer. The stabilizing material shall be spread and compacted in lifts of not more than 4 inches. The finished elevation of stabilized subgrades shall not be above subgrade elevations indicated on the Drawings. Costs for stabilization shall be considered incidental to the unit prices for "Bank Run Gravel, at Per Ton" as measured in place by certified weight, and "Overexcavation of Unsuitable Material, at Per Cubic Yard", as measured by neat line measure in the field, including excavating, loading, hauling and disposing of the unsuitable material, and furnishing, hauling, placing and compacting the bank run gravel.

6.07 Excavation

Excavation for this project is required to regrade the project area. Areas shall be excavated to the contours shown on the plans and staked in the field, unless otherwise
directed by the Engineer. The unit prices bid for the excavation shall include all excavation and shaping required to establish the lines and grades indicated on the drawings or as directed by the Engineer. In general, the area shall be excavated to a depth of approximately 1-foot below cap subgrade elevations as shown on the drawings, or as directed by the Engineer. This is designed to leave approximately 12 inches of intermediate cover material in place, undisturbed. The subgrade shall then be prepared in accordance with Section 6.08. Excavated material which is to be reused by the Contractor as part of the soil bedding layer shall be stockpiled within the actual construction area, as identified by the limits of liner installation. Excess material shall be stockpiled in the main stockpile area shown on the plans. This material is to be used as part of a different contract.

Any stumps, rocks, or other large debris which are encountered during excavation shall be removed and disposed of in accordance with Section 6.02 of the specifications. All labor, equipment, and materials costs associated with removal, loading, hauling, and disposal of this debris, including pavement chunks, shall be considered incidental to the contract unit price for "Excavation, at Per Cubic Yard" as listed in the proposal. In addition, the Contractor may encounter existing refuse when excavating. This material shall be hauled to the working face of the landfill, and all costs associated with removal, loading, hauling and disposing of this material shall be considered incidental to the contract unit price for "Excavation, at Per Cubic Yard". All costs for excavation required for the installation of catch basins shall be considered incidental to the contract unit price for "Structure Excavation, Class B, Including Haul, at Per Cubic Yard" as listed in the proposal. Refer to Sections 2-09 and 7-05 of the State Standard Specifications as amended by the City of Tacoma.

The contract unit price for "Excavation, at per Cubic Yard" shall be considered full compensation for all labor, equipment and materials costs associated with excavating, loading, hauling, and stockpiling all material required to be excavated, including excavating, shaping, loading, hauling, and stockpiling in the location shown on the plans or as directed by the Engineer. Payment for this excavation bid item shall be based on the cubic yard as measured in the hauling vehicle.

6.08 Subgrade Preparation

After excavation, as described in Section 6.07, the area to be covered shall then be prepared by proofrolling with a
smooth-drum roller (Dynapac CA-25B or equal) to an unyielding subgrade. At the direction of the Engineer, soft or yielding areas shall be excavated and replaced with Bank Run gravel in accordance with Section 6.06. Sharp sticks, objects, or other objectionable material shall be removed at the direction of the Engineer. The unit contract price "Subgrade Preparation, at per Square Yard" shall be considered full compensation for all labor, equipment, and materials costs associated with removal of objectionable objects and proofrolling, as described above. Excavation of soft or yielding areas shall be compensated at the unit contract price for "Overexcavation of Unsuitable Material, at Per Cubic Yard", as explained in Section 6.06. Replacement of soil shall be compensated at the contract unit price for "Bank Run Gravel, at Per Ton", as explained in Section 6.06.

6.09 Soil Bedding

One foot of bedding soil shall be applied over the 1 foot of existing cover soil over the wastes to provide a subgrade for the lower synthetic membrane. Bedding shall be placed in two lifts. The material which was excavated as described in Section 6.07 shall be used for the first 6" compacted depth lift of this bedding layer providing it is free of sharp objects and rocks larger than 3 inches in diameter. The top 6 inch lift shall be 3/4-inch minus pit run sand.

The removal and stockpiling of excess soils as described in Section 6.07 shall be paid at the unit price for "Excavation, at per Cubic Yard". Approximate depths of cover material already in place are contained in the Geotechnical Investigation Report in Attachment C. The bedding soil shall be graded to attain a smooth, shaped surface on which to place the synthetic cap. The finished surface shall meet the requirements of Section 8.05. Bedding soil shall be compacted to 90 percent of the maximum density of the optimum moisture content as determined by ASTM D698. Bedding soil shall be placed within minus 2 percent to plus 2 percent of the optimum moisture content.

Following installation of each lift of the soil bedding, the area to be covered shall be compacted with a smooth-drum vibratory roller (Dynapac CA-25B or equal) to meet the compaction requirements. Any sharp objects or other objectionable material shall be removed at the direction of the Engineer. The finished surface shall meet the requirements of Section 8.05. Any soft or yielding areas disclosed during compaction shall be excavated, backfilled and paid for in accordance with Section 6.08. Backfill material for these areas shall be the 3/4-inch minus pit run...
Sand, and all costs for furnishing backfilling and compacting this material shall be considered incidental to the contract unit price for "Soil Bedding, Top Lift, Imported 3/4-inch minus Pit Run Sand, at Per Ton" as listed in the proposal.

The contract unit price for "Soil Bedding, Lower Lift On-site Material, at per Cubic Yard" shall be considered full compensation for all labor, equipment, and materials costs associated with loading, hauling, placing, spreading, and compacting the first lift of soil bedding material as described above. In addition, this material shall be placed over the native material as the cover layer in the unlined areas as shown on detail G-1 on sheet 16 of 31. Measurement for this first lift of soil bedding material shall be by the cubic yard in the hauling vehicle. The contract unit price for "Soil Bedding Top Lift, Imported 3/4-inch Minus Pit Run Sand, at Per Ton" by certified weight in place shall be considered full compensation for all labor, equipment and materials costs associated with furnishing, hauling, placing, spreading, and compacting this material to be used in the top lift to the job site.

6.10 Sand

Sand bedding shall be placed between the geomembranes. The material shall be free from clay or humus or other objectionable material and shall be graded in accordance with the Washington State Department of Transportation 1988 Standard Specifications for Road, Bridge, and Municipal Construction requirements for "Backfill for Sand Drains" as set forth in paragraph 9-03.13 of the State Standard Specifications. Sand shall be placed in a continuous 12-inch lift so as to prevent damage to the underlying geomembrane. Sand bedding shall be compacted to 90 percent of the maximum density as determined by ASTM D698. Sand shall be placed within minus 2 percent to plus 2 percent of the optimum moisture content.

Sand bedding will be measured and paid for by the ton, in place, by certified weights. Load tickets will be collected, verified and used as the basis for payment. The contract unit price for "Sand for Drainage Layer, at per Ton" as listed in the proposal shall be considered full compensation for all labor, equipment and materials costs associated with furnishing, hauling, placing, spreading and compacting the sand material as described herein and as shown on the Drawings.
6.11 **Cover Material**

A protective soil cover shall be placed over the synthetic cap system as shown on the plans. This 18-inch layer of soil shall be placed over the filter fabric and graded to provide cover and protection for the cap system and a base for the topsoil. Soil used as cover material shall be 3/4-inch minus pit run sand. This pit run sand shall consist of free draining granular material, free from various types of wood waste or other extraneous or objectionable materials.

Material deposited in piles or windrows by excavating or hauling equipment shall be spread and leveled prior to compaction. Cover material shall be placed in two lifts. The initial lift of cover material shall be a minimum of 12-inches of loose depth. Material shall be compacted to 90 percent of the maximum density at optimum moisture content as determined by ASTM D698. The material shall be placed within minus 2 percent to plus 2 percent of the optimum moisture content. Soil shall be placed so that the membrane system is not wrinkled or folded.

Soil to be used as cover material shall be imported. Material will be measured and paid for by the ton in place by certified weight. The contract price for "Cover Material, at per Ton" shall be considered full compensation for all labor, equipment, and material costs associated with furnishing, hauling, placing, grading, and compacting the cover material in place as shown on the Drawings.

6.12 **Crushed Surfacing Top Course**

The Proposal quantity for "Crushed Surfacing Top Course, Per Ton" is an estimated amount of material which shall be placed on the area to be paved, and on the shoulder adjacent to the paved area, as shown on the plans. The Proposal quantity is an estimate only and the Contractor shall be compensated only for the actual amount of material used during construction. Crushed Surfacing Top Course shall meet the requirements of Section 9-03.9(3) of the State Standard Specifications.

The contract unit price for "Crushed Surfacing Top Course, per Ton" shall be full compensation for all labor, material and equipment required to provide, spread, process and compact the material over the roadway surface as directed by the Engineer.
6.13 Crushed Surface Base Course

Crushed Surface Base Course (CSBC) shall be used under the pavement section. Crushed Surfacing Base Course shall meet all the requirements of Section 9-03.9(3) of the State Standard Specifications. The contract unit price for "Crushed Surfacing Base Course, at per Ton" as listed in the proposal shall be full compensation for all labor, equipment, and materials costs associated with providing, spreading, processing, and compacting the material on the roadway surface as shown on the Drawings and directed by the Engineer.

6.14 Crushed Ballast

Crushed ballast shall be used on access roadways, where shown on the Drawings. Crushed ballast material shall meet the requirements of Section 9-03.16 of the 1988 City of Tacoma Amendments to the State Standard Specifications. This material shall be compacted to 90-percent of the maximum density at optimum moisture content as determined by ASTM D698. The crushed ballast shall be placed within minus 2 percent to plus 2 percent of the optimum moisture content. The contract unit price for "Crushed Ballast, at Per Ton" shall be full compensation for all labor, equipment, and materials costs associated with furnishing, placing, grading, and compacting the material in place, and shall be paid by the ton, in place, by certified weight.

6.15 Bank Run Gravel

Bank run gravel shall be used as the first 12" compacted depth layer of cover over the access roads, as shown on the drawings. This material shall be placed in one lift.

Bank run gravel shall consist of free draining granular material, free from various types of wood waste or other extraneous or objectionable materials. It shall meet the following requirements for grading and quality when placed in hauling vehicles for delivery to the roadway or during manufacture and placement into a temporary stockpile. The exact point of acceptance will be determined by the Engineer.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
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<tbody>
<tr>
<td>4&quot; Square</td>
<td>100</td>
</tr>
<tr>
<td>1/4&quot; Square</td>
<td>25-50</td>
</tr>
<tr>
<td>U.S. No. 200 (Wet Sieve)</td>
<td>5 Maximum</td>
</tr>
<tr>
<td>Dust Ratio</td>
<td>2/3 Maximum</td>
</tr>
<tr>
<td>Sand Equivalent</td>
<td>50 Minimum</td>
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</table>
That portion of the material retained on the 1/4" square opening shall not contain more than 0.20 percent (by weight) of wood waste.

The contract unit price for "Bank Run Gravel, at Per Ton" shall be considered full compensation for all labor, equipment, and materials costs associated with furnishing, hauling, placing, spreading and compacting the bank run gravel on the roadways, in soft spots, and any other area identified in these specifications, shown on the drawings, or directed by the Engineer, excluding bank run used for trench backfill.

6.16 Tests

All tests required for preliminary review of materials shall be made by an acceptable independent testing laboratory at the expense of the Contractor. Two initial gradation tests shall be made for each type of embedment, fill, or backfill material and one additional gradation test shall be made for each additional 500 tons of each material. Promptly after award of the Contract, the Contractor shall notify the Engineer of the proposed source of sand, cover material, crushed surfacing top course, crushed surfacing base coarse, crushed ballast material and the 3/4-inch Minus Pit Run Sand. The Contractor shall furnish material from other approved sources if it is found that sources of supply that have been approved do not furnish a uniform product or if the product is determined to be unacceptable.

Moisture-Density (Proctor) tests on the materials, and all in-place field density tests, shall be made by the Owner and at the expense of the Owner.

6.17 Protection of Existing Liner

The Contractor shall use every means possible to protect and prevent damage to any of the existing geomembranes during construction. The City shall stake the location of the geomembrane at the connection to the Public Receiving Facility cap. The Contractor shall note this location and shall select his equipment accordingly. The existing anchor trench at the connection to the Public Receiving Facility Cap is covered with plywood, backfilled and staked. The Contractor shall be liable for all damage to the geomembrane and shall provide full compensation for the repair of the damaged geomembrane. Any and all protective measures shall be considered incidental to the Contract. The contract unit price "Connection to Public Receiving Facility Geomembrane, at per Linear Foot" shall include compensation for all labor,
equipment, and materials required to excavate the existing cover soil and load, haul, and dispose of the material in the stockpile area, and, expose, clean, and repair the existing geomembrane where necessary, and to connect the new geomembrane to the Public Receiving Facility Geomembrane, as shown on the Drawings, Detail G-6.

(STAGE 1 NORTH CLOSURE)
(TACOMA LANDFILL)
7.00 STORM DRAINAGE FACILITIES

7.01 Scope

This section covers the material and installation requirements for catch basins and storm drainage facilities to be installed under this project. This work shall consist of constructing catch basins, storm sewers, and PVC drainage lines of the sizes and types designated on the Drawings and described herein, in accordance with the WSDOT 1988 Standard Specifications for Road, Bridge, and Municipal Construction as amended by the City of Tacoma, the WSDOT Standard Plans for Road, Bridge, and Municipal Construction, and as supplemented by the following.

7.02 Materials

All materials and construction requirements for catch basins and other storm drainage facilities shall conform to the WSDOT 1988 Standard Specifications and Standard Plans for Road, Bridge, and Municipal Construction as amended by the City of Tacoma.

7.03 Six Inch PVC Subsurface Drain Pipes

This section covers perforated polyvinyl chloride (PVC) subsurface drainage collection lines to be installed above the top liner in drainage ditches and under the asphalt section. The contract unit price for "6-inch Diameter Perforated PVC Subsurface Drain Pipe, at Per Linear Foot" as listed in the proposal shall be full compensation for all labor, equipment and materials costs associated with providing and installing all 6-inch PVC Subsurface Drain Pipes as shown on the plans including all jointing materials, appurtenances, and connections to catch basins. All costs associated with providing and installing filter fabric and drain rock, required to complete the subsurface drain installation as shown on the plans shall be considered incidental to this contract unit price.

Perforated PVC piping shall meet the requirements set forth in Section 9-05.2(6) of State Standard Specifications. At the Contractor's option, an approved equal slotted PVC pipe may be used. Should the Contractor choose this option, he shall submit plans showing pipe dimensions and slot sizes and intervals for approval.

Excavation, formation and compaction of the drainage ditches in which these subsurface drain lines are to be installed shall be
considered incidental to the contract unit price for "Drainage Swale Construction at Per Linear Foot" as listed in the proposal. Placement of all other materials in the drainage swales, including soil bedding, sand, cover material and topsoil shall be considered incidental to the appropriate soil material bid item. As shown on the drawings, some areas have short distances where the pipe is not perforated. There will be no separate payments for this unperforated pipe. Costs will be considered incidental to the contract unit price for the perforated pipe, or for the liner penetrations, whichever is appropriate.

7.04 Four Inch Perforated PVC Underdrain Pipe

This section covers perforated polyvinyl chloride (PVC) underdrain lines to be installed between the two liners in drainage ditches and under the asphalt section. The contract unit price for "4-inch Diameter Perforated PVC Underdrain Pipe Wrapped with Filter Fabric, at Per Linear Foot" as listed in the proposal shall be full compensation for all labor, equipment and materials costs associated with providing and installing all PVC Underdrain Pipes wrapped with filter fabric as shown on the plans including all jointing materials, appurtenances, and connections to catch basins. All costs associated with providing and installing filter fabric as shown on the plans shall be considered incidental to this contract unit price.

Requirements for the PVC materials shall be the same as those described in Section 7.03.

As stated in Section 7.03, excavation, formation and compaction of the drainage ditches in which these two subsurface drain lines are to be installed shall be considered incidental to the contract unit price for "Drainage Swale Construction, at Per Linear Foot" as listed in the proposal. Placement of all other materials in the drainage swales, including soil bedding, sand, cover material and top soil shall be considered incidental to the appropriate soil material bid item.

7.05 Drain Rock For Subsurface Drains

Drain Rock shall be installed as backfill for the subsurface drain pipes as described in Section 7.03. Drain Rock to be used shall meet the State Standard Specification 9-03.12(4) Grading No. 5, Gravel Backfill for Drains.

All costs associated with furnishing and placing the drain rock shall be considered incidental to the contract unit price for "6-inch Diameter Perforated PVC Subsurface Drain Pipe, at Per Linear Foot" as listed in the proposal.
7.06 **Filter Fabric**

Filter fabric to be used in conjunction with subsurface drain lines and drainage swales shall meet the specifications listed in Sections 8.03(c) and 8.04(c). All costs associated with furnishing and installing the filter fabric as shown on the details shall be considered incidental to the contract unit prices for "6-inch Diameter Perforated PVC Subsurface Drain Pipe, at Per Linear Foot", or "4-inch Diameter Perforated PVC Underdrain Pipe Wrapped with Filter Fabric, at per Linear Foot", whichever is appropriate.

7.07 **Concrete Storm Sewer Pipe**

This section covers sewer pipe to be installed. The contract unit price for "18-inch Concrete Storm Sewer Pipe, at Per Linear Foot" as listed in the proposal shall be considered full compensation for all labor, equipment, and materials costs associated with furnishing and installing all concrete storm sewer pipes as shown on the plans or directed by the Engineer including all bedding, joints, appurtenances and connection to catch basins.

7.08 **Polyethylene Storm Sewer Pipe**

Polyethylene storm sewer pipe shall be installed where shown on the drawings. Polyethylene pipe shall meet the requirements of Section 9.05.18 of the State Standard Specifications as amended by the City of Tacoma. Pipe shall have an SDR rating of 32.5 and shall be installed in accordance with manufacturer's recommendations.

The contract unit price for "12-inch Diameter Polyethylene Storm Sewer Pipe, at Per Linear Foot" shall be considered full compensation for all labor, equipment, and materials costs associated with installation of the PE pipe as shown on the Drawings, including all bedding, joints, appurtenances, and connections to catch basins.

7.09 **Adjust Existing Catch Basins to Grade**

All labor, equipment, and materials required to adjust existing catch basins and to provide and install the new frame and grate shall be paid for in accordance with the unit contract price for "Adjust Existing Catch Basins, Furnish New Frame and Grate, at Per Each," as listed in the proposal. This work shall be performed as shown on Standard Plan B-2b.
7.10 **Trench Dewatering**

No trench dewatering shall be allowed prior to actual trench excavation. All dewatering measures shall be taken in the open trench. Water from dewatering operations shall be disposed of in the storm or sanitary sewer as directed by the Engineer.

Any trench dewatering which is required shall be considered incidental to the contract unit price for trench excavation.

7.11 **Catch Basin Frames and Grates**

All frames and grates for catch basin inlets on this project shall be "vane" type and shall conform to that shown on Standard Plan No. B-2b.

7.12 **Connection to Existing Manhole**

In accordance with Section 7-05.5 of the Standard Specifications as amended by the City of Tacoma, connections to existing manhole above the concrete shelf or to an existing stub shall be considered incidental to the contract.

7.13 **Shoring and Cribbing/Trench Safety Systems**

A. **General**

If workers enter any trench or other excavation four feet or more in depth that does not meet the open pit requirements of Section 2-09.3(3)b of the State Standard Specifications, it shall be shored and cribbed. The Contractor alone shall be responsible for worker safety and the City assumes no responsibility. All trench safety systems shall meet the requirements of the Washington Industrial Safety and Health Act, Chapter 49.17 RCW.

Where the trench is excavated to a depth of 4 feet or more and shoring and cribbing is constructed or the earth faces are excavated to meet the slope of repose provided it is \( \frac{3}{4} \) to 1 or flatter as required to meet safety regulations, the area of payment will be measured on the center line of the trench or excavation where such work is performed.

B. **Measurement**

Where the trench is excavated to a depth of 4 feet or greater and shoring and cribbing is constructed or the earth faces are excavated to meet the slope of repose provided it is \( \frac{3}{4} \) to 1 or flatter as required to meet safety regulations, the area of payment will be measured as follows:
1. Trenches for Pipes, Etc.

Measurement of depth shall be from existing grade, at pipe centerline, to the pipe invert as determined by the Engineer. Depth measurements shall be taken at intervals not to exceed 50 feet. An average depth shall be computed over those intervals where the depth is 4 feet or greater. The square foot quantity for payment shall be the average depth multiplied by the length of the interval where the depth exceeds 4 feet. Please note the above language for measurement specifically describes one, and only one, vertical plan area on the pipe centerline. It shall be understood the quantity measured is not the area of either or both trench sidewalls.

2. Excavation for Catch Basins, Manholes, Etc.

The square-foot quantity for payment shall be calculated by multiplying the length of the perimeter of the excavation, which exceeds four (4) feet in depth, by the average depth of the excavation. The perimeter of the excavation shall be defined as the perimeter that provides one foot of outside clearance from the outside surface of the structure.

C. Payment

"Shoring and Cribbing or Extra Excavation, at Per Square Foot" shall be paid only in areas where the depth is 4 feet or greater. The unit contract price per square foot for "Shoring and Cribbing or Extra Excavation" shall be full pay for the construction and removal of shoring and cribbing. The unit contract price shall also be full pay for all excavation, backfill, compaction, and other work when extra excavation is used in lieu of constructing shoring and cribbing. If "Bank Run Gravel" is required for backfilling within the limits of the additional excavation, it will be paid for as specified in the City Amendment up to a maximum trench width as discussed in Section 2-09.4 of the State Standard Specifications. If additional "Bank Run Gravel" is necessary for backfill beyond the specified maximum trench width, it shall be considered for the Contractor's benefit and it shall be at the Contractor's expense.

In addition, the minimum unit price bid for "Shoring and Cribbing or Extra Excavation" shall be twenty-five cents per square foot. Should the Contractor determine that his costs for this work are greater than $0.25 per square foot, he may
bid a unit price greater than the minimum by crossing out the minimum bid, writing in his bid price and initialing the change. Should a contractor write in a bid less than the minimum for these items, the $0.25 per square foot minimum bid shall govern and shall become a part of his bid.

7.14 This section is vacant.

7.15 Pipe Bedding

Pipe bedding for storm sewers shall conform to Standard Plan No. B-18c. Rigid pipe shall be bedded in accordance with Class 8 requirement. Flexible pipe shall be bedded in accordance with Class F requirements. Bedding material shall conform to Section 9-03.12(3) of the State Standard Specifications as amended by the City of Tacoma.

All costs relative to furnishing and placing pipe bedding material shall be considered incidental to the respective unit contract prices for the pipe being installed.

7.16 Trench Excavation

The contract unit price for "Trench Excavation, at Per Cubic Yard" shall be full compensation for all labor, equipment, and materials required for excavation, removal of water, backfilling and all other work necessary to the construction of the storm sewer trenches shown on the plans and described herein, including pavement removal and chipping of the existing roadway surface where required. It is likely that the Contractor will be excavating existing refuse during trench excavation. This material shall be removed and disposed of as described below.

Trench excavation for all underground gas transmission lines, horizontal gas wells, condensate lines, and electrical lines shall be paid for as discussed in Sections 9.00 and 10.00.

Materials excavated from the trench shall be used for backfill, except that organic material, refuse, frozen lumps, or rocks, or pavement chunks more than six inches in maximum dimension shall not be used; and except that material determined by the Engineer to be unsuitable for backfill at the time of excavation shall be removed and replaced with imported backfill.
material meeting Section 9-03.18 of the Standard Specifications as amended by the City of Tacoma. All costs for removal and disposal of such unsuitable material shall be considered incidental to the contract unit price for "Trench Excavation, at Per Cubic Yard".

7.17 **Bank Run Gravel for Trench Backfilling**

The quantity as listed in the proposal for "Bank Run Gravel for Trench Backfilling, at per Ton" is the estimated quantity to be used for trench backfill where the Engineer determines that the excavated material is unsuitable for use as backfill. Placement of all Bank Run Gravel shall be with the approval of the Engineer. Bank Run gravel shall meet the requirements of Section 9-03.18 of the Standard Specifications as amended by the City of Tacoma. The quantity listed in the proposal also contains an estimated quantity to be used for backfill of the anchor trench as specified in Section 8.06 of these specifications.

7.18 **Cleanouts**

The contract unit price for "Cleanouts, at Per Each" shall be considered full compensation for all labor, equipment, and materials costs associated with construction of the cleanouts as shown on Detail G-8 on Sheet 18 of the Drawings, including all excavation and haul of excavated material, special fittings, (wyes, els & plugs) meter box, backfilling and all other work required for a complete installation. Cleanouts will vary somewhat in length but average length is approximately 8 feet.

7.19 **Grass-Lined Drainage Swales**

The drainage swales which are to be constructed on this project shall be lined with jute matting and hydroseed. Formation, shaping, and compaction of the swales shall be considered incidental to the contract unit price for "Drainage Swale Construction, at Per Linear Foot", as listed in the proposal. Installation of soil bedding, synthetic cap system, sand, cover material and topsoil shall be performed and paid for as discussed in the appropriate specification sections. The contract unit price for "Jute Matting, at Per Square Foot" shall be considered full compensation for all labor, equipment, and materials costs associated with furnishing and installing the jute matting in the drainage swales to the limits shown on the plans or as directed by the Engineer. Jute matting shall meet the requirements of Section 14.04(G). All costs associated with hydroseeding the drainage swales shall be considered incidental to the contract unit price for "Hydroseeding, Fertilizing, and Mulching, at per Acre" as listed in the proposal.
7.20 Catch Basin Installation Over Existing 18-inch Diameter Polyethylene Pipe

At the west end of access road "B", a Type II catch basin is to be installed over an existing 18-inch diameter polyethylene storm sewer pipe. The existing storm sewer pipe shall be cut to provide adequate space for installation of the Type II catch basin as shown on the plans. The storm sewer shall then be reconnected to the catch basin using Raychem 18" diameter UT X Ultrafuse Couplers, as distributed by Maskell-Robbins, Inc., or approved equal.

All costs associated with installation of this catch basin including excavation, backfill, bedding, etc., shall be considered incidental to the contract unit price for "Catch Basin, Type II, 48-inch Diameter, at Per Each" as listed in the proposal. All labor, equipment and materials costs associated with making the fused connections of the existing polyethylene pipe shall be considered incidental to the contract unit price for "Fused Coupler, at Per Each" as listed in the proposal.
Frame and grate
(See Standard Plan for details)

Notes:
Catch Basins to be constructed in accordance with ASTM C 478 (AASHTO M 199) & ASTM C 850 unless otherwise shown on plans or noted in the Standard Specifications.

As an acceptable alternate to rebar, welded wire fabric having a minimum area of 0.12 square inches per foot may be used. Welded wire fabric shall comply to ASTM A 491 (AASHTO M 221). Wire fabric shall not be placed in the knockouts.

The bottom of the precast base section may be rounded.

Precast bases shall be furnished with cutouts or knockouts. Knockouts shall have a wall thickness of 2' minimum.

Knockouts may be on all 4 sides with maximum diameter of 20'. Knockouts may be either round or D' shape. Pipe to be installed in factory supplied knockouts.

Knockout cutout hole size is equal to pipe outer diameter plus catch basin wall thickness.

The maximum depth from the finished grade to the pipe invert is 5'-0'.

The taper on the sides of the precast base section and riser section shall not exceed 1/4"/ft.

Catch basin frame and grate shall be in accordance with Standard Specifications and meet the strength requirements of Federal Specification RR-F-620D. mating surfaces shall be finished to assure non-rocking fit.

Frame and grate may be installed with flange down or cast into riser.

CATCH BASIN TYPE I
CATCH BASIN TYPE 2
48' & 54'

Catch Basins to be constructed in accordance with ASTM C 476 (AASHTO M 1991) & ASTM C 890 unless otherwise shown on plans or noted in the Standard Specifications.

Handholds in riser or adjustment section shall have 3" minimum clearance. Steps in catch basin shall have 6" minimum clearance. No steps are required when 'B' is 4' or less.

All reinforced cast in place concrete shall be Class A. All precast concrete shall obtain 4000 PSI 28 days.

Precast bases shall be furnished with cutouts or knockouts. Knockouts shall have a wall thickness of 2" minimum.

Knockout or cutout hole size is equal to pipe outer diameter plus catch basin wall thickness. Maximum hole size for 48" catch basin is 35" for 48" catch basin, 42" for 54" catch basin Minimum distance between holes is 8".

Frame and grate or ring and cover shall be in accordance with Standard Specifications and meet the strength requirements of Federal Specification RR-F-620. Wasting surfaces shall be finished to assure non-rocking fill.

All base reinforcing steel shall have a minimum yield strength of 60,000 PSI and be placed in the upper half of the base with 1" minimum clearance.

The bottom of the precast Catch Basin may be rounded.

For details showing frame and grate, ring and cover see Standard Plan 'Metal Frame and Gate for Catch Basin and Inlets'.

For details showing ladder, steps, handrail and top slab see Standard Plan 'Miscellaneous Catch Basin Details'.

Frame and grate may be installed with flange down or cast into riser.
NOTES:
1. The name of the manufacturer and direction of flow shall be embossed on the top surface of each Grate. Lettering to be recessed 1/16".
2. Material shall be in accordance with Division 9 of the Standard Specifications "Metal Frame and Grate for Catch Basins or Inlets."
3. The material used for the grate shall be designated by embossing either DI (for Ductile Iron) or CS (for Cast Steel) near the name of the manufacturer.
4. Dimensions shall have a ± 1/16" tolerance, except as noted.
5. Edges shall have 1/8" radius, 1/8" chamfer, or complete deburring.
6. The grate shall be manufactured in accordance with Standard Plan B-2A.
7. Welding is not permitted.
8. As an alternate, 8 pads 1 1/2" x 3/4" x 1/8", integrally cast with the grate, may be used.

Approximate weight = 101 Lbs.
NOTES:
1. Proprietary catch basin steps are acceptable, provided that they conform to Section R, ASTM C 478 (AASHTO M 199) and meet all WISHA requirements.

2. Catch basin step legs shall be parallel or approximately radial at the option of the manufacturer, except that all steps in any catch basin shall be similar. Penetration of outer wall by a leg is prohibited.

3. Slab opening may be 24" x 20" or 24" diameter.

4. As an acceptable alternative to rebar, welded wire fabric having a minimum area of 0.12 square inches per foot may be used. Welded wire fabric shall comply to ASTM A 497 (AASHTO M 221).

TYPICAL ORIENTATION FOR ACCESS AND STEPS

MISCELLANEOUS CATCH BASIN DETAILS
BEDDING FOR RIGID PIPE IN TRENCHES

Notes:
1. Provide uniform support under barrel.
2. Hand tamp under haunches.
3. Compact bedding material to 95% MAX density except directly over pipe, hand tamp only.
4. Make surface of bedding level or slope up away from pipe.
5. See Sec. 7-17.3(11) for trench width "W" and trenching options. The pipe zone will be the actual trench width, except that for Class A bedding, the MIN concrete width shall be 1½ I.D. + 18".
6. See Sec. 9-03.1(3) for bedding gradation.
7. Sidestuff material shall conform to Sec. 7-17.3(13), backfill, except that rocks or lumps larger than 1" per foot of pipe diameter shall not be used.

PIPE BEDDING FOR SANITARY SEWERS IN TRENCHES ONLY

STANDARD PLAN B-18c
8.00 GEOSYNTHETICS

8.01 Scope

This section covers the material and installation requirements for the geosynthetics. High density polyethylene (HDPE) geomembrane, HDPE drainage net, and geotextile fabric shall be installed as part of the Tacoma Landfill Stage 1 final cover. Geosynthetics shall be installed to the limits indicated on the Drawings.

8.02 General

A. The Contractor shall provide or employ the services of a qualified geomembrane manufacturer and installer with a minimum of 5 years experience in satisfactory production and installation of a minimum of 10,000,000 square feet of geomembrane similar to the membrane to be installed under these specifications. The 10,000,000 square feet of satisfactory installation shall include at least three separate locations and the owners, locations and installation dates shall be furnished to the Owner prior to initiating geomembrane installation.

B. The Contractor shall furnish all labor, material, tools, and equipment to install the geosynthetics as indicated on the contract drawings, as specified, and as required for a complete and proper installation, including, but not limited to, the following:

1. Placing, anchoring, and seaming of the 60 mil thick HDPE geomembranes.

2. Placing, anchoring, and tying the HDPE drainage net.


In addition, the geomembrane supplier will provide a representative to visit the site prior to or during the early stages of installation, to explain installation procedures to the City, Contractor, Engineer, and appropriate regulatory agencies.

8.03 Materials

A. High Density Polyethylene (HDPE) Resin.
Physical properties of the resin shall be as specified below. The raw material testing shown below is intended to assure optimum product consistency, and shall be closely monitored by personnel employed by the manufacturer of the resin. The raw material manufacturer shall provide for permanent inspection during production, shall execute the following tests specific to the material's processing and physical and chemical behavior before delivery, and shall forward the results in a report to the sheet manufacturer.

<table>
<thead>
<tr>
<th>Physical Property</th>
<th>Test Method</th>
<th>Typical Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density, g/cm$^3$ without carbon black</td>
<td>ASTM D 1505</td>
<td>.936 - .956</td>
</tr>
<tr>
<td>Carbon black content, percent</td>
<td>ASTM D 1603</td>
<td>2 - 2.5</td>
</tr>
<tr>
<td>Melt-index, g/10 min</td>
<td>ASTM D 1238</td>
<td>0.10 - 0.25</td>
</tr>
<tr>
<td>Moisture content, percent</td>
<td>ASTM D 570</td>
<td>&lt;0.10</td>
</tr>
</tbody>
</table>

The sheet manufacturer shall sample and test all incoming resins to determine if raw materials comply with the requirements listed above. The test results must fall in exact tolerance ranges, to be determined by the sheet manufacturer. The raw material data shall be retained by the sheet manufacturer and, together with the production data, forwarded to Engineer if requested. Batches not complying to the required ranges shall not be delivered for use in sheet production. The sheet manufacturer shall accept and observe this quality control and will not substitute or mix any untested batches, other material, or additives in the product. The incoming granulate shipment shall be subject to acceptance testing by the sheet manufacturer. The sheet manufacturer shall carry out certain tests as batch identification, before unloading, such as melt-index, density, and moisture content. Raw material not complying to the required ranges shall not be accepted for use in sheet production. The test results are to serve as documentation, and shall be forwarded to Engineer if requested. When transported from storage to the production plant, the granulate must remain a closed system (bagging not allowed), thus precluding effacement of the individual batches and ensuring pure base materials for sheet production.
B. HDPE Drainage Net

The drainage net shall be fabricated from HDPE material compatible with welding techniques used for the HDPE membrane. The physical properties of the resin for the drainage net shall be:

<table>
<thead>
<tr>
<th>Physical Property</th>
<th>Test Method</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific Gravity</td>
<td>ASTM D 1505A</td>
<td>0.93</td>
</tr>
<tr>
<td>Melt Index, /10 min</td>
<td>ASTM D 1238E</td>
<td>0.10 - 0.28</td>
</tr>
<tr>
<td>Carbon black content, percent</td>
<td>ASTM D 1603</td>
<td>1</td>
</tr>
</tbody>
</table>

C. Geotextile.

An 8-ounce geotextile fabric shall be placed over the HDPE drainage net as shown on the Drawings. An 8-ounce geotextile fabric will also be used to cover the drain rock surrounding the 6-inch perforated PVC pipe, and wrap the 4-inch perforated PVC underdrain pipe, as shown on the Drawings. The geotextile fabric shall consist of a nonwoven fabric consisting only of continuous chain or stapled polymeric filaments or yarns of polyester or polypropylene formed into a stable network by needle punching.

8.04 Performance and Design Requirements

A. High Density Polyethylene (HDPE) Membrane.

The sheet shall be extruded so as to produce a uniform sheet free of defects such as holes, tears, punctures blisters, or other manufacturing defects that may affect its durability. Minimum manufactured sheet width shall be 20 feet. The physical properties of the HDPE sheeting shall conform to the requirements listed below.

<table>
<thead>
<tr>
<th>Physical Property</th>
<th>Test Method</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness, mils (nominal)</td>
<td>ASTM D 1593</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Para 8.1.3</td>
<td></td>
</tr>
<tr>
<td>Specific Gravity (minimum)</td>
<td>ASTM D 792</td>
<td>0.940</td>
</tr>
<tr>
<td></td>
<td>Method A</td>
<td></td>
</tr>
<tr>
<td>Physical Property</td>
<td>Test Method</td>
<td>Requirement</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Carbon Black Dispersion</td>
<td>ASTM D 3015</td>
<td>Grade A-2</td>
</tr>
<tr>
<td>Carbon Black Content Percent</td>
<td>ASTM D 1503</td>
<td>2-2.5</td>
</tr>
<tr>
<td>Minimum Tensile Properties (each direction)</td>
<td>ASTM D 638</td>
<td>Speed 4</td>
</tr>
<tr>
<td>Tensile Strength Yield (lb/sq. in.)</td>
<td></td>
<td>2,000</td>
</tr>
<tr>
<td>Tensile Strength at Break (lb/sq. in.)</td>
<td></td>
<td>3,000</td>
</tr>
<tr>
<td>Elongation at Yield (percent)</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Elongation at Break (percent)</td>
<td></td>
<td>500</td>
</tr>
<tr>
<td>Modulus of Elasticity (lb/sq in.)</td>
<td></td>
<td>80,000</td>
</tr>
<tr>
<td>Tear Resistance (lb, minimum)</td>
<td>ASTM D 1004</td>
<td>Die C</td>
</tr>
<tr>
<td>Low Temperature, F</td>
<td>ASTM D 746</td>
<td>Procedure B</td>
</tr>
<tr>
<td>Dimensional Stability (each direction, percent change maximum)</td>
<td>ASTM D 1204</td>
<td>±2</td>
</tr>
<tr>
<td>Environmental Stress Crack (minimum, hours) Condition C</td>
<td>ASTM D 1693</td>
<td>2,000</td>
</tr>
<tr>
<td>Thermal Stability Oxiditavtive Induction Time, Minutes</td>
<td>ASTM D 3895</td>
<td>2,000</td>
</tr>
</tbody>
</table>

Physical property requirements for the resin used for the extrusion joining sheets shall be the same as for the HDPE liner.
A written report covering melting behavior, melt appearance, and forming behavior shall be prepared. The report shall be forwarded to Engineer if requested. The production approval report of the testing engineer shall be attached to the subsequent sheet chart. If a batch does not show favorable behavior in all three respects, it shall be excluded from production. Important extrusion data (processing parameters), such as melt temperature, production rate, etc., shall be monitored. As above, the results may be inspected on request by Engineer at the manufacturer's records department. Melting behavior, melt appearance, and forming behavior shall be monitored during production and documented. The data, labeled with the respective batch and sheet roll numbers, shall be assembled as product documentation and be available on request to Engineer at the manufacturer's records department. The data sheets shall be numerically labeled to expedite this process.

Samples 21 by 30 centimeters or larger shall be excised from the sheet edge at random intervals during production, and at least one sample per roll be stored with appropriate labeling. At least one sample for each 25,000 square feet of liner manufactured shall be subjected to testing such as tensile strength, melt index, ESCR and shrinkage by the sheet manufacturer. The test results must fall in an exactly determined tolerance ranges. The values shall be documented for each individual sample, stored with the respective sheet report and production report, and made available to Engineer on request. The completed labeled sheet roll shall not be placed in storage if any of its test values deviate from the limits.

It is the manufacturer's express obligation to exclude any sheet not complying with these quality standards. A sheet report showing the entire sheet roll shall be prepared on which any visible faults must be accurately entered. A stress cracking durability of range of tolerance greater than or equal to 1,500 hours must be documented in this testing. All results of this testing must, as above, be made available to Engineer on request. If negative results are obtained, the test shall be repeated on another sample from the sheet roll in question. If these results corroborate a substandard tensile-cracking durability, the manufacturer is obligated to exclude the roll from use and additional rolls shall be tested to determine the ESCR of the remaining rolls.
B. HDPE Drainage Net.

The HDPE drainage net shall conform to the following physical properties:

<table>
<thead>
<tr>
<th>Physical Property</th>
<th>Test Method</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness, mm</td>
<td>ASTM D 1593</td>
<td>4</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>ASTM D 1505A</td>
<td>0.93</td>
</tr>
<tr>
<td>Transmissivity, meters²/sec @ 14.5 psi</td>
<td>ASTM D 4716</td>
<td>$3 \times 10^{-6}$</td>
</tr>
</tbody>
</table>

C. Geotextile Fabric.

The fabric shall be inert to commonly encountered chemicals and hydrocarbons. It shall also be resistant to mildew and rot, ultraviolet radiation, insects and rodents. The geotextile fabric shall conform to the properties in the following table. The average roll minimum value (weakest principal direction) for strength properties of any individual roll tested, from the manufacturing lot or lots of a particular shipment, shall be in excess of the average roll minimum value (weakest principal direction) stipulated below. The average roll minimum value is defined as the sampling average (weakest principal direction) of the physical properties for any individual roll tested within a lot designated first quality.

<table>
<thead>
<tr>
<th>Physical Property</th>
<th>Test Method</th>
<th>Average Roll Minimum Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grab Tensile Strength*, lb</td>
<td>ASTM D 4632-86</td>
<td>200</td>
</tr>
<tr>
<td>Elongation at Failure*, percent</td>
<td>ASTM D 4632-86</td>
<td>50</td>
</tr>
<tr>
<td>Mullen Burst Strength, psi</td>
<td>ASTM D 3786</td>
<td>300</td>
</tr>
<tr>
<td>Thickness, mils</td>
<td>ASTM D 1777</td>
<td>90</td>
</tr>
<tr>
<td>Trapezoid Tear Strength*, lb</td>
<td>ASTM D 1117</td>
<td>60</td>
</tr>
<tr>
<td>Puncture Strength, lb</td>
<td>ASTM D 4833</td>
<td>80</td>
</tr>
</tbody>
</table>
Weight (oz/yd²)  ASTM D3776-85  8

Apparent Opening  ASTM D4751-87  120
Size, Maximum U.S. Standard Sieve No.

*Weakest Principal Direction

The geotextile fabric shall be furnished in rolls wrapped with protective covering to protect the fabric from mud, dirt, dust, and debris. The fabric shall be free of defects or flaws which significantly affect its physical properties. Each roll of fabric in the shipment shall be labeled with a number or symbol to identify that production run.

The geotextile fabric may, at the Contractor's option be heat bonded to the HDPE drainage net.

8.05 Subgrade Preparation

Subgrade for the lower geomembrane consists of a 12-inch thick soil bedding layer. The top 6 inches of the soil bedding layer shall be fine graded as specified in Section 6.09. Prior to geomembrane placement, rocks, sticks, or other objectionable material shall be removed. The subgrade for the upper geomembrane consists of a 12-inch sand layer, as specified in Section 6.10.

The lower membrane installation shall not commence until the bedding soil preparation, anchor trench excavation, and pipe penetration preparation are complete.

The Contractor shall provide the Engineer with written certification from the geomembrane installer verifying the acceptability of the soil bedding and sand layers as the geomembrane subgrade prior to the start of installation. It will be responsibility of the Contractor to keep the receiving surface in the accepted condition until complete installation of the geomembrane is accomplished.

8.06 Installation

A. HDPE Membrane.

1. General.

The membrane shall be installed in accordance with manufacturer's recommendations, as indicated on the Drawings, and as specified herein. The membrane shall be installed by crews experienced in the installation
of HDPE sheet of the thickness specified. The installation supervisor shall have supervised in the field or installed at least 2,000,000 square feet of the HDPE liner. The Contractor shall furnish equipment, materials, and personnel to make all field seams, place ballast, and attach the membrane to pipe penetrations. Installation work shall not begin until all required drawings and data have been submitted and the installer has certified the acceptability of the subgrade.

2. Sheet Delivery

The Contractor shall perform a visual inspection of delivered membrane materials on arrival at the site for possible transport damage. The membrane materials showing damage shall be isolated and clearly labeled as damaged.

3. Installation

The membrane shall be installed over the prepared subgrade to the limits indicated on the Drawings. The membrane shall be placed in such a manner to minimize field seaming. The membrane shall be installed such that field seams run longitudinally down the embankment slope. The Contractor shall provide temporary wind anchorage during membrane installation. Only membrane panels for each day's field seaming shall be spread each day and shall be held in position by sandbags until field seaming is complete. The Engineer shall be notified of the damage. As membrane materials are unpacked or unrolled, the Contractor shall perform further visual inspection of the membrane surface. If damage or faults not previously observed are discovered, they shall be clearly marked and the respective sheet roll will be set aside. The Engineer shall be notified of the damage. All faulty areas shall be repaired in an appropriate, workmanlike manner. The membrane panels shall be installed by experienced workmen and handled in a good workmanlike manner. All rips, tears, puncture, or other injuries to the lining shall be repaired the same day to the satisfaction of the Engineer and in accordance with procedures as specified herein. All rips and tears with sharp edges shall be rounded prior to patching. All patches shall have rounded edges.

The Contractor shall install at the time of liner seaming additional liner material for compensation for changes in liner area due to temperature changes and sheet stability. The additional temperature compensation material shall be installed evenly across the base and slope liner. As a minimum, sufficient additional material shall be installed at 60 foot intervals to eliminate stresses at the liner seams due to liner contraction. The Contractor will supply the Engineers prior to liner installation a table providing the required additional compensation material necessary versus sheet temperature. The minimum design operating liner temperature for this table shall be 40 degrees F. This table shall include the necessary compensation for sheet stability. No liner shall be installed until table has been submitted to Engineers. The Contractor shall install at each pipe penetration, roadway edge, or concrete cover sufficient compensation to eliminate stress at the liner anchorages due to temperature and sheet stability contraction.

5. Seaming.

All seams, including anchor trench seams, shall be made by extrusion or fusion welding. The Contractor shall use only welding apparatus on which proper control of extrudate or wedge temperature, apparatus pressure, welding speed, width of weld, and sheet preheating temperature can be maintained. The Contractor will verify that the welding apparatus meets these requirements.

A determination of sheet surface temperature, peel and shear testing in a tensometer, and visual inspection of seam surface and cross section shall be performed satisfactorily on a test weld, approximately 2 meters in length, before any seam welding is begun each day. Additional test welds at the Engineer's option may be requested before startup of any welding equipment after it has been shutdown for an extended period, at 4-hour intervals, or if the temperature falls below 45 F.

Extrusion welds will be made by overlapping adjacent sheets a minimum of 3 inches and a maximum of 4 inches and extruding a ribbon of hot fusion-joining resin no less than 1.0 inch in width between the overlapped sheets or over the seams between the overlapped
sheets, as required. The slick surface of the HDPE sheet shall be roughened by an acceptable means before extrudate is placed between overlapping sheet or over the lapped seam. Excessive grinding resulting in grooving of the liner or reducing the liner thickness greater than 10 percent shall not be permitted.

Fusion field seams shall be made by overlapping adjacent sheets a minimum of 3 inches and forming a double welded seam separated by an air space approximately 0.375 inch in width. Welded seams shall be produced by a double hot shoe welder capable of maintaining a recordable temperature determined by onsite conditions and shall not vary more than 10 C from the target temperature.

After positive evaluation of the test weld, the welding of the sheet geomembrane shall begin.

Welding shall not be performed unless the membrane sheet is dry and the sheet temperature is above 45 F (7.2 C) and below 95 F (35 C). If the temperature falls below 45 F, seaming may continue at the direction of the Engineer. Prior to allowing seaming to continue, the Engineer shall consider the need to require more frequent test welding. No welding shall be performed if it is raining or the membrane is wet.

Penetrations through the membrane for pipes and patches shall be field welded using a fusion joint. The seaming procedure shall consist of cleaning and roughening the membrane and softening the membrane material by application of heated air. Directly following the application of heat, a hot strip of the same high density polyethylene from which the sheet is made shall be extruded over the seam to produce the fusion-welded seam.

Any required repair of small holes in the membrane surface shall be made with an HDPE patch and the appropriate fusion joint gun. An HDPE patch, meeting the requirements of the HDPE membrane, shall be placed over the hole. The patch shall completely cover the hole, with a minimum clearance between the hole and the edge of the patch of 3 inches. Membrane and patch material shall be cleaned of all dirt, dust, and other foreign material, all smooth HDPE surfaces roughened, heated to the prescribed temperature, and the patch extrusion welded to the membrane to complete the repair.

(STAGE 1 NORTH CLOSURE)
(TACOMA LANDFILL)

Temporary gas flaps shall be installed during installation at the lower geomembrane to prevent gas from accumulating and bubbling the geomembrane. The gas flaps shall be installed as shown on Figure 8-1. Gas flaps shall be installed at the direction of the Engineer. Generally, gas flaps shall be installed at high points and at approximately 50-foot spacing along ridges. Prior to installation of the sand layer, all gas flaps shall be seamed shut in accordance with Section 8.06(A)(5).

7. Quality Control.

The lining Contractor shall submit to the Engineer 30 days prior to delivery of liner material to the project site, a quality control manual including quality control procedures, tests, inspection personnel, and documentation including, but not limited to, the following items included in this specification.

Daily progress reports shall be prepared including the following:

- Names and job description of personnel
- Date
- Weather conditions, including range of wind speed and temperature, cloud cover, and precipitation
- Project location
- Panels installed
- Panels seamed
- Field observation

Quality control records acceptable to the Engineers shall be prepared detailing the initial weld qualification of equipment and welding crews. Daily quality records shall be maintained of all field seaming including, but not limited to, the following:

- Date
- Project location
PLAN VIEW

SECTION VIEW

<table>
<thead>
<tr>
<th>CITY OF TACOMA</th>
<th>FIGURE 8-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>TACOMA LANDFILL</td>
<td>TEMPORARY GAS FLAP</td>
</tr>
<tr>
<td>STAGE ONE CLOSURE SPECIFICATIONS</td>
<td>TEMPORARY GAS FLAP</td>
</tr>
</tbody>
</table>
Weld location, sheet number
Sheet temperature
Weld crew identification
Weld machine identification
Weld samples, if taken
General observations

8. Testing.

Along with observance of the welding parameters, continuous vacuum box for extrudate welds shall be carried out as product control. All 60 mil fusion seams shall be pressure tested at 28 psi for 10 minutes. If the pressure drop in the seam is greater than 5 psi, the leak shall be repaired and retested.

Samples of production seams 12 inches wide by 24 inches long shall be taken every 400 feet of seam, or as directed by the Engineer for testing of seam integrity. Testing of 5 samples of 1 inch wide production field seam samples shall be performed both in accordance with ASTM D 3083-76 (1980) for shear and ASTM D 413-82 (1988) for peel strength. The seam shall be tested in tension and in peel. The tension test results shall exhibit at least 90 percent of the sheet tensile strength at yield in shear and 70 percent in peel to be considered acceptable. The peel test sample shall fail as a film bond tear. The failure mechanism of the seam shall be ductile in nature with no indication of crystallization. Test results of the seam testing shall be submitted to the Engineer and Consultant in accordance with the requirements of the Section 3.0 submittals.

If the samples prove defective, the Contractor shall conduct additional testing to determine the extent of the defect. The Contractor shall make any repairs required to bring the defective areas in compliance with these specifications. It is the Contractor's obligation to forward all weld seam reports, labeled with the weld seam number as per installation chart, to the Engineer and Consultant for final approval. Any faulty spots shall be repaired by one of the two methods previously specified and the repaired sections subjected to thorough visual inspection testing or vacuum box testing. Other methods of testing may be proposed in conjunction with the vacuum box testing.
B. Drainage Net.

The drainage net shall be installed in accordance with the manufacturer's recommendations as indicated on the Drawings, or as specified herein. The HDPE drainage net shall be rolled out downhill. Before installing the drainage net, the membrane material shall be cleaned of all dirt, dust, and other foreign material.

C. Geotextile.

The geotextile shall be installed over the drainage net as soon as the drainage net is installed, to prevent dirt, dust, and other foreign material from accumulating. Laps between sheets shall be at least 18 inches.

The geotextile seam shall be heat bonded. The bonded seams shall exhibit 75 percent of the strength of the parent material in accordance with ASTM D 4632-86.

If the Contractor chooses to install a bonded HDPE drainage net and geotextile, sheets of the bonded materials shall be overlapped and joined as described for the drainage net, Section 8.06(B).

D. Liner Penetrations.

Liner penetrations, as shown on details L-1, L-2, L-3, L-5, L-6, and L-7 shall utilize the identified materials, as defined below. All labor, equipment, and materials necessary for providing and installing the materials identified shall be considered incidental to the contract unit price for the various liner penetration types.

Passing pipes and penetration sleeves shall be HDPE pipe of a minimum 32.5 SDR. The pipes and sleeves shall be sized as appropriate so as to minimize the clearance between the penetrating structure(s) and the passing pipe and the clearance between the passing pipe and the penetration sleeve.

Metal clamps, battens, and hardware shall be stainless steel.

Neoprene cord packing and sponge material shall be a closed-cell neoprene material, with adhesive where shown on the Drawings.

Silicone sealant shall be RTV103 silicone.
Bentonite shall be a free-flowing, high-swelling sodium bentonite. The sealant shall have a dry fineness of the following: 15 percent maximum retained on a 20 mesh screen and 20 percent maximum passing on a 200 mesh screen. The colloid content of the bentonite shall exceed 85 percent, as measured by evaporating the suspended portion of a 2 percent solution after 24 hours of sedimentation in a glass graduate or beaker. Bentonite shall be 100 barrel yield minimum with a viscosity of 15 centipoise (30 dial reading) when 13.5 grams of bentonite are mixed with 350 milliliters of water and held for 20 minutes. Testing shall be performed with a FANN viscosimeter model #35A. Grout shall be a nonshrinking grout and shall be furnished factory premix so only water is added at the jobsite. Grout shall be mixed in a mechanical mixer. No more water shall be used than is necessary to produce a flowable grout. The nonshrinking grout shall be a Glifford-Hill "Supreme", L&M "Crystex", Masterbuilders "Masterflow 713 Grout", Savereisen Cements "F-100 Level Fill Grout", U.S. Grout "Five Star Grout", UPCO "Upcon High Flow" or "Upcon Super Flow", or equal. Nonshrinking grout shall be protected against rapid loss of moisture by covering with wet rags or polyethylene sheets.

E. Soil Cover.

The soil cover shall be placed as specified in Section 6.11, except as specified herein. The initial soil cover lift shall be no less than 12 inches in uncompacted thickness. Soil cover shall be placed so that the membrane system is not wrinkled or folded.

F. Measurement and Payment.

1. Cap System.

The contract unit price for "Primary Cap Materials, 60 mil HDPE Synthetic Membrane, at Per Square Yard" shall include all costs to furnish one layer of 60 mil synthetic HDPE membrane. Measurement of the membrane shall be based upon the square yards of material which is installed, as measured in the field. All waste geomembrane material shall be considered incidental to this bid item. Material contained within the seam overlap will not be included in the measurement and payment of this bid item, but material installed within the anchor trench shall be included.

The contract unit price for "Secondary Cap System Materials, 60 mil HDPE Synthetic Membrane, Drainage
Net, and Geotextile, at Per Square Yard" shall include all costs to furnish one layer each of 60 mil HDPE synthetic membrane, drainage net, and geotextile. Measurement of the cap system shall be based upon the square yards of HDPE membrane material which is installed, as measured in the field. All waste geomembrane, drainage net, and geotextile material shall be considered incidental to this bid item. Material contained within the seam overlap will not be included in the measurement and payment of this bid item, but material installed within the anchor trench shall be included.

The contract unit price for "Primary Cap, Installation, 60 mil HDPE Synthetic Membrane, at Per Square Yard" shall be considered full compensation for all labor, equipment, and materials costs associated with installing and testing the lower geomembrane on the soil bedding layer as shown on the drawings and described herein. Measurement of the geosynthetic installation shall be by the square yards of installed material, as measured in the field. All waste geosynthetic material shall be considered incidental to this bid item. Material contained within the seam overlap will not be included in the measurement and payment of this bid item, but material installed within the anchor trench shall be included.

The contract unit price for "Secondary Cap System, Installation, 60 mil HDPE Synthetic Membrane, Drainage Net, Geotextile, at Per Square Yard" as listed in the proposal shall be considered full compensation for all labor, equipment and materials costs associated with installing and testing the upper cap system on the sand layer as shown on the drawings and described herein. Measurement of the cap system installation shall be by the square yards of installed geomembrane material, as measured in the field. All waste geosynthetic material shall be considered incidental to this bid item. Material contained within the seam overlap will not be included in the measurement and payment of this bid item, but material installed within the anchor trench shall be included.

2. Anchor Trench.

The unit price for "Anchor Trench, at per Linear Foot" shall be full compensation for furnishing all labor, equipment, and materials necessary or incidental to the excavation of the anchor trench, and placement and compaction of the anchor trench backfill. Materials
excavated from the anchor trench shall be used for backfill, except that organic material, refuse, frozen lumps, rocks, or pavement chunks more than six inches in maximum dimension shall not be used; and except that material determined by the Engineer to be unsuitable for backfill at the time of excavation shall be removed and replaced with imported material meeting the requirements of Section 6.15 of these specifications. All costs for removal and disposal of such unsuitable material shall be considered incidental to the contract unit price for "Anchor Trench, at Per Linear Foot". Measurement for payment shall be the actual liner feet of anchor trench installed.

3. Synthetic Liner Penetration Type I.

The unit price for "Synthetic Liner Penetration, Type I, at per Each" shall include all costs for all labor, equipment, and materials to furnish, install and inspect complete the monitoring well liner penetration as shown on detail L-6 on drawing sheet 20 of 31. This type of penetration shall be used for single completion gas wells and the groundwater monitoring well penetrations. Measurement for payment shall be each penetration, and shall include but is not limited to furnishing and installing the penetration sleeve, bonding adhesive, stainless steel clamp and all other appurtenances required for a complete installation. Payment for each liner penetration shall include penetration through and booting of both layers of liner, as shown on the referenced detail.

4. Liner Penetration Type IA

The unit price for "Liner Penetration, Type IA, _ inch diameter, at Per Each" shall include all costs for all labor, equipment and materials costs to furnish, install and inspect, complete, the liner penetration Type IA with the given size of passing pipe, as shown on detail L-7 on drawing sheet 20 of 31. This type of penetration shall be used for multiple completion gas well penetrations. Measurement and payment shall be for each penetration, and shall include, but is not limited to, furnishing and installing HDPE passing pipe and penetration sleeve of various sizes, neoprene cord packing, non-shrink grout, and all other appurtenances required for a complete installation. Payment for each liner penetration shall include penetration through and booting of both layers of liner, as shown on the referenced detail.
5. Synthetic Liner Penetration, Type IB.

The unit price for "Synthetic Liner Penetration, Type IB, at per Each" shall include all costs for all labor, equipment, and materials to furnish, install and inspect, the liner penetration as shown on detail L-5 on drawing sheet 20 of 31. This type of penetration shall be used for utility pole penetrations. Measurement for payment shall be each penetration, and shall include, but is not limited to, furnishing and installing all liner material, nails, silicone sealer, and all other appurtenances required for a complete installation. Payment for each liner penetration shall include penetration through and booting of both layers of liners, as shown on the referenced detail.

6. Synthetic Liner Penetration Type II.

The unit price for "Synthetic Liner Penetration, Type II, at per Each" shall include all costs for all labor, equipment, and materials to furnish, install and inspect, complete, the liner penetration Type II as described on detail L-6 on drawing sheet 20 of 31. This type of penetration shall be used for HDPE sewer pipe penetrations. Measurement for payment shall be each penetration, and shall include but is not limited to, furnishing and installing the HDPE boots and all other appurtenances required for a complete installation. Payment for each liner penetration shall include penetration through and booting of both layers of liner, as shown on the referenced detail.

7. Synthetic Liner Penetration Type IIA.

The unit price for "Synthetic Liner Penetration, Type IIA, at per Each" shall include all costs for all labor, equipment, and materials to furnish, install and inspect complete, the liner penetration Type IIA as described on detail L-6 of drawing sheet 20 of 31. This type of penetration shall be used for horizontal gas wells. Measurement for payment shall be each penetration, and shall include but is not limited to, furnishing and installing bonding adhesive, stainless steel clamp, and all other appurtenances required for a complete installation. Payment for each liner penetration shall include penetration through and booting of both layers of liner, as shown on the referenced detail.
8. Liner Penetration Type III.

The unit price for "Liner Penetration, Type III Alternative A, at Per Each" as listed in the proposal shall be full compensation for all labor, equipment, and materials costs associated with furnishing, installing, and inspecting complete, the liner penetration, alternative A as shown, and described on detail L-1 on sheet 20 of 31 of the drawings. Measurement and payment shall be per each of this type of penetration installed, as directed by the Engineer, including, but not limited to cutting liner, bentonite, liner, drainage net and geotextile. Excavation and backfill will be paid at the unit prices for the appropriate excavation and backfill bid item. The unit price for "Liner Penetration, Type III, Alternative B, at Per Each" as listed in the proposal shall be full compensation for all labor, equipment, and materials costs associated with furnishing, installing, and testing, complete, the liner penetration alternative B, as shown and described on detail L-1 on sheet 20 of 31 of the drawings. Measurement and payment shall be per each of this type of penetration installed, so directed by the Engineer, including but not limited to clamps, bonding adhesive, batten (as shown in detail L-9 on sheet 20 of 31) HDPE boot, and all other appurtenances required for a complete installation. Excavation and backfill will be paid for at the unit price for the appropriate excavation or backfill bid item. Payment for each liner penetration shall include penetration through and booting of both layers of liner, as shown on the referenced detail.

9. Liner Penetration Type IV.

The unit price for "Liner Penetration, Type IV, Alternative A, at Per Each" as listed in the proposal shall be full compensation for all labor, equipment, and materials costs associated with furnishing, installing, and inspecting complete, the liner penetration, alternative A, as shown and described on detail L-2 on sheet 20 of 31 of the drawings. Measurement and payment shall be per each of this type of penetration installed, as directed by the Engineer, including but not limited to solid wall PVC pipe, 6-inch and 4-inch, concrete with reinforcing, bentonite, filter fabric, liner and drainage net. Excavation and backfill will be paid for at the appropriate excavation or backfill bid item.
The unit price for "Liner Penetration, Type IV, Alternative B, at Per Each" as listed in the proposal shall be full compensation for all labor, equipment and materials costs associated with furnishing, installing and testing, complete, the liner penetration, alternative B, as shown and described on detail L-2 on sheet 20 of 31 of the drawings. Measurement and payment shall be per each of this type of penetration installed, as directed by the Engineer, including but not limited to clamps, bonding adhesive, batter, (as shown on detail L-9 on sheet 20 of 31) HDPE boot, and all other appurtenances required for a complete installation. Excavation and backfill will be paid for at the unit price for the appropriate excavation or backfill bid item. Payment for each liner penetration shall include penetration through and booting of both layers of liner, as shown on the referenced detail.

10. Guy Anchor Cable Liner Penetration, Type V.

The unit price for "Guy Anchor Cable Liner Penetration Type V, at per Each" shall include all costs for all labor, equipment, and materials to furnish, install, and inspect complete the guy anchor cable liner installation as shown on detail L-3 of drawing sheet 20 of 31. Measurement for payment shall be each penetration through both of the liners as shown on the detail. Payment for each liner penetration shall include penetration through and booting of both layers of liner, as shown on the referenced detail.


Costs for geotextile filter fabric used around the 4-inch perforated PVC underdrain and over the drain rock surrounding the 6-inch perforated PVC subsurface drainage pipes shall be considered incidental to the unit price for the two types of perforated pipe.


The contract unit price "Temporary Gas Flaps, at Per Each" shall include all costs for labor, equipment and materials associated with forming and then sealing the temporary gas flaps described in Section 8.06(A)(6) and shown on Figure 8-1 of the specifications.
8.07 Warranties

The following warranties shall be furnished on material and installation.

A. Material Warranty.

The material supply contractor shall warrant against manufacturing defects and material degradation for a period of 5 years pro-rated from the date of Official Acceptance by the Owner. The Contractor shall replace any material which fails within the warranty period at no cost to the Owner. The Contractor shall furnish the Owner with a written warranty covering the above requirements.

B. Installation Warranty.

The installation contractor shall warrant the installation of the membranes against installation defects for a period of one year from the date of Official Acceptance by the Owner. The Contractor, or his designated representative, shall repair any defects due to improper installation which occur during the warranty period at no cost to the Owner. The Contractor shall furnish the Owner with a written warranty covering the above requirements.

8.08 Drawings and Data

Complete specifications and data pertaining to the cap materials shall be submitted in accordance with the Section 3.0, SUBMITTALS. The Contractor shall submit detail drawings and data for the geomembrane and all accessories.

Detail drawings shall indicate the extent, size, and details for each geomembrane, including seam locations, seam details, penetration details, geomembrane terminations, and all special details. Certification test results indicating that the membranes meet the specification shall be supplied on request.
9.00 LANDFILL GAS COLLECTION SYSTEM

9.01 Scope

This section covers the material and installation requirements for all piping, valves, fittings, and other equipment associated with the Landfill Gas Collection System.

9.02 General

This work shall consist of removing and replacing existing gas system structures, furnishing and installing below ground high density polyethylene piping systems, above ground polyvinyl chloride piping systems, temporary gas manifold piping, miscellaneous valves and pipe supports of appropriate sizes and type, and removing, stockpiling and reusing various landfill gas system components, as described in the Plans and these Specifications.

9.03 Removal of Existing Gas System Structures

A. Construction Details

The work shall consist of removing an estimated 3400 linear feet of existing 6" and 8" gas collection system piping, 10 existing water traps, 2 road crossings, and 7 thrust blocks, and removing and stockpiling for reuse all existing 4" PVC gas piping, in stages described in the Project Phasing Plan (Appendix B). It shall also include excavating, raising existing underground well casings to a minimum of five feet above grade and reinstalling the existed underground well nest assemblies above ground for temporary connection to the temporary ADS Gas Collection System.

The Engineer and the Contractor shall coordinate gas system removal, as per the Project Phasing Plan. After wells and the sections of the collection manifold to be removed have been disconnected by the Contractor, the Contractor shall remove, stockpile or dispose of all existing PVC gas piping in accordance with the following:

1) The Contractor shall remove, salvage and stockpile on-site, all existing 4-inch gas PVC piping, unless otherwise directed by the Engineer, for reuse in the final piping system.

The lengths at which the existing piping are cut for handling and storage shall be up to the Contractor, subject to the Engineer’s approval, recognizing that couplers necessary for the reuse of the piping is incidental to the length of pipe.
2) The Contractor shall remove and salvage approximately 1700 linear feet of existing 6-inch and approximately 1300 linear feet of 8-inch PVC gas piping, and haul it to the east side of the Central Area of the landfill, or where directed by the Engineer, for stockpiling and reuse by the Owner. Cut and haul lengths shall be as approved by the Engineer.

The Contractor shall remove and dispose of approximately 400 linear feet of 6-inch HDPE above grade header as directed by the Engineer. All existing water traps, thrust blocks, and road crossings shall be removed as directed by the Engineer. All wooden pallets currently being used for pipe supports will be removed by the Contractor and disposed of when the piping is moved. The Contractor will also remove and dispose of all underground piping that is encountered during the excavation of soil during the landfill cap installation activities.

3) The Contractor shall salvage and stockpile on-site all existing system valves, pipe clamps, flex hoses, and vault boxes, unless otherwise directed by the Engineer, for reuse either in the final gas system, or returned to the Owner for spare material. All salvaged and stockpiled materials shall be protected from damage.

The Contract unit price for "Removal of Existing Gas System Structures, at Per Lump Sum" shall be considered full compensation for all labor, equipment and materials required to disconnect, remove, haul, salvage, stockpile or dispose of, as directed by the Engineer, the existing gas system piping, wellheads, pipe supports, water traps, road crossings, thrust blacks, pallets, and other structures associated with the existing gas system piping.

9.04 Temporary Gas Collection System Piping

The work shall consist of laying and jointing various lengths of 3-inch, 8-inch, and 12-inch diameter "ADS" corrugated HDPE temporary gas piping, with necessary tees and fittings, and connecting landfill gas extraction wells to the temporary ADS system, as directed by the Engineer and described in the Project Phasing Plan (Appendix B). The intent of this temporary gas collection system piping is to maintain as much of the existing well field under a vacuum as possible during the final grading construction activities.
A. Materials

The temporary gas manifold piping and fittings shall be 3-inch, 8-inch, and 12-inch diameter corrugated high density polyethylene pipe, ASTM F40S, as manufactured by Advanced Drainage Systems, 1025 Commerce Drive, Madera, California, 93637, (209) 674-0903, or approved equal.

B. Construction Details

The Contractor shall provide temporary gas manifold piping and fittings and connect landfill gas extraction wells to the temporary ADS system, as described in the Project Phasing Plan (Appendix B) of these Specifications. The Contractor shall reuse wellhead valving removed as described in Section 9.10 of these Specifications. During the phasing of the construction, the Contractor shall reuse the temporary ADS piping as much as possible, as directed by the Engineer.

C. Measurement and Payment

The Contract unit price "Furnishing ____-inch, ADS Temporary Gas Piping, at Per Linear Foot" shall be considered full compensation for furnishing the corresponding pipe size and assorted fittings (3-inch, 8-inch, and 12-inch) to the job site.

All costs for labor, equipment and materials for installing the temporary ADS piping, ADS fittings and including all necessary wellhead connections and fittings shall be considered incidental to the contract Unit Price Item "Installing ____-inch, ADS Temporary Gas piping, at per linear foot". All costs for labor, equipment and material for removal, reuse and re-installing temporary ADS piping and fittings to another location as part of Phased Construction, will be paid for under this unit price item, with removal and transporting to the next location considered incidental. Upon completion the Contractor shall stockpile all ADS temporary piping as directed by the Engineer for future use by the Owner.

9.05 Underground High-Density Polyethylene (HDPE) Piping Systems

The work consists of laying pipe, jointing, trenching, testing, backfilling and compacting required for the
construction of the "______-Inch, HDPE, Class C, Landfill Gas Pipe", and underground connections to existing or future vertical gas extraction wells, horizontal gas collection pipes and connections to vacuum valve stations as shown on the Plans.

A. Materials

Pipe and fittings used for the "______-Inch, HDPE, Class C, Landfill Gas Pipe" shall be High Density Polyethylene (HDPE) pipe conforming to the following specifications:

- Pipe sizing is to be according to ASTM F714-83 and ASTM D 3035-83.
- The pipe shall be made from Premium High Density Polyethylene resin qualified as Type III, Category 5, Class C, Grade P34 in ASTM D1248-81.
- This material shall have a long term hydrostatic strength of 1600 psi when tested and analyzed by ASTM D2837-76 (1981), and listed by the Plastic Pipe Institute as a P.E. 3408 resin.

The following minimum engineering design specifications are required:

- ASTM D-638 Tensile Strength Yield (2in/min), >3300 P.S.I.
- ASTM D-638 Elongation at break, 800%
- ASTM D-638 Modulus of Elasticity, 120,000 P.S.I.
- ASTM D-3350 Flexural Modulus, 140,000 P.S.I.
- ASTM D-2837 Long term strength (L.T.H.S.) @73.4 F, 1600 P.S.I.

In addition to the above, the High Density Polyethylene Material will have the following general characteristics:

- ASTM D-1505 Density with carbon black, 0.955 g/cm$^3$ (min)
- ASTM D-1238 Melt index (E) Condition, 0.14 g/10min
- ASTM D-1238 Melt index (F) Condition, 11.0 g/10min
- ASTM D-1525 Vicat softening point, 257 F (min)
The pipe shall contain no recycled compound, except that generated in the manufacturer's own plant from resin of the same specification from the same raw material supplier.

The polyethylene pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, or other injurious defects. The pipe shall be uniform in color, opacity, density, and other physical properties.

The following information shall be continuously marked on the pipe, or spaced at intervals not exceeding five feet:

- Name and/or trademark of the pipe manufacturer.
- Nominal pipe size.
- Standard Dimension Ratio (SDR).
- PE 3408
- Manufacturers Standard Reference.
- A production code from which the date and place of manufacture can be determined.

Polyethylene compound shall be protected against ultra-violet degradation by carbon black in concentration of not less than 2%. All gas manifold pipe shall have a minimum work pressure of 160 psi at 73.4 °F and a minimum SDR of 11.

B. Proof Tests

The intent of this requirement is to pre-qualify a joint system, components of which meet the above requirements, as to the water and air/vacuum tightness capability of that joint system. This proof test shall be understood to apply to the gas lines which are to be tested for water and air/vacuum tightness prior to acceptance. Material and test equipment for proof testing shall be provided by the manufacturer.
When approved by the Engineer, internal hydrostatic testing may be applied by a suitable joint tester.

C. Material Certification

The manufacturer shall furnish appropriate certification, based on the manufacturer's routine quality control tests, that the pipe and pipe fittings meet the requirements of the pertinent ASTM or ANSI specifications.

D. Construction Details

Pipe which is to be installed underground shall be laid in a manner that the excavation, pipe laying, and back-filling as described on the Plans, shall be completed, and gas wells connected to the temporary gas manifold as described in the Phasing Plan (Appendix B) and Section 9.04 of these Specifications, within the same day and before the Contractor leaves the site on that day, unless otherwise approved by the Engineer. The Contractor shall plug any open ends of the pipe at the end of each working day to prevent dirt from accidentally entering the pipe.

The Contractor shall use extreme care when trenching for the landfill gas system piping, to prevent damaging the landfill cap liner system. Any damage to the liner system shall be promptly repaired to the satisfaction of the Engineer and at the Contractor's sole expense.

When necessary to cut the HDPE gas pipe, the pipe shall be cut using a tool or tools specifically designed to leave a smooth, even and square end on the piping material to be cut. Cut ends shall be reamed to the full inside diameter of the pipe.

The individual lengths of pipe, tees and other fittings shall be jointed together by thermal butt fusion. This pipe shall be fused of the same type, grade, and class of polyethylene compound and supplied by the same raw material supplier. All tees and other required fittings shall be prefabricated HDPE. No saddle connections shall be used.

Butt fusion shall be made only when the pipe materials to be jointed are clean and dry, and only at ambient temperatures of 40 F and above, or as approved by the
Engineer. The butt fusion shall be accomplished according to the pipe manufacturer's recommendation and the butt fusion machine shall be supplied by the same representative as supplies the pipe. The Contractor shall take care when handling the pipe so as to not damage it by dragging it over sharp and cutting objects. Sections of the pipe with gouges or cuts shall be cut out and the ends of the pipe rejoined.

Pipe bedding shall conform to Standard Plan No. B-18c. Rigid pipe shall be bedded in accordance with Class B requirements. Flexible pipe shall be bedded in accordance with Class F requirements. Bedding material shall conform to Section 9-03.12(3) as amended by the City of Tacoma.

All costs relative to furnishing and placing pipe bedding material in accordance with the Plans and Specifications shall be considered incidental to the respective unit contract price for the size of pipe being installed.

Trench excavation for all underground gas transmission lines shall be considered incidental to the contract unit prices for the various types of gas pipe required.

Materials excavated from the trench shall be used for backfill, except that organic material, refuse, frozen lumps, or rocks or pavement chunks more than six inches in maximum dimension shall not be used; and except that material determined by the Engineer to be unsuitable for backfill at the time of excavation shall be removed and replaced with imported backfill material meeting Section 9-03.18 of the Standard Specifications as amended by the City of Tacoma.

E. Measurement and Payment

1) The Contract unit price "_____-Inch HDPE, Class C, Landfill Gas Pipe, at Per Lin. Ft." shall be considered full compensation for all labor, equipment and materials to furnish, install, slope, grade and test the corresponding size of pipe, including but not limited to the following:

a) Trench excavation, bedding, backfill, and compaction of backfill material, including chipping
of existing asphalt where required.

b) Dewatering of trenches excavated above the flexible membrane liner.

c) All below ground gas manifold fittings, reducers, above ground to below ground transition fittings, connections and pipe placement.

2) The Contract unit price "____" x "____" Tee, with 2'-0" Long Pipe Stub, at Per Each" shall be considered full compensation for all labor, equipment and material to furnish and install the corresponding HDPE tee with 2'-0" Long Pipe stub, required on this connection of below ground individual wells.

3) The Contract unit price "4-Inch HDPE Flange, at Per Each" shall be considered full compensation for all labor, equipment and material to furnish and install the 4-inch HDPE flanged fittings, on this project along the Gas Manifold System for the connection of individual wells.

The work of cleaning and testing, and furnishing caps and plugs for the tests, shall be considered incidental to the bid items for the appropriate type of pipe as listed in the Bid Form. Measurement shall be from the beginning to the end of the various sizes at pipe in place, including all fittings.

All work shall be performed in accordance with the Drawings and these Specifications.

The Contractor shall provide all necessary water for construction and air for testing purposes, and all costs associated with providing air and water shall be considered incidental to the contract.

9.06 New Polyvinyl Chloride (PVC) Piping

The work consists of laying pipe, jointing, and testing required for the construction of the "____-Inch PVC Landfill Gas Pipe", connections to existing vertical gas extraction wells, manifold systems, condensate systems and connections to the vacuum valve assemblies, as shown on the Plans.

NOTE: There are two sources of PVC gas piping to be used on this project. One is the reuse of the existing PVC gas
piping removed, as described in Section 9.03 of these specifications. Installation and payment for this reused PVC piping shall be as specified under Section 9.07. This section (9.06) refers to new PVC piping to be used on this project.

A. Rigid PVC Materials

PVC gas and condensate collection piping shall be manufactured from Type 1, Grade 1, PVC material conforming to the requirements of ASTM D1784. All piping shall be solvent weld, unless otherwise shown or required for connection to other components. Pipe that is to be threaded shall be Schedule 80.

Pipe 8-inches in diameter and smaller shall meet the requirements of ASTM D1785 and shall be Schedule 40, unless otherwise noted or required. Pipe larger than 8-inches shall comply with ASTM D2241, SDR 26, Class 160.

Fittings shall be solvent weld and shall be manufactured of the same material as the pipe. All fittings shall be Schedule 80 when located below grade. Fittings above grade shall be Schedule 40.

All fittings shall be rated and warranted to the full pressure of the pipe they are fabricated from. The manufacturer shall be able to demonstrate that fittings have been randomly tested to exceed the following:

- Short-term quick burst at 2.5 times the normal operating pressure rating of the pipe material or greater.
- Long-term 1,000 hour test at 2.0 times the normal operating pressure rating of the pipe material, or greater, without damage.

All fittings 8-inches and smaller shall meet the requirements of ASTM D2466-73. Fittings over 8 inches shall be either injection molded or fabricated from PVC material utilizing butt fusion welded, or mitered and welded joints. Joints for fabricated fittings for 45 degree and 90 degree bends shall be butt fusion welded. All other bends may be thermoplastic welded with a minimum of three full weld passes. Welding rod shall be of the same material as the pipe.
All fabricated fittings shall be reinforced with fiberglass, chemically bonded to the fittings, to achieve a shear strength of at least 1,000 psi. Test results shall be available upon request by the Engineer.

Flanges shall be 150 pound flat face solvent weld socket type, and shall comply with the requirements of ANSI B16.5, Class 150. Flange gaskets shall be full faced. Solvent cement shall conform to ASTM D2554.

The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, or other injurious defects. Any pipe with nicks, scrapes, or gouges deeper than 5% of the nominal wall thickness shall be rejected. It shall be uniform in color, density, and other physical properties. All gas manifold pipe shall have a minimum work pressure of 160 psi at 73.4 F. All pipe and fittings shall have a minimum rating of Schedule 40.

B. Flex PVC Materials

Flexible PVC pipe for gas and condensate collection shall be sized with I.D. to match O.D. of rigid PVC pipe, have rigid outer wall reinforcement, and a minimum vacuum rating of 25.0 inches Hg, and shall be as manufactured by "Kanaflex Corporation of America", Series 10HPS, Flexible PVC Pipe, or approved equal.

C. Proof Tests

The intent of this requirement is to pre-qualify a joint system, components of which meet the above requirements, as to the water and air/vacuum tightness capability of that joint system. This proof test shall be understood to apply to the gas lines which are to be tested for water and air/vacuum tightness prior to acceptance. Material and test equipment for proof testing shall be provided by the manufacturer. When approved by the Engineer, internal hydrostatic testing may be applied by a suitable joint tester.

D. Material Certification

The manufacturer shall furnish appropriate certification, based on the manufacturer's routine quality control tests, that the pipe and pipe fittings meet the requirements of the pertinent ASTM or ANSI specifications.
E. Construction Requirements

For pipe which is to be installed above ground, the ground surface shall be smoothed and ruts filled in 30 inches on each side of the pipe routing, prior to pipeline installation.

Pipe which is to be installed underground shall be laid in a manner that the excavation, pipe laying, and backfilling, as described on the Plans, of the pipe trench shall be completed within the same day and before the Contractor leaves the site on that day, unless otherwise authorized by the Engineer. The Contractor shall plug any open ends of the pipe at the end of each working day to prevent dirt from accidentally entering the pipe.

When necessary to cut the PVC gas pipe, the pipe shall be cut using a tool or tools specifically designed to leave a smooth, even and square end on the piping material to be cut. Cut ends shall be reamed to the full inside diameter of the pipe.

The individual lengths of pipe shall be jointed together by solvent welding. The pipe bell and spigot shall be clean and dry before jointing operations begin. The bell and spigot shall both be coated with primer, followed by the application of cementing material to both the bell and spigot, in accordance with the manufacturer's instructions.

Care shall be taken to properly align the pipe before the joints are forced home. Where dirt, water, or other foreign material comes in contact with the primer or cementing material for the joints, the joint shall be thoroughly cleaned and dried and new primer and cementing material applied, before the joint is forced home. The joint shall be maintained in position for the time specified by the manufacturer before any pressure is applied to the pipe.

Piping will be installed on the supports/posts as shown on the plans and as directed by the Engineer. Tees, fittings, anchor blocks, flex joints, and expansion loops shall be installed as shown on the Plans.
The minimum slopes for placement of the header pipes are 1% when condensate and gas flow are in the same direction, and 3% when condensate and gas flow are in opposite directions.

The Contractor shall take care when handling the pipe so as to not damage it by dragging it over sharp and cutting objects. Sections of the pipe with gouges or cuts shall be cut out and the ends of the pipe rejoined.

F. Measurement and Payment

The Contract unit price "_____ -Inch, PVC, Landfill Gas Piping" shall be considered full compensation for all labor, equipment and material to furnish, install, slope, grade and test the corresponding size of new PVC pipe, expansion loops and all connection fittings, except as noted below.

The Contract unit price "_____ x _____" Tee, PVC, at Per Each" shall be considered full compensation for all labor, equipment and material to furnish and install the corresponding size PVC Tee Fittings on this project along the gas manifold system for the connection of individual wells.

Measurement and payment associated with the above grade well head completions, horizontal gas wells, reused 4-inch PVC pipe, and retrofitting existing horizontal gas wells, shall be in accordance with their respective sections under Section 9.00.

The work of cleaning and testing, and furnishing caps and plugs for the tests, shall be considered incidental to the bid items for the appropriate type of pipe as listed in the Bid Form.

All work shall be performed in accordance with the Drawings and these Specifications.

The Contractor shall provide all necessary water for construction, and air for testing purposes, and all costs associated with providing air and water shall be considered incidental to the contract prices for other work.
9.07 Re-Used Existing 4-Inch PVC Pipe

The Owner desires to reuse all existing 4-inch diameter piping as practical in the construction of the final gas collection system. The Contractor shall, as directed by the Engineer, salvage for reuse, all 4-inch piping removed as part of Section 9.03 of these Specifications.

A. Construction Requirements

The Contractor shall, at the direction of the Engineer, store and salvage all existing 4-inch diameter PVC piping which is removed as part of the work described in Section 9.03 of these Specifications. The Contractor shall store this pipe at a location on-site designated by the Engineer.

As the final PVC above ground gas collection system is installed, as described in Section 9.06 of these Specifications, the Contractor shall reuse the existing stockpiled 4-inch diameter PVC piping where "4-inch diameter PVC piping" is called for on the Plans.

The re-used existing 4-inch diameter PVC piping shall be jointed in the same manner as that described in Section 9.06 of these Specifications.

B. Measurement and Payment

The Contract unit bid price "Re-Used Existing 4-Inch PVC Pipe, at Per Lin. Ft." shall be full compensation for all labor, equipment and materials necessary to reuse and install the existing 4-inch diameter PVC pipe including fittings, solvents, and glues required to join the individual lengths of re-used piping.

9.08 Retrofit of Existing Horizontal Gas Wells

The work consists of excavating existing horizontal gas well ends, connecting the existing horizontal gas well ends to new underground manifold pipes, and backfilling the excavation of the existing horizontal gas well ends. The pay limit for "Retrofit of Existing Horizontal Gas Well, at Per Each" shall be from the new 8-inch diameter HDPE pipe sleeve through and including the HDPE tee/bushing for the connection to the new gas collection manifold as shown on Detail C-14 on Sheet 23 of the Plans.
A. Materials

The piping for the retrofit of existing horizontal gas wells shall be HDPE, as per Section 9.04 of these Specifications.

B. Construction Requirements

Prior to the installation of final cover in the area shown on the Plans, which include the existing horizontal gas wells, the Contractor shall excavate an area at locations staked by the Engineer, to locate the end of the existing horizontal gas well. All excavated refuse and debris shall immediately be hauled to the working face of the landfill. Once located, the Contractor shall excavate, as necessary, to construct the well end connection as shown on Detail C-14 on Sheet 23 of the Plans. Excavation and hauls of excavated material shall conform with Section 6.08 of the Specifications.

After the existing horizontal gas well end has been exposed, the Contractor shall clean the end of any dirt or debris, and install the retrofit piping as shown on Detail C-14 of the Plans, from the 8-inch diameter by 5-foot long HDPE pipe sleeve, through the 6-inch by 2-inch HDPE pipe reducer. The Contractor shall slip the new 8-inch diameter pipe sleeve over the existing 6-inch diameter horizontal gas well end. The Contractor shall not fuse or glue the two pipes together.

The Contractor shall temporarily plug the 6-inch by 2-inch HDPE pipe reducer until the underground wellhead for that existing horizontal gas well has been installed.

Upon completion of the work described in this section, the Contractor shall backfill the excavation with the soil bedding material, as described in Section 6.10 of these Specifications.

C. Measurement and Payment

1) The Contract unit price for "Retrofit of Existing Horizontal Gas Wells, at Per Each" shall be considered full compensation for labor, equipment and materials to furnish, install and complete the retrofit of existing below ground horizontal gas
wells as shown on Detail C-14 on Sheet 23 of the Plan, and shall include, as incidental to the unit price item, the following:

a) Furnishing and installing all HDPE pipe, fittings, and connections from the connection of the new 8-inch HDPE sleeve to the existing pipe through and including the HDPE tee/bushing for the connection to the new gas collection manifold.

b) Furnishing and installing the meter vault box, 2-inch flanged gate valve, and monitoring port.

c) Vault penetrations and grout.

d) Furnishing and placing gravel drain rock under the vault box.

All costs associated with excavation for the retrofit of horizontal wells shall be paid for under the unit price item "Excavation, at Per Cubic Yard" as per Section 6.08 of these Specifications. All costs associated with hauling and disposing of excavated refuse and debris as directed by the Engineer is considered incidental to this unit item. All costs associated with backfill of the retrofit trench area shall be paid for under the unit price item "Soil Bedding, Lower Lift, On-Site Material, at Per Cubic Yard" as per Section 6.10 of these Specifications.

9.09 Below Ground Wellhead Completions

The work consists of excavating existing below ground wellheads, constructing below ground wellhead terminations, raising existing casings, removing, stockpiling and/or disposing of existing pipe valves, hose and hose clamps, and fittings, as directed by the Engineer, and removing, salvaging and stockpiling for the Owners use, existing concrete vaults, as required at locations shown on the Plans, and reconstructing below grade wellhead completions in accordance with the manufacturer's recommendations and applicable sections of these Specifications.

There are two types of below ground wellhead completions. One is existing in place and operating wells and the second is new wells (placed by others). The existing operating wells are presently below grade completions with vault boxes. The new are simply vertical pipes extending
above grade with PVC caps. Final completion for this project will be the same for both types, as will measurement and payment.

A. Materials

Valves to be used in below ground wellhead completions shall be new gate valves manufactured with PVC flanged body type and straight through flow passage, with EDPM seats and seals with hand wheel operator, as manufactured by Asahi/America or approved equal. (Existing valve will be salvaged and stockpiled for the Owners use.)

These valves will be used on below ground wellhead completions only. All piping and fittings for below ground wellhead completions shall be Schedule 80 PVC. PVC, pipe, fittings and flexhose shall be as per Section 9.06 of these Specifications.

All below ground wellhead completions shall be installed within a new vault box, as shown on the Details. The vaults shall be pre-cast sectional vaults, "Brooks" Model No. 700, or approved equal. The vault dimensions shall be as shown on the Details, and 16 inches deep. Each vault shall be supplied with a locking diamond plate cover.

B. Construction Requirements

Existing wellheads shall be excavated and cut just below the elbow, and extended to the elevations as shown on the Drawings. All existing vaults, valves, hose and hose clamps, shall be saved and stockpiled as directed by the Engineer, for reuse by the Owner, while all existing pipe and fittings removed shall be disposed of by the Contractor in an appropriate manner.

All valves shall be oriented for operator convenience with the operation handle or actuator in the most accessible position.

Flange bolts shall be tightened by pulling down on diametrically opposite nuts until proper bolt torque values are achieved. Bolt torques for the PVC Flanges are given below:

(STAGE 1 NORTH CLOSURE) 9-16
(TACOMA LANDFILL )
<table>
<thead>
<tr>
<th>Flange Size (inches)</th>
<th>Torque (foot pounds)</th>
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<tr>
<td>2 to 4</td>
<td>20 to 30</td>
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<td>6 to 8</td>
<td>33 to 50</td>
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<td>53 to 75</td>
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Contractor shall provide necessary gaskets and bolting to install between adjoining flanges or back-up rings. Flanged connections are required where disconnection of one flange is required for removal, repair or maintenance of equipment.

All below ground wellhead connections shall be fabricated and installed as shown on the Plans.

Vault box core penetrations and grouting shall be done by the Contractor in accordance with the Plans.

C. Measurement and Payment

The Contract unit price "Below Ground Wellhead Connections (Single, Double, Triple or Quadruple) Completions, at Per Each" shall be considered full compensation for all labor, equipment and material necessary to furnish, install and completed the associated wellhead completions, as shown on Details C-1, C-2, C-3, C-4 on Sheet 21 of the Plans, and shall include, as incidental to this unit price item, the following:

a) Excavation around wellhead.
b) Raising existing well casings as necessary.
c) Furnishing and installing all fittings, valves, test ports, and flexhoses from the wellheads up to and including the 4-inch by 2-inch PVC flanged bushing shown on said Details C-1, C-2, C-3 and C-4 of the Plans.
d) Furnishing and installing the valve boxes and pipe penetrations.

All costs associated with providing the 4-inch HDPE flanges, 4-inch HDPE piping and 4-inch by ______-inch HDPE tees with 2'-0" long pipe stub, as shown on Details C-1, C-2, C-3 and C-4 on Sheet 21 of the Plans, shall be provided for under their own pay items as specified in Section 9.05.
9.10 Above Ground Wellhead Completions

The work consists of constructing above ground wellhead terminations, raising existing casings, and removing and disposing of existing pipe and fittings, as directed by the Engineer, and removing, stockpiling, relocating and installing existing valves, as required at locations shown on the Plans and in accordance with the manufacturer's recommendations and applicable sections of these Specifications.

A. Materials

Valves shall be NPT brass body gate valves. The existing numbers of valves are not adequate to cover all above ground well casings. Therefore, some new valves will be furnished by the Contractor under the Contract. All new valves for above ground wellhead connections shall be NPT brass body gate valves.

PVC Pipe shall be as per Section 9.06 of these Specifications.

Pipe supports shall be as per Section 9.16 of these Specifications.

B. Construction Requirements

Existing wellheads shall be cut just below the elbow and extended to the elevations as shown on the Drawings. All valves shall be saved and stockpiled and re-used on the final completion. Existing pipe and fittings removed shall be disposed of in an appropriate manner, as directed by the Engineer. Existing flexhoses and clamps shall be saved and stockpiled for the Owners use. The Contractor shall use special care in removing and stockpiling all valves to prevent damage to the valves and to keep them free from dirt and debris.

All valves shall be oriented for operator convenience with the operation handle or actuator in the most accessible position. All threads shall be inspected and cleaned prior to installation.

All above ground wellhead connections shall be fabricated and installed as shown on the Plans.

(STAGE 1 NORTH CLOSURE)  9-18
(TACOMA LANDFILL    )
C. Measurement and Payment

1) The Contract unit price "Above Ground Wellhead Connections (Single, Double, Triple or Quadrupal) Completions, at Per Each" shall be considered full compensation for all labor, equipment and materials necessary to furnish, install and complete the associated above ground wellhead completions, as shown on Details C-6, C-7 and C-12 on Sheet 22 of the Plans, and shall include as incidental to this bid item the following:

a) Furnishing and installing all PVC Pipe, fittings, and connections from the existing well casings through the point at which the well nest completion is connected to the associated gas manifold, as shown on Details C-6, C-7 and C-12 on Sheet 22 of the Plans, excluding the tee fitting and 4-inch PVC piping to the gas manifold, which shall be paid for in accordance with Section 9.06.

b) Installation of re-used valves and providing monitoring ports.

c) Cutting and/or extending existing well casing to the grades shown on the Plans.

2) The Contract unit price "New 2-Inch Gate Valves, at Per Each" shall be considered full compensation for all labor, equipment and materials necessary to furnish all new 2-inch gate valves needed for above ground well completions (for wells without re-used valves). The valve installation compensation is provided in the associated well completion bid items.

3) Where wells are located more than five feet from the manifold, a lateral 4-inch PVC extension pipe is required, as shown on Detail 13 on Sheet 22 of the Plans. Payment for this pipe shall be in accordance with the 4-inch PVC pipe pay item per Section 9.06. Pipe supports shall be as per Section 9.16 of these Specifications.

9.11 Road Crossings

The work consists of laying culvert pipe, jointing, trenching, backfilling, asphalting and compacting required
for the construction of the "Road Crossing" as shown on the Plans.

A. Materials

Pipe used for the "Culvert pipe" shall be ductile iron pipe in sizes as shown on the Plans. The culvert pipe shall be supplied by the Owner.

B. Construction Requirements

All road crossings, whether single or multiple lines, shall be inserted in the culvert piping using 2-inch by 2-inch by 18-inch long cedar blocking at 5-foot centers, strapped to pipe with stainless steel bands as shown on the Plans.

Pipe culverts shall be laid in a manner that the excavation, pipe laying, and backfilling, as described on the Plans, of the pipe trench shall be completed within the same day and before the Contractor leaves the site on that day, unless otherwise approved by the Engineer. The Contractor shall plug any open ends of the pipe at the end of each working day to prevent dirt from accidentally entering the pipe.

C. Measurement and Payment

The Contract unit price "Road Crossing, at Per Each" shall be considered full compensation for all labor, equipment and materials necessary to furnish and install all gas manifold road crossings in accordance with Details C-26 and C-27 on Sheet 24 of the Plans. All trenching and backfilling shall be considered incidental to this item.

All work shall be performed in accordance with the Drawings and these Specifications.

9.12 Valves for Gas Collection Manifold System

The work consists of furnishing and installing valves as required at locations shown on the Plans and in accordance with the manufacturer's recommendations and applicable sections of these Specifications.

A. Materials

Valves 4 inches and larger shall be Demco Lug-Type
Butterfly Valves with gear operators, position indicator, and hand wheel.

Valves 3 inches and smaller shall be NPT Brass Body Gate Valves.

B. Construction Requirements

All valves shall be oriented for operator convenience, with the handle or actuator in the most accessible position. Valves for individual gas well control shall be installed and paid for in accordance with above and below ground wellhead completions, as shown on the Plans and in accordance with Sections 9.08, 9.09 and 9.10 of these Specifications.

Gas manifold butterfly valves shall be installed with the shaft situated as directed by the Engineer. Where gas manifold valves are to be buried, a valve box is to be provided with a sealable lid to allow access to the valve from the surface. This valve box shall be as shown on the Plans and Details, and shall be paid for as described below.

Flange bolts shall be tightened by pulling down on diametrically opposite nuts until proper bolt torque values are achieved. Bolt torques for the PVC Flanges are given below:

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<thead>
<tr>
<th>Flange Size (inches)</th>
<th>Torque (foot pounds)</th>
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</table>

C. Measurement and Payment

1. The Contract unit price "___-Inch Valve, Butterfly, at Per Each" shall be considered full compensation for all labor, equipment and materials necessary to furnish and install each corresponding size valve onto the gas manifold pipeline, including all necessary fittings.

2. The Contract unit price "Gas Manifold Valve Box, at Per Each" shall be considered full compensation for all labor, equipment and materials necessary to furnish and install below ground gas manifold
valve box, including all excavation and backfill in accordance with the Plans and Specifications.

3. Valves and vault boxes for underground wellhead completions, and valves for above ground wellhead completions, shall be paid for in accordance with Sections 9.08, 9.09 and 9.10 of these Specifications.

9.13 Anchor Blocks for Gas Collection Manifold System

The work consists of furnishing and installing anchor blocks as required at locations shown on the Plans and in accordance with the Details and applicable sections of these Specifications.

A. Materials

Anchor blocks shall be fabricated from hot dipped galvanized steel pipe and pipe clamps as shown on the Drawings. Any raw surfaces created by the cutting of the galvanized steel shall be painted with a high zinc content paint to avoid rusting. Concrete, when required, shall be in accordance with Section 11 of these Specifications.

B. Construction Requirements

Anchor blocks shall be fabricated, as shown in the details shown on the Drawings, or as directed by the Engineer. Anchor blocks will be installed at each vacuum valve station, and as directed by the Engineer.

C. Measurement and Payment

The Contract unit price "Anchor Block, at Per Each" shall be considered full compensation for all labor, equipment and materials necessary to furnish and install all anchor blocks required on the project as shown on Detail C-38 on Page 26 of the Plans. All concrete, rebar, pipe clamps and PVC couplers (regardless of size) required for anchor blocks as shown on the Plans, shall be incidental to this unit price item.

9.14 Expansion Joints for Gas Collection Manifold System

The work consists of furnishing and installing expansion joints as required at locations shown on the Plans and in
accordance with the Details and applicable sections of these Specifications.

A. Materials

Expansion joints shall be constructed of high strength silicone rubber with polyester fabric reinforcement as manufactured by Industrial Tube Corporation, 3091 Indian Avenue, Parris, California, 92370, or acceptable substitute. Stainless steel Type 302 wire shall be encapsulated within the inner and outer plies and not exposed. Scuff strips shall be added to the outside of the coupling over the wire areas. The ends shall be flanged to match 125 pound C.I. bolt pattern. The coupling shall have an operating temperature range of between -64F through +325F. The coupling shall have the flexibility of 50% contraction and 20% extension and a bend radius of 1.5% the diameter.

B. Construction Requirements

Expansion joints shall be installed and located as shown on the Drawings, or as directed by the Engineer.

C. Measurement and Payment

The Contract unit price "-Inch Expansion Joint, at Per Each" shall be considered full compensation for all labor, equipment and materials necessary to furnish and install all corresponding size expansion joints on this project, including all flanges (including PVC) as shown on Detail C-9 on Sheet 22 of the Plans.

9.15 Horizontal Gas Wells

The work consists of laying pipe, jointing, trenching, backfilling, asphalting and compacting required for the construction of the "Horizontal Gas Well" as shown on the Plans and applicable sections of these Specifications.

A. Materials

All pipe noted on the plans as "Horizontal Gas Collection Trench Piping" shall have a minimum rating of Schedule 40, and shall be manufactured per the requirements listed in Section 9.06 of these Specifications. This pipe is to be installed as horizontal gas collection trench piping only, as shown on the Plans.
B. Construction Requirements

The horizontal gas collection trench piping shall be "broken-back" style piping, using 10 foot lengths of 4-inch diameter pipe, and 5 foot lengths of 6-inch diameter pipe slipped together as shown on the Plans. This piping shall not be glued or mechanically joined. All 4-inch diameter horizontal gas collection trench piping shall have 4 5/8-inch diameter perforations drilled around the circumference, along every 6 linear inches of pipe.

All excavated refuse and debris shall immediately be disposed of at the working face of the landfill.

The horizontal gas collection pipe, which is to be installed underground, shall be laid in a manner that the excavation, pipe laying, and backfilling as described on the Plans, of the pipe trench shall be completed within the same day and before the Contractor leaves the site on that day, unless otherwise approved by the Engineer. The Contractor shall plug any open ends of the pipe at the end of each working day to prevent dirt from accidentally entering the pipe.

C. Measurement and Payment

The Contract unit price "Horizontal Gas Extraction Well, at Per Lin. Ft." shall be considered full compensation for all labor, equipment and materials necessary to furnish and install all new horizontal gas extraction wells on this project, in accordance with Detail C-15 on Sheet 23 of the Plans, and shall include, as incidental to the unit price item, the following:

1) All associated trench excavation and disposal of excavated material.
2) Furnishing and installing all drain rock backfill and filter fabric as shown on the Plans.
3) Furnishing and installing all 4-inch and 6-inch PVC piping, including perforations and fittings from the end of each well up to the 2-inch gate valve shown on the Plans.

Measurement shall be from end to end of the completed in place horizontal well piping, measured along the center line of the piping.
The 2-inch gate valve shall be provided and paid for as a new 2-inch gate valve, per Section 9.10.C.2 of these Specifications. The 4-inch PVC lateral pipe to PVC manifold tee will be provided and paid for per Section 9.10.

9.16 Supports and Guides

The work consists of furnishing and installing pipe supports and pipe guides as required at locations shown on the Plans and as required by the Engineer.

A. Materials

Pipe supports and pipe guides shall be fabricated from hot dipped galvanized steel pipe and structural tubing, where shown on the Plans and in accordance with Details C-17, C-18 and C-19 on Sheet 23. Any raw surfaces created by the cutting of the galvanized steel shall be painted with a high zinc content paint to avoid rusting. Concrete, when required, shall conform with Section 11 of these Specifications.

B. Construction Requirements

Pipe supports shall be fabricated as shown on Details C-17, C-18 and C-19 on Sheet 23 of the Plans. Pipe supports will be required at minimum 15-foot centers along the gas collection manifold (Type G and G1), and 10-foot centers along the well connection pipes (Type G3), where the manifold or well connection pipe is required to be installed above the ground to maintain minimum pipe slopes. Pipe supports at the Vacuum Pump Station shall be provided and paid for as described in Sections 10.05 and 10.07 of these Specifications. Type G2 gas pipe supports shall be installed on 50-foot centers along all non-supported above ground gas collection piping, or as directed by the Engineer.

C. Measurement and Payment

1. The Contract unit price "Pipe Support, Type G, at Per Each" shall be considered full compensation for all labor, equipment and materials necessary to furnish and install the pipe support shown on Detail C-17 on Sheet 23 of the Plans, including all costs to furnish and install all galvanized
pipe, u-bolts, concrete and rebar as shown on the Plans.

2. The Contract unit price "Pipe Support, Type G1, at Per Each" shall be considered full compensation for all labor, equipment and materials necessary to furnish and install the pipe support shown on Detail C-17 on Sheet 23 of the Plans, including all costs to furnish and install all galvanized pipe, u-bolts, concrete and rebar as shown on the Plans.

3. The Contract unit price "Pipe Support, Type G3, at Per Each" shall be considered full compensation for all labor, equipment and materials necessary to furnish and install the pipe support shown on Detail C-18 on Sheet 23 of the Plans, including all costs to furnish and install all steel angles, rebar and u-bolts shown on the detail.

4. The Contract unit price "Pipe Support, Type G2, at Per Each" shall be considered full compensation for all labor, equipment and materials necessary to furnish and install the pipe support shown on Detail C-19 on Sheet 23 of the Plans, including all steel angles and u-bolts.

9.17 Probe Station Modifications

The work shall include the excavation, extension, and protection of the perimeter gas monitoring probes along the east boundary of the landfill.

A. Material

The gas monitoring probes shall be extended using 1/2-inch diameter Schedule 80 PVC pipe, as described in Section 9.06 of these Specifications.

The valves on the probes shall be salvaged and re-used for final gas monitoring probe installations. The Contractor is required to clearly mark the different completions on both the valves and the extension pipe during excavation and raising, so as not to confuse different completions.

The apron shall be constructed of concrete conforming to Section 11.00 of these Specifications.
The gas monitoring probe vault shall be salvaged and re-used in the final probe vault installation.

B. Construction Requirements

The Contractor shall remove and salvage the existing vault and remove and dispose of the existing apron material at gas monitoring probes shown on the Plans.

The Contractor shall raise the existing gas monitoring probe completions to the elevation shown on the plans. The Contractor shall clearly mark each probe completion within each vault, as directed by the Engineer, prior to removing the shut-off valve and raising the probe completions. The Contractor shall join the piping, as shown on Detail C-22 on Sheet 24 of the Plans. The Contractor shall not use any glues or solvents on the probe completion piping.

The Contractor shall be responsible for protecting and maintaining access to all gas monitoring probes during the construction activities. Any probe stations damaged during the construction activities shall be immediately repaired or replaced at the Contractor’s expense, as directed by the Engineer. If a probe station is damaged beyond repair as determined by the Engineer, it shall be replaced by the Contractor within 10 working days, at the Contractor’s expense. This requirement will hold for all probe stations along the east boundary of the landfill, even those which the Contractor will not be raising as part of this contract.

The Contractor must maintain access to all probe stations, and probe stations must remain in service at all times during construction activities, to allow City personnel to monitor from these probes on a daily basis.

C. Measurement and Payment

The Contract unit price "Probe Station Modifications, at Per Each" shall be considered full compensation for all labor, equipment and materials necessary to modify a probe station as specified, including all costs for removing and replacing the existing vault boxes, furnishing and installing all concrete, pipe, fittings, etc. for the complete probe station modification.
10.00 CONDENSATE COLLECTION SYSTEM

10.01 Scope
This section covers the material and installation requirements for all piping, valves, fittings, and other equipment associated with the condensate collection system.

10.02 General
This work shall consist of furnishing and installing below ground high density polyethylene piping systems, below ground polyvinyl chloride piping systems, miscellaneous valves and fittings of appropriate sizes and type, as described in the Plans and these Specifications, one vacuum pump station, two condensate pump stations and 15 vacuum valve stations.

10.03 Condensate System Piping
The condensate piping system involves the installation of 2-inch HDPE condensate collection piping, 1-inch PVC condensate vacuum piping and 2-inch PVC condensate pump discharge piping, as shown on the Plans.

A. Materials
All HDPE piping and fittings and all PVC piping and fittings, shall conform to the specifications listed in Sections 9.05 and 9.06 of these Specifications, respectively.

Proof testing and piping material certification shall be furnished in accordance with Sections 9.05 and 9.06 of these Specifications.

B. Construction Details
All HDPE and PVC piping, shall be laid in a manner as described in Sections 9.05 and 9.06 of these Specifications, respectively.

Trenching, bedding material and backfill shall conform to Section 10.04.

C. Measurement and Payment
1) The Contract unit price "2-Inch, HDPE, Class C, Condensate Piping, at Per Lin. Ft." shall be considered full compensation for all labor,
equipment and materials necessary to furnish, install and test the 2-inch HDPE underground condensate piping in accordance with the Plans including all connections and fittings. Measurement shall be the actual in place length installed, measured through all fittings.

2) The Contract unit price "1-Inch PVC, Condensate Vacuum Piping, at Per Lin. Ft." shall be considered full compensation for all labor, equipment and materials necessary to furnish, install and test the 1-inch PVC underground condensate vacuum piping in accordance with the Plans, including all connections and fittings. Measurement shall be the actual in place length installed measured through all fittings.

3) The Contract unit price "2-Inch PVC, Condensate Pump Discharge Piping, at Per Lin. Ft." shall be considered full compensation for all labor, equipment and materials necessary to furnish, install and test the 2-inch PVC, condensate pump discharge piping in accordance with the Plans, including all connections and fittings. Measurement shall be the actual in place length installed, measured through all fittings.

Payment for chipping of existing asphalt, trench excavation, bedding and backfill shall be in accordance with Section 10.04. Payment for electrical conduits placed in trenches shall be paid per Section 15 of these Specifications.

The costs associated with installing the condensate discharge lines into the sanitary sewer manhole including core penetrations, grouting, and all required fittings, as per the Plan, shall be incidental to the cost of the 2-inch HDPE piping per lin. ft.

The work of cleaning and testing, and furnishing caps and plugs for the tests, and temporary system isolation shall be considered incidental to the bid items for the appropriate type of pipe as listed in the Bid Form.

All work shall be performed in accordance with the Drawings and these Specifications.

The Contractor shall provide all necessary water for construction, and air for testing purposes, and all costs
10.04 Condensate Piping System Trench Excavation, Bedding and Backfill

The condensate system piping (condensate, collection, vacuum, pump discharge, electrical conduits) are to be placed underground, as shown on the trench detail shown on Sheet 25 of the Plans. Trenching for the installation of the various condensate piping will be both within the lined area and outside of it along the landfill access road.

A. Materials

Pipe bedding material shown shall be sand bedding conforming to Section 7.15 of these Specifications.

B. Construction Details

The Contractor shall use extreme care when trenching for condensate system piping, so as not to damage the landfill cap liner system. Any damage to the liner system shall be promptly repaired to the satisfaction of the Engineer, and at the Contractor's sole expense.

The condensate system piping and trenches shall be installed, as shown on the Plans or as directed by the Engineer. Pipe bedding material shall be placed around the various condensate system piping, as shown on the Plans.

C. Measurement and Payment

The Contract unit price "Condensate Piping Trenching, Bedding and Backfill, at Per Lin. Ft." shall be considered full compensation for all labor, equipment and materials necessary for all condensate piping trenching, bedding and backfill regardless of the trench size, depth and number of conduits in the trench, including costs associated with chipping existing asphalt where required, in accordance with the details on Sheet 25 of the Plans. All trenching, furnishing and installing pipe bedding and compaction and backfill, shall be considered incidental to this bid item. Providing and placing the various condensate piping within the trench shall be paid per Section 10.03 of these Specifications.
10.05 Vacuum Pump Station

The work to be performed includes furnishing all equipment and materials, and constructing the vacuum pump station as per the Drawings. Included in the vacuum pump station are the following components:

1. All piping, piping supports, fittings, and valves within the walls of the vacuum pump station enclosure, and between the vacuum pump station enclosure and the condensate collection tank, as shown on the Details.
2. One Vacuum Reserve Tank System
3. Two Condensate Discharge Pumps (one spare)
4. One Condensate Collection Tank
5. One Vacuum Pump Station Building

These items shall be installed at the locations shown on the Drawings.

A. Material

1. Vacuum Pump Station Piping

The piping is to be Schedule 80 PVC material, as per Section 9.06 of these specifications. This piping is to be tested upon installation, as per Section 9.06.

2. Vacuum Pump Station Valves

All ball valves required at the Vacuum Pump Station shall be "Duo-Bloc" true union ball valves, as manufactured by Asahi/America, or approved equal. The body of the valve shall be PVC, with Teflon seats backed by Viton, and Viton seals.

3. Vacuum Pump Station Vacuum Reserve Tank System

The Vacuum Reserve Tank System shall be "Gast" Model 5565-V15DTD-T338 Vacuum Tank System, or approved equal. The vacuum tank shall be steel construction, minimum 60-gallon capacity, with horizontal foot supports. The vacuum pumps shall be installed on top of the tank and shall be capable of producing, at its extremes, 56 cfm air at 0 inches Hg vacuum and 26 inches Hg at 0 cfm air. The vacuum reserve tank system shall be furnished with a control panel containing magnetic...
starters for each vacuum pump, adjustable upper and lower pressure switches for automatic operation, and a vacuum gauge. The vacuum pump motors shall be 3 HP TEFC 460 V, 3 PH. The unit shall be sold as a package including all plumbing, valves, gauges, and electrical connections, shipped ready for installation and start-up from the vendor.

4. Vacuum Pump Station Condensate Discharge Pumps

The condensate discharge pumps (one spare) shall be "jet" pumps, as manufactured by Berkeley Pumps, Model 7DB with 3/4 HP TEFC 460 V, 3 PH motors with a 7D40 ejector. The pumps shall be capable of pumping 11 gpm water against a negative suction head of a 40 foot water column. The pump casing shall be close grained cast iron, with smooth finish "noryl" impeller and buna-n seals. The pumps shall be supplied with a stainless steel 7D40 ejector and a foot valve, for installation in the condensate collection tank as shown on the Drawings.

5. Vacuum Pump Station Condensate Collection Tank


The Condensate Collection Tank shall have adequate wall thickness, fiberglass mat, and stiffener for an operating vacuum of 25 inches Hg.

The Condensate Collection Tank shall meet the classification of Type II, Grade 2 in conformance with ASTM Standard Specification D3299. The resin used to fabricate the Condensate Collection Tank shall be a commercial-grade, vinyl ester resin, corrosion resistant thermoset suitable for corrosive leachate collection systems. The chopped strand mat, the continuous roving, and the surface mat shall be in accordance with ASTM Standard Specification D3299. The woven roving shall be in accordance with ASTM Standard Specification D2150.

(STAGE 1 NORTH CLOSURE) 10-5
(TACOMA LANDFILL )
The Condensate Collection Tank shall be coated with a protective coating resin to resist ultraviolet degradation. The interior shall have a vinyl ester liner, 100 mil thick, and shall be Koppers Atlac 580, or approved equal.

6. Vacuum Pump Station Building

This section covers the work necessary to furnish and install the Vacuum Pump Station Building, complete, as shown on the Drawings and specified herein.

Materials shall not be dissimilar in nature and shall meet the intended service requirements. Walls and ceilings shall be watertight and have corrosion-resistant paint. The structure shall carry a 10-year warranty to obligate the manufacturer to repair or replace any defect in materials or workmanship. Building construction and materials shall be Underwriters Laboratories and Factory Mutual approved, as applicable.

i. Manufacturer. Shall be Bally Insulated Modular Structures, or approved equal. The local representative is Carlson Sales, Vancouver, Washington, (206) 573-8203.

ii. Dimensions. Height to be 10'-2". Minimum width to be 15'-0" and minimum length to be 15'-0".

iii. Walls and Corners. Prefabricated wall panels, 22 gage galvanized steel sheet, with urethane foam core sandwiched in the middle. Provide additional internal supports for electrical outlets, overhead lights, and light switches as shown on the Plans. Provide fasteners to allow Contractor to mount electrical backing board.

iv. Roof. Aluminum pre-formed weatherproof ceiling panels. The roofing system shall consist of an inner and outer aluminum panel with necessary structural metal members for exposure to Class C conditions, wind loads to 90 MPH, and to meet Uniform Building Code, 1988 requirements. The inner core shall be urethane foam. The outer surface shall have a finish suitable for service as
roofing material to withstand the elements. The inner surface shall have the manufacturer's standard paint finish. All roof panels shall have elastomeric seals to provide a watertight seal and be capable of the expected expansion and contraction of the building.

v. Insulation. 4-inch poured and heat cured urethane core, ceiling and walls, R-34 rating.

vi. Doors. The doors shall be 24 gauge steel with seamless face panels, sized and located as shown on the Drawings. Core shall be 2-inch thick urethane. An operable louver shall be located in the lower door. Butt hinges (3 pairs) and lockset (to match City of Tacoma keying) with keys shall also be included with all other hardware, weatherization metal door frame. The doors shall have pneumatic door closer devices with integral hold open locks. Weatherproof shields and sill plates shall be included.

vii. Finish. Paint all interior and exterior surfaces per manufacturer's standard coating finishes and erection drawings. Provide Owner with color samples for selection prior to painting.

viii. Ventilation. Provide 100 CFM power ventilator with thermostat control and manual wall switch. The thermostat shall be adjustable to turn the ventilator on between the range of 60°F and 100°F.

ix. Hardware. The manufacturer shall provide all hardware for assembly and securing the building in place. All hardware for securing the building components shall be corrosion resistant with insulating washers for interface where dissimilar metals are in contact. All concrete anchors for securing the building to the concrete slab shall be stainless steel and shall be anchor bolts with lock washers or inserts shot into the concrete slab.

x. Electrical. See the Drawings and Section 15 of these Specifications for electrical and lighting requirements.

xi. Foundation. See the Drawings and Section 11 of these Specifications for enclosure foundation requirements.

xii. Wall Penetrations. The manufacturer shall
propose to the Engineer, a method of penetrating and sealing enclosure walls in the field. This proposal shall consist of a narrative description and any drawings required to adequately describe the method of wall penetration and sealing.

7. Pipe Supports and Pipe Guides

Pipe supports and pipe guides at the Vacuum Pump Station shall be fabricated as shown on the Plans. Materials and construction requirements shall be as per Section 9.18.

B. Construction Requirements

Each element of the Vacuum Pump Station shall be constructed in accordance with the applicable sections of these specifications for the type of work being performed and in accordance with the Plans.

The Vacuum Pump Station Building shall be designed by the manufacturer to meet local Building Code, Wind Loadings, 1988 UBC, and environmental conditions encountered at the site. Design drawings and calculations shall be stamped by a registered professional engineer in the State of Washington and submitted in accordance with the GENERAL CONDITIONS. Design drawings shall include details for anchoring the modular structure to the concrete slab. Manufacturer's installation instructions shall also be provided.

The Vacuum Pump Station Building shall be erected and finished according to the manufacturer's printed instructions. The structure shall be watertight at all joints and conform to local Building Code and 1988 UBC.

The building shall rest and be secured on top its' foundation as per the Plans. Provide watertight sealing of all joints with 20-year life sealant per the manufacturer's recommendation. Following erection, seal all external joints not sealed during the erection process, including the base of the wall where it meets the foundation.
C. Measurement and Payment

The Contract unit price for "Vacuum Pump Station, at Per Lump Sum" shall be considered full compensation for all materials, labor, and equipment required to install the vacuum pump station as per the Drawings and these specifications, including, but not limited to, furnishing and installing the following specific items:

1. All piping, fittings, supports, guides, and valves within the walls of the vacuum pump station enclosure and between the vacuum pump station enclosure and the condensate collection tank as shown on Detail B-26 on Page 26 of the Drawings.
2. One Vacuum Reserve Tank System
3. Two Condensate Discharge Pumps (one spare)
4. One Condensate Collection Tank
5. One Vacuum Pump Station Building, including concrete slab
6. All other piping, tubing, insulation, electrical tracing, and all other appurtenances, as described in these specifications and on the drawings, as related to the "Vacuum Pump Station".

10.06 Vacuum Valve Station

The work to be performed includes furnishing all material and fabricating the vacuum valve stations, as per Details C-37 and C-39 on Sheet 26 of the Plans. Included in each vacuum valve station are the following components:

1. All piping and fittings between the 2-inch condensate collection pipe (HDPE) and the gas collection manifold.
2. Two 1/2-inch stainless steel ball valves as shown on the Drawings.
3. 3/16 inch stainless steel tubing with fittings and valve as shown on the Drawings.
4. One "APCO" model 65.5 air release valve. This valve shall be installed "upside down" as shown on the Drawings, in that it will be used as a vacuum release valve rather than an air release valve.
5. One precast concrete meter box.

A. Material

1. The stainless steel piping shall be 316L stainless steel HDPE and PVC connection fittings shall be per Sections 9.05 and 9.06.
2. The ball valves shall be stainless steel body, stainless steel ball and stem, with EDPM seats.

3. All stainless steel tubing, fittings and valves shall be 316L stainless steel "Swagelock" or approved equal.

4. The vault shall be a "Utility Vault Company" pre-cast concrete vault with a Model No. 2436-R6 riser and a Model No. 23-2436P locking cover, or approved equal. The overall dimensions of the vault shall be 3'-0" x 2'-0" x 1'-9" deep. The vault shall be installed with 1-inch thick "Styrofoam-Blue" brand polyfoam board as manufactured by DOW Chemical Company. The polyfoam board shall be secured to all interior surfaces of the vault including the lid, using DOW Chemical PL-300 adhesive, or approved equal.

5. The "APCO" Model 65.5 air release valve shall be constructed of stainless steel body, internals, and seats. No substitutions will be accepted for this air release valve.

6. All gravel material shall be gravel drain rock as per Section 6 of these Specifications.

B. Construction Requirements

Each "Vacuum Valve Station" shall be installed per standard pipe fitting methods, at the locations indicated in the Drawings.

C. Measurement and Payment

1) The Contract unit price for "Vacuum Valve Station, at Per Each" shall be full compensation for all materials, labor, and equipment required to install each vacuum valve station as per the Drawings and these Specifications, including, but not limited to, furnishing and installing the following specific items at each vacuum valve station, as incidental:

   a. All excavation, gravel material and backfill associated with each Vacuum Valve Station.

   b. All piping and fittings between the 2-inch condensate collection pipeline (HDPE) and "plastic-to-stainless steel" flange break at the gas collection manifold, including the 2-inch HDPE tee and flange fittings necessary for connection to the condensate pipeline.

(STAGE 1 NORTH CLOSURE) 10-10
(TACOMA LANDFILL )
Payment for the connection from the "plastic-to-stainless steel" flange break to the gas collection manifold shall be as specified in Section 10.06.C.2 below.

c. Two 1/2 inch stainless steel ball valves as shown on the Drawings.
d. 3/16 inch stainless steel tubing with fittings and valve as shown on the Drawings.
e. One "APCO" model 65.5 air release valve. This valve shall be installed "upside down" as shown on the Drawings, in that it will be used as a condensate vacuum release valve rather than an air release valve.
f. The five foot by five foot HDPE liner material, 50 mil (min) as shown.
g. One precast concrete vault with locking cover with core penetration, grouting, as required, and installation of "Styrofoam Blue" polyfoam boards, as required.

2) The Contract unit price "Vacuum Station/Above Ground Gas Manifold Connection, _______-Inch, at Per Each" shall be considered full compensation for all labor, equipment and materials necessary to furnish and install the necessary fittings from the "plastic-to-stainless steel" flange to the corresponding size of gas manifold piping including the PVC tee and 2-inch bushing, as shown on the Plans.

3) The Contract unit price "Vacuum Station/Below Ground Gas Manifold Connection, _______-Inch, at Per Each" shall be considered full compensation for all labor, equipment and materials necessary to furnish and install the necessary fittings from the "plastic-to-stainless steel" flange break, to the corresponding size of below ground HDPE gas manifold piping, including the special fabricated tee/drip leg as shown on the plans.

10.07 North Remote Condensate Pump Station

The work to be performed includes furnishing all equipment and material, and constructing the "North Remote Condensate Pump Station" as per the Drawings. Included in the condensate pump stations are the following components:

1. All piping, fittings, and valves between the two condensate pumps and the condensate collection tanks as shown on Details C-40 on page 26 of the Plans.

(STAGE 1 NORTH CLOSURE) 10-11
(TACOMA LANDFILL )
2. Two Condensate Discharge Pumps (one spare) per Condensate Pump Station
3. One Condensate Collection Tank per Condensate Pump Station, including concrete base.
4. One concrete pump foundation for the Pump Station
5. Two utility vaults for both pump station and condensate collection tank.

These items shall be installed at the locations shown on the Details.

A. Material

1. Condensate Pump Station Piping
   The piping is to be PVC material, as per Section 9.06 of these specifications. This piping is to be tested upon installation as per Section 9.06.

2. Condensate Pump Station Valves
   All ball valves required at the Condensate Pump Station shall be "Jamesbury" Model No. 21V-1136TT-3 threaded ball valves with brass bodies, stainless steel trim, TFE seats and seals, and stainless steel body fasteners, or approved equal.

3. Condensate Pump Station Condensate Discharge Pumps
   The condensate discharge pumps (one spare) shall be "jet" pumps, as manufactured by Berkeley Pumps, Model 7DB with 3/4 HP TEFC 460 V, 3 PH motors with a 7D40 ejector. The pumps shall be capable of pumping 11 gpm water against a negative suction head of a 40 foot water column. The pump casing shall be close grained cast iron, with smooth finish "noryl" impeller and buna-n seals. The pumps shall be supplied with a stainless steel 7D40 ejector and a foot valve for installation in the condensate collection tank, as shown on the Drawings.

4. Condensate Pump Station Condensate Collection Tanks
   The Condensate Collection Tanks shall be furnished ready for installation in conformance with ASTM Standard Specification D3299 for "Filament-Wound Glass-Fiber-Reinforced Thermoset Resin Chemical-

The Condensate Collection Tanks shall have adequate wall thickness, fiberglass mat, and stiffener for an operating vacuum of 25 inches Hg.

The Condensate Collection Tanks shall meet the classification of Type II, Grade 2, in conformance with ASTM Standard Specification D3299. The resin used to fabricate the Condensate Collection Tank shall be a commercial grade, vinyl ester resin, corrosion resistant thermoset, suitable for corrosive leachate collection systems. The chopped strand mat, the continuous roving, and the surface mat shall be in accordance with ASTM Standard Specification D3299. The woven roving shall be in accordance with ASTM Standard Specification D2150.

The Condensate Collection Tanks shall be coated with a protective coating resin to resist ultraviolet degradation. The interior shall have a vinyl ester liner, 100 mil thick, and shall be Koppers Atlac 580, or approved equal.

5. North Remote Condensate Pump Station and Condensate Tank Vaults

The North Remote Condensate Pump Station and Condensate Tank Vaults shall be a "Utility Vault Company" pre-cast concrete vault with a Model No. 504-L vault, with drain hole provided, and a Model No. 55-332P locking cover, or approved equal. The overall dimensions of the pump vault shall be 4'-8" x 4'-8" x 4'-0" deep (outside dimensions). The vaults shall be installed with 1-inch thick "Styrofoam-Blue" brand polyfoam board, as manufactured by DOW Chemical Company. The polyfoam board shall be secured to all interior surfaces of the pump vault using DOW Chemical PL-300 adhesive, or approved equal.

B. Construction Requirements

Each element of the North Remote Condensate Pump Station shall be constructed in accordance with the applicable sections of these specifications for the type of work performed.
C. Measurement and Payment

The Contract unit price for "North Remote Condensate Pump Station, at Per Lump Sum" shall be full compensation for all materials, labor, and equipment required to install the condensate pump station, as per the Drawings and these specifications, including, but not limited to, furnishing and installing the following specific items:

1. All piping, fittings, and valves between the two condensate pumps and the condensate collection tanks as shown on the Plans.
2. Two Condensate Discharge Pumps (one spare)
3. One Condensate Collection Tank
4. Two concrete vaults
5. All other piping, tubing, insulation, electrical tracing, and all other appurtenances, as described in these specifications and on the drawings, as related to the "North Remote Condensate Pump Station".

10.08 Spare Material

A. General

The Contractor shall supply, for the City, the following material for the City to use as spare supplies for the gas and condensate collection system:

1. Two (2) APCO Model 65.5 Air Release Valves, as described in Section 9.04A of these Specifications.
2. One (1) Condensate Pump, as described in Section 10.07 of these Specifications.

B. Measurement

There shall be no separate measurement for "Spare Material".

C. Payment

The Contract unit price "Spare APCO Model 65.5 Air Release Valve, at Per Each" and "Spare Condensate Pump, at Per Each" shall be full compensation for the costs associated with the purchase and delivery of all materials listed above. The Contractor is to deposit the material in a location designated by the Engineer at the time it is delivered to the job site.
10.09 Condensate Cleanout

The work consists of furnishing and installing condensate cleanouts along the 2-inch condensate piping at locations shown on the Plans and in accordance with Detail C-43 on sheet 27 of the Plans.

A. Materials

The HDPE piping and fitting for the condensate cleanouts shall conform to Section 9.05 of the specifications. Vault boxes shall be as shown on the Plans.

B. Construction

The condensate cleanouts, vault boxes, lids and pipe fittings shall be installed as shown on Detail C-43 on sheet 27 of the Plans.

C. Measurement and Payment

The Contract Unit Price "Condensate Cleanouts, at Per Each" shall be considered full compensation for all labor, equipment and materials necessary to furnish and install the condensate cleanouts as shown on Detail C-43 on sheet 27 of the Plans. All costs for furnishing and install all fitting and vault boxes with lids and all cost for excavation, bedding and backfill shall be considered incidental to this bid item.
11.00 CAST-IN-PLACE CONCRETE

11.01 Scope
This section covers all cast-in-place concrete, including reinforcing steel, forms, finishing, curing, and other appurtenant work. All concrete furnished hereunder shall be air-entraining. The cost for concrete shall be considered incidental to the unit costs for the various items requiring concrete. All work shall be carried out in accordance with Section 6-02 of the Standard Specifications.

11.02 General Requirements
Concrete structures, or parts thereof may be placed directly against excavation faces without the use of outer forms, provided that such faces are stable and also provided that a layer of polyethylene film is placed between the earth and the concrete.

11.03 Preliminary Review
The source and quality of concrete materials and the concrete proportions proposed for the work shall be submitted to the Engineer for review before any concrete is placed.

11.04 Placement
Concrete shall be conveyed to the point of final deposit and placed by methods which will prevent the separation or loss of the ingredients. During and immediately after placement, all concrete shall be thoroughly compacted, worked around all reinforcements and embedments, and worked into the corners of the forms. Unless otherwise authorized, compaction shall be by immersion-type vibrators.

11.05 Reinforcement
Reinforcements shall be accurately formed and positioned, and shall be maintained in proper position while the concrete is being placed and compacted.

11.06 Forms
Forms shall be designed to produce hardened concrete having the shape, lines, and dimensions indicated on the drawings. Forms shall be substantial and sufficiently tight to prevent leakage of mortar and shall be maintained in proper position and accurate alignment. Forms shall be thoroughly cleaned and oiled before concrete is placed and shall not be removed until the concrete has hardened sufficiently to support all loads without damage.
11.07 **Finishing**

Surface voids and recesses resulting from removal of form ties shall be filled with mortar.

Unformed surfaces shall be given a float finish.

11.08 **Curing**

Concrete shall be protected from loss of moisture for at least 7 days by polyethylene film or membrane curing compound. Membrane curing compound shall be applied as recommended by the manufacturer. Concrete shall not be permitted to freeze for at least 7 days following placement.

11.09 **Measurement and Payment**

All concrete, including furnishing, hauling, placing, compacting, finishing, reinforcing steel, curing, compacting and forming, required on this project shall be considered incidental to the unit price for the item where the concrete is used, including but not limited to condensate vacuum pump station foundation, fence post foundations, liner penetrations, pipe supports, probe extensions, pipeline anchor blocks, and condensate collection tanks.
12.00 ASPHALT

12.01 Asphalt, Class B

The contract unit price for "Asphalt Concrete Pavement, Class B, at Per Ton" as listed in the proposal shall be considered full compensation for all labor, equipment and materials costs associated with furnishing, hauling, placing and compacting the asphalt pavement to the limits shown on the plans or as directed by the Engineer. The estimated quantity listed in the proposal includes an amount of asphalt to be used to patch the existing landfill entry road. All work shall be performed in accordance with Section 5-04 of the Standard Specifications. Asphalt shall be compacted to a minimum 92 percent of Rice Density, in accordance with Section 5-04.3(10)(B) of the State Standard Specifications. Asphalt tack and sealers for joints shall be considered incidental to the contract unit price for "Asphalt Concrete Pavement, Class B, at Per Ton" as listed in the proposal.

Crushed surfacing base course and crushed surfacing top course shall be installed and paid for as described in sections 6.12 and 6.13.

12.02 Cold Mix for Temporary Patch

Included in the proposal is an estimated quantity of Cold Plant Mix for temporary pavement patch. This material shall be used wherever directed by the Engineer for temporary patching of the landfill entry road. All labor, equipment, and materials costs associated with preparation, placing, and removal of the temporary patch shall be considered incidental to the contract unit price for "Cold Plant Mix for Temporary Pavement Patch, at the Per Ton" as listed in the proposal.

12.03 Chipping Existing Asphalt

Existing asphalt surfacing shall be cut where shown on the drawings, and where directed by the Engineer to provide a smooth edge for the meeting of old and new pavement. This bid item does not include chipping of asphalt associated with trench excavation. This work shall be performed in accordance with Section 2-02.3(3) of the State Specifications as amended by the City of Tacoma. All labor, equipment and materials costs associated with performing this work shall be considered incidental to the contract unit price for "Chipping Existing Asphalt Surface, at Per Square Yard" as listed in the proposal.
13.00 Fencing

13.01 Fence Removal

The contract unit price for "Remove Existing Chain Link Fence, at per Linear Foot" shall be considered full compensation for all labor, equipment, and materials costs associated with removal of the existing 8' chain link fence fabric, fence posts, tension wire, barbed wire, and barbed wire brackets within the construction area as shown on the drawings or as directed by the Engineer. All fence fabric and barbed wire brackets which are removed under this bid item shall be reused by the Contractor as part of either bid item No. 129 or 130. Therefore the fence fabric and barbed wire brackets shall be removed with care so as not to damage the materials. Any material which is damaged by the Contractor during the removal process shall be repaired by the Contractor to the satisfaction of the Engineer, or replaced with new materials. The Contractor shall remove existing fence posts and foundation and shall cut the fence post from the foundation. Posts shall be stockpiled where directed by the Engineer. Foundations may be disposed of at the working face of the landfill at no charge to the Contractor. All costs associated with removing, loading, and hauling this debris to the landfill shall be considered incidental to this unit price.

13.02 Relocated Fence Installation, Within Capped Area

A portion of the chain link fence which was removed as discussed in Section 13.01, shall be reconstructed over the cap system as shown on the drawings. The fence shall be replaced in as good or better condition as exists at the time of removal. Any materials required to be salvaged which are damaged by the Contractor during the reconstruction process, shall be repaired by the Contractor to the satisfaction of the Engineer, or replaced with new materials at no cost to the City.

New posts shall be provided to accommodate the fabric height of 8 feet plus the 18-inch burial depth. Posts for fencing replaced within the limits of cap installation shall be anchored using the spread footing design as shown on detail L-4 on sheet 20 of 31 of the drawings.

All labor, equipment, and materials costs associated with reconstruction of the chain link fencing over the capped area, including, but not limited to, providing and installing
concrete, formwork, reinforcing, posts, welded steel plate, excavation and all other costs associated with construction of the fence post foundations, along with labor, equipment and materials costs associated with installation of the chain link fence fabric, new tension wire, barbed wire, and barbed wire brackets shall be considered incidental to the contract unit price for "Reconstruction of Chain Link Fence, Capped Area, at Per Linear Foot" as listed in the proposal.

13.03 **Relocated Fence Installation, Outside Capped Area**

A portion of the chain link fence which was removed as discussed in Section 13.01, shall be reconstructed outside the area which is capped, as shown on the drawings. The fence shall be reconstructed in as good or better condition as exists at the time of removal. Any materials which are damaged by the Contractor during the reconstruction process, shall be repaired by the Contractor to the satisfaction of the Engineer, or replaced with new materials at no cost to the City.

New posts shall be provided to accommodate the fabric height of 8 feet plus the 30-inch burial depth required for Type 3 fencing in accordance with the Standard Plans. New tension wire and barbed wire shall be installed to match the existing fences within the project area. Posts for fencing replaced outside the limits of cap installation shall be anchored with standard type post bases as shown on the standard plans.

All labor, equipment, and materials costs associated with reconstruction of the chain link fencing outside the capped area, including, but not limited to, providing and installing posts and concrete and excavation of post holes, along with labor, equipment, and materials costs associated with installation of the chain link fence fabric, barbed wire brackets, barbed wire, and tension wire, shall be considered incidental to the contract unit price for "Reconstruction of Chain Link Fence, Outside Capped Area, at Per Linear Foot" as listed in the proposal.

13.04 **Double 20-Foot Chain Link Gate**

The Contractor shall construct a double 20-foot chain link gate where depicted on the contract plans. Such gate shall conform to the gate detail shown on Standard Plan L-3 located elsewhere in these specifications.
The contract unit price for "Double 20-Foot Chain Link Gate, at Per Each, as listed in the proposal shall be considered full compensation for all labor, equipment, and materials costs associated with furnishing and constructing such gate.

13.05 Relocate Existing Double 20-Foot Chain Link Gate

The contract unit price for "Relocate Existing Double 20-Foot Chain Link Gate, at Per Each" shall be considered full compensation for all labor, equipment, and materials costs associated with removal and reconstruction of the existing chain link gates, gateposts, hinges, and ducktails where shown on the plans and directed by the Engineer.

13.06 Fence Construction

Fences shall be installed where shown on the plans in accordance with WSDOT Standard Specification 8.12.
CHAIN LINK FENCE TYPE 1

CHAIN LINK FENCE TYPE 3

CHAIN LINK FENCE TYPE 4

ROLL FORMED SECTIONS

NOTES:
All concrete post bases shall be concrete class C, 10" minimum diameter.
All posts shall be spaced at 10' maximum intervals unless otherwise directed by the Engineer.
Top or bottom tension wires shall be placed within the limits of the felt roll fabric weave.
The illustrative detail shown herein shall not be construed as limiting to hardware design or post selection for any particular fence type.
NOTES:
1. Fence fabric shall be secured to gate frames with knuckled salvage along top edge for Types 4 & 6 chain link fence installations.
2. Minimum post length:
   Types 1 & 3  5'-0"
   Types 4 & 6  5'-6"

CHAIN LINK GATES

STANDARD PLAN 4-3

January 21, 1969

STANDARD PLAN 4-3
14.00 SEEDING

14.01 Description

All work shall be done with accepted horticultural practices by an experienced contractor licensed to practice in the State of Washington.

Topsoil placement and hydroseeding shall be performed as specified herein. Work shall consist of preparing surfaces, placing and compacting topsoil where specified, mulching, seeding and fertilizing all graded and disturbed areas in accordance with these Specifications and Plans.

All seeding operations shall occur as soon as grading operations are complete and it is an acceptable time of the year.

14.02 General

All seeding operations shall occur as soon as grading operations are complete and it is an acceptable time of year for seeding.

Seeded areas steeper than 4 to 1 and all areas when seeding beyond the optimum seeding dates, shall be mulched. Seeding done during optimum seeding dates, on slopes flatter than 4 to 1, and outside drainageways need not be mulched.

Between November 1, 1990 and March 31, 1991 mulching shall be used for erosion control on areas requiring seeding.

Erosion control fabric shall be provided when seeding slopes steeper than 3 to 1 and on drainageways.

14.03 Materials

A. Topsoil, Type C

Topsoil to be used on this project shall be Type C as specified in Section 8-01.3(2)C of the Standard Specifications.

B. Seed

Seed shall meet the requirements of Section 9-14.2 of the State Standard Specifications.
All seeding areas shall be seeded with the following mix and rate of application:

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C. Fertilizer

Fertilizer shall meet the requirements of Section 9-14.3 of the State Standard Specifications.

Fertilizer shall be free-flowing, granular, 50 percent slow-release 10-20-20 formula, applied at a uniform rate of 15-20 pounds/1,000 square feet.

D. Lime

No lime will be required for this project.

E. Wood Cellulose Fiber

Mulch for application to seedbed areas shall be wood cellulose fiber.

Wood cellulose fiber shall meet the requirements of Section 9-14.4(2) of the State Standard Specifications.

The wood cellulose fiber may contain a maximum moisture content of 10 percent, air-dry weight basis. Suppliers shall be prepared to certify that laboratory and field-testing of their product has been accomplished, and that their product meets all of the foregoing requirements based upon such testing.

The wood cellulose fiber mulch shall be applied at the rate of 45 pounds/1000 square feet.
F. Water

All water to be used during seeding shall be free from oil, acid, alkali, salt, and other substances harmful to growth of seed and shall be from a source approved prior to use.

G. Erosion Control Matting

Erosion control matting shall meet the requirements of Section 9-14.5 of the State Standard Specifications.

The Contractor may use jute or excelsior mat for erosion control.

14.04 Construction Requirements

A. Topsoil Installation

A 6-inch minimum layer of topsoil shall be placed over the protective cover soil prior to seeding, as indicated on the Drawings.

B. Preparation of Area

Preparation of area shall meet the requirements of Sections 8-01.3(1)C of the State Standard Specifications.

Equipment in good condition shall be provided for the proper preparation of the ground and for handling and placing all materials.

Previously established grades shall be maintained on the areas to be treated in a true and even condition; necessary repairs shall be made to previously graded areas. Where grades have not been established, the areas shall be graded as shown and all surfaces shall be left in an even and properly compacted condition to prevent formation of depressions. Finished grade shall be such that after seeding, the planted grade will join flush with adjoining surface grades.

Should any portion of the sloped surfaces become gullied or otherwise damaged or treatment is destroyed, the affected portion shall be repaired to original condition and grade prior to injury. Repair work required because of faulty operations or negligence on the part of the Contractor shall be performed without cost to the Owner.

C. Seeding

Seeding shall meet the requirements of Section 8.01.3(4)A of the State Standard Specifications.
If wood cellulose fiber is used as a tracer, the application rate shall not exceed 45 pounds per 1000 square feet. The Contractor shall be responsible for having thoroughly flushed out his hydroseeding tank to ensure that no undesirable seed types are mixed in with the specified mix given in these Specifications. Should any undesired seed become established in the lawn, the Contractor shall be responsible for eradicating the unwanted plants prior to acceptance.

D. Fertilizing

Fertilizing shall meet the requirements of Section 8-01.3(4)B of the State Standard Specifications.

E. Wood Cellulose Fiber

Wood cellulose fiber shall meet the requirements of Section 9-14.4(2) of the State Standard Specifications.

F. Dates for Application of Seed, Fertilizer, and Mulch

Dates for application of seed, fertilizer, and mulch shall meet the requirements of Section 8-01.3(7) except as specified herein.

The Contractor shall notify the Engineer not less than 24 hours in advance of any seeding operation, and he shall not begin the work until areas prepared or designated for seeding have been approved. Following the Engineer's approval, seeding of the approved slopes shall begin immediately.

Seed shall be broadcast with approved hydraulic seeding equipment, in combination with wood cellulose fiber mulch, and fertilizer as specified herein and as shown on the drawings, or with other approved sowing equipment at the specified rate. Seed shall be distributed uniformly over designated areas. Half of seed shall be sown with sower moving in one direction, and the remainder with sower moving at right angles to first sowing. Seed shall not be broadcast during windy weather. When area to be seeded adjoins undisturbed vegetation, seeding shall meet that vegetation as designated by the Engineer or as indicated on the drawings.

The Contractor shall guarantee the hydroseed for a period of 90 (ninety) days or until a healthy stand of grass is established, whichever comes first. The establishment
period shall commence on the date of acceptance of the hydroseed, in place. All hydroseed which, in the opinion of the Engineer, is not in a healthy growing condition at the end of the establishment period shall be replaced by the Contractor at his own expense. Seeding shall be replaced with the same mixture and grade as was originally placed.

G. Placing Jute or Excelsior Matting

Placing Jute or excelsior matting shall meet the requirements of Section 8-01.3(8) of the State Standard Specifications.

14.05 Measurement and Payment

The contract unit price for "Topsoil, Type C, at per Cubic Yard" shall be considered full compensation for all labor, equipment, and materials costs associated with furnishing, hauling, spreading, placing and compacting the topsoil as shown on the Drawings. The contract unit price for "Hydroseeding, Fertilizing, and Mulching, at per Acre" shall be considered full compensation for all labor, equipment and materials costs associated with completing the work as specified. The contract unit price for "Jute Matting, at Per Square Foot" as listed in the proposal shall be considered full compensation for all labor, equipment, and materials costs associated with furnishing and placing the jute matting in the grass lined drainage swales as discussed in Section 7.19.

(STAGE 1 NORTH CLOSURE)
(TACOMA LANDFILL)
15.00 ELECTRICAL - GENERAL

15.00.1 General

A. Description of Work. The Contractor shall provide all labor, material, tools, equipment and services required to complete the furnishing, installation, wiring, connection, calibration, adjustment, testing and operation of all electrical equipment, devices and components as indicated and implied by the plans and these specifications.

Complete the wiring, connection, adjustment, calibration, testing and operation of mechanical equipment having electric motors and/or built-in or furnished electrical components. Install electrical components that are furnished with mechanical equipment.

Provide the size, type and rating of motor control devices, equipment and wiring necessary to match the ratings of motors furnished with mechanical equipment.

Provide adequate space and fit for the electrical installation, including but not limited to, determination of access-ways and doorways, shipping sections, wall and floor space, space occupied by mechanical equipment. Provide electrical equipment that fits in the areas shown on the drawings. All equipment shall be readily accessible for maintenance, shall have electrical clearances in accordance with NEC and shall be installed in locations which will provide adequate cooling.

Complete the procurement, installation, wiring, connection, calibration, adjustment, testing and operation of all electrical devices, components, accessories and equipment which is not shown or specified but which is nonetheless required to make the systems shown and specified properly function.

Test electrical equipment prior to installation so that defective equipment is not installed.

Make all corrective measures required during start-up.

Provide field services of qualified technicians to supervise and check out the installation of the equipment, to supervise and check out interconnecting wiring, to conduct start-up of operation of the equipment, and to correct any problems which occur during start-up.

Provide circuit breakers, conduit, wire and installation for all items which require 120 VAC power.

Nameplates shall be provided on all motor control equipment, MCC cubicles, control stations, and all electrical control equipment enclosures. Nameplates shall be made of 1/16" thick machine engraved laminated phenolic having white letters not less than 3/16" high on black
background. All Nameplates shall include the equipment name or number. All H-O-A switches shall be provided with "HAND-OFF-AUTOMATIC" nameplates.

The words "plans" and "drawings" are used interchangeably in this specification and in all cases shall be interpreted to mean "drawings".

Remove all existing electrical equipment, electrical portion of mechanical equipment, conduit, and wiring which is not required or needed in the final facility. Electrical demolition and rework shown on the drawings shall be used as the basis for determining the general intent of this work. Repair and refinish areas damaged in removal to prior condition.

B. Standards and Codes. Permits, licenses, approvals and other arrangements for work shall be obtained and paid for by the Contractor and included in the bid price.

Electrical work shall be executed in strict accordance with the latest edition of the National Electrical Code and local ordinances and regulations.

All electrical equipment, materials, construction methods, tests and definitions shall be in strict conformity with the established standards of the following in their latest adopted revision:

a. Underwriters' Laboratories, Inc. (UL)
b. National Electrical Manufacturers Association (NEMA)
c. Canadian Standards Association (CSA)
d. Electrical Testing Laboratories (ETL)
e. Factory Mutual (FM)

All materials and equipment specified herein shall, within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.

All materials shall be new, free from defects, of current manufacture, of quality specified or shown. Each type of material shall be of the same manufacture throughout the work.

C. Contract Documents

The electrical layouts are generally diagrammatic. The location of equipment is approximate unless dimensioned. Exact locations and routing of conduits shall be governed by structural conditions and physical interferences and by locations of electrical terminations on equipment.

D. Reference Documents

The Contractor shall refer to the drawings, project data and shop drawings of other trades for additional details which affect the proper installation of the work. Diagrams and symbols showing electrical
connections are diagrammatic only, and so do not necessarily show the exact physical arrangement of the equipment.

E. Site Familiarization

Before submitting a bid, the Electrical Contractor shall familiarize himself with all features of the site which may affect the execution of his work. The Contractor shall take all field measurements necessary for his work and shall assume full responsibility for their accuracy.

F. Project Record Drawings

A set of drawings shall be maintained at the job site showing any deviations in the electrical systems from the original design. Minor changes in branch circuit wiring may be omitted.

A set of electrical drawings marked in red to indicate the routing of conduit runs, shall be submitted to the Engineer for review at the completion of conduit rough-in and prior to cover.

G. Guarantee

The Contractor shall guarantee his work and all components thereof, excluding incandescent and fluorescent lamps for a period of 1 year from date of acceptance of the installation. He shall remedy any defects in workmanship and repair or replace any faulty equipment which shall appear within the guarantee period without additional cost to the Owner.

H. Cleanup

The premises must be kept free of accumulated materials, rubbish and debris at all times. Surplus material, tools and equipment must not be stored at the job site. At the completion of the job, all equipment and fixtures shall be left clean and in proper condition for their intended use.

Lamps and fluorescent tubes shall be cleaned and defective units replaced at the time of final acceptance.

I. Test Reports

Testing for installed feeder cables and motors is required as specified in sections 15.03 and 15.09. Test reports shall be submitted to the engineer prior to final acceptance.

15.01 RACEWAYS

15.01.1 General

(STAGE 1 NORTH CLOSURE)  
(TACOMA LANDFILL )
A. Description of Work

This section covers the furnishing and installation of all raceways, fittings and boxes used in the construction of this facility. All wiring shall be in a raceway system.

Ground Conductor:

All power distribution raceway shall contain a minimum of one continuous copper equipment grounding conductor sized in accordance with the NEC.

B. Standards and Codes

All materials and equipment specified herein shall within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.

All materials and equipment specified herein shall conform with all applicable NEMA, ANSI and IEEE standards.

All materials and equipment specified herein and their installation methods shall conform to the latest published version of the National Electric Code, NEC.

C. Submittals

Submit catalog data showing material information and conformance with specifications. The intended use of each item shall be indicated.

D. Area Classifications

The following classification of areas shall be used as a reference in determining application of material covered by this Section:

Hazardous areas: Condensate Collection Tanks.
General Purpose areas: All other areas not described above.

15.01.2 Products

A. General

All materials shall be new, free from defects, of current manufacture, of quality specified or shown. Each type of material shall be of the same manufacturer throughout the work.

B. Raceway

Application:

a. All conduits shall be rigid galvanized steel (RGS) or intermediate metal conduit (IMC) unless otherwise noted.
b. Conduit between condensation tank and handhole shall be PVC coated rigid steel.

c. All connections to vibrating equipment or motors shall be liquidtight flexible metallic conduit.

d. Underground secondary power service shall be schedule 40 PVC.

Rigid steel conduit: Rigid conduit shall be steel, hot dipped galvanized. Terminations shall be by means of threaded hubs or double locknuts and insulating grounding type bushings.

Intermediate metal conduit: Intermediate metal conduit shall be of steel and shall be hot dipped galvanized in accordance with UL 1242. Fittings shall be compression type or threaded.

Liquidtight flexible metal conduit: Flexible conduit shall be interlocking single strip, hot dipped galvanized and shall have a polyvinyl chloride jacket extruded over the outside to form a flexible watertight raceway.

Nonmetallic Conduit: Nonmetallic conduit shall be rigid PVC, Schedule 40. Fittings shall be of the same material as the raceway and installed with solvent per the manufacturer's instructions. Conduit, fittings and solvent shall all be manufactured by the same manufacturer. All 90 degree elbows and penetrations or transition from below grade shall be made with galvanized rigid steel.
PVC Coated Rigid Steel Conduit:

Coating: A Polyvinyl Chloride (PVC) coating shall be bonded to the galvanized outer surface of rigid steel conduit. The bond between the PVC coating and the conduit surface shall be greater than the tensile strength of the plastic. The thickness of the PVC coating shall be a minimum of .035" (35 mil) (40 mil nominal).

Couplings: A loose coupling shall be furnished with each length of conduit. A PVC coating shall be bonded to the outer surface of the coupling and a PVC sleeve equal to the outside diameter of 2"; whichever is smaller. The wall thickness of the coating on the coupling and the sleeve shall be a minimum of .055" (55 mil).

C. Fittings and Boxes

Unions shall be of the type designated as UNF and UNY and shall be suitable for use in moist atmospheres. Unions shall be of cast ferrous alloy, electro-plated with zinc.

Locknuts shall be extra heavy steel electroplated with zinc for sized 3/4" to 2". Locknuts larger than 2" shall be of malleable iron, electroplated with zinc.

Bushings:

General: Bushings shall be steel or malleable iron threaded type electroplated with zinc or hot-dip galvanized. Bushings shall have a molded-phenolic or nylon insulating collar.

Grounding Bushings: Grounding-type bushings shall have a projecting portion drilled for the size grounding cable used and shall be provided with a clamp or set screw for securing the cable. In addition, a set screw shall be provided to securely lock the bushing to the conduit. Grounding bushings shall be Gedney Type IBC-LS, Type BL, or T&B No. 3870 through 3880.

Bushed Openings: Bushings for protection of cables passing through metal boxes or troughs shall be all phenolic type and shall be OZ Type ABB.

Hubs for connection of conduit to boxes shall be of zinc. Hubs for use in corrosive areas shall be PVC coated zinc. The hubs shall provide a liquidtight connection to the box and an insulating bushing for the wiring. Hubs shall be Thomas and Betts - bullet type.

Connectors for liquidtight conduit shall be electroplated zinc malleable iron. An O-ring gasket and an approved grounding insert shall be part of the unit. 45 degree and 90 degree fittings shall be used where applicable. Liquid-tight connectors shall be by O.Z. Gedney.
Expansion fittings in exposed runs shall be of the weatherproof type and shall be provided with an external bonding jumper. The expansion fittings shall allow for 4" longitudinal movement and shall be designed so that when completely assembled the end of each conduit entering the fitting is bushed. Fittings shall be O.Z. Gedney, Type EX.

Expansion fittings in embedded runs shall be of the watertight type and shall be provided with an internal bonding jumper. The expansion material shall be neoprene and shall allow for 3/4" movement in any direction. Fittings shall be O.Z. Gedney, Type DX.

Junction boxes, device boxes, fixture support boxes, oblong, round and rectangular conduit fittings (condulets) for use on galvanized rigid steel raceways shall be zinc electroplated cast ferrous alloy. Integrally cast threaded hubs or bosses shall be provided for all conduit entrances and shall provide for full 5 thread contact on tightening. Drilling and threading shall be done before finishing. The cover plate shall be of similar cast ferrous alloy material and finish. A full body neoprene gasket shall be provided with the cover. Stainless steel screws shall be provided for all covers. Outlet and device boxes shall be ganged where two or more devices are to be installed side-by-side. Device covers shall be provided with neoprene gaskets. Covers shall be of cast ferrous alloy finished as described for box unless the particular device requires a cover that is not manufactured in this material.

Where NEMA 12 boxes are called out, they shall be of heavy gauge sheet steel, or if they are device boxes they shall be cast metal. All NEMA 12 boxes shall be UL labeled, provided with a 5 mil thick light gray thermoplastic finish, and designed so that moisture will drain away from the gasketed cover joint. Covers for sheet steel boxes shall have turned edges, ground smooth to form a tight seal against the gasket when the cover is closed.

Fittings and boxes in hazardous areas shall be rated for Class I, Division 1. Conduit fittings shall be rigid steel. Seal fittings for hazardous areas shall be Crouse Hinds "EYS".

Outlet boxes in non-classified areas shall be recessed where conduit is recessed and surface mounted "FS" or "FD" boxes where conduit is surface mounted.
D. Conduit & Cable Supports

Conduit clamps shall be of the one-hole type of hot-dip galvanized malleable iron. Clamp backs and nesting backs shall be of similar material and finish. Clamps shall be as manufactured by O.Z. Gedney Electric Company.

Ceiling hangers for single conduit shall be of the adjustable wrought steel ring type. Hanger rods shall be ½¨ all-thread rod. Hangers and rods shall be electro-galvanized after fabrication. Hangers shall be as manufactured by Grinnel Company.

Framing channels on all exterior areas and in corrosive areas shall be aluminum or Fiberglass. All hardware shall be stainless steel. Hanger rods may be steel hot-dipped galvanized, 1.8 electrolysis. Channel section shall be sufficient to limit deflection to 1/360 of span.

E. Conduit Schedule

Refer to raceway wire and cable schedule on the drawing for raceway sizing and routing description.

15.01.3 EXECUTION

A. Conduit

Exposed conduit shall be installed with runs parallel or perpendicular to walls, structural members or intersections of vertical planes and ceiling. No conduit shall approach closer than 6" to any object operating above the rated temperature of the insulation of the wiring in the conduit. Frequency of conduit supports shall be per NEC.

Conduit supported directly from the building structure shall be spaced out at least 5/8" using framing channel. Framing channel shall meet the requirements of paragraph D.

Where three or more conduits are suspended from ceiling or overhang, they shall be supported by racks of threaded rod and framing channel.

Welding, brazing or otherwise heating of the conduit is not allowed. Plumber's perforated strap hanger iron shall not be used for any purpose.

Where required for ease of pulling and as necessary to meet codes, install junction, pull boxes or handholes even though not shown on the drawings.

Conduit shall terminate in junction boxes, outlet boxes or panels with proper fittings. Conduit entering free-standing panels shall terminate in clear wiring space. Where such conduits are located on drawings with dimensions or elevations, adjust as necessary for conduits to enter clear wiring space and shall be terminated with a grounding bushing.

(STAGE 1 NORTH CLOSURE) 15-8
(TACOMA LANDFILL )
All conduit entering sheet-steel NEMA 1 boxes or cabinets shall be secured by locknuts on both the interior and exterior and an insulating bushing installed over the conduit end. All conduit entering NEMA 12 or JIC boxes shall be terminated with a raintight hub. All surface-mounted cast boxes shall have threaded hubs. All joints shall be made with standard couplings or specified unions. Running threads shall not be used in lieu of conduit nipples, nor shall excessive threads be used on any conduit. Conduit terminated in NEMA 4 shall be terminated with raintight hubs. Conduits terminated in cast boxes shall have five full threads of contact. The ends of all conduit shall be cut square, reamed and threaded with straight threads. Conduit joints shall be made up with T&B Kopr-Shield which shall be applied to the male threads only.

Exposed threads on PVC coated RGS conduits located below grade and all surfaces of RGS conduit routed in corrosive areas are to be coated in the field following installation with either bich-mastic or brush applied Rob Roy coating. Spray-on coating is not allowed.

Underground electrical conduit shall be kept 3' - 0" horizontally and 1' - 0" vertically at crossings from other underground utilities except telephone. Minimum cover shall be 18". After trench excavation, the bottom of the trench shall be trimmed by hand to prepare a smooth, even bed. After 12" of compacted backfill is installed, a yellow warning tape shall be placed in the trench. The warning tape shall be of a non-biodegradable material and shall have the words "caution buried electrical conductors below."

A separate foil type warning tape is to be installed directly above PVC conduits which have been installed as spares, for future location of the conduit.

Conduit installed in concrete slabs or walls shall be placed in the middle third where possible. Slabs laid on the earth shall be thickened by trenching, if the conduit cannot be placed within the slab thickness shown.

Clearances equal to the conduit trade diameter but not less than 1- ½" shall be maintained between conduits encased in slabs. Clearances of less than 1-½" at conduit crossings and terminating locations may be allowed by the Engineer at his discretion. No conduit shall be installed in beams or footings.

Flexible conduit shall not be used as a general purpose raceway, but shall be provided in locations requiring flexibility. Flexible conduit shall be used for all motor connections. Where flexibility is required for electrical raceways on equipment, flexible conduit shall be used in accordance with JIC standards, these specifications, and the local inspection agency. The maximum length of flexible conduit shall be 72" unless otherwise shown, and the terminating fittings and sealing shall be similar to existing installations.
All conduits scheduled on the drawings shall be identified at each end with a permanent metal marker. Designation shall be pressure stamped into the tag, and be labeled as identified on the Conduit and Cable Schedule. The tag shall be a 1/4 minimum diameter brass tag attached to cables or conduit by using a nylon cable tie. Identify conduits entering equipment, panelboards, or enclosures by attaching marker tag to cables as they exit the conduit. Embedded conduits and conduits routed underground shall be labeled also at point of entry and exit, by attaching a marker tag to the exterior of the conduit.

Spare conduits shall contain one 3/16" diameter nylon pull rope.

Exercise the necessary precautions to prevent the lodging of dirt, concrete or trash in the conduit, fittings and boxes during the course of installation.

After the conduit has been installed, the conduit shall be tested for obstructions or flattening by pulling a mandrel of appropriate size through the conduit. If an obstruction is found, that section is to be replaced. Cleaning conduits shall be performed by drawing a brush with stiff bristles and a swab through each duct and conduit to make certain no foreign materials are left in the conduit. Cleaning and mandrelling operations may be performed simultaneously.

Where conduit enters the facility below grade. The conduit shall be sealed with duct seal.

When rigid steel and PVC coated rigid steel conduit is threaded in the field, the threads shall be re-galvanized by the Galv-a-weld process or by Gal-van-ize as manufactured by Lawson Products, Inc.

B. Outlet Boxes

Outlet boxes shall be located to provide ample clearance between fixtures and pipes, beams and ducts. The location of all outlets shown as approximate. The exact location shall be verified on the job to avoid conflict with other work. Boxes shall be accurately placed and independently and securely supported. Wooden plugs inserted in masonry or concrete shall not be used as a base to secure boxes. Boxes shall be secured by galvanized brackets, expansion bolts, toggle bolts, or machine or wood screws depending on the type of construction.

C. Handholes

Conduits entering handholes shall have grounding bushings installed and the conduit ends shall be sealed with Permagum sealing compound. Where conduits enter through sides of handholes the penetration shall be made watertight.
15.02 WIRE AND CABLE

15.02.1 General

A. Description of Work

This section covers furnishing and installation of all wiring used in the construction of this facility. All wiring shall be in raceways.

B. Standards and Codes

All materials and equipment specified herein shall within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.

All materials and equipment specified herein shall conform with all applicable NEMA, ANSI and IEEE standards.

All materials and equipment specified herein and their installation methods shall conform to the latest published version of the National Electric Code, N.E.C..

C. Submittals

Submit catalog data showing material information and conformance with specifications. The intended use of each item shall be indicated.

15.02.2 Products

A. Conductors

Conductors shall be copper. Sizes AWG No. 14, 12 and 10 shall be solid except in control panels, all larger conductors shall be stranded. Insulation shall THW, THWN, or THHN, chosen to satisfy environmental conditions. Conductors used for power circuits shall not be smaller than No.12. Control conductors may be No. 15.

B. Connectors

Utilize Ideal Industries "Wing Nut" or 3M Company "Scotchlock" preinsulated connectors for splices and taps in conductors No.10. AWG and smaller. For No.8 AWG and larger conductors, utilize T&B compression connectors. Compress using recommended die and tools.
C. Splice Insulation

Splice insulation shall be equal to the conductor utilized.

15.02.3 Execution

A. General

Keep all conductors within the allowable tension limits during installation. Lubricants for wire pulling, if used, shall be approved for the insulation and raceway material. Observe cable manufacturer's and industry standard cable bending radius recommendations.

Incoming cables in panels, No.6 AWG and smaller, shall be bundled and laced at intervals not greater than 6" and neatly spread into trees and connected to their respective terminals.

Sufficient slack shall be allowed in cables for alterations in terminal connections and handholes. Lacing shall be done with plastic cable ties using a tensioning tool designed for that purpose.

Cables crossing hinges shall be made up into groups not exceeding 12 and shall be so arranged that they will be protected from chafing when the hinged member is moved.

B. Wire and Cable Termination

Power conductors, No. 8 AWG and larger may be terminated directly in box-type lugs without terminals. Insulated terminals of the spade or ring-tongue type shall be used on all stranded control and power conductors No. 12 AWG and smaller. Insulated terminals shall be used also on all stranded instrumentation wiring. Special instrumentation cables shall be terminated in accordance with the recommendations of the manufacturer of the equipment and subject to review by the Engineer.

Terminals and connectors shall be installed with the compression tool recommended by the terminal manufacturer. Solid wire shall not be lugged, but shall be terminated with a full ring eye of the wire under the binding-head screw or saddle of the terminal block. Electrical spring connectors may be used only on lighting circuits.

All control conductors in instrument and relay compartments of control panels, instrument panels, field panels and control stations as well as connections to mechanical equipment shall be tagged at each end with legible, permanently coded tight fitting wire-marking sleeve showing the complete wire designation.

Control conductors within a single motor control cubicle need not be marked, except that the conductors connected to the control terminal board shall be tagged with the basic wire number. All field wiring to pushbutton stations and other isolated control devices shall be labeled at each end.
with the complete circuit number. All control wiring, between the phase sequence and loss (PSL) monitor and individual motor control cubicles shall be wired and labeled by the manufacturer in the factory. All wiring to other panels, relay compartments of the same panel or interlocking wiring shall have the applicable identification at each end of the conductors. When selecting wire labels for field installed wires, the contractor shall incorporate either the remote device tag name or the output terminal number at the original equipment or control panel whenever possible.

Field installed wire markers shall be T&B SMS pre-printed clip-on markers, or equal.

C. General Tests

The Contractor shall perform voltage, current and resistance tests as required to complete the Electrical System Test Report form included herein. Test reports must be submitted to the engineer prior to final acceptance by the owner.

If the test results indicate corrective measures are required, the Contractor shall undertake all such corrective measures. No additional compensation will be paid for corrective measures.

Test Scope:

a. The Contractor shall provide all material, equipment, labor and technical supervision to perform tests and inspections as specified herein.

b. It is the intent of these tests to assure that all electrical equipment as supplied and installed by the Contractor is operational within the industry and manufacturer's tolerances and is installed in accordance with the design documents.

c. The tests and inspection shall determine the suitability for energization.

Conductor Tests:

a. Following the completion of installation; test the following:

   i. All underground wiring.
   ii. Service feeder and pump feeder power cabling
   iii. All new grounding; measure ground resistance at each ground rod.

Visual and Mechanical Inspections:

a. Inspect exposed section for physical damage.

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(TACOMA LANDFILL )
b. Verify cable is supplied and connected in accordance with specifications and one line diagram, and that phases are labeled correctly.

Electrical Tests:

a. Perform insulation resistance test on each cable with respect to ground and adjacent cables.

b. Perform continuity test to ensure proper cable connection.

Test Values:

a. Insulation resistance tests shall be performed at 500 volts DC for one-half minute.

b. Minimum megger readings at 20 degrees C shall be one megohm.

c. The minimum acceptable reading for an individual ground rod shall be 25 ohms as required by the NEC and measured by the three rod method. The composite ground electrode shall have a minimum acceptable reading of 15 ohms.
ELECTRICAL SYSTEM TEST REPORT - 600V CABLE

ELECTRICAL SYSTEM DESCRIPTION DATA

SERVICE DESCRIPTION:
nominal voltage, phase to phase/phase to neutral - single or three phase -
number of conductors

SERVICE CONDUCTORS:
phase size and insulation type
neutral size and insulation type
ground size and insulation type

SERVICE DISCONNECT DESCRIPTION:
circuit breaker or disconnect switch
size (amps)
fuse (amps)

MEASURED CONDITIONS DATA

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<th>Operating Load Voltage</th>
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<th>Vca</th>
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<td>Vcn</td>
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<td>1. Service Feeder</td>
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</table>

(STAGE 1 NORTH CLOSURE) 15-15
(TACOMA LANDFILL )
15.03 WIRING DEVICES

15.03.1 General

A. Description of Work

This section covers furnishing and installing all receptacles, switches and other wiring devices indicated on the drawings.

B. Standards and Codes

All materials and equipment specified herein shall within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.

All materials and equipment specified herein shall conform with all applicable NEMA, ANSI and IEEE standards.

All materials and equipment specified herein and their installation methods shall conform to the latest published version of the National Electric Code, NEC.

C. Submittals

Submit catalog data showing material information and conformance with specifications. The intended use of each item shall be indicated.

15.03.2 Products

A. Switches and Receptacles

Standard wall switches shall be single-pole, or double-pole, three-way, as shown on the drawings and shall be AC quiet type rated 20 amp, 125/277 volt with screw terminals. Wiring devices shall be ivory colored for general use and brown when installed in service areas or dark finished walls. Approved manufacturers are:

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Ground Fault Circuit Interrupter receptacles shall be 20 amp, 120 volt specification grade and UL listed.
B. Plates

Scope: Provide plate for each wiring device, for each signal or communication outlet.

Device plates on flush devices, in general, shall be satin finish stainless steel Sierra 302 stainless steel line or approved equal, modern classic design, corrosion resistant. Special finish plates shall be provided to match special paneled walls as directed by Architect.

Device plates for switches and receptacles in outdoor areas shall have weatherproof plates with hinged cover. Sierra Electric WP series or equal.

Plates on exposed wiring shall be of metal, of the same manufacture as the conduit fittings; specifically suited for device and fitting used.

C. Outlet Boxes

See Section 15.01

15.03.3 Execution

A. Position of Outlets

Center all outlets with regard to building lines, furring and trim. Symmetrically arrange outlets in the room. Satisfactorily correct outlets improperly located or installed. Repair or replace damaged finished.

Set outlets plumb and extend flush outlets to the finished surface of the wall, ceiling or floor without projecting beyond same.

Install symmetrically all receptacles, switches and outlets shown on the trim and where necessary, set the long dimension of the plate horizontal or gang in tandem.

B. Mounting Heights

Receptacles shall generally be 24 inches above the floor. Wall switches shall be 48 inches above the floor.
15.04 OVERCURRENT PROTECTIVE DEVICES

15.04.1 General

A. Description of Work

This section covers the furnishing and installation of all fuses and circuit breakers used in this project.

B. Standards and Codes

All materials and equipment specified herein shall within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.

All materials and equipment specified herein shall conform with all applicable NEMA, ANSI and IEEE standards.

All materials and equipment specified herein and their installation methods shall conform to the latest published version of the National Electric Code, NEC.

C. Submittals

Submit catalog date showing material information and conformance with specifications. The intended use of each item shall be indicated.

15.04.2 Products

A. Molded Case Circuit Breakers

Molded case circuit breakers shall be quick-make and quick-break type. They shall have wiping type contacts. Each shall be provided with arc chutes, individual trip mechanisms on each pole. Two and three pole breakers shall be common trip. All breakers shall be calibrated for operation in an ambient temperature of 40 degrees C. Molded case circuit breakers shall be trip-free. Each breaker shall have trip indication independent of the ON or OFF positions.

Breakers shall have lugs UL listed for both copper and aluminum.

Breakers shall have the interrupting rating and trip rating indicated on the drawings.
B. **Uses**

Breakers covered under this specification may be installed in panelboards, combination motor starters and individual enclosures.

C. **Fuses**

Fuses shall be of the type indicated on the drawing. The voltage rating shall be appropriate for the application indicated. The fuse types indicated on the drawings imply a certain set of fuse characteristics. No substitutions of fuse types will be allowed without written approval from the Engineer.

Where fuses in motor circuits are indicated but not sized, provide manufacturer's recommended fuse size.

Acceptable manufacturers:

i. Bussman
ii. Gould Shawmut
iii. Littel Fuse
iv. Reliance

15.04.3 **Execution**

A. **Installation**

Fuses and circuit breakers shall be installed in their respective enclosures and locations in such a manner as to insure tight connections so as to preclude arcing and overheating.
15.05 SERVICE AND METERING

15.05.1 General

A. Description of Work

Work consists of installation of new 100 amp 480/277V, 3Ø 4W overhead service, and service entrance equipment.

B. Utility Responsibilities

The electrical utility company providing primary service to this facility is Tacoma City Light. During design contact was made with Ron Reygers, at (206) 593-8285. The contractor shall be fully and completely responsible for all scheduling and coordination with Utility Company. Contractor shall contact Mr. Reygers to coordinate scheduling and to verify responsibilities.

All utility company charges for connection of new service will be paid by the Contractor and shall be included in the Contractors' bid price.

Utility Company will:

a. Provide secondary overhead service to vacuum pump station weatherhead.

b. Provide and install meter in Contractor supplied enclosure.

C. Contractor Responsibilities

The Contractor shall perform the following:

a. Provide service mast with weather head, and guy wire.

b. Provide secondary service conductors to weatherhead per Tacoma City Light specifications.

c. Provide meter base per Tacoma City Light specifications.

D. Quality Assurance

Comply with all serving utility company standards and requirements.

E. Standards and Codes

Work involving service installation shall be done in accordance with Utility Company’s standards and the National Electric Code.

Service equipment shall be listed and labeled by UL as "suitable for use as service equipment".
F. **Submittals**

Submit catalog data showing material information and conformance with specifications on the following:

a. Meter Enclosure  
b. Service Entrance Switchboard

15.05.2 **Products**

A. **Meter Enclosure**

Meter enclosure shall be a Circle AW and as required to meet the requirements of the serving utility. Installation shall be in vandal proof NEMA 3R enclosure with a lockable hinged door.

Contractor shall coordinate with Utility Co. on type of metering required and shall provide all labor and material necessary to meet Utility Co. requirements.

B. **Service Entrance Panelboard**

Service entrance equipment shall be panelboard construction and shall be main circuit breaker type.

Ground bus and neutral bus shall be provided.

Panelboard shall meet all applicable UL, NEMA, NEC and local code requirements for service entrance equipment; panelboard shall be furnished with a UL service entrance label.

Panelboard shall be installed in accordance with section 15.07.

Short-circuit rating for 3 phase, 480/277V rated panelboards shall be 14,000 RMS symmetrical amperes.
15.05.3 Execution

A. Ground Electrode System

The grounded conductor and ground bus shall be connected to the grounding electrode system, via the grounding electrode conductor as indicated on system one-line diagram.

The system shall be as indicated in Article 250-81 of the National Electrical Code.

B. Underground Secondary Service

Install in accordance with Section 15.02.
15.06 PANELBOARDS

15.06.1 General

A. Description of Work

This section covers the furnishing and installation of all panelboard equipment complete.

B. Standards and Codes

All materials and equipment specified herein shall within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.

All materials and equipment specified herein shall conform with all applicable NEMA, ANSI and IEEE standards.

All materials and equipment specified herein and their installation methods shall conform to the latest published version of the National Electric Code, NEC.

C. Submittals

Submit catalog data showing material information and conformance with specifications. The intended use of each item shall be indicated.

15.06.2 Products

A. Panelboard Type

Panelboards shall be rated at proper voltage and current for intended use with bus bars of aluminum. Panels shall be 1 phase, 100 percent neutral, with equipment ground bar, unless noted otherwise. Panelboards shall be dead front.

B. Circuit Breakers

The following interrupting capacity shall be considered minimum. Other ratings shall be as specified on the drawings.

120/240V Panelboards 10,000 AIC symmetrical

Mount breakers in all panelboards so that breaker handles operate in a horizontal plane. Bolt-type only. Provide common trip on all multiple pole breakers.

Where noted, provide spare breakers, complete for future connection of wiring circuits. Where "Space Only" is indicated for breakers, provide all bussing and breaker mounting hardware in the panelboard; provide steel knockouts in dead front metal closure of unused part of panel. If any
steel knockouts are removed, provide breakers in such spaces or approved cover plates. Open spaces are not permitted.

C. Cabinet for Each Panelboard

Flush or surface as indicated; tight closing doors without play when latched. Where two cabinets are located adjacent to each other in finished areas, provide matching trim of the same height.

Provide cabinets of sufficient dimensions to allow for future expansion and addition of circuit breakers within the panelboards as indicated on drawings.

Provide lock for each cabinet door. All Electrical distribution equipment locks to be keyed identically.

Fasten panelboard with machine screws with oval countersunk heads, finish hardware quality, with escutcheons or approved trim clamps. Clamps accessible only when dead front door is open are acceptable. Surface mounted panelboards with fronts greater than 48 inches vertical dimension shall have trim hinged at right side in addition to hinged door over dead front.

Provide factory standard lacquer or enamel finish, ANSI #49 grey.

D. System of Numbering and Bus Arrangement

Shall be as shown on the Panel Schedules on the drawings.

E. Panelboard Nameplate

Provide engraved (color layer - engraved through outer layer) plastic name plate with 1/2 inch high characters for panel identification (for panel name); attached with screws to each panelboard front. Emergency system - white on red; Normal system - white on black. Include voltage, phase and wire (i.e., 120/240V, 1 phase, 3 wire) in 3/8 inch characters.

15.06.3 Execution

A. Mounting

Secure in place with top of cabinet at 5' - 6", unless otherwise noted. Top of cabinet and trim shall be level.

B. Circuit Index

For each branch circuit panelboard: Provide as built information for each panelboard by circuit with its proper load designation.

C. Dead Front Closures

(STAGE 1 NORTH CLOSURE) 15-24
(TACOMA LANDFILL)
Close all openings in dead front with closures manufactured for the purpose or install spare breakers.
15.07 LIGHTING

15.07.1 General

A. Description of Work

This section covers furnishing and installation of all light fixtures and lamps indicated on the drawings or specified herein.

B. Standards and Codes

All materials and equipment specified herein shall within the scope of UL Examination Services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the UL label.

All materials and equipment specified herein shall conform with all applicable NEMA, ANSI and IEEE standards.

All materials and equipment specified herein and their installation methods shall conform to the latest published version of the National Electric Code, NEC.

C. Submittals

Submit catalog data showing material information and conformance with specifications. The intended use of each item shall be indicated.

15.07.2 Products

A. Light Fixtures

Fixture Schedule - Provide in accordance with Lighting Fixture Schedule as shown on plans.

The fixture catalog numbers listed in the fixture schedule indicate manufacturer, fixture design, quality of design and manufacture, appearance, features and options required. Lighting fixtures specified will be the basis for comparison in the consideration of fixtures of other manufacturers. Fixtures of lesser quality shall not be considered equivalent.

Contractor shall investigate ceiling construction and supply fixtures designed for the application.

All fixture component parts shall be manufactured and/or assembled at the manufacturing plant for shipment. The shipment from the fixture manufacturer shall include integrally mounted and/or remote mounted ballasts where ballasts are required for the proper operation of the fixture lamps.

B. Ballasts

(STAGE 1 NORTH CLOSURE) 15-26
(TACOMA LANDFILL)
Ballasts shall be of the high power factor type. All ballasts shall be equipped with automatic resetting protective devices in accordance with UL requirements.

Ballasts for use in fluorescent fixtures shall be energy efficient G.E. Maxi-Miser II ballasts or equal.

C. **Lamps**

Provide all lamps as specified. Refer to the Lighting Fixture Schedule at end of this section for the ordering information of lamps. Fluorescent lamps shall be energy efficient G.E. Watt-Miser II or as otherwise indicated. Approved manufacturers are: Westinghouse, Sylvania and G.E. Lamps shall be provided for all lighting fixtures.

D. **Special Accessories**

Provide accessories such as junction boxes, plastic frames, stem, hangers, canopies, couplings, cords, toggle bolts, etc., necessary to mount fixture in a proper and approved method.

E. **Controls**

Photoelectric relay- SPST normally closed, raintight 120V, 2000W tork time controls Model 2101.

15.07.3 **Execution**

A. **Fixture Mounting**

Where fixtures are indicated for installation on low-density ceiling material, mount on 1 ½" ceiling spacers unless UL approved for mounting directly to ceiling material.

Properly support and align fixtures and provide all necessary steel shapes for support of the fixtures. Coordinate complete fixture installation with the facility construction. Clean and mount all lighting fixtures with new lamps immediately prior to final inspection.

Square and rectangular fixtures shall be mounted with sides parallel to building lines and parallel with ceiling lines.

Install fluorescent fixtures as recommended by the manufacturer or as necessary to provide exact horizontal alignment, preventing horizontal or vertical deflection or angular jointing of fixtures installed in continuous rows.
15.08 POWER AND CONTROL PANEL

15.08.1 General

A. Description of Work

Work and materials specified in this section include the equipment for control of the pumps and other equipment in the pump station.

B. System Description

This section covers the main control system indicated on the drawings and specified herein. The work shall include, but not be limited to the following:

a. Provide a complete pump control system consisting of float switches, associated control equipment, annunciator panel, relays, indicating lights and selector switches. The control components shall be supplied and installed as an integrated system which includes all accessories necessary for operation. The manufacturer of the control system shall assemble the system to provide the control functions and sequences indicated by the drawings and specifications.

b. Provide pump status indication.

The power and control panel shall be designed and assembled by the manufacturer to provide:

a. Automatic control and monitoring of operation of condensate pumps.

b. Automatic monitoring of alarm conditions and control of alarm annunciation.

The power and control panel shall be designed and assembled by the manufacturer to:

a. Be an integrated system composed of components which are specifically designed and used for control and operation of pumping equipment and which are standard, catalog listed products.

b. Provide the capabilities indicated and implied by the plans and these specifications and such additional capabilities as may be necessary for proper operation of the pumps and pump station equipment.

c. Provide the control functions and sequences indicated and implied by these specifications and such additional and alternative functions and sequences as may be defined by the engineer and/or owner after testing of the panel and/or after the condensate pump stations are placed into operation.

(STAGE 1 NORTH CLOSURE) 15-28
(TACOMA LANDFILL)
C. **Responsibility of Contractor & Control System Manufacturer**

The manufacturer of the power and control panel shall be fully and completely responsible for the design and assembly of the system as specified herein. The assignment of specific responsibilities herein to the manufacturer shall not, in any way and under any conditions, diminish or usurp the contractor's full and complete responsibility for all work performed and all materials installed under this contract. The contract between the contractor and the manufacturer shall specifically require that the manufacturer conform to and meet all requirements specified herein.

D. **Standards and Codes**

All equipment and materials shall conform to the latest revised editions of applicable standards published by the following organizations:


b. National Electrical Manufacturers Association (NEMA).

c. Underwriter's Laboratories (U/L).

d. Instrument Society of America (ISA).

All electrical equipment and materials, and the design, construction, installation, and application, thereof shall comply with all applicable provisions of the National Electrical Code (NEC), the Occupational Safety and Health Act (OSHA), and any applicable federal, state, and local ordinances, rules, and regulations.

All materials and equipment specified herein shall within the scope of U/L examination services, be approved by the Underwriter's Laboratories for the purpose for which they are used and shall bear the U/L label.

All control panels shall bear a U/L label for the completed assembled panel.

E. **Shop Drawings**

The manufacturer of the power and control panel shall develop all shop drawings required for design, fabrication, assembly, programming and installation of the system. Shop drawings shall include all drawings required in manufacture of components and assembly and installation of the system.

Installation details shall include the size, number, type and location of all interconnecting wiring between the power and control panel and all other cabinets, enclosures, sensors and equipment which must be connected to or with the power and control panel. Shop drawings shall be submitted
to the contractor for review and approval. After approval by the contractor, copies of all shop drawings shall be provided to the engineer.

F. Submittals

The control system manufacturer shall develop and the contractor shall submit to the engineer, for review and approval, the following project data:

a. System schematic diagrams with all components indicated.

b. Technical data sheets for all components.

c. General arrangement and dimensional drawings of the power and control panel with all panel front- and internal-mounted equipment indicators, switches, and devices indicated.

d. Explanatory text which describes in detail the operation of the entire control system and all components.

e. Interconnecting wiring diagrams complete with terminal numbers, and description of wire markers to be used.

G. Warranty

In accordance with the requirements of Section 15.00, the contractor shall guarantee the control system to be free of defects in design, materials and workmanship for a period of one (1) year following the date of acceptance, by formal action of the Owner, of all work under the contract.

As part of the guarantee, the contractor and the manufacturer of the power and control panel shall indemnify and hold harmless the owner, the consultant and their officers, agents and employees against and from all claims and liability arising from all damage and injury due to defects in the control system.

The contractor shall cause the manufacturer of the power and control panel to make any and all repairs, replacements, modifications and adjustments within thirty-six (36) hours of notification. Should the manufacturer fail to begin the work within 12 hours or complete the work within 36 hours, the owner may proceed to undertake or complete the work. In such event, the contractor and his surety shall be liable for all costs incurred by the owner.

H. Equipment Size

Electrical equipment shall fit in the space provided on the plan drawings or as specified. Equipment heights and widths shall not exceed those shown or specified. Larger equipment shall not be considered acceptable.
Equipment that is larger than specified shall not be considered equivalent.

I. Operation and Maintenance Data

The manufacturer of the power and control panel shall prepare and assemble detailed operation and maintenance manuals. The manuals shall include, but not be limited to the following:

1. Preventative maintenance procedures
2. Trouble-shooting
3. Calibration
4. Testing
5. Replacement of components
6. Automatic mode operation
7. Manual mode operation
8. System schematics
9. As-built wiring diagrams
10. Catalog data and complete parts list for all equipment and control devices
11. Listing of recommended spare parts
12. Listing of recommended maintenance tools and equipment

15.08.2 Products

A. Design and Assembly

The manufacturer of the power and control panel shall be solely and completely responsible for the design and assembly of the entire panel. The panel shall be designed to provide the control capabilities and functions indicated and implied by the plans and these specifications and to provide trouble-free operation with minimum maintenance.

All equipment and materials utilized in the panel shall be the products of reputable, experienced manufacturers with at least five (5) years experience in the manufacture of similar equipment. Similar items in the panel shall be the products of the same manufacturer. All equipment shall be of industrial grade and of standard construction, shall be capable of reliable, trouble-free service, and shall be specifically intended for operation and control of pumps and associated equipment. All equipment shall be of modular design to facilitate interchangeability of parts and to assure ease of servicing. All equipment, where practical, shall be of solid state, integrated circuit design.

The power and control panel shall be completely assembled in the shop by the manufacturer. All components and equipment shall be prewired to the maximum extent possible.

All interconnecting wires installed by the manufacturer shall be numbered at each end using custom pre-printed heatshrink sleeve markers. Markers shall be T&B SHRINK-KON HVM or approved equal. Terminations shall be made
using solderless pressure connectors at all terminations. All conductors shall be cabled in groups and supported so as to prevent breaking and to present an orderly arrangement and neat appearance. All outgoing wiring shall be terminated on a marked terminal strip capable of connection of at least No. 12 wire and all terminal connections shall be numbered consecutively throughout the system.

Control and signal conductors shall be bundled separately from alternating current circuits. All wiring shall be neatly tied in position with nylon cable ties. Instruments with portable cord connections shall be fed through the instrument panel plug strip which shall be located near the top of the panel directly above the instruments. Instrument supply cords shall be the only panel wiring which is not continuously supported and tied.

All wiring and tubing crossing hinges shall be installed in a manner to prevent chafing. Bundles of similar conductors shall be clamped securely to the door and to the panel, and the bundles shall run parallel to the hinge for at least 12 inches. Spiral nylon cable wrap shall be provided in the hinge section of the bundle to fully protect the conductors or tubing against chafing.

All components, including both internally and face-mounted instruments and devices, shall be clearly identified with phenolic nameplates of black background with white letters.

B. Interconnecting Wiring

The manufacturer of the power and control panel shall determine all requirements for field-installed interconnecting wiring between the panel and all other cabinets, enclosures, sensors and equipment. The manufacturer shall determine the location number, size and type of wires.

The wire shown on the plans shall be considered only as general guidelines for signal and control circuits. The manufacturer shall determine all specific requirements and shall conform to such requirements.

C. Factory Testing

Operation of the complete panel shall be tested in the shop by the manufacturer. Testing shall include, but not be limited to the following:

a. Varying wet well demand conditions shall be simulated.

D. Motor Starters

Motor starter units shall be of the combination type with components and wiring readily accessible. The motor starter units shall contain the magnetic starters and control components as indicated on the drawings and specified herein. Thermal overload relays on starters shall be nonambient
compensated melting alloy type for manual reset, separate N.O. overload contact shall be provided in addition to standard N.C. overload contact. All starters shall be provided with two field convertible auxiliary contacts.

E. **Selector Switches**

Shall be heavy duty oil tight industrial type, for use on 120VAC control circuits. Contacts shall have a continuous current rating of 10 Amperes both inductive and resistive.

F. **Indicating Lights**

Indicating lights shall be heavy-duty industrial oil tight, push to test AC transformer type with 6.3 volt lamps.

G. **Control Relays**

Shall be IDEC RH SERIES SNAP MOUNT or equal and shall be interchangeable with one another. One spare relay of each type shall be provided with the system. Control relays shall have indicating light to energized position and time delay relays shall have additional indicating light to show timed out feature.

H. **Terminal Boards**

Terminal boards shall be 300 volt modular terminal blocks ENTRELEC #110-280-07 or equal.

(STAGE 1 NORTH CLOSURE) 15-33  
(TACOMA LANDFILL )
I. Wireways

Shall be provided for interconnecting major groups of devices mounted within the panel. The wireways shall be 2½" x 2½" or 4" x 4" steel wireways. PVC slotted side panel wiring duct (PANDUIT) shall be provided adjacent to relays and may also be used for control wire. The duct shall be arranged in horizontal configurations to pass near all relays and devices being fed from the duct. Header ducts shall, in general, be steel wireways as specified above.

J. Level Float Switches

Level switches for in-plant pumpstation and sumps shall be mercury tube switch type enclosed in a sealed polyurethane float. A weight shall be on the cord near the float switch. Switches shall be Hydr-o-matic #3900 or equal. 2/C #12 flexible type SJ0 oil proof 300 volt cord shall be integral with float switch and shall be sufficient length to reach nearest junction box.

K. Phase Loss and Unbalance Relay

Provide a phase loss/unbalance, low voltage and reverse phase protection, three-phase, 480 vac, standard time delay. Manufacturer - Go-Tronic Model 51-48011-02.

L. Alarm Horns

Shall be modular in design and provide a loud, penetrating sound output that is easily heard over most ambient noise levels. Horn shall be semi-flush mounted in the condensate control panel. Sound level shall be 95 db at 10 feet.

M. Enclosures

Enclosures for control panels shall be NEMA 12 steel construction equal to Hoffman Company standards and quality of manufacturer. Enclosure sizes shall be as shown on the drawings.

15.08.3 Execution

A. Installation

The power and control panel shall be installed by the contractor or, at the option of the contractor, by the manufacturer of the panel in accordance with the installation drawings and instructions prepared by the manufacturer. Installation shall be performed by workers who are skilled and experienced in the installation of electrical instrumentation and control systems.

Installation shall include all elements and components of the panel and all interconnecting wiring between all equipment, components, and
sensors. All wiring between cabinets, sensors and equipment shall be labeled at both ends for ease of servicing. All terminations shall be made with solderless pressure connectors. All wiring shall be in accordance with the requirements of Section 15.02.

B. Calibration and Start-Up

All components of the panel shall be calibrated by the contractor's qualified technicians after completion of installation. Each component shall be adjusted to be within the required range and for the specific application. Components that cannot be properly calibrated or that are found to exceed the specified range or accuracy shall be removed and replaced.

The contractor and the manufacturer of the power control panel shall anticipate that the owner may delay acceptance of all work under the contract if, in the judgement of the owner, malfunctions or failures in operation of the panel occur after start-up. Both the contractor and the manufacturer shall not be entitled to an extension of time or to any claim for damages because of hinders, delays or complications caused by or resulting from delay by the owner in accepting the work because of malfunctions or failures in operation of the panel.
15.09 MOTORS

15.09.1 General

A. Description of Work

This section covers motors which are supplied with and as part of connected equipment specified in other sections of this specification.

B. Standards and Codes

All materials and equipment specified herein shall within the scope of UL Examination Services, be approved by the Underwriter’s Laboratories for the purpose for which they are used and shall bear the UL label.

All materials and equipment specified herein shall conform with all applicable NEMA, ANSI and IEEE standards.

All materials and equipment specified herein and their installation methods shall conform to the latest published version of the National Electric Code, NEC.

C. Submittals

In accordance with the requirements of Section PR-05, submit the following project data:

. Drawings and Data: Catalog information and complete name-plate and efficiency information.

15.09.2 Products

A. General

Unless specifically excepted, all motors shall be of the "energy efficient" or "energy saver" type. Normal efficiency motors shall not be supplied. In addition, all motors shall have a minimum power factor rating of .85 at full load, motors rated at a lower power factor shall not be supplied.

All Motors shall be suitable both electrically and mechanically to drive the connected equipment under any and all modes of operation. The speed, horsepower, torque, base, bearing, shaft, insulation, and enclosure shall be closely coordinated with equipment requirements specified herein and in other portions of this specification so as to provide a satisfactory, efficient drive without overloading, overheating, abnormal noise or vibration.
The rated nameplate horsepower of the motor, when operating at a service factor of 1.0, shall be equal to or greater than the horsepower required to drive the connected equipment under any and all modes of operation.

All Motors shall be designed and built for long, trouble-free life in industrial service and shall be capable of operating successfully under the following application conditions:

a. 40 degrees centigrade maximum ambient temperature to -20 degrees centigrade minimum ambient temperature.
b. 3,300 ft. maximum altitude
c. Voltage variations to plus or minus 10% of nameplate rating.
d. Frequency variations to plus or minus 5% of nameplate rating.
e. .85 minimum full load power factor.

All motors shall be rated for full voltage starting, NEMA Design B, normal torque, normal starting current, unless otherwise required by the driven equipment or specified.

All motors shall be suitable for the environment in which they are to be installed.

Provide motors in accordance with standard NEMA type classifications as specified. The use of industry standard subclassifications such as "Mill and Chemical" motors and similar "standard" heavy-duty designs are encouraged where they meet or exceed the specified minimum requirements.

Provide motors in accordance with standard NEMA type classifications as specified. The use of industry standard subclassifications such as "Mill and Chemical" motors and similar "standard" heavy-duty designs are encouraged where they meet or exceed the specified minimum requirements.

B. Enclosures

Open drip proof unless otherwise specified.

Cast iron stator frames and end shields, rigid construction.

Heavy fabricated steel, or cast iron for single phase motors.
C. **Insulation Class**

Provide NEMA Class B insulation with additional nonhygroscopic moisture protection which will maintain a minimum resistance of 1.0 megohms after 168 hours of exposure at 100% humidity.

Class F insulation with additional nonhygroscopic moisture protection as specified above may be utilized at the Contractor's option, however, the temperature rise as measured by resistance when operating at rated service factor and load shall conform to the limiting observable temperatures in NEMA-MGI, for class B insulation.

Class A insulating materials shall not be utilized.

D. **Service Factor**

The rated nameplate horsepower of the motor, when operating at a service factor of 1.0, shall be equal to or greater than the horsepower required to drive the connected equipment under any and all modes of operation.

Provide motors with a 1.15 service factor.

Provide motors in accordance with standard NEMA type classifications as specified. The use of industry standard subclassifications such as "Mill and Chemical" motors and similar "standard" heavy-duty designs are encouraged where they meet or exceed the specified minimum requirements.

E. **Power Ratings**

Motor horsepower, if indicated in the detailed equipment specifications, are minimum size acceptable.

Ratings indicated on the electrical drawings are for guidance only and do not limit the equipment size.

Frame/hp relationships shall conform to the latest NEMA standards for "T" or "U" frames, and all dimensions shall meet NEMA standards.

F. **Synchronous Speed**

In general, the motor speed indicated is the rated synchronous speed. Provide motor rated full-load speeds which are compatible with the specified performance of the driven equipment.
G. **Standard Rated Voltage Phase and Frequency**

Provide motors nameplate-rated for 60 hertz power supply as follows unless otherwise specified or shown on the drawings:

- Motors less than 1/6 hp, single-phase, 115 volts.
- Motors 1/6 hp to 1/2 hp, single-phase, 115/230 volts.
- Motors 1/2 hp through 100 hp, three-phase 230/460 volts.

Conform to the specified service conditions and the equipment specifications without reduction in the service factor.

H. **Bearings & Shafts**

All bearings shall be antifriction-type AFBMA standard sizes. All motors up to and including 40 horsepower shall provide a minimum (B-10) bearing life of one year (approximately 17,500) hours. All motors shall have thrust ratings not less than the combined static and dynamic loads to be imposed.

Shafts shall be in accordance with NEMA "T" or "TS" dimensions. Long shafts shall be suitable for belt, chain or gear drive within limits established by good industrial practice and documented by NEMA. Short shafts shall be used for direct connection. Vertical motors shall be the solid-shaft type except where application requires a hollow-shaft design.

Balance and Vibration: Conform to NEMA standard, MG1, latest revision.

I. **Duty Cycle**

Provide motors rated for continuous duty unless otherwise specified.

J. **Lubrication**

Horizontal polyphase motors shall be grease lubricated. The bearing housing shall be large enough to hold sufficient lubricant to minimize the need for frequent relubrication but facilities shall be provided for adding new grease and draining out old grease without major motor disassembly. Motors 180T frame and smaller may utilize grease release fitting in lieu of grease drain plug. The bearing housing shall have long, tight, running fits or rotating seals to protect against the entrance of foreign matter into the bearings or leakage of grease out of the bearing cavity.

Vertical polyphase motor lubrication shall conform to the motor manufacturer's recommendations. Except as otherwise recommended, guide bearings shall be ball bearings, grease lubricated; thrust bearings shall
be grease lubricated through frame 280T, oil lubricated in larger frame sizes.

K. Efficiency

Efficiency shall be determined by testing production motors with a dynamometer at rated output, voltage and frequency in accordance with IEEE Specification 112A, paragraph B.

L. Shop Tests

Each polyphase motor shall be given a routine test to determine that it is free from electrical or mechanical defects and provide assurance that it meets the specifications. The routine test shall conform to applicable NEMA and IEEE standards latest revision and shall be as generally defined as "Standard Commercial Test."

Copies of the test report will not be required unless actual operation and installation suggests the motors' performance should be verified, in which case certified copies of the test report shall be submitted upon the Engineer's request.

15.09.3 Execution

A. Erection

Motors shall be factory installed on common bases, stands, etc., with the driven equipment. Provide suitable couplings and guards between motor and driven equipment.

Align and connect to driven equipment.

Provide suitable personnel guards over all shafts, couplings, or other exposed moving parts.

Connect motors to power supply and controllers.

Verify correct rotation of equipment.
B. Installation Check

Provide services of an experienced, competent, and authorized representative of manufacturer to visit site of work and inspect, check, adjust if necessary, and approve equipment installation for motors.

Assure that equipment manufacturer's representative is present when equipment is placed in operation.

Verify that equipment representative revisits jobsite as often as necessary until all trouble is corrected and equipment installation and operation are satisfactory, in opinion of Engineer.

Verify that motor overcurrent protection is in accordance with the NEC.

C. Tests

The Contractor shall perform voltage, current and resistance tests as required to complete the Motor Test Report form included herein.

If the test results indicate corrective measures are required, the Contractor shall undertake all such corrective measures until the electrical system is accepted by the Engineer. No additional compensation will be paid for corrective measures.
MOTOR DATA AND TEST REPORT

EQUIPMENT NAME AND NUMBER: ____________________________________________

EQUIPMENT SPECIFICATION SECTION: _______________________________________

MOTOR STARTER LOCATION: ________________________________________________

CONTRACTORS REPRESENTATIVE ___________________________ DATE _____________

MOTOR NAMEPLATE DATA

MFR Name/Model No. _______________________________________________________
Voltage/Phase/HP _________________________________________________________
FLA/LRA _________________________________________________________________
Efficiency Index _________________________________________________________
NEMA Design ___________________________________________________________
Code Letter _______________________________________________________________
Insulation Type _________________________________________________________
Temperature Rise _________________________________________________________
Ambient Temperature _____________________________________________________
RPM _________________________________________________________________
Enclosures _______________________________________________________________
Thermal Trip Setting _____________________________________________________
Space HTR: Watts/Volts ____________________________________________________
Other Data ______________________________________________________________

MOTOR STARTER INFORMATION
Manufacturer ____________________________
Overload Heater No. ______________________

RECORDED FULL LOAD DATA

Full Load Operating Current ph.-a _____ ph.-b _____ ph.-c _____

INSULATION RESISTANCE

MOTOR CIRCUIT RESISTANCE - OHMS ab____ bc____ ca____
aG____ bG____ cG____

MOTOR WINDING RESISTANCE - OHMS ab____ bc____ ca____
aG____ bG____ cG____

(STAGE 1 NORTH CLOSURE) 15-42
(TACOMA LANDFILL )
15.10 VACUUM PUMP CONTROL SYSTEM

15.10.1 General

A. Description of Work

Work and materials specified in this section include the equipment for control of the pumps and other equipment in the vacuum station.

B. System Description

This section covers the control system indicated on the drawings and specified herein. The work shall include, but not be limited to the following:

a. The manufacturer of the vacuum pump control system shall assemble the system to provide the control functions and sequences indicated by the drawings and specification Section ... The electrical contractor shall make wiring connections to the prepackaged system and accomplish all interconnecting wiring required to make the prepackaged system operational.

The power and control panel shall be designed and assembled by the manufacturer to provide:

a. Be an integrated system composed of components which are specifically designed and used for control and operation of pumping equipment and which are standard, catalog listed products.

b. Provide the capabilities indicated and implied by the plans and these specifications and such additional capabilities as may be necessary for proper operation of the pumps and pump station equipment.

c. Provide the control functions and sequences indicated and implied by these specifications and such additional and alternative functions and sequences as may be defined by the engineer and/or owner after testing of the panel and/or after the sewage pump station is placed into operation.

C. Standards and Codes

All equipment and materials shall conform to the latest revised editions of applicable standards published by the following organizations:


b. Institute of Electrical Manufacturers Association (NEMA).

c. National Electrical Manufacturers Association (NEMA).

d. Underwriters’ Laboratories (U/L).

e. Instrument Society of America (ISA).

All electrical equipment and materials, and the design, construction, installation, and application thereof shall comply with all applicable
provisions of the National Electrical Code (NEC), the Occupational Safety and Health Act (OSHA), and any applicable federal, state, and local ordinances, rules and regulations.

All materials and equipment specified herein shall within the scope of UL examination services, be approved by the Underwriter’s Laboratories for the purpose for which they are used and shall bear the UL label.

All control panels shall bear a UL label for the completed assembled panel.

D. Shop Drawings

The manufacturer of the vacuum pump control panel shall develop all shop drawings required for design, fabrication, assembly, programming and installation of the system. Shop drawings shall include all drawings required in manufacture of components and assembly and installation of the system.

Installation details shall include the size, number, type and location of all interconnecting wiring between the power and control panel and all other cabinets, enclosures, sensors and equipment which must be connected to or with the power and control panel. Shop drawings shall be submitted to the contractor for review and approval. After approval by the contractor, copies of all shop drawings shall be provided to the engineer.

E. Submittals

The control system manufacturer shall develop and the contractor shall submit to the engineer, for review and approval, the following project data:

a. System schematic diagrams with all components indicated.
b. Technical data sheets for all components.
c. General arrangement and dimensional drawings of the power and control panel with all panel front- and internal-mounted equipment indicators, switches, and devices indicated.
d. Explanatory text which describes in detail the operation of the entire control system and all components.
e. Interconnecting wiring diagrams complete with terminal numbers, and description of wire markers to be used.
F. Warranty

In accordance with the requirements of section 01010, the contractor shall guarantee the control system to be free of defects in design, materials and workmanship for a period of one (1) year following the date of acceptance, by formal action of the Owner, of all work under the contract.

As part of the guarantee, the contractor and the manufacturer of the vacuum pump control panel shall indemnify and hold harmless the owner, the consultant and their officers, agents and employees against and from all claims and liability arising from all damage and injury due to defects in the control system.

The contractor shall cause the manufacturer of the vacuum pump control panel to make any and all repairs, replacements, modifications and adjustments within thirty-six (36) hours of notification. Should the manufacturer fail to begin the work within 12 hours or complete the work within 36 hours, the owner may proceed to undertake or complete the work. In such event, the contractor and his surety shall be liable for all costs incurred by the owner.

G. Equipment Size

Electrical equipment shall fit in the space provided on the plan drawings or as specified. Equipment heights and widths shall not exceed those shown or specified. Larger equipment shall not be considered acceptable. Equipment that is larger than specified shall not be considered equivalent.

H. Operation and Maintenance Data

The manufacturer of the power and control panel shall prepare and assemble detailed operation and maintenance manuals in accordance with the requirements of section 01730. The manuals shall include, but not limited to the following:

a. Preventative maintenance procedures
b. Trouble-shooting
c. Calibration
d. Testing
e. Replacement of components
f. Automatic mode operation
g. Manual mode operation
h. System schematics
i. As-built wiring diagrams
j. Catalog data and complete parts list for all equipment and control devices
k. Listing of recommended spare parts
l. Listing of recommended maintenance tools and equipment
15.10.2 Products

A. Motor Starters

Motor starter units shall be of the type with components and wiring readily accessible. The motor starter units shall contain the magnetic starters and control components as indicated on the drawings and specified herein. Thermal overload relays on starters shall be nonambient compensated melting alloy type for manual reset, separate N.O. overload contact shall be provided in addition to standard N.C. overload contact.

All starters shall be provided with two field convertible auxiliary contacts.

B. Selector Switches

Shall be heavy duty oil tight industrial type, for use on 120VAC control circuits. Contacts shall have a continuous current rating of 10 Amperes both inductive and resistive.

C. Indicating Lights

Indicating lights shall be heavy-duty industrial oil tight, push to test AC transformer type with 6.3 volt lamps.

D. Control Relays

Shall be IDEC RH SERIES SNAP MOUNT or equal and shall be interchangeable with one another. One spare relay of each type shall be provided with the system. Control relays shall have indicating light to show energized position and time delay relays shall have additional indicating light to show timed out feature.

E. Terminal Boards

Terminal boards shall be 300 volt modular terminal blocks ENTRELEC #110-280-07 or equal.

F. Wireways

Shall be provided for interconnecting major groups of devices mounted within the panel. The wireways shall be 2-1/2" X 2-1/2" or 4" X 4" steel wireways. PVC slotted side panel wiring duct (PANDUIT) shall be provided adjacent to relays and may also be used for control wire. The duct shall be arranged in horizontal configurations to pass near all relays and devices being fed from the duct. Header ducts shall, in general, be steel wireways as specified above.

G. Phase Sequence & Power Loss Relay

(STAGE 1 NORTH CLOSURE) 15-46
(TACOMA LANDFILL )
Provide phase loss/unbalance, low voltage and reverse phase protection. Three phase, 480 vac, standard time delay. Manufacturer - Go-Tronic Model 51-48011-02.

H. Enclosures

Enclosures for control panels shall be NEMA 12 steel construction equal to Hoffman Company standards and quality of manufacturer. Enclosure sizes shall be as shown on the drawings.

I. Alarm Horns

Shall be modular in design and provide a loud, penetrating sound output that is easily heard over most ambient noise levels. Horn shall be semi-flush mounted in the condensate control panel. Sound level shall be 95 db at 10 feet.

15.10.3 Execution

A. Installation

The power and control panel shall be installed by the contractor in accordance with the installation drawings and instructions prepared by the manufacturer. Installation shall be performed by workers who are skilled and experienced in the installation of electrical instrumentation and control systems.

Installation shall include all elements and components of the panel and all interconnecting wiring between all equipment, components, and sensors. All wiring between cabinets, sensors and equipment shall be labeled at both ends for ease of servicing. All terminations shall be made with solderless pressure connectors. All wiring shall be in accordance with the requirements of Section 15.03.

B. Calibration and Adjustment

All level switches, pressure switches, limit switches, and all other control devices shall be factory or field-adjusted by the contractor's qualified technicians to the values specified or provided by the engineer. The contractor is advised that several readjustments of each device may be required to obtain satisfactory operation, and he shall have qualified personnel available at all times during startup and initial testing.

(STAGE 1 NORTH CLOSURE)  15-47
(TACOMA LANDFILL  )
15.11 MEASUREMENT

There will be no measurement for this section.

15.12 PAYMENT

Compensation for the cost necessary to complete work described in Section 15 shall be made at the lump sum bid price for "Condensate System Electrical". "Condensate System Electrical" shall include furnishing and installation of all items specified and shown on the Drawings, including all conduits wiring, connections and electrical devices, and all items required by code to complete the electrical installation of the vacuum and condensate pump stations, the control building, and its electrical service requirements.

Special Note: Approximately 2500 feet of underground conduit and approximately 2500 feet of spare conduit is to be installed in a trench between the North Remote Condensate Pump Station and the Vacuum Pump Station as part of the electrical contractor's work. This conduit is to be placed within the trench containing the gas condensate collection, discharge and vacuum lines as shown on the Drawings. The Contractor and electrical subcontractor shall coordinate all work to allow all conduits to be placed in the trench at the same time, such that each section of the trench will be backfilled at the end of each work day unless otherwise approved by the Engineer. If the contractor does not elect to install the electrical conduit within the same trench, all costs for labor, equipment and material to excavate and backfill a separate trench for electrical/conduits, including furnishing bedding material, shall be considered to the unit price item "Condensate System Electrical at per Lump Sum".

(STAGE 1 NORTH CLOSURE) 15-48
(TACOMA LANDFILL )
16.00 REMOVAL OF OBSTRUCTIONS

16.01 Scope

This section covers procedures and requirements for removal and subsequent handling, stockpiling, and/or disposal of obstructions encountered during construction of the Tacoma Landfill Stage 1 final cover. Items to be removed are indicated on the Drawings. Items to be disposed of at the landfill's working face may be done so at no cost to the Contractor.

16.02 Bollards

Concrete bollards shall be removed and disposed of at the landfill working face or as otherwise directed by the Engineer. The contract unit price for "Bollard Removal, at per each" shall be considered full compensation for all labor and equipment costs associated with bollard removal and disposal.

16.03 Drop Inlet

The existing inlet structure shall be removed as indicated on the drawings. The structure shall be removed in such a way as to avoid damage. The structure shall be moved to a storage area or disposed of at the working face of the landfill, as directed by the Engineer.

The contract unit price for "Inlet Structure Removal, at Per Each" as listed in the proposal shall be considered full compensation for all labor, equipment, and materials costs associated with removal of the inlet structure, including but not limited to, excavation, handling, and hauling.

16.04 Culverts

Culverts, as indicated on the Drawings, shall be removed during the subgrade preparation (Section 6.08). Culverts shall be removed in a manner as to avoid damage. Culverts shall be stored and later reinstalled, where indicated on the Drawings, stockpiled, or disposed of at the landfill working face, at the direction of the Engineer. The contract unit price for "Culvert Removal, at Per Each" shall include compensation for all items associated with the removal, including excavation and hauling.

16.05 Light Pole Removal

The unit price for "Light Pole Removal, at Per Each" shall be considered full compensation for all labor, equipment and materials costs associated with removal of the light poles and their foundations as shown on the drawings. The light poles shall be removed in such a manner as to avoid damage. The light poles shall be moved to a storage area, as directed by the Engineer. The unit price shall also include all costs associated with removal and
disposal of the light pole foundations at the working face of the landfill.

16.06 18-inch Concrete Pipe Removal

The existing 18-inch concrete pipe at the Northeast corner of the construction area shall be removed as indicated on the drawings. The pipe and trash rack shall be removed in such a manner as to avoid damage. The materials shall be moved to a storage area or disposed of at the landfill working face, at the direction of the Engineer.

The contract unit price for "18-inch Concrete Pipe Removal, at Per Linear Foot" shall be considered full compensation for all labor, equipment, and materials costs associated with chipping existing pavement, excavation, removal of pipe, handling, and hauling.
Appendix A

Geotechnical Evaluation Report
SUMMARY OF GEOTECHNICAL ENGINEERING STUDIES

TACOMA LANDFILL CLOSURE
Tacoma, Washington

Prepared For
Parametrix, Inc. and B&V Waste Science and Technology Corp.

W-6435
January, 1990
11 January 1990

Parametrix, Inc.
P.O. Box 460
Sumner, Washington 98390

Attention: Mr. Thomas J. Jeátran, P.E.

Subject: Summary of Geotechnical Engineering Studies
Tacoma Landfill Closure
Tacoma, Washington

Gentlemen:

We are pleased to present herein a copy of the above referenced report. This report presents the results of our subsurface exploration, laboratory testing, and geotechnical engineering studies for the above referenced project. Authorization to proceed with this study was provided verbally by Mr. Doug Drennen of Parametrix, Inc. on 11 October 1989. This study has been completed in general accordance with our Scope of Work and Budget for Geotechnical Services letter dated 27 September 1989.

We appreciate this opportunity to be of service to you and would be pleased to discuss the contents of this report or other aspects of the project with you at your convenience.

Respectfully submitted,

RITTENHOUSE-ZEMAN & ASSOCIATES, INC.

[Signature]

James S. Dransfield, P.E.
Associate
Summary of Geotechnical Engineering Studies
Tacoma Landfill Closure
Tacoma, Washington

Prepared for
Parametrix, Inc.
P.O. Box 460
Sumner, Washington 98390

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RITTENHOUSE-ZEMAN & ASSOCIATES, INC.
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Bellevue, Washington 98005

January 1990

W-6435
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1.0 SUMMARY

The proposed project construction is feasible with respect to the subsurface conditions encountered at the subject site. A brief summary of the project geotechnical considerations is presented below:

- Our field exploration program consisted of excavating 37 test pits in Stage One North, 4 test pits in Stage One South, and 6 test pits and 3 borings in the former Tacoma City Light property. The subsurface conditions at our exploration locations generally consisted of silty, gravelly sand (glacial till), either in its native state or reworked as compacted fill atop refuse. The fines content of the glacial till typically ranged from 10 to 30 percent (based on that portion of the sample passing the 3/4-inch sieve).

- The observed depth of fill atop refuse in Phase One North varied from about 1 foot to 11.5 feet at our test pit locations. Final cover elevations have not been determined as of this writing.

- Laboratory testing has consisted of grain size distribution analyses and permeability testing on recompressed samples. In general, it appears that for soils with at least 15 percent fines, a laboratory permeability coefficient of $1 \times 10^{-5}$ cm/sec can be achieved for soils recompressed to at least 95 percent density (ASTM: D-698) at molding moisture contents at or slightly above optimum moisture.

- As requested, four test pits were excavated in Stage One South. The thickness of soil cover atop refuse at Stage One South ranged from 1.5 to 3.25 feet.
Explanations in the former City Light property disclosed glacial till, with a measured laboratory permeability coefficient of recompacted soil samples less than $1 \times 10^{-5}$ cm/sec. Our explorations and a deeper well log in the vicinity indicate the till is on the order of 30 to 35 feet thick near the topographic high point of the City Light site.

This summary is presented for introductory purposes only and should be used in conjunction with the full text of this report. The project description, site conditions, and our detailed design recommendations are presented in the text of this report. The exploration procedures and logs are presented in Appendix A. The laboratory test procedures and results are presented in Appendix B and on the exploration logs where appropriate.

2.0 SITE AND PROJECT DESCRIPTION

We understand that in accordance with Appendix II to the Consent Decree between WDOE and City of Tacoma, a landfill cap is to be designed as part of the Tacoma Landfill closure. As we understand it, the preferred landfill cap design consists of, as a minimum, 24 inches of topsoil over 12 inches of drainage layer over a 60 mil geomembrane, all over 24 inches of soil compacted to a saturated hydraulic conductivity (permeability coefficient) of not more than $1 \times 10^{-5}$ cm/sec with the top six inches consisting of a finely graded $1 \times 10^{-5}$ layer. We understand final grading will occur in three stages, with Stage One (North and South) to be completed during the 1990 (summertime) construction season.

The Stage One North area is roughly trapezoidal in shape. Its dimensions are about 2700 feet in a north-south direction by about 700 feet wide on the north tapering to about 150 wide on the south. The topography across Stage One North is fairly flat-lying, except for a terrace some five to ten feet higher on the northeast end of this overall area. The site is bounded by a roadway on the north, and further to the north the ground slopes down to a level some 20 to 30 feet lower in elevation. To the east, the Stage One North area is bounded by steep cut slopes, which rise some 50 feet in elevation to new apartment buildings at the north end of the site. Further south, the ground to the east slopes down moderately to the south, and by the southern end of Stage One North, the slopes to the east descend moderately steeply by almost 50 feet in elevation. The Stage
One North site was sparsely vegetated with grasses and brush. There was no evidence of standing surface water on the Stage One North area at the time of our field studies.

The Stage One South area is approximately rectangular in shape, being about 1600 feet by 800 feet in overall dimension. The topography across this area was relatively level in the center of the northern half of this area and then gradually slopes off to the west, south and east. Maximum relief in this area is estimated to be on the order of 20 feet. Vegetation across this portion of the site was essentially non-existent except for scattered grasses and brush mainly along the east and west portions of this area. No standing surface water was observed in Stage One South during our field studies, however, the surface soils were saturated and easily turned to mud when disturbed. We understand that another lift of refuse will be placed over the center of Stage One South.

The former Tacoma City Light property is a roughly 660 foot-square parcel located between Stage One South on the west and Tyler Street on the east. The topography across this parcel was fairly steep, consisting of a north-south trending ridge which rises about 10 feet above the landfill level at the western property boundary and then descends steeply from this high point by about 70 feet to Tyler Street. Vegetation on this parcel consisted of a medium dense stand of coniferous and deciduous trees and associated underbrush. No evidence of standing water or flowing water was noted on the parcel at the time of our field studies.

3.0 MATERIALS EVALUATION
The subsurface conditions within the Stage One North, South, and former City Light parcels were evaluated for this study in October and early November of 1989. The subsurface conditions disclosed by our explorations are described below, while the exploration procedures and logs of the explorations are presented in Appendix A. The approximate Stage One North, South, and former City Light parcels as well as the approximate exploration locations are indicated on the Site and Exploration Plans, Figures 2 through 4.

3.1 Laboratory Testing
A series of laboratory tests were performed on representative samples of soil obtained from Stage One North, Stage One South, and the City Light property. Laboratory test
procedures and results are presented in Appendix B. A summary of the laboratory testing performed on each sample is presented as Table B-1 in Appendix B. Grain size distribution analyses were performed on representative samples from each test pit. The results of grain size distribution analyses are summarized on Table B-2 in Appendix B.

Permeability testing was also performed on representative samples of soil from selected test pits and borings. The permeability testing was performed on samples which were recompacted in accordance with compaction standard ASTM: D 698, at natural moisture content (which was usually slightly dry of optimum), and then at moisture contents generally in the range of 0 to 4 percent above optimum. The results of permeability testing is presented as Table B-4.

We have correlated the results of permeability testing with the results of grain size distribution analyses to characterize the permeability of all samples tested. The grain size distribution analyses presented in Table B-2 provide percentages passing each screen on the basis of the total sample weight. The permeability of a soil is highly dependent on the composition of the finer particles which comprise the soil matrix. Our studies indicate the particle size distribution and the percentage passing the U.S. No. 200 sieve to be useful in correlation of grain size with permeability. However, where substantial amounts of gravel-sized particles are present in the sample, the fines content (that portion passing the U.S. No. 200 sieve) will be skewed towards a lower number, which is not fully representative of the composition of the soil matrix. To obtain a more meaningful correlation, we have also computed the percentage fines by weight when based on that portion of the sample passing the 3/4-inch screen. These percentage fines (on the basis of the minus 3/4-inch material) are presented as Table B-3. For purposes of clarity, the fines content based on the minus 3/4-inch fraction is referred to as the "revised" fines content elsewhere in this report.

3.2 Stage One North
A total of 37 test pits were made in the Stage One North area. The test pits were made on an approximately 200-foot staggered grid spacing (see Figure-3). The test pits were made to evaluate the characteristics of soil cover and the depth to refuse. Table A-1 in Appendix A presents a summary of test pit locations, and the depth to refuse.
The soil cover encountered in our test pits generally consisted of a silty, gravelly sand fill. The material was interpreted to be primarily reworked glacial till. We understand that at least a portion of this material came from the cut slope immediately to the east. The "revised" percentage fines data (Table B-3) show that the majority of the material had fines contents in the range of 10 to 30 percent. Samples from TP-1 and TP-9 had less than 10 percent fines by weight. These two test pits were excavated on the margin of the previously placed fill, and therefore may not be representative of the body of the fill. According to Mr. Wayne Coates of Tacoma Public Works, pockets of clean gravelly soil were encountered in random locations within the glacial till borrow area. Coarse grained soils at the margin of fill areas may also reflect segregation from fill stockpiles or fill placement operations.

3.3 Stage One South
The test pits made in Stage One South were requested during our field studies primarily to verify assumed thickness of fill atop refuse. The fill thickness atop refuse varied from 1.5 to 3.25 feet at our test pit locations. The surveyed grid locations of the test pits and the measured depths to refuse at the test pit locations are summarized on Table A-2 in Appendix A. The measured permeability and gradation of the soil cover in Stage One South was similar to Stage One North, apparently consisting of a reworked glacial till.

3.4 City Light Property
Test pits and borings were made in the former City Light property to review the use of the soil materials for a borrow source for low permeability cover. Our explorations generally disclosed one-half foot of topsoil over about 2 to 3 feet of medium dense silty gravelly sand (weathered glacial till). Below the weathered till to the bottom of our deepest borings at 33 feet below ground surface, our explorations encountered dense to very dense, silty, gravelly SAND (unweathered glacial till).

The samples retrieved from the City Light property exhibited permeability values consistent with those encountered in the existing landfill cover. Although not directly observed in our explorations, we would expect pockets of cleaner-sandy gravelly soils at random locations within the glacial till. Likewise, the occasional presence of glacial "erratic" cobbles and boulder sized materials is typical in glacial till.
The grab samples recovered from the borings for laboratory testing were obtained from the auger flights. These samples are not considered to be totally representative, since the driller used bentonite chips in some areas during drilling. Based on our observations and testing, including the test pits made in the City Light property (without bentonite), the soils from this area appear to be generally consistent with the soils observed in the existing cover materials in Stage One North and South.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Based on our subsurface exploration program, laboratory testing and engineering analyses, the proposed project appears feasible from a geotechnical standpoint. Our conclusions and recommendations for design and construction are presented in the following sections of this report.

4.1 Subgrade Permeability

Because elevations will be changed significantly during final grading, it was not feasible to measure in situ permeability of the subgrade soils. Specifically, it would have been necessary to measure in-place density and moisture content at subgrade elevation, retrieving samples at that elevation, returning the samples to our laboratory, and measuring permeability on samples recompacted to field moisture and density. The depth of cover atop refuse made it infeasible (and unsafe) to measure in-place density, even if subgrade elevations were known. Therefore, a contour map of insitu permeability could not be generated for this project.

On the basis of a total of 58 permeability tests on 20 samples, and grain size distribution analyses on 62 samples, it is our opinion that a permeability of $1 \times 10^{-5}$ cm/sec can be attained by recompaction of most site soils to at or slightly above optimum moisture content. We recommend compaction to a minimum 95 percent density, using ASTM: D 698 as the standard.

As part of construction quality assurance and quality control, because of the variability in grain size distribution, we recommend performing grain-size analyses during construction to determine the percent passing the U.S. No. 200 sieve, based on that portion of the sample passing the 3/4-inch screen. In Figure 5, we have plotted the "revised" percentage fines versus the measured laboratory permeability coefficient. The
permeability coefficient plotted is the average value measured for samples compacted at
moisture contents ranging from 1 percent below to 3 percent above optimum moisture
content. As can be seen, the permeability coefficient was found to be less than $1 \times 10^{-5}$
cm/sec for all samples with more than 15 percent passing the U.S. No. 200 sieve
(based on 3/4 inch fraction). We would therefore recommend grain size testing be
performed on a regular spacing (such as one sample every 500 cubic yards) to
document that the material placed has sufficient fines. We would recommend regular
testing of moisture content, density and grain size during construction of the low
permeability cover to provide quality assurance. Correlation of these parameters with
soil permeability has been established on the basis of our laboratory testing of the
borrow materials.

Based on our grain size distribution testing, 10 samples in 62 had less than 15 percent
fines, based on the "revised" fines criteria. Of those samples with less than 15 percent
fines, a few were from the margins of Stage One North fill, and some were from random
locations on the City Light property. If soils with less than 15 percent fines are disclosed
during fill placement they would need to be removed. Alternatively, mixing of cleaner
soils with on-site soils containing a higher fines content could be considered. As a third
option, the cleaner soils could be amended with bentonite or other import materials to
achieve the desired grain size distribution.

Bentonite suppliers familiar with the soils at Tacoma Landfill indicated the 5 percent
bentonite admixture by weight would provide sufficient fines content. Based on our
previous experience, dry bentonite can be admixed with insitu soils using equipment
such as an asphalt pavement reclaimer. The permeability of the bentonite admixed soil
could be evaluated by laboratory testing. By recompacting the admixed soil to the same
moisture content and density as measured in the field, these samples could be tested for
permeability.

As discussed above, if grain size testing indicates a "revised" fines content below the
recommended 15 percent, treatment of the deficient portion of the cover soils by either
removal and replacement, mixing, or amendment will be recommended. The
construction quality assurance program should outline the criteria for determination of
the size of the deficient area to be treated. We would suggest performing three grain
size tests around the deficient test. The actual limits to be treated should be determined by the project geotechnical engineer (or his representative) or the basis of the testing and visual observation. Since the amount of subgrade treatment will only become evident during the course of the earthwork, we recommend the contractor be required to provide a unit cost for subgrade treatment per square foot by the selected method.

4.2 Site Preparation
Prior to fill placement, all areas to receive fill should be proofrolled. Proofrolling should consist of thoroughly compacting the subgrade with a padfoot-type roller, to disclose any soft and yielding areas. Proofrolling should be accomplished under the full time observation of the geotechnical engineer (or his representative). The need for vibration during proofrolling should be determined by the geotechnical engineer, based on site and weather conditions during construction.

It is common construction practice to overexcavate any soft or organic rich areas prior to fill placement. We recommend removal of such soft areas down to a firm, non-yielding surface and replacement with crushed rock, rounded drainage rock such as pea gravel or washed rock, or fill compacted to at least 90 percent density, ASTM:D-698. The excavation to subgrade elevation prior to placement of the low permeability soil cover will presumably be made close to the top of the refuse in some areas, in which case overexcavation to a firm and unyielding surface may not be feasible. Provisions should be made for excavation and disposal of refuse if encountered at subgrade elevations. We would recommend placement of at least a 1-foot layer of gravel, crushed rock or quarry spalls between the top of refuse and the subgrade level to receive low permeability soil cover, in order to provide a relatively stable subgrade for fill placement.

Based on observed conditions in our test pit excavations, the resulting subgrade after proofrolling and localized repair of soft spots will be relatively firm. However, these site soils are silt rich and highly susceptible to disturbance and softening in the presence of moisture. The continued movement of equipment over even the firm subgrade soils may turn them to mud. Once subgrade elevations are reached, the contractor should limit traffic to established access roads when the subgrade is wet, to limit disturbance and softening associated with vehicular traffic. The contractor should select equipment so as to minimize subgrade disturbance. The contractor should be made responsible for
control of all surface water, subsurface seepage or other sources of water during construction, and diversion and removal of the water from areas to be filled.

4.3 Fill Placement and Compaction
Because much of the soils exposed at subgrade elevation will consist of glacial till, it would be feasible to recompact the site soils in-place, and incorporate these soils into the 2-foot low permeability soil cover. We recommend scarifying the glacial till subgrade to a depth of 8 inches, and adjusting the moisture content to 1 percent below to 3 percent above optimum moisture content for the soil as determined by ASTM:D-698 testing. Grain size analysis should then be performed on this 8-inch scarified layer, to verify sufficient fines to achieve the required permeability.

The scarified and moisture conditioned soil should then be recompacted to a minimum 95 percent density, using ASTM:D-698 as the standard. We anticipate the 8-inch scarified thickness of soil will represent about a 6-inch compacted thickness. We recommend the moisture content be allowed to vary from 1 percent below to 3 percent above optimum moisture to achieve permeabilities equal to or less than $1 \times 10^{-5}$ cm/sec. Moisture control within this range will also be critical to achieve a workable surface and desired compaction.

Additional lifts of fill should be spread out in level lifts, a maximum of 8-inch loose thickness. Any individual rocks larger than 3-inches in diameter should be removed from the fill. Based on our field observations, the majority of the site soils available for use in the low permeability cover contained only minor amounts of rocks larger than 3-inches diameter. We would suggest that sufficient removal of larger rocks could be accomplished by use of a rock windrower and hand picking. Further processing of the fill would not be necessary, in our opinion, since the permeability will be controlled by the soil matrix and will not be influenced by an occasional larger rock. The moisture content should be adjusted within a range from 1 percent below to 3 percent above optimum moisture content, prior to compaction to at least 95 percent density (ASTM:D-698). This may require aerating over optimum soils.

The final 1/2 foot of low permeability soil will need to be compacted with a smooth drum vibratory roller, so that individual rocks do not protrude above the fill surface and cause
damage to the overlying membrane liner. For the uppermost 1/2-foot, we recommend preprocessing the material by screening, to remove any rocks larger than 3/4-inch in diameter.

Due to the silt-rich, moisture-sensitive nature of on-site silty soils, we anticipate the construction process will be hampered by periods of wet, or cooler weather or even single days of sustained precipitation. In our opinion, this work will only be feasible during extended periods of warm, dry weather. All parties should be made aware that glacial till must be used as fill on-site. If work is not completed by the onset of protracted periods of wet weather, work will need to be delayed until the following warm, dry summer season.

It should be noted that the silty on-site soils are moisture sensitive and thus difficult or impossible to compact if substantially above optimum moisture content. Since much of the glacial till will be at or above optimum moisture content in its natural state, proper compaction will be highly weather dependent. The contractor should be made aware that the use of glacial till fill is a necessity for this project and other all-weather fill materials such as "pit run" cannot be substituted. The contractor should be further instructed to have aeration equipment on-site so that fill materials with over optimum moisture content can be scarified and dried during warm summer weather. While less commonly required, water trucks, hoses or other methods may by necessary to add water during sustained hot or dry periods so that the desired moisture content range to allow suitable compaction may be maintained. Even during the summer months, delays in grading are likely to be caused by weather.

5.0 CLOSURE
The conclusions and recommendations presented in this report are based on the subsurface explorations and laboratory testing performed for this study. This work was performed within the site and proposal constraints so as to obtain the necessary information to formulate our recommendations. Because of the variability of the existing fill soils, we anticipate geotechnical engineering decisions will be required.

We therefore recommend we be present during the site preparation, excavation and fill placement phases of the earthwork, to perform appropriate testing and provide
geotechnical consultation as the project progresses regarding any changes in soil conditions, design modifications, or other aspects of the project which may develop during the course of the earthwork.

Respectfully submitted,

RITTENHOUSE-ZEMAN & ASSOCIATES, INC.

[Signature]

Eric C. Pond
Geotechnical Engineer

[Signature]

James S. Dransfield, P.E.
Associate

[Signature]

Kurt W. Groesch, P.E.
Associate
LANDFILL BOUNDARY

APPROXIMATE SCALE

IN FEET

1600

STAGE I SOUTH

STAGE I NORTH

SEE SITE & EXPLORATION PLAN, FIGURE 3

MULLEN STREET

CITY LIGHT PROPERTY
(SEE SITE & EXPLORATION SKETCH, FIGURE 4)

LEGEND

TP-41 INDICATES TEST NUMBER AND APPROXIMATE LOCATION

TACOMA LANDFILL CLOSURE
TACOMA, WASHINGTON
SITE & EXPLORATION PLAN
FIGURE 2
LEGEND

TP-37
INDICATES TEST PIT NUMBER AND
APPROXIMATE LOCATION

TACOMA LANDFILL CLOSURE
STAGE 1 NORTH
TACOMA, WASHINGTON
SITE & EXPLORATION PLAN

FIGURE 3

RITTENHOUSE-ZEMAN & ASSOCIATES, INC.
Geotechnical & Hydrogeological Consultants
1400 146th Avenue N.E.
Bellevue, Washington 98005
LEGEND

TP-47  INDICATES TEST PIT NUMBER AND APPROXIMATE LOCATION

B-3  INDICATES BORING NUMBER AND APPROXIMATE LOCATION

TACOMA LANDFILL CLOSURE
FORMER CITY LIGHT PROPERTY
TACOMA, WASHINGTON

SITE & EXPLORATION SKETCH

FIGURE 4

W.O.  W-6435
BY  ECP
DATE  DEC 1989
SCALE  N.T.S.

RITTENHOUSE-ZEMAN & ASSOCIATES, INC.
Geotechnical & Hydrogeological Consultants
1400 140th Avenue N.E.
Bellevue, WA 98005
REVISED PERCENTAGE FINES BASED ON THE MINUS 3/4 INCH FRACTION

PERMEABILITY vs. PERCENT FINES

TACOMA LANDFILL CLOSURE
TACOMA, WASHINGTON

W.O. W6435
BY ECP
DATE DEC 1989
SCALE NOTED
APPENDIX A
FIELD EXPLORATION AND PROCEDURES
Field Exploration
The field exploration program conducted for this study consisted of advancing 3 hollow-stem auger test borings, and 47 backhoe test pits. The exploration locations were obtained in the field by taping from survey stakes provided by the owner, or at locations selected by us and later surveyed by the owner. The locations of the explorations should be considered as accurate as the degree implied by the method used.

Hollow Stem Auger Borings
The borings were drilled on 21 and 22 November 1989. All the borings were drilled by local exploration drilling companies under subcontract to our firm. The borings consisted of advancing a 4-inch inside diameter, hollow-stem auger with a truck-mounted drill rig. During the drilling process, samples were obtained at generally 2.5 or 5.0 feet depth intervals. The borings were continuously observed and logged by a geotechnical engineer from our firm.

Disturbed samples were obtained by using the Standard Penetration Test Procedure as described in ASTM:D 1586. This test and sampling method consists of driving a standard 2-inch diameter split barrel sampler a distance of 18 inches into the soil with a 140 pound hammer free falling a distance of 30 inches. The number of blows for each 6-inch interval is recorded. The number of blows required to drive the sampler the final 12 inches is considered the Standard Penetration Resistance ("N") or blow count. The blow count is presented graphically on the boring logs in this appendix. If a total of 50 blows is recorded within any 6-inch interval the blow count is recorded as 50 for the number of inches of penetration. The resistance, or "N" value, provides a measure of the relative density of granular soils or the relative consistency of cohesive soils.

The soil samples obtained from the split-barrel sampler were classified in the field and representative portions placed in water tight containers. The samples were then transported to our laboratory for further visual classification and laboratory testing.
Samples are generally saved for a period of 30 days unless special arrangements are made.

The boring logs presented in this appendix are based on the drilling action, inspection of the samples secured, laboratory results and field logs. The various types of soils are indicated as well as the depths where the soils or characteristics of the soils changed. It should be noted that these changes may have been gradual, and if the changes occurred between sample intervals, they were interpreted.

The groundwater conditions observed during the exploration program are indicated on the boring logs. These subsurface water conditions were evaluated by observing the moisture condition of the samples, or the free water on the sampling rods. The groundwater level is indicated on the boring logs where appropriate by the water symbol. No observation wells were installed in any of the borings.

Test Pit Excavations
Forty-seven test pits were excavated on 24, 25 and 26 October 1989 with a rubber-tired backhoe by a local excavating contractor under subcontract to our firm. Each test pit was continuously observed and logged by one of our experienced geotechnical engineers. In-situ strength and quality attributes of materials encountered in the test pits were estimated by our field observer based on experience with similar soils and on the difficulty incurred during excavation. Disturbed, but representative samples of the soils in the test pits were retrieved, classified in the field, and transported in plastic containers to our laboratory for further evaluation and laboratory testing classification. The test pit logs are presented in this appendix and are based on the inspection of the samples secured the laboratory testing, and on the field logs.
### Soil Description

**Approximate Ground Surface Elevation:**

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Soil Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Medium dense, moist, tan with rust motling, gravelly, silty, fine to coarse SAND, with several fine to medium roots (Weathered Glacial Till)</td>
</tr>
<tr>
<td>5</td>
<td>Very dense, moist, grey with rust motling, gravelly, silty, fine to coarse SAND, some cobbles (Glacial Till)</td>
</tr>
<tr>
<td>10</td>
<td>Grades to gray</td>
</tr>
<tr>
<td>15</td>
<td>Grades to wet</td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Boring terminated at approximately 28 feet.</td>
</tr>
</tbody>
</table>

### Standard Penetration Resistance

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Ground Water</th>
<th>Blows per Foot</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-1</td>
<td>84</td>
<td></td>
</tr>
<tr>
<td>S-2</td>
<td>50/5&quot;</td>
<td></td>
</tr>
<tr>
<td>S-3</td>
<td>50/3&quot;</td>
<td></td>
</tr>
<tr>
<td>S-4</td>
<td>50/3&quot;</td>
<td></td>
</tr>
<tr>
<td>S-5</td>
<td>50/4&quot;</td>
<td></td>
</tr>
<tr>
<td>S-6</td>
<td>50/5&quot;</td>
<td></td>
</tr>
<tr>
<td>S-7</td>
<td>50/3&quot;</td>
<td></td>
</tr>
</tbody>
</table>

### Legend

- 2-inch 00 split spoon sampler
- Groundwater level at time of drilling

**Drilling started:** 27 November 1989
**Drilling completed:** 21 November 1989
### Soil Description

**Approximate ground surface elevation:**

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Soil Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Medium dense, moist, tan with rust mottling, gravelly, silty, fine to coarse SAND, some cobbles, some fine to medium roots (Weathered Glacial Till)</td>
</tr>
<tr>
<td>5</td>
<td>Very dense, moist, gray with rust mottling, silty, fine to coarse sandy GRAVEL, some cobbles (Glacial Till)</td>
</tr>
<tr>
<td>10</td>
<td>Gravels to with trace to some cobbles</td>
</tr>
<tr>
<td>15</td>
<td>Gravels to gray with trace of rust mottling, with interbedded layers of lower silt content</td>
</tr>
<tr>
<td>20</td>
<td>Gravels to wet</td>
</tr>
<tr>
<td>25</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

### Standard Penetration Resistance

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Blows per foot</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-1</td>
<td>55/8'' ▲</td>
</tr>
<tr>
<td>S-2</td>
<td>50/5'' ▲</td>
</tr>
<tr>
<td>S-3</td>
<td>50/5'' ▲</td>
</tr>
<tr>
<td>S-4</td>
<td>50/5'' ▲</td>
</tr>
<tr>
<td>S-5</td>
<td>86 ▲</td>
</tr>
<tr>
<td>S-6</td>
<td>50/6'' ▲</td>
</tr>
<tr>
<td>S-7</td>
<td>50/5'' ▲</td>
</tr>
</tbody>
</table>

### Moisture Content

- Plastic limit
- Natural
- Liquid limit

---

**Legend:**

- 2-inch OD split spoon sampler
- Groundwater level at time of drilling

Drilling started: 21 November 1989  
Drilling completed: 21 November 1989  
Logged by: EOP
<table>
<thead>
<tr>
<th>DEPTH (feet)</th>
<th>SOIL DESCRIPTION</th>
<th>APPROXIMATE GROUND SURFACE ELEVATION</th>
<th>SAMPLE</th>
<th>SAMPLE NUMBER</th>
<th>STANDARD PENETRATION RESISTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>Graded loam with brown, yellow and rust motting</td>
<td></td>
<td>5-8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Boring terminated at approximately 35 feet.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**LEGEND**

1. 2-inch 90 split spoon sampler

**MOISTURE CONTENT**

Drilling started: 21 November 1989
Drilling completed: 21 November 1989
Logged by: RZA
**SOIL DESCRIPTION**

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Sample</th>
<th>Sample Type</th>
<th>Standard Penetration Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>50/6”</td>
<td>S-1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>50/5”</td>
<td>S-2</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>50/5”</td>
<td>S-3</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>50/5”</td>
<td>S-4</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>50/1.3”</td>
<td>S-5</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Interbedded layer with some silt.**

**Very dense, wet, gray with rust mottling, gravelly, silty fine to coarse SAND, some cobbles (Glacial Till).**

Boring terminated at approximately 23 feet.

**LEGEND**

- 2-inch OD split spoon sampler

**Drilling started:** 22 November 1989

**Drilling completed:** 22 November 1989
### TEST PIT LOGS

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Soil Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 - 5.0</td>
<td>Loose, moist, gray, gravelly, fine to coarse SAND, trace silt</td>
</tr>
<tr>
<td>5.0 - 7.5</td>
<td>Dense, moist, gray and tan with rust mottling, silty, gravelly SAND</td>
</tr>
<tr>
<td>7.5 - 11.0</td>
<td>Dense, moist, gray and rust, silty, gravelly, fine to coarse SAND.</td>
</tr>
</tbody>
</table>

Test Pit TP-1

- No refuse encountered
- No caving
- No seepage

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Soil Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 - 3.5</td>
<td>Dense, moist, layered gray, rust and tan, gravelly, silty fine to coarse SAND.</td>
</tr>
<tr>
<td></td>
<td>Refuse encountered at 3.5 feet</td>
</tr>
<tr>
<td></td>
<td>No caving</td>
</tr>
<tr>
<td></td>
<td>No seepage</td>
</tr>
</tbody>
</table>

Test Pit TP-2

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Soil Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 - 2.5</td>
<td>Dense, moist, gray, silty, gravelly, fine to coarse SAND.</td>
</tr>
<tr>
<td>2.5 - 4.0</td>
<td>Dense, moist, tan, silty, gravelly, fine to coarse SAND.</td>
</tr>
<tr>
<td>4.0 - 6.5</td>
<td>Dense, moist, blue-gray, silty, gravelly, fine to coarse SAND.</td>
</tr>
<tr>
<td>6.5 - 6.75</td>
<td>Sod and topsoil</td>
</tr>
<tr>
<td>6.75-10.5</td>
<td>Dense, moist, blue-gray, silty, gravelly, fine to coarse SAND.</td>
</tr>
</tbody>
</table>

Test Pit TP-3

- Refuse encountered at 10.5 feet
- No caving
- No seepage
<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Soil Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Test Pit TP-4</td>
</tr>
<tr>
<td>0.0 - 4.0</td>
<td>Medium dense, moist grading to wet, tan, silty, fine to coarse sandy GRAVEL</td>
</tr>
</tbody>
</table>
| 4.0 - 11.5  | Medium dense, wet, blue-gray, silty, gravelly, fine to coarse SAND.  
Refuse encountered at 11.5 feet  
No caving  
No seepage |
|             | Test Pit TP-5       |
| 0.0 - 4.0   | Very dense, moist, gray, silty, gravelly SAND (Glacial Till)  
No refuse encountered  
No caving  
No seepage |
|             | Test Pit TP-6       |
| 0.0 - 5.0   | Medium dense, moist, tan, blue-gray and brown, silty, fine to coarse sandy GRAVEL  
Refuse encountered at 5 feet  
No caving  
No seepage |
|             | Test Pit TP-7       |
| 0.0 - 2.5   | Loose, moist to wet, blue-gray, silty, gravelly, fine to coarse SAND.  
2.5 - 9.0    | Loose, moist to wet, brown, silty, gravelly, fine to coarse SAND, with many fine to medium roots  
Refuse encountered at 9 feet  
No caving  
No seepage |
<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Soil Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Test Pit TP-8</strong></td>
</tr>
<tr>
<td>0.0 - 3.0</td>
<td>Loose, moist, tan and brown, silty, gravelly, fine to coarse SAND.</td>
</tr>
<tr>
<td>3.0 - 9.5</td>
<td>Loose, moist, brown, silty, gravelly, fine to coarse SAND, many fine to medium roots</td>
</tr>
<tr>
<td>9.5 - 11.5</td>
<td>Medium dense, moist to wet, blue-gray, silty, gravelly, fine to coarse SAND.</td>
</tr>
<tr>
<td></td>
<td>Refuse encountered at 11.5 feet</td>
</tr>
<tr>
<td></td>
<td>No caving</td>
</tr>
<tr>
<td></td>
<td>No seepage</td>
</tr>
<tr>
<td></td>
<td><strong>Test Pit TP-9</strong></td>
</tr>
<tr>
<td>0.0 - 5.5</td>
<td>Medium dense, moist, gray and tan, silty, gravelly, fine to coarse SAND, scattered fine to medium roots</td>
</tr>
<tr>
<td>5.5 - 11.5</td>
<td>Dense, moist, gray, gravelly, fine SAND, trace to some medium to coarse sand, some silt</td>
</tr>
<tr>
<td></td>
<td>No refuse encountered</td>
</tr>
<tr>
<td></td>
<td>No caving</td>
</tr>
<tr>
<td></td>
<td>No seepage</td>
</tr>
<tr>
<td></td>
<td><strong>Test Pit TP-10</strong></td>
</tr>
<tr>
<td>0.0 - 6.0</td>
<td>Medium dense, moist, gray and brown, silty, gravelly, fine to coarse SAND.</td>
</tr>
<tr>
<td></td>
<td>Refuse encountered at 6.0 feet</td>
</tr>
<tr>
<td></td>
<td>No caving</td>
</tr>
<tr>
<td></td>
<td>No seepage</td>
</tr>
<tr>
<td>Depth (feet)</td>
<td>Soil Classification</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------</td>
</tr>
</tbody>
</table>

**Test Pit TP-11**
0.0 - 5.5  
Loose, moist, tan and brown, silty, gravelly, fine to coarse SAND, occasional fine to medium roots

5.5 - 8.5  
Medium dense, moist to wet, blue-gray, silty, gravelly, fine to coarse SAND, trace cobbles
Refuse encountered at 8.5 feet
No caving
No seepage

**Test Pit TP-12**
0.0 - 9.5  
Medium dense grading to dense, damp to moist, gray and tan, silty, fine to medium SAND, gravelly, some coarse sand, with trace cobbles
No refuse encountered
No caving
No seepage

**Test Pit TP-13**
0.0 - 3.0  
Medium dense, damp to moist, gray and tan, fine to coarse sandy GRAVEL, some silt
Refuse encountered at 3 feet
No caving
No seepage

**Test Pit TP-14**
0.0 - 3.5  
Medium dense, damp to moist, tan and brown, silty, gravelly, fine to coarse SAND, many fine to medium roots

3.5 - 5.5  
Medium dense, moist, blue-gray, silty, gravelly, fine to coarse SAND.
Refuse encountered at 5.5 feet
No caving
No seepage
<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Soil Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 - 5.5</td>
<td>Medium dense, moist, brown, silty, gravelly, fine to coarse SAND, scattered fine to medium roots. Refuse encountered at 5.5 feet. No caving. No seepage.</td>
</tr>
<tr>
<td>0.0 - 1.5</td>
<td>Medium dense, moist, gray, silty, gravelly, fine to coarse SAND. Refuse encountered at 1.5 feet. No caving. No seepage.</td>
</tr>
<tr>
<td>0.0 - 2.5</td>
<td>Medium dense, moist, gray and tan, silty, gravelly, fine to coarse SAND. Refuse encountered at 2.5 feet. No caving. No seepage.</td>
</tr>
<tr>
<td>0.0 - 6.0</td>
<td>Loose, moist, tan, silty, gravelly, fine to coarse SAND, trace cobbles.</td>
</tr>
<tr>
<td>6.0 - 7.5</td>
<td>Very dense, moist, gray, silty, gravelly, fine to coarse SAND, some cobbles (Glacial Till). No refuse encountered. No caving. No seepage.</td>
</tr>
<tr>
<td>Depth (feet)</td>
<td>Soil Classification</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>0.0 - 1.0</td>
<td>Medium dense, moist, brown and gray, fine to coarse sandy GRAVEL, some silt</td>
</tr>
<tr>
<td></td>
<td>Refuse encountered at 1.0 foot</td>
</tr>
<tr>
<td></td>
<td>No caving</td>
</tr>
<tr>
<td></td>
<td>No seepage</td>
</tr>
</tbody>
</table>

**Test Pit TP-20**

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Soil Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 - 2.0</td>
<td>Medium dense, moist, gray, silty, gravelly, fine to coarse SAND.</td>
</tr>
<tr>
<td></td>
<td>Refuse encountered at 2 feet</td>
</tr>
<tr>
<td></td>
<td>No caving</td>
</tr>
<tr>
<td></td>
<td>No seepage</td>
</tr>
</tbody>
</table>

**Test Pit TP-21**

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Soil Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 - 1.75</td>
<td>Medium dense, moist, brown, silty, fine to coarse sandy GRAVEL.</td>
</tr>
<tr>
<td></td>
<td>Refuse encountered at 1.75 feet</td>
</tr>
<tr>
<td></td>
<td>No caving</td>
</tr>
<tr>
<td></td>
<td>No seepage</td>
</tr>
</tbody>
</table>

**Test Pit TP-22**

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Soil Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 - 1.5</td>
<td>Medium dense, moist, tan, silty, fine to coarse sandy GRAVEL.</td>
</tr>
<tr>
<td></td>
<td>Refuse encountered at 1.5 feet</td>
</tr>
<tr>
<td></td>
<td>No caving</td>
</tr>
<tr>
<td></td>
<td>No seepage</td>
</tr>
</tbody>
</table>

**Test Pit TP-23**

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Soil Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 - 1.0</td>
<td>Medium dense, moist, gray and tan, gravelly, fine to coarse SAND, with silt</td>
</tr>
<tr>
<td></td>
<td>Refuse encountered at 1.0 feet</td>
</tr>
<tr>
<td></td>
<td>No caving</td>
</tr>
<tr>
<td></td>
<td>No seepage</td>
</tr>
<tr>
<td>Depth (feet)</td>
<td>Soil Classification</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------</td>
</tr>
<tr>
<td></td>
<td><strong>Test Pit TP-24</strong></td>
</tr>
<tr>
<td>0.0 - 2.0</td>
<td>Gravel surfacing over medium dense, moist, tan, silty, gravelly, fine to coarse SAND.</td>
</tr>
<tr>
<td>2.0 - 6.0</td>
<td>Medium dense, moist, gray, silty, fine to coarse sandy GRAVEL. Refuse encountered at 6.0 feet. No caving. No seepage.</td>
</tr>
<tr>
<td></td>
<td><strong>Test Pit TP-25</strong></td>
</tr>
<tr>
<td>0.0 - 1.0</td>
<td>Medium dense, moist, gray, silty, gravelly, fine to coarse SAND. Refuse encountered at 1.0 feet. No caving. No seepage.</td>
</tr>
<tr>
<td></td>
<td><strong>Test Pit TP-26</strong></td>
</tr>
<tr>
<td>0.0 - 1.5</td>
<td>Medium dense, moist, gray and brown, silty, gravelly, fine to coarse SAND. Refuse encountered at 1.5 feet. No caving. No seepage.</td>
</tr>
<tr>
<td></td>
<td><strong>Test Pit TP-27</strong></td>
</tr>
<tr>
<td>0.0 - 3.5</td>
<td>Gravel surfacing over medium dense, moist, gray and tan, silty, gravelly, fine to coarse SAND. Refuse encountered at 3.5 feet. No caving. No seepage.</td>
</tr>
<tr>
<td></td>
<td><strong>Test Pit TP-28</strong></td>
</tr>
<tr>
<td>0.0 - 2.0</td>
<td>Medium dense, moist, gray, silty, gravelly, fine to coarse SAND. Refuse encountered at 2.0 feet. No caving. No seepage.</td>
</tr>
<tr>
<td>Depth (feet)</td>
<td>Soil Classification</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>0.0 - 2.0</td>
<td>Medium dense, moist, gray, silty, gravelly, fine to coarse SAND</td>
</tr>
<tr>
<td></td>
<td>Refuse encountered at 2.0 feet</td>
</tr>
<tr>
<td></td>
<td>No caving</td>
</tr>
<tr>
<td></td>
<td>No seepage</td>
</tr>
<tr>
<td><strong>Test Pit TP-29</strong></td>
<td></td>
</tr>
<tr>
<td>0.0 - 4.0</td>
<td>Medium dense, moist, gray and brown, silty, gravelly, fine to coarse SAND, occasional medium roots</td>
</tr>
<tr>
<td></td>
<td>Refuse encountered at 4.0 feet</td>
</tr>
<tr>
<td></td>
<td>No caving</td>
</tr>
<tr>
<td></td>
<td>No seepage</td>
</tr>
<tr>
<td><strong>Test Pit TP-30</strong></td>
<td></td>
</tr>
<tr>
<td>0.0 - 3.0</td>
<td>Medium dense, moist, tan, gravelly, fine to coarse SAND, some silt</td>
</tr>
<tr>
<td></td>
<td>Refuse encountered at 3.0 feet</td>
</tr>
<tr>
<td></td>
<td>No caving</td>
</tr>
<tr>
<td></td>
<td>No seepage</td>
</tr>
<tr>
<td><strong>Test Pit TP-31</strong></td>
<td></td>
</tr>
<tr>
<td>0.0 - 1.0</td>
<td>Medium dense, moist, gray, silty, gravelly, fine to coarse SAND</td>
</tr>
<tr>
<td></td>
<td>Refuse encountered at 1.0 feet</td>
</tr>
<tr>
<td></td>
<td>No caving</td>
</tr>
<tr>
<td></td>
<td>No seepage</td>
</tr>
<tr>
<td><strong>Test Pit TP-32</strong></td>
<td></td>
</tr>
<tr>
<td>0.0 - 2.0</td>
<td>Medium dense, moist, brown and blue-gray, silty, gravelly, fine to coarse SAND</td>
</tr>
<tr>
<td></td>
<td>Refuse encountered at 2.0 feet</td>
</tr>
<tr>
<td></td>
<td>No caving</td>
</tr>
<tr>
<td></td>
<td>No seepage</td>
</tr>
<tr>
<td><strong>Test Pit TP-33</strong></td>
<td></td>
</tr>
<tr>
<td>Depth (feet)</td>
<td>Soil Classification</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>0.0 - 1.5</td>
<td>Medium dense, moist, gray, silty, gravelly, fine to coarse SAND. Refuse encountered at 1.5 feet No caving No seepage</td>
</tr>
<tr>
<td>0.0 - 3.0</td>
<td>Medium dense, damp, tan, silty, gravelly, fine to coarse SAND. Refuse encountered at 3.0 feet No caving No seepage</td>
</tr>
<tr>
<td>0.0 - 6&quot;</td>
<td>Sod</td>
</tr>
<tr>
<td>6&quot; - 5.0</td>
<td>Medium dense, damp to moist, tan and brown, silty, gravelly, fine to coarse SAND</td>
</tr>
<tr>
<td>5.0 - 7.0</td>
<td>Dense, moist, blue-gray, gravelly, fine to coarse SAND, some silt Refuse encountered at 7.0 feet No caving No seepage</td>
</tr>
<tr>
<td>0.0 - 2.5</td>
<td>Medium dense, moist to wet, gray, silty, gravelly, fine to coarse SAND, with scattered refuse</td>
</tr>
<tr>
<td>2.5 - 5.5</td>
<td>Medium dense, moist, tan, silty, gravelly, fine to coarse SAND, with occasional fine to medium roots</td>
</tr>
<tr>
<td>5.5 - 7.0</td>
<td>Very dense, moist, gray, silty, gravelly, fine to coarse SAND, (Glacial Till) No refuse encountered No caving No seepage</td>
</tr>
</tbody>
</table>
Depth (feet) | Soil Classification

Test Pit TP-38
0.0 - 2.0 | Medium dense, moist to wet, brown and blue-gray, silty, gravelly, fine to coarse SAND.
Refuse encountered at 2.0 feet
No caving
No seepage

Test Pit TP-39
0.0 - 1.5 | Medium dense, moist to wet, brown, silty, gravelly, fine to coarse SAND.
Refuse encountered at 1.5 feet
No caving
No seepage

Test Pit TP-40
0.0 - 1.0 | Medium dense, moist to wet, brown, silty, gravelly, fine to coarse SAND.
1.0 - 1.5 | Medium dense, moist to wet, blue-gray, silty, gravelly, fine to coarse SAND, with refuse mixed in the soil
Refuse encountered at 1.5 feet
No caving
No seepage

Test Pit TP-41
0.0 - 0.75 | Medium dense, moist to wet, brown, silty, fine to coarse sandy GRAVEL.
0.75 - 3.25 | Medium dense, moist to wet, blue-gray, silty, gravelly, fine to coarse SAND
Refuse encountered at 3.25 feet
No caving
No seepage
TEST PIT LOGS

Test Pits excavated on former Tacoma City Light Property

Test Pit TP-42

0.0 - 6" Topsoil
6" - 2.5 Medium dense, damp, tan, silty, fine to medium sandy GRAVEL, some coarse sand, some cobbles, with occasional boulders, many fine to medium roots
2.5 - 6.5 Dense grading to very dense, damp, gray, silty, gravelly, fine to medium SAND, some coarse sand, trace cobbles (Glacial Till)
6.5 - 7.0 Very dense, damp, gray, medium to coarse sandy GRAVEL, trace silt and fine sand, some cobbles
7.0 - 9.0 Very dense, damp to moist, gray, silty, gravelly, fine to medium SAND, some coarse sand, some cobbles (Glacial Till)

No caving
No seepage

Test Pit TP-43

0.0 6" Topsoil
6" - 3.0 Medium dense, damp, tan, silty, fine to medium sandy GRAVEL, some coarse sand, some cobbles, with occasional boulders, many fine to medium roots
3.0 -10.0 Very dense, damp, gray, silty, gravelly, fine to medium SAND, some coarse sand, trace cobbles (Glacial Till)

No caving
No seepage
<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Soil Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 - 1.0</td>
<td>Topsoil</td>
</tr>
<tr>
<td>1.0 - 3.0</td>
<td>Medium dense, damp, tan, silty, fine sandy GRAVEL, some medium to coarse sand, with cobbles, with occasional boulders, many fine to medium roots</td>
</tr>
<tr>
<td>3.0 - 10.0</td>
<td>Very dense, damp, gray, silty, gravelly, fine to medium SAND, some coarse sand, trace cobbles, (Glacial Till)</td>
</tr>
<tr>
<td></td>
<td>No caving</td>
</tr>
<tr>
<td></td>
<td>No seepage</td>
</tr>
</tbody>
</table>

**Test Pit TP-45**

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Soil Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 - 6&quot;</td>
<td>Topsoil</td>
</tr>
<tr>
<td>6&quot; - 3.0</td>
<td>Medium dense, damp, tan, silty, fine to medium sandy GRAVEL, some coarse sand, some cobbles, with occasional boulders, many fine to medium roots</td>
</tr>
<tr>
<td>3.0 - 10.0</td>
<td>Very dense, damp, gray, silty, gravelly, fine to medium SAND, some coarse sand, trace cobbles (Glacial Till)</td>
</tr>
<tr>
<td></td>
<td>No caving</td>
</tr>
<tr>
<td></td>
<td>No seepage</td>
</tr>
</tbody>
</table>

**Test Pit TP-46**

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Soil Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 - 6&quot;</td>
<td>Topsoil</td>
</tr>
<tr>
<td>6&quot; - 3.5</td>
<td>Medium dense, damp, tan, silty, fine to coarse sandy GRAVEL, some cobbles, with occasional boulders, many fine to medium roots</td>
</tr>
<tr>
<td>3.5 - 9.0</td>
<td>Very dense, damp, gray, silty, gravelly, fine to coarse SAND, trace cobbles (Glacial Till)</td>
</tr>
<tr>
<td></td>
<td>No caving</td>
</tr>
<tr>
<td></td>
<td>No seepage</td>
</tr>
<tr>
<td>Depth (feet)</td>
<td>Soil Classification</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>0.0 - 6&quot;</td>
<td>Topsoil</td>
</tr>
<tr>
<td>6&quot; - 3.0</td>
<td>Medium dense, damp, tan, silty, fine to medium sandy GRAVEL, some coarse sand, some cobbles, with occasional boulders, many fine to medium roots</td>
</tr>
<tr>
<td>3.0 - 10.0</td>
<td>Very dense, damp, gray, silty, gravelly, fine to medium SAND, some coarse sand, trace cobbles (Glacial Till)</td>
</tr>
<tr>
<td>10.0 -11.0</td>
<td>Very dense, damp, gray, fine to coarse sandy GRAVEL, some silt, trace to some cobbles</td>
</tr>
</tbody>
</table>

No caving
No seepage
TABLE A-1
STAGE 1 NORTH TEST PIT LOCATIONS AND DEPTHS TO REFUSE
LANDFILL CLOSURE SAMPLES
TACOMA LANDFILL

<table>
<thead>
<tr>
<th>TEST PIT #</th>
<th>EASTING</th>
<th>NORTHING</th>
<th>DEPTH TO REFUSE (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>E1503200</td>
<td>N698520</td>
<td>*</td>
</tr>
<tr>
<td>2</td>
<td>E1503400</td>
<td>N698550</td>
<td>3.5</td>
</tr>
<tr>
<td>3</td>
<td>E1503600</td>
<td>N698550</td>
<td>10.5</td>
</tr>
<tr>
<td>4</td>
<td>E1503800</td>
<td>N698570</td>
<td>11.5</td>
</tr>
<tr>
<td>5</td>
<td>E1503320</td>
<td>N698370</td>
<td>*</td>
</tr>
<tr>
<td>6</td>
<td>E1503500</td>
<td>N698350</td>
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</tr>
<tr>
<td>7</td>
<td>E1503700</td>
<td>N698350</td>
<td>9.0</td>
</tr>
<tr>
<td>8</td>
<td>E1503900</td>
<td>N698350</td>
<td>11.5</td>
</tr>
<tr>
<td>9</td>
<td>E150420</td>
<td>N698150</td>
<td>*</td>
</tr>
<tr>
<td>10</td>
<td>E1505600</td>
<td>N698150</td>
<td>6.0</td>
</tr>
<tr>
<td>11</td>
<td>E1503792</td>
<td>N698159</td>
<td>8.5</td>
</tr>
<tr>
<td>12</td>
<td>E1503970</td>
<td>N698150</td>
<td>*</td>
</tr>
<tr>
<td>13</td>
<td>E1503500</td>
<td>N697950</td>
<td>3.0</td>
</tr>
<tr>
<td>14</td>
<td>E1503700</td>
<td>N697950</td>
<td>5.5</td>
</tr>
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<td>15</td>
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<td>N697970</td>
<td>5.5</td>
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<td>17</td>
<td>E1503800</td>
<td>N697750</td>
<td>2.5</td>
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<tr>
<td>18</td>
<td>E1504000</td>
<td>N697750</td>
<td>*</td>
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<td>N697550</td>
<td>1.0</td>
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<td>20</td>
<td>E1503900</td>
<td>N697550</td>
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</tr>
<tr>
<td>21</td>
<td>E1503590</td>
<td>N697350</td>
<td>1.8</td>
</tr>
<tr>
<td>22</td>
<td>E1503790</td>
<td>N697350</td>
<td>1.5</td>
</tr>
<tr>
<td>23</td>
<td>E1504000</td>
<td>N697350</td>
<td>1.5</td>
</tr>
<tr>
<td>24</td>
<td>E1503700</td>
<td>N697150</td>
<td>6.0</td>
</tr>
<tr>
<td>25</td>
<td>E1503900</td>
<td>N697150</td>
<td>1.0</td>
</tr>
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<td>26</td>
<td>E1504075</td>
<td>N697150</td>
<td>1.5</td>
</tr>
<tr>
<td>27</td>
<td>E1503605</td>
<td>N696950</td>
<td>3.5</td>
</tr>
<tr>
<td>28</td>
<td>E1503800</td>
<td>N696950</td>
<td>2.0</td>
</tr>
<tr>
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<td>E1504000</td>
<td>N696950</td>
<td>2.0</td>
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<tr>
<td>30</td>
<td>E1503715</td>
<td>N696750</td>
<td>4.0</td>
</tr>
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<td>E1503900</td>
<td>N696750</td>
<td>3.0</td>
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<tr>
<td>32</td>
<td>E1504100</td>
<td>N696750</td>
<td>1.0</td>
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<tr>
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<td>E1503800</td>
<td>N696550</td>
<td>2.0</td>
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<td>E1504000</td>
<td>N696550</td>
<td>1.5</td>
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<td>E1503900</td>
<td>N696350</td>
<td>3.0</td>
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<td>36</td>
<td>E1504000</td>
<td>N696150</td>
<td>7.0</td>
</tr>
<tr>
<td>37</td>
<td>E1503900</td>
<td>N695950</td>
<td>*</td>
</tr>
</tbody>
</table>

*: NO REFUSE ENCOUNTERED
### TABLE A-2

**STAGE 1 SOUTH TEST PIT LOCATIONS AND DEPTHS TO REFUSE**  
**LANDFILL CLOSURE SAMPLES**  
**TACOMA LANDFILL**

<table>
<thead>
<tr>
<th>TEST PIT #</th>
<th>EASTING</th>
<th>NORTHING</th>
<th>DEPTH TO REFUSE (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>E1503622.0</td>
<td>N693437.8</td>
<td>2.0</td>
</tr>
<tr>
<td>39</td>
<td>E1503567.6</td>
<td>N692833.3</td>
<td>1.5</td>
</tr>
<tr>
<td>40</td>
<td>E1503949.5</td>
<td>N692872.8</td>
<td>1.0</td>
</tr>
<tr>
<td>41</td>
<td>E1504016.9</td>
<td>N693235.5</td>
<td>3.3</td>
</tr>
</tbody>
</table>
Laboratory Testing Procedures
A series of laboratory tests were performed during the course of this study to evaluate the index and geotechnical engineering properties of the subsurface soils. A summary of the laboratory testing program is presented as Table B-1 in this appendix. Descriptions of the types of tests performed are given below.

Visual Classification
Samples recovered from the exploration locations were visually classified in the field during the exploration program. Representative portions of the samples were carefully packaged in watertight containers and transported to our laboratory where the field classifications were verified or modified as required. Visual classification was done in general accordance with the United Soil Classification system. Visual soil classification included color, relative moisture content, soil type based on grain size, and accessory soil types included in the sample.

Moisture Content Determinations
Moisture content determinations were performed on representative samples obtained from the explorations in order to aid in identification and correlation of soil types. The determinations were made in general accordance with the test procedures described in ASTM:D-2216. A summary of moisture contents is presented on Table B-5.

Grain Size Analysis
A grain size analysis indicates the range in diameter of soil particles included in a particular sample. Sieve analyses and hydrometer analyses were performed on representative samples in general accordance with ASTM:D-422. The results are presented on Table B-2.
Laboratory Maximum Density Test
The laboratory maximum density represents the highest degree of density which can be obtained from a particular soil type by inducing a predetermined compaction effort. The test determines the "optimum" moisture content of the soil at the laboratory maximum density. The laboratory maximum density test was performed in general accordance with ASTM:D-698 on bulk samples of material. The results are presented on Table B-4 in conjunction with permeability test results.

Permeability Tests
Constant head permeability tests were performed on selected samples of the material collected in the field, in general accordance with ASTM:D-2434. The test methodology was modified to be in general conformance with Draft ASTM guidelines for permeability testing using a rigid wall permeameter. The samples were tested by removing particles larger than the 3/4 inch sieve, and compaction into a 4-inch diameter Proctor compaction mold in accordance with ASTM:D-698, noting the molding moisture content and dry density of the soil. The samples were then saturated under a constant pressure of 1.75 psi (gradient of 10.5), with flow from bottom to top. The sample was considered saturated when flow was observed exiting the top of the sample, and when a constant flow rate was measured. The coefficient of permeability was then determined by measuring the volume of water passing through the sample. The results of the permeability testing are summarized in Table B-4.
## TABLE B-1
SUMMARY OF LABORATORY TESTING
LANDFILL CLOSURE SAMPLES
TACOMA LANDFILL

### LEGEND

<table>
<thead>
<tr>
<th>INDICATES TEST PERFORMED</th>
<th>INDICATES WHERE TEST RESULT IS PRESENTED IN APPENDIX B</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>TABLE B-4 (PERMEABILITY AND PROCTOR)</td>
</tr>
<tr>
<td>G</td>
<td>TABLE B-2 (GRAIN SIZE SUMMARY)</td>
</tr>
<tr>
<td>M</td>
<td>TABLE B-5 (MOISTURE CONTENTS)</td>
</tr>
</tbody>
</table>

### SAMPLES WITH 0-10% FINES BASED ON TOTAL SAMPLE

<table>
<thead>
<tr>
<th>SAMPLE NO.</th>
<th>DEPTH</th>
<th>PROCTOR</th>
<th>SIEVE</th>
<th>MOISTURE</th>
<th>PERMEABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP1/S1</td>
<td>0-5'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TP1/S2</td>
<td>7.5-11'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TP9/S2</td>
<td>5.5-11.5'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TP13/S1</td>
<td>0-3'</td>
<td>P</td>
<td>G</td>
<td>M</td>
<td>P</td>
</tr>
<tr>
<td>TP42/S3</td>
<td>6.5-7'</td>
<td>P</td>
<td>G</td>
<td>M</td>
<td>P</td>
</tr>
</tbody>
</table>

### SAMPLES WITH 10-20% FINES BASED ON TOTAL SAMPLE

<table>
<thead>
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<th>PROCTOR</th>
<th>SIEVE</th>
<th>MOISTURE</th>
<th>PERMEABILITY</th>
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## TABLE B-1
SUMMARY OF LABORATORY TESTING
LANDFILL CLOSURE SAMPLES
TACOMA LANDFILL
(CONTINUED)

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<th>PERMEABILITY</th>
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<td>TP44/S1</td>
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TABLE B-2
SUMMARY OF GRAIN SIZE ANALYSES
BASED ON TOTAL SAMPLE
TACOMA LAND FILL

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Tp·003
Tp·003
Tp·004
TP-004
TP-005
Tp·006
Tp·007
TP-OOB
TP-008
TP-009
TP·009
TP-Ol0
TP·Oll
TP-Oll
TP-012
TP-013
TP-014
TP-015
TP-016
TP-017
TP·018
TP·019
TP-020
TP-021
TP-022
TP·023
TP·024
TP·025
TP-026
TP-027
TP-028
TP·029
Tp·030
Tp·031
TP-032
TP-033
TP-034
TP-035
TP-036
TP·036

5-001
S-OOZ
5-001
5-001
5-002
5·001
5-002
s-001
S·OOl
S·OOl
S-OOl
S·002
S·OOI
S-002
S-OOl
S-001
S-002
5-001
S·OOl
S·OOl
S·OOl
S-OOl
S-OOl
S·OOl
S·OOl
5-001
S-OOl
S·OOl
S-OOl
S-OOI
5-001
5,001
S·001
S-OOl
S·OOl
S·OOl
S·OOI
S-OOl
S-OOl
S·OOl
S-OOl
S-OOI
5-002

< 1 1/2 11

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100.0
100.0
100.0
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100.0

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3/4"

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91.1
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89.4
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97.2
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95.8
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96.2
91.0
91.9
91.0
87.3
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84.6
85.6
96.8
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91.7
74. I
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84.7
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81.4
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95.1
91.9
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92.6
96.6
91.6
89.7
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97.6
84.0
96.2

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3/8"

< #4

< #10

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81.9
75.1
74.4
55.9
84.3
77.8
47.9
87.9
83.4
83.4
75.7
91.4
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83.0
81.4
80.7
42.1
80.B
90.0
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73.0
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65.8
71.4
79.9
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76.6
86.4
76.7
82_6
77.5
79.6
84.7
80.5
80.0
82.7

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79.2
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67.0
49.6
74.1
68.2
41.2
76.3
71.0
71.6
66.8
89.7
72.4
74.4
69.3
72.0
36.2
6B.4
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69.4
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67.6
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69.8
70.4
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64.2
67.1
6B.2
62.1
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72.1
71.6
74.3
73.9

59.3
76.2
63.9
60.6
59.2
44.1
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. 53.6
52.2
58.8
57.5
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66.4
60.6
62.4
66.9
64.8
(CONT IHUED)

PAGE 1/2

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#20

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54.3
52.4
39.3
57.4
53.4

31.7
58.6
53.3
53.8
53.5
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61.3
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52.7
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52.3
43.5
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46.0
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52.0
48.4
46.2
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51.7
53.0
60.8
57.4

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44.5
45.0
46.5
83.4

48.9
48.8
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41.7
22.3
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30.3
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45.9
33.8
37.9
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43.7
38.3
38.5
47.0
41.2
41.2
53.449.1

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#60

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37.9
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33.7
25.2
37.4
33.9
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33.5

34.7
33.2
57.6
38.0
38.0
31.7
31.4
15.8
34.1
39.4
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29.9
28.2
23.9
37.3
26.3
29.0
31.5
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2B.6
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33.1
26.5 _
28.6
34.3
28.0
29.6
43.2
38.3

#100

< #200

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18.2
27.8
2B.l
25.3
lB.5
2B.1
25.1
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10.8
14.9
21.0
10.2
16.6
25.4
22.8

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## TABLE B-2
SUMMARY OF GRAIN SIZE ANALYSES
BASED ON TOTAL SAMPLE
TACOMA LANDFILL
(CONTINUED)

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(Continued)
### TABLE B-4
**SUMMARY OF PERMEABILITY TESTING**
**TACOMA LANDFILL**
(Continued)

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**SAMPLES WITH 10-20% FINES ON THE -3/4 FRACTION** (continued)

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TABLE B-4
SUMMARY OF PERMEABILITY TESTING
TACOMA LANDFILL
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SAMPLES WITH 20-30% FINES ON THE -3/4 FRACTION (continued)

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ATTACHMENT 5

W-02 Location Map
ATTACHMENT 6

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Notes:  
* PW-SA is constructed with a low carbon, galvanized screen  
** Numbers refer to grain size of sand. Colorado Silica Sand used. Channel Pack refers to the trademark Johnson Well product.
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**2' Stainless Pipe**
ATTACHMENT 7

W-02 Nearby Well W-03 Log
Cement/Bentonite Grout
Water Level at time of Drilling

Bentonite Chips (Enviroplug)
6-inch PVC Riser Pipe

PVC/Stainless Adaptor
8 Feet .060-inch Slot
Colorado 8–12 Silica Sand

2 Feet tight Wind Tail Pipe
Factory Welded Bottom Plate

Bentonite Chips (Enviroplug)
ATTACHMENT 8

W-02 Photographs
Figure 1: W-02 Well Photographs

City of Tacoma Landfill
Tacoma, Washington
ATTACHMENT 9

W-02 Video Survey Photographs
Sand material is visible within the screen and settled to within 1-2 ft of the top of the well screen.
The threads of the top of the screen are visible, indicating possible dislocation of screen from casing.
ATTACHMENT 10

Section from 1993 GETS O&M Plan
GROUNDWATER EXTRACTION/TREATMENT SYSTEM
O&M PLAN

TACOMA LANDFILL

TACOMA, WASHINGTON
GROUNDWATER EXTRACTION/TREATMENT SYSTEM O&M PLAN

TACOMA LANDFILL

TACOMA, WASHINGTON

PREPARED FOR:

CITY OF TACOMA, WASHINGTON

PREPARED BY:

THE CITY OF TACOMA
AND
B & V WASTE SCIENCE
AND TECHNOLOGY CORP.

FEBRUARY 1993
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The above control conditions will never be bypassed. Bypassing a sump low level pump shutdown will cause the pump to operate dry which may cause serious damage to pump and motor. Bypassing the influent tank high level shutdown may cause tank overflow and/or tank damage. Manual operation will be used for maintenance purposes only under the supervision of an experienced operator.

2.3.1.3.5 Alternate Procedure in Case of Failure.

SUMP PUMPS - If the sump pump (P-205) fails no treatment system shutdown or bypass will be required. The pumps will be repaired and/or replaced in case of failure.

2.3.2 EXTRACTION SYSTEM

2.3.2.1 Groundwater Extraction Wells and Pumps.

2.3.2.1.1 Purpose and Principles of Operation. The groundwater extraction system consists of 19 POC wells and 9 EOP wells. The purpose of these extraction wells is to control further migration of the contaminated groundwater plume and reduce the volume of contaminated groundwater on and off the landfill site. The extraction wells pump groundwater from the aquifer to HDPE collection piping that discharge into a collection tank at the treatment facility. A pipeline located along the western side of the landfill serves the POC wells and a dedicated pipeline serving the EOP wells runs east to the landfill property line and connects to the POC well pipeline (see Figure 1-2). Each extraction well is equipped with a submersible centrifugal pump with level and flow controls. Each well's flow controls will maintain a pre-set flow rate. Extraction well piping, valves, and controls are located in a vault enclosing the well head or above ground at the well head.

Performance wells are also installed downgradient of the extraction wells. These wells are used to monitor the degree of contaminant reduction in the groundwater. Sampling of these wells will also indicate if the groundwater pumping scheme needs to be revised.

2.3.2.1.2 References.

- Shop Drawings

02650 Drainage Structures and Extraction Well Vaults
02673 Extraction and Performance Monitoring Wells
11155 Submersible Well Pumps
15060 Miscellaneous Piping
15072 High Density Polyethylene (HDPE) Pipe
115100 Miscellaneous Valves
15900 Miscellaneous Mechanical Equipment
16050 Electrical
16903 Distributed Control System (DCS)
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2.3.2.1.3 Equipment Characteristics.

**Extraction Wells**

See Table 2-1 for construction information.

**Extraction Pumps**

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<th>Designation</th>
<th>P-18, P-19 (Motors EWPM-18, EWPM-19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Submersible Centrifugal</td>
</tr>
<tr>
<td>Head, ft.</td>
<td>199 to 208</td>
</tr>
<tr>
<td>Capacity, gpm</td>
<td>50</td>
</tr>
<tr>
<td>Model</td>
<td>75S50-8</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>GRUNDFOS</td>
</tr>
<tr>
<td>Motor Size, hp</td>
<td>5</td>
</tr>
<tr>
<td>Motor Voltage/Phase/Hertz</td>
<td>460/3/60</td>
</tr>
<tr>
<td>Motor Speed, rpm</td>
<td>3450</td>
</tr>
<tr>
<td>Riser Pipe Diameter, inches</td>
<td>2</td>
</tr>
<tr>
<td>Materials of Construction</td>
<td>Stainless Steel</td>
</tr>
<tr>
<td>Designation</td>
<td>P-35, P-36, P-37 (Motors EWPM-35, EWPM-36, and EWPM-37)</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>Type</td>
<td>Submersible Centrifugal</td>
</tr>
<tr>
<td>Head, ft.</td>
<td>229 to 234</td>
</tr>
<tr>
<td>Capacity, gpm</td>
<td>60</td>
</tr>
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<td>Model</td>
<td>75S75-10</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>GRUNDFOS</td>
</tr>
<tr>
<td>Motor Size, hp</td>
<td>7.5</td>
</tr>
<tr>
<td>Motor Voltage/Phase/Hertz</td>
<td>460/3/60</td>
</tr>
<tr>
<td>Motor Speed, rpm</td>
<td>3450</td>
</tr>
<tr>
<td>Riser Pipe Diameter, inches</td>
<td>2</td>
</tr>
<tr>
<td>Materials of Construction</td>
<td>Stainless Steel</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Designation</th>
<th>P-30 and P-38 (Motors EWPM-30 and EWPM-38)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Submersible Centrifugal</td>
</tr>
<tr>
<td>Head, ft.</td>
<td>241 to 265</td>
</tr>
<tr>
<td>Capacity, gpm</td>
<td>92 to 94</td>
</tr>
<tr>
<td>Model</td>
<td>75S100-16</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>GRUNDFOS</td>
</tr>
<tr>
<td>Motor Size, hp</td>
<td>10</td>
</tr>
<tr>
<td>Motor Voltage/Phase/Hertz</td>
<td>460/3/60</td>
</tr>
<tr>
<td>Motor Speed, rpm</td>
<td>3450</td>
</tr>
<tr>
<td>Riser Pipe Diameter, inches</td>
<td>2</td>
</tr>
<tr>
<td>Materials of Construction</td>
<td>Stainless Steel</td>
</tr>
</tbody>
</table>

**FLOWMETERS**

<table>
<thead>
<tr>
<th>Designation</th>
<th>FM-1 through FM-19, FM-30 through FM-38</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Magnetic</td>
</tr>
<tr>
<td>Diameter, inches</td>
<td>2</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>Sparling Instruments Co., Inc.</td>
</tr>
<tr>
<td>Model</td>
<td>FM 621-021-300-0</td>
</tr>
<tr>
<td>Full Scale, gpm</td>
<td>FM-30 and 38  150</td>
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<tr>
<td></td>
<td>FM-31 through 34  120</td>
</tr>
<tr>
<td></td>
<td>All Others  100</td>
</tr>
<tr>
<td>Metering Tube Materials</td>
<td>Polyurethane, 316 Stainless Steel</td>
</tr>
<tr>
<td>Transmitter Enclosure</td>
<td>NEMA 4x</td>
</tr>
<tr>
<td>Rating</td>
<td>NEMA 4x</td>
</tr>
<tr>
<td>Power Installation</td>
<td>120 VAC, 60 HZ</td>
</tr>
<tr>
<td>Requirements</td>
<td>Wafer Style</td>
</tr>
</tbody>
</table>

2-28
### BACKPRESSURE VALVE

<table>
<thead>
<tr>
<th>Designation</th>
<th>BRV-1 through, BRV-14 through BRV-17, BRV-31 through BRV-34</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Sliding Gate</td>
</tr>
<tr>
<td>Design Flowrate, gpm</td>
<td>55</td>
</tr>
<tr>
<td>Spring Range, psi</td>
<td>20-60</td>
</tr>
<tr>
<td>Valve Manufacturer</td>
<td>Jordan Valve</td>
</tr>
<tr>
<td>Valve Model</td>
<td>Mark 50</td>
</tr>
<tr>
<td>Flow Coefficient, CV</td>
<td>25</td>
</tr>
<tr>
<td>End Connections</td>
<td>2&quot; NPT</td>
</tr>
<tr>
<td>Materials of Construction</td>
<td></td>
</tr>
<tr>
<td>Body</td>
<td>Ductile Iron</td>
</tr>
<tr>
<td>Trim</td>
<td>Stainless Steel and Bronze</td>
</tr>
<tr>
<td>Seats</td>
<td>303 Stainless Steel</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Designation</th>
<th>BRV-35, BRV-36, BRV-37</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Sliding Gate</td>
</tr>
<tr>
<td>Design Flowrate, gpm</td>
<td>60</td>
</tr>
<tr>
<td>Spring Range, psi</td>
<td>40-90</td>
</tr>
<tr>
<td>Valve Manufacturer</td>
<td>Jordan Valve</td>
</tr>
<tr>
<td>Valve Model</td>
<td>Mark 50</td>
</tr>
<tr>
<td>Flow Coefficient, CV</td>
<td>25</td>
</tr>
<tr>
<td>End Connections</td>
<td>2&quot; NPT</td>
</tr>
<tr>
<td>Materials of Construction</td>
<td></td>
</tr>
<tr>
<td>Body</td>
<td>Ductile Iron</td>
</tr>
<tr>
<td>Trim</td>
<td>Stainless Steel and Bronze</td>
</tr>
<tr>
<td>Seats</td>
<td>303 Stainless Steel</td>
</tr>
</tbody>
</table>
### Designation
- BRV-30, BRV-38

### Type
- Sliding Gate

### Design Flowrate, gpm
- 100

### Spring Range, psi
- 40-90

### Valve Manufacturer
- Jordan Valve

### Valve Model
- Mark 501

### Flow Coefficient, Cv
- 50

### End Connections
- 2" NPT

### Materials of Construction
- **Body**: Ductile Iron
- **Trim**: Stainless Steel and Bronze
- **Seats**: 303 Stainless Steel

---

### Designation
- BRV-18, BRV-19

### Type
- Sliding Gate

### Design Flowrate, gpm
- 50

### Spring Range, psi
- 20-60

### Valve Manufacturer
- Jordan Valve

### Valve Model
- Mark 50

### Flow Coefficient, CV
- 25

### End Connection
- 2" NPT

### Materials of Construction
- **Body**: Ductile Iron
- **Trim**: Stainless Steel and Bronze
- **Seats**: 303 Stainless Steel

---

### VAULTS

- **Designation**: V-30 though V-38
- **Vault Manufacturer**: Pacific International Pipe Enterprises, Inc.
- **Vault Model**: 776 - Special Vault
- **Vault Inside Dimensions, feet**: 5.5 ft. long x 5.5 ft wide x 6.0 ft. high
- **Vault Materials**: 5000 psi Concrete
- **Hatch Manufacturer**: LW Hatch Co.
- **Hatch Part Number**: HD-1
- **Hatch Dimensions, feet**: 48" x 48"
- **Hatch Materials**: Aluminum

---

### COLLECTION PIPELINE

- **Diameter, inches**: 2 through 10
- **Material**: HDPE Grade P3408 cell classification 345434C
- **Wall Thickness Ratio**: SDR-11

---

2-30
EXTRACTION WELL LEVEL CONTROLS

| Designation | WLS-1 through WLS-19, WLS-30 through WLS-38 |
| Enclosure Rating | NEMA 4x or 7 per Construction Drawings |

Component Make and Model:
- Control Relays: Warrick Series 27
- Electrode Holder: Warrick 3E3C
- Electrodes: Warrick 3W2
- Wire Connectors: Warrick 3Z1B
- Suspension: Warrick 3Z1A

VAULT SUMP LEVEL SWITCHES

| Designation | SLSH-30 through SLSH-38, SLSHH-30 through SLSHH-38 |
| Type | Mercury Tilt Float |
| Materials of Construction | Polypropylene |
| Manufacturer | Warrick Controls, Inc. |
| Catalog Number | Series F |

2.3.2.1.4 Operational Controls.

A. GENERAL. Under normal operation, the pumps run continuously. However, each well is provided with high and low level switches inside the well casing. Pumping rates have been determined based on anticipated aquifer response, required contaminant control, and surrounding soil condition to prevent or reduce pump cycling by level changes. Output from the level switches control the pump motor operation using the pump's motor starter located at the well or in the well vault.

If the groundwater level falls below the low level switch, the pump motor will stop. The low level will be recorded at the treatment facility. Recordings of low levels on the DCS enable the operator to adjust flow rates accordingly. The pump remains off until the groundwater level reaches the high level switch.

A HOA selector switch is provided near the head of each well. When the switch is in the "AUTO" position, the pump is controlled by the well level switches and the distributed control system. When the switch is moved to the "OFF" position, the level switches and DCS are bypassed and the pump is shut off. When the switch is moved to the "hand" position, the distributed control system is bypassed and the pump is turned on. The level switches remain operational. Remote start/stop control of each well pump and the extraction system is provided at the DCS OIU located in the GTF control building.

The flow rate from each pump is controlled by a manually operated pressure regulating valve. The flow rate is controlled at the pump and not remotely at the DCS. Flowmeters provide local identification of instantaneous and total flow.
A check valve is located downstream of the well pump discharge, this is followed by a ball valve to isolate the pump from the rest of the extraction system. A combination sample tap and air release valve follows the isolating ball valve. A strainer screen follows the sample tap. An electronic flow meter is located downstream of the strainer. A pressure regulating valve follows the electronic flow meter. A second sample tap is located downstream of the pressure regulating valve. Following the second sample valve is a check valve. A second isolating ball valve is located after the check valve. Figure 2-4 shows the valving and instrumentation for the extraction wells.

Level switches are installed in the vault sumps. A high level switch activates an alarm on the DCS OIU at the treatment facility. The operator must go to the vault calling the alarm to close the valving above the well seal to prevent artesian water from entering the vault. A high-high level switch stops the extraction well pump motor. Liquid collected in the vault sump must be removed either by bailing or with a portable pump. Contaminated water collected in the sump must be transported to the treatment facility for treatment.

Shunt trip alarms were installed for each well in the EOP in the event the high-high level switch alarm is activated. The shunt trips will turn the main power to the motor starter off. Power is still available to monitor well status at the DCS OIU at the GTF Plant.

Locations of pump controls associated with the extraction system are listed in Table 2-15. The control functions are listed in Table 2-16. For description of DCS and Power Distribution Systems, see Sections 2.3.3 and 2.3.4.

B. NORMAL OPERATION. Normally, the extraction well pumps will be operated with their HOA selector switches in the AUTO position. This permits automatic starting and stopping according to extraction well level and treatment system operation. An extraction well pump in the AUTO position will operate only if all of the following conditions exist:

- Extraction well level is above the low level set point.
- The treatment system is operating as indicated by an influent tank T-201 level below the high level set point.
- The extraction system or pump is enabled by the DCS.

C. MANUAL OPERATION. Manual operation of the extraction well pumps with their selector switches in the HAND position is possible without any control permissives. Manual operation will be used for maintenance purposes only under the supervision of an experienced operator. Operating a pump dry may damage the pump and motor. Overflowing the collection tank will result in a contaminant release and possible tank damage.
<table>
<thead>
<tr>
<th>Control or Indicator</th>
<th>Number of Units</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combination Motor Starter</td>
<td>1-per Vault or Well</td>
<td>In each Vault or at each Well</td>
</tr>
<tr>
<td>Red pump ON indicating light</td>
<td>1-per Vault or Well</td>
<td>Combination motor starter</td>
</tr>
<tr>
<td>Green pump OFF indicating light</td>
<td>1-per Vault or Well</td>
<td>Combination motor starter</td>
</tr>
<tr>
<td>Extraction Well Level System (WLS)</td>
<td>1</td>
<td>In each Vault or at each Well</td>
</tr>
<tr>
<td>Hand/Off/Auto Switch</td>
<td>1 per Vault or Well</td>
<td>Combination Motor Starter</td>
</tr>
<tr>
<td>Vault Sump Level Switches</td>
<td>2 per Vault Sump</td>
<td>In Vault Sump</td>
</tr>
<tr>
<td>Control of Indicator</td>
<td>Functions</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Combination Motor Starter</td>
<td>Controls and protects extraction well pump motor.</td>
<td></td>
</tr>
<tr>
<td>Red pump ON indicating light</td>
<td>Illuminates when extraction well pump is running.</td>
<td></td>
</tr>
<tr>
<td>Green pump OFF indicating light</td>
<td>Illuminates when extraction well pump is stopped.</td>
<td></td>
</tr>
<tr>
<td>Extraction Well Level System (WLS)</td>
<td>An extraction well pump will not operate if its associated extraction well level is below the low level set point.</td>
<td></td>
</tr>
<tr>
<td>HAND-OFF-AUTO selector switch</td>
<td>HAND - Pump operates continuously.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OFF - Pump does not operate.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AUTO - Pump is controlled by extraction well level system and DCS.</td>
<td></td>
</tr>
<tr>
<td>Vault Sump Level Switches</td>
<td>Detect and alarm upon leak in Vault.</td>
<td></td>
</tr>
<tr>
<td>Shunt Trip Alarm (EOP only)</td>
<td>Shut off of main power to motor starter in the event of a high-high level alarm in vault.</td>
<td></td>
</tr>
</tbody>
</table>
2.3.2.1.5 Alternate Procedure in Case of Failure.

**Extraction Pumps** - In case of failure, the well will be shutdown, the pump removed and replaced or repaired. The remainder of the wells will stay on-line.

**Collection Pipeline** - The collection pipeline will be shutdown in the event of a failure until repairs are completed.

**Extraction Well Level Controls** - The well will be shutdown. The remaining wells within the system and the treatment facility to remain operational. The controls will be repaired and/or replaced for the pump.

2.3.3 Distributed Control System (DCS)

2.3.3.1 System Description. The DCS uses discrete and programmable logic to monitor and control activities associated with the extraction and treatment systems. Major components of the DCS are as follows:

- One (1) personal computer, keyboard and monitor.
- One (1) dot matrix printer.
- One (1) automatic dialing alarm monitor.
- One (1) programmable logic controller (PLC) and main PLC input/output (I/O) rack.
- Four (4) remote PLC I/O racks.
- Five (5) Control Cabinets.
- Fiber optic cable.
- DCS communication cable.
- Control software.

DCS component characteristics are summarized in Section 2.3.3.3 below and detailed in Appendix C of this manual. Specific activities monitored and/or controlled are summarized in Section 2.3.3.4 below and detailed in Appendix C.

Control cabinet CC-5 housing the PLC and the I/O rack is located in the control building of the GTF. The personal computer, keyboard, monitor, printer and automatic dialing alarm monitor are also located in the control building. One control cabinet is located in each of the four extraction system zones (CC-1 through CC-4) to house one each of the four remote PLC I/O racks. Communication between the PLC and the remote PLC I/O racks in control cabinets CC-1, CC-2, CC-3, and CC-4 is accomplished over fiber optic cable in buried PVC raceway. Extraction and treatment system activities are monitored and/or controlled by hard-wired circuits connected to one of the PLC I/O racks. The PLC communicates directly with the personal computer by a RS-422 port and cable. The PLC can also communicate with the automatic dialing alarm monitor over a hard-wired circuit. The automatic dialing alarm monitor can communicate over a standard telephone line with programmed telephone numbers to notify selected personnel of extraction and/or treatment system trouble 24 hours a day.
ATTACHMENT 11

Groundwater Extraction Wellhead Construction Records
City of Tacoma
Department of Public Works

W.O. AU 6820
TACOMA LANDFILL -
GROUNDWATER EXTRACTION/TREATMENT SYSTEM

SPEC. NO. G-206-92

Drawings not included
<table>
<thead>
<tr>
<th>Pipe Designation</th>
<th>Service Description</th>
<th>Material</th>
<th>Specification</th>
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<tbody>
<tr>
<td>GW</td>
<td>Ground Water</td>
<td>Steel</td>
<td>15060</td>
</tr>
<tr>
<td></td>
<td>above grade</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>below grade</td>
<td>Double-Wall HDPE</td>
<td>15072</td>
</tr>
<tr>
<td>TGW</td>
<td>Treated Ground Water</td>
<td>Steel</td>
<td>15060</td>
</tr>
<tr>
<td></td>
<td>above grade</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>below grade</td>
<td>PVC</td>
<td>02628</td>
</tr>
<tr>
<td>SW</td>
<td>Sump Water</td>
<td>Galv. Steel</td>
<td>15060</td>
</tr>
<tr>
<td>V</td>
<td>Vent</td>
<td>Galv. Steel</td>
<td>15060</td>
</tr>
<tr>
<td>AW</td>
<td>Acid Wash</td>
<td>Lined Steel, CPVC</td>
<td>15060</td>
</tr>
<tr>
<td>NAW</td>
<td>Neutralized Acid</td>
<td>Steel</td>
<td>15060</td>
</tr>
<tr>
<td>A</td>
<td>Acid</td>
<td>Lined Steel</td>
<td>15060</td>
</tr>
<tr>
<td>PW</td>
<td>Potable Water</td>
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<td></td>
</tr>
<tr>
<td>Drain</td>
<td>Drainage</td>
<td>Galv. Steel</td>
<td>15060</td>
</tr>
</tbody>
</table>
SECTION 15060

MISCELLANEOUS PIPING

1. SCOPE. This section covers furnishing and installation of miscellaneous piping and piping accessories (except as otherwise indicated) for all services within 5 feet of the treatment facility. See Table P1 for service piping material requirements. Table P1 indicates piping material covered in other sections.

Miscellaneous piping shall be furnished and installed complete with all fittings, jointing materials, hangers, supports, anchors, and other necessary appurtenances.

2. MATERIALS.

Steel pipe

The following types of steel pipe shall be provided. The specific type of pipe material and wall thickness to be provided for each service listed herein shall conform to the requirements of the applicable Service and Type requirements paragraph.

<table>
<thead>
<tr>
<th>material</th>
<th>requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM A53, seamless (Type S), or electric resistance welded, (Type E), Grade A or B.</td>
<td></td>
</tr>
<tr>
<td>ASTM A106, Grade A or B.</td>
<td></td>
</tr>
<tr>
<td>Nipples</td>
<td>ASTM A733, seamless, extra strong (Schedule 80); &quot;close&quot; nipples will be permitted only by special authorization in each case.</td>
</tr>
<tr>
<td>Cast Iron</td>
<td>ANSI B16.4, Class 125.</td>
</tr>
<tr>
<td>Threaded</td>
<td>ANSI B16.1, Class 125.</td>
</tr>
<tr>
<td>Flanged</td>
<td>ANSI B16.3, Class 150, or Fed Spec WW-F-521, Type II (galvanized) for galvanized pipe or Type I (black) for ungalvanized pipe.</td>
</tr>
<tr>
<td>Malleable Iron</td>
<td>ANSI B16.9; standard weight for use with standard weight pipe.</td>
</tr>
<tr>
<td>Buttwelding</td>
<td></td>
</tr>
</tbody>
</table>
# Unions

**Malleable Iron**

Fed Spec WW-U-531, Class 2; Type B (galvanized) for galvanized pipe or Type A (black) for ungalvanized pipe.

### Flanges

**For Standard Weight Pipe**

ANSI B16.5, Class 150, flat face.

**Flange Bolts and Nuts**

ASTM A307, length such that, after installation, the bolts will project 1/8 to 3/8 inch beyond outer face of the nut.

**Flange Gaskets**

**Water Service**

ASTM D1330, Grade I, red rubber, ring type, 1/8 inch thick.

**Other Services**

**Flat Face Flanges**

ANSI B16.21; non-asbestos filler with neoprene or nitrile binder; dimensions to suit flange contact face; 1/16 inch minimum thickness for plain finished surfaces, 3/32 inch minimum thickness for serrated surfaces.

**Raised Face Flanges**

Continuous stainless steel ribbon wound into a spiral with non-asbestos filler between adjacent coils with a carbon steel gauge ring. Compressed gasket thickness shall be 0.095 inch ±0.005 inch.

**Iron-Pipe-Size Brass Pipe**

**Pipe**

ASTM B43, red brass, regular weight and extra strong.

**Fittings**

ANSI B16.15, Class 125.

**Unions**

Fed Spec WW-U-516, Class 125.

**Polypropylene Lined Steel Pipe and Fittings (Acid Piping)**

ASTM F492.
<table>
<thead>
<tr>
<th>Pipe Material</th>
<th>ASTM A53, Type E or S, Schedule 40, or ASTM A587.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fittings</td>
<td>Same material and lining as for pipe.</td>
</tr>
<tr>
<td>Flanges</td>
<td>Steel, forged or cast.</td>
</tr>
<tr>
<td>Diameter and Drilling</td>
<td>ANSI B16.5, Class 150.</td>
</tr>
<tr>
<td>Flange Bolts and Nuts</td>
<td>As specified for steel pipe.</td>
</tr>
</tbody>
</table>

**PVC Pipe**

<table>
<thead>
<tr>
<th>Well Vault Vent Service</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe</td>
<td>ASTM D1785, Schedule 80, Cell Classification 12454-B, bearing NSF seal.</td>
</tr>
<tr>
<td>Fittings</td>
<td>ASTM D2464 or D2467, Cell Classification 12454-B, bearing NSF seal.</td>
</tr>
<tr>
<td>Solvent Cement</td>
<td>ASTM D2564.</td>
</tr>
<tr>
<td>Primer</td>
<td>ASTM F656.</td>
</tr>
</tbody>
</table>

**CPVC Pipe and Fittings**

<table>
<thead>
<tr>
<th>Acid Wash Piping</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe</td>
<td>ASTM D1785, Schedule 80.</td>
</tr>
<tr>
<td>Fittings</td>
<td>ASTM F-439 socket type solvent welded.</td>
</tr>
<tr>
<td>Flanges</td>
<td>Drilling and diameter shall conform to ANSI B16.5, Class 150.</td>
</tr>
<tr>
<td>Solvent Cement</td>
<td>ASTM D2564, ASTM F493</td>
</tr>
<tr>
<td>Primer</td>
<td>ASTM F656</td>
</tr>
<tr>
<td>Materials</td>
<td>ASTM D1784</td>
</tr>
</tbody>
</table>

**Hose, Acid Service**

| 3/4 Inch and Smaller | Gates "101W Hypalon Tube Acid Discharge Hose". |

---

**TACOMA LANDFILL**

**GROUNDWATER EXTRACTION & TREATMENT SYSTEM**

-3- 1-31-92 15060
<table>
<thead>
<tr>
<th>Couplings</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Insert Type</td>
<td>Rigid PVC or other material suitable for service conditions and stainless steel clamps.</td>
</tr>
<tr>
<td>Quick-Disconnect</td>
<td>OPW &quot;Quick Coupler&quot; or PT Coupling &quot;Quick Connect/Disconnect Coupling&quot;; polypropylene or other material suitable for service conditions.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pipe Insulation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold Piping</td>
<td>Fed Spec HH-I-558; Form D, Type III, Class 12 fiberglass. Certain Teed &quot;500 Snap-On&quot; or Manville &quot;Jim&quot; or approved equal.</td>
</tr>
</tbody>
</table>

| Watertight/Dusttight Pipe Sleeves            | O-Z Electrical Manufacturing "Thruwall" and Floor Seals", or Thunderline "Link-Seals"; with modular rubber sealing elements, nonmetallic pressure plates, and galvanized bolts. |

| Anti-Seize Thread Lubricant                  | Jet-Lube "Nikal", John Crane "Thred Gard Nickel", Never-Seez "Pure Nickel Special", or Permatex "Nickel Anti-Seize". |
| Teflon Thread Sealer                         | Paste type; John Crane "JC-30", Hercules "Real-tuff", or Permatex "Thread Sealant with Teflon". |
| Teflon Thread Tape                           | John Crane "Thred-Tape" or Hercules "Tape Dope". |
| Pipe Sleeve Sealant                          | Polysulfide or urethane as specified in the caulking section. |

TACOMA LANDFILL
GROUNDWATER EXTRACTION & TREATMENT SYSTEM

FINAL 1-31-92 15060
3. SERVICE AND TYPE REQUIREMENTS. Except as otherwise specified, pipe shall conform to the general requirements which follow and as indicated in Table Pl. Pipe materials for service conditions not listed shall be as specified in other sections, as indicated on the drawings or, in the absence of any definite requirement, as determined by the ENGINEER.

Where optional pipe materials or fittings are specified for a particular service, either may be provided at the CONTRACTOR’s option.

For all services where ASTM A53 steel pipe is required, the use of ASTM A106 steel pipe of equivalent wall thickness will be acceptable.

3.01. Galvanized Steel Pipe.

   a. ASTM A53 Standard Weight Type E with Threaded Malleable Iron Fittings. All 2 inch and smaller piping for the following services:
      Collection tank drain piping.
      Collection tank venting.
      Sump pump discharge piping.
      Inside extraction well vault piping.
      Potable water, above ground.

3.02. Black Steel Pipe.

   a. ASTM A53 Standard Weight Type S with Threaded Cast Iron Fittings. Lime slurry (neutralized acid wash) in pump discharge line from sludge pump.

   b. ASTM A53 Standard Weight Type E with Buttwelding Fitting. All above ground 8-inch and 10-inch ground water piping.

3.03. Regular Weight Iron-Pipe-Size Brass Pipe. Gauge piping as indicated on the drawings.

3.04. PVC Service Pipe.

   a. With Threaded Joints.
      Vents at indicated extraction well vault enclosures.

3.05. Polypropylene Lined Steel Pipe and Fittings.

   Acid wash piping
   Acid piping
3.06. **CFVC Pipe.**

Acid wash piping.

3.07. **Hose, Chemical Service.**

Flexible connection between portable drum pump and rigid acid piping.

3.08. **Pipe Insulation.** Pipe, fittings, flanges, valves, and other accessories in the following services shall be insulated:

All above ground piping, unless indicated otherwise.

4. **PIPE JOINTS.** Pipe joints shall be carefully and neatly made in accordance with the requirements which follow.

4.01. **Threaded.** Pipe threads shall conform to ANSI/ASME B1.20.1, NPT, and shall be full and cleanly cut with sharp dies. Not more than three threads at each pipe connection shall remain exposed after installation. Ends of pipe shall be reamed, after threading and before assembly, to remove all burrs.

Threaded joints in plastic piping shall be made up with teflon thread tape applied to all male threads. At the option of the CONTRACTOR, threaded joints in other piping may be made up with teflon thread tape, thread sealer, or a suitable joint compound. Thread tape and joint compound or sealers shall not be used in threaded joints which are to be seal welded.

4.02. **Solvent Welded.** All joint preparation, cutting, and jointing operations shall comply with the pipe MANUFACTURER's recommendations and ASTM D2855. Pipe ends shall be beveled or chamfered to the dimensions recommended by the MANUFACTURER. Newly assembled joints shall be suitably blocked or restrained to prevent movement during the set time recommended by the MANUFACTURER. Pressure testing of solvent welded piping systems shall not be performed until the applicable curing time, set forth in Table X2.1 of ASTM D2855, has elapsed.

4.03. **Flanged.** Flange bolts shall be tightened sufficiently to slightly compress the gasket and effect a seal, but not so tight as to fracture or distort the flanges. A plain washer shall be installed under the head and nut of bolts connecting plastic pipe flanges. Anti-seize thread lubricant shall be applied to the threaded portion of all stainless steel bolts during assembly.

4.04. **Other Pipe Joints.** Joints shall be made in accordance with the MANUFACTURER's recommendations and to the satisfaction of the ENGINEER.

5. **PIPE SLEEVES.** Piping passing through concrete or masonry shall be installed through sleeves.

Unless otherwise indicated on the drawings, all pipes passing through walls or slabs which have one side in contact with earth or exposed to the weather shall be sealed watertight with special rubber gasketed sleeve and joint assemblies or with sleeves and modular rubber sealing elements.
6. PIPE INSTALLATION. Pipe shall be installed as specified, as indicated on the drawings, or, in the absence of detail piping arrangement, in a manner acceptable to the ENGINEER.

Pipe shall be cut from measurements taken at the site and not from the drawings. All necessary provisions shall be taken in laying out piping to provide throughout for expansion and contraction. Piping shall not obstruct openings or passageways. Pipes shall be held free of contact with building construction so as not to transmit noise resulting from expansion.

Water supply piping within structures shall be arranged, and facilities provided, for complete drainage. All piping serving metering equipment shall be uniformly graded so that air traps are eliminated and complete venting is provided.

Taps for pressure gauge connections on the suction and discharge of pumping units shall be provided with a nipple and a ball type shutoff valve.

Drilling and tapping of pipe walls for installation of pressure gauges or switches will not be permitted.

In all piping insulating fittings shall be provided to prevent contact of dissimilar metals wherever copper tubing or fittings or stainless steel pipe, tubing, or fittings are connected to iron or steel pipe or fittings.

7. ACID PIPING. All acid piping shall be installed so that lines are readily accessible for cleaning. At changes in direction in all acid piping tees shall be provided with extra openings plugged to facilitate cleaning. Teflon thread tape or teflon thread sealer shall be applied to the threads of all plugs so that they can be easily removed. At each point where hose or reinforced plastic tubing is connected to rigid piping, a quick-disconnect coupling shall be provided.

8. INSULATION. Pipe insulation shall be neatly installed by skilled workmen. Piping shall be clean and dry and shall have been tested before insulation is applied.

End joints shall be tightly butted. Seams and joints shall be held by the MANUFACTURER's standard adhesive. Jacket laps shall be neatly pasted in place. All joints shall be pointed with insulating cement.

Fittings, flanges, and valves shall be insulated with the same thickness as the pipe insulation. Hangers shall permit insulation to pass through and suitable saddles shall be provided to prevent the weight of the piping from being supported by the insulation.

Use fiberglass insulation with factory-applied, all service reinforced vapor barrier jacket having integral laminated aluminum vapor barrier. Supply in thickness as indicated below.

<table>
<thead>
<tr>
<th>Item</th>
<th>Thickness (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe 2-inches and smaller pipe</td>
<td>2</td>
</tr>
<tr>
<td>3-inch and larger</td>
<td>1</td>
</tr>
</tbody>
</table>

TACOMA LANDFILL
GROUNDWATER EXTRACTION & TREATMENT SYSTEM

FINAL 1-31-92 15060
Provide self-fastening aluminum jacket on all insulated pipe, pipe fittings and valves. Aluminum jacket shall be type 3003-H14 aluminum alloy, 0.016-inch thick.

9. CLEANING. The inside of all pipe, valves, and fittings shall be smooth, clean, and free from blisters, loose mill scale, sand, dirt, and other foreign matter when erected. The interior of all lines shall be thoroughly cleaned, to the satisfaction of the ENGINEER, before being placed in service.

10. PRESSURE AND LEAKAGE TESTING. Specified tests as discussed below shall be made by and at the expense of the CONTRACTOR in the presence, and to the satisfaction, of the ENGINEER. Each piping system shall be tested for at least one hour with no loss of pressure. Piping shall be tested at the following pressures:

<table>
<thead>
<tr>
<th>Service</th>
<th>Test Pressure</th>
<th>Test Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground water system,</td>
<td>100 psi</td>
<td>water</td>
</tr>
<tr>
<td>Potable water system,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acid wash system and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sludge discharge system</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Leakage may be determined by loss of pressure, soap solution, chemical indicator, or other positive and accurate method acceptable to the ENGINEER. All devices, or other accessories which are to be connected to the lines which would be damaged if subjected to the specified test pressure shall be disconnected and ends of the branch lines plugged or capped as required during the testing procedures.

Drainage and venting systems shall be tested by filling with water to the level of the highest vent stack. Openings shall be plugged as necessary. Each system shall hold the water for 30 minutes without any drop in the water level.

All necessary testing equipment and materials, including tools, appliances and devices, shall be furnished and all tests shall be made by and at the expense of the CONTRACTOR and at such time as directed by the ENGINEER.

All joints in piping shall be tight and free from leaks. All joints which are found to leak by observation or during any specified test shall be repaired and tests repeated.

11. DRAWINGS AND DATA. Complete specifications, data, and catalog cuts or drawings covering the following items furnished under this section shall be submitted in accordance with the Submittals Section:

- Acid pipe and fittings.
- Flange gaskets.
- Gauge snubbers and cocks.
- Pipe insulation.
- PVC well vault vent service pipe and fittings.
Watertight/dusttight pipe sleeves.

CPVC acid wash system piping.

End of Section
WELL PAD INSTALLATION COMPLETE - ABOVE GROUND PIPING CONSTRUCTION

EDGE OF PLUME VAULT CONSTRUCTION & INSTALLATION

EDGE OF PLUME WELL INSTALLATION. CONTRACTOR INSTALLED ALL 2-INCH DISCHARGE PIPING ABOVE GROUND FOR EASE OF INSTALLATION. THE WELLS WERE ARTESIAN AND TO DEAL WITH WATER NEEDED TO BE INSTALLED QUICKLY.
<table>
<thead>
<tr>
<th>Well #</th>
<th>Date installed</th>
<th>Feet</th>
<th>Total Feet</th>
<th>Order install</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>6-10-92</td>
<td>136.50</td>
<td>136.50</td>
<td>1</td>
</tr>
<tr>
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<td>15</td>
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<td>144.69</td>
<td>2468.99</td>
<td>19</td>
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</table>

Wells in red boxes are part of this Work.
EXTRACTION WELL PLAN #2

A = 3.0
B = 4.25
C = 1.36
EXTRACTION WELL PLAN #2

A - 3.25
B - 4.25
C - 1.36

N #4
EXTRACTION WELL PLAN #1

N #6

A-5.0
B-4.25
C-1.36
D-10.61
EXTRACTION WELL PLAN #1

N #7

A-1.16
B-5.25
C-1.36
7.77
EXTRACTION WELL PLAN #1
EXTRACTION WELL PLAN #2
EXTRACTION WELL PLAN #2
EXTRACTION WELL PLAN #2

A = 4.25
B = 3.50
C = 1.90

9.65
EXTRACTION WELL PLAN #1

A = 0.50
B = 2.83
C = 1.36

\[
\frac{\text{C}}{\text{A}} = \frac{1.36}{0.50} = 2.72
\]
EXTRACTION WELL PLAN #2
EXTRACTION WELL PLAN #1

5-13-92

A = 5
B = 4.16
C = 1.36

N #19

6.02

A

B

C
Owner: City of Tacoma
Plant: GETS
Project No.: 40473
Title: W-20 (POC)

See Blowup "B" Typical

Distance
Electrical

Ground Surface

See Blowup "B" Typical

- High Control '865
- Low Control '865
- Reference Control '865

129'665 Bottom of Sound Tube
130'865 Pump Intake

REVISED, SUPERSEDED, AND VOID CALCULATIONS MUST BE CLEARLY IDENTIFIED, INITIALED, AND DATED BY THE RESPONSIBLE INDIVIDUAL.
REVISED, SUPERSEDED, AND VOID CALCULATIONS MUST BE CLEARLY IDENTIFIED, INITIALED, AND DATED BY THE RESPONSIBLE INDIVIDUAL.
REVISED, SUPERSEDED, AND VOID CALCULATIONS MUST BE CLEARLY IDENTIFIED, INITIALED, AND DATED BY THE RESPONSIBLE INDIVIDUAL.
Flexible Conduit

Electrical & Well Conduit
2 in. Van Cline

Discharge Pipe (PVC)

Sound Tube (PVC)

Stainless Coupler

Stainless Plate

Flange (PVC)

Flange Base (PVC)

Spacer (PVC)

Bell Housing (PVC)

Bell Adapter (PVC)

Base Disk (Carbon Steel)

Concrete PAA

Well Casing

REVISED, SUPERSEDED, AND VOID CALCULATIONS MUST BE CLEARLY IDENTIFIED, INITIALED, AND DATED BY THE RESPONSIBLE INDIVIDUAL.
ATTACHMENT 12

Landfill Gas Extraction Well CA18 Decommissioning Details
Decommission CA-18 (formerly GW-14). Extraction well damaged by lawnmower. Nearby wells will provide extraction, no replacement necessary at this time. Well consists of one 4-inch diameter schedule 40 PVC casing. Wells are in waste and cannot be over-drilled. Recommend grout-in place using tremmie pipe. Requires Notification of Intent (NOI) to decommission, and variance authorization from Ecology.
ATTACHMENT 13

Gas Probe and Groundwater Well Decommissioning Work Plan
Gas Probe and Groundwater Well Decommissioning Work Plan
City of Tacoma Landfill
Tacoma, Washington

October 9, 2020

Prepared for
City of Tacoma
326 East D Street
Tacoma, Washington
Gas Probe and Groundwater Well Decommissioning Work Plan
City of Tacoma Landfill
Tacoma, Washington

This document was prepared by, or under the direct supervision of, the technical professionals noted below.

Document prepared by: Kelsey Mach, GIT
Senior Staff GIT

Document reviewed by: Eric Weber, LHG, CWRE
Project Manager

Date: October 9, 2020
Project No.: 0094089.060
File path: Y:\094\089.042 Decommissioning\R\LAI_City of Tacoma Decommissioning Work Plan_Final_10-08-20.docx
Project Coordinator: KJG
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# FIGURES

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<td>Eastern Site Boundary Hydraulic Gradients – 2003-2011</td>
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<td>7</td>
<td>Groundwater Elevation Contours – July 2018</td>
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<td>Off-Site Landfill Gas Probe Details</td>
</tr>
<tr>
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<td>On-Site Monitoring Well Details</td>
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<td>3</td>
<td>Off-Site Monitoring Well Details</td>
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<td>Landfill Gas Probe Construction Details</td>
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<td>C</td>
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<tr>
<td>D</td>
<td>Groundwater Quality Data</td>
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<tr>
<td>E</td>
<td>Health and Safety Plan</td>
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</table>
LIST OF ABBREVIATIONS AND ACRONYMS

bgs ...................................................................................................................... below ground surface
CCR .............................................................................................................. Construction Completion Report
CD ................................................................................................................... Consent Decree
City .............................................................................................................. City of Tacoma
CERCLA .................................. Comprehensive Environmental Response, Compensation, and Liability Act
COCs ........................................................................................................... contaminants of concern
Ecology ........................................................................................................ Washington State Department of Ecology
EPA ................................................................................................................ U.S. Environmental Protection Agency
ft ......................................................................................................................... foot/feet
GETS ............................................................... groundwater extraction and treatment system
GWPS ........................................................................................................... groundwater performance standards
HASP ............................................................................................................. Health and Safety Plan
IDW .............................................................................................................. investigation-derived waste
LAI ................................................................................................................... Landau Associates, Inc.
LFG ................................................................................................................ landfill gas
Minimum Standards ... Minimum Standards for Construction and Maintenance of Wells
NPL .............................................................................................................. National Priorities List
PCC ............................................................................................................... post closure care
POC .............................................................................................................. Point of Compliance
PVC ................................................................................................................ Polyvinyl Chloride
Qog ................................................................................................................ Pre-Olympia Gravel
Qol ................................................................................................................ Lacustrine
Qos ................................................................................................................ sand
Qva .................................................................................................................. Vashon Advance Outwash
Qvr .............................................................................................................. Vashon Recessional Outwash
Qvt ............................................................................................................... Vashon Till
ROD ........................................................................................................... Record of Decision
ROW .......................................................................................................... Right-of-Way
SOW ............................................................................................................. scope of work
TPCHD ............................................................ Tacoma-Pierce County Department of Health
WAC ......................................................................................................... Washington Administrative Code
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1.0 INTRODUCTION

This work plan (Work Plan) has been prepared on behalf of the City of Tacoma (City). The Work Plan presents a scope of work to decommission 31 offsite landfill gas (LFG) monitoring probes, 38 onsite and offsite groundwater monitoring wells, and 14 onsite groundwater extraction wells at the City Landfill (Site) in Tacoma, Washington. The following subsections provide background information, justification for decommissioning the 83 probes and wells (collectively herein termed installations), and an overview with objectives for this Work Plan. The Site location is shown on Figure 1. The 83 installations are shown on Figure 2 (LFG probes) and Figure 3 (groundwater monitoring and extraction wells).

The Work Plan excludes decommissioning active LFG probes and all LFG extraction wells listed in the current LFG management plan (LAI 2019a), and all groundwater monitoring and extraction wells listed in the current operating groundwater monitoring plan (LAI 2019b).

1.1 Site Background

This section summarizes Site regulatory, geology and hydrogeology, and well installations background information.

1.1.1 Regulatory Background

The Site is part of the Commencement Bay/South Tacoma Channel Federal Superfund Site which was placed on the Nation Priorities List (NPL) in 1983 by the U.S. Environmental Protection Agency (EPA). A final remedy to address landfill contamination from the Site is documented in the 1988 Record of Decision (ROD) issued by the EPA (EPA 1988) with concurrence from the Washington State Department of Ecology2 (Ecology). Remedial actions have been carried out by the City under a 1991 Consent Decree (CD) (Court 1991) with EPA and Ecology, which included the 1988 ROD as Appendix I.

The final remedy is in place and includes the following environmental control and monitoring facilities required for post closure care (PCC): (1) landfill cap and leachate control, (2) LFG system, and (3) groundwater extraction and treatment system (GETS). The landfill cap and leachate control facilities and the LFG system are anticipated to operate long-term as part of PCC.

The GETS was designed to prevent further migration of landfill-contaminated groundwater by (1) installing extraction wells as a hydraulic barrier along the western landfill boundary designated the point of compliance (POC), and (2) installing edge of plume extraction wells to clean up offsite groundwater to groundwater performance standards (GWPS)3. The 1991 CD states that the GETS shall continue to operate until water quality at and beyond the POC (defined by Washington Administrative

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1 Installation TL-22A/SPS01W is a nested soil gas probe and groundwater monitoring well. It is included with the off-site groundwater wells for the purposes of the Work Plan.
2 Ecology’s letter of concurrence is provided as Appendix D of the 1988 ROD.
3 GETS extraction well locations were proposed in the City's 1992 Extraction/Treatment System Sampling Analysis Plan.
Code [WAC 173-100(58)] consistently meets what subsequently became the GWPS. The graphical depiction of the edge of plume and POC were defined in remediation design documents in the 1990s and are shown on Figure 3. The GETS has been successful, GWPS have been achieved offsite and, as a result, the GETS operation has been substantially downscaled from 35 to five POC extraction wells. It is anticipated the GETS will be fully decommissioned prior to delisting the Site from the NPL and therefore will not operate long-term as part of PCC.

Landfilling at the Site concluded in 2013. Formal closure occurred in April 2015 with submittal, and subsequent approval from EPA, of final construction, and the Site has been in PCC status since that time. The City is implementing PCC practices documented in the CD and WAC 173-351-500 as required by its permit with Tacoma-Pierce County Health Department (TPCHD). The City’s current PCC monitoring program is documented in LAI 2019b.

Well decommissioning for LFG probes, groundwater monitoring wells, and groundwater extraction wells in the State of Washington falls under the regulatory authority of Ecology, and associated standards are specified in WAC 173-160 Minimum Standards for Construction and Maintenance of Wells (Minimum Standards). Because the Site remains under EPA’s regulatory authority, and to be consistent with requirements of the CD, the City is submitting this Work Plan to EPA for approval under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) authority for permit equivalency. However, this Work Plan is intended to meet the requirements outlined in WAC 173-160 and, because a number of the locations proposed for decommissioning have conditions warranting a variance under WAC 173-160-106(1), a completed Variance Request – Minimum Standards for Well Construction form from Ecology’s Water Resources Program is included in this document as Appendix A.

1.1.2 Geology and Hydrogeology

The geology and hydrogeology of the Site is well documented due to the hundreds of wells and borings completed in and surrounding the Site, and the multitude of Site studies completed since the 1980s.

Geologic conditions present at the Site are related to recent Vashon glaciation and older pre-Vashon-age interglacial deposits. Vashon-age deposits, from youngest to oldest, include Vashon Recessional Outwash (Qvr), Vashon Till (Qvt), and Vashon Advance Outwash (Qva). Underlying Vashon-age deposits are pre-Vashon deposits. These pre-Vashon deposits, from youngest to oldest, are Pre-

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5 Extraction wells W-01R, W-03R, W-04, W-15, and W-16 are still in operation. On February 26, 2019, the Landfill received approval from EPA to discontinue groundwater extraction from W-04, W-15, and W-16. Discontinuation of those extraction wells has not been implemented yet. The City will continue groundwater extraction from W-01R and W-03R.

Olympia Gravel (Qog), Sand (Qos), and Lacustrine (Qol). The relatively permeable Vashon Advance Outwash and underlying Olympia Gravels are representative of the primary aquifer in the vicinity of the landfill. This primary aquifer also includes saturated Qvr deposits in the vicinity of Leach Creek. The upper portion of the aquifer is also known as the Colvos Sand Aquifer (Tacoma 2004). A summary of the Site hydrogeological conceptual model is presented in two geological cross sections on Figures 4 and 5; the cross section locations are shown on Figure 3.

LFG probes proposed for decommissioning are screened within landfill material or Vashon-age deposits, above the primary aquifer water table. Groundwater monitoring and extraction wells proposed for decommissioning are screened within the primary aquifer with the exception of well TL-11D which is screened deeper in the Pre-Olympia Lacustrine confining unit.

As documented in the 1988 ROD and observed through present time, the predominant groundwater flow direction for Site groundwater is southwesterly toward Leach Creek. The 1988 ROD indicated that the Site groundwater flow direction was observed to reverse towards the east during the dry season when the City operated its supply wells in the Tacoma Channel. Seasonal groundwater flow patterns have been characterized in annual reports with quarterly and annual groundwater contour maps for multiple years since 1988. With the final remedy components implemented at the Site and a reduced number of groundwater extraction wells operating, groundwater elevation contours from the City’s 2011 annual report demonstrated that, even during the dry season, groundwater flowed west and southwest (Tacoma 2012). Furthermore, a hydraulic gradient evaluation was completed for this Work Plan using the difference in groundwater elevation data from eastern Site boundary wells TL-15A and TL-12 and offsite wells TL-18A and TL-13A, respectively. Using available data from 2003 to 2011, groundwater gradients were calculated and are shown on Figure 6. With the exception of denoted outlier measurements (time periods with apparently inaccurate water level data), the calculated gradients indicate offsite wells TL-18A and TL-13A were consistently hydraulically upgradient of the eastern Site boundary wells TL-15A and TL-12, respectively, indicating groundwater did not flow eastward from the eastern Site boundary from 2003 to 2011. The location of these four wells used for gradient analysis are shown on Figure 3.

The 2018 monitoring well network primarily consisted of wells along the western boundary of the landfill and off site to the west between the landfill boundary and Leach Creek. Groundwater gradients based on measurements at these wells are relatively flat beneath the landfill boundary due to final remedy capping and surface drainage controls, which prevent recharge. Localized cones of depression are apparent at or near active extraction wells (W-16, W-15, W-04 and W-03R). The groundwater gradient west of the landfill boundary is from east to west toward Leach Creek. Groundwater elevation contours from the most recent annual report for 2018 are presented on Figure 7.

7 Figures 2-1 through 2-4.
1.1.3 Construction Records and Standards for Installations

The 31 LFG probes proposed for decommissioning are located off-site. The probes have nested or single completions constructed of ½-inch diameter schedule 80 Polyvinyl Chloride (PVC) with varying lengths of perforated casing for LFG monitoring at discrete intervals. Annular seals consist of cement bentonite grout and are located between the surface completion and the top of the first discrete monitoring interval, and between each subsequent discrete monitoring interval. Pea gravel surrounds the solid and perforated casings within each discrete monitoring interval. Surface completions commonly consist of vaults that are flush with grade or 8- and 12-inch steel flush-mount monuments. The vaults are typically rectangular (pre-cast concrete with metal lids and concrete apron, vitrified clay, or plastic) or 24-inch circular steel flush-mount manhole covers. Probe depths and borehole diameters, where known, are presented in Table 1. Available probe details and a general site probe as-built are included in Appendix B. Groundwater has not historically been encountered at any off-site LFG probe locations, and the probes are located outside of landfill waste material.

The 38⁸ groundwater monitoring wells proposed for decommissioning are located on-site and off-site. The wells are single completion or nested. Single completion wells generally have 2-inch diameter casing made of Schedule 40 or 80 PVC with cement bentonite grout annular seals and slotted PVC screens. Nested wells generally have 0.5-inch or 1.5-inch diameter casings paired with 2-inch diameter casings, or multiple 2-inch diameter casings constructed of schedule 40 or 80 PVC with cement bentonite grout annular seals and slotted PVC screens. Surface completions commonly consist of steel 6- to 8-inch diameter flush-mounts, 24-inch by 24-inch steel vaults, and stick-up monuments set in concrete. Stick-up monuments may be surrounded by 3-foot (ft) steel bollards. All of these groundwater wells are non-artesian (i.e. the groundwater elevation is below ground surface) with the exception of PW-11 and TL-05A,C,D. Well depths, borehole diameters, well completion materials, and other details are presented in Table 2 (on-site wells) and Table 3 (off-site wells). Consultant and driller boring logs, where available, are included in Appendix C. Submersible pumps may still be installed within the groundwater monitoring wells. Locations of all groundwater monitoring wells are shown on Figure 3.

The 14 groundwater extraction wells are single completions associated with the on-site GETS. The groundwater extraction wells are 6- or 8-inch diameter, schedule 80 PVC with cement bentonite grout annular seals and stainless steel screens. Surface completions commonly consists of steel vaults or 6- to 8-inch diameter steel stick-up monuments set in a concrete pad. Each extraction well has an associated electrical box and piping to connect it to the main extraction system piping. Well depths, borehole diameters, well completion materials, and other details are presented in Table 2 (on-site wells). Submersible pumps are still installed in some of the extraction wells. Consultant and driller

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⁸ Of the 38 monitoring wells, one has not been located during recent Site visits (e.g. PW-06). For the purpose of this Work Plan, it is assumed that this well still exists and will require decommissioning.
boring logs, where available, and general as-built drawings are included in Appendix C. Locations of all groundwater extraction wells are shown on Figure 3.

Ecology’s online well log database has driller’s logs for 13 of the 83 installations. There are complete or partial consultant well logs available for 61 of the remaining 70 installations. The other nine installations without driller or consultant well logs include LFG probes, a single groundwater extraction well (W-08), and an on-site groundwater monitoring well (LW-01). It appears the number of logs created or retained for the groundwater extraction wells and LFG probes is limited because of consistency in construction methods among each installation type. Available details are summarized in Tables 1 through 3.

Based on available records (design information and logs), all installations are classified as resource protection wells as defined in the Minimum Standards (WAC 173-160-400), which means the installations have a screen and well casing installed with a sand pack and annular seal. All 83 installations were installed under rigorous oversight by Ecology and EPA. Compared to current standards, the primary difference in the construction of some installations is that the majority of LFG probes (22 of 31) and some groundwater monitoring wells (11 of 38) are nested (i.e. have more than one cased resource protection well in a single bore hole).

### 1.2 Justification for Decommissioning

As presented in Section 1.1.1, the Site is nearing transition from Federal Superfund status to State PCC status, offsite GWPS have generally been met, and the GETS operation is nearing conclusion. From Section 1.1.2, Site groundwater gradients appear consistent since the early 2000s without indication of a seasonal groundwater divide.

Installations required for the current PCC program and the small subset for which CD requirements continue to be monitored are shown as active installations excluded from decommissioning on Figures 2 and 3. Decommissioning the 83 installations no longer required for CD or PCC monitoring purposes is a necessary step towards delisting the Site from the NPL and will allow for future land redevelopment. Therefore, the City seeks to decommission the 31 LFG gas probes and 52 groundwater wells shown on Figures 2 and 3, and listed in Tables 1 through 3. Specific discussion is provided for the LFG probes and the groundwater wells in the following subsections.

#### 1.2.1 Landfill Gas Probes

Off-site LFG probes were installed to monitor the potential for landfill gas migration outside of the landfill boundary. As indicated in the current LFG management plan (LAI 2019a), monitoring the 31 off-site LFG probes is no longer required based on consistent monitoring trends that indicate off-site
LFG probes are outside the area of elevated landfill gas concentrations. All probe locations and recent methane gas concentrations at the Site are shown on Figure 2.

1.2.2 Groundwater Wells

Justification for decommissioning the 52 groundwater wells can generally be summarized as attainment of GWPS (46 wells), well replacement (3 wells), or other supporting evidence (3 wells), as presented below.

1.2.2.1 Attainment of Groundwater Performance Standards

Forty-six of the wells planned for decommissioning have had concentrations below GWPS for contaminants of concern (COCs) during the most recent eight sampling events, including wells where concentrations have always been below the GWPS. The established end-point for determining attainment of the GWPS for the Site is the POC shown on Figure 3. These 46 locations occur upgradient of the POC, at the POC, and downgradient of the POC (both within the 1991 edge of plume and further downgradient). The 1991 CD technically requires attainment of GWPS for locations downgradient of the POC only, however this Work Plan uses the GWPS attainment determination criteria to demonstrate several groundwater wells qualified for decommissioning.

Forty-one of the 46 wells were documented\(^\text{11}\) as being removed from sampling plans between 2010 and 2019 due to either determination of attainment or having not been impacted by the Site groundwater plume. These 41 wells are listed in Tables 2 and 3 with the year attainment was determined.

The remaining five wells are located upgradient of the landfill boundary (TL-14A, TL-16R, TL-17AR, and TL-17BR) or downgradient of the 1991 edge of plume (TL-19A) as shown on Figure 3. Sampling was discontinued at these wells between 2006 and 2014, and it appears attainment of GWPS for COCs was reached prior to conclusion of sampling. Data demonstrating attainment of GWPSs for these five wells are presented in the Appendix D data table.

1.2.2.2 Replaced Wells

The replaced wells that appear qualified for decommissioning are as follows:

- Wells W-03 and W-04 were replaced by W-03R and W-04R due to having compromised well screens. Both W-03 and W-04 are proposed for decommissioning and the replacement wells will remain active as long-term (W-03) and interim (W-04) monitoring wells (LAI 2019b).

- TL-16 is proposed for decommissioning since it was replaced by well TL-16R in 1995. Both of these wells were background monitoring locations. They are located adjacent to each other (Figure 3) and are approximately the same depth (see well logs in Appendix C-1). While there

\(^{11}\) Fourteen wells in 2010 (City of Tacoma 2010), 23 wells in 2014 (LAI 2014), and 4 wells in 2019 (LAI 2019b)
is no recent data for well TL-16, TL-16R has not had a recent exceedance of GWPS (Appendix D). By extension, we are assuming TL-16 also has not had an exceedance.

1.2.2.3 Other Supporting Evidence

The wells that appear qualified for decommissioning based on other conditions are as follows:

- W-13 has not been monitored historically for COCs, and pumping was discontinued in 2002 due to poor production. However, similarly screened extraction wells W-12 (upgradient) and W-14 (downgradient) shown on Figure 3 have reached attainment of GWPS (LAI 2014)\textsuperscript{12}.

- TL-12 is an on-site monitoring well located upgradient of the POC. According to the 2010 groundwater monitoring plan prepared by the City, the purpose of TL-12 was to monitor the effect of the GETS on the plume and general plume conditions. The GETS operation was substantially downscaled in 2010\textsuperscript{13} and monitoring data was collected at TL-12 through 2014 with indication of stable conditions. TL-12 is no longer required for monitoring compliance with the CD and is upgradient of the POC. TL-12 groundwater sampling data is presented in Appendix D.

- LW-01 was a drinking water well installed prior to the City purchasing the Site in 1960. Based on a reconnaissance by the City or its contractors, LW-01 was determined to be suitable for groundwater elevation data monitoring (only) (B&V 1987).

1.3 Objectives and Work Plan Overview

All 31 LFG probes and 26 of the groundwater wells are located off-site on properties owned by private entities and within City rights-of-way (ROW), and the other 24 installations are located on-site. Given the dormant nature of these 81 installations and the sufficiency of other active installations supporting PCC and CD-related requirements, these 81 installations are extraneous, encumber the use of property, and are an unnecessary ongoing expense to the City and its taxpaying citizens. Therefore, the objectives of this Work Plan are to 1) prepare the Site transition from Federal Superfund status to State PCC status, 2) unencumber property, and 3) eliminate unnecessary spending for the benefit of the City and its citizens.

This Work Plan includes the following steps which are discussed in subsequent sections:

- Section 2: Planning activities pertaining to access coordination, traffic control, and contracting.
- Section 3: Field activities and procedures.
- Section 4: Schedule coordination with agencies and reporting.

\textsuperscript{12} W-12, W-13 and W-14 are screened within the same hydrogeological unit.
\textsuperscript{13} Thirty of the 35 extraction wells were shutdown.
2.0 PLANNING ACTIVITIES

Of the 83 installations included in this Work Plan, all LFG probes are located off-site, groundwater monitoring wells are located both on-site and off-site, and all groundwater extraction wells are located on-site. The City will coordinate with the local landfill personnel for decommissioning installations on-site. The City has existing access agreements with private property owners where off-site installations for decommissioning are located, and will follow communication protocols and field procedures in accordance with the access agreements. For installations located within public rights-of-way that require traffic control plans and following street occupancy permit requirements, the City will coordinate internally and may hire a subconsultant traffic control service if qualified City personnel are not available to conduct traffic control during decommissioning. The City will contract with a qualified drilling company for well decommissioning.
3.0 FIELD ACTIVITIES AND PROCEDURES

This section presents well decommissioning field activities and procedures.

3.1 Construction Oversight and Field Documentation

Public and private utility locates will be completed prior to well decommissioning at all locations. Decommissioning of all installations will be performed by a qualified driller contracted by the City. On behalf of the City, Landau Associates, Inc. will provide field coordination, construction oversight of the driller for quality assurance, and field documentation services. The driller is responsible for submitting the notice of intent and well completion documentation to Ecology. In addition, the City will provide Ecology with a letter outlining any variances from regulatory methods used to decommission all installations. If traffic control services are to be conducted by a private company (i.e. non-City personnel), the private company may be under a direct contract to the City. Investigation-derived waste (IDW) samples will be obtained prior to disposal of subsurface materials generated during decommissioning. A composite IDW sample will be collected at a minimum frequency one per 20 yard roll-off bin.

3.2 Decommissioning Procedures

WAC 173-160-460 describes the requirements for decommissioning resource protection wells. According to WAC 173-160-460, wells that were not constructed in accordance with current regulations under WAC 173-160-420 may be decommissioned by (a) perforating the entire casing of the well and pressure grouting the casing, or (b) over-drilling the casing and filling the borehole with an approved sealant.

Following decommissioning standards as laid out in WAC 173-160-460 is considered impractical in the case of decommissioning the installations presented here for the following reasons:

1. All installations proposed for decommissioning are cased with PVC and therefore cannot be perforated due to the likelihood that the casing will fracture and fail.
2. Due to the number and depth of installations proposed for decommissioning, waste generation from complete over-drilling of all installations would be extreme (estimated to be approximately 200 cubic yards).
3. The cost of over-drilling and waste disposal is not commensurate with the risk reduction.

This Work Plan proposes a decommissioning method for groundwater well installations (excluding artesian wells PW-11 and TL-05A,C,D) and LFG probes that is equally, if not more, protective than methods listed under the Minimum Standards. In addition, the proposed method generates less waste, limits the noise and logistical burden associated with installations located off-site, reduces time spent in roadways which reduces health and safety concerns, and is more cost effective.
The alternative method proposed in this Work Plan will provide equal or greater protection than the Minimum Standards, for the following reasons:

1. The hydrogeology of the Site is thoroughly characterized.
2. The extended 18-ft surface seal (for non-artesian groundwater wells and LFG probes) will prevent the potential for the installations to act as a migration pathway for surface contamination. The 18-ft surface seal is equivalent to the sealing requirement for a water well specified in the Minimum Standards. Consequently, the decommissioned installations will be more protective than an installed water well because they will have an equivalent surface seal but will also have a grouted annular seal below the surface seal.\(^\text{14}\)
3. No installations extend through multiple aquifers. All installations proposed for decommissioning are located either:
   a. Above the water table (LFG probes),
   b. Within the upper primary unconfined aquifer (groundwater monitoring and extraction wells, except for well TL-11d), or
   c. Within the uppermost confining unit (well TL-11d).
4. The majority of installations presented in this Work Plan have associated consultant well logs detailing their installation. Installations without well logs have other associated documentation (i.e. general as-built drawing and report tables).
5. The Site has an extensive groundwater monitoring system in place that is sampled quarterly. This system will remain in place to verify the protective ness of the alternative decommissioning approach.

The proposed decommissioning methods are presented below for (1) non-artesian groundwater wells, (2) artesian groundwater wells, and (3) LFG probes. With the exception of the below-proposed variation in decommissioning methods, installations will be decommissioned in accordance with the Minimum Standards. All final surface completions will be consistent with that of the surface surrounding the wells. When decommissioning nested wells, all intervals within the boring will be decommissioned. Where necessary, pumps and discharge piping will be removed by the drilling crew, or a separate contractor, and disposed of as solid waste.

3.2.1 Non-Artesian Groundwater Wells

Non-artesian groundwater monitoring and extraction wells will be decommissioned by pressure grouting the casing from the bottom up to 18 feet below ground surface (bgs) using a tremie pipe or equivalent; and over-drilling, using an auger method, along with grouting the remaining boring from the top of casing down to 18 ft bgs to create a surface seal (WAC 173-160-231). Pressure grouting material may be neat cement grout, neat cement, or bentonite slurry. Neat cement grout or neat cement will be used for pressure grouting well locations within the ROW unless otherwise instructed by the City. Material for grouting the over-drilled portion of the well will also consist of neat cement.

\(^{14}\) Water wells typically have steel casing below the surface seal without an annular seal.
grout, neat cement, or bentonite slurry, dependent on if the well is within the ROW. Vaults, steel or PVC stick-up monuments and steel flush mount monuments will be removed with an excavator, fork lift, or other similar equipment as determined by the contractor. Concrete pads will be broken up and removed by an excavator or similar equipment as determined by the contractor.

Groundwater monitoring well location LW-01 was installed prior to the City’s ownership of the landfill. It is located within or abutting the dual membrane liner system in the northeastern portion of the landfill. If LW-01 is outside of the dual membrane liner, it will be decommissioned consistent with other non-artesian groundwater wells as described above. If it is found to be within the dual membrane liner, a contractor will carefully cut the primary geomembrane, excavate and stockpile the sand down to the top of secondary geomembrane, carefully cut the secondary geomembrane, and excavate and stockpile soil down into the underlying soil bedding. Once excavation is complete, a licensed driller will perforate the casing from the bottom to within five feet of the land surface and pressure seal the casing in accordance with WAC 173-160-381(1)(1). Perforations shall be at least four equidistant cuts per row, and one row per foot. The perforations must be sufficient enough to allow sealing material (neat cement grout or neat cement, or bentonite slurry) to migrate outside the casing and effectively prevent the movement of water. The driller will apply enough pressure to force the sealing material through the perforations, filling any voids on the outside of the casing. The casing shall be filled completely with neat cement grout, neat cement, or bentonite slurry to within five feet of the land surface, and the remainder of the riser pipe must be removed. Subsequently, a contractor will reconstruct the dual membrane layers and restore the ground surface.

Prior to decommissioning activities, where necessary for extraction wells, the City (or its contractor) will remove electrical equipment associated with the extraction system. The extraction well valves will be shut to isolate well-related piping from the main downstream extraction system piping. The well-related piping will then be removed from the well and covered by a blind flange until such time that the entire GETS system is decommissioned.

### 3.2.2 Artesian Groundwater Wells

Artesian wells PW-11 and TL-05A,C,D will be decommissioned by over-drilling the full vertical extent of the casing and grouting with neat cement grout, neat cement, or bentonite slurry as required by the Minimum Standards (WAC 173-160-381).

### 3.2.3 Landfill Gas Probes

To provide an appropriate seal to prevent migration to the subsurface for landfill gas probes, where maximum depths of the gas probes are greater than 18 ft, the screen and up to 18 ft bgs of riser pipe may be filled with neat cement grout, neat cement, or bentonite slurry from the bottom of the well. The top 18 ft (or full vertical extent if probe is less than 18 ft deep) of casing will then be over-drilled using an auger method, and grouted using neat cement grout, neat cement, or bentonite slurry (adapted from WAC 173-160-231 and WAC 173-160-381).
3.3 Quality Assurance

To assure the Work Plan decommissioning procedures are followed at each installation, landfill staff (or their representative) will meet the drilling contractor on-site at each installation prior to the decommissioning to document reconnaissance details, and will remain on-site as necessary to document the decommissioning techniques employed and any other pertinent details. Where applicable and feasible\textsuperscript{15}, landfill staff will measure water level and well/probe depth prior to beginning decommissioning. Field documentation will include daily site photographs and construction progress summaries, decommissioning field forms per installation, quantities of materials used by contractor, and other field notes. Any deviations from the Work Plan will be documented and communicated to EPA and applicable regulatory agencies.

3.4 Health and Safety

A health and safety plan (HASP) has been prepared for this decommissioning scope of work and is included as Appendix E. The field portion of the proposed well decommissioning activities will more than likely be conducted during the COVID-19 pandemic; therefore additional safety procedures for COVID-19 protection are included in the HASP.

\textsuperscript{15} Groundwater elevations are assumed to be below all LFG probe screen elevations, and LFG probes may be too small to measure depth with a sounding tape.
4.0 SCHEDULING AND REPORTING

The City anticipates implementing decommissioning activities following EPA approval of this Work Plan and selection of a decommissioning contractor through a competitive bid process. The City will provide notification to EPA, Ecology, and TPCHD in advance of commencing field activities.

A decommissioning construction completion report (CCR) will be prepared by the City within 60 calendar days following conclusion of decommissioning field activities. The CCR will be submitted to EPA, Ecology, and TPCHD.
5.0 USE OF THIS REPORT

This Work Plan has been prepared for the exclusive use of City of Tacoma for specific application to the Tacoma Landfill. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of Landau Associates. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by Landau Associates, shall be at the user’s sole risk. Landau Associates warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

KAM/LKK/EFW/kjg

\TACOMA\PROJECT\094\089.042 DECOMMISSIONING\DECOMMISSIONING WORKPLAN\LAI_CITY OF TACOMA DECOMMISSIONING WORK PLAN_FINAL_10-08-20.DOCX}
6.0 REFERENCES


1. Coloring contours based on inverse distance weighting interpolation of monitoring data with the following inputs:
   - Power: 4
   - Search Radius: Variable
   - Number of Points: 10
   - Maximum Distance: 120 ft
2. Section boundaries are not included in the interpolation.
3. Where multiple measurements exist at the same location, the highest measurement was chosen.
5. Horizontal collectors in the Central Area are not included in this analysis.
6. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.
Data Source: City of Tacoma; Esri World Imagery.

Notes:
1. PW-11 and TL-05A, C, D are artesian wells and will be decommissioned by complete overdrilling.
2. PW-06 was not able to be found during a recent site visit but is assumed to exist for the purposes of this workplan.
3. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

City of Tacoma Landfill
Tacoma, Washington

Groundwater Well Decommissioning Plan
Leach Creek

Orchard Street

Legend

Vashon Recessional Deposit
Vashon Glacial Till
Vashon Advance Outwash
Pre-Olympia Gravel
Pre-Olympia Lacustrine
Screened Interval
Approximate Water Level Elevation

Note:

1. This cross-section has been interpreted and generalized from field data collected by Landau Associates and others. Variations between this cross section and actual conditions may exist.

Reference: End of Plume Residual Plume Characterization Report, LAI, 2006
Elevation (ft, NVGD 29)

1. This cross-section has been interpreted and generalized from field data collected by Landau Associates and others. Variations between this cross-section and actual conditions may exist.

Reference: End of Plume Residual Plume Characterization Report, LAI, 2006
Outlier measurements
**Table 1**
Off-Site Landfill Gas Probes
City of Tacoma Landfill
Tacoma, Washington

<table>
<thead>
<tr>
<th>Well ID</th>
<th>Well Type</th>
<th>Number of Probes</th>
<th>Consultant Log</th>
<th>Ecology Well Log</th>
<th>Well Depth (ft bgs)</th>
<th>Diameter of Borehole (in)</th>
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</thead>
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<tr>
<td>SPS01</td>
<td>Nested Soil Gas Well</td>
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<td>Yes</td>
<td>No</td>
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<td>12</td>
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<td>Single Soil Gas Well</td>
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<td>No</td>
<td>45</td>
<td>6 - 12</td>
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<td>Nested Soil Gas Well</td>
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**Notes:**
- -- = Probe detail unknown
- (a) Well depths per communication with Ed Gronlund at the City of Tacoma Landfill, May 2019
- All probes have ½-in diameter, schedule 80 Polyvinyl Chloride (PVC) probes with cement bentonite grout annular seals

**Abbreviations and Acronyms:**
- bgs = below ground surface
- ft = feet
- in = inches
# On-Site Groundwater Monitoring Wells and Extraction Wells

**City of Tacoma Landfill**  
**Tacoma, Washington**

## Monitoring Wells

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### Notes:
- -- = information not recorded
- (a) W-03 and W-04 are to be decommissioned, as opposed to their replacements (W-03R and W-04R) which are still active extracting wells.

### Year of Remediation Goals Attainment Determination:
- 2010
- 2014
- 2019
- Other

### Abbreviations and Acronyms:
- bgs = below ground surface
- ft = feet
- in = inches
- POC = Point of Compliance
- PVC = PolyVinyl Chloride
- Sch = Schedule

---

7/24/2020\tacoma\SPROJECT\04\88-042 Decommissioning\P\Decommissioning Workplan\Tables\Table 2_ On Site Monitoring wells.xlsx

Landau Associates
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Notes:
-- = Information is unknown
All wells included in the table are resource protection wells
(a) Well was not found during a recent site visit.
(b) Well is artesian and will be decommissioned by complete overdrilling.
(c) Well was replaced by TL-16R.

Year of Remediation Goals Attainment Determination:
- 2010
- 2014
- 2019
- See Appendix A
- Other

Abbreviations and Acronyms:
- bgs = below ground surface
- ft = feet
- in = inches
- PVC = PolyVinyl Chloride
- Sch = Schule

Landau Associates
APPENDIX A

Ecology Variance Request Form
WAC173-160-106(1) allows you to request a variance from the Department of Ecology when strict compliance with state well construction standards is impractical. The variance request must propose comparable alternative specifications that will provide equal or greater human health and resource protection than the minimum standards. You must apply for a variance in writing and receive approval before constructing or decommissioning the well. (All fields must be completed.)

Requested by: Eric Weber (Landau Associates, Inc.) and Calvin Taylor (City of Tacoma)

Mailing Address: 950 Pacific Ave, Ste 515  City: Tacoma  State: WA  Zip: 98402

Daytime Phone: 253-926-2493  Date: ______

Property Owner (if different): City of Tacoma

Site Location: NW ¼ SW ¼ Section: 13  Township: 20N  Range: 2E  E or WWM

Tax Parcel Number: 0220133049

Well Address: Landfill Address; 4601 S Orchard St, Tacoma, WA.

Well Driller/Company (if known): Not known

Check one: ☐ Water Well ☐ Resource Protection Well ☐ Dewatering Well

What construction standard cannot be met?

Please see decommissioning workplan.

Describe the reason why standard cannot be met. Include site map and distances from all known potential sources of contamination if setback variance is being requested.

Please see decommissioning workplan.

Describe the alternative construction method that will provide equal or greater protections than those provided by the minimum standard.

Please see decommissioning workplan.

(Attach additional pages if necessary.) Complete and return with your site map to the appropriate regional office:

Northwest Regional Office
ATTN: Noel Philip
3190 160th Avenue SE
Bellevue, WA 98008
425-649-7044
npni461@ecy.wa.gov

Southwest Regional Office
ATTN: John Pearch
PO Box 47775
Olympia, WA 98504
360-407-0297
jope461@ecy.wa.gov

Eastern Regional Office
ATTN: Mark Ader
N 4601 Monroe
Spokane, WA 99205
509-329-3544
made461@ecy.wa.gov

Central Regional Office
ATTN: Avery Richardson
1250 W Alder St.
Union Gap, WA 98903
509-575-2639
aric461@ecy.wa.gov
Landfill Gas Probe Construction Details
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**FIGURE 3-2**

**SINGLE METHANE DETECTION PROBE**

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### CITY OF TACOMA LANDFILL

METHANE DETECTION PROBE COORDINATES AND COMPLETIONS 7/16/93

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City of Tacoma  
Public Works Department  
INSPECTOR'S DAILY REPORT  
Imp. No. AU6501  
Federal Aid No.  
Date 05-01-91  
Project Description SPS # 1A  
Weather A.M. OVERCAST  
P.M. CLEAR  
Contractor's Representative(s) and Title  PAT MILLER AND ASSISTANT  
Location and Type of Work  
Number and Classification of Contractor's Men and Equipment SAME  

Diary (Report of day's operations, orders given and received, discussions with contractor or visitors from other City departments, unusual conditions, recommendations, traffic signing, change orders and force accounts)

<table>
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<tr>
<th>Time</th>
<th>Activity</th>
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<td>START</td>
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<td>2.5</td>
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<tr>
<td>4</td>
<td>- NO PROBLEMS DRILLING</td>
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<tr>
<td>8.2</td>
<td>- SATURATION AT 35' TO 55'</td>
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<tr>
<td>8</td>
<td>- 8-50# BAGS BENTONITE CHIPS</td>
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<td>12.2</td>
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<td>41.4</td>
<td>- PVC PIPE #1) 6.7</td>
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<td>42.9</td>
<td>- )#2) 22.3</td>
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<td>45.8</td>
<td>- )#3) 37.9</td>
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<td>53</td>
<td>- )#4) 53</td>
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<td>TOTAL 119.9'</td>
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<tr>
<td>1</td>
<td>WET</td>
</tr>
<tr>
<td>6</td>
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<td>53.5</td>
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<td>55</td>
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ACTUAL DRILLING TIME 8AM-10:30AM  
TOTAL 2.5 hrs.

Inspector's Signature

David O. Burns
# Probe Drilling Log

**City of Tacoma Refuse Utility**

**Probe Drilling Log**

<table>
<thead>
<tr>
<th>Probe Number</th>
<th>Date</th>
<th>Inspector</th>
<th>Drilling Start Time</th>
<th>Drilling Stop Time</th>
<th>Total Drilling Time</th>
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<tbody>
<tr>
<td>SPS 1A</td>
<td>05-01-91</td>
<td>Burns/Walsh</td>
<td>0800</td>
<td>1030</td>
<td>2.5 hrs</td>
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**Drilling Bore Dia.:** 9 ft

**Drilling Equipment/Drilling Co.:** Holt

**Operator Name:** Pat Miller

<table>
<thead>
<tr>
<th>Depth</th>
<th>Moisture Content</th>
<th>State of Decomp.</th>
<th>Sample No. for Analysis</th>
<th>Composition Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>10'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Sand + Rock</td>
<td></td>
</tr>
<tr>
<td>20'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Hard Till</td>
<td></td>
</tr>
<tr>
<td>30'</td>
<td>Damp</td>
<td></td>
<td></td>
<td>Sand + Rock, Hard Till</td>
<td>Hard Till at 25’ to 35’</td>
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<tr>
<td>40'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Rock + Sand Layers</td>
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</tr>
<tr>
<td>50', 55'</td>
<td>Wet</td>
<td></td>
<td></td>
<td>Wet Sand w/ Rock</td>
<td></td>
</tr>
<tr>
<td>60'</td>
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<td></td>
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<tr>
<td>70'</td>
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<td>90'</td>
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<tr>
<td>100'</td>
<td></td>
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</table>

**Driller Signature for Total Depth of Boring:**

**Inspector Signature for Total Depth of Boring:**

**Total Depth:** 55'
**City of Tacoma**  
**Public Works Department**  
**INSPECTOR'S DAILY REPORT**

<table>
<thead>
<tr>
<th>Imp. No.</th>
<th>AD6501</th>
<th>Federal Aid No.</th>
<th>Date</th>
<th>4/12</th>
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<tbody>
<tr>
<td>Project Description</td>
<td>SP5-1</td>
<td>Weather A.M.</td>
<td>SUNDAY</td>
<td>P.M.</td>
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</table>

**Contractor's Representative(s) and Title**

**Location and Type of Work**

**Number and Classification of Contractor's Men and Equipment**

---

**Diary (Report of day's operations, orders given and received, discussions with contractor or visitors from other City departments, unusual conditions, recommendations, traffic signing, change orders and force accounts)**

**START - 0755**

- **08**
  - Conversation with M. Havelas
  - Place 1 Prob. In Am
  - Wait or Move

- **0830**
  - Paved 12 Gc., AB Placing
  - P. Gravel, Havelas Continued

- **0940**
  - M. Havelas - Abandon
  - Horse - File 20 Wc SW
  - Bentonite, P. Rx, Crushed Coir

**Finish 1140**

- **11**
  - Havelas, Recovered Pipe -

- **12**
  - 21 - Bent
  - 12 - P. Gravel

- **1305**
  - 2 Concrete

---

**Stand By**

[Signature]

Inspector's Signature
City of Tacoma
Public Works Department

INSPECTOR’S DAILY REPORT

Imp. No. A06501 Federal Aid No.  

Project Description  SPS-1

Weather A.M. SUNDAY  P.M. SUNDAY

Contractor’s Representative(s) and Title  P. Miller  Drill

Location and Type of Work

Number and Classification of Contractor’s Men and Equipment  SAMH

Diary (Report of day’s operations, orders given and received, discussions with contractor or visitors from other City departments, unusual conditions, recommendations, traffic signing, change orders and force accounts)

START 08:15

PLACE C'DM R"T

60” RAYS OF BENTONITE  
60" RAYS OF P. CRAKER

11:00 AT  TUBS READY 15 MINS

20°-25°  SILT & H2O. AFTER

A DAY OF WORK WAS

DECIDE BY HOUR...

DECIDE BY 2:00 PM

TO LEAVE IT STANDING OVERNIGHT

REFERENCES STANDING H2O

AT 38°

H2O STAYS AT 37°

IN TIME OF 4:12 A.M

DECOP OF 12° OVERNIGHT

RECORDS COMPLETE  SEE NEXT PAGE.

TENDER PAVE

PLACE PAVE

SS" REQUIRED

Finish - Pull off 16:00

DIRECTIONS TO 57+ 10 PM

STAND BY  12:30  13:15 -

14:30 15:15 -
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<th>Depth</th>
<th>Moisture Content</th>
<th>State of Decomp.</th>
<th>Sample No. for Analysis</th>
<th>Composition Description</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>10'</td>
<td>DAMP</td>
<td>-</td>
<td>-</td>
<td>HARDPAK, ROCK, GRAVEL, SAND</td>
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</tr>
<tr>
<td>20'</td>
<td>DAMP</td>
<td>-</td>
<td>-</td>
<td>GRAVEL, SILT, SAND</td>
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</tr>
<tr>
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<td>SATURATION</td>
<td>-</td>
<td>-</td>
<td>WET STICKY SAND SMALL ROCK</td>
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<tr>
<td>40'</td>
<td>SATURATION</td>
<td>-</td>
<td>-</td>
<td>WET SAND SILT</td>
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<tr>
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<td>SATURATION</td>
<td>-</td>
<td>-</td>
<td>WET SAND SILT</td>
<td></td>
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<tr>
<td>80'</td>
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<tr>
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Driller Signature for Total Depth of Boring: [Signature]

Total Depth: 55'
City of Tacoma  
Public Works Department  

**INSPECTOR’S DAILY REPORT**  

| Imp. No. | 5801 | Federal Aid No. | Date  
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<td>Snow/Cold/Clearing</td>
<td>P.M. Clear</td>
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<td>Location and Type of Work</td>
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Number and Classification of Contractor’s Men and Equipment | 5AMU |

---

Diary (Report of day’s operations, orders given and received, discussions with contractor or visitors from other City departments, unusual conditions, recommendations, traffic signing, change orders and force accounts)  

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<tr>
<td>9:00</td>
<td>24.4 Void with water flow in this area.</td>
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<tr>
<td>10:00</td>
<td>31.1 Difficult to install chips @ 22' - 26'</td>
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<tr>
<td>11:00</td>
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Inspector’s Signature: [Signature]

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<th>MOISTURE CONTENT</th>
<th>STATE OF DECOMP.</th>
<th>SAMPLE NO. FOR ANALYSIS</th>
<th>COMPOSITION DESCRIPTION</th>
<th>COMMENTS</th>
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</thead>
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<tr>
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<td>-</td>
<td>-</td>
<td>SANDPAN/FILL/GRASS</td>
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<td>Very Moist</td>
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<td>Gravel/Rocks/Sand</td>
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<td>WET</td>
<td>-</td>
<td>-</td>
<td>Sandy Silt</td>
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<tr>
<td>40'</td>
<td>WET</td>
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<td>-</td>
<td>Sandy Silt</td>
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<td>45'-50'</td>
<td>WET</td>
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<td>-</td>
<td>Sandy Silt</td>
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<td>100'</td>
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DRILLER SIGNATURE FOR TOTAL DEPTH OF BORING: [Signature]  TOTAL DEPTH: 450

INSPECTOR SIGNATURE FOR TOTAL DEPTH OF BORING: [Signature]  TOTAL DEPTH: 450
City of Tacoma
Public Works Department

INSPECTOR'S DAILY REPORT

Imp. No.  A06501  Federal Aid No.  Date 9/1/91
Project Description  SPS 8
Weather A.M.  P.M.  Sunny/Cloudy
Contractor's Representative(s) and Title  Miller
Location and Type of Work

Number and Classification of Contractor's Men and Equipment  S Chris

Diary (Report of day's operations, orders given and received, discussions with contractor or visitors from other City departments, unusual conditions, recommendations, traffic signing, change orders and force accounts)

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SPS - 8  START: 13:55

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70 |

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20.5

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24.0

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<td>43</td>
</tr>
</tbody>
</table>

Finish - 16:45

Inspector's Signature
# City of Tacoma Refuse Utility

## Probe Drilling Log

**Probe Number:** 3PS-8  
**Date:** 4/10/91  
**Inspector:** WA8518

**Drilling Start Time:** 13:55  
**Drilling Stop Time:** 16:45  
**Total Drilling Time:** 2:50

**Drilling Bore Dia.:** 0.9 ft  
**Drilling Equipment/Drilling Co.:** HOST  
**Operator Name:** Miller

<table>
<thead>
<tr>
<th>Depth</th>
<th>Moisture Content</th>
<th>State of Decomp.</th>
<th>Sample No. for Analysis</th>
<th>Composition Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>10'</td>
<td>Damp</td>
<td>—</td>
<td>—</td>
<td>Brown Sandy Light Gravel</td>
<td></td>
</tr>
<tr>
<td>20'</td>
<td>Damp</td>
<td>—</td>
<td>—</td>
<td>Brown Sand Light Gravel</td>
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</tr>
<tr>
<td>30'</td>
<td>Damp</td>
<td>—</td>
<td>—</td>
<td>Brown Sand</td>
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<tr>
<td>35'</td>
<td>Damp</td>
<td>—</td>
<td>—</td>
<td>Brown Sand</td>
<td></td>
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<td>60'</td>
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<td>80'</td>
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<td>90'</td>
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<tr>
<td>100'</td>
<td></td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Driller Signature for Total Depth of Boring:** [Signature]  
**Total Depth:** 35 ft

**Inspector Signature for Total Depth of Boring:** [Signature]  
**Total Depth:** 35 ft
DRILL REPORT

Well No. SP-49

Date 9/1/81

Start Time 8:20

End Time 9:00

Total Time 40 min

Comments 18" Auger pipe 1/2" above grade for install

Bentonite Total

Ref. Page

Gravel Backfill Total

Ref. Page

PVC Pipe Total

Ref. Page

Total PVC

Depth of Well 45'
# Probe Drilling Log

**Probe Number**: SPS #9  
**Date**: 9/11/91  
**Inspector**: Nate Graves

**Drilling Start Time**: 8:20 am  
**Drilling Stop Time**: 9:00  
**Total Drilling Time**: 40 min

**Drilling Bore Dia.**:  
**Drilling Equipment/Drilling Co.**:

<table>
<thead>
<tr>
<th>Depth</th>
<th>Moisture Content</th>
<th>State of Decomp.</th>
<th>Sample No. for Analysis</th>
<th>Composition Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>10'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Sand with clay</td>
<td></td>
</tr>
<tr>
<td></td>
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<td>small rock</td>
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<tr>
<td>20'</td>
<td>Normal</td>
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<td></td>
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<td>small rock</td>
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<tr>
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<td>Normal</td>
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<td>Sand</td>
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<td>50'</td>
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<tr>
<td>60'</td>
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<td>70'</td>
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<td>90'</td>
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</tr>
<tr>
<td>100'</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Driller Signature for Total Depth of Boring**:  
**Total Depth**: ___

**Inspector Signature for Total Depth of Boring**:  
**Total Depth**: 45'
MONITORING PROBE CONSTRUCTION LOG

PROBE NO. SPS 9

Location: Orchard Terrace Apartments
Driller/Contractor: EJ Rody & Son
Inspection: Nate Graves
Date/Time: 9/11/91 91

DIMENSIONS
A. Total depth of boring 45 ft.
B. Diameter of boring 1.5 ft.
C. Diameter of probe pipe 0.5 in.
D. Height of pipe above grade
1. 0 ft.
2. 7 ft.
3. 31.7 ft.
4. 44 ft.
5. ft.
E. Depth of pipe below grade
1. 7 ft. 2. 19.4 ft.
3. 31.7 ft. 4. 44 ft.
5. ft.
F. Perforated pipe interval
1. from 5 ft. to 7 ft.
2. from 12 ft. to 19.4 ft.
3. from 24.4 ft. to 31.7 ft.
4. from 36.7 ft. to 44 ft.
5. from ft. to ft.
G. Permeable material interval
1. from 4 ft. to 8 ft.
2. from 10 ft. to 20.4 ft.
3. from 22.4 ft. to 32.7 ft.
4. from 34.7 ft. to 45 ft.
5. from ft. to ft.
H. Impermeable plug interval
1. from 1 ft. to 4 ft.
2. from 8 ft. to 10 ft.
3. from 20.4 ft. to 22.4 ft.
4. from 32.7 ft. to 45 ft.
5. from ft. to ft.
I. Backfill interval
1. from 1.5 ft. to .5 ft.
2. from ft. to ft.
3. from ft. to ft.
4. from ft. to ft.
5. from ft. to ft.

MATERIALS
Permeable material
Pea Gravel
Impermeable plug
 Bentonite
Backfill material
Pea Gravel
Casing material

CONSTRUCTION
Method of fill placement
Poured Through Hollow Auger
Method of casing placement

Comments

1/2" Dia. PVC Pipe Total 102.1 lin. ft.
Total Well Construction Depth 45 lin. ft.

Crew Foreman Sig. on Total Probe Completion Depth x Depth
## PROBE COMPLETION CHECK SHEET

PROBE STATION NO. JAS 9

| Location: __________________________ | Inspector: __________________________ |
| Contractor: __________________________ | Date/Time: __________________________ |

- 1/2" Stainless Steel Metal Screws (no glue/primer used in the installation of these probes) **YES** **NO**
- Identification of Probe Station **YES** **NO**
- Identification of Probe Depths **YES** **NO**
- Lab Cocks Installed W/Grease not Glued **YES** **NO**
- Pre-Cast Concrete Vault on Top of Minimum 24" Bentonite Seal **YES** **NO**
- Concrete Apron Installed in Accordance with Plans **YES** **NO**

Crew Foreman Signature on Total Probe Completion Depth x ________________ Depth __________
DRILL REPORT

Well No. SPS #10

Date 9/10/91 drilled
9/11/91 probes installed

Start Time 3:00 pm
End Time 4:30 pm
Total Time 1 hr. 30 min

Comments 18" drill 1' of pipe above grade for installation

---

Bentonite Total
Ref. Page ________

Gravel Backfill Total
Ref. Page ________

FVC Pipe Total
Ref. Page ________

Total FVC

---

Depth of Well 70

---

33 bags = 1650 lbs
<table>
<thead>
<tr>
<th>DEPTH</th>
<th>MOISTURE CONTENT</th>
<th>STATE OF DECOMP.</th>
<th>SAMPLE NO. FOR ANALYSIS</th>
<th>COMPOSITION DESCRIPTION</th>
<th>COMMENTS</th>
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<tbody>
<tr>
<td>10'</td>
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<td>Small-Medium Rock</td>
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<td>Sand with clay</td>
<td></td>
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<td></td>
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<td>Small-Medium Rock</td>
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<tr>
<td>30'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Sand with clay</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Small-Medium Rock</td>
<td></td>
</tr>
<tr>
<td>40'</td>
<td>Normal</td>
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<td></td>
<td>Sand with clay</td>
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<td></td>
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<td></td>
<td>Small-Medium Rock</td>
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<td>Small Rock</td>
<td></td>
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<tr>
<td>70'</td>
<td>Normal</td>
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<td>Sand</td>
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<td></td>
<td></td>
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<td></td>
<td>Small Rock</td>
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DRILLER SIGNATURE FOR TOTAL DEPTH OF BORING

TOTAL DEPTH

INSPECTOR SIGNATURE FOR TOTAL DEPTH OF BORING

TOTAL DEPTH
MONITORING PROBE CONSTRUCTION LOG
PROBE NO. SB5210

Location: Orchard Terrace Apt's
Driller/Contractor: ET Ready & Son
(Mahaffey)

Inspector: Nate Graves
Date/Time: 9/10/91 drilled
9/11/91 installed

DIMENSIONS
A. Total depth of boring 70 ft.
B. Diameter of boring 1.5 ft.
C. Diameter of probe pipe .5 in.
D. Height of pipe above grade
   1. 0 ft.
E. Depth of pipe below grade
   1. 7 ft.
   2. 27.6 ft.
   3. 48.3 ft.
   4. 69 ft.
   5. ft.
F. Perforated pipe interval
   1. from 5 ft. to 7 ft.
   2. from 12 ft. to 27.6 ft.
   3. from 32 ft. to 48.3 ft.
   4. from 53.3 ft. to 69 ft.
   5. from ft. to ft.
G. Permeable material interval
   1. from 4 ft. to 8 ft.
   2. from 10 ft. to 30.6 ft.
   3. from 30.6 ft. to 69.3 ft.
   4. from 51.3 ft. to 70.0 ft.
   5. from ft. to ft.
H. Impermeable plug interval
   1. from 1 ft. to 4 ft.
   2. from 8 ft. to 10 ft.
   3. from 28.5 ft. to 30.6 ft.
   4. from 49.3 ft. to 51.3 ft.
   5. from ft. to ft.
I. Backfill interval
   1. from 15 ft. to 5 ft.
   2. from ft. to ft.
   3. from ft. to ft.
   4. from ft. to ft.
   5. from ft. to ft.

MATERIALS
Permeable material
Pea Gravel
Impermeable plug
Bentonite
Backfill material
Pea Gravel
Casing material

CONSTRUCTION
Method of fill placement
FOUR THROUGH HOLLOW AUGER
Method of casing placement

Comments

1/2" Dia. PVC Pipe Total 152 lin. ft.
Total Well Construction Depth 70 lin. ft.

Crew Foreman Sig. on Total Probe Completion Depth

Depth
PROBE COMPLETION CHECK SHEET

PROBE STATION NO. SPS 10

Location: ____________________________  Inspector: ____________________________
Contractor: __________________________ Date/Time: / /91

- 1/2" Stainless Steel Metal Screws (no glue/primer used in the installation of these probes)
  - YES  NO
- Identification of Probe Station
  - YES  NO
- Identification of Probe Depths
  - YES  NO
- Lab Cocks Installed W/Grease not Glued
  - YES  NO
- Pre-Cast Concrete Vault on Top of Minimum 24" Bentonite Seal
  - YES  NO
- Concrete Apron Installed in Accordance with Plans
  - YES  NO

Crew Foreman Signature on Total Probe Completion Depth x__________ Depth ________
DRILL REPORT

Well No. SPS-11
Start Time 11:45
End Time 2:45
Total Time 2 hrs
Comments 1 hr break for lunch

Bentonite Total
Ref. Page

Gravel Backfill Total
Ref. Page

PVC Pipe Total
Ref. Page

Total PVC

Depth of Well 80
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<th>State of Decomp.</th>
<th>Sample No. for Analysis</th>
<th>Composition Description</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
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<td>Normal</td>
<td></td>
<td></td>
<td>Sand with clay, small rock</td>
<td>Hard Pan</td>
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<tr>
<td>20'</td>
<td>Normal</td>
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<td>Sand with clay, small rock</td>
<td>Hard Pan</td>
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<tr>
<td>30'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Sand with clay, small rock</td>
<td>Hard Pan</td>
</tr>
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<td>40'</td>
<td>Normal</td>
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<td></td>
<td>Sand with clay, small rock</td>
<td>Hard Pan</td>
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<td>50'</td>
<td>Normal</td>
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<td>Sand with clay, small rock</td>
<td>Hard Pan</td>
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<tr>
<td>60'</td>
<td>Normal</td>
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<tr>
<td>100'</td>
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<td></td>
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</tbody>
</table>

Driller Signature for Total Depth of Boring: ______________________  Total Depth: 80

Inspector Signature for Total Depth of Boring: ______________________  Total Depth: 80
Location: Orchard Terrace Apt's
Driller/Contractor: EJ Roddy & Son
Inspector: Nate Graves
Date/Time: 8/91

DIMENSIONS
A. Total depth of boring 80 ft.
B. Diameter of boring 1.5 ft.
C. Diameter of probe pipe .5 in.
D. Height of pipe above grade
1. 0 ft.
2. 7 ft.
3. 25 ft.
4. 61 ft.
5. 79 ft.
E. Depth of pipe below grade
1. 1 ft.
2. 25 ft.
3. 61 ft.
4. 79 ft.
F. Perforated pipe interval
1. from 5 ft. to 7 ft.
2. from 12 ft. to 25 ft.
3. from 30 ft. to 43 ft.
4. from 48 ft. to 61 ft.
5. from 66 ft. to 79 ft.
G. Permeable material interval
1. from 4 ft. to 8 ft.
2. from 10 ft. to 26 ft.
3. from 28 ft. to 44 ft.
4. from 46 ft. to 62 ft.
5. from 64 ft. to 80 ft.
H. Impermeable plug interval
1. from 1 ft. to 4 ft.
2. from 8 ft. to 10 ft.
3. from 26 ft. to 28 ft.
4. from 44 ft. to 46 ft.
5. from 62 ft. to 64 ft.
I. Backfill interval
1. from 10 ft. to .5 ft.
2. from .5 ft. to .5 ft.
3. from .5 ft. to .5 ft.
4. from .5 ft. to .5 ft.
5. from .5 ft. to .5 ft.

MATERIALS
Permeable material
Peg Gravel
Impermeable plug
Bentonite
Backfill material
Peg Gravel
Casing material

CONSTRUCTION
Method of fill placement
Pour through hollow auger
Method of casing placement

Comments

1/2" Dia. PVC Pipe Total lin. ft.
Total Well Construction Depth lin. ft.

Crew Foreman Sig. on Total Probe Completion Depth x Depth
PROBE COMPLETION SHEET

PROBE STATION NO. SPS II

Location: ____________________________
Contractor: _______________________

Inspector: __________________________
Date/Time: ___/1/91

- 1/2" Stainless Steel Metal Screws (no glue/primer used in the installation of these probes) (YES/NO)
- Identification of Probe Station (YES/NO)
- Identification of Probe Depths (YES/NO)
- Lab Cocks Installed W/Grease not Glued (YES/NO)
- Pre-Cast Concrete Vault on Top of Minimum 24" Bentonite Seal (YES/NO)
- Concrete Apron Installed in Accordance with Plans (YES/NO)

Crew Foreman Signature on Total Probe Completion Depth x ________________ Depth _______
DRILL REPORT

Well No. SPS 12
Date 9/10/81
Start Time 8:15
End Time 11:30
Total Time 3 hrs. 15 min.
Comments 1 of pipe above grade for installation

Bentonite Total
Ref. Page _____

Gravel Backfill Total
Ref. Page _____

FVC Pipe Total
1  8.0
2  28.5
3  49.0
4  69.5
5  90

Total FVC
245 Total

Depth of Well
90'
<table>
<thead>
<tr>
<th>DEPTH</th>
<th>MOISTURE CONTENT</th>
<th>STATE OF DECOMP.</th>
<th>SAMPLE No. FOR ANALYSIS</th>
<th>COMPOSITION DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Sand with some Clay</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>small Rock</td>
<td></td>
</tr>
<tr>
<td>20'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Sand with some Clay</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>small Rock</td>
<td></td>
</tr>
<tr>
<td>30'</td>
<td>Normal</td>
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<td></td>
<td>Sand with some Clay</td>
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<td></td>
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<td></td>
<td>small Rock</td>
<td></td>
</tr>
<tr>
<td>40'</td>
<td>Normal</td>
<td></td>
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<td>Sand with some Clay</td>
<td>Material seems to be close to hard pan</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>small Rock</td>
<td></td>
</tr>
<tr>
<td>50'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Sand with some Clay</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>small Rock, mix Medium Rock</td>
<td></td>
</tr>
<tr>
<td>60'</td>
<td>Normal</td>
<td>65' Damp</td>
<td></td>
<td>Sand with some Clay</td>
<td>65' Hit wet area dried out again</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>small Medium Rock</td>
<td></td>
</tr>
<tr>
<td>70'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Sand with some Clay</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>small Medium Rock</td>
<td></td>
</tr>
<tr>
<td>80'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Sand with some Clay</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>small Medium Rock</td>
<td></td>
</tr>
<tr>
<td>90'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Pure Sand w/Small Rock</td>
<td>89' it keep caving in dipped out to 90' Actual drill depth 92'</td>
</tr>
</tbody>
</table>

DRILLER SIGNATURE FOR TOTAL DEPTH OF BORING

INSPECTOR SIGNATURE FOR TOTAL DEPTH OF BORING
MONITORING PROBE CONSTRUCTION LOG
PROBE NO. SPS 12

Location: Orchard Terrace AP's
Driller/Contractor: El Roy & Sons
Inspector: Nate Graves
Date/Time: 9/10/91

DIMENSIONS
A. Total depth of boring 90 ft.
B. Diameter of boring 1.5 ft.
C. Diameter of prope pipe .5 in.
D. Height of pipe above grade
   1. 0 ft.
   2. 27.5 ft.
   3. 48 ft.
   4. 68.5 ft.
   5. 89 ft.
E. Depth of pipe below grade
   1. 7 ft.
   2. 27.5 ft.
   3. 48 ft.
   4. 68.5 ft.
   5. 89 ft.
F. Perforated pipe interval
   1. from 5 ft. to 7 ft.
   2. from 12 ft. to 27.5 ft.
   3. from 32.5 ft. to 48 ft.
   4. from 53 ft. to 68.5 ft.
   5. from 73.5 ft. to 89 ft.
G. Permeable material interval
   1. from 4 ft. to 8 ft.
   2. from 10 ft. to 28.5 ft.
   3. from 30.5 ft. to 49 ft.
   4. from 51 ft. to 69.5 ft.
   5. from 71.5 ft. to 90 ft.
H. Impermeable plug interval
   1. from 1 ft. to 4 ft.
   2. from 8 ft. to 10 ft.
   3. from 28.5 ft. to 30.5 ft.
   4. from 49 ft. to 51 ft.
   5. from 69.5 ft. to 71.5 ft.
I. Backfill interval
   1. from 1.5 ft. to .5 ft.
   2. from .5 ft. to 1.5 ft.
   3. from 2.5 ft. to .5 ft.
   4. from .5 ft. to 2.5 ft.
   5. from 2.5 ft. to .5 ft.

MATERIALS
Permeable material
   Pea Gravel
Impermeable plug
   Bentonite
Backfill material
   Pea Gravel
Casing material

CONSTRUCTION
Method of fill placement
   POUR THROUGH HOLLOW AUGER
Method of casing placement

Comments

1/2" Dia. PVC Pipe Total 245 lin. ft.
Total Well Construction Depth 90 lin. ft.

Crew Foreman Sig. on Total Probe Completion Depth x Depth 90'
PROBE COMPLETION CHECK SHEET
PROBE STATION NO. 5PS12

Location: Orchard Terrace Apts
Contractor: E.J. Bodo & Son
Inspector: Nate Graves
Date/Time: 1/1991

- 1/2" Stainless Steel Metal Screws (no glue/primer used in the installation of these probes) [YES/NO]
- Identification of Probe Station [YES/NO]
- Identification of Probe Depths [YES/NO]
- Lab Coats Installed W/Grease not Glued [YES/NO]
- Pre-Cast Concrete Vault on Top of Minimum 24" Bentonite Seal [YES/NO]
- Concrete Apron Installed in Accordance with Plans [YES/NO]

Crew Foreman Signature on Total Probe Completion Depth x ___________ Depth _______
City of Tacoma  
Public Works Department  
INSPECTOR'S DAILY REPORT  

Imp. No. AUG501  
Federal Aid No.  
Date 4/4/91  

Project Description  

Weather A.M. RAIN  
P.M. RAIN  

Contractor's Representative(s) and Title  
Jim N.  

Location and Type of Work  

Number and Classification of Contractor's Men and Equipment  
SAMS  

Diary (Report of day's operations, orders given and received, discussions with contractor or visitors from other City departments, unusual conditions, recommendations, traffic signing, change orders and force accounts)  

SPS-14  

START - 10:25  

1  
2"  
BENTONITE  
5"  
5" P. ROCK  
5 1/2 BENT 6th 13  
Pipes - 13 5"  

FINISH - 12:15  

Inspector's Signature
<table>
<thead>
<tr>
<th>DEPTH</th>
<th>MOISTURE CONTENT</th>
<th>STATE OF DECOMP.</th>
<th>SAMPLE NO. FOR ANALYSIS</th>
<th>COMPOSITION DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
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<tbody>
<tr>
<td>10'</td>
<td>NORMAL Damp</td>
<td>-</td>
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<tr>
<td>15'-20'</td>
<td>NORMAL Damp</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>100'</td>
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</table>

DRILLER SIGNATURE FOR TOTAL DEPTH OF BORING: [Signature]
TOTAL DEPTH 150'

INSPECTOR SIGNATURE FOR TOTAL DEPTH OF BORING: [Signature]
TOTAL DEPTH 150'
City of Tacoma
Public Works Department

INSPECTOR'S DAILY REPORT

Imp. No. AUS501 Federal Aid No. Date 4/4/91

Project Description SPS-15

Weather A.M. P.M. RAIN

Contractor's Representative(s) and Title J. N. Diller

Location and Type of Work

Number and Classification of Contractor's Men and Equipment SAMS

Diary (Report of day's operations, orders given and received, discussions with contractor or visitors from other City departments, unusual conditions, recommendations, traffic signing, change orders and force accounts)

SPS. 15

START 1250

12

20

5 DEE

5 P ROCK - 500 #

1/2 BENT - 75 #

13 3/8 PIPE

NO PROBLEMS DRILLING

9° HEEL

14

15 1/4

FINISH 1430

Inspector's Signature
<table>
<thead>
<tr>
<th>Depth</th>
<th>Moisture Content</th>
<th>State of Decomp.</th>
<th>Sample No. for Analysis</th>
<th>Composition Description</th>
<th>Comments</th>
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<tr>
<td>10'</td>
<td>MOIST</td>
<td></td>
<td></td>
<td></td>
<td>SAND/ROCK - FILL</td>
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<tr>
<td>15—20'</td>
<td>MOIST</td>
<td></td>
<td></td>
<td></td>
<td>SAND/ROCK -</td>
</tr>
<tr>
<td>30'</td>
<td></td>
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<td></td>
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<td>90'</td>
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<tr>
<td>100'</td>
<td></td>
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</tr>
</tbody>
</table>

Driller Signature for Total Depth of Boring: [Signature]
Total Depth: 154'

Inspector Signature for Total Depth of Boring: [Signature]
Total Depth: 159'
City of Tacoma
Public Works Department

INSPECTOR'S DAILY REPORT

Imp. No. AUG 501 Federal Aid No. Date 4/1/91
Project Description SPS 16
Weather A.M. RAIN P.M. RAIN
Contractor's Representative(s) and Title Jim N. - DRIVER
Location and Type of Work

Number and Classification of Contractor's Men and Equipment SAME

Diary (Report of day's operations, orders given and received, discussions with contractor or visitors from other City departments, unusual conditions, recommendations, traffic signing, change orders and force accounts)

SPS - 16 START 0815

- 0°
- 15°
- 2°
- 5°
- 6° Holes

NO PROBLEM DRILLING
CLASS ROCK

5 BARS P. ROCK 500
1 5 RIG RENT CHIPS 75 #

PIPS - 13.5 LF

14° PIPE

15°

FINISH 1010

[Inspector's Signature]
CITY OF TACOMA REFUSE UTILITY
PROBE DRILLING LOG

PROBE NUMBER SPS-16
DATE 4/4/91
INSPECTOR WA514

DRILLING START TIME 0815
DRILLING STOP TIME 1010
TOTAL DRILLING TIME 1:55

DRILLING BORE DIA. 0.75 FT
DRILLING EQUIPMENT/DRILLING CO. Hoot
OPERATOR NAME __________

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>MOISTURE CONTENT</th>
<th>STATE OF DECOMP.</th>
<th>SAMPLE NO. FOR ANALYSIS</th>
<th>COMPOSITION DESCRIPTION</th>
<th>COMMENTS</th>
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<tr>
<td>10'</td>
<td>DAMP</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>BACK FILL/HACCPAN/ROCK CLAY</td>
</tr>
<tr>
<td>15'</td>
<td>DAMP</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>BACK FILL/HACCPAN/ROCK CLAY</td>
</tr>
<tr>
<td>20'</td>
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<tr>
<td>100'</td>
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<td></td>
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</tr>
</tbody>
</table>

DRILLER SIGNATURE FOR TOTAL DEPTH OF BORING __________
TOTAL DEPTH 15'

INSPECTOR SIGNATURE FOR TOTAL DEPTH OF BORING __________
TOTAL DEPTH 15'
City of Tacoma
Public Works Department

INSPECTOR'S DAILY REPORT

Imp. No. A06501 Federal Aid No. Date 4/17/91

Project Description SPS-17

Weather A.M. P.M. 4/17/18 4/18/18

Contractor's Representative(s) and Title P. Miller

Location and Type of Work

Number and Classification of Contractor's Men and Equipment S A M Y S

Diary (Report of day's operations, orders given and received, discussions with contractor or visitors from other City departments, unusual conditions, recommendations, traffic signing, change orders and force accounts)

SPS-17

<table>
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<th>Start</th>
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<tr>
<td>Finish</td>
<td>4/17 1645 60'</td>
</tr>
<tr>
<td>Start</td>
<td>4/18 0730</td>
</tr>
<tr>
<td>Finish</td>
<td>4/18 1745</td>
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</tbody>
</table>

4/18 Arrived at Site - Drilling Big Line Van Mieoed During Night

22H 16.5 1.1

Aqua fee 26.7 28.7

K X 12 100 2.60

Aqua fee 404 41.4 2.5

Pipe 6.5 2 16.5 3 35.9

108 13 100 4 71.8 5 93.5

723 738 757 772

11.8 13.100

90

Inspector's Signature
<table>
<thead>
<tr>
<th>Depth</th>
<th>Moisture Content</th>
<th>State of Decomp.</th>
<th>Sample No. for Analysis</th>
<th>Composition Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>10'</td>
<td>Normal</td>
<td>-</td>
<td>-</td>
<td>Gravel, Blown, Sand</td>
<td></td>
</tr>
<tr>
<td>20'</td>
<td>Damp</td>
<td>-</td>
<td>-</td>
<td>Gravel, Blown, Sand, Silt</td>
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</tr>
<tr>
<td>30'</td>
<td>Damp</td>
<td>Wet</td>
<td>-</td>
<td>Dark Blown, Gravel, Sand, Silt, Muddy - Gravel Sand</td>
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</tr>
<tr>
<td>40'</td>
<td>Damp</td>
<td>Normal</td>
<td>-</td>
<td>Gravel, Sand</td>
<td></td>
</tr>
<tr>
<td>50'</td>
<td>Normal</td>
<td>-</td>
<td>-</td>
<td>Gravel, Sand</td>
<td></td>
</tr>
<tr>
<td>60'</td>
<td>Damp</td>
<td>Wet</td>
<td>-</td>
<td>Muddy Light Gravel (Thick), Gravel Sand</td>
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<tr>
<td>70'</td>
<td>Damp</td>
<td>Normal</td>
<td>-</td>
<td>Gravel Sand</td>
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</tr>
<tr>
<td>75'</td>
<td>Normal</td>
<td>Wet</td>
<td>-</td>
<td>Muddy Sand, Silt (Soup), Muddy Sandy (Thick)</td>
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</tbody>
</table>

Driller Signature for Total Depth of Boring: [Signature]  
Total Depth: 95'  
Inspector Signature for Total Depth of Boring: [Signature]  
Total Depth: 95'
City of Tacoma  
Public Works Department  
INSPECTOR'S DAILY REPORT  

Imp. No. **AU6501**  
Federal Aid No.  
Date **06-20-91**  

**Project Description**  
**GAS PROBE INSTALLATION**  

**Weather A.M.**  
**RAIN**  
**P.M.**  
**RAIN**  

**Contractor's Representative(s) and Title**  
**PAT MILLER (DRILLER) AND 2 ASSISTANTS**  

**Location and Type of Work**  

**Number and Classification of Contractor's Men and Equipment**  

**Diary** (Report of day's operations, orders given and received, discussions with contractor or visitors from other City departments, unusual conditions, recommendations, traffic signing, change orders and force accounts)

<table>
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<th>Date</th>
<th>Time</th>
<th>Description</th>
<th>Details</th>
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<tr>
<td>05-20-91</td>
<td>8:30 AM</td>
<td><strong>STARTED DRILLING</strong></td>
<td><strong>TRANSPORT PROBLEMS 9:45 AM 10' DEPTH</strong></td>
</tr>
<tr>
<td></td>
<td>11:00 AM</td>
<td><strong>LETION</strong></td>
<td><strong>GROUNDS 11:00 AM</strong></td>
</tr>
<tr>
<td>06-20-91</td>
<td>8:15 AM</td>
<td><strong>ARRIVED</strong></td>
<td><strong>STARTED DRILLING 8:15 AM</strong></td>
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<tr>
<td></td>
<td>12:00 NOON</td>
<td><strong>STOPPED DRILLING</strong></td>
<td><strong>12:00 NOON</strong></td>
</tr>
<tr>
<td>16.75</td>
<td>20</td>
<td><strong>SCREEN</strong></td>
<td><strong>TOTAL DRILL TIME: 3 HRS</strong></td>
</tr>
<tr>
<td>20</td>
<td>28.75</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>29.75</td>
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</tr>
<tr>
<td></td>
<td>31.75</td>
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<td>33.75</td>
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<td></td>
<td>16.75</td>
<td><strong>SCREEN</strong></td>
<td></td>
</tr>
<tr>
<td>50.5</td>
<td>51.5</td>
<td><strong>86 - BAGS PEAS ROCK</strong></td>
<td><strong>#60 EA. = #5160</strong></td>
</tr>
<tr>
<td>53.5</td>
<td>55.5</td>
<td><strong>12 - BAGS BENT. CHIPS</strong></td>
<td><strong>#80 EA. = #600</strong></td>
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<td>16.75</td>
<td>59</td>
<td><strong>SCREEN</strong></td>
<td><strong>LEFT SITE 6 PM</strong></td>
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<tr>
<td>72.5</td>
<td>75.75</td>
<td><strong>PVC PIPE</strong></td>
<td><strong>1) 6.5</strong></td>
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<tr>
<td></td>
<td>75.75</td>
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<td><strong>2) 28.25</strong></td>
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<tr>
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<td>77.25</td>
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<td><strong>3) 50.</strong></td>
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<tr>
<td>16.75</td>
<td>94</td>
<td><strong>SCREEN</strong></td>
<td><strong>4) 71.75</strong></td>
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<td><strong>5) 93.5</strong></td>
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<td><strong>TOTAL 250 LF</strong></td>
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</table>

[Signature]
David L. Evans  
Inspector's Signature
MONITORING PROBE CONSTRUCTION LOG
PROBE NO. JF5-178

Location: CHRCH  Inspector: D.G. BURNS
Driller/Contractor: P. MILLER-HOLT  Date/Time: 06/20/91

DIMENSIONS
A. Total depth of boring: 95 ft.
B. Diameter of boring: 9 ft.
C. Diameter of prop pipe: 5 in.
D. Height of pipe above grade
   1. 0 ft.
   2. 10 ft.
E. Depth of pipe below grade
   1. 6.5 ft.  2. 8.75 ft.
   3. 10 ft.  4. 12 ft.
   5. 18 ft.
F. Perforated pipe interval
   1. from 5 ft. to 7 ft.
   2. from 12 ft. to 28.75 ft.
   3. from 33.75 ft. to 50.5 ft.
   4. from 55.5 ft. to 72.25 ft.
   5. from 77.25 ft. to 94 ft.
G. Permeable material interval
   1. from 4 ft. to 8 ft.
   2. from 10 ft. to 28.75 ft.
   3. from 31.75 ft. to 51.5 ft.
   4. from 55.5 ft. to 73.25 ft.
   5. from 77.25 ft. to 95 ft.
H. Impermeable plug interval
   1. from 1.5 ft. to 4 ft.
   2. from 8 ft. to 10 ft.
   3. from 28.75 ft. to 31.75 ft.
   4. from 51.5 ft. to 53.5 ft.
   5. from 73.25 ft. to 75.25 ft.
I. Backfill interval
   1. from 1.5 ft. to 5 ft.
   2. from 18 ft. to 28.75 ft.
   3. from 28.75 ft. to 31.75 ft.
   4. from 51.5 ft. to 53.5 ft.
   5. from 73.25 ft. to 75.25 ft.

MATERIALS
Permeable material
PEA ROCK
Impermeable plug
BENTONITE CHIPS
Backfill material
PEA ROCK/CEMENT ON TOP
Casing material
CONSTRUCTION
Method of fill placement
POUR THROUGH HOLLOW AUGER
Method of casing placement
Comments

1/2" Dia. PVC Pipe Total 250 lin. ft.
Total Well Construction Depth 95 lin. ft.

Crew Foreman Sig. on Total Probe Completion Depth 85
<table>
<thead>
<tr>
<th>DEPTH</th>
<th>MOISTURE CONTENT</th>
<th>STATE OF DECOMP.</th>
<th>SAMPLE NO. FOR ANALYSIS</th>
<th>COMPOSITION DESCRIPTION</th>
<th>COMMENTS</th>
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<tr>
<td>10'</td>
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</tr>
<tr>
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DRILLER SIGNATURE FOR TOTAL DEPTH OF BORING: [Signature]  TOTAL DEPTH: 95'

INSPECTOR SIGNATURE FOR TOTAL DEPTH OF BORING: [Signature]  TOTAL DEPTH: 96'
PROBE COMPLETION CHECK SHEET

PROBE STATION NO. 575-178

Location: CHRCH
Contractor: HOLT DRILLING

Inspector: D.G. BURNS
Date/Time: 03/20/91

- 1/2" Stainless Steel Metal Screws (no glue/primer used in the installation of these probes) YES NO
- Identification of Probe Station YES NO
- Identification of Probe Depths YES NO
- Lab Cocks Installed W/Grease not Glued YES NO
- Pre-Cast Concrete Vault on Top of Minimum 24" Bentonite Seal YES NO
- Concrete Apron Installed in Accordance with Plans YES NO

Crew Foreman Signature on Total Probe Completion Depth Depth 95
City of Tacoma  
Public Works Department  
INSPECTOR'S DAILY REPORT  

Imp. No. A00501  Federal Aid No.  Date 4/8/91

Project Description SPS - 18  
Weather A.M. CLEAR  P.M. LIGHT RAIN

Contractor's Representative(s) and Title  

Location and Type of Work  

Number and Classification of Contractor's Men and Equipment  

Diary (Report of day's operations, orders given and received, discussions with contractor or visitors from other City departments, unusual conditions, recommendations, traffic signing, change orders and force accounts)

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Inspectors Signature
### CITY OF TACOMA REFUSE UTILITY
### PROBE DRILLING LOG

**PROBE NUMBER**: SPS-1B  
**DATE**: 4/8/91  
**INSPECTOR**: WASH

**DRILLING START TIME**: 0825  
**DRILLING STOP TIME**: 1520  
**TOTAL DRILLING TIME**: 6:55

**DRILLING BORE DIA.**: 6.8 FT  
**DRILLING EQUIPMENT/DRILLING CO.**: Hout  
**OPERATOR NAME**: Mike

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<th>STATE OF DECOMP.</th>
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**DRILLER SIGNATURE FOR TOTAL DEPTH OF BORING**: 
**TOTAL DEPTH**: 55'

**INSPECTOR SIGNATURE FOR TOTAL DEPTH OF BORING**: 
**TOTAL DEPTH**: 55'
**DRILL REPORT**

**Well No.** SPS 21  
**Date** 08/28/91

**Start Time** 1:15pm  
**End Time** 6:30pm  
**Total Time** 5 hours 15 minutes

**Comments** Drilled through waste from entire way.

### Bentonite Total

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2.3 bags = 1150 ft

### Gravel Backfill Total

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### PVC Pipe Total

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1. 8'

2. 28.6'

3. 49.3'

4. 50'

Total PVC: 156'

### Depth of Well

70'
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<td>Poured water into well/probe hole to ease drilling</td>
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**DRILLER SIGNATURE FOR TOTAL DEPTH OF BORING**

**TOTAL DEPTH** 70

**INSPECTOR SIGNATURE FOR TOTAL DEPTH OF BORING**

**TOTAL DEPTH** 70
MONITORING PROBE CONSTRUCTION LOG
PROBE NO. SPE 21

Location: Overseek Run Equipment
Driller/Contractor: EJ. Reay & Sons
Inspector: C. O'Brien
Date/Time: 08/28/91

DIMENSIONS
A. Total depth of boring 70 ft.
B. Diameter of boring 1 ft.
C. Diameter of probe pipe 0.5 in.
D. Height of pipe above grade 1 ft.

E. Depth of pipe below grade
1. 7 ft.
2. 2.5 ft.
3. 48.3 ft.
4. 69 ft.
5. ft.

F. Perforated pipe interval
1. from 5 ft. to 27 ft.
2. from 12 ft. to 27 ft.
3. from 32 ft. to 48.3 ft.
4. from 33 ft. to 69 ft.
5. from ft. to ft.

G. Permeable material interval
1. from 4 ft. to 8 ft.
2. from 10 ft. to 28.6 ft.
3. from 30.6 ft. to 49.3 ft.
4. from 51.3 ft. to 70 ft.
5. from ft. to ft.

H. Impermeable plug interval
1. from 1 ft. to 4 ft.
2. from 8 ft. to 10 ft.
3. from 28.6 ft. to 30.6 ft.
4. from 49.3 ft. to 51.3 ft.
5. from ft. to ft.

I. Backfill interval
1. from 18 ft. to 5 ft.
2. from ft. to ft.
3. from ft. to ft.
4. from ft. to ft.
5. from ft. to ft.

MATERIALS
Permeable material
Per gravel
Impermeable plug
Bentonite
Backfill material
Per gravel
Casing material

CONSTRUCTION
Method of fill placement
Pour through hollow auger
Method of casing placement

Comments
Drilled through hanned entire depth

1/2" Dia. PVC Pipe Total 756 ft.
Total Well Construction Depth 70 ft.

Crew Foreman Sig. on Total Probe Completion Depth X 0.12 ft.
PROBE COMPLETION CHECK SHEET

PROBE STATION NO. SPS21

Location: Overlook Run
Contractor: E. T. Ryan & Sons
Inspector: C. O' Barrel
Date/Time: 08/28/91

- 1/2" Stainless Steel Metal Screws (no glue/primer used in the installation of these probes)  YES NO
- Identification of Probe Station  YES NO
- Identification of Probe Depths  YES NO
- Lab Cocks Installed W/Grease not Glued  YES NO
- Pre-Cast Concrete Vault on Top of Minimum 24" Bentonite Seal  YES NO
- Concrete Apron Installed in Accordance with Plans  YES NO

Crew Foreman Signature on Total Probe Completion Depth x Depth 70'
DRILL REPORT

Well No. 5PS 24

Date 08/29/91, 08/30/91

Start Time 8:05 8/29
End Time 3:00 12:35 8/30

Total Time 11 hrs 00 min

Comments: Drilled through humus to ~78', then hit a more sandy material layer. Drilled to 90' - hole cover in 90'-92' drilled back to 90' and set a 90' probe (instead of a 110' probe) (Table drill could only go to 90' - past 90' hard to use a stem on a table type drill)

Bentonite Total
Ref. Page _________

Gravel Backfill Total
Ref. Page _________

PVC Pipe Total
Ref. Page _________

28 bags = 1400 lb.

Depth of Well

90'

Drill L.F. = 90'
<table>
<thead>
<tr>
<th>DEPTH</th>
<th>MOISTURE CONTENT</th>
<th>STATE OF DECOMP.</th>
<th>SAMPLE NO. FOR ANALYSIS</th>
<th>COMPOSITION DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Silty Sand - Small Cobble</td>
<td>Pouring Water into hole</td>
</tr>
<tr>
<td>20'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Silty Sand w/some clay (hand pan) small-medium cobbles</td>
<td>To ease drilling and increase cohesion to drill from 30' to 80'</td>
</tr>
<tr>
<td>30'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Silty Sand w/some clay (hand pan) small-medium cobbles</td>
<td></td>
</tr>
<tr>
<td>40'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Silty Sand w/some clay (hand pan) small-medium cobbles</td>
<td></td>
</tr>
<tr>
<td>50'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Silty Sand w/some clay (hand pan) small-medium cobbles</td>
<td></td>
</tr>
<tr>
<td>60'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Silty Sand w/some clay (hand pan) small-medium cobbles</td>
<td>Drilling into a more sandy material layer</td>
</tr>
<tr>
<td>70'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Silty Sand (hand pan) small-medium cobbles</td>
<td>Hole caved in using stem</td>
</tr>
<tr>
<td>80'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Silty Sand small-medium cobbles</td>
<td></td>
</tr>
<tr>
<td>90'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Silty Sand small-medium cobbles</td>
<td></td>
</tr>
</tbody>
</table>

DRILLER SIGNATURE FOR TOTAL DEPTH OF BORING

INSPECTOR SIGNATURE FOR TOTAL DEPTH OF BORING
MONITORING PROBE CONSTRUCTION LOG
PROBE NO. SPS 24

Location: OVERLOOK RIM
Driller/Contractor: E.J. Studio & Son
Inspector: C. O'Brien
Date/Time: 08/29/81

DIMENSIONS
A. Total depth of boring 90 ft.
B. Diameter of boring 1 ft.
C. Diameter of prop pipe .5 in.
D. Height of pipe above grade 0 ft.
E. Depth of pipe below grade
   1. 7 ft.
   2. 27.5 ft.
   3. 48 ft.
   4. 68.5 ft.
   5. 89 ft.
F. Perforated pipe interval
   1. from 5 ft. to 7 ft.
   2. from 12 ft. to 27.5 ft.
   3. from 32.5 ft. to 48 ft.
   4. from 53 ft. to 68.5 ft.
   5. from 73.5 ft. to 89 ft.
G. Permeable material interval
   1. from 4 ft. to 8 ft.
   2. from 10 ft. to 28.5 ft.
   3. from 30.5 ft. to 49 ft.
   4. from 51 ft. to 69.5 ft.
   5. from 71.5 ft. to 90 ft.
H. Impermeable plug interval
   1. from 1 ft. to 4 ft.
   2. from 8 ft. to 10 ft.
   3. from 28.5 ft. to 30.5 ft.
   4. from 51 ft. to 57 ft.
   5. from 69.5 ft. to 71.5 ft.
I. Backfill interval
   1. from 18 ft. to 5 ft.
   2. from 53 ft. to 55 ft.
   3. from 68.5 ft. to 70 ft.
   4. from 73.5 ft. to 79 ft.
   5. from 89 ft. to 90 ft.

MATERIALS
Permeable material
   Pea Gravel
Impermeable plug
   Bentonite
Backfill material
   Pea Gravel
Casing material

CONSTRUCTION
Method of fill placement
   Pour through Hollow Auger
Method of casing placement

Comments
   Well cave in at 90' to 92'
   Required and set a 90' well
   Instead of 110'

1/2" Dia. PVC Pipe Total 1 lin. ft.
Total Well Construction Depth 90' 1 lin. ft.

Draw Foreman Sign on Total Probe Completion Depth 90'
PROBE COMPLETION CHECK SHEET
PROBE STATION NO. SPS24

Location: Overlook Rim
Contractor: E.J. Roody & Sons

Inspector: C. O'Brien
date/Time: 08/10/91

- 1/2" Stainless Steel Metal Screws (no glue/primer used in the installation of these probes) [YES] [NO]
- Identification of Probe Station [YES] [NO]
- Identification of Probe Depths [YES] [NO]
- Lab Cocks Installed W/Grease not Glued [YES] [NO]
- Pre-Cast Concrete Vault on Top of Minimum 24" Bentonite Seal [YES] [NO]
- Concrete Apron Installed in Accordance with Plans [YES] [NO]

Crew Foreman Signature on Total Probe Completion Depth X ______________________ Depth _______
DRILL REPORT

Well No. SPS25

Date 08/30/91

Start Time 11:55 am

End Time 5:18 pm

Total Time 5.2 hrs

Comments material was consistent throughout entire drill process.

<table>
<thead>
<tr>
<th>Layer</th>
<th>Depth</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>27.6</td>
</tr>
<tr>
<td>1</td>
<td>28.6</td>
</tr>
<tr>
<td>2</td>
<td>30.6</td>
</tr>
<tr>
<td>2</td>
<td>32.6</td>
</tr>
<tr>
<td>1</td>
<td>49.3</td>
</tr>
<tr>
<td>1</td>
<td>49.3</td>
</tr>
<tr>
<td>2</td>
<td>51.3</td>
</tr>
<tr>
<td>2</td>
<td>53.3</td>
</tr>
<tr>
<td>2</td>
<td>61.3</td>
</tr>
</tbody>
</table>

Bentonite Total 18 bags = 900 lb

Gravel Backfill Total

PVC Pipe Total

Depth of Well 70
<table>
<thead>
<tr>
<th>Depth</th>
<th>Moisture Content</th>
<th>State of Decomp.</th>
<th>Sample No. for Analysis</th>
<th>Composition Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>10'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Silty Sand w/ clay</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SMALL-MEDIUM COBBLES</td>
<td></td>
</tr>
<tr>
<td>20'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Silty Sand w/ clay</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SMALL-MEDIUM COBBLES</td>
<td></td>
</tr>
<tr>
<td>30'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Silty Sand w/ some clay</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SMALL-MEDIUM COBBLES</td>
<td></td>
</tr>
<tr>
<td>40'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Silty Sand w/ some clay</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SMALL-MEDIUM COBBLES</td>
<td></td>
</tr>
<tr>
<td>50'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Silty Sand</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SMALL-MEDIUM COBBLES</td>
<td></td>
</tr>
<tr>
<td>60'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Silty Sand</td>
<td>water poured into hole to ease</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SMALL-MEDIUM COBBLES</td>
<td></td>
</tr>
<tr>
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<td>Normal</td>
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<td></td>
<td>Silty Sand</td>
<td>Drilling</td>
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<td></td>
<td></td>
<td>SMALL-COBBLIES</td>
<td></td>
</tr>
<tr>
<td>80'</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>90'</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>100'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Driller Signature for Total Depth of Boring: [Signature]  Total Depth: 70'

Inspector Signature for Total Depth of Boring: [Signature]  Total Depth: 70
MONITORING PROBE CONSTRUCTION LOG
PROBE NO. SP525

Location: OVERLOOK RIN  Inspector: C. O'BRIEN
Driller/Contractor: E. T. ROBY & SONS Date/Time: 09/30/91

DIMENSIONS
A. Total depth of boring 70 ft.
B. Diameter of boring 1 ft.
C. Diameter of probe pipe .5 in.
D. Height of pipe above grade
   1. 0 ft.
   2. 7 ft.
   3. 48.3 ft.
   4. 69 ft.
   5. ft.

E. Depth of pipe below grade
   1. 7 ft.
   2. 27.6 ft.
   3. 48.3 ft.
   4. 69 ft.
   5. ft.

F. Perforated pipe interval
   1. from 5 ft. to 7 ft.
   2. from 12 ft. to 27.6 ft.
   3. from 32.4 ft. to 48.3 ft.
   4. from 53.3 ft. to 69 ft.
   5. from ft. to ft.

G. Permeable material interval
   1. from 4 ft. to 8 ft.
   2. from 10 ft. to 28.6 ft.
   3. from 35.6 ft. to 49.3 ft.
   4. from 51.3 ft. to 70 ft.
   5. from ft. to ft.

H. Impermeable plug interval
   1. from 1 ft. to 4 ft.
   2. from 8 ft. to 10 ft.
   3. from 28.6 ft. to 35.6 ft.
   4. from 49.3 ft. to 51.3 ft.
   5. from ft. to ft.

I. Backfill interval
   1. from 16 ft. to .5 ft.
   2. from ft. to ft.
   3. from ft. to ft.
   4. from ft. to ft.
   5. from ft. to ft.

MATERIALS
Permeable material  PER GRAVEL
Impermeable plug  BENTONITE
Backfill material  PER GRAVEL
Casing material  N.A.

CONSTRUCTION
Method of fill placement
POUR THROUGH HOLLOW AUGER
Method of casing placement

Comments

1/2" Dia. PVC Pipe Total 70 lin. ft.
Total Well Construction Depth 70 lin. ft.

Crew Foreman Sig. on Total Probe Completion Depth x Roi.
PROBE COMPLETION CHECK SHEET
PROBE STATION NO.: SPS 25

Location: Overlook Rim
Contractor: E.J. Reay & Sons
Inspector: O'Brien
Date/Time: 1/1/91

- 1/2" Stainless Steel Metal Screws (no glue/primer used in the installation of these probes) [YES] [NO]
- Identification of Probe Station [YES] [NO]
- Identification of Probe Depths [YES] [NO]
- Lab Cocks Installed W/Grease not Glued [YES] [NO]
- Pre-Cast Concrete Vault on Top of Minimum 24" Bentonite Seal [YES] [NO]
- Concrete Apron Installed in Accordance with Plans [YES] [NO]

Crew Foreman Signature on Total Probe Completion Depth X ____________________________ Depth ______
DRILL REPORT

Well No. SPS 27
Start Time 9:20
End Time 3:00
Total Time 5 hrs 40 min.

Date 9-3-91

Comments

Bentonite Total
Ref. Page 700 lbs
14 Bags = 700 lbs

Gravel Backfill Total
Ref. Page

PVC Pipe Total
1 8
2 28.6
3 49.3
4 76.0
Total PVC 155.9

Depth of Well 70'
<table>
<thead>
<tr>
<th>Depth</th>
<th>Moisture Content</th>
<th>State of Decomp.</th>
<th>Sample No. for Analysis</th>
<th>Composition Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>10'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Sand &amp; Clay</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Small To Medium Rocks</td>
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<td></td>
<td>Small To Medium Rocks</td>
<td></td>
</tr>
<tr>
<td>30'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Sand &amp; Clay</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Small To Medium Rocks</td>
<td></td>
</tr>
<tr>
<td>40'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Sand &amp; Clay</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Small To Medium Rocks</td>
<td></td>
</tr>
<tr>
<td>50'</td>
<td>Damp</td>
<td></td>
<td></td>
<td>Mono Clay Than Sand</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td>Small Rocks</td>
<td></td>
</tr>
<tr>
<td>60'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Sand &amp; Clay</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Small Rocks</td>
<td></td>
</tr>
<tr>
<td>70'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Sand &amp; Clay</td>
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</tr>
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</tr>
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<td>80'</td>
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</tr>
<tr>
<td>90'</td>
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</tr>
<tr>
<td>100'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Driller Signature for Total Depth of Boring:**

**Inspector Signature for Total Depth of Boring:**

**Total Depth:**

---

**Drilling Log Details:**

- **Probe Number:** SPS 27
- **Date:** 9/3/91
- **Inspector:** Nate Graves
- **Drilling Start Time:** 9:20 am
- **Drilling Stop Time:** 2:00
- **Total Drilling Time:** 4 hr 40 min
- **Drilling Bore Dia.:** 1"
- **Drilling Equipment/Drilling Co.:** EJ Rody & Sons
- **Operator Name:** Dave Wolven
MONITORING PROBE CONSTRUCTION LOG
PROBE NO. 5PS-27

Location: Overlook Rim Area
Driller/Contractor: EJ Boyd & Sons
Inspector: Nate Graves
Date/Time: 9/3/91

DIMENSIONS
A. Total depth of boring 70 ft.
B. Diameter of boring 1 ft.
C. Diameter of probe pipe .5 in.
D. Height of pipe above grade
   1. 0 ft.
   3. 48.3 ft.
   5.
E. Depth of pipe below grade
   1. 7 ft.
   2. 27.6 ft.
   3. 48.3 ft.
   4. 69.
   5.
F. Perforated pipe interval
   1. from 5 ft. to 7 ft.
   2. from 12 ft. to 27.6 ft.
   3. from 32.6 ft. to 48.3 ft.
   4. from 53.3 ft. to 69.
   5.
G. Permeable material interval
   1. from 4 ft. to 8 ft.
   2. from 10 ft. to 28.6 ft.
   3. from 30.6 ft. to 49.3 ft.
   4. from 51.3 ft. to 70
   5.
H. Impermeable plug interval
   1. from 1 ft. to 4 ft.
   2. from 8 ft. to 10 ft.
   3. from 28.6 ft. to 30.6 ft.
   4. from 49.3 ft. to 51.3 ft.
   5.
I. Backfill interval
   1. from 1.0 ft. to .5 ft.
   2. from 3 ft. to 3 ft.
   3. from 4 ft. to 4 ft.
   4. from 5 ft. to 5 ft.
   5.

MATERIALS
Permeable material
Pea Gravel

Impermeable plug
Bentonite

Backfill material
Bentonite to Pea Gravel

Casing material

CONSTRUCTION
Method of fill placement
POUR THROUGH HOLLOW AUGER
Method of casing placement

Comments

1/2" Dia. PVC Pipe Total 156 lin. ft.
Total Well Construction Depth 70 lin. ft.

Crew Foreman Sig. on Total Probe Completion Depth 70'
Location: Overlook Rim Apts  
Contractor: EJ Rody & Sons

Inspector: Nate Graves  
Date/Time: 1/91

- 1/2" Stainless Steel Metal Screws (no glue/primer used in the installation of these probes)  
  YES  NO

- Identification of Probe Station  
  YES  NO

- Identification of Probe Depths  
  YES  NO

- Lab Cocks Installed W/Grease not Glued  
  YES  NO

- Pre-Cast Concrete Vault on Top of Minimum 24" Bentonite Seal  
  YES  NO

- Concrete Apron Installed in Accordance with Plans  
  YES  NO

Crew Foreman Signature on Total Probe Completion Depth: x. ___________________________ Depth ________
DRILL REPORT

Well No. 6PS 28
Date 9-4-91

Start Time 2:20 pm
End Time 4:45

Total Time 2 hrs 25 min

Comments: drill auger 12" broke off in first hole, could not remove, redrilled.

---

Bentonite Total
Ref. Page 900 lb

Gravel Backfill Total
Ref. Page

PVC Pipe Total
Ref. Page

1 8.0
2 28.6
3 49.3
4 70.0

Total PVC 155.9

18 bags = 900 lbs

---

Depth of Well 70
### CITY OF JMA RISE UTILITY
### PROBE DRILLING LOG

**PROBE NUMBER**  SPS 28  **DATE**  9/4/91  **INSPECTOR**  Nate Graves  
**DRILLING START TIME**  3:20 pm  **DRILLING STOP TIME**  4:45 pm  **TOTAL DRILLING TIME**  2 hr. 25 min.
**DRILLING BORE DIA.**  1 1/2'  **DRILLING EQUIPMENT/DRILLING CO.**  EJ Rody & Sons  **OPERATOR NAME**  Dave Walen

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>MOISTURE CONTENT</th>
<th>STATE OF DECOMP.</th>
<th>SAMPLE NO. FOR ANALYSIS</th>
<th>COMPOSITION DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10'</td>
<td>Normal</td>
<td>To Dry</td>
<td></td>
<td>Clay with Sand</td>
<td></td>
</tr>
<tr>
<td>20'</td>
<td>Normal</td>
<td>To Wet</td>
<td></td>
<td>Clay with Sand</td>
<td></td>
</tr>
<tr>
<td>30'</td>
<td>Normal</td>
<td>To Damp</td>
<td></td>
<td>Clay with Sand</td>
<td></td>
</tr>
<tr>
<td>40'</td>
<td>Normal</td>
<td>To Damp</td>
<td></td>
<td>Clay with Sand</td>
<td></td>
</tr>
<tr>
<td>50'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Sand with Clay</td>
<td>Drill Teeth kept coming off</td>
</tr>
<tr>
<td>60'</td>
<td>Normal</td>
<td></td>
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<td>Sand with Clay</td>
<td>Contractor installed new Drill Teeth</td>
</tr>
<tr>
<td>70'</td>
<td>Normal</td>
<td></td>
<td></td>
<td>Sand with Clay</td>
<td>Water being used (2' auger broke)</td>
</tr>
<tr>
<td>80'</td>
<td></td>
<td></td>
<td></td>
<td>Sand with Clay</td>
<td></td>
</tr>
<tr>
<td>90'</td>
<td></td>
<td></td>
<td></td>
<td>Sand with Clay</td>
<td></td>
</tr>
<tr>
<td>100'</td>
<td></td>
<td></td>
<td></td>
<td>Sand with Clay</td>
<td></td>
</tr>
</tbody>
</table>

**DRILLER SIGNATURE FOR TOTAL DEPTH OF BORING**  [Signature]  **TOTAL DEPTH**  [M]  
**INSPECTOR SIGNATURE FOR TOTAL DEPTH OF BORING**  [Signature]  **TOTAL DEPTH**  70
MONITORING PROBE CONSTRUCTION LOG
PROBE NO. SPS28

Location: Nob Hill Apt's.
Driller/Contractor: EJ Roddy & Sons

Inspector: Nate Graves
Date/Time: 9/4/91

DIMENSIONS
A. Total depth of boring 70 ft.
B. Diameter of boring 1.5 ft.
C. Diameter of probe pipe .5 in.
D. Height of probe above grade
1. 0 ft.
2. 27.6 ft.
3. 48.3 ft.
4. 69.0 ft.
5. ft.
F. Perforated pipe interval
1. from 5.0 ft. to 7.0 ft.
2. from 12.0 ft. to 27.6 ft.
3. from 33.0 ft. to 48.3 ft.
4. from 53.3 ft. to 69.0 ft.
5. ft.
G. Permeable material interval
1. from 4.0 ft. to 8.0 ft.
2. from 10.0 ft. to 28.0 ft.
3. from 30.6 ft. to 49.3 ft.
4. from 51.3 ft. to 70.0 ft.
5. ft.
H. Impermeable plug interval
1. from 1.0 ft. to 4.0 ft.
2. from 8.0 ft. to 10.0 ft.
3. from 28.0 ft. to 30.0 ft.
4. from 49.3 ft. to 51.3 ft.
5. ft.
I. Backfill interval
1. from 1.0 ft. to .5 ft.
2. from .5 ft. to .5 ft.
3. from .5 ft. to .5 ft.
4. from .5 ft. to .5 ft.
5. ft.

MATERIALS
Permeable material
- Pea Gravel
Impermeable plug
- Bentonite
Backfill material
- Pea Gravel
Casing material

CONSTRUCTION
Method of fill placement
- Pour Through Hollow Auger
Method of casing placement

Comments

1/2" Dia. PVC Pipe Total 156.0 lin. ft.
Total Well Construction Depth 70 lin. ft.

Crew Foreman Sig. on Total Probe Completion Depth x___ Depth ___
PROBE COMPLETION CHECK SHEET

PROBE STATION NO. SPS 28

Location: Nob Hill Apts.    Inspector: Nate Graves
Contractor: E.J. Rody & Sons    Date/Time: 1/1991

- 1/2" Stainless Steel Metal Screws (no glue/primer used in the installation of these probes)  YES NO
- Identification of Probe Station YES NO
- Identification of Probe Depths YES NO
- Lab Cocks Installed W/Grease not Glued YES NO
- Pre-Cast Concrete Vault on Top of Minimum 24" Bentonite Seal YES NO
- Concrete Apron Installed in Accordance with Plans YES NO

Crew Foreman Signature on Total Probe Completion Depth: [Signature]
**City of Tacoma**  
**Public Works Department**  
**INSPECTOR'S DAILY REPORT**  

<table>
<thead>
<tr>
<th>Imp. No.</th>
<th>AU 6501</th>
<th>Federal Aid No.</th>
<th>Date</th>
<th>4/5/91</th>
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**Project Description**
SPS 30

**Weather A.M.**

<table>
<thead>
<tr>
<th>P.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>S0 W5</td>
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**Contractor's Representative(s) and Title**
J. W.

**Location and Type of Work**

**Number and Classification of Contractor's Men and Equipment**

| SAMU |

**Diary (Report of day's operations, orders given and received, discussions with contractor or visitors from other City departments, unusual conditions, recommendations, traffic signing, change orders and force accounts)**

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<tr>
<td>4 - BIG P. ROCK 400 ft</td>
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<td>1 - BIG P. ROCK FOR 100 ft</td>
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<tr>
<td>CLEAN UP / CIVIL ENG</td>
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**Inspector's Signature**

[Signature]
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<th>STATE OF DECOMP.</th>
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<th>COMPOSITION DESCRIPTION</th>
<th>COMMENTS</th>
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<td>DRY SAND (WET)</td>
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DRILLER SIGNATURE FOR TOTAL DEPTH OF BORING: [Signature]  TOTAL DEPTH: 15'
## Inspector's Daily Report

**City of Tacoma**  
**Public Works Department**

**Inspector’s Signature**

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**Project Description**  
SPS - 21

**Weather**
A.M.: Foggy  -  Sunny  
P.M.: Sunny

**Contractor’s Representative(s) and Title**  
P. Miller

**Location and Type of Work**

---

**Number and Classification of Contractor's Men and Equipment**  
Same

---

**Diary (Report of day's operations, orders given and received, discussions with contractor or visitors from other City departments, unusual conditions, recommendations, traffic signing, change orders and force accounts)**

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<td>61°</td>
<td>64°</td>
<td>67°</td>
<td>70°</td>
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</table>

**Finish 1330**

---

**Notes:**
- Good sandy soils
- Water 60°-70°
# City of Tacoma Refuse Utility
## Probe Drilling Log

**Probe Number:** SP5-31  
**Date:** 4/16/91  
**Inspector:** WAESHT

**Drilling Start Time:** 0800  
**Drilling Stop Time:** 1330  
**Total Drilling Time:** 5:30

**Drilling Equipment/Drilling Co.:** HSTC  
**Operator Name:** INGEST

<table>
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<tr>
<th>Depth</th>
<th>Moisture Content</th>
<th>State of Decomp.</th>
<th>Sample No. for Analysis</th>
<th>Composition Description</th>
<th>Comments</th>
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<tbody>
<tr>
<td>10'</td>
<td>Dry, No Mire</td>
<td>—</td>
<td>—</td>
<td>Rocky Brown Sandy</td>
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</tr>
<tr>
<td>20'</td>
<td>Dry, No Mire</td>
<td>—</td>
<td>—</td>
<td>Rocky Brown Sandy</td>
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</tr>
<tr>
<td>30'</td>
<td>Dry, No Mire</td>
<td>—</td>
<td>—</td>
<td>sandy</td>
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<tr>
<td>40'</td>
<td>Normal</td>
<td>—</td>
<td>—</td>
<td>Rock Clay/Sand</td>
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<tr>
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<td>Rock Clay/Little Sand</td>
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<td>Sand Very Light Rock</td>
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</table>

**Driller Signature for Total Depth of Boring:**  
**Total Depth:** 70'

**Inspector Signature for Total Depth of Boring:**  
**Total Depth:** 70'
City of Tacoma  
Public Works Department  
INSPECTOR'S DAILY REPORT  
Page 11  

Imp. No.  AUG 581  
Federal Aid No.  
Date 4/5/91  

Project Description  SPS-32  

Weather A.M.  Showers/Cloudy  
P.M.  

Contractor's Representative(s) and Title  J. N.  

Location and Type of Work  SPS-32  

Number and Classification of Contractor's Men and Equipment  

---  

Diary (Report of day's operations, orders given and received, discussions with contractor or visitors from other City departments, unusual conditions, recommendations, traffic signing, change orders and force accounts)  

---  

SPS-32  

START: 08:20  

---  

1hr  

---  

1hr  

---  

1/hr  

---  

5°  

---  

5°  

---  

6°  

---  

5-5°  

---  

1/2-But-Chips-75  

---  

Pipe - 13.5'  

---  

14°  

---  

15°  

---  

Finish: 10:40  

---  

Inspector's Signature:  

[Signature]
## City of Tacoma Refuse Utility

### Probe Drilling Log

- **Probe Number**: SPS-32
- **Date**: 4/5/91
- **Inspector**: WAGSH
- **Drilling Start Time**: 0820
- **Drilling Stop Time**: 1040
- **Total Drilling Time**: 2:20
- **Drilling Bore Dia.**: 6.7 ft.
- **Drilling Equipment/Drilling Co.**: HOCT
- **Operator Name**: 

### Table

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<th>Depth</th>
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<th>Comments</th>
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<td>-</td>
<td>SAND/MUD/ROCK GRAVEL</td>
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<td>-</td>
<td>SAND/MUDY/ROCK GRAVEL</td>
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**Driller Signature for Total Depth of Boring**: F. M. Cleek

**Total Depth**: 15½

**Inspector Signature for Total Depth of Boring**: H. F. N.

**Total Depth**: 15½
City of Tacoma
Public Works Department

INSPECTOR'S DAILY REPORT

Imp. No.  A6501  Federal Aid No.  

Project Description  SPRS 33  

Weather A.M.  Showers  P.M.  Clear  

Contractor's Representative(s) and Title  Jim Nupeckorn  -  

Location and Type of Work  

Number and Classification of Contractor's Men and Equipment  SAME  

Diary (Report of day's operations, orders given and received, discussions with contractor or visitors from other City departments, unusual conditions, recommendations, traffic signing, change orders and force accounts)

SPRS 33

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<td>5 P. Cuck 500 ft</td>
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<td>6°</td>
<td></td>
<td>2½ BT CHIPS 125 ft</td>
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<td>8°</td>
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<td>WET HOLE TO 3°</td>
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<td>CLAY MUD/SAND CUCK</td>
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<td>PIPE 13.5'</td>
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<td></td>
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<td>LUNCH 1200 - 1230</td>
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<td>13°</td>
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<td>FINISH 1345</td>
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Inspectors Signature
# City of Tacoma Refuse Utility

## Probe Drilling Log

**Probe Number:** 5 P5 33  
**Date:** 4/5/91  
**Inspector:** Wash  

**Drilling Start Time:** 1110  
**Drilling Stop Time:**  
**Total Drilling Time:**  
**Drilling Bore Dia.:** 0.7 FT  
**Drilling Equipment/Drilling Co.:** HDCT  
**Operator Name:**  

<table>
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<th>Moisture Content</th>
<th>State of Decompl.</th>
<th>Sample No. for Analysis</th>
<th>Composition Description</th>
<th>Comments</th>
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<td>Wet H2O</td>
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<td>100'</td>
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**Driller Signature for Total Depth of Boring:**  
**Total Depth:** 15 3/4  

**Inspector Signature for Total Depth of Boring:**  
**Total Depth:** 15 3/4
City of Tacoma  
Public Works Department  
INSPECTOR'S DAILY REPORT  
Imp. No. AU6501  Federal Aid No.  Date 04-30-91 
Project Description SPS #34  
Weather A.M. CLEAR  P.M. CLEAR  
Contractor's Representative(s) and Title PAT MILLER AND ASSISTANT  
Location and Type of Work  

Number and Classification of Contractor's Men and Equipment SAME  

Diary (Report of day's operations, orders given and received, discussions with contractor or visitors from other City departments, unusual conditions, recommendations, traffic signing, change orders and force accounts)

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<td>17:15</td>
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- 2.5 NO PROBLEMS DRILLING
- SATURATION AT 56' AND 70'
- REACHED 105' AT 10:15AM

- 8-50" BAGS BENTONITE CHIPS
- 92-60" BAGS P-ROCK

<table>
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<th>Depth</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>4.5</td>
<td>PVC PIPE #1 6.5</td>
</tr>
<tr>
<td>5.5</td>
<td>#2 30.75</td>
</tr>
<tr>
<td>6.5</td>
<td>#3 55 50.5</td>
</tr>
<tr>
<td>7.5</td>
<td>#4 79.25</td>
</tr>
<tr>
<td>8.5</td>
<td>#5 103.5</td>
</tr>
<tr>
<td>9.5</td>
<td>PVC TOTAL 2705 2788.5</td>
</tr>
</tbody>
</table>

ACTUAL DRILLING TIME: 2.25 HRS.
<table>
<thead>
<tr>
<th>DEPTH</th>
<th>MOISTURE CONTENT</th>
<th>STATE OF DECOMP.</th>
<th>SAMPLE NO. FOR ANALYSIS</th>
<th>COMPOSITION DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10'</td>
<td>NORMAL</td>
<td></td>
<td></td>
<td>SILTY SAND W/ ASSORTED COBBLES</td>
<td></td>
</tr>
<tr>
<td>20'</td>
<td>NORMAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30'</td>
<td>NORMAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40'</td>
<td>NORMAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50'</td>
<td>MOIST</td>
<td></td>
<td></td>
<td>SILTY MOIST SAND/SMALL ROCK</td>
<td></td>
</tr>
<tr>
<td>60'</td>
<td>NORMAL</td>
<td></td>
<td></td>
<td>HARD TILL</td>
<td></td>
</tr>
<tr>
<td>70'</td>
<td>NORMAL</td>
<td></td>
<td></td>
<td>SILTY MOIST SAND/GRAVEL</td>
<td></td>
</tr>
<tr>
<td>80'</td>
<td>NORMAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90'</td>
<td>NORMAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100', 105'</td>
<td>NORMAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DRILLER SIGNATURE FOR TOTAL DEPTH OF BORING: [Signature]

TOTAL DEPTH

INSPECTOR SIGNATURE FOR TOTAL DEPTH OF BORING: [Signature]

TOTAL DEPTH 105'
COMMENT
Total drill depth 99.5 ft.
Example: 11-25 drill time inc. ½ hr lunch. Contractor shut down ½ hr. 11-26 methane detected. ½ hr spent disposing of drill material. Pat Reed on-site monitoring for methane and taking samples. 14 foot bentonite @ 50 lbs. gravel @ 50 lbs.

CONTRACTOR: Holt Drilling
DRILLER: Pat Miller
### Comment

- Total drill depth of 99.5' for sample. Drilling broke down at 9:15.
- Pat Reed of Black and Veatch on site monitoring for methane.
- Taking samples, 22 sacks of bentonite @ 50 lb, 8 sacks of pea gravel @ 60 lb.

### Contractor
- Holt Drilling

### Driller
- Pat Miller
Key to Exploration Logs
Sample Descriptions

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following:
Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

### Density/Consistency

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance. Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

<table>
<thead>
<tr>
<th>SAND or GRAVEL</th>
<th>Standard Penetration Resistance in Blows/Foot</th>
<th>SILT or CLAY</th>
<th>Standard Penetration Resistance in Blows/Foot</th>
<th>Approximate Shear Strength in TSF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td></td>
<td>Consistency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very loose</td>
<td>0 - 4</td>
<td>Very soft</td>
<td>0 - 2</td>
<td>&lt;0.125</td>
</tr>
<tr>
<td>Loose</td>
<td>4 - 10</td>
<td>Soft</td>
<td>2 - 4</td>
<td>0.125 - 0.25</td>
</tr>
<tr>
<td>Medium dense</td>
<td>10 - 30</td>
<td>Medium stiff</td>
<td>4 - 8</td>
<td>0.25 - 0.5</td>
</tr>
<tr>
<td>Dense</td>
<td>30 - 50</td>
<td>Stiff</td>
<td>8 - 15</td>
<td>0.5 - 1.0</td>
</tr>
<tr>
<td>Very dense</td>
<td>&gt;50</td>
<td>Very stiff</td>
<td>15 - 30</td>
<td>1.0 - 2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hard</td>
<td>&gt;30</td>
<td>&gt;2.0</td>
</tr>
</tbody>
</table>

### Moisture

Dry Little perceptible moisture
Damp Some perceptible moisture, probably below optimum moisture content
Moist Much perceptible moisture, probably above optimum

### Minor Constituents

Not identified in description 0 - 5
Slightly (clayey, silty, etc.) 5 - 12
Clayey, silty, sandy, gravelly 12 - 30
Very (clayey, silty, etc.) 30 - 50

### Legends

#### Sampling

- **BORENG SAMPLES**
  - Driven
  - Bailed
  - Cuttings
  - Core Run

- **TEST PIT SAMPLES**
  - Grab (Jar)
  - Bag
  - Shelby Tube

#### Test Symbols

8-inch Ø Steel Monument
2-inch Ø Riser Pipe
Concrete Mix
Cement-Bentonite Grout
Water Level
8-inch Ø Borehole
Colorado Silica Sand
Cement-Bentonite Grout
Bentonite Slurry
2-inch Ø Schedule 80 PVC Screen
(0.020 Slot Size)
PVC End Cap
Natural Material

J-1775 November 1986
HART-CROWSER & associates, inc.
Figure A-1
GEOLOGIC LOG

SAMPLE NO. | TYPE & LOCATION
---|---
GS-1 | Sandy Silt; brown; stiff; dry; gravel; roots; and wood debris.
GS-2 | Silty Sand; brown; loose fine grained; trace clay; moist.
GS-3 | Silt; gray-brown; stiff; wet; low plasticity.
SS-4 | Sand; gray; fine-medium grained; subangular; medium dense; trace gravel and silt.
GS-5 | gravel grading in TILL
SS-6 | Sandy Gravel; gray; dense; wet; some silt.
SS-7 | Silty Clay; blue-gray; moist; wet; very stiff; low plasticity.
SS-8 | Silty Clay; blue-gray; moist; wet; very stiff; low plasticity.

WELL CONSTRUCTION DETAILS

SURFACE COMPLETION

HOLE PLUG BENTONITE/CEMENT

2" O.D. SCH 40 NSF PVC

VOLCLAY/BENTONITE CHIPS 1/2" HINUS

2" 0.020" SLOT OPENING SCH 40 NSF PVC

COLORADO SAND 10-20

BENTONITE 1/2" CHIP:

BOTTOM OF BORING 860.5 FEET, 8" DIA. WATER LEVEL NOT RECORDED

Drilling Firm: Tacoma Pump & Drill
Drilling Method: Boring advanced w/6" O.D. hollow stem auger, 140" hammer, 30" drop, 2" O.D. split spoon sampler.

Boring Completed on: 09-10-1992
Well Installation Completed on: 09-10-1992
## TACOMA LANDFILL
### P-10

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>GEOLOGIC LOG</th>
<th>SAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Brown and gray mottled, very silty SAND with fine gravel and roots</td>
<td>Qtr</td>
</tr>
<tr>
<td>5</td>
<td>Damp, clean, fine to medium SAND</td>
<td>Qtr</td>
</tr>
<tr>
<td>10</td>
<td>Damp, gray, slightly silty SAND (sandy TILL) getting silty</td>
<td>Qtr</td>
</tr>
<tr>
<td>15</td>
<td>Damp to moist, silty to very silty, gravelly SAND (TILL) Moister zones perched on silty zones</td>
<td>Qtr</td>
</tr>
<tr>
<td>20</td>
<td>Damp to wet, clean, fine to medium SAND</td>
<td>Qtr</td>
</tr>
<tr>
<td>30</td>
<td>Wet, gray, sandy GRAVEL Drill action indicates SAND layers to 66 feet</td>
<td>Qtr</td>
</tr>
<tr>
<td>40</td>
<td></td>
<td>Qtr</td>
</tr>
<tr>
<td>50</td>
<td></td>
<td>Qtr</td>
</tr>
<tr>
<td>60</td>
<td></td>
<td>Qtr</td>
</tr>
<tr>
<td>70</td>
<td>Bottom of Boring Completed 1-31-94</td>
<td>Qtr</td>
</tr>
<tr>
<td>75</td>
<td></td>
<td>Qtr</td>
</tr>
</tbody>
</table>

**FIGURE 2**

LOCATION: SW 1/4 SE 1/4, T20N, R2E
START CARD NUMBER: RG7065
DATUM: Old City of Tacoma
WATER LEVEL ELEVATION: 212.14
INSTALLED: 1-31-94
DEVELOPED: 2-1-94
NORTHING: 532199.51
EASTING: 1499593.02

---

* Samples submitted for GeoX Labs analysis

PROJECT NAME: Tacoma Landfill
WELL IDENTIFICATION NUMBER: P-10
DRILLING METHOD: Hollow Stem Auger
DRILLER: Pat Fewkes
FIRM: Geoboring and Development
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Russell Prior

TOP OF CASING ELEVATION: 246.27
Real-Mix Concrete
Flush Mounted Monument (not to scale)
Sand Drain Bed
9-inch Borehole
2-inch PVC Riser Pipe
Pure Cold Grout Seal
2-inch, 20 slot PVC Screen
Colorado Silica Sand
1-foot Tall Pipe
**PROJECT NAME:** Tacoma Landfill  
**WELL IDENTIFICATION NUMBER:** PW-11  
**DRILLING METHOD:** Hollow-Stem Auger  
**DRILLER:** John Bennett  
**FIRM:** Holt Drilling Inc.  
**CONSULTING FIRM:** Pacific Groundwater Group  
**REPRESENTATIVE:** Russell Prior  
**LOCATION:** SW ¹⁄₄ NL ¹⁄₄ Section 23 T20N R2E  
**DATUM:** Old City of Tacoma  
**Northing:** 691158.09, Easting: 1500557.64  
**INSTALLED:** May 23, 1997  
**DEVELOPED:** May 23, 1997  
**START CARD NO.:** R27904

---

<table>
<thead>
<tr>
<th>DEPTH in feet</th>
<th>GEOLOGIC LOG</th>
<th>WELL CONSTRUCTION DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Soft, damp, light-gray, silty CLAY with roots and some peat grades to Stiff, wet, light-gray, SILT with occasional pebbles</td>
<td>Top of Well Finished with 3/8&quot; Stop Cock</td>
</tr>
<tr>
<td>20</td>
<td>Dense, wet, gray, slightly silty, gravelly SAND</td>
<td>2&quot; Sch. 40, flush threaded, PVC riser</td>
</tr>
<tr>
<td>30</td>
<td>Very dense, wet, brownish-gray, fine to medium SAND</td>
<td>9 1/2&quot; D.D. Auger Borehole</td>
</tr>
<tr>
<td>40</td>
<td>Very dense, wet, brown, silty, sandy GRAVEL</td>
<td>EnviroPlug Bentonite Pellets</td>
</tr>
<tr>
<td>40</td>
<td>(Loose), wet, brown, fine to medium SAND with occasional GRAVEL</td>
<td>Caved Hole</td>
</tr>
<tr>
<td>40</td>
<td>Unable to sample lower portion of hole because of heaving conditions</td>
<td>5 feet of 2&quot; Sch. 40, 0.020 slot screen</td>
</tr>
<tr>
<td>43</td>
<td>Bottom of Boring @ 43 Feet Completed 5-23-97</td>
<td>At time of drilling the water level was at least 10 feet above ground surface and the well was flowing approximately 1 to 2 gallons per minute.</td>
</tr>
</tbody>
</table>

---

**FIGURE 1**
Client: CITY OF TACOMA
Project No.: 43024-312
Inspector: JY BLACK/JL DIRIDONI
Approved by: MJ LALLY

Top of Protective Casing Elevation: 308.00 (City Datum)
Coordinates: N 498228 E 1502269

GEOLOGIC LOG

0
Sandy GRAVEL, red-browns well
graded, subrounded, w/some silt
(Recessional Outwash)

10
Gravelly SAND, yellow-brown well
graded, coarse grained, subrounded,
with silt (Recessional Outwash)

Gravelly SILT, gray-brown, low
plasticity, w/some sand (Till)

20
Gravelly SAND, dark gray-brown,
well graded, medium to coarse
grained, subrounded, w/trace silt
(Advance Outwash)

30
Gravelly SAND, dark gray-brown,
well graded, medium to coarse
grained, subrounded w/trace silt
and cobbles (Advance Outwash)

Sandy GRAVEL, gray-brown well
graded, subrounded, w/some
SILT, (Advance Outwash)

Silty SAND, brown, poorly
graded, fine to medium
grained, subangular, w/some
gravel (Colvos Sand)

40
Silty SAND, brown-gray, poorly
graded, fine to coarse grained,
subrounded, w/trace gravel
(Colvos Sand)

SAND, gray, poorly graded, fine to
coarse grained, subangular to
rounded, w/some silts, trace gravel
(Colvos Sand)

60
Grading fine to coarse grained,
w/some gravel, trace silt

70
Grading lenses of gray silty clay

80

SAMPLE GRAPHIC WELL CONSTRUCTION
NO., TYPE LOG DETAILS

GEOLOCATION

CS-1

8-Steel Protective Casing
Concrete

8-Steel

Cable-tool Bore-
hole Diameter: 8"

2" NSF Certified
Sch. 40 PVC

Pure Gold Grout
Mud Wt: 10.2

Bentonite Chips

Colorado Silica
Sand (#B-12)

2" NSF Certified
Sch. 40 PVC
w/0.020 Inch Slots

Drilling Firm: TACOMA PUMP & DRILLING CO., INC.
Driller: J VIGNALI
Drilling Method: 7-3/4" O.D. CABLE TOOL DRIVE
BIT & 8" CASING ADVANCED AS
BORING WAS DRILLED.

Boring Completed on 10/10/89 - 10/12/89 (TL-2A)
Well Installation Completed on 10/11/89 (TL-2C)
Well Developed on 11/15/89 (TL-2A)
11/09/89 (TL-2C)
**Geologic Log**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Sample No.</th>
<th>Type</th>
<th>Location</th>
<th>Graphic Log</th>
<th>Well Construction Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>CS-21</td>
<td>Sand</td>
<td>Gray, poorly graded, fine to medium grained, subangular to subrounded (Covos Sand)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>CS-22</td>
<td>Grading coarse grained w/trace gravel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>CS-23</td>
<td>Grading fine to coarse grained w/trace gravel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>CS-24</td>
<td>Grading w/trace cobbles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>CS-25</td>
<td>Sandy Gravel, variable color, poorly graded, subrounded to rounded w/trace silt (Older Gravel)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>130</td>
<td>CS-26</td>
<td>Gravelly Sand, poorly graded, fine to medium grained, subangular to subrounded w/trace silt (Older Gravel)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>140</td>
<td>CS-27</td>
<td>Grading w/trace cobbles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>CS-28</td>
<td>Grading fine to coarse grained w/some silt</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>160</td>
<td>CS-29</td>
<td>Gravelly Sand, poorly graded, fine to coarse grained, subangular to subrounded w/trace silt and cobbles (Older Gravel)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>170</td>
<td>CS-30</td>
<td>Sandy Gravel, variable color, poorly graded, angular to rounded w/trace silt (Older Gravel)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>CS-31</td>
<td>Gravelly Sand, poorly graded, fine to coarse grained, subangular to subrounded (Older Gravel)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>190</td>
<td>CS-32</td>
<td>gravelly Sand, poorly graded, fine to coarse grained, subangular to subrounded (Older Gravel)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>CS-33</td>
<td>sandy silty blue-gray, loamy plastic, soil, interbedded w/silty sand, poorly graded, fine to medium grained, subangular to subrounded (Older Gravel)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Drilling Firms:** TACOMA PUMP & DRILLING CO., INC.

**Driller:** J. VIGNALI

**Drilling Method:** 3/4" O.D. CABLE TOOL DRIVE BIT, 8" CASING Advanced as BORING WAS DRILLED.

**Boring Completed on:** 10/10/89

**Boring Installation Completed on:** 10/12/89 (TL-2A)

**Well Developed on:** 11/09/89 (TL-2A)
### GEOLOGIC LOG

<table>
<thead>
<tr>
<th>Depth</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>160</td>
<td>Sandy SILT; blue grey; low plasticity; moist w/trace gravel</td>
</tr>
<tr>
<td></td>
<td>Silty SAND; blue-grey; poorly graded; fine to medium grained; subangular w/some gravel</td>
</tr>
<tr>
<td>170</td>
<td>Gravelly SAND; blue-grey; well graded; fine to coarse grained; subangular to subrounded w/some silt (Older Outwash)</td>
</tr>
<tr>
<td></td>
<td>Silty GRAVEL; dark grey; poorly graded; angular to rounded; w/some sand (Older Outwash)</td>
</tr>
<tr>
<td>180</td>
<td>Sedimentary gravel: dark grey; poorly graded; subrounded to rounded; w/some silt (trace)</td>
</tr>
<tr>
<td></td>
<td>Gravel: dark grey; poorly graded; subrounded to rounded; w/some sand and silt (Older Outwash)</td>
</tr>
<tr>
<td></td>
<td>Caving Material</td>
</tr>
<tr>
<td>190</td>
<td>Gravelly SAND; dark blue-grey; moderately graded; fine to medium grained; subangular to subrounded; w/some gravel (Older Outwash)</td>
</tr>
<tr>
<td></td>
<td>Silty GRAVEL; dark grey; well graded; fine to medium grained; subangular to subrounded; w/some sand (Older Outwash)</td>
</tr>
<tr>
<td></td>
<td>Trace cobbles (Older Outwash)</td>
</tr>
<tr>
<td></td>
<td>Silty GRAVEL; green grey; poorly graded; subrounded</td>
</tr>
<tr>
<td></td>
<td>Bottom of Boring @ 212.8'</td>
</tr>
</tbody>
</table>

### WELL CONSTRUCTION DETAILS

- **Pure Gold Grout Mud Wt.** 10.2
- **Bentonite Chips**
- **Bentonite Chips**
- **Caving Material**

### WELL INSTALLATION DETAILS

- **Boring Completed on** 10-10-89
- **Well Installation Completed on** 10/11/89 (TL-2C)
- **11/10/89 (TL-2A)
- **11/09/89 (TL-2A)
# Boring/Monitoring Well Log

## Geologic Log

### Sample & Location Log

<table>
<thead>
<tr>
<th>Depth Below Ground Surface, Feet</th>
<th>Sample No.</th>
<th>Type</th>
<th>Graphic Log</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>CS-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>CS-2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>CS-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>CS-4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>CS-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>CS-6</td>
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</tr>
<tr>
<td>60</td>
<td>CS-7</td>
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<td>70</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>CS-9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>CS-10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>CS-11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>CS-12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>CS-13</td>
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<tr>
<td>130</td>
<td>CS-14</td>
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<tr>
<td>140</td>
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<tr>
<td>150</td>
<td>CS-16</td>
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<tr>
<td>160</td>
<td>CS-17</td>
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<tr>
<td>170</td>
<td>CS-18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>CS-19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>190</td>
<td>CS-20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Well Construction Details

- **8" Steel Protective Casing**: Concrete
- **Cable-tool Borehole Diameter**: 8" NSC Certified Sch. 40 PVC
- **Pure Gold Grout Mud Wt**: 10.2
- **Colored Sand**: (Sand Size #8-#12)
- **Bentonite Chips**:
- **2" NSF Certified Sch. 40 PVC w/0.020 Inch Slots**:

---

**Drilling Firm**: TACOMA PUMP & DRILLING CO., INC.
**Driller**: J. VIGNALI
**Drilling Method**: 7 3/4" O.D. CABLE TOOL DRIVE
**Boring Completed on**: 10/10/89
**Well Installation Completed on**: 10/12/89 (TL-2A)
**Well Developed on**: 11/16/89 (TL-2A)
RESOURCES PROTECTION WELL REPORT

PROJECT NAME: TACOMA RIVER
WELL IDENTIFICATION NO. 12-3 A+B+C
DRILLING METHOD: CABLE TOOL
DRILLER: Jim Vignali
FIRM: Tacoma Pump & Drilling Co., Inc.
SIGNATURE: Jim Vignali (MSP)
CONSULTING FIRM: BLACK & WACHTE WATERSERVICE
REPRESENTATIVE: Janette Black

LOCATION: T20N R2E SEC. 11 SE 5E
DISTANCE: 691410 FT. FROM N/S SECTION LINE
1561749 FT. FROM E/W SECTION LINE
DATUM: 274.10
WATER LEVEL ELEVATION:
INSTALLED: 11-14-89
DEVELOPED: 12-14-89

AS-BUILT

WELL DATA

FORMATION DESCRIPTION

Please See Attached

SCALE: 1" = __________

PAGE ____ OF ____

ECY 050-12
GEOLOGIC LOG

DEPTH BELOW GROUND SURFACE, FEET

0
20
30
40
50
60
70
80

Sandy GRAVEL; gray brownish well graded, subangular to subrounded, w/trace silt (Recessional Outwash)
Grading w/trace silt
Roots grade out
Sandy GRAVEL; brownish gray well graded, subangular to subrounded, w/trace silt (Recessional Outwash)
Gravelly SAND; brownish gray well graded, fine to coarse grained, subangular to subrounded, w/trace silt (Recessional Outwash)
Sandy SILT; light brown low plasticity w/trace gravel (Till)
Silty SAND; brown gray poorly graded fine to medium grained, subangular to subrounded (Till)
SAND; brownish gray; poorly graded, fine to coarse grained, subangular to subrounded, w/trace silt and gravel (Colvos Sand)
Grading w/trace wood pieces
Grading w/some silt
Grading fine to medium grained
Gravelly SAND; brown gray poorly graded, fine to medium grained, subangular to rounded, w/trace cobbles and silt (Older Gravel)
Sandy GRAVEL; variable color; well graded, subrounded, w/trace silt; Sand layer w/some cobbles 8'-78.0'

SAMPLE NO., TYPE & LOCATION

CS-1
CS-2
CS-3
CS-4
CS-5
CS-6
CS-7
CS-8
CS-9
CS-10
CS-11
CS-12
CS-13
CS-14
CS-15

WELL CONSTRUCTION DETAILS

10" Steel Flush Mount Protective Casing
Concrete
1/2" NSF Certified Sch. 40 PVC
Pure Gold Grout Mud Mt: 10.2
Bentonite Chips
1/2" NSF Certified Sch. 80 PVC w/0.010 Inch Slots
Pea Gravel
0.3' Blank Riser Pipe
Bentonite Chips
2" NSF Certified Sch. 40 PVC
2" NSF Certified Sch. 40 PVC w/0.020 Inch Slots
Colorado Silica Sand (#8-12)
2' Blank Riser Pipe
Pure Gold Grout Mud Mt: 10.2-10.25
Cable Tool Borehole Diameter: 8"
WATER WELL REPORT
STATE OF WASHINGTON

(1) OWNER: [PROJECT - TACOMA LANDFILL] Address

(2) LOCATION OF WELL: County [TL-52, C, D] NE, NW ¼ Sec. 14 T20 N, R2 W M. Coordinates [N 69°20' E 150°18']

(3) PROPOSED USE: Domestic [ ] Irrigation [ ] DeWater [ ] Industrial [ ] Municipal [ ] Test Well [ ] Other [ ]

(4) TYPE OF WORK: Owner's number of well [ ] Abandoned [ ] New well [ ] Method: Dug [ ] Bored [ ] Reconditioned [ ] Deepened [ ] Cable [ ] Rotary [ ] Jetted [ ]

(5) DIMENSIONS: Diameter of well [ ] inches. Depth of completed well [ ] ft.

(6) CONSTRUCTION DETAILS:
- Casing installed: [ ] Diam. from [ ] ft. to [ ] ft.
- Welded [ ] Diam. from [ ] ft. to [ ] ft.
- Liner installed: [ ] Diam. from [ ] ft. to [ ] ft.
- Threaded [ ] Diam. from [ ] ft. to [ ] ft.
- Perforations Yes [ ] No [ ]
- Type of perforator used [ ]
- Size of perforations [ ] in. by [ ] in. from [ ] ft. to [ ] ft.
- Depth of strata [ ] ft.

(7) SCREENS: [ ] Yes [ ] No
- Manufacturer's Name [ ]
- Type [ ] Model No. [ ]
- Diam. [ ] ft. Slot size: [ ] ft. from [ ] ft. to [ ] ft.
- Diam. [ ] ft. Slot size: [ ] ft. from [ ] ft. to [ ] ft.

(8) GRAVEL PACKED: Yes [ ] No [ ]
- Size of gravel [ ] ft.
- Gravel placed from [ ] ft. to [ ] ft.
- Surface seal: Yes [ ] No [ ]
- Material used in seal [ ]
- To what depth? [ ] ft.
- Did any strata contain usable water? Yes [ ] No [ ]
- Type of water [ ]
- Depth of strata [ ] ft.

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
- Was a pump test made? Yes [ ] No [ ]
- Yield: [ ] gal./min. with [ ] ft. drawdown after [ ] hrs.
- Recovery date (time taken as zero when pump turned off) (water level measured from well top to water level)
- Date of test [ ]
- Bail test [ ] gal./min. with [ ] ft. drawdown after [ ] hrs.
- Aireast [ ] gal./min. with stem set at [ ] ft. for [ ] hrs.
- Artesian flow [ ] g.p.m. Date [ ]
- Temperature of water [ ] Was a chemical analysis made? Yes [ ] No [ ]

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION
- Description: [ ]
- Thickness of aquifers and the kind and nature of the material in each stratum penetrated,
- with at least one entry for each change of information.

MATERIAL FROM TO

SEE ATTACHED

NAME: [ ]

ADDRESS: [ ]

LICENSE NO: [ ]

SIGNATURE: [ ]

DATE: [ ]

USE ADDITIONAL SHEETS IF NECESSARY
## Tacoma Landfill Monitoring Well Log

**TL-5a,c,d**

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>GEOLOGIC LOG</th>
<th>OYA Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Ground Surface Elevation: 219.00</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Moist, brown, sandy, silty GRAVEL</td>
<td>6.0</td>
</tr>
<tr>
<td>20</td>
<td>Saturated, brown-gray, silty, gravelly SAND</td>
<td>67</td>
</tr>
<tr>
<td>30</td>
<td>Saturated, brown-gray, silty, slightly sandy GRAVEL with brown, very silly SAND layers</td>
<td>19</td>
</tr>
<tr>
<td>40</td>
<td>Saturated, interbedded andesite (purple), fine SAND and greyish-gray SILT</td>
<td>39</td>
</tr>
<tr>
<td>50</td>
<td>Saturated, gray SILT with wood</td>
<td>100</td>
</tr>
<tr>
<td>60</td>
<td>Saturated, dark gray, silty, slightly gravelly SAND grading to dark gray, cleaner, sandy GRAVEL</td>
<td>200</td>
</tr>
<tr>
<td>80</td>
<td>80</td>
<td>11</td>
</tr>
<tr>
<td>90</td>
<td>90</td>
<td>5</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
<td>5</td>
</tr>
<tr>
<td>110</td>
<td>110</td>
<td>5</td>
</tr>
<tr>
<td>120</td>
<td>Bottom of boring at 119.5 feet, Completed 11-8-89</td>
<td>3</td>
</tr>
</tbody>
</table>

**WELL CONSTRUCTION DETAILS**

- Locking monument
- Casing Elevation: 220.83
- Bentonite/cement Mud wt. 14.2
- 0.50" schedule 40 flush-threaded PVC riser
- Envirotug
- Colorado Silica Sand # 8-12
- 2" schedule 40 flush-threaded PVC riser
- Colorado Silica Sand # 8-12
- 5 ft. 0.020" slot screen
- Pure Gold Gravel Mud wt. 10.2
- 2" schedule 40 flush-threaded PVC riser
- Colorado Silica Sand # 8-12
- 5 ft. 0.020" slot screen

---

**PROJECT NAME:** Tacoma Landfill Predesign  
**WELL IDENTIFICATION NUMBER:** TL-5a,c,d  
**LOCATION:** NE 1/4, NE 1/4, Sec. 14, T20N R2E  
**DRILLING METHOD:** Cable Tool  
**DRILLER:** John Hansen  
**FIRM:** Tacoma Pump and Drilling  
**CONSULTING FIRM:** Pacific Groundwater Group  
**REPRESENTATIVE:** Kathleen Galloway/Russell Prior  
**WATER LEVEL ELEVATION:** Flowing  
**WATER LEVEL DATE:** NA  
**START CARD NO.:** 03-72-82  
**WA ST COORD:** E1501781 N696202  
**DATUM:** City of Tacoma Datum  
**PACIFIC GROUNDWATER GROUP**
WATER WELL REPORT
STATE OF WASHINGTON

(1) OWNER: Name CITY OF TACOMA Address 45TH AND ORCHARD ST.
County PIERCE
Bearing and distance from section or subdivision corner

(2) LOCATION OF WELL: NE ¼, SE ¼, Sec. 14, T 20 N., R 2 E W.M.

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐
□ MONITORING: Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner’s number of well
□ New well ☐ Method: Dug ☐ Bored ☐ Driven ☐
□ Deepened ☐ Cable ☐ Driven ☐
□ Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 20-22 inches.
Drilled 108 ft. Depth of completed well 106 ft.

(6) CONSTRUCTION DETAILS:
□ Casing installed: “ ” Diam. from 8 ft. to 106 ft.
□ Threaded ☐ “ ” Diam. from 8 ft. to 68 ft.
□ Welded ☐ “ ” Diam. from 8 ft. to 68 ft.

Perforations: Yes ☐ No ☒
□ Type of perforator used
□ Size of perforations __________ In. by __________ In.
□ perforations from __________ Ft. to __________ Ft.
□ perforations from __________ Ft. to __________ Ft.
□ perforations from __________ Ft. to __________ Ft.

Screens: Yes ☒ No ☐
□ Manufacturer’s Name HYDROPHILIC/LAMINAR
□ Type: PVC-FLUSH THREAD
□ Diam. __________ Slot size __________ from 101 ft. to 106 ft.
□ Diam. __________ Slot size __________ from 63 ft. to 68 ft.

Gravel packed: Yes ☒ No ☐ Size of gravel: 10-20
□ Gravel placed from __________ FT ABOVE SCREENS __________ FT.

Surface seal: Yes ☒ No ☐ To what depth: 18 ft.
□ Material used in seal CEMENT-BENTONITE
□ Did any strata contain unusable water? Yes ☐ No ☐
□ Type of water: __________
□ Depth of strata: __________
□ Method of sealing strata off:

(7) PUMP: Manufacturer’s Name INST. N.W.
□ Type: HYDROSTAR-MANUAL H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level __________ ft.
□ Static level __________ ft. below top of well __________ Date 9-25-86
□ Artesian pressure __________ lbs. per square inch __________ Date
□ Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS:
□ Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☒ If yes, by whom?
□ Yield: gal./min. with __________ ft. drawdown after __________ hrs.
□ __________
□ __________
□ __________
□ __________
□ __________
□ __________

□ Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)
□ Time Water Level Time Water Level Time Water Level
□ __________
□ __________
□ __________
□ __________
□ __________
□ __________

Date of test __________
□ Balist test gal./min. with __________ ft. drawdown after __________ hrs.
□ Artesian flow __________ g.p.m. __________ Date
□ Temperature of water __________ Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:
□ Material FROM TO
□ TOPSOIL 0 3
□ GRAY TILL 3 18
□ GRAVEL, SAND 18 43
□ FINE SAND, SOME GRAVEL 43 83
□ CLEAN SAND, GRAVEL 83 94
□ LARGE GRAVEL, ROCK, SAND 94 108

DESIGNATED WELL #’S:
□ TL-9A 68 FT
□ TL-9B 106 FT

Work started __________ 18 Completed __________

WELL DRILLER’S STATEMENT:
This well was drilled under my jurisdiction and this report is
true to the best of my knowledge and belief.

□ NAME TACOMA PUMPS DRILLING CO., INC.
□ Person, firm, or corporation (Type of print)
□ Address 30816 MTN HWY GRAHAM, W.A.
□ (Signed) [Signature] (Well Driller)
□ License No. 0193 Date DEC 22, 1986

(USE ADDITIONAL SHEETS IF NECESSARY)
# Boring Log and Construction Data for Well TL-9 a,b

## Geologic Log

<table>
<thead>
<tr>
<th>Depth (in Feet)</th>
<th>Head Space</th>
<th>H-Nu</th>
<th>OVA</th>
<th>Lab</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Damp, brown, gravelly silty SAND (weathered TILL)</td>
<td>-</td>
<td>1.6</td>
<td>S-1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Damp, gray, gravelly, silty SAND (TILL)</td>
<td>-</td>
<td>50</td>
<td>S-2</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Damp, brown, SAND and GRAVEL</td>
<td>-</td>
<td>30</td>
<td>S-3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>gradational contact</td>
<td>-</td>
<td>&gt;1000</td>
<td>S-4</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Damp to saturated, brown, fine to medium SAND.</td>
<td>-</td>
<td>&gt;1000</td>
<td>S-5</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>-</td>
<td>-</td>
<td>&gt;1000</td>
<td>S-6</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>-</td>
<td>-</td>
<td>&gt;1000</td>
<td>S-7</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>-</td>
<td>-</td>
<td>&gt;1000</td>
<td>S-8</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>* 220</td>
<td>-</td>
<td>-</td>
<td>S-9</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>* &gt;1000</td>
<td>-</td>
<td>-</td>
<td>S-10</td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>* 2.5</td>
<td>-</td>
<td>-</td>
<td>S-11</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>* 3.3</td>
<td>GS</td>
<td>-</td>
<td>S-12</td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>* 6.5</td>
<td>-</td>
<td>-</td>
<td>S-13</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>Saturated, brown, (some gray), very gravelly SAND to sandy GRAVEL.</td>
<td>* 4.8</td>
<td>GS</td>
<td>S-14</td>
<td></td>
</tr>
<tr>
<td>130</td>
<td>* 6</td>
<td>-</td>
<td>-</td>
<td>S-15</td>
<td></td>
</tr>
<tr>
<td>140</td>
<td>- 11</td>
<td>GS</td>
<td>-</td>
<td>S-16</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>- 20</td>
<td>-</td>
<td>-</td>
<td>S-17</td>
<td></td>
</tr>
</tbody>
</table>

Bottom of Boring at 108.0 Feet.
Completed 9/25/86.

## Well Design

Top Casing Elevation in Feet 288.40
Steel Casing Stickup in Feet 1.4

---

**NOTES:**
1. Soil descriptions are interpretive and actual changes may be gradual.
2. Water level \( \sqrt{\text{H-NU}} \) is for data indicated and may vary with time of year.
3. Head space readings in ppm.
4. * indicates negative deflection on H-NU.

---

J-1775 November 1986
HART-CROWSER & associates, inc.
Figure A-4
PROJECT NAME: Tacoma Water
WELL IDENTIFICATION NO. T6-N, R2E, Sec. 13, SW 1/4
DRILLING METHOD: Cable Tool
DRILLER: Jim Vignali
FIRM: Tacoma Pump & Drilling Co., Inc.
SIGNATURE: Jim Vignali
CONSULTING FIRM: Black & Veatch
REPRESENTATIVE: Janene Black

LOCATION: T 20 N, R 2 E, Sec. 13, SW 1/4
DISTANCE: 699162 FT. FROM N/S SECTION LINE
1602192 FT. FROM E/W SECTION LINE
DATUM: 284.50
WATER LEVEL ELEVATION:
INSTALLED: 12-8-89
DEVELOPED: 12-14-89

PLEASE SEE ATTACHED
<table>
<thead>
<tr>
<th>GEOLeGIC LOG</th>
<th>SAMPLE LOG</th>
<th>WEF CONSTRUCTION DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undifferentiated Overburden (See TL-10A &amp; TL-10B log in Remedial Investigation Report Tacoma Landfill, December, 1987)</td>
<td></td>
<td>8” Steel Protective Casing Concrete</td>
</tr>
</tbody>
</table>

**Drilling Firm:** TACOMA PUMP & DRILLING CO., INC.  
**Driller:** J. VIGNALL  
**Drilling Method:** 7 3/4” O.D. CABLE TOOL DRIVE  
**Initial 8” Casing Advanced As Boring Was Drilled.**  
Boring Completed on 12-01-89  
Well Installation Completed on 12-06-89 TL-10C  
Well Developed on 12-14-89
Boring Log and Construction Data for Well TL-12

Geologic Log
Coordinates N 693,607  E 1,504,125

Ground Surface Elevation in Feet 372.0

Damp, brown to gray, silty, gravelly SAND. TILL

Gradational Contact

Damp, grayish brown, sandy GRAVEL.

Moist, grayish brown, silty, gravelly SAND with SILT layers.

Damp, brown, fine to medium SAND.

Damp, brown, fine to medium SAND.

Gravelly zone

Gravelly zone

Bottom of Boring at 155.0 Feet
Completed 2/10/87.

Sample

Well Design
Top Casing Elevation in Feet 373.65
Casing Stickup in Feet 1.6 6-inch-diameter space

NOTES: 1. Soil descriptions are interpretive and actual changes may be gradual.
2. Water Level is for data indicated and may vary with time of year.
3. ATD: At Time of Drilling

HART-CROWSER & associates, Inc.
Boring Log and Construction Data for Well TL-16

Coordinates
N 698,536  E 1,505,052

Geologic Log

Ground Surface Elevation in Feet

<table>
<thead>
<tr>
<th>Sample</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-1</td>
<td>Wet, dark brown, silty SAND with organic silt and roots and wet, light brown, very sandy SILT (Soft)</td>
</tr>
<tr>
<td>S-2</td>
<td>Damp, grayish brown, gravelly silty SAND TILL</td>
</tr>
<tr>
<td>Qvt</td>
<td>Damp, brown, slightly silty, gravelly SAND</td>
</tr>
<tr>
<td></td>
<td>Very gravelly to</td>
</tr>
<tr>
<td></td>
<td>Gets siltier</td>
</tr>
<tr>
<td>S-4</td>
<td>Damp, brown, silty, sandy GRAVEL</td>
</tr>
<tr>
<td>S-5</td>
<td>Damp, brown, fine to medium. SAND with varying gravel content.</td>
</tr>
<tr>
<td>S-6</td>
<td></td>
</tr>
<tr>
<td>S-7</td>
<td></td>
</tr>
<tr>
<td>S-8</td>
<td></td>
</tr>
<tr>
<td>S-9</td>
<td></td>
</tr>
<tr>
<td>S-10</td>
<td></td>
</tr>
</tbody>
</table>

Bottom of Boring at 117.0 Feet
Completed 2/9/87.

Well Design
Top Casing Elevation in Feet 343.01
Casing Stickup in Feet 5-Inch diameter steel monument

Sample

NOTES:
1. Soil descriptions are interpretive and actual changes may be gradual.
2. Water Level is for data indicated and may vary with time of year.

HART-CROWSER & associates, Inc.

Figure
# Boring Log and Construction Data for Well TL-16

**Geologic Log**

<table>
<thead>
<tr>
<th>Depth in Feet</th>
<th>Sample</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>S-1</td>
<td>Damp, brown, slightly silty, gravelly SAND. (Earthwork FILL)</td>
</tr>
<tr>
<td>10</td>
<td>S-2</td>
<td>Wet, dark brown, silty SAND with organic silt and roots and wet, light brown, very sandy SILT (Soft)</td>
</tr>
<tr>
<td>20</td>
<td>Qvt</td>
<td>Damp, grayish brown, gravelly silty SAND. TILL</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td>Damp, brown, slightly silty, gravelly SAND. Very gravelly</td>
</tr>
<tr>
<td>40</td>
<td></td>
<td>Gets siltier</td>
</tr>
<tr>
<td>50</td>
<td>S-3</td>
<td>Damp, brown, silty, sandy GRAVEL</td>
</tr>
<tr>
<td>60</td>
<td>S-4</td>
<td>Damp, brown, fine to medium. SAND with varying gravel content.</td>
</tr>
<tr>
<td>70</td>
<td>S-5</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>110</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>S-6</td>
<td></td>
</tr>
<tr>
<td>130</td>
<td>S-7</td>
<td></td>
</tr>
<tr>
<td>140</td>
<td>S-8</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>S-9</td>
<td></td>
</tr>
<tr>
<td>160</td>
<td>S-10</td>
<td></td>
</tr>
</tbody>
</table>

**Well Design**

- Top Casing Elevation in Feet: 343.01
- Casing Slickup in Feet: 6-inch diameter/steel monument
- Production casing: pulled to 33 feet depth.
- 6-inch-diameter casing:
- 2-inch-diameter SCH. 80 PVC riser pipe
- Bentonite pellets:
- Colorado Silica SAND 6B-12
- 2-inch 2-inch diameter PVC screen (0.020-inch slot size)

**Notes:**

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Water Level is for date indicated and may vary with time of year.

Bottom of Boring at 117.0 Feet Completed 2/9/87.

Well installation observed by Black & Veatch.

J-1775-01 February 1987
HART-CROWSER & associates, Inc.
<table>
<thead>
<tr>
<th>Depth</th>
<th>Geologic Log</th>
<th>Fill</th>
<th>Sample</th>
<th>PID</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Ground elevation: 341.3 ft</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Damp, brown to gray-brown, slightly sandy, gravelly SILT</td>
<td>S-2</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Damp, brown—gray, slightly gravely, silty SAND with gravelly layers.</td>
<td>S-3</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Moist, brown—gray, slightly fine sandy SILT</td>
<td>S-4</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Damp, brown to gray-brown, silty, gravelly SAND and gravelly gravelly SAND</td>
<td>S-5</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Damp to moist, brown to gray-brown, gravelly, silty SAND grading to slightly silty, gravelly SAND</td>
<td>S-6</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>Damp, brown, fine to medium SAND</td>
<td>S-7</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td></td>
<td>S-8</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td></td>
<td>S-9</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>90</td>
<td></td>
<td>S-10</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>Damp to well, brown, gravelly, fine to medium SAND</td>
<td>S-11</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>110</td>
<td></td>
<td>S-12</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>Well, brown, fine to medium SAND</td>
<td>S-13</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>130</td>
<td></td>
<td>S-14</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>140</td>
<td></td>
<td>S-15</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td></td>
<td>S-16</td>
<td>0.2</td>
<td></td>
</tr>
</tbody>
</table>

**Bottom of Boring 123 Feet Completed 9-29-95**

**Figure XX**

- **Project Name**: Tacoma Landfill
- **Well Identification Number**: TL-16R
- **Drilling Method**: Hollow Stem Auger
- **Driller**: Rodney La Brosse
- **Firm**: Cascade Drilling, Inc.
- **Consulting Firm**: Pacific Groundwater Group, Inc.
- **Representative**: Chad A. Bring
- **Location**: SE 1/4 SW 1/4 Sec. 12, T20N, R2E
- **NORTHING**: 698538
- **EASTING**: 1520930.25
- **Datum**: Old City of Tacoma
- **Water Level Elevation**: 230.9 ft
- **Installed**: 9-29-95
- **Developed**: 10-17-95
**PIEZOMETER INSTALLATION LOG**

**CLIENT**  
City of Tacoma

**PROJECT**  
Tacoma Landfill Remedial Invest.

**PROJECT LOCATION**  
Tacoma, Washington

**COORDINATES**  
N669',128'; E1,503,394

**GROUND ELEVATION**  
298.0' (Tacoma)

**DATE**  
8/28/86

**INSPECTOR**  
E. W. Meyer

**CHECKED BY**  
M. J. Lally

**APPROVED BY**  
R. H. Herzog

---

**DIAMETER OF BOREHOLE**  
7-1/2"

**TYPE OF FILTER**  
None

**TYPE AND SIZE OF SCREEN OR OPENINGS**  
2" Sch 80 PVC w/0.02" slots

**TYPE OF SEAL**  
Cement-Bentonite Grout

**O.D. & TYPE OF RISER PIPE**  
2" Sch 80 PVC

**TYPE OF SEAL**  
Bentonite Slurry

**5'-8' (20 gal.)**

**14.1'**

**1.0'**

**72.4'**

**45'**

**86'**

**METHOD OF INSTALLATION:**
Boring drilled to completion; pulled augers to 60'; readvanced augers down to 75.5'; set riser pipe & screen; alternated pulling augers & placing filter; pumped in bentonite slurry; alternated pulling augers & grouting to 3' below ground surface; placed concrete

**REMARKS:**
Note: 3' of blank riser below surface seal; set steel protective surface screen; boring caved from casing.

75.4' to 86.0'
LOG OF BORING
BORING NO. TL-17A

CLIENT
City of Tacoma

PROJECT
Tacoma Landfill Remedial Invest.

PROJECT LOCATION
Tacoma, Washington

COORDINATES
N69°49'; E1°503.39'

ELEVATION (DATUM)
298' (Tacoma)

TOTAL DEPTH
86'

DATE START
8/25/86

DATE FINISH
8/27/86

SURFACE CONDITIONS
Flat: @ edge of parking lot; near wooded area

INSPECTOR
E. W. Meyer

APPROVED BY
R. H. Herzog

M. J. Lally

SAMPLING

CORE SIZE
SPT

RUN NUMBER
1

RUN LENGTH
100

2ND RUN
0

3RD RUN
0

RECOVERY
0

RECOVERY
0

PERCENT RECOVERY
0

DEPTH IN FEET
10

SAMPLE TYPE
SAND; brown; very dense; poorly graded; fine to coarse grained; rounded; moist; v/some gravel; trace silt; occasional cobble (Till)

GRAPHIC LOG
grading grayish-brown

SAND; grayish-brown; very dense; poorly graded; fine to coarse grained; rounded; moist; v/trace gravel

SAND; grayish-brown; very dense; poorly graded; fine to coarse grained; rounded; moist; v/some silt & gravel; occasional cobble (Till)

REMARKS
Boring advanced w/7'-1/2" O.D., 4-1/4" I.D. hollow stem flight auger

Samples obtained w/ 2'-1/2" and 3" O.D. split spoon samplers
<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Core Size</th>
<th>Run</th>
<th>Length</th>
<th>Recovery</th>
<th>Percent</th>
<th>Depth (ft)</th>
<th>Classification of Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPT 6</td>
<td>6</td>
<td>35</td>
<td>100</td>
<td>-</td>
<td>1.0</td>
<td>1-40</td>
<td>SAND; brown; very dense; poorly graded; fine to coarse grained; rounded; moist; w/trace gravel</td>
</tr>
<tr>
<td>SPT 7</td>
<td>7</td>
<td>39</td>
<td>100</td>
<td>-</td>
<td>0.9</td>
<td>50</td>
<td>grading w/trace silt</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4.5&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPT 8</td>
<td>8</td>
<td>35</td>
<td>100</td>
<td>-</td>
<td>1.0</td>
<td>40</td>
<td>silt grades out</td>
</tr>
<tr>
<td>SPT 9</td>
<td>9</td>
<td>25</td>
<td>67</td>
<td>70</td>
<td>1.5</td>
<td>50</td>
<td>grading w/trace silt; occasional thin silt lens</td>
</tr>
<tr>
<td>SPT 10</td>
<td>10</td>
<td>30</td>
<td>100</td>
<td>-</td>
<td>1.0</td>
<td>60</td>
<td>silt &amp; silt lenses grade out</td>
</tr>
<tr>
<td>SPT 11</td>
<td>11</td>
<td>28</td>
<td>100</td>
<td>-</td>
<td>0.9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sample 11 submitted for chemical analysis
**Log of Boring**

**City of Tacoma**  
**Project:** Tacoma Landfill Remedial Invest. 13209

**Client:** City of Tacoma  
**Project Location:** Tacoma, Washington  
**Coordinates:** N699,128'; E1,503,394'  
**Elevation (Datum):** 298' (Tacoma)  
**Total Depth:** 86'

**Surface Conditions:** Flat; @ edge of parking lot; near wooded area  
**Inspector:** R. V. Meyer  
**Date Finish:** 8/27/86

<table>
<thead>
<tr>
<th>Core Size</th>
<th>Core Number</th>
<th>Core Length</th>
<th>Core Recovery</th>
<th>Core Description</th>
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</thead>
<tbody>
<tr>
<td>SPT</td>
<td>12</td>
<td>57</td>
<td>70</td>
<td>1.5</td>
</tr>
<tr>
<td>SPT</td>
<td>13</td>
<td>70</td>
<td>100</td>
<td>1.0</td>
</tr>
<tr>
<td>SPT</td>
<td>14</td>
<td>100</td>
<td>40</td>
<td>0.9</td>
</tr>
<tr>
<td>SPT</td>
<td>15</td>
<td>100</td>
<td>50</td>
<td>0.9</td>
</tr>
<tr>
<td>SPT</td>
<td>16</td>
<td>100</td>
<td>0.9</td>
<td>0.5</td>
</tr>
<tr>
<td>SPT</td>
<td>17</td>
<td>Blows not counted</td>
<td>1.0</td>
<td>Grading w/occasional light brown 0.02' clay lens; trace gravel</td>
</tr>
</tbody>
</table>

**Remarks:**

- Water @ 63.4' on 8/26/86 prior to drilling
- Sand; gray; very dense; poorly graded; fine to coarse grained; rounded; moist; v/trace wood
- Water @ 62.6' on 8/26/86 prior to adding water to hole
- Grading w/occasional light brown 0.02' clay lens; trace gravel

**Checked By:** M. J. Lally  
**Approved By:** R. H. Herzog  
**Date:** 8/25/86
**Method of Installation:**
Boring drilled to completion; set riser pipe & screen; alternated pulling augers & placing filter; pumped in bentonite slurry; pumped one batch of grout; pulled augers back above grout & left overnight; in morning, augers grouted in hole; drilled three holes

**Remarks:**
Note: 3' of blank riser below w/5-7/8" tricone roller bit using air around screen; boring caved from 104.8' to 106.0'

**Cement-Bentonite Grout**
- 2" Sch 80 PVC

**Bentonite Slurry**
- 2" Sch 80 PVC w/0.02" slots

**Colorado Silica Sand from 89' to 104.8'**
- None

**Type of Filter**
N/A

**Type of Seal**
- None

**Diameter of Borehole**
7-1/2"
# Log of Boring

**Boring No. TL-17B**  
**Sheet 1 of 4**

**Client:** City of Tacoma  
**Project:** Tacoma Landfill Remedial Invest.  
**Project No.:** 13209

**Project Location:** Tacoma, Washington  
**Coordinates:** N699,138', E1,503,394'  
**Elevation (Datum):** 298.6' (Tacoma)  
**Total Depth:** 106'  
**Date Start:** 8/29/86  
**Date Finish:** 9/2/86

**Inspector:** E. W. Meyer  
**Approved by:** R. H. Herzog

**Surface Conditions:** Flat @ edge of parking lot; near wooded area

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Sample Number</th>
<th>Set 6</th>
<th>2nd 6</th>
<th>3rd 6</th>
<th>M</th>
<th>Sample Recovery</th>
<th>Checked by</th>
<th>Approved by</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M. J. Lally</td>
<td>R. H. Herzog</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Core Size</th>
<th>Run Number</th>
<th>Run Length</th>
<th>Coring Recovery</th>
<th>Rqd</th>
<th>Rqd Recovery</th>
<th>Depth in Feet</th>
<th>Sample Type</th>
<th>Graphic Log</th>
<th>Classification of Material</th>
<th>Remarks</th>
</tr>
</thead>
</table>
|           |            |            |                 |     |             |               |             |             | Undifferentiated overburden (see boring log for Well TL-17A) | Boring advanced w/7-1/2" O.D., 4-1/4" I.D. hollow stem flight auger  
Located 10' north of TL-17A  
Water added to boring during drilling  
Cobble @ 8' |
<table>
<thead>
<tr>
<th>Depth in Feet</th>
<th>Sample Type</th>
<th>Classification of Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td></td>
<td>Undifferentiated overburden (see boring log for TL-17A)</td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Remarks: None
**Log of Boring**

**Client:** City of Tacoma  
**Project:** Tacoma Landfill Remedial Invest.  
**Project No.:** 13209

**Project Location:** Tacoma, Washington  
**Coordinates:** N69°31'42"; E115°03'39.6"

**Surface Conditions:** Flat @ edge of parking lot; near wooded area  
**Inspector:** E. W. Meyer  
**Date Start:** 8/29/86  
**Date Finish:** 9/2/86

**Sample Type:**  
**Sample Number:** Sample  
**Set:** 6"  
**2nd 6:**  
**3rd 6:**  
**N:**  
**Value:**  
**Sample Recover:**  
**Checked by:** M. J. Lally  
**Approved by:** R. H. Herzog

<table>
<thead>
<tr>
<th>Core Size</th>
<th>Run Number</th>
<th>Core Length</th>
<th>2nd Recover</th>
<th>3rd Recover</th>
<th>Percent Recover</th>
<th>RQD</th>
<th>Depth in Feet</th>
<th>Sample Type</th>
<th>Remarks</th>
</tr>
</thead>
</table>

Undifferentiated overburden (see boring log for Well TL-17A)
## Log of Boring

**City of Tacoma**

**Tacoma Landfill Remedial Invest.**

**PROJECT LOCATION**

Tacoma, Washington

**COORDINATES**

N69°138' E115°36' E1 503.794'

**ELEVATION (DATUM)**

298.6' (Tacoma)

**TOTAL DEPTH**

106'

**DATE START**

8/29/86

**DATE FINISH**

9/2/86

**INSPECTOR**

E. V. Meyer

**APPROVED BY**

R. H. Herzog

### Sampling

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Run Number</th>
<th>Set 6&quot;</th>
<th>2nd 6&quot;</th>
<th>3rd 6&quot;</th>
<th>N</th>
<th>Value</th>
<th>Percent Recov</th>
<th>Sample Recov</th>
<th>Depth in Feet</th>
<th>Sample Type</th>
<th>Graphic Log</th>
<th>Classification of Material</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPT</td>
<td>1</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SAND; brown; very dense; poorly graded; fine to medium grained; rounded; moist; w/trace gravel; occasional thin clay lens</td>
<td>Samples 1 &amp; 2 obtained with 2-1/2&quot; O.D. split spoon sampler</td>
</tr>
<tr>
<td>SPT</td>
<td>2</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPT</td>
<td>3</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPT</td>
<td>4</td>
<td>14</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Bottom of boring @ 106.0’**

**Water level not recorded**

**Piezometer installed on 9/2/86 thru 9/8/86**
GEOLOGIC LOG

NO., TYPE & LOCATION

UNDIFFERENTIATED OVERBURDEN (See boring log for TL-19)

Well Construction Details

9" Steel Protective Casing
Concrete
Bentonite Chips
2" NSF Certified Sch. 40 PVC
Colorado Silica Sand (#8–#12)
Hollow Stem Auger
Borehole Diameter: 7.5"
2" NSF Certified Sch. 40 PVC w/ 0.020 Inch Slots
2" Blank Riser P:

DEPTH BELOW GROUND SURFACE, FEET

Drilling Firm: TACOMA PUMP & DRILLING CO., INC.
Driller: E HANSEN
Drilling Method: BORING ADVANCED W/ 7.5" O.D., 4.25" I.D. HOLLOW STEM FLIGHT AUGER

Boring Completed on 8-30-89
Well Installation Completed on 8-30-89
Well Developed on 9/28/89

Top of Protective Casing Elevation: 233.77 (City Datum)
Coordinates: N 89'31'63" E 150'14'89

Client: CITY OF TACOMA
Project No.: 40024.312
Inspector: JY BLACK
Approved by: MJ LALLY

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.
BOREHOLE/EXCAVATION WELL LOG

NO. (S) TL-19A
SHEET 1 OF 1

GEOLOGIC LOG

SAMPLE NO., TYPE
& LOCATION

GRAPHIC LOG

WELL CONSTRUCTION DETAILS

Top of Protective Casing Elevation: 233.77 (City Datum)
Coordinates: N 683163 E 1501489

- Undifferentiated Overburden (See boring log for TL-19)

- Bottom of Boring @ 27.5'

Drilling Firm: TACOMA PUMP & DRILLING CO., INC.
Driller: E. HANSEN
Drilling Method: BORING ADVANCED W/ 7.5" D.B.
4.25" 1.6" HOLLOW STEM FLIGHT AUGER

Boring Completed on 8-30-89
Well Installation Completed on 8-30-89
Well Developed on 9/28/89
GEOLOGIC LOG

GEOLOGIC LOG
Gravely SAND, yellow-brown, well graded, fine to coarse grained, subrounded, wet, w/some silt
SILT, gray, firm, low plasticity, wet (GCL)

Bottom of Boring @ 86.0'

GEOLOGIC LOG

SAMPLE

NO. TYPE
CS-5
CS-6

& LOCATION

GRAPHIC

WELL CONSTRUCTION DETAILS

Drilling Firm: TACOMA PUMP & DRILLING CO., INC.
Driller: F. HANSEN
Drilling Method: 5 5/8" DIAMETER TRICONE ROLLER BIT USING AIR, ADVANCING 6" I.D. CASING AS BORING WAS DRILLED

Boring Completed on 09-15-89
Well Installation Completed on 09-15-89
Well Developed on 09-28-89
## Tacoma Landfill Monitoring Well Log

### TL-20a,c

<table>
<thead>
<tr>
<th>Depth</th>
<th>Geologic Log</th>
<th>OHA Reading</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Ground Surface Elevation: 240.00</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>Dry, brown, slightly clayey, slightly sandy, gravelly TILL with mottling throughout</td>
<td>0</td>
<td>CS-1</td>
</tr>
<tr>
<td>20</td>
<td>Dry, dark gray, sandy GRAVEL</td>
<td>0</td>
<td>CS-2</td>
</tr>
<tr>
<td></td>
<td>Becomes saturated</td>
<td>10</td>
<td>CS-3</td>
</tr>
<tr>
<td>30</td>
<td>Saturated, gray-brown, slightly silty, fine to medium SAND</td>
<td>1.6</td>
<td>CS-4</td>
</tr>
<tr>
<td></td>
<td>Some gravelly zones</td>
<td>0.6</td>
<td>CS-5</td>
</tr>
<tr>
<td>40</td>
<td>Saturated, gray-brown, sandy GRAVEL</td>
<td>0.4</td>
<td>CS-6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.7</td>
<td>CS-7</td>
</tr>
<tr>
<td>50</td>
<td></td>
<td>0.7</td>
<td>CS-8</td>
</tr>
<tr>
<td>60</td>
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<td>0.7</td>
<td>CS-9</td>
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<td>0.7</td>
<td>CS-13</td>
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<td></td>
<td>0.7</td>
<td>CS-14</td>
</tr>
<tr>
<td>120</td>
<td></td>
<td>0.7</td>
<td>CS-15</td>
</tr>
<tr>
<td></td>
<td>Bottom of boring at 94 feet Completed 10-27-89</td>
<td>150</td>
<td>CS-16</td>
</tr>
<tr>
<td></td>
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<td>50</td>
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</tr>
</tbody>
</table>

### Well Construction Details

- Locking monument
- Casing Elevation: 242.20
- Pure Gold Grout Mud wt. 10.2
- Enviroplug
- Colorado Silica Sand # 8-12
- 2" schedule 40 flush threaded PVC riser
- 15 ft. 0.020" slot screen
- Pure Gold Grout Mud wt. 10.2
- 2" schedule 40 flush threaded PVC riser
- Colorado Silica Sand # 8-12
- 5 ft. 0.030" slot screen

---

PROJECT NAME: Tacoma Landfill Predesign
WELL IDENTIFICATION NUMBER: TL-20a,c
LOCATION: SE 1/4 SE 1/4 Sec. 14 T20N R2E
DRILLING METHOD: Cable Tool
DRILLER: Jim Vignoli
FIRM: Tacoma Pump and Drilling
CONSULTING FIRM: Pacific Groundwater Group
REPRESENTATIVE: Kathleen Galloway/Russell Prior

DATUM: City of Tacoma Datum
WATER LEVEL ELEVATION: A 223.70 C 218.00
WATER LEVEL DATE: 11-08-89
START CARD NO.: 03-72-82
WA ST COORD: E1505344 N692345

© PACIFIC GROUNDWATER GROUP

JP8902
**Tacoma Landfill Monitoring Well Log**

**TL-20a,c**

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>GEOLOGIC LOG</th>
<th>QVA Reading</th>
<th>SAMPLING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Surface Elevation: 240.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Dry, brown, slightly clayey, slightly sandy, gravelly TILL with mottling throughout</td>
<td>0</td>
<td>CS-1</td>
</tr>
<tr>
<td></td>
<td>Dry, dark gray, sandy GRAVEL</td>
<td>0</td>
<td>CS-2</td>
</tr>
<tr>
<td></td>
<td>Becomes saturated</td>
<td>1.6</td>
<td>CS-4</td>
</tr>
<tr>
<td>20</td>
<td>Saturated, gray-brown, slightly silty, fine to medium SAND</td>
<td>0.6</td>
<td>CS-7</td>
</tr>
<tr>
<td></td>
<td>Some gravelly zones</td>
<td>0.4</td>
<td>CS-8</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td>0.7</td>
<td>CS-9</td>
</tr>
<tr>
<td></td>
<td>Saturated, gray-brown, sandy GRAVEL</td>
<td>0.6</td>
<td>CS-10</td>
</tr>
<tr>
<td>40</td>
<td></td>
<td>6.0</td>
<td>CS-11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8.0</td>
<td>CS-12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17</td>
<td>CS-13</td>
</tr>
<tr>
<td>50</td>
<td></td>
<td>200</td>
<td>CS-15</td>
</tr>
<tr>
<td>60</td>
<td></td>
<td>30</td>
<td>CS-16</td>
</tr>
<tr>
<td>70</td>
<td></td>
<td>50</td>
<td>CS-17</td>
</tr>
<tr>
<td>80</td>
<td></td>
<td>150</td>
<td>CS-18</td>
</tr>
<tr>
<td></td>
<td>Saturated, brown, fine to medium SAND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>Saturated, brown-gray, (peaty), SILT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>Bottom of boring at 94 feet</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Completed 10-27-89</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**WELL CONSTRUCTION DETAILS**

- **Leaking monument**
  - Casing Elevation: 242.20

- **Casing**
  - Pure Gold Gravel Mud wt. 10.2

- **Emboplug**
  - 2" schedule 40 Flush threaded PVC riser
  - 15 ft. 0.020" slot screen

- **Colorado Silica Sand & 5-12**
  - 2" schedule 40 Flush threaded PVC riser
  - 5 ft. 0.020" slot screen

**PROJECT NAME:** Tacoma Landfill Pre-design

**WELL IDENTIFICATION NUMBER:** TL-20a,c

**LOCATION:** SE 1/4 SE 1/4 Sec. 14 T20N R2E

**DRILLING METHOD:** Cable Tool

**DRILLER:** Jim Vignoli

**FIRM:** Tacoma Pump and Drilling

**CONSULTING FIRM:** Pacific Groundwater Group

**REPRESENTATIVE:** Kathleen Galloway/Russell Prior

**DATUM:** City of Tacoma Datum

**WATER LEVEL ELEVATION:** A 223.70 C 218.00

**WATER LEVEL DATE:** 11-08-89

**START CARD NO.:** 03-72-82

**WA ST COORD:** E1501344 N692345

**PACIFIC GROUNDWATER GROUP**

**JP9802**
BOREING/MONITORING WELL LOG

NO. (s) TL-21A

Client: CITY OF TACOMA
Project No. 1 40029.312
Inspector: JY BLACK
Approved by: MJ LALLY

GEOLOGIC LOG

NO. TYPE & LOCATION

0
Hood and Fill, red brown

Silty SAND, brown; dense; poorly
graded; fine grained; subangular;
mottled w/ some gravel

10
Silty SAND; gray-brown; dense;
poorly graded; fine grained;
subangular; mottled w/ some gravel

CA-2

Sandy SILT; gray; hard; low
plasticity; moist (Till)

CA-3

Grading w/ gravel

CA-4

CA-5

CA-6

Sandy SILT; gray; hard; low
plasticity; moist w/ some gravel
(Till)

CA-7

SAND; gray-brown; dense; poorly
graded; fine grained; angular to
subrounded w/ some silt

CA-8

Silty SAND; yellow-brown; very dense;
poorly graded; medium grained;
subrounded; w/ some gravel

CA-9

SAND; gray-brown; very dense;
poorly graded; medium grained;
subrounded w/ trace silt

CA-10

Silty GRAVEL; yellow brown;
very dense; poorly graded; fine
to medium grained; subrounded;
sets w/ trace sand

Bottom of Boring @ 51.0'
Auger boring grouted due to
installation problems

8° Steel
Protective Casing
Concrete

CA-4

CA-5

CA-6

CA-7

CA-8

CA-9

CA-10

8° Steel
Protective Casing
Concrete

Pure Gold Grout
Nub Ml: 10.15

2" NSF Certified
Sch. 40 PVC

Air Rotary Borehole
Diameter: 6"

Bentonite Chips

Coloredo Silica
Sand 1/8-1/4

2" NSF Certified
Sch. 40 PVC
w/0.320 Inch Slots

2' Blank Riser Pipe

20

30

40

50

60

70

80

Drilling Firm: TACOMA PUMP & DRILLING CO., INC.
Drillers: E HANSEN
Drilling Method: BORING ADVANCED W/7.5" Q.B.
4.25" I.D. HOLLOW STEM FLIGHT
AUGER REDRILLED W/AIR ROTARY

Boring Completed on 9-26-88
Well Installation Completed on 9-22-88
Well Developed on 10-02-88

Top of Protective Casing Elevation: 220.81 (City Datum)
Coordinates: N 630625 E 1500995

Drill Line: No. (s) TL-21A
BOREING/MONITORING WELL LOG

NO. (s)       TL-22A

SHEET 1 OF 2

Client: CITY OF TACOMA
Project No.: 40002-132
Inspector: JL DIRICONI
Approved by: RJ LALLY

Top of Protective Casing Elevation: 317.32 (City Datum)
Coordinates: N 692118 E 1502509

GEOLOGIC LOG

NO., TYPE & LOCATION

SAMPLE LOG

WELL CONSTRUCTION DETAILS

- 10" Flush Mount Steel Protective Casing
- Concrete Pca Gravel Drain
- Air Rotary Borehole Diameter: 6"
- 2" NSF Certified Sch. 40 PVC
- 1/2" NSF Certified Sch. 80 PVC
- Cement Bentonite Grout Mud HL: 12.5-13.2
- Bentonite Pellets (1/4"
- Pee Gravel
- 1/2" NSF Certified Sch. 80 PVC w/0.010 Inch Slot
- 0.3' Blank Riser Pipe
- Bentonite Pellets (1/4"

Drilling Firm: TACOMA PUMP & DRILLING CO., INC.
Drilling Method: 5 5/8" DIAMETER TRICONE ROLLER BIT USING AIR; ADVANCING 6" Casing as Boring Was Drilled

Boring Completed on 9-18-89
Well Installation Completed on 9-18-89
Well Developed on 9-23-89
## BORING/MONITORING WELL LOG

### GEOLOGIC LOG

<table>
<thead>
<tr>
<th>Depth Below Ground Surface, Feet</th>
<th>Sample Location</th>
<th>Sample Type</th>
<th>Graphic Log</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>CS-1</td>
<td>Gravely SAND; dark grayish-brown; poorly graded fine to coarse grained; rounded to subrounded; dry w/trace to some silt (TILL)</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>CS-2</td>
<td>Sandy CLAY; brown; low plasticity; w/trace gravel (TILL)</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>CS-3</td>
<td>Clayey SAND; brown; poorly graded; fine to medium grained; subrounded; w/trace gravel (TILL)</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>CS-4</td>
<td>SAND; light yellow-brown; poorly graded; fine to medium grained; subrounded (Colville Sand)</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>CS-5</td>
<td>Grading w/trace silt and gravel</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>CS-6</td>
<td>Silt grades out</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>CS-7</td>
<td>Grading w/trace silt</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>CS-8</td>
<td>Silt grades out</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>CS-9</td>
<td>Grading w/trace silt and gravel</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>CS-10</td>
<td>Grading coarse grained</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>CS-11</td>
<td>Grading coarse grained</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>CS-12</td>
<td>Grading coarse grained</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>CS-13</td>
<td>Grading coarse grained</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>CS-14</td>
<td>Grading coarse grained</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>CS-15</td>
<td>Grading coarse grained</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>CS-16</td>
<td>Grading coarse grained</td>
<td></td>
</tr>
</tbody>
</table>

### WELL CONSTRUCTION DETAILS

- 8" Steel Protective Casing
- Concrete
- Air Rotary Borehole Diameter: 6"
- Voiselay Grout Mud Weight: 9.7
- 2" NSF Certified Sch. 40 PVC
- Bentonite Pellets (1/4"
- 2" NSF Sch. 40 PVC w/0.029 Inch Slots
- Colorado Silica Sand (6-12)
- 2" Blank Riser Pipe

**Drilling Firm:** TACOMA PUMP & DRILLING CO., INC.
**Driller:** E. HANSEN
**Drilling Method:** 5 1/2" DIAMETER TRICONE ROLLER BIT USING AIR; ADVANCING 6" CASTING AS BORING WAS DRILLED

**Boring Completed on:** 9-10-89
**Well Installation Completed on:** 9-10-89
**Well Development on:** 8-23-89

**Client:** CITY OF TACOMA
**Project No.:** 40024.312
**Inspector:** JY BLACK
**Approved By:** MJ LALLY
### GEOLOGIC LOG

<table>
<thead>
<tr>
<th>DEPTH BELOW GROUND SURFACE, FEET</th>
<th>SAMPLE NO.</th>
<th>LOG TYPE</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>CS-1</td>
<td>Silty Sand; light orange-brown; poorly graded fine to coarse grained; subangular to rounded w/trace gravel (fill)</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>CS-2</td>
<td>Silty Sand; brown-gray; poorly graded fine to coarse grained; subangular to rounded w/trace gravel (Outwash)</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>CS-3</td>
<td>Grading w/some gravel</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>CS-4</td>
<td>Sandy Silt; brown-gray; low plasticity w/some gravel; trace clay (Outwash)</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>CS-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>CS-6</td>
<td>Silty Sand; brown-gray; poorly graded fine to coarse grained; subangular to subrounded w/some gravel; trace clay (Colvos Sand)</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>CS-7</td>
<td>Grading brown</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>CS-8</td>
<td>Silty Sand; brown; poorly graded fine to coarse grained; subangular to subrounded w/some silt (Colvos Sand)</td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>CS-9</td>
<td>Grading fine to medium grained w/trace gravel</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>CS-10</td>
<td>Silty Sand; brown; poorly graded fine to coarse grained; subangular to subrounded w/some gravel (Colvos Sand)</td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>CS-11</td>
<td>Grading fine to medium grained w/trace gravel</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>CS-12</td>
<td>Grading fine to coarse grained w/trace gravel</td>
<td></td>
</tr>
<tr>
<td>130</td>
<td>CS-13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>140</td>
<td>CS-14</td>
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<td></td>
</tr>
<tr>
<td>150</td>
<td>CS-15</td>
<td></td>
<td></td>
</tr>
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<td>160</td>
<td>CS-16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>170</td>
<td>CS-17</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### WELL CONSTRUCTION DETAILS

- **10° Flush Mount Protective Steel Casing**
- **Concrete**
- **Air Rotary Borehole Diameter: 6″**
- **Pure Gold Grout Mud Mkt: 10.1-10.2**
- **2° NSF Certified Sch. 40 PVC**
- **Bentonite Pellets (3/8″)**
- **Colorado Silica Sand (<8-#12)**

---

**Drilling Firm:** TACOMA PUMP & DRILLING CO., INC.
**Driller:** E HANSSEN
**Drilling Method:** 5 5/8″ DIAMETER TRICONE ROLLER

**Boring Completed on:** 9-27-89
**Well Installation Completed on:** 9-28-89
**Well Development on:** 10-03-89
GEOLOGIC LOG AND AS-BUILT MONITORING WELL TL-25a

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>GEOLOGIC LOG</th>
<th>UNIT</th>
<th>SAMPLE</th>
<th>PID</th>
<th>LOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>GROUND ELEVATION: 287.9 ft</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
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</tr>
<tr>
<td>150</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No samples collected from this boring
See log for TL-25b

BOTTOM OF BORING 69 FEET
COMPLETED 9-25-95

WELL CONSTRUCTION DETAILS

- CASING ELEVATION: 288.9 ft
- Above ground, locking steel monument; stickup = 1.0 ft
- 8-inch borehole

- 2-inch flush threaded, Sch 40 PVC
- Enviroplug

- Pure Gold bentonite chips
- Colorado Silica Sand #8-12
- 10 feet of 0.020 Slot Sch 40 PVC well screen

FIGURE XX

PROJECT NAME: Tacoma Landfill
WELL IDENTIFICATION NUMBER: TL-25a
DRILLING METHOD: Hollow Stem Auger
DRILLER: Rodney La Brosse
FIRM: Cascade Drilling, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Chad A. Bring

LOCATION: NE 1/4 SE 1/4 Sec.14, T20N, R2E
NORTHING: 694063.57
EASTING: 1502004.96
DATUM: Old City of Tacoma
WATER LEVEL ELEVATION: 227.4 ft
INSTALLED: 9-25-95
DEVELOPED: 10-16-95
RESOURCE PROTECTION WELL REPORT

6362

PROJECT NAME: Tacoma Landfill

WELL IDENTIFICATION NO: 04-051/P58

DRILLING METHOD: HSA

DRILLER: Rodney LeBrosse

FIRM: Cascade Drilling Inc.

SIGNATURE: Rodney LeBrosse

CONSULTING FIRM: PCG Inc. Group

REPRESENTATIVE: Russ Prior

STAND CARD NO: R03468

COUNTY: Pierce

LOCATION: SW 40 SW 40 Sec 3 Twn 20 N R 2E

STREET ADDRESS OF WELL: 4019 S Orchard St, Tacoma

WATER LEVEL ELEVATION: 61'61

GROUND SURFACE ELEVATION: N/A

INSTALLED: 9-25-25

DEVELOPED: N/A

AS-BUILT

WELL DATA

FORMATIONS DESCRIPTION

WELL COVER

CONCRETE SURFACE SEAL

DEEP = 1 ft

PVC BLANK 2 x 25

BACKFILL

TYPE: Gravel Course

3 ft.0

PVC SCREEN 2 x 5

SLOT SIZE: 0.20

GRAVEL PACK 9 ft.0

MATERIAL: 2/8 in. silica

WELL DEPTH 95 ft.

Lee

 SCALE: 1" =

PAGE OF

ECY 660-12 (Rev. 11/09)
# GEOLOGIC LOG AND AS-BUILT MONITORING WELL TL-25b

<table>
<thead>
<tr>
<th>Depth</th>
<th>Geologic Log</th>
<th>Unit</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Ground Elevation: 287.8 ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Dry to damp, brown, silty, gravelly SAND (weathered TILL)</td>
<td>Ge</td>
<td>5-1</td>
</tr>
<tr>
<td>20</td>
<td>Slightly silty, less weathered below 15 feet</td>
<td>Ge</td>
<td>5-2</td>
</tr>
<tr>
<td>30</td>
<td>Damp, brown, slightly silty, gravelly SAND</td>
<td>Ge</td>
<td>5-3</td>
</tr>
<tr>
<td>40</td>
<td>Damp lo wet, brown, fine to medium SAND</td>
<td>Ge</td>
<td>5-5</td>
</tr>
<tr>
<td>50</td>
<td>Well, brown to gray-brown, sandy GRAVEL</td>
<td>Ge</td>
<td>5-6</td>
</tr>
<tr>
<td>60</td>
<td>8-inch borehole</td>
<td>Sch</td>
<td>5-7</td>
</tr>
<tr>
<td>70</td>
<td>2-inch, flush threaded, Sch 40 PVC</td>
<td>Sch</td>
<td>5-8</td>
</tr>
<tr>
<td>80</td>
<td>Enviroplug</td>
<td>Sch</td>
<td>5-9</td>
</tr>
<tr>
<td>90</td>
<td>Pure Gold bentonite chips</td>
<td>Sch</td>
<td>5-10</td>
</tr>
<tr>
<td>100</td>
<td>Colorado Silica Sand #8-12</td>
<td>Sch</td>
<td>5-11</td>
</tr>
<tr>
<td>110</td>
<td>5 feet of 0.020 Slot Sch 40 PVC well screen with 1 foot lollipop</td>
<td>Sch</td>
<td>5-12</td>
</tr>
<tr>
<td>120</td>
<td>Bottom of boring 102 feet completed 9-25-95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>130</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>140</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**WELL CONSTRUCTION DETAILS**

- **Casing Elevation:** 288.8 ft
- **Above ground, locking steel monument; stickup = 1.0 ft**

**FIGURE XX**

**PROJECT NAME:** Tacoma Landfill  
**WELL IDENTIFICATION NUMBER:** TL-25b  
**DRILLING METHOD:** Hollow Stem Auger  
**DRILLER:** Rodney La Brosse  
**FIRM:** Cascade Drilling, Inc.  
**CONSULTING FIRM:** Pacific Groundwater Group, Inc.  
**REPRESENTATIVE:** Chad A. Bring  
**LOCATION:** NE 1/4 SE 1/4 Sec.14, T20N, R2E  
**NORTING:** 694081.53  
**EASTING:** 1502000.57  
**DATUM:** Old City of Tacoma  
**WATER LEVEL ELEVATION:** 225.4 ft  
**INSTALLED:** 9-25-95  
**DEVELOPED:** 10-16-95
## GEOLOGIC LOG AND AS-BUILT MONITORING WELL TL-26b

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>GEOLOGIC LOG</th>
<th>UNIT</th>
<th>SAMPLE</th>
<th>PID</th>
<th>WELL CONSTRUCTION DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>GROUND ELEVATION: 318.8 ft</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Damp, gray-brown, silty, gravelly SAND and gravelly, silty SAND (TILL)</td>
<td>Col</td>
<td>5-1</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>Col</td>
<td>5-2</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Damp, brown to gray-brown, slightly silty, gravelly SAND</td>
<td>Col</td>
<td>5-4</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
<td>Col</td>
<td>5-5</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Damp to wet, brown, fine to medium SAND with occasional gravel</td>
<td>Col</td>
<td>5-7</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td>Col</td>
<td>5-8</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td></td>
<td>Col</td>
<td>5-9</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td></td>
<td>Col</td>
<td>5-10</td>
<td>0.0</td>
<td>Casing elevation: 318.4 ft</td>
</tr>
<tr>
<td>90</td>
<td></td>
<td>Col</td>
<td>5-11</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td></td>
<td>Col</td>
<td>5-12</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>Wet, brown, gravelly SAND</td>
<td>Col</td>
<td>5-14</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>130</td>
<td>Wet, dark gray, slightly sandy SILT</td>
<td>Col</td>
<td>5-15</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>140</td>
<td>Wet, brown, silty and sandy GRAVEL</td>
<td>Col</td>
<td>5-17</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>BOTTOM OF BORING 146.5 FEET COMPLETED 9-26-95</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### FIGURE XX

**PROJECT NAME:** Tacoma Landfill  
**WELL IDENTIFICATION NUMBER:** TL-26b  
**DRILLING METHOD:** Hollow Stem Auger  
**DRILLER:** Rodney La Brosse  
**FIRM:** Cascade Drilling, Inc.  
**CONSULTING FIRM:** Pacific Groundwater Group, Inc.  
**REPRESENTATIVE:** Chad A. Brink  
**LOCATION:** SW¼ SW¼ Sec.13, T20N, R2E  
**NORTHING:** 652811.31  
**EASTING:** 1502575.56  
**DATUM:** Old City of Tacoma  
**WATER LEVEL ELEVATION:** 226.2 ft  
**INSTALLED:** 9-26-95  
**DEVELOPED:** 10-16-95
GEOLOGIC LOG AND AS-BUILT
MONITORING WELL TL-26b

No samples collected from this boring
See log for abandoned Well TL-26b

GEOLOGIC LOG
GROUND ELEVATION: 218.8 ft

UNIT

SAMPLE

TOC

WELL CONSTRUCTION DETAILS
CASING ELEVATION: 318.4 ft
Flush-mounted monument

8-inch borehole

2-inch, flush threaded, Sch 40 PVC

Enviroplug

Pure Gold bentonite chips

Pre-pack screen assembly:
3 feet of 2-inch 0.020 Slot
Sch 40 PVC well screen
Inside 4-inch 0.020 Slot
Sch 40 PVC well screen
with 8-inch tailpipe

BOTTOM OF BORING 144 FEET
COMPLETED 10-27-95

FIGURE XX

PROJECT NAME: Tacoma Landfill
WELL IDENTIFICATION NUMBER: TL-26b
DRILLING METHOD: Hollow Stem Auger
DRILLER: Rodney La Brousse
FIRM: Cascade Drilling, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Chad A. Bring

LOCATION: SW¼ SW¼ Sec.13, T20N, R2E
NORTHING: 692811.81
EASTING: 1502579.56
DATUM: Old City of Tacoma
WATER LEVEL ELEVATION: 228.2 ft
INSTALLED: 9-26-95
DEVELOPED: 10-16-95
RESOURCE PROTECTION WELL REPORT

PROJECT NAME: TACOMA LANDFILL
WELL IDENTIFICATION NO.: ACD: 157102A
DRILLING METHOD: HSA
DRILLER: Rodney LaBrosse
FIRM: Cascade Drilling Co.
SIGNATURE: Rodney LaBrosse
CONSULTING FIRM: PAC GW Group
REPRESENTATIVE: Russ Prior

COUNTY: Pierce
LOCATION: Sec 13 Tm 20N R 2E
STREET ADDRESS OF WELL: 4013 S Orchard St, Tacoma
WATERLEVEL ELEVATION: 92'
GROUND SURFACE ELEVATION: N/A
INSTALLED: 9-29-95
DEVELOPED: NO

AG-BUILT

WELL DATA

WELL COVER
CONCRETE SURFACE SEAL
DEPTH = 1'/ft

PVC BLANK 2" x

BACKFILL
TYPE: Enviro Grout

PVC SCREEN 2" x 1/0
SLT SIZE: 020

GRAVEL PACK 8' ft 5"
MATERIAL: 3/8 silica sand

WELL DEPTH 101.5'

FORMATION DESCRIPTION

0 - 1.5 ft.
asphalt cap base

1.5 - 37 ft.
till, brown sandy
silt and silt loam

37 - 53 ft.
med dr gray
sand w/some
gravel

53 - 101.5 ft.
med dr gray sand

SCALE: 1" = ______

ECY 050-12 (Rev 11/10)
RESOURCE PROTECTION WELL REPORT

PROJECT NAME: Tacoma Landfill
WELL IDENTIFICATION NO. ACD 157012A
DRILLING METHOD: HSA
DRILLER: Rodney Labrosse
FIRM: Cascade Drilling, Inc.
SIGNATURE: Rodney Labrosse
CONSULTING FIRM: PAC Group
REPRESENTATIVE: Russ

COUNTY: Pierce
LOCATION: 5W 1/4 SW 1/4 Sec 3
STREET ADDRESS OF WELL: 4012 S Orchard Street, Tacoma
WATER LEVEL ELEVATION: 92'
GROUND SURFACE ELEVATION: N/A
INSTALLED: 7-29-95
DEVELOPED: NO

AS-BUILT

WELL COVER
CONCRETE SURFACE SEAL
DEPTH = 1/ft

PVC BLANK 2" x

BACKFILL
TYPE: Envi. Grout

PVC SCREEN 2" X 10'
SLT SIZE: 020

GRAVEL PACK 8 ft.
MATERIAL: 8/25 0.1 cu

WELL DEPTH 101.5'

FORMATION DESCRIPTION

0 - 7.5 ft.
asphalt & base

1.5 - 3.7 ft.
till, coarse sand, silt and cobbles

3.7 - 53 ft.
med dk gray sand w/some gravel

53 - 101.5'
med dk gray sand

ECY 050-12 (Rev. 11/09)
GEOLOGIC LOG AND AS-BUILT MONITORING WELL TL-27a

GROUND ELEVATION: 320.2 ft

No samples collected from this boring
See log for TL-27b

CASING ELEVATION: 319.8 ft

- Flush-mounted monument
- 8-inch borehole
- Enviroplug
- 2-in. flush threaded, SCH 40 PVC
- Pure Gold bentonite chips
- Colorado Silica Sand #8-12
- 10 feet of 0.020 Slot SCH 40 PVC well screen with 8-inch nipple

BOTTOM OF BORING 101.5 FEET
COMPLETED 9-29-95

FIGURE XX

PROJECT NAME: Tacoma Landfill
WELL IDENTIFICATION NUMBER: TL-27a
DRILLING METHOD: Hollow Stem Auger
DRILLER: Rodney La Brasse
FIRM: Cascade Drilling, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Chad A. Bring

LOCATION: NW 1/4 NW 1/4 Sec. 24, T20N, R2E
NORTHING: 691598.72
EASTING: 1503061.94
DATUM: Old City of Tacoma
WATER LEVEL ELEVATION: 225.7 ft
INSTALLED: 9-29-95
DEVELOPED: 10-17-95

Pacific Groundwater Group
RESOURCES PROTECTION WELL REPORT

PROJECT NAME: TACOMA LANDFILL
WELL IDENTIFICATION NO: ADC 156/1428
DRILLING METHOD: HSA
DRILLER: Rodney LaBrosse
FIRM: Cascade Drilling, Inc.
SIGNATURE: Rodney LaBrosse
CONSULTING FIRM: PACGEO Group
REPRESENTATIVE: Russ Prior

COUNTY: PIERCE
LOCATION: SW 5W, SW 1/4 Sec 3, Twn 20N, R 2E
STREET ADDRESS OF WELL: 40th St & Orchard St, Tacoma
WATER LEVEL ELEVATION: 45'
GROUND SURFACE ELEVATION: N/A
INSTALLED: 9-28-95
DEVELOPED: NO

5399

AS-BUILT

WELL DATA

CONCRETE SURFACE SEAL
DEPTH = 2' ft

PVC BLANK 2" x

BACKFILL 2 ft. 0
TYPE: ENVIRONMENTAL

PVC SCREEN 2" x 5'
SLOT SIZE: 0.25

GRAVEL PACK 128 ft. 0
MATERIAL: 5/12 stone

WELL DEPTH 136'

FORMATION DESCRIPTION

0 - 45 ft.
Asphalt: Base

1.5 31'
Brownish sandy soil
and cobbles

7.11 ft.
37.53 ft.
Med. dark grey
sand with some
gravel

53 - 117'
Med. dark grey sand

117 - 137
Med. or grey sand
w/large gravel

SCALE: 1" = 1-

PAGE 1 OF 1
PROJECT NAME: TACOMA LANDFILL
WELL IDENTIFICATION NO.: ACD 156/128
DRILLING METHOD: HSA
DRILLER: Rodney LaBrosse
FIRM: Cascade Drilling, Inc.
SIGNATURE: Rodney LaBrosse
CONSULTING FIRM: PAC NW Group
REPRESENTATIVE: Russ Givler

COUNTY: Pierce
LOCATION: SW 1/4 SW 1/4 Sec 3 Twn 20N R 2E
STREET ADDRESS OF WELL: 4619 7th Orchard St. Tacoma
WATER LEVEL ELEVATION: 95
GROUND SURFACE ELEVATION: N/A
INSTALLED: 9/28/95
DEVELOPED: 

AS-BUILT

WELL COVER
CONCRETE SURFACE SEAL
DEPTH = 24 ft.
PVC BLANK 2" x 5'
BACKFILL 2 ft. C
TYPE: ENVIRONGRANT

PVC SCREEN 2" x 5'
SLOT SIZE: 0.020
GRAVEL PACK 12 ft. C
MATERIAL: 8/12 5#/cu.

WELL DEPTH 136 ft.

FORMATION DESCRIPTION
0 - 1.5 ft.
asphalt / base
1.5 - 3 ft.
7/11 = ft.
brownwood sandy mud and cobbles
3.7 - 53 ft.
red mud with clay
53 - 117 ft.
med dark grey sand
117 - 737 ft.
red dr grey sand
w/large gravel

SCALE: 1" = 10 ft.

Page 1 of 1

ECY 050-12 (Rev. 11/09)
GEOLOGIC LOG AND AS-BUILT
MONITORING WELL TL-27b

DEPTH
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

GEOLOGIC LOG
GROUND ELEVATION: 320.5 ft
Damp, brown to gray-brown, slightly silty to silty, gravelly SAND (TILL)
Slightly gravelly and sandy SILT layer at 11 feet (silty TILL)

UNIT
Damp, gray-brown, slightly silty, gravelly SAND, and SAND & GRAVEL

SAND, and SAND & GRAVEL

SAMPLE
3=1
3=2
3=3
3=4
3=5
3=6
3=7
3=8
3=9
3=10
3=11
3=12
3=13
3=14
3=15
3=16
3=17
3=18
3=19
3=20
3=21
3=22
3=23
3=24
3=25
3=26
3=27

PIE
1.2
1.3
0.3
1.1
0.7
1.1
0.2
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0

TOC

WELL CONSTRUCTION DETAILS
CASING ELEVATION: 320.3 ft
Flush-mounted monument

2-inch borehole

2-inch, flush threaded, Sch 40 PVC

Enviroplug

5 feet of 0.020 Slot Sch 40 PVC well screen with 6-inch tailpipe

Location: NW 1/4 NW 1/4 Sec.24, T20N, R2E
NORTHING: 691512.79
EASTING: 1503062.45
DATUM: Old City of Tacoma
WATER LEVEL ELEVATION: 225.9 ft
INSTALLED: 9-28-95
DEVELOPED: 10-17-95

NR = No Recovery

PROJECT NAME: Tacoma Landfill
WELL IDENTIFICATION NUMBER: TL-27b
DRILLING METHOD: Hollow Stem Auger
DRILLER: Rodney La Brosse
FIRM: Cascade Drilling, Inc.
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Chad A. Bring
<table>
<thead>
<tr>
<th>AS-BUILT</th>
<th>WELL DATA</th>
<th>FORMATION DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>WELL COVER</td>
<td>CONCRETE SURFACE SEAL DEPTH: 1 ft</td>
<td></td>
</tr>
<tr>
<td>PVC BLANK: 2&quot; x 6'7&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BACKFILL: 2 ft. D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TYPE: ENVIRONMENT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PVC SCREEN: 2&quot; x 10'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SLOT SIZE: 0.040</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRAVEL PACK: 6'4 ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATERIAL: 8/12 5'/6'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WELL DEPTH: 77</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TILL 0 - 35 ft. Brown sandy till (dark color)

35 - 77 ft. Fine gray sand

---

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.
RESOURCE PROTECTION WELL REPORT

PROJECT NAME: TACOMA LANDFILL
WELL IDENTIFICATION NO.: ACD 155/PIU
DRILLING METHOD: HSA
DRILLER: Rodney LaBrosse
FIRM: Cascade Drilling, Inc.
SIGNATURE: Rodney LaBrosse
CONSULTING FIRM: PAC NW Group
REPRESENTATIVE: Russ Prior

COUNTY: Pierce
LOCATION: SW 1/4, SW 1/4 Sod 3, Twn 20 N, R 26 E
STREET ADDRESS OF WELL: 4015 S. Orchard St, Tacoma
WATER LEVEL ELEVATION: 68'
GROUND SURFACE ELEVATION: N/A
INSTALLED: 9-27-95
DEVELOPED: NO

AS-BUILT

WELL DATA

WELL COVER
CONCRETE SURFACE SEAL
DEPTH = 1/ft

PVC BLANK 2" x 67'

BACKFILL TYPE: Enviroguard

PVC SCREEN 2" x 10'
SLOT SIZE: 0.20

GRAVEL PACK 64 ft
MATERIAL: 3/8, 3/4, 1"

WELL DEPTH 77'

FORMATION DESCRIPTION

Till 0 - 35 ft.
Brown sandy silty clays

35 - 77 ft.
Fine alkaline sand

RECEIVED
95 Nov 2 P1 A2
<table>
<thead>
<tr>
<th>DEPTH</th>
<th>GEOLOGIC LOG</th>
<th>SAMPLE</th>
<th>PID</th>
<th>TOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>GROUND ELEVATION: 296.0 ft</td>
<td>1-1 1.3</td>
<td>8-9 0.0</td>
<td>10-17-95</td>
</tr>
<tr>
<td>10</td>
<td>Dry to damp, brown to gray-brown, silty, gravelly SAND (TILL)</td>
<td>2-2 0.3</td>
<td>8-10 0.0</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Damp, brown to gray-brown, slightly clayey and silty, gravelly SAND</td>
<td>3-3 0.1</td>
<td>8-14 0.1</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Damp to wet, brown, fine to medium SAND with trace gravel</td>
<td>3-4 3.4</td>
<td>5-11 0.1</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Some coarse sand at 50 feet</td>
<td>5-7 0.0</td>
<td>5-12 0.1</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td>5-8 0.0</td>
<td>5-13 0.2</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td>5-9 0.0</td>
<td>5-14 0.1</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td></td>
<td>5-10 0.0</td>
<td>5-15 0.1</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>BOTTOM OF BORING 77.5 FEET</td>
<td>5-11 0.1</td>
<td>5-14 0.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>COMPLETED 5-27-95</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**WELL CONSTRUCTION DETAILS**
- CASING ELEVATION: 295.7 ft
- Flush-mounted monument
- 8-inch borehole
- 2-inch flush threaded, Sch 40 PVC
- Enviroplug
- Pure Gold bentonite chips
- Colorado Silica Sand #6-12
- 10 feet of 0.020 Std
- Sch 40 PVC well screen with 1-foot tailpipe

**FIGURE XX**

**PROJECT NAME:** Tacoma Landfill
**WELL IDENTIFICATION NUMBER:** TL-28a
**DRILLING METHOD:** Hollow Stem Auger
**DRILLER:** Rodney LaBrosse
**FIRM:** Cascade Drilling, Inc.
**CONSULTING FIRM:** Pacific Groundwater Group, Inc.
**REPRESENTATIVE:** Chad A. Bring

**LOCATION:** NE 1/4 NW 1/4 Sec. 24, T20N, R2E
**NORTHING:** 691793.93
**EASTING:** 1503971.70
**DATUM:** Old City of Tacoma
**WATER LEVEL ELEVATION:** 227.0 ft
**INSTALLED:** 5-27-95
**DEVELOPED:** 10-17-95
Key to Exploration Logs
Sample Descriptions

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following:
Density/consistency, moisture, color, minor constituents. MAJOR CONSTITUENT, additional remarks.

Density/Consistency
Soil density/consistency in borings is related primarily to the Standard Penetration Resistance. Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

<table>
<thead>
<tr>
<th>SAND or GRAVEL</th>
<th>Standard Penetration Resistance in Blows/Foot</th>
<th>SILT or CLAY</th>
<th>Standard Penetration Resistance in Blows/Foot</th>
<th>Approximate Shear Strength in TSF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very loose</td>
<td>0 - 4</td>
<td>Very soft</td>
<td>0 - 2</td>
<td>&lt;0.125</td>
</tr>
<tr>
<td>Loose</td>
<td>4 - 10</td>
<td>Soft</td>
<td>2 - 4</td>
<td>0.125 - 0.25</td>
</tr>
<tr>
<td>Medium dense</td>
<td>10 - 30</td>
<td>Medium stiff</td>
<td>4 - 8</td>
<td>0.25 - 0.5</td>
</tr>
<tr>
<td>Dense</td>
<td>30 - 50</td>
<td>Stiff</td>
<td>8 - 15</td>
<td>0.5 - 1.0</td>
</tr>
<tr>
<td>Very dense</td>
<td>&gt;50</td>
<td>Very stiff</td>
<td>15 - 30</td>
<td>1.0 - 2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hard</td>
<td>&gt;30</td>
<td>&gt;2.0</td>
</tr>
</tbody>
</table>

Moisture
Dry              Little perceptible moisture
Damp             Some perceptible moisture, probably below optimum moisture content
Moist            Much perceptible moisture, probably above optimum

Minor Constituents
Not identified in description
Slightly (clayey, silty, etc.)
Clayey, silty, sandy, gravelly
Very (clayey, silty, etc.)

Estimated Percentage
0 - 5
5 - 12
12 - 30
30 - 50

Legends
Sampling
BORING SAMPLES
- Driven
- Bailed
- Cuttings
- Core Run

P Tube Pushed, Not Driven

TEST PIT SAMPLES
- Grab (Jar)
- Bag
- Shelby Tube

Test Symbols
GS Grain Size Classification

8-inch Ø Steel Monument
2-inch Ø Riser Pipe
Concrete Mix
Cement-Bentonite Grout
Water Level
8-inch Ø Borehole
Colorado Silica Sand
Cement-Bentonite Grout
Bentonite Slurry
2-inch Ø Schedule 80 PVC Screen (0.020 Slot Size)
PVC End Cap
Natural Material

J-1775 November 1986
HART-CROWSER & associates, inc.
Figure A-1
GEOLOGIC LOG AND AS-BUILT MONITORING WELL FL-1a

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>GEOLOGIC LOG</th>
<th>SAMPLE</th>
<th>BLOW COUNTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>GROUND ELEVATION:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>No samples collected from this boring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>See log for Well FL-1b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>8-inch borehole</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Bentonite slurry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Bentonite chips</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>2-inch, flush threaded, Sch 40 PVC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>10 feet of 0.020 Slot Sch 40 PVC well screen with 8-inchfailpipe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>Colorado Silt Sand #10-12 and #8-12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>Bottom of boring 85 feet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>Completed 1-22-96</td>
<td></td>
<td></td>
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<tr>
<td>110</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td></td>
<td></td>
<td></td>
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<td>130</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>150</td>
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</tbody>
</table>

FIGURE 1

PROJECT NAME: Tacoma Landfill
WELL IDENTIFICATION NUMBER: FL-1a
DRILLING METHOD: Air Rotary
DRILLER: Terry Burns
FIRM: Geoborong and Development, Inc.
CONSULTING FIRM: Block & Veitch SPC
REPRESENTATIVE: Sue Martin

LOCATION: SW1/4 NW1/4 Sec.12, T20N, R2E
NORTHING: 698757.2
EASTING: 1502548.9
DATUM: Old City of Tacoma
WATER LEVEL ELEVATION: Installed: 1-22-96
START CARD # R-19204

Pacific Groundwater Group
## GEOLOGIC LOG AND AS-BUILT MONITORING WELL FL-1b

### BOTTOM OF BORING 117.5 FEET COMPLETED 1-17-96

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>GEOLOGIC LOG</th>
<th>UNIT</th>
<th>SAMPLE</th>
<th>BLOW COUNTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Dam, gray, gravelly, silty SAND (FILL) with boulders or rubble</td>
<td>fm</td>
<td>5-1</td>
<td>28</td>
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<tr>
<td>10</td>
<td>Very dense, gray, slightly silty, gravelly SAND</td>
<td>g</td>
<td>5-2</td>
<td>50/5</td>
</tr>
<tr>
<td>20</td>
<td>Very dense, damp, gray, slightly silty to silty, gravelly SAND</td>
<td>g</td>
<td>5-3</td>
<td>50</td>
</tr>
<tr>
<td>30</td>
<td>Very dense, dam, brownish-gray to brown, clean fine to medium SAND with some coarse grains</td>
<td>g</td>
<td>5-4</td>
<td>50</td>
</tr>
<tr>
<td>40</td>
<td>Very dense, saturated, gray GRAVEL</td>
<td>g</td>
<td>5-5</td>
<td>50/3</td>
</tr>
<tr>
<td>50</td>
<td>Poor recovery</td>
<td>g</td>
<td>5-6</td>
<td>50/3</td>
</tr>
<tr>
<td>60</td>
<td>Very dense, gravelly, silty, gravelly SAND</td>
<td>g</td>
<td>5-7</td>
<td>50</td>
</tr>
<tr>
<td>70</td>
<td>2-inch, flush threaded, 5ch 40 PVC</td>
<td>g</td>
<td>5-8</td>
<td>50/3</td>
</tr>
<tr>
<td>80</td>
<td>Water level 75 feet</td>
<td>g</td>
<td>5-9</td>
<td>50/3</td>
</tr>
<tr>
<td>90</td>
<td>Colorado Silica Sand #8-12</td>
<td>g</td>
<td>5-10</td>
<td>50/3</td>
</tr>
<tr>
<td>100</td>
<td>5 feet of 0.020 Slot</td>
<td>g</td>
<td>5-11</td>
<td>100/3</td>
</tr>
<tr>
<td>110</td>
<td>Poor recovery</td>
<td>g</td>
<td>5-12</td>
<td>100/3</td>
</tr>
<tr>
<td>120</td>
<td>BOTTOM OF BORING 117.5 FEET</td>
<td>g</td>
<td>5-13</td>
<td>100/3</td>
</tr>
</tbody>
</table>

### PVC CASING ELEV: 307.22
- Above ground, lacking steel monument, pickup 2
- Quick Grout surface seal
- 6-inch ID hollow stem auger in cored borehole
- 8-inch borehole
- 2-inch, flush threaded, 5ch 40 PVC
- Water level 75 feet
- Colorado Silica Sand #8-12
- 5 feet of 0.020 Slot

### PROJECT NAME: Tacoma Landfill
- WELL IDENTIFICATION NUMBER: FL-1b
- DRILLING METHOD: Hollow Stem Auger
- DRILLER: Pat Ternes
- FIRM: Geoboring and Development, Inc.
- CONSULTING FIRM: Pacific Groundwater Group, Inc.
- REPRESENTATIVE: Russell Prior

### LOCATION: SW 1/4 SW 1/4 Sec.12, T20N, R2E
- NORTING: 688758.9
- EASTING: 1502539.2
- DATUM: Old City of Tacoma
- WATER LEVEL ELEVATION: INSTALLED: 1-17-96
- START CARD #: R-19204

---

**FIGURE 2**

Pacific Groundwater Group
Client: CITY OF TACOMA
Project No.: 40024.351
Inspector: J.L. DIRIDONI
Approved by: E.O. MEYER

Top of Protective Casing Elevation: 342.95
Coordinates: N62°43'40" E150°33'49"
Location: SE1/4 SW1/4 Sec.13 T20N R2E

Client: CITY OF TACOMA
Project No.: 40024.351
Inspector: J.L. DIRIDONI
Approved by: E.O. MEYER

Top of Protective Casing Elevation: 342.95 (City Datum)
Coordinates: N62°43'40" E150°33'49"
Location: SE1/4 SW1/4 Sec.13 T20N R2E

BORING/MONITORING WELL LOG
NO.(s) MW-11.1
SHEET 1 OF 2

GEOLOGIC LOG

SAMPLE NO., TYPE & LOCATION

GRAPHIC LOG

WELL CONSTRUCTION DETAILS

Drilling Firm: TACOMA PUMP & DRILLING CO., INC.
Driller: H RAMLO
Drilling Method: BORING ADVANCED W/ 6" TRICONE ROLLER BIT USING AIR & DRIVING 6" STEEL CASING AS ADVANCE BORING.

Boring Completed on 6-8-90
Well Installation Completed on 6-8-90
Well Developed on N/A
Client: CITY OF TACOMA
Project No.: 40024.351
Inspector: J.L. DIRIDONI
Approved by: E.W. MEYER

Top of Protective Casing Elevation: 343.75 (City Datum)
Coordinates: NES2436 E1503388
Location: SE1/4 SW1/4 Sec.13 T25N R2E

GEOLOGIC LOG

Silty SAND, gray brown, well graded, fine to coarse grained; subangular to subrounded; moist, w/trace to some gravel (Till)

Sandy SILT, gray, low plasticity, moist; w/trace to some gravel, trace clay

Grading poorly graded; fine to medium grained

Sandy SAND, gray, poorly graded; fine grained; subrounded, moist; w/trace gravel

Grading poorly graded; fine to coarse grained; subrounded; moist; w/trace silt

Gravelly SAND, gray, well graded, fine to coarse grained; angular; moist; w/some silt

Gravelly SAND, gray, well graded, fine to coarse grained; angular; moist; w/some silt

SAND, gray brown, poorly graded; fine grained; subrounded; moist; w/trace silt

Boring/MONITORING WELL LOG

NO.(s) MN-11-2

SHEET 1 OF 2

WELL CONSTRUCTION DETAILS

BORING/MONITORING WELL LOG

NO.(s) MN-11-2

SHEET 1 OF 2

WELL CONSTRUCTION DETAILS

8" Steel Protective Casing
Concrete
Pure Gold Grout
2" Sch 40 NSF Certified PVC

Drilling Firm: TACOMA PUMP & DRILLING CO., INC.
Driller: M RAMLO
Drilling Method: BORING ADVANCED W/ 6" TRICON ROLLER BIT USING AIR & DRIVING 6" STEEL CASING AS ADVANCE BORING.

Boring Completed on 6-5-90
Well Installation Completed on 6-5-90
Well Developed on N/A
Client: City of Tacoma
Project No.: 40024.351
Inspector: G. Jackson
Approved by:

Top of Protective Casing Elevation: 333.17' (msl)
Coordinates: N 695821.77, E 1502582.73
Ground Surface Elevation: 331.11'

GEOLOGIC LOG

DEPTH BELOW GROUND SURFACE FEET

NO., TYPE & LOCATION

GRAPHIC LOG

WELL CONSTRUCTION DETAILS

0
Gravely SAND: light brown; dense; well graded; fine to coarse grained; subangular; moist; w/trace silt (fill)
grading grayish brown

10
SAND: dark brown; dense; well graded; fine to coarse grained; subangular to subrounded; moist; w/some gravel and some refuse; (landfill refuse)
Refuse consists of plastic, fabric, paper, metal

20
grading light gray

30
SAND: light gray; dense; well graded; medium to coarse grained; subangular; moist; w/some silt, gravel (fill)

40
Sandy GRAVEL: light brown; very dense well graded; fine to medium gravel; subrounded; moist w/trace gravel (outwash deposits)

50
SAND: light grayish brown; dense; well graded; 1/4"-1.5" grained; subrounded; moist; w/trace gravel (outwash deposits)
grading light brown; w/trace silt

60
Sandy GRAVEL: light gray; dense; well graded; 1/4 inch to 2 inch; subrounded; moist; w/some silt (fill)

70
[SAND: gray; dense; well graded; fine to medium grained; subangular; wet; w/trace silt

80
[SAND: light brown; dense; well graded; fine to medium grained; subrounded; moist; w/trace silt (Colvos sand)

Drilling Firm: Ramlo Drilling
Driller: J. Morris
Drilling Method: 8 inch air rotary bit

Boring Completed on 07-11-91
WELL INSTALLATION COMPLETED ON 07-11-91

Concrete (3.0' - 0.0')

Pure Gold grout (106.3' - 3.0')

2" dia Sch. 40 NSF certified PVC

Client: City of Tacoma
Project No.: 40024.351
Inspector: G. Jackson
Approved by:

Top of Protective Casing Elevation: 333.17' (msl)
Coordinates: N 695821.77, E 1502582.73
Ground Surface Elevation: 331.11'

GEOLOGIC LOG

DEPTH BELOW GROUND SURFACE FEET

NO., TYPE & LOCATION

GRAPHIC LOG

WELL CONSTRUCTION DETAILS

0
Gravely SAND: light brown; dense; well graded; fine to coarse grained; subangular; moist; w/trace silt (fill)
grading grayish brown

10
SAND: dark brown; dense; well graded; fine to coarse grained; subangular to subrounded; moist; w/some gravel and some refuse; (landfill refuse)
Refuse consists of plastic, fabric, paper, metal

20
grading light gray

30
SAND: light gray; dense; well graded; medium to coarse grained; subangular; moist; w/some silt, gravel (fill)

40
Sandy GRAVEL: light brown; very dense well graded; fine to medium gravel; subrounded; moist w/trace gravel (outwash deposits)

50
SAND: light grayish brown; dense; well graded; 1/4"-1.5" grained; subrounded; moist; w/trace gravel (outwash deposits)
grading light brown; w/trace silt

60
Sandy GRAVEL: light gray; dense; well graded; 1/4 inch to 2 inch; subrounded; moist; w/some silt (fill)

70
[SAND: gray; dense; well graded; fine to medium grained; subangular; wet; w/trace silt

80
[SAND: light brown; dense; well graded; fine to medium grained; subrounded; moist; w/trace silt (Colvos sand)

Drilling Firm: Ramlo Drilling
Driller: J. Morris
Drilling Method: 8 inch air rotary bit

Boring Completed on 07-11-91
WELL INSTALLATION COMPLETED ON 07-11-91
Boring/Monitoring Well Log

Client: City of Tacoma
Project No.: 40024.351
Inspector: G. Jackson
Approved by:

Top of Protective Casing Elevation: 333.17' (msl)
Coordinates: N 696621.77', E 1502562.73
Ground Surface Elevation: 331.17'

GEOLOGIC LOG

Gravely Sand, dark gray, dense, well graded, medium to coarse grained, subangular, wet.
Sand, dark gray, dense, well graded, medium to coarse grained, subangular, wet, w/ some gravel
Grading w/trace gravel
Silt grades out
Grading fine to coarse grained
Grading w/trace gravel

GEOLOGIC LOG

Sample
No. TYPE
& LOCATION

10-20 Colorado
Silica Sand
(106.8'–106.3')
Bentonite Chips

WELL CONSTRUCTION
DETAILS

Drilling Firm: Ramlo Drilling
Driller: J. Morris
Drilling Method: 8" inch air rotary bit
Boring Completed on 07-11-91
Well Installation Completed on 07-11-91
**BORING/MONITORING WELL LOG**

**GEOLOGIC LOG**

<table>
<thead>
<tr>
<th>Sample No. &amp; Type Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
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<td>20</td>
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<tr>
<td>40</td>
</tr>
<tr>
<td>50</td>
</tr>
<tr>
<td>60</td>
</tr>
<tr>
<td>70</td>
</tr>
<tr>
<td>80</td>
</tr>
</tbody>
</table>

**WELL CONSTRUCTION DETAILS**

- Concrete (3.0'-0.0')
- Bentonite Chips (5.0'-3.0')
- Pure Gold grout (5.0'-30.0')
- 2" dia Sch. 40 NSF certified PVC

**Drilling Details**

- Drilling Firm: Ramlo Drilling
- Driller: J. Morris
- Drilling Method: 8 inch air rotary bit

- Boring Completed on 07-03-91
- Well Installation Completed on 07-03-91

**Client:** City of Tacoma

**Project No.:** 40024.351

**Inspector:** G. Jackson

**Approved by: City of Tacoma**

**Top of Protective Casing Elevation:** 334.30' (msl)

**Coordinates:** N 695467.92, E 1502365.45

**Ground Surface Elevation:** 333.13'
Boring/Monitoring Well Log

Sample Location Log

Client: City of Tacoma
Project No.: 40024.351
Inspectot: G. Jackson
Approved by:

Top of Protective Casing Elevation: 334.90' (msl)
Coordinates: N 695467.72, E 1502565.45
Ground Surface Elevation: 333.13'

Geologic Log

Grades to trace gravel.

Grading w/some silt.
Grades to trace silt.

2' natural sand

10-20 Colorado Silica Sand

2" dia sch 40 NSF certified PVC w/0.020" slots

Borehole Diameter:
0'- 40': 8"
40'- 123.3': 6"

Drilling Firm: Ramlo Drilling
Driller: J. Morris
Drilling Method: 8 inch air rotary bit

Boring Completed on 07-03-91
Well Installation Completed on 07-03-91
**LOG OF BORING**

**BORING NO. TL-1A**

**CLIENT**
City of Tacoma

**PROJECT**
Tacoma Landfill Remedial Invest.

**PROJECT NO.**
13209

**PROJECT LOCATION**
Tacoma, Washington

**COORDINATES**
N697.877', E1 502.303'

**ELEVATION (DATUM)**
330.8' (Tacoma)

**TOTAL DEPTH**
115.7'

**DATE START**
7/16/86

**DATE FINISH**
7/29/86

**INSPECTOR**
E. W. Meyer

**CHECKED BY**
M. J. Lally

**APPROVED BY**
R. H. Herzog

---

**SURFACE CONDITIONS**
Flat; on shoulder of road

---

**SAMPLE TYPE**
CORING

<table>
<thead>
<tr>
<th>SAMPLE NUMBER</th>
<th>SET</th>
<th>LENGTH</th>
<th>RUN</th>
<th>RUN</th>
<th>2ND</th>
<th>3RD</th>
<th>4TH</th>
<th>5TH</th>
<th>6TH</th>
<th>N</th>
<th>PERCENT RECV.</th>
<th>ROD</th>
<th>DEPTH IN FEET</th>
<th>COLOR</th>
<th>GRAPHIC LOG</th>
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<tbody>
<tr>
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<td>19</td>
<td>21</td>
<td>24</td>
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<td>SAND</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>SAND</td>
<td></td>
</tr>
</tbody>
</table>

---

**CLASSIFICATION OF MATERIAL**

**REMARKS**

- Boring advanced w/4-1/2" O.D., 4-1/4" I.D. hollow stem flight auger.
- Samples obtained w/3" O.D. diameter split spoon.
- Silt grades to trace.
<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Core Size</th>
<th>Sampling</th>
<th>CORING</th>
<th>RQD</th>
<th>Percent Recovered</th>
<th>Sample Description</th>
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<tbody>
<tr>
<td>SPT</td>
<td>6 100</td>
<td></td>
<td></td>
<td>0.5</td>
<td></td>
<td>Gravelly SAND; light gray; very dense; poorly graded; medium to coarse grained; rounded; moist; w/occasional cobble</td>
</tr>
<tr>
<td>SPT</td>
<td>7 100</td>
<td></td>
<td></td>
<td>0.5</td>
<td></td>
<td>grading w/numerous cobbles; occasional lens w/trace silt</td>
</tr>
<tr>
<td>SPT</td>
<td>8 100</td>
<td>2</td>
<td></td>
<td>0.2</td>
<td>40</td>
<td>SILT; light gray; very dense; moist; w/trace sand &amp; gravel; numerous gravel lenses; occasional cobble</td>
</tr>
<tr>
<td>SPT</td>
<td>9 100</td>
<td>2.5</td>
<td></td>
<td>0.2</td>
<td></td>
<td>SAND; light gray; very dense; poorly graded; medium to coarse grained; rounded; moist; w/some gravel; trace silt; numerous cobbles</td>
</tr>
<tr>
<td>SPT</td>
<td>10 100</td>
<td>5</td>
<td></td>
<td>0.4</td>
<td>50</td>
<td>SAND; olive-brown; very dense; well graded; fine to coarse grained; rounded; moist; w/some silt &amp; gravel</td>
</tr>
<tr>
<td>SPT</td>
<td>11 100</td>
<td>5</td>
<td></td>
<td>0.3</td>
<td></td>
<td>Gravelly SAND; brown; very dense; well graded; fine to coarse grained; rounded; wet; w/some silt</td>
</tr>
</tbody>
</table>

Water encountered during drilling while advancing from 55' to 60'.
<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Core Size</th>
<th>Run Number</th>
<th>Sample Length</th>
<th>Percent Recovered</th>
<th>RQD</th>
<th>Depth in Feet</th>
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<tbody>
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<td>SPT</td>
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<td>12</td>
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<td>-</td>
<td>0.5</td>
<td>10</td>
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<tr>
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<td>-</td>
<td>0.5</td>
<td>10</td>
</tr>
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<td>-</td>
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<td>SPT</td>
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<td>15</td>
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<td>-</td>
<td>0.8</td>
<td>55</td>
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<td>16</td>
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<td>-</td>
<td>0.9</td>
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<td>17</td>
<td>42</td>
<td>70 101</td>
<td>1.5</td>
<td>101</td>
</tr>
</tbody>
</table>

**Classification of Material**

- **SPT 12**: Olive brown; very dense; poorly graded; medium to coarse grained; rounded; moist; w/trace to some gravel; occasional lens w/trace silt
- **SPT 13**: Grading w/trace silt
- **SPT 14**: Olive brown; very dense; poorly graded; fine to coarse grained; rounded; moist; w/trace gravel
- **SPT 15**: Grading w/occasional 0.03' sand lens w/trace silt
- **SPT 16**: Grading fine to medium grained sand; trace silt grades out; gravel grades out

**Remarks**

- Boring dry @ 65'
- Sample 14 submitted for chemical analysis
<table>
<thead>
<tr>
<th>SAMPLE NUMBER</th>
<th>SET 6'</th>
<th>200 6'</th>
<th>400 6'</th>
<th>N</th>
<th>VALUE</th>
<th>RECOV</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPT 18</td>
<td>70</td>
<td>100</td>
<td>100</td>
<td>-</td>
<td>1.5</td>
<td>3.2</td>
</tr>
<tr>
<td>SPT 19</td>
<td>55</td>
<td>100</td>
<td>5</td>
<td>-</td>
<td>0.9</td>
<td>-</td>
</tr>
<tr>
<td>SPT 20</td>
<td>15</td>
<td>70</td>
<td>70</td>
<td>-</td>
<td>1.5</td>
<td>100</td>
</tr>
<tr>
<td>SPT 21</td>
<td>7</td>
<td>100</td>
<td>5.5</td>
<td>-</td>
<td>0.0</td>
<td>-</td>
</tr>
<tr>
<td>SPT 22</td>
<td>89</td>
<td>100</td>
<td>40</td>
<td>-</td>
<td>0.0</td>
<td>110</td>
</tr>
<tr>
<td>SPT 23</td>
<td>86</td>
<td>100</td>
<td>20</td>
<td>-</td>
<td>0.0</td>
<td>-</td>
</tr>
</tbody>
</table>

**REMARKS**

- Boring dry prior to drilling on 7/18/86
- SAND; olive-brown; very dense; poorly graded; fine to medium grained; rounded; wet; w/trace gravel
- Water @ 97.3' on 7/28/86
- Water @ 99.9' on 7/29/86
- Introduced water prior to advancing to 115 ft.
- Bottom of boring @ 115.7'
- Water level not recorded
- Piezometer installed on 7/30/86
PIEZOMETER INSTALLATION LOG

CLIENT: City of Tacoma

PROJECT: Tacoma Landfill Remedial Invest

PROJECT LOCATION: Tacoma, Washington

COORDINATES: N97,877', E1,502,303'

GROUND ELEVATION: 330.8' (Tacoma)

DATE: 7/30/86

STRATUM MONITORED: Sand from 87.6' to 110.8'

PROJECT NO: Tacoma Landfill Remedial Invest.

CONTRACT: 13209

INSPECTOR: E. W. Meyer

CHECKED BY: M. J. Lally

APPROVED BY: R. H. Herzog

PIEZOMETER NO. TL-1

METHOD OF INSTALLATION:
Boring drilled to completion; set riser pipe & screen; alternated pulling augers & placing filter; placed bentonite pellet seal; hydrated bentonite w/water; alternated pulling augers & grouting to ground surface; set steel protective surface casing

REMARKS: Note: 4.9' of blank riser pipe below screen

GROUND SURFACE: GROUND SURFACE

TYPE OF SEAL: Cement-Bentonite Grout

O.D. & TYPE OF RISER PIPE: 2" Sch 80 PVC

TYPE OF SEAL: Bentonite Pellets

TYPE AND SIZE OF SCREEN OR OPENINGS: 2" Sch 80 PVC w/0.02" slots

TYPE OF FILTER: Combination of Colorado Silica sand & natural sand

TYPE OF SEAL: None

DIAMETER OF BOREHOLE: 7-1/2"
WATER WELL REPORT

STATE OF WASHINGTON

(1) OWNER: 
Name: CITY OF TACOMA
Address: 35TH AND ORCHARD ST.

(2) LOCATION OF WELL: 
County: PIERCE

(3) PROPOSED USE: 
Domestic □ Industrial □ Municipal □
□ Monitoring

(4) TYPE OF WORK: 
Owner's number of well (if more than one): 
□ New well □ Method: Dug □ Bored □ Driven □
□ Deepened □ Cable □ Driven □
□ Reconditioned □ Rotary □ Jetted □

(5) DIMENSIONS: 
Diameter of well: 2 2/8" inches.
Drilled: 203 ft. Depth of completed well: 138.6 ft.

(6) CONSTRUCTION DETAILS: 
Casing installed: 2" Diam. from 0 ft. to 173.5 ft.
Threaded □ Diam. from 0 ft. to 1380 ft.
Welded □ Diam. from 0 ft. to 1380 ft.

Perforations: Yes □ No □
Type of perforator used: 
□ Size of perforations: 1/16 in. by □
□ perforations from 0 ft. to 173.5 ft.
□ perforations from 0 ft. to 1380 ft.
□ perforations from 0 ft. to 1380 ft.

Screens: Yes □ No □
Manufacturer's Name: HYDROPHILIC INC.
Type: PVC, FLUSH INLET
Model No.
Diam. 2" Slot size 0.20 from 163.5 ft. to 173.5 ft.
Diam. 2" Slot size 0.20 from 133.5 ft. to 1380 ft.

Gravel packed: Yes □ No □
Gravel placed from 5' above both screens ft.

Surface seal: Yes □ No □
□ To what depth: 138 ft.
Material used in seal: CEMENT - BENTONITE
Did any strata contain unusable water? Yes □ No □
Type of water? 
□ Depth of strata.
Method of sealing strata off.

(7) PUMP: 
Manufacturer's Name: HYDROSTAR
Instrument, N.Y.
Type: H.P.MAN.

(8) WATER LEVELS: 
Static level = 98 ft. below top of well Date: 8-20-86
Artesian pressure = lbs. per square inch Date:
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: 
Drawdown is amount water level is lowered below static level
Was a pump test made? Yes □ No □
If yes, by whom?
Yield: gal/min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)
Time Water Level Time Water Level

Date of test

Balloon test: gal/min. with ft. drawdown after hrs.
Artesian flow = g.p.m. Date
Temperature of water: Was a chemical analysis made? Yes □ No □

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILL</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>TILL</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>SAND, GRAVEL (F-M)</td>
<td>20</td>
<td>118</td>
</tr>
<tr>
<td>SANDY, GRAVEL</td>
<td>118</td>
<td>165</td>
</tr>
<tr>
<td>SAND, GRAVEL, SILT</td>
<td>165</td>
<td>177</td>
</tr>
<tr>
<td>SILT, SAND, GRAVEL</td>
<td>177</td>
<td>203</td>
</tr>
</tbody>
</table>

DESIGNATED WELL 

TL-1B DEPTH

136 FT

173.5 FT

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME: TACOMA PUMP & DRILLING CO INC
(Person, firm, or corporation) (Type or print)
Address: 3256 MTH HWY-GRAHAM, W. N.

(Signed) [Signature] (Well Driller)

License No. 0193 Date: DEC 22, 1986

(USE ADDITIONAL SHEETS IF NECESSARY)
Geologic Log

<table>
<thead>
<tr>
<th>Depth in Feet</th>
<th>Head Space</th>
<th>H-Nu</th>
<th>OVA</th>
<th>Lab</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>Ground Surface Elevation in Feet</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>160</td>
<td>Saturated, brown, sandy GRAVEL to</td>
<td>32</td>
<td>210</td>
<td>S-9</td>
<td>S-10</td>
</tr>
<tr>
<td>170</td>
<td>very sandy GRAVEL</td>
<td></td>
<td>90</td>
<td>S-10</td>
<td>S-11</td>
</tr>
<tr>
<td>180</td>
<td></td>
<td></td>
<td></td>
<td>S-12</td>
<td>S-13</td>
</tr>
<tr>
<td>190</td>
<td>Saturated, gray, gravelly, silty</td>
<td>10</td>
<td>GS</td>
<td>S-14</td>
<td>S-15</td>
</tr>
<tr>
<td></td>
<td>SAND (TILL).</td>
<td></td>
<td></td>
<td></td>
<td>S-16</td>
</tr>
<tr>
<td>200</td>
<td>Saturated, gray, slightly silty to</td>
<td>11</td>
<td></td>
<td>S-17</td>
<td>S-17</td>
</tr>
<tr>
<td></td>
<td>silty, gravelly SAND with silt</td>
<td></td>
<td></td>
<td></td>
<td>S-18</td>
</tr>
<tr>
<td></td>
<td>layers</td>
<td></td>
<td></td>
<td></td>
<td>S-19</td>
</tr>
</tbody>
</table>

Bottom of Boring at 203.0 Feet. Completed 8/20/86.

NOTES: 1. Soil descriptions are interpretive and actual changes may be gradual.
2. Water Level - - is for date indicated and may vary with time of year.
   ATO: At Time of Drilling
3. Head space readings in ppm.

J-1775 November 1986
HART-CROWSER & associates, inc.
Sheet 2 of 2 Figure A-2
<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Sample Number</th>
<th>Set 6'</th>
<th>2nd 6'</th>
<th>3rd 6'</th>
<th>Recov.</th>
<th>RQD</th>
<th>Depth in Feet</th>
<th>Sample Type</th>
<th>Graphic Log</th>
<th>Classification of Material</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
<td></td>
<td>10</td>
<td>CS</td>
<td></td>
<td>Silty SAND; yellowish-brown (Fill)</td>
<td>Boring advanced w/5-7/8&quot; diameter tricone roller bit using air &amp; advancing 6&quot; steel casing as it is drilled.</td>
</tr>
<tr>
<td>CS</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
<td></td>
<td>20</td>
<td>CS</td>
<td></td>
<td>Silty SAND; grayish-brown; poorly graded; fine to coarse grained; rounded; moist; w/trace to some gravel. (Till)</td>
<td></td>
</tr>
<tr>
<td>CS</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
<td></td>
<td>30</td>
<td>CS</td>
<td></td>
<td>SAND; brown; poorly graded; fine to coarse grained; rounded; moist; w/some gravel.</td>
<td></td>
</tr>
<tr>
<td>CS</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
<td></td>
<td>30</td>
<td>CS</td>
<td></td>
<td>Silty SAND; gravish-brown; poorly graded; fine to coarse grained; rounded; moist; w/some gravel (Till)</td>
<td></td>
</tr>
<tr>
<td>CS</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
<td></td>
<td>30</td>
<td>CS</td>
<td></td>
<td>SAND; brown; poorly graded; fine to coarse grained; rounded; moist; w/trace gravel</td>
<td></td>
</tr>
</tbody>
</table>

---

BLACK & VEATCH ENGINEERS-ARCHITECTS

LOG OF BORING

BOARING NO. TL-11

DATE START 9/25/86
DATE FINISH 9/26/86

PROJECT LOCATION: Tacoma, Washington
COORDINATES: N692.474', E1,503.387'
ELEVATION (DATUM): 343.3' (Tacoma)
TOTAL DEPTH: 128.0'
PROJECT No.: 13209

SURFACE CONDITIONS: Flat; sloping to southwest

CHECKED BY: M. J. Lally
APPROVED BY: R. H. Herzog
<table>
<thead>
<tr>
<th>Sample</th>
<th>Depth (ft)</th>
<th>Core Type</th>
<th>Classification of Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 6</td>
<td>0-10</td>
<td>CS</td>
<td>grading w/some gravel</td>
</tr>
<tr>
<td>CS 7</td>
<td>10-20</td>
<td>CS</td>
<td>Silty SAND; grayish-brown;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>well graded; fine to coarse</td>
</tr>
<tr>
<td>CS 8</td>
<td>20-30</td>
<td>CS</td>
<td>Gravelly SAND; brown;</td>
</tr>
<tr>
<td>CS 9</td>
<td>30-40</td>
<td>CS</td>
<td>Silty SAND; grayish-brown;</td>
</tr>
<tr>
<td>CS 10</td>
<td>40-50</td>
<td>CS</td>
<td>SAND; grayish-brown;</td>
</tr>
<tr>
<td>CS 11</td>
<td>50-60</td>
<td>CS</td>
<td>grading w/less silt</td>
</tr>
<tr>
<td>Sample Number</td>
<td>Sample Type</td>
<td>Core Size</td>
<td>Depth in Feet</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
<td>-----------</td>
<td>---------------</td>
</tr>
<tr>
<td>12</td>
<td>CS</td>
<td>CS</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>CS</td>
<td>CS</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>CS</td>
<td>CS</td>
<td>70</td>
</tr>
<tr>
<td>15</td>
<td>CS</td>
<td>CS</td>
<td>80</td>
</tr>
<tr>
<td>16</td>
<td>CS</td>
<td>CS</td>
<td>90</td>
</tr>
<tr>
<td>17</td>
<td>CS</td>
<td>CS</td>
<td></td>
</tr>
<tr>
<td>SAMPLE TYPE</td>
<td>CORE SIZE</td>
<td>RUN NUMBER</td>
<td>RUN LENGTH</td>
</tr>
<tr>
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<td>------------</td>
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<td>CS</td>
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<tr>
<td>CS</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS</td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS</td>
<td>23</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PROJECT LOCATION**

- Tacoma, Washington
- $N692.474'; E1503.387'$
- $343.3' (Tacoma)$ $128.0'$

**START DATE**

- 9/25/86

**FINISH DATE**

- 9/26/86

**CLASSIFICATION OF MATERIAL**

- SAND: olive brown; well graded; medium to coarse grained; rounded; moist; w/some silt; trace gravel.
- Water encountered @ 115' during drilling
**LOG OF BORING**

**BORING NO.** TL-11
**SHEET** 5 OF 5

<table>
<thead>
<tr>
<th>CLIENT</th>
<th>PROJECT</th>
<th>PROJECT NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Tacoma</td>
<td>Tacoma Landfill Remedial Invest.</td>
<td>13209</td>
</tr>
</tbody>
</table>

**PROJECT LOCATION**
Tacoma, Washington

**COORDINATES**
N 592.474'; E 1,503.387' |

**ELEVATION (DATUM)**
343.3' (Tacoma) |

**TOTAL DEPTH**
128.0' |

**DATE START**
9/25/86 |

**DATE FINISH**
9/26/86 |

**SURFACE CONDITIONS**
Flat; sloping to southwest |

**SAMPLING CHECKED BY**
M. J. Lally |

**APPROVED BY**
R. H. Herzog |

<table>
<thead>
<tr>
<th>SAMPLE TYPE</th>
<th>RUN NUMBER</th>
<th>SAMPLE NUMBER</th>
<th>RUN LENGTH</th>
<th>1ST 6'</th>
<th>2ND 6'</th>
<th>3RD 6'</th>
<th>N VALUE</th>
<th>SAMPLE RECOV.</th>
<th>GRAPHIC LOG</th>
<th>CLASSIFICATION OF MATERIAL</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC</td>
<td>24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Drove 6&quot; steel casing to 130'; cleaned casing out to 128' using 5-7/8&quot; drill bit using air and bailing</td>
<td>SAND; olive-brown; poorly graded; fine to medium grained; rounded; moist w/trace gravel</td>
</tr>
<tr>
<td>CS</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Added 25 gallon water as fods were pulled.</td>
<td></td>
</tr>
<tr>
<td>CS</td>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Added about 60 gallon water total while cleaning casing</td>
<td>Bottom of boring @ 128'</td>
</tr>
</tbody>
</table>

Piezometer installed on 9/27/86 & 9/29/86
# PIEZOMETER INSTALLATION LOG

**PIEZOMETER NO.** TL-11

**CLIENT**  
City of Tacoma

**PROJECT**  
Tacoma Landfill Remedial Invest. 13209

**PROJECT LOCATION**  
Tacoma, Washington

**COORDINATES**  
N692.474', E1,503.387'

**GROUND ELEVATION**  
343.3' (Tacoma)

**PROJECT NO.**  
13209

**DATE**  
9/27/86

**INSPECTOR**  
E. W. Meyer

**CHECKED BY**  
M. J. Lally

**APPROVED BY**  
R. H. Herzog

---

**STRATUM MONITORED**  
Sand from 99.2' to 124.4'

**PROJECT LOCATION**  
Tacoma, Washington

**GROUND SURFACE**

**TYPE OF SEAL**
- Cement-Bentonite Grout

**O.D. & TYPE OF RISER PIPE**
- 2" Sch 80 PVC

**TYPE AND SIZE OF SCREEN OR OPENINGS**
- Bentonite Pellets
- 2" Sch 80 PVC w/0.02" slots

**TYPE OF FILTER**
- Colorado Silica Sand from 99.2' to 123.5'
- Natural sand from 123.5' to 125.0'

**DIA METTER OF BOREHOLE**
- 7-1/2"

**METHOD OF INSTALLATION:**
- Boring drilled to completion; set riser pipe & screen; alternated pulling casing & placing filter; placed bentonite seal; hydrated bentonite w/water; alternated pulling casing & grouting to 1.5' below ground surface; placed concrete surface seal; set steel protective surface casing.

**REMARKS:**
- Note: 0.6' blank riser
- Below screen; boring
- Caved from 125.0' to 128.0'

---
Boring Log and Construction Data for Well TL-11 b,d

Geologic Log

<table>
<thead>
<tr>
<th>Depth in Feet</th>
<th>Sample</th>
<th>OVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>S-1</td>
<td>5</td>
</tr>
<tr>
<td>20</td>
<td>S-2</td>
<td>15</td>
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<tr>
<td>30</td>
<td>S-3</td>
<td>6</td>
</tr>
<tr>
<td>40</td>
<td>S-4</td>
<td>7</td>
</tr>
<tr>
<td>50</td>
<td>S-5</td>
<td>50</td>
</tr>
<tr>
<td>60</td>
<td>S-6</td>
<td>300</td>
</tr>
<tr>
<td>70</td>
<td>S-7</td>
<td>&gt;1000</td>
</tr>
<tr>
<td>80</td>
<td>S-8</td>
<td>&gt;1000</td>
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<tr>
<td>90</td>
<td>S-9</td>
<td>30</td>
</tr>
<tr>
<td>100</td>
<td>S-10</td>
<td>20</td>
</tr>
<tr>
<td>110</td>
<td>S-11</td>
<td>300</td>
</tr>
<tr>
<td>120</td>
<td>S-12</td>
<td>300</td>
</tr>
<tr>
<td>130</td>
<td>S-13</td>
<td>80</td>
</tr>
<tr>
<td>140</td>
<td>S-14</td>
<td>&gt;100</td>
</tr>
<tr>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>160</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sample descriptions:
- Damp, gray, silty, gravelly SAND (TILL).
- Damp, brown, slightly silty to silty, sandy GRAVEL and gravelly SAND.
- Damp to saturated, fine to medium SAND with occasional individual gravels.
- Saturated, gray, very sandy GRAVEL.
- Saturated, brown, sandy GRAVEL.

Well Design

Top Casing Elevation in Feet
Casing Stickup in Feet

NOTES:
1. Soil descriptions are interpretative and actual changes may be gradual.
2. Water Level is for data indicated and may vary with time of year.
3. ATO: At Time of Drilling

FIGURE 2 (SHEET 1 OF 2)
BORING LOG AND CONSTRUCTION DATA FOR WELL TL-11 b,d
TACOMA LANDFILL RF/FS
Well Design
Top Casing Elevation in Feet
Casing Stickup in Feet

Geologic Log

<table>
<thead>
<tr>
<th>Depth in Feet</th>
<th>Sample</th>
<th>OVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>160</td>
<td></td>
<td></td>
</tr>
<tr>
<td>170</td>
<td></td>
<td></td>
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<tr>
<td>180</td>
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<tr>
<td>190</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200</td>
<td></td>
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<td>300</td>
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<tr>
<td>310</td>
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<td></td>
</tr>
</tbody>
</table>

- Rusty color.
- Fine to medium SAND with SILT layers.
- Thin bed of hard, brown SILT.
- Saturated, blue-gray, fine SAND becomes silty with depth.
- Kat, blue-gray SILT.
- Slightly gravelly, sandy zone.
- Slightly pebbly/sandy zone.
- Bottom of Boring at 236 Feet. Completed 9/4/87

OVA-128
Sample Jar Head Space Reading in ppm

NOTES: 1. Soil gradations are interpretative and actual changes may be gradual.
2. Water Level - is for data indicated and may vary with time of year.
AOD: At Time of Drilling

FIGURE 2 (SHEET 2 OF 2)
BORING LOG AND CONSTRUCTION DATA FOR WELL TL-11b,d
TACOMA LANDFILL R/FS
**LOG OF BORING**

**BORING NO. TL-15A**  
**SHEET 1 OF 3**

**PROJECT**  
Tacoma Landfill Remedial Invest.  13209

**COORDINATES**  
N 696,024'; E1,504,173'  307.5' (Tacoma)  87.5'  8/20/86

**ELEVATION (DATUM)**  
307.5' (Tacoma)  87.5'  8/20/86

**TOTAL DEPTH**  
307.5' (Tacoma)  87.5'  8/20/86

**DATE FINISH**  
8/21/86

**SAMPLING**  
Flat v/slope to east; 25' east of landfill berm

**INSPECTOR**  
E. W. Meyer

**APPROVED BY**  
R. H. Herzog

---

<table>
<thead>
<tr>
<th>SAMPLE TYPE</th>
<th>SAMPLE NUMBER</th>
<th>SET</th>
<th>2ND</th>
<th>3RD</th>
<th>N</th>
<th>SAMPLER REV.</th>
<th>CHECKED BY</th>
<th>APPROVED BY</th>
</tr>
</thead>
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<td></td>
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<td></td>
<td></td>
<td>M. J. Lally</td>
<td>R. H. Herzog</td>
</tr>
</tbody>
</table>

---

**CLASSIFICATION OF MATERIAL**  
Undifferentiated overburden (see boring log for Wells TL-15B & TL-15C)

**REMARKS**  
Boring advanced  
\( \frac{v}{7}-172'' \) O.D.,  
4-1/4'' I.D.  
hollow stem  
flight auger  
Located 15' south of TL-15B & TL-15C
### LOG OF BORING

**BORING NO.** TL-15A  
**PROJECT NO.** 13209  
**PROJECT** Tacoma Landfill Remedial Invest.  
**SHEET 2 OF 3**

**CLIENT**  
City of Tacoma

**PROJECT LOCATION**  
Tacoma, Washington

**COORDINATES**  
N 696,024'; E1,504,173'; 307.5' (Tacoma)

**ELEVATION (DATUM)**  
87.5'

**TOTAL DEPTH**  

**DATE START**  
8/20/86

**DATE FINISH**  
8/21/86

**SURFACE CONDITIONS**  
Flat v/slope to east; 25' east of landfill berm

**INSPECTOR**  
E. V. Meyer

**CHECKED BY**  
M. J. Lally

**APPROVED BY**  
R. H. Herzog

---

<table>
<thead>
<tr>
<th>SAMPLE TYPE</th>
<th>SAMPLE NUMBER</th>
<th>SET</th>
<th>6&quot;</th>
<th>2&quot;D.</th>
<th>2&quot;D.</th>
<th>N</th>
<th>VALUE</th>
<th>SAMPEL RECOV.</th>
<th>DEPTH IN FEET</th>
<th>CORE</th>
<th>CORE</th>
<th>LENGTH</th>
<th>RUN RUN RECOV.</th>
<th>QC</th>
<th>RQD</th>
<th>GRAPHIC LOG</th>
</tr>
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<tbody>
<tr>
<td>Undifferentiated overburden (see boring log for Wells TL-15B &amp; TL-15C)</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**REMARKS**
### Log of Boring

**Boring No.: TL-15A**  
**Project:** Tacoma Landfill Remedial Invest.  
**Project No.: 13209**

**Client:** City of Tacoma  
**Project Location:** Tacoma, Washington

**Coordinates:** N 696,024'; E 504,173'; (Tacoma) 875'  
**Elevation (Datum):** 307.5'

**Surface Conditions:** Flat v/slope to east; 25' east of landfill berm

**Sampling:**

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Sample Number</th>
<th>6'</th>
<th>2nd 6'</th>
<th>3rd 6'</th>
<th>N</th>
<th>Value</th>
<th>Sample Recovery</th>
</tr>
</thead>
</table>

**Checking:**

- Checked by: M. J. Lally  
- Approved by: R. H. Rerzo

**Remarks:**

- Boring advanced v/7-1/2" O.D., 4-1/4" I.D. hollow stem flight auger
- Located 15' south of TL-15B & TL-15C

**Classification of Material:**

- Undifferentiated overburden (see boring log for Wells TL-15B & TL-15C)

---

**Sample Log:**

- Depth in feet: 0, 10, 20, 30

---

**Graphic Log:**

- Undifferentiated overburden

---

**Elevation IDatum Total Depth Date Start**

- Elevation IDatum: 307.5'  
- Total Depth: 875'

**Date Start:** 8/20/86  
**Date Finish:** 8/21/86
METHOD OF INSTALLATION:
Boring drilled to completion; set riser pipe & screen; pulled augers back 15'; poured
30 gal. water down auger to cave hole; alternated pulling augers & placing filter; placed
bentonite seal; hydrated bentonite w/water; alternated pulling augers & grouting to 1.5'

REMARKS:
Note: 3' of blank riser below ground surface; placed surface cement screen; boring caved from set steel protective surface casing.
WATER WELL REPORT
STATE OF WASHINGTON

(1) OWNER: Name CITY OF TACOMA Address EAST SIDE

(2) LOCATION OF WELL: County PIERCE NE 1/4 NW 1/4 Sec. 13 T 20 N., R 2E W.M.

(3) PROPOSED USE: Domestic [ ] Industrial [ ] Municipal [ ]
Monitoring [ ] Irrigation [ ] Test Well [ ] Other [ ]

(4) TYPE OF WORK: Owner's number of well [ ]
(if more than one) New well [ ] Method: Dug [ ] Bored [ ]
Deepened [ ] Cable [ ] Driven [ ]
Reconditioned [ ] Rotary [ ] Jetted [ ]

(5) DIMENSIONS: Diameter of well [ ] 7 1/2" inches.
Drilled 177.5 ft. Depth of completed well 157 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: [ ] Diameter from 0 ft. to 157 ft.
Threaded [ ] Diameter from 0 ft. to 122 ft.
Welded [ ] Diameter from 0 ft. to 157 ft.

Perforations: Yes [ ] No [ ]
Type of perforator used:
SIZE of perforations ______ in. by ______ in.
perforations from ______ ft. to ______ ft.
perforations from ______ ft. to ______ ft.

Screens: Yes [ ] No [ ]
Manufacturer's Name: HYDROPHILIC APPLIANCE
PVC-FLUSH THERMO
Type: [ ]
Model No. [ ]
Diam. [ ] Slot size: 0.12 in. from 112 ft. to 122 ft.
Diam. [ ] Slot size: 0.12 in. from 152 ft. to 157 ft.

Gravel packed: Yes [ ] No [ ]
Size of gravel: 10-20
Gravel placed from ______ ft. above both screens

Surface seal: Yes [ ] No [ ]
To what depth? 18 + ft.
Material used in seal: CEMENT - BENTONITE
Did any strata contain unusable water? Yes [ ] No [ ]
Type of water: [ ]
Depth of strata: [ ]
Method of sealing strata off:

(7) PUMP: Manufacturer's Name: INST. N.W.
Type: HYDROSTAR-MANUAL. H.P.

(8) WATER LEVELS:
Land-surface elevation above mean sea level:
Static level 79 ft. below top of well Date 7-29-86
Artesian pressure ______ lbs. per square inch Date ______
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [ ] If yes, by whom?
Yield: gal./min. with ______ ft. drawdown after ______ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)
Time Water Level Time Water Level Time Water Level

Date of test ______
Water level test: gal./min. with ______ ft. drawdown after ______ hrs.
Artesian flow g.p.m. Date ______
Temperature of water [ ]
Was a chemical analysis made? Yes [ ] No [ ]

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOPSOIL</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>TILL</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>CLEAN SAND, GRAVEL</td>
<td>21</td>
<td>50</td>
</tr>
<tr>
<td>SAND, SOME GRAVEL</td>
<td>50</td>
<td>106</td>
</tr>
<tr>
<td>BROWN SANDY GRAVEL</td>
<td>106</td>
<td>108</td>
</tr>
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<td>CLEAN SAND, GRAVEL</td>
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<tr>
<td>LAYEDER FINE SAND, SILT</td>
<td>130</td>
<td>162</td>
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<tr>
<td>GRAY SILT</td>
<td>162</td>
<td>166</td>
</tr>
<tr>
<td>GRAY SILT, GRAVELY SAND</td>
<td>166</td>
<td>178</td>
</tr>
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</table>

DESIGNATED WELLS:
TL15 - B 122 FT
TL15 - C 157 FT

Work started 7-16-86 Completed 7-29-86

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME: TACOMA PUMP & DRILLING CO INC
(Person, firm or corporation) (Type or print)
Address: 30316 MTH HWY-GRAHAM, WA.

(Signed) [ ]
(Well Driller) [ ]
License No. 0193 Date DEC 22, 1986

(USE ADDITIONAL SHEETS IF NECESSARY)
### Geologic Log

**Coordinates**

N 696,039 E 1,504,169

<table>
<thead>
<tr>
<th>Depth in Feet</th>
<th>Head Space</th>
<th>OVA</th>
<th>Lab</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td>S-1</td>
</tr>
<tr>
<td>10</td>
<td>&gt;1000</td>
<td></td>
<td></td>
<td>S-2</td>
</tr>
<tr>
<td>20</td>
<td>&gt;1000</td>
<td></td>
<td></td>
<td>S-3</td>
</tr>
<tr>
<td>30</td>
<td>700</td>
<td></td>
<td></td>
<td>S-4</td>
</tr>
<tr>
<td>40</td>
<td>&gt;1000</td>
<td></td>
<td></td>
<td>S-5</td>
</tr>
<tr>
<td>50</td>
<td>&gt;1000</td>
<td></td>
<td></td>
<td>GS</td>
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<td></td>
<td>S-7</td>
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<td>-</td>
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<td>&gt;1000</td>
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<td>S-9</td>
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<td>0</td>
<td>&gt;1000</td>
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<td>S-11</td>
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<td>0</td>
<td>400</td>
<td></td>
<td>S-12</td>
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<td>&gt;1000</td>
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<td>0.4</td>
<td>60</td>
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<td>150</td>
<td>1</td>
<td>-</td>
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<td>S-15</td>
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**NOTES:**

1. Soil descriptions are interpetive and actual conditions may be gradual.
2. Water Level is for date indicated and may vary with time of year.
3. Head space readings in ppm.

---

### Well Design

**Top Casing Elevation in Feet:** 309.3

**Steel Casing Stringup in Feet:** 1.6

---

**J-1775 November 1988**

HART-CROWSER & associates, inc.

Sheet 1 of 2 Figure A-5
Boring Log and Construction Data for Well TL-15 b,c

Geologic Log
Coordinates
N 696,039 E 1,504,169

<table>
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<tr>
<th>Ground Surface Elevation in Feet</th>
<th>Head Space</th>
<th>OVA</th>
<th>Lab</th>
<th>Sample</th>
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<td>160</td>
<td>20</td>
<td>2</td>
<td>S-31</td>
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<td>170</td>
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<td>0</td>
<td>S-32</td>
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<td>3</td>
<td>GS</td>
<td>S-33</td>
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<td>200</td>
<td>12</td>
<td>12</td>
<td>S-35</td>
<td></td>
</tr>
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Bottom of Boring at 177.5 Feet.
Completed 7/29/86.

Well Design

NOTES: 1. Soil descriptions are interpretive and actual changes may be gradual.
2. Water Level is for date indicated and may vary with time of year.
   ATD: At Time of Drilling
3. Head space readings in ppm.
Cement/Bentonite Grout
Water Level at time of Drilling

Bentonite Chips (Enviroplug)

6-inch PVC Riser Pipe

PVC/Stainless Adaptor

8 Feet .060-inch Slot
Colorado 8-12 Silica Sand

2 Feet tight Wind Tal Pipe
Factory Welded Bottom Plate

Bentonite Chips (Enviroplug)

W-03

RECOMMENDED SCREEN DESIGN

Pacific Groundwater Group
Cement/Bentonite Grout

Water Level on 4-17-92 @ 128.5 feet

Bentonite Chips (Enviroplug)

6-inch PVC Riser Pipe

PVC/Stainless Adaptor

10 Feet .060-inch Slot
Colorado 8-12 Silica Sand

2 Feet Tight Wind Tail Pipe Factory Welded Bottom Plate

Bentonite Chips (Enviroplug)

W-06

RECOMMENDED SCREEN DESIGN

TLF
Cement/Bentonite Grout

Water Level ATD

Bentonite Chips (Enviroplug)

6-inch PVC Riser Pipe

PVC/Stainless Adaptor

8 Feet .060-inch Slot

Colorado 8-12 Silica Sand

2 Feet tight Wind Tail Pipe

Factory Welded Bottom Plate

Bentonite Chips (Enviroplug)

W-07

RECOMMENDED SCREEN DESIGN

TLF
Cement/Bentonite Grout

Water Level at 123.3 BGS
Measured on 5-6-92

Bentonite Chips (Enviroplug)

6-inch PVC Riser Pipe

PVC/Stainless Adaptor with

8 Feet .060-inch Slot
Colorado 8-12 Silica Sand

2 Feet of Tight Wind Tail Pipe
Welded Bottom Plate
Bentonite Chips (Enviroplug)

RECOMMENDED SCREEN DESIGN

W-12

5-7-92
Cement/Bentonite Grout

Water Level at 103.1 BGS as Measured by B&VWST

10"

Bentonite Chips (Enviroplug)

6-inch PVC Riser Pipe

PVC/Stainless Adaptor with

8 Feet .060-inch Slot

Colorado 8-12 Silica Sand

2 Feet of Tight Wind Tail Pipe Welded Bottom Plate

Bentonite Chips (Enviroplug)

RECOMMENDED SCREEN DESIGN

W-13

4-30-92
Cement/Bentonite Grout
Water Level at 96.4 ft BGS
Measured on 4-30-92

Bentonite Chips (Enviroplug)

6-inch PVC Riser Pipe

PVC/Stainless Adaptor with
10 Feet .060-inch Slot

Colorado 8-12 Silica Sand

2 Feet of Tight Wind Tail Pipe
Welded Bottom Plate
Bentonite Chips (Enviroplug)

RECOMMENDED SCREEN DESIGN

W-18

5-6-92

Pacific Groundwater Group
**Recommended Screen Design**

**W-19**

- **105 ft**
  - Cement/Bentonite Grout
  - Water Level at 108.1 BGS
  - Measured on 5-6-92

- **115 ft**
  - Bentonite Chips (Enviroplug)

- **128 ft**
  - 6-inch PVC Riser Pipe

- **131 ft**
  - PVC/Stainless Adaptor

- **141 ft**
  - 10 Feet .060-inch Slot

- **143 ft**
  - Colorado 8-12 Silica Sand

- **145 ft**
  - 2 Feet of Tight Wind Tail Pipe
  - Welded Bottom Plate
  - Bentonite Chips (Enviroplug)

**Vertical Scale in Feet**

- 0 2.5 5 10
FIELD DRAWING  WELL #19

EQUIP. "AS REMOVED"

12-4-97
W. RAMLO

EQUIP. LIST

1 EA 7.5 H.P. GRUNDFOS 75675-10 PUMP

136 L.F. 2" SCH. 20 STAINLESS TEC DROP PIPE
(13x10', 1x6')

140± L.F. #12-4 PVC TWISTED DROP WIRE SPIDER 65'

38± L.F. 3/8" STAINLESS WIRE Kdre

3 EA 6x2 PUMP TORQUE ARRESTORS (spider)

3 EA WARRICK LEVEL SENSORS
SINGLE LEAD TYPE
LENGTH AS SHOWN

SPIDER 105'

136.0 TOP PUMP/SPIDER

138.5' PUMP "INTAKE"

137.5' BOTTOM "LOW" LEVEL SENSOR

142' "COMMON"

B.O.H. 143.5'
<table>
<thead>
<tr>
<th>DEPTH</th>
<th>GEOLOGIC LOG</th>
<th>UNIT</th>
<th>WELL CONSTRUCTION DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Damp, gray, silty, gravelly SAND (FILL)</td>
<td>Q1</td>
<td>8-inch PVC Sch. 80 Riser Pipe</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>High Solids Bentonite Grout</td>
</tr>
<tr>
<td>20</td>
<td>Damp gray and brown, silty GRAVEL with SAND and SILT</td>
<td>Q2</td>
<td>Enviroplug Bentonite Chips</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td>Colorado Silica Sand 8-12</td>
</tr>
<tr>
<td>40</td>
<td>Wet to wet, gray to brown, fine to medium SAND</td>
<td>Q3</td>
<td>Stainless Steel Screen 0.050-inch Slot</td>
</tr>
<tr>
<td>50</td>
<td>Color change from brown to gray</td>
<td>Q4</td>
<td>Naturally Developed</td>
</tr>
<tr>
<td>60</td>
<td></td>
<td></td>
<td>Tight-wind Tail Pipe</td>
</tr>
<tr>
<td>70</td>
<td></td>
<td></td>
<td>Cased Hole</td>
</tr>
<tr>
<td>80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td></td>
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</tr>
<tr>
<td>100</td>
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<td></td>
</tr>
<tr>
<td>130</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>140</td>
<td>Wet, gray, sandy GRAVEL</td>
<td>Q5</td>
<td></td>
</tr>
<tr>
<td>150</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**BOTTOM OF BORING 154 FEET**
**COMPLETED 6-19-96**

**FIGURE 2**

**PROJECT NAME:** Tacoma Landfill

**WELL IDENTIFICATION NUMBER:** W-20

**DRILLING METHOD:** Cable Tool

**DRILLER:** Richard LaRance

**FIRM:** Holt Drilling

**CONSULTING FIRM:** Pacific Groundwater Group, Inc.

**REPRESENTATIVE:** Chad Bring/Russ Prior

**LOCATION:** SW¼ SW¼ Sec.12, T20N, R2E

**DATING:**

**CASTING:**

**DATUM:** Old City of Tacoma

**WATER LEVEL ELEVATION:**

**INSTALLED:** 5-26-96
GEOLOGIC LOG AND AS-BUILT
W-21

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>GEOLOGIC LOG</th>
<th>UNIT</th>
<th>WELL CONSTRUCTION DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Damp, gray, silty, gravelly SAND (TILL)</td>
<td>QM</td>
<td>8-inch PVC Sch. 80 Riser Pipe</td>
</tr>
<tr>
<td>10</td>
<td>Damp gray and brown, silty GRAVEL with SAND and SILT</td>
<td>Qa</td>
<td>High Solids Bentonite Grout</td>
</tr>
<tr>
<td>20</td>
<td>Damp to wet, gray to brown, fine to medium SAND</td>
<td>Qa</td>
<td>Enviroplug Bentonite Chips</td>
</tr>
<tr>
<td>30</td>
<td>Wet to brown SILT</td>
<td>Qa</td>
<td>Colorado Silica Sand # 8-12</td>
</tr>
<tr>
<td>40</td>
<td>Wet, gray, sandy GRAVEL</td>
<td>Qa</td>
<td>Stainless Steel Screen 0.060-inch Slot</td>
</tr>
<tr>
<td>50</td>
<td>Wet, gray, sandy GRAVEL</td>
<td>Qa</td>
<td>Naturally Developed Tight-wind Tail Pipe</td>
</tr>
<tr>
<td>60</td>
<td>Wet, gray, sandy GRAVEL</td>
<td>Qa</td>
<td>Caved Hole</td>
</tr>
<tr>
<td>70</td>
<td>Wet, gray, sandy GRAVEL</td>
<td>Qa</td>
<td></td>
</tr>
<tr>
<td>80</td>
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<td>Qa</td>
<td></td>
</tr>
<tr>
<td>90</td>
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<td>Qa</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>Wet, gray, sandy GRAVEL</td>
<td>Qa</td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>Wet, gray, sandy GRAVEL</td>
<td>Qa</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>Wet, gray, sandy GRAVEL</td>
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<td></td>
</tr>
<tr>
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<td>Qa</td>
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</tr>
<tr>
<td>140</td>
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<tr>
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</table>

BOTTOM OF BORING 154 FEET COMPLETED 6-19-96

PROJECT NAME: Tacoma Landfill
WELL IDENTIFICATION NUMBER: W-21
DRILLING METHOD: Cable Tool
DRILLER: Richard LaRance
FIRM: Hall Drilling
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Russ Prior

LOCATION: NW 44 NW 4 Sec. 13, T20N, R2E
NORTHING:
EASTING:
DATUM: Old City of Tacoma
WATER LEVEL ELEVATION:
INSTALLED: 6-19-96
See Blowup "A"

See Blowup "B"

DO NOT WRITE IN THIS SPACE

REVISED, SUPERSEDED, AND VOID CALCULATIONS MUST BE CLEARLY IDENTIFIED, INITIALED, AND DATED BY THE RESPONSIBLE INDIVIDUAL.
GEOLOGIC LOG AND AS-BUILT
W-22

DEPTH
GROUND ELEVATION:
UNIT
SAMPLE
CASING ELEVATION:

0
Damp, gray, silty, gravelly SAND (TILL)
OOG

10


20
Damp gray and brown, silty sand & GRAVEL
OOG

30


40
Damp to wet, gray to brown, fine to medium SAND
OG

50
Cable tool drilling starts at 81 feet

60


70


80


90


100


110


120


130


140


150


160
Wet, gray, sandy GRAVEL
Wet, gray, slightly silty, sandy GRAVEL
BOTTOM OF BORING 180 FEET
COMPLETED 3-20-96

8-inch PVC Sch. 80
Riser Pipe

High Solids Bentonite Grout

Pure Cold Bentonite Chips
Colorado Silica Sand
\( \frac{\#}{9-12} \)
Stainless Steel Screen
0.060-inch Slot
Naturally Developed
Tight-wind Tail Pipe
Caved Hole

PROJECT NAME: Tacoma Landfill
WELL IDENTIFICATION NUMBER: W-22
DRILLING METHOD: Cable Tool
DRILLER: Richard Larrance
FIRM: Hall Drilling
CONSULTING FIRM: Pacific Groundwater Group, Inc.
REPRESENTATIVE: Russ Prior

LOCATION: NW\( \times \) NW\( \times \) Sec.13, T20N, R2E
NORTHING:
EASTING:
DATUM: Old City of Tacoma
WATER LEVEL ELEVATION:
INSTALLED: 3-20-96

FIGURE 4
## Table 1. Well Design Parameters

<table>
<thead>
<tr>
<th>Well No.</th>
<th>Elevation of Ground Surface</th>
<th>Depth Screen Water Level</th>
<th>Elevation Screen Water Level</th>
<th>Available Well Slot Size (inches)</th>
<th>Filter Pack Material **</th>
<th>Comments</th>
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<tbody>
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<td>(PW-11)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>W-01</td>
<td>345.9</td>
<td>143</td>
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<td>353.7</td>
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<td>137</td>
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<tr>
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<tr>
<td>W-11</td>
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<td>148</td>
<td>158</td>
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<tr>
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<td>147</td>
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<tr>
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<tr>
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<td>78.5</td>
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<td>112</td>
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<tr>
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<td>47</td>
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<tr>
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<td>217.7</td>
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<td>48</td>
<td>56</td>
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</tr>
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<td>58</td>
<td>48</td>
<td>56</td>
<td>5</td>
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</tbody>
</table>

Notes:
- PW-8A is constructed with a low carbon, galvanized screen
- Numbers refer to grain size of sand. Colorado Silica Sand used. Channel Pack refers to the trademark Johnson Well product.
# Table 2-1
Summary of Water Level Data

<table>
<thead>
<tr>
<th>Measuring Point</th>
<th>Depth to Water</th>
<th>Water Level Elevation</th>
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<tr>
<td></td>
<td>Q1</td>
<td>Q2</td>
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<tr>
<td>EW-09</td>
<td>299.80</td>
<td>74.65</td>
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<td>5.67</td>
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<td>75.10</td>
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Tacoma Landfill


Tacoma Landfill

Table 2-1 Summary of Water Level Data Cont.

Well
TL-05e
TL-05d
TL-07a
rL-08a
08b
ITL-08e
TL-09a
TL-09b
TL-10a
TL-10b
TL-10e
TL-10d
TL-11a
~L-11b
ITL-11d
~.12
ITL-13a
!TL-13c
ITL-14a
TL-15a
TL-15b
TL-15e
TL-16r
TL-17a
TL-17b
rL-18a
!TL-18e
!TL-19a
ITL-1ge
!TL-20a
!TL-20e
ITL-20e
TL-21
TL-22a.
TL-23a
TL-24a
TL-25a
TL-25b
jTL-26a
ITL-26b
!TL-27a
!TL-27b
!TL-28a

rn--

1\._ANNRPT.DOC

Measuring
Point
Elevation
220.83
220.83
209.80
343.02
343.42
343.42
288.40
288.40
284.42
284.42
284:50
284.50
344.83
344.83
344.83
. 373.65
319.95
319.95
314.41
309.39
309.40
309.40
343.01
299.59
300.08
315.13
315.13

233.n
233.66
242.20
242.20
242.20
220.81
317.32
294.46
314.08
289.51
289.27
319.73
318.82
320.21
320.75
295.97

Water Level Elevation

Depth to. Water
Q1
-6.30
-3.84
6.00
115.44
115.34
115.66
61.54
61.74
56.60
56.60
56.72
56.75
116.26
118.36
118.70
142.68
84.12
83.96
81.48
78.84
78.22
78.56
111.70
67.85
68.74
83.74
83.76
14.05
23.14
18.16
25.60
25.60
7.58
90.76
59.54
88.94
61.75
61.46
92.52.
91.65
92.60
94.06
64.42

Q2
-7.10
-4.25
6.24
113.70
113.68
113.92
59.84
60.06
55.05
55.04
55.20
55.20
114.44
116.58
116.94
141.54
84.28
84.20
80.40
77.16
76.60
76.94
109.86
66.00
66.74
81.96
81.98
15.50
22.28
17.20
25.84
25.84
6.76
88.34
59.12
86.33
60.22
59.94
90.60
89.64
90.10
90.70
62.86

Q3
-8.50
-3.28
6.00
114.52
114.76
114.80'
60.37
60.58
55.64'
55.60
55.78
55.80
116.32
118.20
118.75
144.78
91.04
91.36
83.82
78.50
78.00
78.00
110.50
66.38
67.58
83.04
83.11
22.17
23.08
. 21.50
26.92
26.92
8.18
88.36
.63.83
85.46
60.83
60.50
91.17
90.17
90.33
91.17
65.17

Q4
-6.36
-3.50
6.49
116.66
116.70
116.96
62.84
.62.99
57.71
57.71
57.82
57.82
118.16
120.44
120.17
145.78
89.66
89.55
84.22
79~90

79.36
79.40
111.95
67.92
. 68.59
84.62
84.84
23.66
21.10
27.82
27.82
8.08
91.15
64.48
87.50
62.97
62.69
93.56
92.53
93.06
93.61
93.61
66.84

Q1
227.13
224.67
203.80
227.58
228.08
227.76
226.86
226.66
227.82
227.82
227.78
227.75
228.57
226.47
226.13
230.97
235.83
235.99
232.93
230.55
231.18
230.84
231.31
231.74
231.34
231.39
231.37
219.72
210.52
224.04
216.60
216.60
213.23
226.56
234.92
225.14
227.76
227.81
227.21
227.17
227.61
226.69
231.55

Q2

Q3

227.93 229.33
225.08 224.11
203.56 203.80
229.32 228.50
229.74 228.66
229.50 228.62
228.56 228.03
228.34 227.82
229.37 228.78
229.38 228.82
229.30 228.72
229.30 228.70
230.39 228.51
228.25 226.63
227.89 226.08
232.11 228.87
235.67 228.91
235.75 228.59
234.01 230.59
232.23 '230.89
232.80 231.40
232.46 231.40
233.15 . 232.51
233.59 233.21
233.34 232.50
233.17 232.09
233.15 232.02
218.27 211.60
211.38 210.58
225.00 220.70
216.36 215.28
216.36 215.28
214.05 212.63
228.98 228.96
235.34 230.63
227.75 228.62
229.29 228.68
229.33 228.n
229.13 228.56
229.18 228.65
230.11 229.88
230.05 229.58
233.11 230.80

Q4
227.19
224.33
203.31
226.36
226.72
226.46
225.56
225.41
226.71
226.71
226.68
226.68
226.67
224.39
224.66
227.87
230.29
·230.40
230.19
229.49
230.04
230.00
231.06
231.67
231.49
230.51
230.49
210.11
212.56
214.38
214.38
234.12
129.66
252.84
206.96
251.11
226.82
195.71
227.20
225.76
226.60
227.14
229.13


### Table 2-2

Groundwater Well Construction & Sampling Details Tacoma Landfill

<table>
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<tr>
<th>Well Number</th>
<th>Location Easting</th>
<th>Location Northing</th>
<th>Measuring Point Elev. CTD**</th>
<th>Measuring Point Elev. NGVD</th>
<th>Well Depth</th>
<th>Well Diameter Top</th>
<th>Well Diameter Bottom</th>
<th>Depth of Screened Interval</th>
<th>Sampling Frequency</th>
<th>Sampling Tool</th>
<th>Groundwater Monitoring Category</th>
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<tbody>
<tr>
<td>TL-01a</td>
<td>1502303</td>
<td>697877</td>
<td>332.27</td>
<td>318.27</td>
<td>111</td>
<td>2'</td>
<td>97</td>
<td>111</td>
<td>M</td>
<td>Hydrostar</td>
<td>Fircrest</td>
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<tr>
<td>TL-01b</td>
<td>1502321</td>
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### Table 2-2
Groundwater Well Construction & Sampling Details Tacoma Landfill

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**Notes:**
- A - Sampled annually at the quarter specified.
- S - Sampled semi-annually at the quarters specified.
- M - Sampled monthly and quarterly, only quarterly analytical results discussed in text.
- Q - Sampled quarterly.
- * - These wells have an additional stickup added after the original installation, current wells depths are accurate but differ from the well depths noted on the original logs.
- ** - CTD stands for "old" City of Tacoma datum which was in use until July 1990.

Hydrostar - Hydrostar pump
Grundfos - Grundfos Rediflow pump
Res. pump - pump installed within the residential well
w.s. pump - pump installed in the water supply well.
TRAFFIC POSTS, 3-6 INCH DIA STEEL, CONCRETE FILLED (TYP)

REMOVABLE PVC CAP

8 INCH DIA LOCKING STEEL PROTECTIVE SURFACE CASING

CONCRETE PAD AND SURFACE SEAL

CEMENT-BENTONITE OR BENTONITE · GROUT

SCHEDULE 40 PVC PIPE, 2 INCH DIA

2" MIN ANNULUS

BELOW THE WATER TABLE: BENTONITE PELLET OR GROUT SEAL

ABOVE THE WATER TABLE: BENTONITE PELLET SEAL

2 INCH DIA PVC WELL SCREEN, 0.020 INCH SLOTS

SAND PACK

2 FOOT PVC TAIL SECTION

PVC CAP

NOTE: PVC SHALL BE NSF CERTIFIED

FIGURE 3
GROUNDWATER MONITORING WELL DIAGRAM
TACOMA LANDFILL RD/RA
TRAFFIC POSTS, 3-6 INCH DIA STEEL, CONCRETE FILLED (TYP)

- REMOVABLE PVC CAP
- 8 INCH DIA LOCKING STEEL PROTECTIVE SURFACE CASING
- CONCRETE PAD AND SURFACE SEAL

- CEMENT-BENTONITE OR BENTONITE GROUT
- SCHEDULE 40 PVC PIPE, 2 INCH DIA
- SCHEDULE 40 PVC PIPE, 2 INCH DIA
- BENTONITE PELLET OR GROUT SEAL
- 2 INCH DIA PVC WELL SCREEN, 0.020 INCH SLOTS
- SAND PACK
- 2 FOOT PVC TAIL SECTION
- PVC CAP
- BENTONITE GROUT SEAL
- 2 INCH DIA PVC WELL SCREEN, 0.020 INCH SLOTS
- SAND PACK
- 2 FOOT PVC TAIL SECTION
- PVC CAP

NOTE: PVC SHALL BE NSF CERTIFIED

FIGURE 4
DOUBLE GROUNDWATER MONITORING WELL DIAGRAM
TACOMA LANDFILL RD/RA
TRAFFIC POSTS, 3-6 INCH DIA STEEL, CONCRETE FILLED (TYP)

REMOVABLE PVC CAP

8 INCH DIA LOCKING STEEL PROTECTIVE SURFACE CASING

PVC SAMPLING VALVE

CONCRETE PAD AND SURFACE SEAL

CEMENT-BENTONITE OR BENTONITE GROUT

SCHEDULE 40 PVC PIPE, 2 INCH DIA

2 INCH MIN ANNULUS

SCHEDULE 80 PVC PIPE, 1/2 INCH DIA

BENTONITE SEAL

PEA GRAVEL

1/2 INCH DIA PVC GAS PROBE SCREEN, 0.010 INCH SLOTS

BENTONITE PELLET OR GROUT SEAL

2 INCH DIA PVC WELL SCREEN, 0.020 INCH SLOTS

SAND PACK

2 FOOT PVC TAIL SECTION

PVC CAP

NOTE: PVC SHALL BE NSF CERTIFIED

FIGURE 5
GROUNDWATER MONITORING WELL/GAS PROBE DIAGRAM
TACOMA LANDFILL RD/RA
TRAFFIC POSTS, 3-6 INCH DIA STEEL, CONCRETE FILLED (TYP)

NOTE: PVC SHALL BE NSF CERTIFIED

FIGURE 6
DOUBLE GROUNDWATER MONITORING WELL / GAS PROBE DIAGRAM
TACOMA LANDFILL RD/RA
FIGURE 4-1
PILOT EXTRACTION
WELL DESIGN
TACOMA LANDFILL RDPS

Pacific Groundwater Group
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TOTAL FOR PAGE
TACOMA LANDFILL
GROUNDWATER EXTRACTION/TREATMENT SYSTEM
CITY OF TACOMA
REFUSE UTILITY

WORK ORDER NO. AU6820
1. SEE STRUCTURAL DRAWINGS ON SHEETS S-1 THROUGH S-5
   FOR SLAB DIMENSIONS.

2. SEE PLAN & PROFILE DRAWINGS ON SHEETS C-4 THROUGH C-9
   FOR PROPOSED EXTRACTION PIPELINE.

3. SEE PLAN & PROFILE DRAWINGS ON SHEETS C-4 AND C-10
   FOR PROPOSED DISCHARGE PIPELINE.
1. SEE SHEET E-1 FOR GENERAL NOTES.

2. CONTRACTOR TO PROTECT EXISTING CULVERT AT STA 100+30.

3. MINIMUM COVER FOR DISCHARGE PIPELINE SHALL BE 2'-6". SEE DETAIL 2 ON DRAWING NO. C-14 FOR PIPE BEDDING AND TRENCH WIDTH REQUIREMENTS.

4. CONTRACTOR TO PLACE PIPE WEIGHTS ON TOP OF EXTRACTION PIPE FROM STA 102+00 TO 133+00. WEIGHTS TO BE CONSTRUCTED AS SHOWN ON DETAIL 6, DRAWING NO. C-14. WEIGHTS TO BE SPACED EVERY 200 FEET.

NOTES:

- ONLY MINOR AUGMENT CHANGES WERE MADE DURING CONSTRUCTION. PROFILES REMAINED THE SAME.
NOTES:

1. FOR GENERAL NOTES SEE SHEET C-1.

2. CONTRACTOR TO PLACE PIPE WEIGHTS ON TOP OF EXTRACTION PIPE FROM STA 102+00 TO 133+00. WEIGHTS TO BE CONSTRUCTED SHOWN ON DETAIL 6 DRAWING NO C-14. WEIGHTS TO BE SPACED EVERY 200 FEET.
NOTES:
1. For general notes see sheet C-1.
2. Existing well vaults may vary in configuration from those shown on drawing M-8. Contractor shall review installation of mechanical and electrical components with engineer before starting work on these vaults.
3. Well W-18 to be installed through refuse. See section 02673(8) of the specifications for special installation instructions.
4. Contractor to place pipe weights on top of extraction pipe from STA 102+00 to 133+00. Weights to be constructed as shown on detail 6 drawing NO C-14. Weights to be spaced every 200 feet.

KEY MAP

RECORD DRAWINGS

DEPARTMENT OF PUBLIC WORKS
TACOMA LANDFILL EXTRACTION/TREATMENT SYSTEM
EXTRACTION PIPELINE PLAN AND PROFILE
CONTRACTOR TO PLACE PIPE WEIGHTS ON TOP OF EXTRACTION PIPE FROM STA 102+00 TO 133+00. WEIGHTS TO BE CONSTRUCTED AS SHOWN ON DETAIL 6, DRAWING NO. C-14. WEIGHTS TO BE SPACED EVERY 200 FEET.

ACTUAL GRADES MAY DIFFER FROM THOSE SHOWN DUE TO RECENT CONSTRUCTION.

1. SEE SHEET C-1 FOR GENERAL NOTES.

3. CONTRACTOR TO PLACE PIPE WEIGHTS ON TOP OF EXTRACTION PIPE FROM STA 102+00 TO 133+00. WEIGHTS TO BE CONSTRUCTED AS SHOWN ON DETAIL 6, DRAWING NO. C-14. WEIGHTS TO BE SPACED EVERY 200 FEET.

NOTES:

1. SEE SHEET C-1 FOR GENERAL NOTES.

2. CONTRACTOR TO PLACE PIPE WEIGHTS ON TOP OF EXTRACTION PIPE FROM STA 102+00 TO 133+00. WEIGHTS TO BE CONSTRUCTED AS SHOWN ON DETAIL 6, DRAWING NO. C-14. WEIGHTS TO BE SPACED EVERY 200 FEET.

5. CONTRACTOR TO PLACE PIPE WEIGHTS ON TOP OF EXTRACTION PIPE FROM STA 102+00 TO 133+00. WEIGHTS TO BE CONSTRUCTED AS SHOWN ON DETAIL 6, DRAWING NO. C-14. WEIGHTS TO BE SPACED EVERY 200 FEET.

NOTES:

1. SEE SHEET C-1 FOR GENERAL NOTES.

2. CONTRACTOR TO PLACE PIPE WEIGHTS ON TOP OF EXTRACTION PIPE FROM STA 102+00 TO 133+00. WEIGHTS TO BE CONSTRUCTED AS SHOWN ON DETAIL 6, DRAWING NO. C-14. WEIGHTS TO BE SPACED EVERY 200 FEET.

NOTES:

1. SEE SHEET C-1 FOR GENERAL NOTES.

2. CONTRACTOR TO PLACE PIPE WEIGHTS ON TOP OF EXTRACTION PIPE FROM STA 102+00 TO 133+00. WEIGHTS TO BE CONSTRUCTED AS SHOWN ON DETAIL 6, DRAWING NO. C-14. WEIGHTS TO BE SPACED EVERY 200 FEET.

NOTES:

1. SEE SHEET C-1 FOR GENERAL NOTES.
NOTES:

1. FOR GENERAL NOTES SEE SHEET C-1

2. CONTRACTOR TO PROTECT EXISTING ABOVE GROUND GAS AND OIL WELL (#101) AND OIL WELL (#100) WHICH RANS (STA 35+50 TO 42+00) FROM MINE ROAD/STANDARD PLAN H-13A AT ABOVE GROUND INLINES AND GAS PIPE WHICH RUNS ON WEST EDGE OF EXISTING ROAD.

3. PROTECT EXISTING GAS LINE AND PROVIDE MINIMUM CLEARANCE BETWEEN EXTRACTION WELL PIPELINE AND GAS LINE OF 3'- 0" AND GAS LINE OF 6'- 0" TO BE INSTALLED PER THE ENGINEER.

4. LATERALS FROM WELLS W-6 THRU W-11 TO BE REMOVED AND EXIT FROM ROAD AT 1.1K.

5. MINOR ALIGNED CHANGES WERE MADE DURING CONSTRUCTION. PROFILES REMAINED THE SAME.
NOTES:

1. FOR GENERAL NOTES SEE SHEET C-1
CONTRACTOR TO PROTECT EXISTING GAS PROBES STA 48+00 TO 58+00.
PIPELINE MAY VARY FROM ALIGNMENT SHOWN BASED ON FIELD CONDITIONS IN
THIS AREA.
BOLLARDS TO BE INSTALLED PER STATE STANDARD PLAN H-13A AT ABOVEGROUND
EXTRACTION WELL INSTALLATION AS REQUIRED BY THE ENGINEER.

2.

CAP EXTRACTION PIPE
RECOMMENDATION

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REFERENCE EXTRACTION WELL SLAB PARTIAL
PLAN, DRAWING M-9

REFERENCE EXTRACTION PIPELINE
RECORD DRAWINGS
FILED IN X-61

P.O. BOX 6820
TACOMA, WA 98402-6820

BWSI
PROJECT NO.
40224

DEPARTMENT OF PUBLIC WORKS
TACOMA LANDFILL EXTRACTION/TREATMENT SYSTEM
EXTRACTION PIPELINE
PLAN AND PROFILE

RECORD DRAWINGS
FILED IN X-61

HORIZONTAL SCALE: 1=50
VERTICAL SCALE: 1=10

AL R. ROBERTS
PROJ. ENGR.

TACOMA PUBLIC WORKS
DIRECTOR OF PUBLIC WORKS

PROJECT NO.
40024

DEPUTY "PUBLIC WORKS DEPUTY DIRECTOR"

REVISION DATE APPROVED

THIS DRAWING SERVES AS EVIDENCE OF THIS PROJECT
DATE SCALE 1-31-92 1=50

ADDENDUM NO. 1 CONSTRUCTION CHECKED

DATE 6/21/94

DATE 6/21/94

(206) 383-1436

DATE
16:01:44 AROBERTS-C:PROJECTS\424-C9.DWG

June 22, 1994
1. See Sheet C-1 for general notes.
2. Contractor to protect existing storm sewer STA 4+06.

Notes:

- 8" Dia. HDPE Pipe STA. 4+04.2 N 694769.10 L. = 45' WYE 8"X8"X2" HDPE Pipe
- STA. 4+29.0 N 694769.40 E 1502536.73 L. = 14.75' 8" Dia. HDPE Pipe
- STA. 5+11.8 N 694766.64 E 1502445.56 L. = 11.25' 8" Dia. HDPE Pipe
- Protect existing fence

Key Map

Record Drawings

City of Tacoma
Department of Public Works
Tacoma Landfill Extraction/Treatment System
Plan and Profile

Scale: 1" = 50'

Horizontal Scale: 1" = 50'
Vertical Scale: 1" = 10'

Edge of Plume Pipeline

Record Map
1. FOR GENERAL NOTES SEE SHEET C-1.
2. CONTRACTOR SHALL PROTECT EXISTING TRAFFIC SIGNAL / STREET LIGHT FACILITIES IN PROJECT AREA. REFER TO SPECIAL PROVISIONS SECTION 1 GENERAL SPECIFICATIONS.

STA 9+13 INSTALL 90' TEE WITH BLIND FLANGE FACING NORTH

NOTES:

EDGE OF SIDEWALK
EXTRACTION PIPELINE N 694785.79 E 1501479.70

NOTE: ONLY MINOR ALIGNMENT CHANGES MADE DURING CONSTRUCTION, PROFILES REMAINED THE SAME.

560
240
270
290

HORIZONTAL SCALE: 1"=50'
VERTICAL SCALE: 1"=10'

RECORD DRAWINGS

1. FOR GENERAL NOTES SEE SHEET C-1.
2. CONTRACTOR SHALL PROTECT EXISTING TRAFFIC SIGNAL / STREET LIGHT FACILITIES IN PROJECT AREA. REFER TO SPECIAL PROVISIONS SECTION 1 GENERAL SPECIFICATIONS.
2. CONTRACTOR TO PROVIDE MIN 3' COVER OVER ELECTRICAL CONDUITS UNDER 54TH AVE W. SEE DETAIL 5 SHEET C-1 FOR PIPE BEDDING AND TRENCH WIDTH REQUIREMENTS.

CONTRACTOR TO RESTORE EXISTING ROADWAY TO ORIGINAL CONDITION FOLLOWING TRENCH BACKFILL.

1. FOR GENERAL NOTES SEE SHEET C-1.

NOTES:

SEE SHEET C-11 NOTE.

IN GENERAL THE APPROXIMATE DEPTH OF THE PIPELINE IS 5' FROM GROUND SURFACE ELEVATION. THE CONTRACT PLAN PROFILES FOR THE EXTRACTION PIPELINE ARE REMOVED.

15' DIA. CMP SLEEVE, APPROX. 75' LENGTH

EXTRACTION PIPELINE

3' DIA. EXTRACTION PIPELINE

4' DIA. EXTRACTION PIPELINE

RECORD DRAWINGS
NOTES:
1. FOR GENERAL NOTES SEE SHEET C-1.
2. SURVEY DATA NOT AVAILABLE FOR STA 18+62 TO 37+88. SEE SECTION 5 ON SHEET C-14 FOR TRENCH CONSTRUCTION IN THIS AREA.

WELL LATERAL PIPES FOR W-31 THRU W-36 WILL BE 6" DIA HDPE. W-30 LATERAL WILL BE 3" DIA HDPE.

NOTE: IN GENERAL THE APPROXIMATE DEPTH OF THE PIPELINE IS 5' FROM GROUND SURFACE ELEVATION. THE CONTRACT PLAN PROFILES FOR THE EXTRACTION PIPELINE ARE REMOVED.

RECORD DRAWINGS

DEPARTMENT OF PUBLIC WORKS

EDGE OF PLUME

PROJECT NO. 40024

CITY OF TACOMA

TACOMA LANDFILL EXTRACTION/TREATMENT SYSTEM

EDGE OF PLUME PLAN AND PROFILE
PIPE BEDDING MATERIAL

EXISTING EXTRATION WELL VAULT

EXISTING Casing

DISCHARGE PIPE

STEEL PIPE

TO EXTRATION HEADER

EXISTING EXTRATION WELL VAULT

TO EXTRATION HEADER

EXTRACTION PIPELINE HEADER

ROAD 1

EXTRACTION TRENCH SECTION IN NATIVE AREAS

SCALE: 1/4"=1'

NOTES:

1. Raise Road 1 to provide 2.0' cover from top of extraction pipeline to top of crushed ballast.

2. 150 LB/CF reinforced concrete

3. See Section 7-10.3 of the State Standard Specifications for trench width "W".

4. Provide native backfill for trench in native soil areas. Provide 16" crushed ballast for trench in road areas.

5. Bank run gravel to be used only where directed by engineer.
GENERAL NOTES:
1. ALL CONSTRUCTIONS SHOWN ARE NOMINAL.
2. CONCRETE DESIGN IS BASED ON Fc = 4000 psi WITH REINFORCING STEEL.
3. STEEL DESIGN IS BASED ON Fy = 60 ksi.
4. CONSTRUCTION TO LOCATE AND DEMONSTRATE SIZE OF RACER-TANK FOUNDATIONS.
   - FABRICATION AND DESIGN TO BE IN CONFORMITY WITH SECTION 4.3 OF ACI 318.

DESIGN LOADS:
- BLOW LOAD: 25 psf
- FABRIC LOAD: 150 psf
- WIND LOAD: 1.00 x ACI 318.15
- LOAD - RISK ZONE 3

SPACING & DEVELOPMENT LENGTHS

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NOTES:
- SMALLER BARS LOCATE AND SHOWN ABOVE.
- OTHERS SPACE LESS DEVELOPMENT LENGTHS SO 318.1 TOLERANCES FOR THE INCURBS ARE 1'-10" PAD AND 1'-4" 25 psi.
- BARS OTHERS HOOKED BARS LOCATION 1'-31'-92 3/16" = 1'-0"
- ALL BARS OTHERS HOOKED BARS LOCATED.
- OTHER LOCATIONS OF REINFORCEMENT SHALL CONFORM TO SECTION 4.3 OF ACI 318.

CONCRETE COVER FOR REINFORCEMENT

LOCATION | MINIMUM COVER
--- | ---
FABRIC SURFACE EXPOSED TO CRUSHING | 3"
EXPOSED TO IMPACT | 2"-
OTHER LOCATIONS | 1-1/2"

TOLERANCES FOR CONCRETE COVER AND THE PLACING OF REINFORCEMENT SHOWN MUST BE IN CONFORMITY WITH REINFORCEMENT SHALL CONFORM TO SECTION 40 ACT 505.
CONT.

AND WEDGES

1/4" THICK LEGS

1/2" = 1'-0"

CONT.

SUPPORT

BOTTOM FIBERGLASS REINFORCED PLASTIC CURB

12" ~ 1" = 1'-0"

AS CLAR WITH TOP #5 @ 12".

FREE DRAINING GRAVEL

1/2" = 1'-0"

ON PLANS AND AS SPECIFIED.

CONCRETE

OF GRATING SECTIONS SHALL BE

1/2" = 1'-0"

ON PLANS AND AS SPECIFIED.

VIEW PVC MATERIAL AND CAULK

FREE DRAINING GRAVEL

EAST SIDE TRENCH @ EQUIPMENT BASE PLATE

SEE NOTES AND ANCHOR BOLT DETAIL ON SHEETS 3.

EXP JT MATERIAL AND CAULK

FREE DRAINING GRAVEL

CHAMFER

NOTE

PAD SIZE SHALL BE MINIMUM INDICATED OR

EQUIPMENT BASES SHALL BE INSTALLED LEVEL UNLESS SPECIFIED OTHER­

WISE.

NOTE

EXP JT MATERIAL AND CAULK

FREE DRAINING GRAVEL

CHAMFER

NOTE

TOP 1/2" = 1'-0"

NOTE

EQUIPMENT BASE NOTES

1. PAD SIZE SHALL BE MINIMUM INDICATED OR AS SHOWN ON THE PLANS

OF THE EQUIPMENT MANUFACTURER AND APPROVED BY THE CONSTRUCTION MANAGER.

2. EQUIPMENT BASES SHALL BE INSTALLED LEVEL UNLESS SPECIFIED OTHER­

WISE.

3. NOTES OR SHEETS ARE NOT TO BE USED TO SUPPORT THE BASE UNLESS THE

DESCRIPTION (OR OTHER) MEANS AND ARE NOT TO BE

2. PROVIDE MISCELLANEOUS GRATING FASTENERS AS REQUIRED.

3. TYPE OF MATERIAL USED SHALL BE SHOWN ON PLANS AND AS SPECIFIED.

NOTE

EQUIPMENT BASE PLATE SEE NOTES.

#4 E.W. 4 PLACES

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NOT
THE CONTRACTOR SHALL BE RESPONSIBLE FOR FINAL LOCATION OF ALL PIPING, MECHANICAL EQUIPMENT AND DUCTWORK. THIS RESPONSIBILITY INCLUDES AVOIDING INTERFERENCE WITH SUEING STRUCTURE, PIPING AND ICR WORK.

3. FOR PIPING AND INSTRUMENT DIAGRAM NOTES =

5. THE CONTRACTOR SHALL VERIFY IMPLEMENT CONNECTIONS AND LOCATION AND SHALL PROVIDE MATCHING FIELD FOUND AS REQUIRED AFTER EQUIPMENT INSTALLATION.

2. FOR ABBREVIATIONS AND GENERAL NOTES DRAWING 14-1.

4. THE CONTRACTOR SHALL PROVIDE BOLTED PIPE CAP AT CONNECT OPTION INTERFACES.
NOTES:
1. FOR DRAWS INDICATE SEE DRAWING C-1.
2. FOR LEGEND, SYMBOLS AND GENERAL NOTES SEE GENERAL HINT.
3. FOR PIPING AND INSTRUMENT DRAWING SEE DRAWING H-2.
5. THE CONTRACTOR SHALL VERIFY ALL EQUIPMENT CONNECTIONS AND LEGENDS AND SHALL PROVIDE MATCHING PIPE SIZE AND LENGTH AS REQUIRED TO THE CONTRACTOR.
6. FOR PUMP SUPPORT BRACKETS, SEE DRAWING H-3.
7. ALL PIPING SHOULD BE INSULATED EXCEPT AIR PIPING.
8. AIR PIPING SHALL BE INSULATED TO MEET THE CONDUCTIVITY REQUIREMENTS OF ASHRAE 90.1-2015.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FINAL LOCATION OF ALL PIPING, MECHANICAL, AND DUCTWORK.
10. THIS RESPONSIBILITY INCLUDES AVOIDING INTERFERENCES WITH BUILDING STRUCTURE, PIPING SYSTEMS, AND OTHER WORK.
11. THE CONTRACTOR SHALL VERIFY ALL EQUIPMENT CONNECTIONS AND LOCATION AND SHALL PROVIDE MATCHING PIPE SIZE AND LENGTH AFTER EQUIPMENT PROCUREMENT.
12. ALL ABOVE GRADE PIPING UNLESS NOTED OTHERWISE.
13. CONTRACTOR SHALL PROVIDE ALL NECESSARY FOR CONNECTIONS DURING AND TUBING TO AIR AND INSTRUMENT.
14. TUBING SHALL BE 1/4" OD STEEL, AND INSULATION SHALL BE PROVIDED TO THE TENSION SIDE LARGER THAN PIPE AND INSULATION DIAMETER.
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CONDUIT DURING

INSTALLATION.

EXTENSION WELL

#5

FLEXIBLE CONNECTION

DEADMAN CONNECTION

FLUSH METER FM-5"M

OCCURRENCE DETAILS

EXISTING SURFACE

EXTRACTION WELI SS NODE IDENTIFICATION 1. SEE DRAWIS: 1/2'-1'-0"

SCALE:

EXTENSION WELL

VAULT AND EQUIPMENT IDENTIFICATION

1. SEE CIVIL DRAWINGS FOR WELL LOCATIONS:

* SIDE EQUIPMENT HANDLER ASSOCIATED WITH WELL NUMBER.*

SEE EXTENSION WELL HOLE AND EQUIPMENT IDENTIFICATION (SHE DRAWINGS)

NOTES:

1. FOR DRAWING INDEX SEE DRAWINGS C-1-

2. FOR LEGEND, ABREVIATIONS AND GENERAL NOTES SEE DRAWINGS H-1.

3. FOR PIPE SUPPORT DETAILS SEE ENV W-6.

4. FOR WATER SUPPLY DETAILS SEE ENV W-8.

5. FOR EXISTING DETAILS SEE ENV W-7.

6. ALL EQUIPMENT IN WELLS WAS SHOWN IN DRAWINGS FOR INSTALLATION. THIS DRAWING SHOWS SHOWN IN PIPE CONNECTION DETAILS.


8. ELECTRICAL SYSTEMS FOR INSTALLATION. THIS DRAWING SHOWS PLEASE READ PIPE OR HOLE DETAIL.

APPLICATION FOR CONSTRUCTION OF CONDUIT DETAILS. SEE CIVIL DRAWINGS.
CONTROL CABINET CC-1

CC-1 COMPONENT LIST

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EXTRACTION ZONE 1 EQUIPMENT LIST

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NOTES:
1. FOR DRAWING INDEX, SEE DAD 0-1.
2. FOR ELECTRICAL LOADING, SPECIFICATIONS AND GENERATOR HOPES, SEE DAD 0-1.
3. FOR ELECTRICAL KEY PLANS, SEE DAD 0-2.
4. FOR EXTRACTION WELL LOCATION AND LOCATION OF EXTRACTIOE RAC STATIONS, SEE EXTRACTIOE WELL PLAN.
5. BOILER ROOM SHALL BE DIMENSIONED TO 33'-6" X 20'-6" X 14'-0".
6. EQUIPMENT SHALL BE COMPRESSED IN LIMIT, EXTRACTIOE WELLS, AND EXTRACTIOE WELL PLANS.
7. EXTRACTION WELL EQUIPMENT AND PUMP DESIGN SHALL BE SUBMITTED TO SUPPLY THE PUMP FOR APPROVAL.
8. SUPERSERSE POWER CABLE SHALL BE PROVIDED WITH SECTIONS TO PUMP WIRING.
9. MOTOR POWER CABLES SHALL BE TERMINATED IN EXTRACTIOE WELL PLANS.
10. FOR MOTOR CONTROL SCHEMATICS, SEE DAD 0-11 AND 0-12.
NOTES:
1. FOR DRAWING INDEX, SEE DWG E-1.
2. FOR ELECTRICAL LAYOUT, LAMINATIONS AND REMARKS, SEE DWG E-2.
3. FOR ELECTRICAL KEY PLAN, SEE DWG E-3.
4. FOR NOTES REFERRED TO ON THIS DRAWING, SEE DWG E-11.
Groundwater Quality Data
## Table D-1
Groundwater Quality Data
City of Tacoma Landfill
Tacoma, Washington

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Table D-1

Groundwater Quality Data
City of Tacoma Landfill
Tacoma, Washington

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City of Tacoma Landfill  
Tacoma, Washington

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City of Tacoma Landfill  
Tacoma, Washington

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</table>

**Notes:**

- **Green Shading** = detected concentration is greater than performance standard
- **Bold** text indicates detected analyte

U = The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit. Samples were collected and results were validated by the City of Tacoma.

Well TL-12 was initially considered for decommissioning, however, GWPS are yet to be attained. Well TL-12 will be added to the current Post-Closure Groundwater Monitoring Plan as an interim monitoring well.

**Acronyms/Abbreviations:**

Cont. = Continued  
µg/L = micrograms per liter  
N/A = not applicable
Health and Safety Plan
# Work Location Personnel Protection and Safety Evaluation Form

Attach Pertinent Documents/Data
Fill in Blanks As Appropriate

<table>
<thead>
<tr>
<th>Project Number:</th>
<th>0094089.060.063</th>
</tr>
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<tbody>
<tr>
<td>Prepared by:</td>
<td>Kelsey Mason</td>
</tr>
<tr>
<td>Reviewed by:</td>
<td>Christine Kimmel</td>
</tr>
<tr>
<td>Date:</td>
<td>August 29, 2018</td>
</tr>
</tbody>
</table>

Date: August 29, 2018

## A. Work Location Description

<table>
<thead>
<tr>
<th>1. Project Name:</th>
<th>Tacoma Landfill (Landfill) National Priorities List (NPL) Closeout</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Location:</td>
<td>3510 South Mullen Street, Tacoma, Washington</td>
</tr>
<tr>
<td>3. Anticipated Activities</td>
<td>Decommissioning 84 wells including soil gas probes, groundwater extraction wells and groundwater monitoring activities.</td>
</tr>
<tr>
<td>6. Buildings/Homes/Industry:</td>
<td>No buildings are within the area of sampling.</td>
</tr>
<tr>
<td>7. Topography:</td>
<td>Elevations on-site range from approximately 314 ft to 346 ft above mean sea level (WGS84). The site is generally flat with some elevation change throughout.</td>
</tr>
<tr>
<td>8. Anticipated Weather:</td>
<td>Variable depending on time of year.</td>
</tr>
<tr>
<td>9. Unusual Features:</td>
<td>None.</td>
</tr>
<tr>
<td>10. Site History:</td>
<td>The site is located within the city limits of Tacoma, Washington. The City of Tacoma (City) Solid Waste Management Division began operating the Landfill in 1960 as sanitary landfill. This site was listed by US Environmental Protection Agency (EPA) on the National Priorities List (NPL) as a part of the Commencement Bay, South Tacoma Channel EPA Superfund Site in 1983 due to identified soil and groundwater contamination. The Landfill no longer accepts waste and has been considered closed as of 2015. Currently, remedial actions are being implemented at the Landfill by the City. Remedial actions included the installation of a landfill gas (LFG) extraction system for removal of methane and volatile organic compounds (VOCs).</td>
</tr>
</tbody>
</table>
## B. Hazard Description

1. **Background Review:**
   - Complete
   - Partial
   
   **If partial, why?**
   
   [Click here to enter text.]

2. **Hazardous Level:**
   - B
   - C
   - D
   - Unknown
   
   **Justification:** Existing data regarding site conditions.

3. **Types of Hazards: (Attach additional sheets as necessary)**
   - **A. Chemical**
   - **Inhalation**
   - ** Explosive**
   - **Biological**
   - **Ingestion**
   - **O₂ Def.**
   - **Skin Contact**
   
   **Describe:** Exposure to chemical hazards from volatile organic compounds (VOCs), metals, and methane. Biological waste in the landfill material. Nitrile gloves will be worn. Incidental inhalation and ingestion is possible from drilling process. If vapor levels warrant, a respirator will be worn. Elevated concentrations of compounds may cause explosive hazards. Down-hole conditions are to be monitored with combustible meter when onsite.

   - **B. Physical**
   - **Cold Stress**
   - ** Noise**
   - **Heat Stress**
   - **Other**
   
   **Describe:** Physical hazards from equipment and overhead obstacles (e.g., overhead power lines) may be encountered during exploration activities. Noise hazards associated with exploration equipment. Ear protection will be used. Heavy object hazards. Steel-toe boots will be worn at all times. Potential trip and fall hazards associated with exploration equipment will be minimized.

   - **C. Radiation**
   
   **Describe:** COVID-19 virus: social distancing, wear face masks, do not share field equipment/supplies-follow COVID Protective Guidance (Attachment C)

4. **Nature of Hazards:**
   - **Air**
   - **Soil**
   - **Surface Water**
   - **Groundwater**
   - **Other**
   
   **Describe:** Potential inhalation exposure to vapors containing VOCs, metals or methane. Potential inhalation, ingestion, or skin exposure to VOCs, metals or methane. Potential inhalation, ingestion, or skin exposure to VOCs, metals or methane. Describe: N/A

   - **Describe:** Potential inhalation, ingestion, or skin exposure to VOCs, metals or methane. Describe: N/A
### Chemical Contaminants of Concern  □ N/A

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>PEL or TWA (ppm)</th>
<th>IDLH/STEL (ppm)</th>
<th>Source/Quantity Characteristics</th>
<th>Route of Exposure</th>
<th>Symptoms of Acute Exposure</th>
<th>Instruments Used to Monitor Contaminant</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCE</td>
<td>50</td>
<td>1,000/200</td>
<td>Concentrations up to 10 ug/L in GW, may be present in soil</td>
<td>Inhalation, ingestion, dermal contact</td>
<td>Irritation of eyes, skin; headache; visual disturbance; lassitude, dizziness; tremor; nausea; vomiting; dermatitis; cardiac arrhythmias; paresthesia; liver injury; potential male reproductive toxin; potential carcinogen</td>
<td>CGI with PID sensor</td>
</tr>
<tr>
<td>PCE</td>
<td>25</td>
<td>150/100</td>
<td>Concentrations up to 5.9 ug/L in GW, may be present in soil</td>
<td>Inhalation, ingestion, dermal contact</td>
<td>Dizziness; nausea; dermatitis; irritation; of mucous membranes; potential carcinogen</td>
<td>CGI with PID sensor</td>
</tr>
<tr>
<td>VC</td>
<td>1</td>
<td>NV/5</td>
<td>Concentrations up to 1.7 ug/L in GW, may be present in soil</td>
<td>Inhalation, ingestion, dermal contact</td>
<td>Lassitude, abdominal pain; gastrointestinal bleeding; enlarged liver; pallor or cyan of extremities; potential carcinogen</td>
<td>CGI with PID sensor</td>
</tr>
<tr>
<td>1,2-DCE</td>
<td>200</td>
<td>1,000/NV</td>
<td>Concentrations up to 5.3 ug/L in GW, may be present in soil</td>
<td>Inhalation, ingestion, dermal contact</td>
<td>Dizziness; nausea; dermatitis; irritation; of mucous membranes</td>
<td>CGI with PID sensor</td>
</tr>
<tr>
<td>Benzene</td>
<td>1</td>
<td>500/5</td>
<td>May be present in groundwater and soil</td>
<td>Inhalation, ingestion, dermal contact</td>
<td>Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, lassitude [carcinogen]</td>
<td>CGI with PID sensor</td>
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<tr>
<td>Chloroethane</td>
<td>1,000</td>
<td>3,800/NV</td>
<td>May be present in groundwater and soil</td>
<td>Inhalation, ingestion, dermal contact</td>
<td>Dizziness; nausea; dermatitis; irritation; of mucous membranes; potential carcinogen</td>
<td>CGI with PID sensor</td>
</tr>
<tr>
<td>1,1-DCA</td>
<td>100</td>
<td>3,000/NV</td>
<td>Concentrations up to 3.3 ug/L in GW, may be present in soil</td>
<td>Inhalation, ingestion, dermal contact</td>
<td>Dizziness; nausea; dermatitis; irritation; of mucous membranes; potential carcinogen</td>
<td>CGI with PID sensor</td>
</tr>
<tr>
<td>1,1,1-TCA</td>
<td>350</td>
<td>700/450</td>
<td>May be present in groundwater and soil</td>
<td>Inhalation, ingestion, dermal contact</td>
<td>Dizziness; nausea; dermatitis; irritation; of mucous membranes; potential carcinogen</td>
<td>CGI with PID sensor</td>
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<tr>
<td>Methane</td>
<td>10% LEL</td>
<td>NA</td>
<td>Present in landfill gas at concentrations ranging from 0 to 55% by volume</td>
<td>Inhalation, ingestion, dermal contact</td>
<td>Asphyxiation</td>
<td>CGI</td>
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**Abbreviations/Acronyms:**
- 1,1-DCA = 1,1-dichloroethane
- 1,1,1-TCA = 1,1,1-trichloroethane
- 1,2-DCE = 1,2-dichlorothene
- CGI = combustible gas indicator
- GW = groundwater
- IDLH = immediately dangerous to life or health concentrations
- LEL = lower exposure limit
- NA = not applicable
- NV = no value
- PCE = tetrachloroethene
- PEL = personal exposure limit
- PID = photoionization detector
- ppm = parts per million
- STEL = short-term exposure limit
- TCE = trichloroethene
- TWA = total weight average
- Ug/L = micrograms per Liter
- VC = vinyl chloride
6. Physical Hazards of Concern ☐ N/A

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Description</th>
<th>Location</th>
<th>Procedures Used to Monitor Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slips, trips, and falls</td>
<td>Wet or uneven ground</td>
<td>Any area</td>
<td>Alert observation of surroundings; site has potential uneven ground surfaces; be aware of footing, keep hands free.</td>
</tr>
<tr>
<td>Overhead utilities</td>
<td>Drill rig connecting with overhead utilities</td>
<td>Drill locations</td>
<td>Coordination with drillers and care when selecting drill locations, maintain 20 ft setback</td>
</tr>
<tr>
<td>Heavy lifting</td>
<td>Moving or lifting heavy objects</td>
<td>Any area</td>
<td>Visual and area awareness, use proper lifting techniques</td>
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<tr>
<td>Pinch points</td>
<td>Contact with construction rigs</td>
<td>Near construction rigs</td>
<td>Visual and area awareness, make eye contact with equipment operator prior to advancing near equipment</td>
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<tr>
<td>Explosion</td>
<td>Presence of methane in subsurface</td>
<td>Drill locations</td>
<td>Verify drill rig is electrically ground to minimize potential sparks. If possible apply water to borehole to minimize release of methane gas and spark potential from drill casing.</td>
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<tr>
<td>Noise</td>
<td>Drill rigs</td>
<td>Near drill rig</td>
<td>Wear hearing protection whenever drill rig is operating.</td>
</tr>
<tr>
<td>Travel to and from site</td>
<td>Operating motor vehicle</td>
<td>Any area</td>
<td>Operate motor vehicle while well rested and physically able to drive safely. Conduct pre-trip vehicle inspection, all vehicles to be maintained and in good working order. Obey all traffic laws including no cell phone use while driving. Secure all cargo properly to avoid shifting. Allow sufficient time to travel to site at safe speeds. Engage emergency brake when parking vehicles. Establish planned route prior to departure</td>
</tr>
<tr>
<td>Weather Related Illness</td>
<td>Exposure to low or high temperatures while working</td>
<td>Entire site</td>
<td>Dress in appropriate clothing (layers for both low and high temperatures); stay hydrated; wear gloves and protective outer layers; use sunscreen and other protective clothing such as hats to shield/protect from the sun.</td>
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### 7. Work Location Instrument Readings  □ N/A

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### 8. Hazards Expected in Preparation for Work Assignment  □ N/A

**Describe:** Potential for contact with or ingestion of contamination from non-decontaminated materials from previous work.
C. Personal Protective Equipment

1. Level of Protection
   ☐ A  ☐ B  ☐ C  ☒ D
   Location/Activity: Soil vapor sampling.

   ☐ A  ☒ B  ☐ C  ☐ D
   Location/Activity: If action levels are met or exceeded for upgrade in personal protection equipment (PPE). See Attachment A.

2. Protective Equipment (specify probable quantity required)

   **Respirator**  ☐ N/A
   ☒ SCBA, Airline
   ☐ Full-Face Respirator
   ☒ Half-Face Respirator (Cart. organic vapor) (Only if upgrade to Level C)
   ☐ Escape mask
   ☐ None
   ☐ Other: ☐ SCBA, Airline, ☒ Fully Encapsulating Suit
   ☒ Chemically Resistant Splash Suit
   ☐ Apron, Specify: ☒ Tyvek Coverall (only if upgrade to Level C)
   ☐ Saranex Coverall
   ☐ Coverall, Specify
   ☒ Other: Highly visible safety vest

   **Head & Eye**  ☐ N/A
   ☒ Hard Hat
   ☐ Goggles
   ☒ Face Shield
   ☒ Safety Eyeglasses
   ☒ Other: hearing protection

   **Hand Protection**  ☐ N/A
   ☒ Undergloves; Type:
   ☒ Gloves; Type: Nitrile
   ☐ Overgloves; Type:
   ☐ None
   ☒ Other:

   **Foot Protection**  ☐ N/A
   ☐ Neoprene Safety Boots with Steel Toe/Shank
   ☐ Disposable Overboots
   ☒ Other: Steel-toed work boots

3. Monitoring Equipment  ☐ N/A

   ☒ CGI
   ☐ O2 Meter
   ☐ Rad Survey
   ☐ Detector Tubes (optional)
   Type: ☒ PID
   ☐ FID
   ☐ Other

D. Decontamination

   Personal Decontamination  ☒ Required  ☐ Not Required
   If required, describe: Washing hands and face prior to leaving work site and for breaks.
   Disposable PPE will be discarded as solid waste.
   Equipment Decontamination  ☒ Required  ☐ Not Required
If required, describe: All non-dedicated equipment must be decontaminated before work starts and at the end of the project. Decontamination process will consist of Alconox soap (or equivalent) with tap water wash followed by a tap water rinse and a distilled water rinse. Down hole drilling equipment will be decontaminated using pressure washer or steam cleaner.
### E. Activities Covered Under This Plan

<table>
<thead>
<tr>
<th>Task No.</th>
<th>Description</th>
<th>Preliminary Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>065</td>
<td>Well decommissioning</td>
<td>Anticipated to occur in 2020</td>
</tr>
</tbody>
</table>

### F. Subcontractor’s Health and Safety Program Evaluation

☒ N/A

**Name and Address of Subcontractor:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Adequate</th>
<th>Inadequate</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Surveillance Program</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal Protective Equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Onsite Monitoring Equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safe Working Procedures Specification</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training Protocols</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ancillary Support Procedures (if any)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency Procedures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evacuation Procedures Contingency Plan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decontamination Procedures Equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decontamination Procedures Personnel</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**General Health and Safety Program Evaluation:**

☐ Adequate ☐ Inadequate

Additional Comments:

Evaluation Conducted by:    Date:
## Emergency Facilities and Numbers

Hospital: Tacoma General Hospital, 315 Martin Luther King Jr Way, Tacoma, WA 98405  
Telephone: (253) 403-1000  
Directions: Attachment B  
Emergency Transportation Systems (Fire, Police, Ambulance) -- 911  
Emergency Routes – Map (Attachment B)  

**Emergency Contacts:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Offsite</th>
<th>On-site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eric Weber</td>
<td>(253) 284-4878</td>
<td>(206) 940-2406</td>
</tr>
<tr>
<td>Chris Kimmel</td>
<td>(425) 329-0254</td>
<td>(206) 786-3801</td>
</tr>
</tbody>
</table>

In the event of an emergency, do the following:

1. Call for help as soon as possible. Call 911. Give the following information:
   - WHERE the emergency is – use cross streets or landmarks
   - PHONE NUMBER you are calling from
   - WHAT HAPPENED – type of injury
   - WHAT is being done for the victim(s)
   - YOU HANG UP LAST – let the person you called hang up first.

2. If the victim can be moved, paramedics will transport to the hospital. If the injury or exposure is not life threatening, decontaminate the individual first. If decontamination is not feasible, wrap the individual in a blanket or sheet of plastic prior to transport.
Health and Safety Plan
Approval/Sign Off Form

I have read, understood, and agreed with the information set forth in this Health and Safety Plan (and attachments) and discussed in the Personnel Health and Safety briefing.

<table>
<thead>
<tr>
<th>Name</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kelsey Mach</td>
<td>Signature</td>
<td>Date</td>
</tr>
<tr>
<td>Site Safety Coordinator</td>
<td>Signature</td>
<td>Date</td>
</tr>
<tr>
<td>Christine Kimmel</td>
<td>Signature</td>
<td>Date</td>
</tr>
<tr>
<td>10/5/20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LAI Health and Safety Manager</td>
<td>Signature</td>
<td>Date</td>
</tr>
<tr>
<td>Eric Weber</td>
<td>Signature</td>
<td>Date</td>
</tr>
<tr>
<td>Project Manager</td>
<td>Signature</td>
<td>Date</td>
</tr>
</tbody>
</table>

Personnel Health and Safety Briefing Conducted by:

<table>
<thead>
<tr>
<th>Name</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
## Attachment A
### Action Levels for Respiratory Protection

<table>
<thead>
<tr>
<th>Monitoring Parameter</th>
<th>Reading</th>
<th>Level of Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOCs</td>
<td>&gt;10 ppm in breathing zone for more than 15 minutes or &gt;35 ppm for momentary peak</td>
<td>Evacuate the area of upgrade to Level C: half-face respirator with organic vapor/HEPA cartridge.</td>
</tr>
<tr>
<td>VOCs</td>
<td>&gt;10 ppm and &gt;100 ppm</td>
<td>Upgrade to Level C and temporarily stop work until ambient concentrations reduce to background.</td>
</tr>
<tr>
<td>VOCs</td>
<td>&gt;100 ppm</td>
<td>Stop work and contact Health and Safety Manager.</td>
</tr>
<tr>
<td>Explosive Vapors</td>
<td>CGI reading &gt;10% LEL</td>
<td>Stop work and allow vapors to reduce prior to resuming work.</td>
</tr>
</tbody>
</table>

### Abbreviations/Acronyms:
- > = less than
- CGI = combustible gas indicator
- HEPA = high efficiency particulate air
- LEL = lower explosive limit
- ppm = parts per million
- VOC = volatile organic compound
## ATTACHMENT B

**Directions to Nearest Hospital**

**Tacoma General Hospital**  
315 Martin Luther King Jr Way  
Tacoma, WA 98405  
(253) 403-1000

<table>
<thead>
<tr>
<th>Start</th>
<th>Head north on S Mullen St toward S 31st St</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Turn right onto Center St</td>
</tr>
<tr>
<td>2</td>
<td>Turn left onto S Wilkeson St</td>
</tr>
<tr>
<td>3</td>
<td>Turn right onto S 19th St</td>
</tr>
<tr>
<td>4</td>
<td>Turn left onto S Ainsworth Ave</td>
</tr>
<tr>
<td>5</td>
<td>Turn right onto S 9th St</td>
</tr>
<tr>
<td>6</td>
<td>Turn left onto Martin Luther King Jr Way</td>
</tr>
</tbody>
</table>

**End**  
Destination will be on the right  
315 Martin Luther King Jr Way  
Tacoma, WA 98405

**Total Est. Time:** 15 minutes  **Total Est. Distance:** 4.4 miles
ATTACHMENT C

COVID-19 Virus Guidance and Best Practices

COVID-19 Field Guidance and Best Practices
The COVID-19 pandemic continues to be rapidly evolving, and Landau Associates, Inc. (LAI) continues to work diligently to provide services using protective guidance from global and regional health authorities to help protect the health and safety of our employees, the public, and our clients. This technical memorandum has been prepared to provide guidance on managing the risks associated with COVID-19 for LAI employees that perform or manage field work.

Symptoms
People infected with COVID-19 may have little to no symptoms and in some cases, symptoms (when they appear) can take up to 14 days to present after exposure to COVID-19. Symptoms can include the following: fever, cough, and difficulty breathing.

Worksite Considerations
Employees working on project sites or in client settings will work to maintain LAI’s company standards and will work transparently with the client to coordinate work approaches. Such topics include, but are not limited to:

- Site Access
- Social Distancing and Working in Isolation
- Fitness for Duty
- Emergency Responses.

Site Access
Prior to mobilization to the project site, the field lead will contact the client to verify that LAI has access to the site and to determine if any new clearance or site procedures are present related to the COVID-19 outbreak.

In addition to reaching out to our clients, LAI will contact vendors and subcontractors to evaluate their capacity to meet project milestones. We will work closely with the vendors and subcontractors to minimize impacts on project timing.

Social Distancing and Working in Isolation
Health and governing agencies are requiring social distancing as a method to flatten the contagion curve of the virus. Washington and Oregon both have a “Stay at Home” or “Shelter in Place” ruling, which are currently in effect. Large gatherings in crowded places have also been temporarily stopped. Experts recommend staying a minimum of 6 feet away from others.
LAI employees are asked to follow the direction of regional government and health agencies regarding social distancing or other measures by maintaining a minimum of 6 feet separation between people. During field activities, a face mask/shield will be worn by LAI employees. Field employees are asked to practice social distancing by driving separate vehicles to a project site and work independently (as much as the task will allow) by not sharing tools and/or equipment. If reasonably practicable, conduct toolbox meetings outside, practice social distancing, and keep group sizes small.

LAI’s field services are typically operated independent of project site operations, and we require very little to no assistance. Our field services are also typically conducted by working in isolation by placing safety cones and/or barriers around the work area to minimize interaction with the public.

Where possible, adjust work planning to maximize social distancing between workers, teams, and site personnel.

If a meeting must take place in-person on site, meet outdoors whenever possible. If indoors or under shelter, the meeting location must be large enough to permit 6 feet of separation between attendees; surfaces will be wiped down prior to convening the meeting; hand sanitizer and wipes must be available to all participants; invitees will be asked not to attend if they are not feeling well; person-to-person contact must be avoided (shaking hands, etc.); and all attendees are reminded to cover any coughs or sneezes using the crook of their arm.

**Fitness for Duty**

As part of the fitness-for-duty checks, LAI’s field employees are asked to confirm that they are in good health and are symptom-free. They must verify that they:

- Do not have any of the following symptoms: fever (no matter how mild), new onset or an exacerbation of chronic cough, or difficulty breathing; and
- Have not traveled outside their home country within the last 14 days; and
- Have not had close contact with a confirmed or probable COVID-19 case or a person who has been outside your home country in the last 14 days.

The following personal hygiene and wellness practices are recommended to prevent or control the transmission of viruses:

- Wash your hands with soap and water for at least 20 seconds after using toilet facilities, before and after eating, after handling potentially contaminated or infectious materials, after removing hand protection and other personal protective equipment (PPE), and after sneezing, coughing, or touching your face. When soap and water are not available, use an alcohol-based hand sanitizer.
- Avoid touching your eyes, nose, and mouth with unwashed hands.
- Cover your mouth and nose when coughing or sneezing with a tissue or the crook of your elbow. Throw the used tissue in the trash and wash your hands.
- Maintain vehicles through regular cleaning and disinfecting of surfaces.
• Do not share tools or equipment (e.g., cell phones, shovels, etc.) between employees without disinfecting them first.

• Avoid handling common-use items such as pens and clipboards; equip each worker with their own. If it is necessary to have common-use items, include them in the cleaning and disinfecting cycle outlined below.

• Get adequate rest, eat a healthy and balanced diet, and stay hydrated.

If an LAI employee experiences signs or symptoms of illness, they are advised to distance themselves from others and notify their supervisor. Supervisors and managers will work with the Corporate Health and Safety Manager and the Human Resources Director to help manage the response.

**Cleaning and Disinfecting**

COVID-19 can survive on different surfaces but can be killed by most cleaners and disinfectants. To prevent transmission of COVID-19 while cleaning, good hygiene measures and consistent use of appropriate PPE is recommended. Cleaning refers to the removal of germs, dirt, and impurities from surfaces. Cleaning does not kill germs; but by removing them, it lowers their numbers and the risk of spreading infection. Disinfecting refers to using chemicals to kill germs on surfaces. This process does not necessarily clean dirty surfaces or remove germs, but by killing germs on a surface after cleaning, it can further lower the risk of spreading infection.

All LAI offices are routinely cleaned and disinfection practices have been implemented. Employees are asked to practice routine cleaning of frequently touched surfaces (e.g., vehicle door handles, interior of vehicle such as steering wheel and control panel, equipment controls, handles, stair railings, toilet facility doors, etc.) with household cleaners and disinfectants that are appropriate for the surface, following label instructions.

It is important to keep vehicles clean. Each vehicle has an ample supply of clean tissues and hand sanitizer, as well as cleaning supplies and disinfectants. Employees are asked to clean vehicles after each use and wear appropriate PPE when cleaning.

**Drinking Water**

A reasonable supply of potable drinking water is to be kept readily accessible at the project site for the use of workers. Drinking water is to be supplied from a piping system, individual servings, or from a clean, covered container with a drain faucet or pump. Workers will be given a sanitary means of drinking the drinking water and must not be required to share a common drinking container. If using water coolers to provide drinking water, wear clean gloves to operate the spigot and verify that a clean source of disposable cups is available. Verify that the cooler is cleaned and sanitized on a regular basis. If using bottled water sources, employees should take measures such as labeling bottles to avoid drinking out of someone else’s bottle.
Personal Protective Equipment
LAI shall review the site-specific health and safety plans and requirements for PPE prior to mobilization to the site. Required PPE shall be donned prior to leaving the vehicle at the site.

LAI has PPE available for employees consisting of disposable nitrile gloves, soap, and disinfectant solutions. Additionally, each employee routinely conducting field services has been trained and fit with a personnel respirator with high-efficiency particulate air (HEPA) filter cartridges. The personnel respirators are rated above an N95 mask for protection against airborne particles and chemicals. Respirators will be worn in confined spaces and while working inside facility buildings.

If field services are being conducted, LAI employees will wear a face maks/shields in addition to the PPE required for the protection of possible environmental contamination.

Gloves shall be worn to match the type of work to be conducted and may consist of, but not be limited to: nitrile gloves, cotton gloves, or leather gloves.

Closing
This guidance document does not address every situation pertaining to LAI projects and clients related to COVID-19 precautionary measures. Additional internal communications will be disseminated to employees as the situation evolves.

LANDAU ASSOCIATES, INC.

Christine Kimmel
Corporate Health and Safety Manager

CBK/ljl
ATTACHMENT 14

EPA Work Plan Approval Letter
Mr. Calvin Taylor  
City of Tacoma Public Works Department  
3510 South Mullen Street  
Tacoma, WA 98409-2200  

RE: Gas Probe and Groundwater Well Decommissioning Work Plan  

Dear Mr. Taylor:  

On October 9, 2020 EPA received the final Gas Probe and Groundwater Well Decommissioning Work Plan for the Tacoma Landfill. The decommissioning work is to be completed in an effort to close out Superfund actions at the Tacoma Landfill OU, Commencement Bay – South Tacoma Channel Superfund Site. EPA has reviewed the work plan. The plan satisfies all of the conditions outlined in EPA’s September 24, 2020 Conditional Approval. Thus, EPA hereby approves the workplan.  

1. A Health and Safety Plan, including a plan to address the COVID virus, has been added.  
2. Following receipt of your September 28, 2020 email, EPA has reviewed our previous discussions and concurs that, since this is part of the CERCLA action, individual variances from the WA Department of Ecology are not required prior to start of drilling.  
3. A valid WA driller’s license is one of the qualifications required for the driller selected by the City of Tacoma for this project.  

In the future, if gas or groundwater data is required at or near the location of any decommissioned probe or well, EPA may require new probes or wells to be installed in those locations.  

As stated in the work plan, please provide EPA notice prior to starting the work outlined in this work plan.  

If you have any questions, please contact me at jennings.jeremy@epa.gov or 206-553-2724. During this COVID period, if leave a voicemail message, please also send me a quick email letting me know a message is waiting.  

Sincerely,  

Jeremy Jennings  
Remedial Project Manager  

Cc: Eric Weber, Landau Associates  
Mohsen Kourchdar, WA Dept. of Ecology  
Dan Watts, Tacoma-Pierce County Health District
ATTACHMENT 15

Well Details
Map Detail
Location Notes

- Pre-Contact: Owner's representative to contact Orchard Terrace Apartments (253-565-8362)
- Access: easy access from residential apartment parking lot
- Permits required: none
- Traffic control required: No Parking signs to be coordinated by Contractor
- Vegetation constraints: tree branches to be cleared by Owner
- Site restoration: Contractor to remove concrete vault, fill void, reseed
Figure A-1c

Gas Probe - PSOT1 Details

City of Tacoma Landfill
Tacoma, Washington

Location Access (2)

Location Close-Up
Map Detail
Location Notes

- Pre-Contact: Owner's representative to contact Orchard Terrace Apartments (253-565-8362)
- Access: easy access from residential apartment parking lot
- Permits required: none
- Traffic control required: No Parking signs to be coordinated by Contractor
- Vegetation constraints: none
- Site restoration: Contractor to remove concrete vault, fill void, reseed

Access Constraints and Location Details Notes
Figure A-2c

Gas Probe – PSOT2 Details

City of Tacoma Landfill
Tacoma, Washington
Location Notes

- Pre-Contact: Owner's representative to contact Orchard Terrace Apartments (253-565-8362)
- Access: easy access from residential apartment parking lot
- Permits required: none
- Traffic control required: No Parking signs to be coordinated by Contractor
- Vegetation constraints: none
- Site restoration: Contractor to remove concrete vault, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
Gas Probe – PSOT3 Details

City of Tacoma Landfill
Tacoma, Washington

Figure A-3c
Location Notes

- Pre-Contact: none
- Access: easy access from residential street
- Permits required: Right-of-Way
- Traffic control required: Single traffic lane/sidewalk closure and No Parking signs to be coordinated by Contractor
- Vegetation constraints: none
- Site restoration: Contractor to remove concrete monument wellhead, fill void, reseed
Location Close-Up

Gas Probe – SPS01 Details

City of Tacoma Landfill
Tacoma, Washington

Figure A-4c
Figure A-5a

Gas Probe – SPS01W Details

City of Tacoma Landfill
Tacoma, Washington
Location Notes

- Pre-Contact: None
- Shared location with monitoring well TL-22A
- Access: easy access from residential street
- Permits required: Right-of-Way
- Traffic control required: Single traffic lane/sidewalk closure and No Parking signs to be coordinated by Contractor
- Vegetation constraints: none
- Site restoration: Contractor to remove concrete monument wellhead, fill void, reseed

Access Constraints and Location Details Notes

Installation TL-22A/SPS01W is a nested soil gas probe and groundwater monitoring well, both of which are scheduled for decommissioning.
Installation TL-22A/SPS01W is a nested soil gas probe and groundwater monitoring well, both of which are scheduled for decommissioning.
Location Notes

- Pre-Contact: None
- Access: easy access within Right-of-Way; western-most of three monuments within Right-of-Way
- Permits required: Right-of-Way
- Traffic control required: Single or double traffic lane closure to be coordinated by Contractor
- Vegetation constraints: none
- Site restoration: Contractor to remove wellhead monument and fill/patch asphalt

Access Constraints and Location Details Notes

Location Access (1)
Location Access (2)

Location Close-Up
(This photo was taken in 2018 when this road was not in frequent use)
Map Detail
Location Notes

- Pre-Contact: Owner's representative to contact Orchard Street Self Storage or Madsen Electric
- Access: potentially easy access from Madsen Electric parking lot; potentially restricted access (narrow space behind building) from Orchard Street Self Storage parking lot; located below electrical power lines
- Permits required: none
- Traffic control required: No Parking signs to be coordinated by Contractor
- Vegetation constraints: bushes to be cleared by Owner
- Site restoration: Contractor to remove concrete monument wellhead, fill void, reseed

Access Constraints and Location Details Notes
Photo unavailable

Location Access (2)

Location Close-Up
Map Detail

City of Tacoma Landfill
Tacoma, Washington

Gas Probe – SPS09 Details

Figure A-8a
**Location Notes**

- **Pre-Contact:** Owner's representative to contact Orchard Terrace Apartments (253-565-8362)
- **Access:** easy access from residential apartment parking lot
- **Permits required:** none
- **Traffic control required:** No Parking signs to be coordinated by Contractor
- **Vegetation constraints:** none
- **Site restoration:** Contractor to remove concrete monument wellhead, fill void, reseed

**Access Constraints and Location Details Notes**

---

**Location Access (1)**
Figure A-8c

Gas Probe – SPS09 Details

City of Tacoma Landfill
Tacoma, Washington

Location Access (2)

Location Close-Up
Figure A-9a
Gas Probe – SPS10 Details

City of Tacoma Landfill
Tacoma, Washington

Map Detail
Location Notes

- Pre-Contact: Owner's representative to contact Orchard Terrace Apartments (253-565-8362)
- Access: easy access from residential apartment parking lot
- Permits required: none
- Traffic control required: No Parking signs to be coordinated by Contractor
- Vegetation constraints: none
- Site restoration: Contractor to remove concrete monument wellhead, fill void, reseed
Location Access (2)

Location Close-Up
### Location Notes
- **Pre-Contact:** Owner's representative to contact Orchard Terrace Apartments (253-565-8362)
- **Access:** easy access from residential apartment parking lot
- **Permits required:** none
- **Traffic control required:** No Parking signs to be coordinated by Contractor
- **Vegetation constraints:** none
- **Site restoration:** Contractor to remove concrete monument wellhead, fill void, reseed

### Access Constraints and Location Details Notes
Location Access (2)
Location Notes

- Pre-Contact: Owner's representative to contact Orchard Terrace Apartments (253-565-8362)
- Access: easy access from residential apartment parking lot
- Permits required: none
- Traffic control required: No Parking signs to be coordinated by Contractor
- Vegetation constraints: none
- Site restoration: Contractor to remove concrete monument wellhead, fill void, reseed

Access Constraints and Location Details Notes
Figure A-11c

City of Tacoma Landfill
Tacoma, Washington

Gas Probe – SPS12 Details

Location Access (2)

Location Close-Up
Location Notes

- Pre-Contact: Owner's representative to contact Verandas Apartments (253-341-4688)
- Access: easy access from residential apartment parking lot
- Permits required: none
- Traffic control required: Traffic Control for parking lot entrance and No Parking signs to be coordinated by Contractor
- Vegetation constraints: none
- Site restoration: Contractor to remove concrete monument wellhead, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
Location Notes

- Pre-Contact: Owner's representative to contact Verandas Apartments (253-341-4688)
- Access: easy access in residential apartment parking lot
- Permits required: none
- Traffic control required: Traffic Control for parking lot lane and No Parking signs to be coordinated by Contractor
- Vegetation constraints: none
- Site restoration: Contractor to remove wellhead monument and fill/patch asphalt

Access Constraints and Location Details Notes

Location Access (1)
Location Access (2)

Location Close-Up
Location Notes

- Pre-Contact: Owner's representative to contact Verandas Apartments (253-341-4688)
- Access: easy access from residential apartment parking lot
- Permits: none
- Traffic Control: No Parking signs to be coordinated by Contractor
- Vegetation: none
- Site Restoration: Contractor to remove concrete monument wellhead, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
Location Access (2)

Location Close-Up
Location Notes

- Pre-Contact: None
- Access: easy access within Right-of-Way
- Permits required: Right-of-Way
- Traffic control required: Double traffic lane closure to be coordinated by Contractor
- Vegetation constraints: none
- Site restoration: Contractor to remove wellhead monument and fill/patch asphalt

Access Constraints and Location Details Notes

Location Access (1)
Figure A-16a
Gas Probe – SPS17B Details

City of Tacoma Landfill
Tacoma, Washington

Map Detail
Location Notes

- Pre-Contact: Owner's representative to contact Praise Covenant Church (253-564-8563)
- Access: easy access from church parking lot
- Permits required: none
- Traffic control required: No Parking signs to be coordinated by Contractor
- Vegetation constraints: light vegetation
- Site restoration: Contractor to remove concrete monument wellhead, fill void, reseed
Map Detail
Location Notes

- Pre-Contact: Owner's representative to contact property owner
- Access: access from Home Depot access road; located behind 4-ft chain link fence; fence to be temporarily removed by Contractor
- Permits required: Right-of-Way
- Traffic control required: Single traffic lane closure to be coordinated by Contractor
- Vegetation constraints: thick vegetation to be cleared by Owner
- Site restoration: Contractor to remove concrete vault, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
Location Access – SPS18 is located to west of TL-17AR/BR, toward right side of this photo

Location Close-Up
Location Notes

- Pre-Contact: Owner’s representative to contact The Lodge at Madrona Apartments (206-709-5829)
- Access: easy access from residential apartment parking lot
- Permits required: none
- Traffic control required: No Parking signs to be coordinated by Contractor
- Vegetation constraints: none
- Site restoration: Contractor to remove concrete vault, fill void, re-mulch
Location Access (2)

Location Close-Up
Location Notes

- Pre-Contact: Owner’s representative to contact The Lodge at Madrona Apartments (206-709-5829)
- Access: easy access from residential apartment parking lot
- Permits required: none
- Traffic control required: Traffic control for apartment parking lot lane and No Parking signs to be coordinated by Contractor
- Vegetation constraints: none
- Site restoration: Contractor to remove concrete vault, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
City of Tacoma Landfill
Tacoma, Washington

Gas Probe – SPS24 Details

Location Close-Up
Location Notes

- Pre-Contact: Owner’s representative to contact The Lodge at Madrona Apartments (206-709-5829)
- Access: easy access from residential apartment parking lot
- Permits required: none
- Traffic control required: none
- Vegetation constraints: none
- Site restoration: Contractor to remove concrete vault, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
Location Notes

- Pre-Contact: Owner’s representative to contact The Lodge at Madrona Apartments (206-709-5829)
- Access: easy access from residential apartment parking lot
- Permits required: none
- Traffic control required: Traffic control for apartment parking lot lane restriction to be coordinated by Contractor
- Vegetation constraints: minor tree branches above, Owner to trim if necessary
- Site restoration: Contractor to remove concrete vault, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
Gas Probe – SPS27 Details

City of Tacoma Landfill
Tacoma, Washington

Location Access (2)

Location Close-Up
Map Detail
Location Notes

- Pre-Contact: Owner's representative to contact Bella Vista Apartments (833-497-2336)
- Access: easy access from residential apartment parking lot
- Permits required: none
- Traffic control required: No Parking signs to be coordinated by Contractor
- Vegetation constraints: none
- Site restoration: Contractor to remove concrete vault, fill void, reseed

Access Constraints and Location Details Notes
City of Tacoma Landfill
Tacoma, Washington

Gas Probe – SPS28 Details

Location Close-Up
Map Detail

City of Tacoma Landfill
Tacoma, Washington

Gas Probe – SPS30 Details

Figure A-23a
Location Notes

- Pre-Contact: None
- Access: easy access from residential street
- Permits required: Right-of-Way
- Traffic control required: Single traffic lane closure and No Parking signs to be coordinated by Contractor
- Vegetation constraints: none
- Site restoration: Contractor to remove concrete monument wellhead, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
Location Close-Up
Location Notes

- Pre-Contact: None
- Access: easy access in residential street; residential communications cable directly overhead
- Permits required: Right-of-Way
- Traffic control required: Double traffic lane/sidewalk closure and No Parking signs to be coordinated by Contractor
- Vegetation constraints: none
- Site restoration: Contractor to remove wellhead and fill/patch asphalt

Access Constraints and Location Details Notes

Location Access (1)
Location Access (2)

Location Close-Up
(Installation: SPS31)
Location Notes

- Pre-Contact: none
- Access: easy access from residential street
- Permits required: Right-of-Way
- Traffic control required: Single traffic lane closure and No Parking signs to be coordinated by Contractor
- Vegetation constraints: none
- Site restoration: Contractor to remove concrete monument wellhead, fill void, reseed

Access Constraints and Location Details Notes
Location Close-Up

SPS32

Location Access (2)
Location Notes

- Pre-Contact: none
- Access: easy access from residential street
- Permits required: Right-of-Way
- Traffic control required: Single traffic lane closure and No Parking signs to be coordinated by Contractor
- Vegetation constraints: none
- Site restoration: Contractor to remove concrete monument wellhead, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
Gas Probe – SPS33 Details

City of Tacoma Landfill
Tacoma, Washington

Figure A-26c
Location Notes

- Pre-Contact: Owner's representative to contact Forest Hill Apartments (833-748-1779)
- Access: easy access from residential apartment parking lot
- Permits required: none
- Traffic control required: No Parking signs to be coordinated by Contractor
- Vegetation constraints: none
- Site restoration: Contractor to remove concrete vault, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
Figure A-27c

Gas Probe – SPS35 Details

City of Tacoma Landfill
Tacoma, Washington

Location Access (2)

Location Close-Up
City of Tacoma Landfill
Tacoma, Washington

Gas Probe – SPS36 Details

Figure A-28a
Location Notes

- Pre-Contact: Owner's representative to contact Forest Hill Apartments (833-748-1779)
- Access: easy access from residential apartment parking lot
- Permits required: none
- Traffic control required: No Parking signs to be coordinated by Contractor
- Vegetation constraints: minor tree branches above, Owner to trim if necessary
- Site restoration: Contractor to remove concrete vault, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
Location Close-Up
Location Notes

- Pre-Contact: Owner's representative will coordinate with property owner to move equipment that may impede work.
- Access: easy access in commercial facility parking lot (asphalt).
- Permits required: none
- Traffic control required: none
- Vegetation constraints: none
- Site restoration: Contractor to remove wellhead monument and fill/patch asphalt

Access Constraints and Location Details Notes
Location Close-Up

Location Access (2)
Map Detail

City of Tacoma Landfill
Tacoma, Washington

Gas Probe – SPSOR1 Details

Figure A-30a
Location Notes

- Pre-Contact: Owner’s representative to contact The Lodge at Madrona Apartments (206-709-5829)
- Access: easy access in residential apartment parking lot
- Permits required: none
- Traffic control required: Traffic Control for parking lot lane and No Parking signs to be coordinated by Contractor
- Vegetation constraints: none
- Site restoration: Contractor to remove wellhead monument and fill/patch asphalt
Location Access (2)

Location Close-Up

City of Tacoma Landfill
Tacoma, Washington

Gas Probe – SPSOR1 Details

Figure A-30c
Location Notes

- Pre-Contact: Owner’s representative to contact Madsen Electric (253-383-4546)
- Access: restricted access, behind Madsen Electric shop building; on moderate slope
- Permits required: none
- Traffic control required: none
- Vegetation constraints: moderate ground cover vegetation, to be cleared by Owner
- Site restoration: Contractor to remove concrete vault, fill void, reseed

Access Constraints and Location Details Notes
Location Access (1)

Location Access (2)
Figure A-32c

Gas Probe – SPSR1 Details

City of Tacoma Landfill
Tacoma, Washington

Location Access (3)

Location Close-Up
Location Notes
- Pre-Contact: Owner's representative to contact Madsen Electric (253-383-4546)
- Access: easy access from commercial business facilities parking lot
- Permits required: none
- Traffic control required: No Parking signs to be coordinated by Contractor
- Vegetation constraints: none
- Site restoration: Contractor to remove concrete vault, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
Location Access (2)

Location Close-Up

City of Tacoma Landfill
Tacoma, Washington

Gas Probe – SPSR2 Details

Figure A-32c
Location Notes

- Pre-Contact: none
- Access: easy access from landfill access road
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: Contractor to remove concrete monument wellhead, fill void, reseed
Onsite Monitoring Well – FL-01A Details

Location Close-Up

Location Access (2)
Figure B-2a

Onsite Monitoring Well – FL-01B

Details
Location Notes

- Pre-Contact: none
- Access: easy access from landfill access road
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: Contractor to remove concrete monument wellhead, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
Location Access (2)

Location Close-Up
Onsite Monitoring Well – LW-01 Details
Location Notes

- Notes: may require liner repairs
- Pre-Contact: none
- Access: easy access from landfill access road
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: Contractor to remove monument wellhead, repair liner as required in the specs, fill void, reseed
Onsite Monitoring Well – LW-01 Details

Location Close-Up

City of Tacoma Landfill
Tacoma, Washington

Figure B-3c
Figure B-4a

Onsite Monitoring Well – MW-11-1

Details
Location Notes

- Pre-Contact: none
- Access: easy access from landfill access road, well is on a moderate slope from road and partially covered with fill
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed

Access Constraints and Location Details Notes
Location Access (2)

Location Close-Up
Figure B-5a

Onsite Monitoring Well – MW-11-2 Details

Map Detail
Location Notes

- Pre-Contact: none
- Access: easy access from landfill access road
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed
Location Access (2)

Location Close-Up
Figure B-6a

Onsite Monitoring Well – MW-16-02 Details

City of Tacoma Landfill
Tacoma, Washington

Map Detail
Location Notes

- Pre-Contact: none
- Access: easy access from landfill access road
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
Onsite Monitoring Well – MW-16-02

Location Close-Up

City of Tacoma Landfill
Tacoma, Washington

Onsite Monitoring Well – MW-16-02
Details

Figure B-6c
Onsite Monitoring Well – MW-16-03 Details

Figure B-7a

City of Tacoma Landfill
Tacoma, Washington

Map Detail
Location Notes

- Pre-Contact: none
- Access: easy access from landfill access road
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed
Onsite Monitoring Well – MW-16-03 Details

City of Tacoma Landfill
Tacoma, Washington

Location Access (2)

Location Close-Up
Onsite Monitoring Well – TL-01A Details

City of Tacoma Landfill
Tacoma, Washington

Map Detail

Figure B-8a
Location Notes

- Pre-Contact: none
- Access: easy access from Orchard Street and landfill access road; location in Right-of-Way, the western-most of two vaults in turn lane
- Permits: Right-of-Way
- Traffic Control: Double traffic lane closure to be coordinated by Contractor
- Vegetation: none
- Site Restoration: Contractor to fill vault with concrete

Access Constraints and Location Details Notes

Location Access (1)
Onsite Monitoring Well – TL-01A

City of Tacoma Landfill
Tacoma, Washington

Details

Figure B-8c
Onsite Monitoring Well – TL-11B,D

City of Tacoma Landfill
Tacoma, Washington

Onsite Monitoring Well – TL-11B,D Details

Map Detail

Figure B-9a
Location Notes

- Pre-Contact: none
- Access: easy access from landfill access road, well is on a moderate slope from road and partially covered with fill
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
Figure B-9c

Onsite Monitoring Well – TL-11B,D Details

City of Tacoma Landfill
Tacoma, Washington

Location Access (2)

Location Close-Up
Location Notes

- Pre-Contact: none
- Access: easy access from landfill access road
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
Onsite Monitoring Well – TL-12 Details

City of Tacoma Landfill
Tacoma, Washington

Location Close-Up

Location Access (2)
Onsite Monitoring Well – TL-15A

City of Tacoma Landfill
Tacoma, Washington

Onsite Monitoring Well – TL-15A Details

Gate, requires key
Location Notes

- Pre-Contact: None
- Access: easy access from landfill access road; requires gate key; located below electrical power lines
- Permits: none
- Traffic control: none
- Vegetation: none
- Site Restoration: Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed
Onsite Monitoring Well – TL-15A Details

Location Close-Up

Figure B-11c

City of Tacoma Landfill
Tacoma, Washington

Location Access (2)
Gate, requires key
Location Notes

- Pre-Contact: None
- Access: easy access from landfill access road; requires gate key; located below electrical power lines
- Permits: none
- Traffic control: none
- Vegetation: none
- Site Restoration: Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed
Figure B-12c

Location Access (2)

Location Close-Up
### Location Notes

- **Notes:** keep all electrical and slab (connected to W-03R)
- **Pre-Contact:** Owner’s representative to contact Ed Gronlund (Owner’s Landfill Gas Manager; 253-405-6508)
- **Access:** easy access from landfill access road; well is 3-4 ft from power supply panel for nearby Well W-03R
- **Permits:** none
- **Traffic Control:** none
- **Vegetation:** none
- **Site Restoration:** remove wellhead, fill, regrade [retain nearby concrete slab and power supply for W-03R]
Onsite Extraction Well – W-03 Details

City of Tacoma Landfill
Tacoma, Washington

Figure C-1c

Location Access (2)

- Old W-03 Well to south (already decommissioned)
- W-03 Well to north scheduled for decommissioning

Location Close-Up
Location Notes

- Notes: keep all electrical and slab (connected to W-04R)
- Pre-Contact: Owner's representative to contact Ed Gronlund (Owner’s Landfill Gas Manager; 253-405-6508)
- Access: easy access from landfill access road; well is adjacent to power supply panel for nearby Well W-04R
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: retain nearby concrete slab and power supply for W-04R
Onsite Extraction Well – W-04
Details

City of Tacoma Landfill
Tacoma, Washington

Location Close-Up

Location Access (2)
Location Notes

- Notes: Owner to deenergize electrical prior to work
- Pre-Contact: Owner's representative to contact Ed Gronlund (Owner’s Landfill Gas Manager; 253-405-6508)
- Access: easy access from landfill access road
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: remove wellhead, above-ground piping, concrete slab, and electrical panel; re-grade

Access Constraints and Location Details Notes

Location Access (1)
Onsite Extraction Well – W-06 Details

City of Tacoma Landfill
Tacoma, Washington

Location Close-Up
Onsite Extraction Well – W-07 Details

City of Tacoma Landfill
Tacoma, Washington

Figure C-4a
Onsite Extraction Well – W-07

**Location Notes**

- Notes: Owner to deenergize electrical prior to work
- Pre-Contact: Owner's representative to contact Ed Gronlund (Owner’s Landfill Gas Manager; 253-405-6508)
- Access: easy access from landfill access road
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: Contractor to remove wellhead, above-ground piping, concrete slab, and electrical panel; re-grade.

**Access Constraints and Location Details Notes**
Location Access (2)

Location Close-Up
Figure C-5a

Onsite Extraction Well – W-08
Details

City of Tacoma Landfill
Tacoma, Washington

Map Detail
Location Notes

- Notes: Owner to deenergize electrical prior to work
- Pre-Contact: Owner’s representative to contact Ed Gronlund (Owner’s Landfill Gas Manager; 253-405-6508)
- Access: easy access from landfill access road
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: remove wellhead, above-ground piping, concrete slab, and electrical panel; re-grade

Access Constraints and Location Details Notes

Location Access (1)
Onsite Extraction Well – W-08

City of Tacoma Landfill
Tacoma, Washington

Details

Location Close-Up
Onsite Extraction Well – W-12
Details

City of Tacoma Landfill
Tacoma, Washington

Onsite Extraction Well – W-12
Details

Figure C-6a
Location Notes

- Notes: Owner to deenergize electrical prior to work
- Pre-Contact: Owner’s representative to contact Ed Gronlund (Owner’s Landfill Gas Manager; 253-405-6508)
- Access: easy access from landfill access road
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: remove wellhead, above-ground piping, concrete slab, and electrical panel; re-grade
Onsite Extraction Well – W-12 Details

City of Tacoma Landfill
Tacoma, Washington

Location Access (2)

Location Close-Up
### Location Notes

- **Notes:** Owner to deenergize electrical prior to work
- **Pre-Contact:** Owner's representative to contact Ed Gronlund (Owner’s Landfill Gas Manager; 253-405-6508)
- **Access:** easy access from landfill access road; located below electrical power lines; located on moderate slope
- **Permits:** none
- **Traffic Control:** none
- **Vegetation:** none
- **Site Restoration:** remove wellhead, above-ground piping, concrete slab, and electrical panel; re-grade
Location Access (2)

Location Close-Up
Location Notes

- Notes: Owner to deenergize electrical prior to work
- Pre-Contact: Owner's representative to contact Ed Gronlund (Owner's Landfill Gas Manager; 253-405-6508)
- Access: easy access from landfill access road; located below electrical power lines; located on moderate slope
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: remove wellhead, above-ground piping, concrete slab, and electrical panel; re-grade

Access Constraints and Location Details Notes

![Location Access (1)]
Onsite Extraction Well – W-14 Details

City of Tacoma Landfill
Tacoma, Washington

Figure C-8c

Location Access (2)

Location Close-Up
Onsite Extraction Well – W-17 Details

Figure C-9a
**Location Notes**

- Notes: Owner to deenergize electrical prior to work
- Pre-Contact: Owner’s representative to contact Ed Gronlund (Owner’s Landfill Gas Manager; 253-405-6508)
- Access: easy access from landfill access road; Owner to shore up rip-rap over culvert opposite of well for rig maneuvering
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: remove wellhead, above-ground piping, concrete slab, and electrical panel; re-grade

**Access Constraints and Location Details Notes**

---

**Location Access (1)**

---
Onsite Extraction Well – W-17
Details

City of Tacoma Landfill
Tacoma, Washington

Location Access (2)

Location Close-Up
Location Notes

- Notes: Owner to deenergize electrical prior to work; W-18 casing may be filled with bentonite
- Pre-Contact: Owner's representative to contact Ed Gronlund (Owner’s Landfill Gas Manager; 253-405-6508)
- Access: easy access from landfill access road; Owner to shore up rip-rap over culvert opposite of well (for rig maneuvering); an existing steel conduit protects a PVC condensate conveyance pipe in front of well
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: remove wellhead, above-ground piping, concrete slab, and electrical panel; re-grade

Access Constraints and Location Details Notes
Onsite Extraction Well – W-18 Details

City of Tacoma Landfill
Tacoma, Washington

Location Access (2)

Location Close-Up
Figure C-11a

Onsite Extraction Well – W-19 Details

City of Tacoma Landfill
Tacoma, Washington

Map Detail
**Location Notes**

- Notes: Owner to deenergize electrical prior to work
- Pre-Contact: Owner's representative to contact Ed Gronlund (Owner’s Landfill Gas Manager; 253-405-6508)
- Access: easy access from landfill access road
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: remove wellhead, above-ground piping, concrete slab, and electrical panel; re-grade

---

**Access Constraints and Location Details Notes**

![Location Access (1)](image-url)
Onsite Extraction Well – W-19 Details

City of Tacoma Landfill
Tacoma, Washington

Location Close-Up

Location Close-Up
Onsite Extraction Well – W-20

City of Tacoma Landfill
Tacoma, Washington

Onsite Extraction Well – W-20 Details

Figure C-12a
Location Notes

- Notes: Owner to deenergize electrical prior to work
- Pre-Contact: Owner's representative to contact Ed Gronlund (Owner’s Landfill Gas Manager; 253-405-6508)
- Access: easy access from landfill access road
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: remove wellhead, above-ground piping, concrete slab, and electrical panel; re-grade

Access Constraints and Location Details Notes
Location Notes

• Notes: Owner to deenergize electrical prior to work
• Pre-Contact: Owner’s representative to contact Ed Gronlund (Owner’s Landfill Gas Manager; 253-405-6508)
• Access: access from landfill access road and maintenance parking; Owner to either remove light post and/or shipping container(s), as necessary
• Permits: none
• Traffic Control: none
• Vegetation: Owner to trim tree branches
• Site Restoration: Remove wellhead, above-ground piping, concrete slab, and electrical panel; re-grade. Remove adjacent cleanout vault and associated piping within; fill void, reseed.

Access Constraints and Location Details Notes
Onsite Extraction Well – W-21 Details

City of Tacoma Landfill
Tacoma, Washington

Figure C-13b
Nearby concrete cleanout vault.

Nearby concrete cleanout vault construction details.

NOTES:
1. INSTALL CROSS NEAR SIDE VAULT WALL; DO NOT CENTER.
2. FOLLOW MANUFACTURER’S RECOMMENDATIONS REGARDING THE NEED FOR FIBERGLASS WRAP FOR REINFORCEMENT.
3. ELECTRICAL CONDUIT NOT SHOWN.
Figure C-14a

Onsite Extraction Well – W-22

Details

City of Tacoma Landfill
Tacoma, Washington

Map Detail

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Decommissioning Specs/Photos C Series Online Extraction Wells C-13 W-21.docx
### Location Notes
- **Notes:** Owner to deenergize electrical prior to work
- **Pre-Contact:** Owner's representative to contact Ed Gronlund (Owner's Landfill Gas Manager; 253-405-6508)
- **Access:** easy access from landfill access road
- **Permits:** none
- **Traffic Control:** none
- **Vegetation:** none
- **Site Restoration:** remove wellhead, above-ground piping, concrete slab, and electrical panel; re-grade

### Access Constraints and Location Details Notes
Figure C-14c

Onsite Extraction Well – W-22 Details

City of Tacoma Landfill
Tacoma, Washington

Location Access (2)

Location Close-Up
Offsite Monitoring Well – 89.5 P1, P2 Details

Map Detail
Location Notes

- Pre-Contact: Owner’s representative to contact Grays Lumber Distribution Center on Tyler Street (+18004524729)
- Access: Easy access from Grays Lumber storage yard; Owner will coordinate moving Ecology block in front of well
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed

Access Constraints and Location Details Notes
Figure D-1c

Offsite Monitoring Well – 89.5 P1, P2 Details

City of Tacoma Landfill
Tacoma, Washington

Location Close-Up

Location Access (2)
Figure D-2a

Offsite Monitoring Well – PW-06 Details

City of Tacoma Landfill
Tacoma, Washington

Map Detail
Location Notes

- Pre-Contact: none
- Access: Narrow vegetated pathway; large aspen tree is ~3 feet from well; wet area - work to be completed in dry season
- Permits: none
- Traffic Control: none
- Vegetation: thick vegetation to be cleared by Owner
- Site Restoration: Contractor to remove monument wellhead, fill void, reseed
Figure D-2c
Offsite Monitoring Well – PW-06 Details

City of Tacoma Landfill
Tacoma, Washington

Location Access (2)

Location Close-Up
Offsite Monitoring Well – PW-07

Details

City of Tacoma Landfill
Tacoma, Washington

Figure D-3a
Location Notes

- Pre-Contact: none
- Access: Easy access from gravel access road; well is located in light vegetation behind a split-rail fence
- Permits: none
- Traffic Control: none
- Vegetation: vegetation and fence to be cleared by Owner
- Site Restoration: Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
Offsite Monitoring Well – PW-09 Details

City of Tacoma Landfill
Tacoma, Washington

Figure D-4a
**Location Notes**

- Pre-Contact: none
- Access: easy access from residential street; Owner to locate well and uncover grass
- Permits: Right-of-Way
- Traffic Control: Single traffic lane closure to be coordinated by Contractor
- Vegetation: none
- Site Restoration: Contractor to remove monument wellhead, fill void, reseed

*Photo unavailable*
Figure D-4c
Offsite Monitoring Well – PW-09
Details

City of Tacoma Landfill
Tacoma, Washington

Location Close-Up

Photo unavailable

Location Access (2)
City of Tacoma Landfill
Tacoma, Washington

Offsite Monitoring Well – PW-10
Details

Figure D-5a
Location Notes

- Pre-Contact: Owner’s representative to contact property owner
- Access: easy access from residential street
- Permits: Right-of-Way
- Traffic Control: Single traffic lane closure to be coordinated by Contractor
- Vegetation: none
- Site Restoration: Contractor to remove monument wellhead, fill void, reseed

Access Constraints and Location Details Notes
Location Access (2)

Location Close-Up
Offsite Monitoring Well – PW-11 Details

City of Tacoma Landfill
Tacoma, Washington

Offsite Monitoring Well – PW-11 Details

Figure D-6a
Location Notes

- Notes: Artesian well
- Pre-Contact: Owner's representative to contact property owner
- Access: easy access from gravel drive
- Permits: none
- Traffic Control: none
- Vegetation: light vegetation
- Site Restoration: Contractor to remove monument wellhead, fill void, regrade

Access Constraints and Location Details Notes
Location Access (2)

Location Close-Up
Location Notes

- Pre-Contact: none
- Access: access from Orchard Street (northbound right lane and/or sidewalk)
- Permits: Right-of-Way
- Traffic Control: Single traffic lane and sidewalk closure to be coordinated by Contractor
- Vegetation: thick vegetation to be cleared by Owner
- Site Restoration: Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed
Figure D-8a

Offsite Monitoring Well – TL-03A,C Details

City of Tacoma Landfill, Tacoma, Washington

Map Detail
Location Notes

- Pre-Contact: none
- Access: easy access from residential street; gas pipeline in vicinity
- Permits: none
- Traffic Control: none
- Vegetation: thick vegetation to be cleared by Owner
- Site Restoration: Contractor to remove monument wellhead, fill void, regrade

Access Constraints and Location Details Notes

Location Access (1)
Figure D-8c

Offsite Monitoring Well – TL-03A,C

Details

City of Tacoma Landfill
Tacoma, Washington

Location Close-Up

Location Access (2)
Location Notes

- Pre-Contact: none
- Access: easy access from gravel drive; City property; requires key for chain gate
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed
Offsite Monitoring Well – TL-05A,C,D Details

City of Tacoma Landfill
Tacoma, Washington

Location Close-Up

Location Access (2)
Map Detail
Location Notes

- Pre-Contact: Owner's representative to contact Kenneth Miller (253-576-4554)
- Access: restricted access through residential gate and orchard trees
- Permits: none
- Traffic Control: none
- Vegetation: Restrictive vegetation to be cleared by Owner
- Site Restoration: Contractor to remove monument wellhead, fill void, reseed

Access Constraints and Location Details Notes
Location Close-Up
Location Notes

- Pre-Contact: Owner's representative to contact Madsen Electric (253-383-4546)
- Access: easy access from Madsen Electric parking lot; located below electrical power lines
- Permits: none
- Traffic Control: none
- Vegetation: bushes to be cleared by Owner
- Site Restoration: Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed
Offsite Monitoring Well – TL-10C,D

City of Tacoma Landfill
Tacoma, Washington

Details

Location Access (2)

Location Close-Up

Figure D-11c
Location Notes

- Pre-Contact: none
- Access: easy access, in Right-of-Way, residential street
- Permits: Right-of-Way
- Traffic Control: Single traffic lane closure and No Parking signs to be coordinated by Contractor
- Vegetation: none
- Site Restoration: Contractor to remove wellhead monument and fill/patch concrete

Access Constraints and Location Details Notes

Location Access (1)
Figure D-12c

Offsite Monitoring Well – TL-14A
Details

City of Tacoma Landfill
Tacoma, Washington

Location Access (2)

Location Close-Up
Figure D-13a

Offsite Monitoring Well – TL-16 Details

City of Tacoma Landfill
Tacoma, Washington

Map Detail
### Location Notes

- **Pre-Contact:** none
- **Access:** easy access from residential street and grass field
- **Permits:** Right-of-Way
- **Traffic Control:** Single traffic lane and sidewalk closure to be coordinated by Contractor
- **Vegetation:** none
- **Site Restoration:** Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed
Location Access (2)

Location Close-Up
Location Notes

- Pre-Contact: none
- Access: Easy access from residential street and grass field
- Permits: Right-of-Way
- Traffic Control: Single traffic lane and sidewalk closure to be coordinated by Contractor
- Vegetation: none
- Site Restoration: Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
Location Close-Up

Location Access (2)
Map Detail

Offsite Monitoring Well – TL-17AR Details
**Location Notes**

- **Pre-Contact:** Owner's representative to contact Property Owner
- **Access:** access from Home Depot access road; located behind 4-ft chain link fence; fence to be temporarily removed by Contractor
- **Permits:** Right-of-Way
- **Traffic Control:** Single traffic lane closure to be coordinated by Contractor
- **Vegetation:** thick vegetation behind fence to be cleared by Owner
- **Site Restoration:** Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed

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**Access Constraints and Location Details Notes**

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**Location Access (1)**
Location Access (2)

Location Close-Up
Offsite Monitoring Well – TL-17BR Details

City of Tacoma Landfill
Tacoma, Washington

Map Detail
## Location Notes

- **Pre-Contact:** Owner's representative to contact Property Owner
- **Access:** Access from Home Depot access road; located behind 4-ft chain link fence; fence to be temporarily removed by Contractor
- **Permits:** Right-of-Way
- **Traffic Control:** Single traffic lane closure to be coordinated by Contractor
- **Vegetation:** Thick vegetation behind fence to be cleared by Owner
- **Site Restoration:** Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed

Access Constraints and Location Details Notes

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![Location Access (1)](image)
Location Close-Up
Map Detail
**Location Notes**

- Pre-Contact: Owner's representative to contact Kenneth Miller (253-576-4554)
- Access: access from gravel drive; need key for private access gate
- Permits: none
- Traffic Control: none
- Vegetation: light vegetation
- Site Restoration: Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed

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Access Constraints and Location Details Notes

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Location Access (1)
Figure D-17c

Offsite Monitoring Well – TL-19A

Details

City of Tacoma Landfill
Tacoma, Washington

Location Close-Up

Photo unavailable

Location Access (2)

Photo unavailable
### Location Notes

- **Pre-Contact:** Owner's representative to contact Kenneth Miller (253-576-4554)
- **Access:** access from gravel drive; need key for private access gate
- **Permits:** none
- **Traffic Control:** none
- **Vegetation:** light vegetation
- **Site Restoration:** Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed

### Access Constraints and Location Details Notes

![Location Access (1)](image-url)
Figure D-18c

Offsite Monitoring Well – TL-19C
Details

Location Access (2)

Location Close-Up
Figure D-19a

Offsite Monitoring Well – TL-20A,C Details

City of Tacoma Landfill
Tacoma, Washington

Map Detail
Location Notes

- Pre-Contact: Owner's representative to contact Kenneth Miller (253-576-4554)
- Access: access from gravel drive, through field, up slight slope; need key for private access gate; access is through wet area – work to be completed in dry season
- Permits: none
- Traffic Control: none
- Vegetation: light vegetation
- Site Restoration: Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
Location Access (2)

Location Close-Up
Offsite Monitoring Well – TL-21A Details

City of Tacoma Landfill
Tacoma, Washington

Map Detail
Location Notes

- Pre-Contact: Owner's representative to contact property owner (Ray Lavesque)
- Access: easy access from gravel access road
- Permits: none
- Traffic Control: none
- Vegetation: thick vegetation to be cleared by Owner
- Site Restoration: Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed

Access Constraints and Location Details Notes
Offsite Monitoring Well – TL-22A

Details

City of Tacoma Landfill
Tacoma, Washington

Offsite Monitoring Well – TL-22A
Details

Figure
D-21a
Location Notes

- Notes: nested with gas probe SPS01W
- Pre-Contact: none
- Access: easy access from residential street
- Permits: Right-of-Way
- Traffic Control: Single traffic lane/sidewalk closure and No Parking signs to be coordinated by Contractor
- Vegetation: none
- Site Restoration: Contractor to remove concrete monument wellhead, fill void, reseed

Access Constraints and Location Details Notes
Location Access (2)

Location Close-Up
Location Notes
- Pre-Contact: none
- Access: easy access over curb from residential street
- Permits: none
- Traffic Control: none
- Vegetation: none
- Site Restoration: Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
Location Access (2)

Location Close-Up
Location Notes

- Pre-Contact: none
- Access: access from residential street; located in grass strip of Birch Street, off of Orchard Street
- Permits: Right-of-Way
- Traffic Control: Single traffic lane/sidewalk closure and No Parking signs to be coordinated by Contractor
- Vegetation: none
- Site Restoration: Contractor to remove monument wellhead stick-up and protective bollards, fill void, reseed
Offsite Monitoring Well – TL-25B Details

City of Tacoma Landfill
Tacoma, Washington

Location Access (2)

Location Close-Up
Location Notes

- Pre-Contact: none
- Access: easy access, in Right-of-Way, residential street
- Permits: Right-of-Way
- Traffic Control: Single traffic lane/sidewalk closure and No Parking signs to be coordinated by Contractor
- Vegetation: none
- Site Restoration: Contractor to remove wellhead monument and fill/patch asphalt

Access Constraints and Location Details Notes

Location Access (1)
Location Access (2)

Location Close-Up
(Installation: TL-27A)
Offsite Monitoring Well – TL-27B Details

Map Detail
Location Notes

- Pre-Contact: none
- Access: easy access, in Right-of-Way, residential street
- Permits: Right-of-Way
- Traffic Control: Single traffic lane/sidewalk closure and No Parking signs to be coordinated by Contractor
- Vegetation: none
- Site Restoration: Contractor to remove wellhead monument and fill/patch asphalt

Access Constraints and Location Details Notes
Location Close-Up
Offsite Monitoring Well – TL-28A Details

City of Tacoma Landfill
Tacoma, Washington

Figure
D-26a
Location Notes

- Pre-Contact: none
- Access: access from residential street; located in gravel strip adjacent to S 49th St
- Permits: Right-of-Way
- Traffic Control: Single traffic lane closure and No Parking signs to be coordinated by Contractor
- Vegetation: none
- Site Restoration: Contractor to remove concrete monument wellhead, fill void, regrade
Offsite Monitoring Well – TL-28A
Details

Location Close-Up

Location Access (2)
Location Notes

- Pre-Contact: Owner's representative to contact Ed Gronlund (CoT LFG Manager; 253-405-6508)
- Access: easy access from landfill access road
- Permits required: none
- Traffic control required: none
- Vegetation constraints: none
- Site restoration: Contractor to remove monument wellhead, fill void, reseed

Access Constraints and Location Details Notes

Location Access (1)
PART 3
STATE PREVAILING WAGE RATES, INSURANCE REQUIREMENTS, and GENERAL PROVISIONS
PREVAILING WAGE RATES

This project requires prevailing wages under chapter 39.12 RCW. Any worker, laborer, or mechanic employed in the performance of any part of the work shall be paid not less than the applicable prevailing rate of wage.

The project site is located in Pierce County.

The effective date for prevailing wages on this project will be the submittal deadline with these exceptions:
   a. If the project is not awarded within six months of the submittal deadline, the award date is the effective date.
   b. If the project is not awarded pursuant to a competitive solicitation, the date the contract is executed is the effective date.
   c. Janitorial contracts follow WAC 296-127-023.

Except for janitorial contracts, these rates shall apply for the duration of the contract unless otherwise noted in the solicitation.

Look up prevailing rates of pay, benefits, and overtime codes from this link:
https://secure.lni.wa.gov/wagelookup/

REQUIRED DOCUMENTS

The Contractor shall submit to the City the following Department of Labor and Industries (L&I) forms for itself and for each firm covered under 39.12 RCW that provided work and materials for the Contract:

1. A copy of an approved Statement of Intent to Pay Prevailing Wages, L&I form number F700-029-000. The City will make no payment under this Contract for the Work performed until this statement has been approved by L&I and a copy of the approved form has been submitted to the City.

2. A copy of an approved Affidavit of Prevailing Wages Paid, L&I form number F700-007-000. The Contracting Agency will not grant completion or release retainage held under chapter 60.28 RCW until all approved Affidavit of Wages paid for Contractor and all Subcontractors have been received by the City.

02/27/2020
The Contractor (Contractor) shall maintain at least the minimum insurance set forth below. By requiring such minimum insurance, the City of Tacoma shall not be deemed or construed to have assessed the risk that may be applicable to Contractor under this Contract. Contractor shall assess its own risks and, if it deems appropriate and/or prudent, maintain greater limits and/or broader coverage.

1. GENERAL REQUIREMENTS

The following General Requirements apply to Contractor and to Subcontractor(s) of every tier performing services and/or activities pursuant to the terms of this Contract. Contractor acknowledges and agrees to the following insurance requirements applicable to Contractor and Contractor’s Subcontractor(s):

1.1. City of Tacoma reserves the right to approve or reject the insurance provided based upon the insurer, terms and coverage, the Certificate of Insurance, and/or endorsements.

1.2. Contractor shall not begin work under the Contract until the required insurance has been obtained and approved by City of Tacoma.

1.3. Contractor shall keep this insurance in force during the entire term of the Contract and for Thirty (30) calendar days after completion of all work required by the Contract, unless otherwise provided herein.

1.4. Insurance policies required under this Contract that name “City of Tacoma” as Additional Insured shall:
   1.4.1. Be considered primary and non-contributory for all claims.
   1.4.2. Contain a “Separation of Insured provision and a “Waiver of Subrogation” clause in favor of City of Tacoma.

1.5. Section 1.4 above does not apply to contracts for purchasing supplies only.

1.6. Verification of coverage shall include:
   1.6.1. An ACORD certificate or equivalent.
   1.6.2. Copies of all endorsements naming the City of Tacoma as additional insured and showing the policy number.
   1.6.3. A notation of coverage enhancements on the Certificate of Insurance shall not satisfy these requirements – actual endorsements must be submitted.

1.7. Liability insurance policies, with the exception of Professional Liability and Workers’ Compensation, shall name the City of Tacoma and its officers, elected officials, employees, agents, and authorized volunteers as additional insured.
   1.7.1. No specific person or department should be identified as the additional insured.
   1.7.2. All references on certificates of insurance and endorsements shall be listed as “City of Tacoma”.
   1.7.3. The City of Tacoma shall be additional insured for both ongoing and completed operations using Insurance Services Office (ISO) form CG 20 10 04 13 and CG 20
1.8. Contractor shall provide a Certificate of Insurance for each policy of insurance meeting the requirements set forth herein when Contractor provides the signed Contract for the work to City of Tacoma. Contractor shall provide copies of any applicable Additional Insured, Waiver of Subrogation, and Primary and Non-contributory endorsements. Contract or Permit number and the City Department must be shown on the Certificate of Insurance.

1.9. Insurance limits shown below may be written with an excess policy that follows the form of an underlying primary liability policy or an excess policy providing the required limit.

1.10. Liability insurance policies shall be written on an “occurrence” form, except for Professional Liability/Errors and Omissions, Pollution Liability, and Cyber/Privacy and Security.

1.11. If coverage is approved and purchased on a “Claims-Made” basis, Contractor warrants continuation of coverage, either through policy renewals or by the purchase of an extended reporting period endorsement as set forth below.

1.12. The insurance must be written by companies licensed or authorized in the State of Washington pursuant to RCW 48 with an (A-) VII or higher in the A.M. Best’s Key Rating Guide www.ambest.com.

1.13. Contractor shall provide City of Tacoma notice of any cancellation or non-renewal of this required insurance within Thirty (30) calendar days.

1.14. Contractor shall not allow any insurance to be cancelled or lapse during any term of this Contract, otherwise it shall constitute a material breach of the Contract, upon which City of Tacoma may, after giving Five (5) business day notice to Contractor to correct the breach, immediately terminate the Contract or, at its discretion, procure or renew such insurance and pay any and all premiums in connection therewith; with any sums so expended to be repaid to City of Tacoma by Contractor upon demand, or at the sole discretion of City of Tacoma, offset against funds due Contractor from City of Tacoma.

1.15. Contractor shall be responsible for the payment of all premiums, deductibles and self-insured retentions, and shall indemnify and hold the City of Tacoma harmless to the extent such a deductible or self-insured retained limit may apply to the City of Tacoma as an additional insured. Any deductible or self-insured retained limits in excess of Twenty Five Thousand Dollars ($25,000) must be disclosed and approved by City of Tacoma Risk Manager and shown on the Certificate of Insurance.

1.16. City of Tacoma reserves the right to review insurance requirements during any term of the Contract and to require that Contractor make reasonable adjustments when the scope of services has changed.
1.17. All costs for insurance shall be incidental to and included in the unit or lump sum prices of the Contract and no additional payment will be made by City of Tacoma to Contractor.

1.18. Insurance coverages specified in this Contract are not intended and will not be interpreted to limit the responsibility or liability of Contractor or Subcontractor(s).

1.19. Failure by City of Tacoma to identify a deficiency in the insurance documentation provided by Contractor or failure of City of Tacoma to demand verification of coverage or compliance by Contractor with these insurance requirements shall not be construed as a waiver of Contractor’s obligation to maintain such insurance.

1.20. If Contractor is a State of Washington or local government and is self-insured for any of the above insurance requirements, a certification of self-insurance shall be attached hereto and be incorporated by reference and shall constitute compliance with this Section.

2. CONTRACTOR

As used herein, "Contractor" shall be the Supplier(s) entering a Contract with City of Tacoma, whether designated as a Supplier, Contractor, Vendor, Proposer, Bidder, Respondent, Seller, Merchant, Service Provider, or otherwise.

3. SUBCONTRACTORS

It is Contractor’s responsibility to ensure that each subcontractor obtain and maintain adequate liability insurance coverage. Contractor shall provide evidence of such insurance upon City of Tacoma’s request.

4. REQUIRED INSURANCE AND LIMITS

The insurance policies shall provide the minimum coverages and limits set forth below. Providing coverage in these stated minimum limits shall not be construed to relieve Contractor from liability in excess of such limits.

4.1 Commercial General Liability Insurance

Contractor shall maintain Commercial General Liability Insurance policy with limits not less than One Million Dollars ($1,000,000) each occurrence and Two Million Dollars ($2,000,000) annual aggregate. The Commercial General Liability Insurance policy shall be written on an Insurance Services Office form CG 00 01 04 13 or its equivalent. Products and Completed Operations shall be maintained for a period of three years following Substantial Completion of the Work related to performing construction services.

This policy shall include product liability especially when a Contract solely is for purchasing supplies. The Commercial General Liability policy shall be endorsed to include:

4.1.1 A per project aggregate policy limit, using ISO form CG 25 03 05 09 or an equivalent endorsement.

4.2 Commercial (Business) Automobile Liability Insurance

Contractor shall maintain Commercial Automobile Liability policy with limits not less than One Million Dollars ($1,000,000) each accident for bodily injury and property damage and bodily injury and property damage coverage for owned (if any), non-owned, hired, or leased vehicles.
Commercial Automobile Liability Insurance shall be written using ISO form CA 00 01 or equivalent. Contractor must also maintain an MCS 90 endorsement or equivalent and a CA 99 48 endorsement or equivalent if “Pollutants” are to be transported.

4.3 **Workers’ Compensation**
Contractor shall comply with Workers’ Compensation coverage as required by the Industrial Insurance laws of the State of Washington, as well as any other similar coverage required for this work by applicable federal laws of other states. The Contractor must comply with their domicile State Industrial Insurance laws if it is outside the State of Washington.

4.4 **Employers’ Liability Insurance**
Contractor shall maintain Employers’ Liability coverage with limits not less than One Million Dollars ($1,000,000) each employee, One Million Dollars ($1,000,000) each accident, and One Million Dollars ($1,000,000) policy limit.

4.5 **Excess or Umbrella Liability Insurance**
Contractor shall provide Excess or Umbrella Liability Insurance with limits not less than Three Million Dollars ($3,000,000) per occurrence and in the aggregate. This coverage shall apply, at a minimum, in excess of primary underlying Commercial General Liability, Employer’s Liability, Pollution Liability, Marine General Liability, Protection and Indemnity, and Automobile Liability if required herein.

4.6 **Pollution Liability Insurance**
Contractor shall maintain a Pollution Liability or Environmental Liability Insurance providing coverage, including investigation and defense costs, for bodily injury and property damage, including loss of use of damaged property or of property that has been physically damaged or destroyed.

Such coverage shall provide both on-site and off-site cleanup costs and cover gradual and sudden pollution, and include in its scope of coverage the City of Tacoma damage claims for loss arising out of Contractor’s work with limits not less than One Million Dollars ($1,000,000) each occurrence and Two Million Dollars ($2,000,000) aggregate. This policy shall include Environmental Resource Damage coverage and Hazardous Substance Removal. If such coverage is provided on a “claims-made” basis, the following additional conditions must be met:

4.6.1 The policy must contain no retroactive date, or the retroactive date must precede the commencement date of this Contract.

4.6.2 The extended reporting period (tail) must be purchased to cover a minimum of Six (6) years beyond completion of work.

4.7 **Other Insurance**
Other insurance may be deemed appropriate to cover risks and exposures related to the scope of work or changes to the scope of work required by City of Tacoma. The costs of such necessary and appropriate Insurance coverage shall be borne by Contractor.
GENERAL PROVISIONS
(Revised December 15, 2020)

SECTION I - BIDDING REQUIREMENTS
SECTION I REQUIREMENTS ARE BINDING ON ALL RESPONDENTS.

1.01 USE AND COMPLETION OF CITY PROPOSAL SHEETS

A. Respondent's Proposal

Each Respondent must bid exactly as specified on the Proposal sheets. All proposals must remain open for acceptance by the City for a period of at least 60 calendar days from the date of opening of the bids.

B. Alterations of Proposals Not Allowed

Proposals that are incomplete or conditioned in any way contain alternatives or items not called for in the General Provisions and Specifications, or not in conformity with law may be rejected as being nonresponsive. The City cannot legally accept any proposal containing a substantial deviation from these Specifications.

C. Filling Out City Proposal Sheets

All proposals must be completed using the proposal sheets and forms included with this specification, and the prices must be stated in figures either written in ink or typewritten. No proposal having erasures or interlineations will be accepted unless initialed by the Respondent in ink.

1.02 CLARIFICATION OF PROPOSAL FOR RESPONDENT

If a prospective Respondent has any questions concerning any part of the Proposal, he/she may submit a written request for answer of his/her questions. Any interpretation of the Proposal will be made by an Addendum duly issued and mailed or delivered to each prospective Respondent. Such addendum must be acknowledged in the proposal. The City of Tacoma will not be responsible for any other explanation or interpretation of the bid documents.

1.03 RESPONDENT'S BOND OR CERTIFIED CHECK

Each bid for construction must be accompanied either by a certified or cashier’s check for 5 percent of the total amount bid, including tax, payable to the City Treasurer, or an approved bid bond, by a surety company authorized to do business in the State of Washington, for 5 percent of the total amount bid. The person legally authorized to sign the bid must sign all bid bonds. The approved bid bond form attached to these Specifications should be used: no substantial variations from the language thereof will be accepted.

If a bid bond is used, the 5 percent may be shown either in dollars and cents, or the bid bond may be filled in as follows, “5 percent of the total amount of the accompanying proposal.”

The check of the successful Respondent will be returned after award of the Contract, acceptance of the Payment and Performance Bond and City’s receipt of the signed Contract. The checks of all other Respondents will be returned immediately upon the award of the Contract. Bid bonds will not be returned.

1.04 DELIVERY OF PROPOSALS TO THE CITY’S PURCHASING OFFICE

A. Proposal packages must be received by the City’s Procurement and Payables Division in SAP Ariba (unless another form of delivery is stated), prior to the scheduled time and date stated in the Solicitation.

B. Supplier is solely responsible for timely delivery of its Submittal.

C. Submittals received after the time stated in the solicitation will not be accepted.

D. For purposes of determining whether a Submittal has been timely received in SAP Ariba, the City’s Procurement and Payables Division will rely on the submittal clock in SAP Ariba.
1.05 LICENSES/PERMITS

A. Suppliers, if applicable, must have a Washington state business license at the time of Submittal and throughout the term of the Contract. Failure to include a Washington state business license may be grounds for rejection of the Submittal or cancellation of contract award. Information regarding Washington state business licenses may be obtained at http://bls.dor.wa.gov.

B. Upon award, it is the responsibility of the Supplier to register with the City of Tacoma's Tax and License Division, 733 South Market Street, Room 21, Tacoma, WA 98402-3768, 253-591-5252, https://www.cityoftacoma.org/government/city_departments/finance/tax_and_license/. Supplier shall obtain a business license as is required by Tacoma Municipal Code Subtitle 6C.20.

C. During the term of the Contract, Supplier, at its expense, shall obtain and keep in force any and all necessary licenses and permits.

1.06 CONTRACTOR’S STATE REGISTRATION NUMBER

Contractors for construction or public works construction are required to be licensed by the state. If the provisions of Chapter 18.27 of the Revised Code of Washington apply to the Respondent, then the Respondent's Washington State Contractor's Registration No. must accompany the bid.

1.07 BID IS NONCOLLUSIVE

The Respondent represents by the submission of the Proposal that the prices in this Bid are neither directly nor indirectly the result of any formal or informal agreement with another Respondent.

1.08 EVALUATION OF BID

A. Price, Experience, Delivery Time and Responsibility

In the evaluation of bids, the Respondent's experience, delivery time, quality of performance or product, conformance to the specifications and responsibility in performing other contracts (including satisfying all safety requirements) may be considered in addition to price. In addition, the bid evaluation factors set forth in City Code Section 1.06.262 may be considered by the City. Respondents who are inexperienced or who fail to properly perform other contracts may have their bids rejected for such cause.

B. Prequalified Electrical Contractor

Certain types of electrical construction require special expertise, experience, and prequalification of the Contractor (or subcontractor) by the City. In such cases, the Respondent must be prequalified or the Respondent must subcontract with a City prequalified electrical contractor for the specialty work.

C. Insertions of Material Conflicting with Specifications

Only material inserted by the Respondent to meet requirements of the Specifications will be considered. Any other material inserted by the Respondent will be disregarded as being nonresponsive and may be grounds for rejection of the Respondent's Proposal.

D. Correction of Ambiguities and Obvious Errors

The City reserves the right to correct obvious errors in the Respondent's proposal. In this regard, if the unit price does not compute to the extended total price, the unit price shall govern.

1.09 WITHDRAWAL OF BID

A. Prior to Bid Opening

Any Respondent may withdraw his/her Proposal prior to the scheduled bid opening time by delivering a written notice to the City's Procurement and Payables Office. The notice may be submitted in person or by mail; however, it must be received by the City's Procurement and Payables Office prior to the time of bid opening.

B. After Bid Opening

No Respondent will be permitted to withdraw his/her Proposal after the time of bid opening, as set forth in the Call for Bids, and before the actual award of the Contract, unless the award of Contract is delayed more than sixty (60) calendar days after the date set for bid opening. If a delay of more than 60 calendar days does occur, then the Respondent must submit written notice withdrawing his/her Proposal to the Purchasing Manager.
1.10 OPENING OF BIDS
At the time and place set for the opening of bids, all Proposals, unless previously withdrawn, will be publicly
opened and read aloud, irrespective of any irregularities or informalities in such Proposal.

1.11 CITY COUNCIL/PUBLIC UTILITY BOARD FINAL DETERMINATION
The City Council or Public Utility Board of the City of Tacoma shall be the final judge as to which is the
lowest and best bid in the interest of the City of Tacoma. The City reserves the right to reject any and all
bids, waive minor deviations or informalities, and if necessary, call for new bids.

1.12 RESPONDENT’S REFUSAL TO ENTER INTO CONTRACT
Any Respondent who refuses to enter into a Contract after it has been awarded to the Respondent will be in
breach of the agreement to enter the Contract and the Respondent's certified or cashier’s check or bid bond
shall be forfeited.

1.13 TAXES
A. Include In Proposal All Taxes
Respondent shall include in his/her Proposal all applicable local, city, state, and federal taxes. It is the
Respondent’s obligation to state on his/her Proposal sheet the correct percentage and total applicable
Washington State and local sales tax. The total cost to the City including all applicable taxes may be the
basis for determining the low Respondent.
B. Federal Excise Tax
The City of Tacoma is exempt from federal excise tax. Where applicable, the City shall furnish a Federal
Excise Tax Exemption certificate.
C. City of Tacoma Business and Occupation Tax
Sub-Title 6A of the City of Tacoma Municipal Code (TMC) provides that transactions with the City of
Tacoma, may be subject to the City of Tacoma's Business and Occupation Tax. It is the responsibility of the
Respondent awarded the Contract to register with the City of Tacoma's Department of Tax and License, 733
South Market Street, Room 21, Tacoma, WA 98402-3768, telephone 253-591-5252. The City’s Business
and Occupation Tax amount shall not be shown separately but shall be included in the unit and/or lump sum
prices bid.

1.14 FIRM PRICES/ESCALATION
Except as specifically allowed by the Special Provisions, only firm prices will be accepted.

1.15 AWARD
A. Construction and/or Labor Contracts
Unless specifically noted in the Special Provisions or Proposal sheets, all construction and/or labor contracts
will be awarded to only one Respondent.
B. Supply/Equipment Contracts
The City reserves the right to award an equipment or supply contract for any or all items to one or more
Respondents as the interests of the City will be best satisfied.

1.16 INCREASE OR DECREASE IN QUANTITIES
The City of Tacoma reserves the right to increase or decrease the quantities of any items under this
Contract and pay according to the unit prices quoted in the Proposal (with no adjustments for anticipated
profit).

1.17 EXTENSION OF CONTRACT
Contracts resulting from this specification shall be subject to extension by mutual agreement per the same
prices, terms and conditions.
1.18 PAYMENT TERMS

A. Prices will be considered as net 30 calendar days if no cash discount is shown. Payment discount periods of twenty (20) calendar days or more if offered in the submittal, will be considered in determining the apparent lowest responsible submittal. Discounts will be analyzed in context of their overall cumulative effect. Invoices will not be processed for payment nor will the period of cash discount commence until receipt of a properly completed invoice and until all invoiced items are received and satisfactory performance of the Contractor has been attained. If an adjustment in payment is necessary due to damage or dispute, the cash discount period shall commence on the date final approval for payment is authorized.

B. ePayable/Credit Card Acceptance. Submittals offering ePayable/Credit card acceptance may be compared against submittals offering a prompt payment discount to evaluate the overall cumulative effect of the discount against the advantage to the City of the ePayable/Credit card acceptance, and may be considered in determining the apparent lowest responsible submittal.

1.19 PAYMENT METHOD – EPAYABLES – CREDIT CARD ACCEPTANCE – EFT/ACH ACCEPTANCE

A. Payment methods include:

• EPayables (Payment Plus). This is payment made via a virtual, single use VISA card number provided by the City’s commercial card provider. Suppliers accepting this option will receive “due immediately” payment terms. Two options for acceptance are available to suppliers. Both are accompanied by an emailed advice containing complete payment details:
  • Straight-through processing (buyer initiated). Immediate, exact payments directly deposited to supplier accounts by the City’s provider bank; the supplier does not need to know card account details.
  • Supplier retrieves card account through the secure, on-line portal provided via email notifications sent by the City’s commercial card provider.

• Credit card. Tacoma’s VISA procurement card program is supported by standard bank credit suppliers and requires that merchants abide by the VISA merchant operating rules. It provides “due immediately” payment terms.
  • Suppliers must be PCI-DSS compliant (secure credit card data management) and federal FACTA (sensitive card data display) compliant.
  • Suppliers must be set up by their card processing equipment provider (merchant acquirer) as a minimum of a Level II merchant with the ability to pass along tax, shipping and merchant references information.

• Electronic Funds Transfer (EFT) by Automated Clearing House (ACH). Standard terms are net 30 for this payment method.

• Check or other cash equivalent. Standard terms are net 30 for this payment method.

B. The City’s preferred method of payment is by ePayables (Payment Plus) followed by credit card (aka procurement card). Suppliers may be required to have the capability of accepting the City’s ePayables or credit card methods of payment. The City of Tacoma will not accept price changes or pay additional fees when ePayables (Payment Plus) or credit card is used.

C. The City, in its sole discretion, will determine the method of payment for goods and/or services as part of the Contract.

1.20 COOPERATIVE PURCHASING

The Washington State Interlocal Cooperative Act RCW 39.34 provides that other governmental agencies may purchase goods and services on this solicitation or contract in accordance with the terms and prices indicated therein if all parties are agreeable.

1.21 PUBLIC DISCLOSURE: PROPRIETARY OR CONFIDENTIAL INFORMATION

A. Respondent’s Submittals, all documents and records comprising any Contract awarded to Respondent, and all other documents and records provided to the City by Respondent are deemed public records subject to disclosure under the Washington State Public Records Act, Chapter 42.56 RCW (Public Records Act). Thus, City may be required, upon request, to disclose the Contract and documents or records related to it unless an exemption under the Public Records Act or other laws applies. In the event CITY receives a request for such disclosure, determines in its legal judgment that no applicable exemption to disclosure applies; and Respondent has complied with the requirements to Respondent has complied with the requirements to mark records considered confidential or proprietary
as such requirements are stated below, City agrees to provide Respondent 10 days written notice of impending release. Should legal action thereafter be initiated by Respondent to enjoin or otherwise prevent such release, all expense of any such litigation shall be borne by Respondent, including any damages, attorneys’ fees or costs awarded by reason of having opposed disclosure. City shall not be liable for any release where notice was provided and Respondent took no action to oppose the release of information.

B. If Respondent provides City with records or information that Respondent considers confidential or proprietary, Respondent must mark all applicable pages or sections of said record(s) as “Confidential” or “Proprietary.” Further, in the case of records or information submitted in response to a Request for Proposals, an index must be provided indicating the affected pages or sections and locations of all such material identified Confidential or Proprietary. Information not included in the required index will not be reviewed for confidentiality or as proprietary before release. If Supplier fails to so mark or index Submittals and related records, then the City, upon request, may release said record(s) without the need to satisfy the requirements of subsection A above; and Respondent expressly waives its right to allege any kind of civil action or claim against the City pertaining to the release of said record(s).

1.22 Submission of materials in response to City’s Solicitation shall constitute assent by Respondent to the foregoing procedure and Respondent shall have no claim against the City on account of actions taken pursuant to such procedure. FEDERAL AID PROJECTS

The City of Tacoma in accordance with Title VI of the Civil Rights Act of 1964, 78 Stat. 252, 42 U.S.C. 2000d to 2000d-4 and Title 49, Code of Federal Regulations, Department of Transportation, subtitle A, Office of the Secretary, part 21, nondiscrimination in federally assisted programs of the Department of Transportation issued pursuant to such Act, hereby notifies all bidders that it will affirmatively insure that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises as defined at 49 CFR, part 26, will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, national origin, or sex in consideration for an award.

SECTION II - CONTRACT REQUIREMENTS

2.01 CONTRACTOR’S RESPONSIBILITY

A. Contract Documents

The Respondent to whom the Contract is awarded, hereinafter called the Contractor, shall enter into a Contract with the City of Tacoma, , within 10 days after receipt from the City of Tacoma of a properly prepared Contract. In addition, the Contractor will do all things required to promptly perform this Contract pursuant to the terms of this Contract. Certain contracts for supplies, goods or equipment may use the City Purchase Order in place of a formal contract document.

B. Surety Bonds

Except as modified by the Special Provisions, the Respondent to whom the Contract is awarded shall provide a payment and performance bond, including power of attorney, for 100 percent of the amount of his/her bid (including sales taxes), to insure complete performance of the Contract including the guarantee. The bonds must be executed by a surety company licensed to do business in the State of Washington. For a supply-type contract, a cashier’s check or cash may be substituted for the bonds; however, this cash or cashier’s check must remain with the City through the guarantee period and any interest on said amount shall accrue to the City.

C. Independent Contractor

Contractor is an independent contractor; no personnel furnished by the Contractor shall be deemed under any circumstances to be the agent or servant of the City. Contractor shall be fully responsible for all acts or omissions of Subcontractors and its and their suppliers and of persons employed by them, and shall be specifically responsible for sufficient and competent supervision and inspection to assure compliance in every respect with the Contract. There shall be no contractual relationship between any Subcontractors or supplier and the City arising out of or by virtue of this agreement. No provision of the Contract is intended or is to be construed to be for the benefit of any third party.
2.02 CONFLICTS IN SPECIFICATIONS

Anything mentioned in the Specifications and not shown on the Drawings and anything on the Drawings and not mentioned in the Specifications shall be of like effect and shall be understood to be shown and/or mentioned in both. In case of differences between Drawings and Specifications, the Specifications shall govern. In addition, in the event of any conflict between these General Provisions, the Special Provisions, the Technical Provisions and/or the Proposal pages, the following order of precedence shall control:

1. Proposal pages prevail if they conflict with the General, Special or Technical Provisions.
3. Technical Provisions prevail if they are in conflict with the General Provisions.

In case of discrepancy of figures between Drawings, Specifications or both, the matter shall immediately be submitted to the Engineer for determination. Failure to submit the discrepancy issue to the Engineer shall result in the Contractor's actions being at his/her own risk and expense. The Engineer shall furnish from time to time such detailed drawings and other information as he/she may consider necessary.

2.03 INSPECTION

A. Of the Work

All materials furnished and work done shall be subject to inspection.

The Inspector administering the Contract shall at all times have access to the work wherever it is in progress or being performed, and the Contractor shall provide proper facilities for such access and inspection. Such inspection shall not relieve the Contractor of the responsibility of performing the work correctly, utilizing the best labor and materials in strict accordance with the Specifications of this Contract. All material or work approved and later found to be defective shall be replaced without cost to the City of Tacoma.

B. Inspector's Authority

The inspector shall have power to reject materials or workmanship which do not fulfill the requirements of these Specifications, but in case of dispute the Contractor may appeal to the Director or Superintendent, whose decision shall be final. The word “Director” means the Director of the City of Tacoma General Government department that is administering the contract. The word “Superintendent” means the Superintendent of the City of Tacoma, Department of Public Utilities Division that is administering the contract.

The Contract shall be carried out under the general control of the representative of the particular City Department or Division administering the Contract, who may exercise such control over the conduct of the work as may be necessary, in his or her opinion, to safeguard the interest of the City of Tacoma. The Contractor shall comply with all orders and instructions given by the representative of the particular Department or Division administering the Contract in accordance with the terms of the Contract.

Provided, that for the purposes of construction contracts, such control shall only apply (a) to the extent necessary to ensure compliance with the provisions of this contract, and (b) to the extent necessary to fulfill any nondelegable duty of the City for the benefit of third parties not engaged in promoting the activity of this contract.

Nothing herein contained, however, shall be taken to relieve the Contractor of his/her obligations or responsibilities under the Contract.

2.04 FEDERAL, STATE AND MUNICIPAL REGULATIONS

All federal, state, municipal and/or local regulations shall be satisfied in the performance of all portions of this Contract. The Contractor shall be solely responsible for all violations of the law from any cause in connection with work performed under this Contract.
2.05 INDEMNIFICATION

A. Indemnification

Contractor acknowledges that pursuant to the terms of this agreement, Contractor is solely and totally responsible for the safety of all persons and property in the performance of this Contract. To the greatest extent allowed by law, Contractor assumes the risk of all damages, loss, cost, penalties and expense and agrees to indemnify, defend and hold harmless the City of Tacoma, from and against any and all liability which may accrue to or be sustained by the City of Tacoma on account of any claim, suit or legal action made or brought against the City of Tacoma for the death of or injury to persons (including Contractor's or subcontractor's employees) or damage to property involving Contractor, or subcontractor(s) and their employees or agents, arising out of and in connection with or incident to the performance of the Contract including if the City is found to have a nondelegable duty to see that work is performed with requisite care, except for injuries or damages caused by the sole negligence of the City. In this regard, Contractor recognizes that Contractor is waiving immunity under industrial Insurance Law, Title 51 RCW. This indemnification extends to the officials, officers and employees of the City and also includes attorney's fees and the cost of establishing the right to indemnification hereunder in favor of the City of Tacoma. In addition, within the context of competitive bidding laws, it is agreed that this indemnification has been mutually negotiated. Provided however, this provision is intended to be applicable to the parties to this agreement and it shall not be interpreted to allow a Contractor's employee to have a claim or cause of action against Contractor.

B. Limitation of Liability for Primarily Supply-Type Contracts

In all contracts where the total cost of the supply of materials and/or equipment constitute at least 70 percent of the total contract price (as determined by the City), the City agrees that it will not hold the contractor, supplier or manufacturer liable for consequential damages for that part of the contract related to the manufacture and/or design of the equipment, materials or supplies.

2.06 CONTRACTOR'S INSURANCE

A. During the course and performance of a Contract, Contractor will provide proof and maintain the insurance coverage in the amounts and in the manner specified in the City of Tacoma Insurance Requirements as is applicable to the services, products, and deliverables provided under the Contract. The City of Tacoma Insurance Requirements document, if issued, is fully incorporated into the Contract by reference.

B. Failure by City to identify a deficiency in the insurance documentation provided by Contractor or failure of City to demand verification of coverage or compliance by Contractor with these insurance requirements shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

2.07 ASSIGNMENT AND SUBLETTING OF CONTRACT

C. Assignment

The Contract shall not be assigned except with the consent of the Superintendent or his/her designee.

Requests for assignment of this contract must be in writing with the written consent of the surety, and the request must show the proposed person or organization to which the contract is assigned is capable, experienced and equipped to perform such work. The proposed substitute person or organization may be required to submit to the City information as to his/her experience, financial ability and give statements covering tools, equipment, organization, plans and methods to fulfill any portion of the Contract prior to approval of assignment.

D. Subletting

The Contract shall not be sublet except with the written consent of the Superintendent or his/her designee. In the event that a prequalified electrical contractor is necessary to perform certain portions of the work, such work may be subcontracted with a City prequalified electrical contractor for the type of work involved.

Requests for subletting of this Contract must be in writing with the written consent of the Surety, and the request must show the proposed person or organization to which the Contract is sublet is capable, experienced and equipped to perform such work. The proposed substitute person or organization may be required to submit to the City information as to his experience, financial ability and give statements covering tools, equipment, organization, plans and methods to fulfill any portion of the Contract prior to approval of subletting.
The written consent approving the subletting of the Contract shall not be construed to relieve the Contractor of his/her responsibility for the fulfillment of the Contract. The Subcontractor shall be considered to be the agent of the Contractor and the Contractor agrees to be responsible for all the materials, work and indebtedness incurred by the agent.

A subcontractor shall not sublet any portion of a subcontract for work with the City without the written consent of the City.

2.08 DELAY

E. Extension of Time

With the written approval of the Superintendent or his/her designee, the Contractor may be granted additional time for completion of the work required under this Contract, if, in the Superintendent's opinion the additional time requested arises from unavoidable delay.

F. Unavoidable Delay

Unavoidable delays in the prosecution of the work shall include only delays from causes beyond the control of the Contractor and which he/she could not have avoided by the exercise of due care, prudence, foresight and diligence. Delay caused by persons other than the Contractor, Subcontractors or their employees will be considered unavoidable delays insofar as they necessarily interfere with the Contractor's completion of the work, and such delays are not part of this Contract.

Unavoidable delay will not include delays caused by weather conditions, surveys, measurements, inspections and submitting plans to the Engineer of the particular Division involved in administering this Contract.

2.09 GUARANTEE

A. Guarantee for Construction, Labor or Services Contract

Neither the final certificate of payment or any provision in the Contract Documents, nor partial or entire occupancy of the premises by the City, shall constitute an acceptance of work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall remedy any defects in the work and pay for any damage to other work resulting therefrom, which shall appear within a period of one year from the date of final acceptance of the work unless a longer period is specified. The City will give notice of observed defects with reasonable promptness.

If it has been discovered, before payment is required under the terms of the Contract, that there is a failure to comply with any of the terms and provisions of this Contract, the City has the right and may withhold payment.

In case of a failure of any part of the work, materials, labor and equipment furnished by the Contract or to fully meet all of the requirements of the Contract, the Contractor shall make such changes as may be necessary to fully meet all of the specifications and requirements of this Contract. Such changes shall be made at the Contractor's sole cost and expense without delay and with the least practicable inconvenience to the City of Tacoma. Rejected material and equipment shall be removed from the City's property by and at the expense of the Contractor.

B. Guarantee for Supply Contracts

Unless a longer period is specified, the supplier and/or manufacturer of the supplies, materials and/or equipment furnished pursuant to this Contract agrees to correct any defect or failure of the supplies, materials and/or equipment which occurs within one year from the date of: (1) test energization if electrical or mechanical equipment; (2) commencement of use if supplies or materials, provided, however, said guarantee period shall not extend beyond eighteen months after date of receipt by the City. All of the costs (including shipping, dismantling and reinstallation) of repairs and/or corrections of defective or failed equipment, supplies and/or material is the responsibility of the supplier and/or manufacturer.

When the supplier is not the manufacturer of the item of equipment, supplier agrees to be responsible for this guarantee and supplier is not relieved by a manufacturer's guarantee.
C. Guarantee Period Extension

The Contract guarantee period shall be suspended from the time a significant defect is first documented by the City until the work or equipment is repaired or replaced by Contractor and accepted by the City. In addition, in the event less than ninety (90) days remain on the guarantee period (after recalculating), the guarantee period shall be extended to allow for at least ninety (90) days from the date the work or equipment is repaired or replaced and accepted by the City.

2.10 DEDUCTIONS FOR UNCORRECTED WORK

If the City of Tacoma deems it expedient to correct work not done in accordance with the terms of this Contract, an equitable deduction from the Contract price shall be made.

2.11 CITY OF TACOMA'S RIGHT TO TERMINATE CONTRACT

A. Termination for Convenience

1. Supplies. The City may terminate a Contract for supplies at any time upon prior written notice to Contractor. Upon the effective date of termination specified in such notice, and payment by the City, all conforming supplies, materials, or equipment previously furnished hereunder shall become its property.

2. Services. The City may terminate a Contract for services at any time, with or without cause, by giving 10-business day's written notice to Supplier. In the event of termination, all finished and unfinished work prepared by Supplier pursuant to the Contract shall be provided to the City. In the event City terminates the Contract due to the City's own reasons and without cause due to Supplier's actions or omissions, the City shall pay Supplier the amount due for actual work and services necessarily performed under the Contract up to the effective date of termination, not to exceed the total compensation set forth in the Contract.

B. Termination for Cause

1. The City may terminate a Contract for either services or supplies in the event of any material breach of any of the terms and conditions of the Contract if the Contractor's breach continues in effect after written notice of breach and 30 days to cure such breach and fails to cure such breach.

2. Bankruptcy. If the Contractor should be adjudged as bankrupt, or makes a general assignment for the benefit of creditors, or a receiver should be appointed on account of his/her insolvency, or if he/she or any of his/her subcontractors should violate any of the provisions of the Contract, or if the work is not being properly and diligently performed, the City of Tacoma may serve written notice upon the Contractor and Surety, executing the Payment and Performance Bond, of its intention to terminate the Contract; such notice will contain the reasons for termination of the Contract, and unless within 10 days after the serving of such notice, such violation shall cease and an arrangement satisfactory to the City of Tacoma for correction thereof shall be made, the Contract shall, upon the expiration of said I 0 days, cease and terminate and all rights of the Contractor hereunder shall be forfeited. In the event the Contract is terminated for cause, Contractor shall not be entitled to any lost profits resulting therefrom.

3. Notice. In the event of any such termination for cause, the City of Tacoma shall immediately send (by regular mail or other method) written notice thereof to the Surety and the Contractor. Upon such termination the Surety shall have the right to take over and perform the Contract, provided however, the Surety must provide written notice to the City of its intent to complete the work within 15 calendar days of its receipt of the original written notice (from the City) of the intent to terminate. Upon termination and if the Surety does not perform the work, the City of Tacoma may take over the work and prosecute the same to completion by any method it may deem advisable, for the account of and at the expense of the Contractor, and the Contractor and the Surety shall be liable to the City of Tacoma for all cost occasioned to the City of Tacoma thereby. The City of Tacoma may without liability for doing so, take possession of and utilize in completing the work, such materials, equipment, plant and other property belonging to the Contractor as may be on the site of the work and necessary therefore.
2.12 LIENS

In the event that there are any liens on file against the City of Tacoma, the City of Tacoma shall be entitled to withhold final or progress payments to the extent deemed necessary by the City of Tacoma to properly protect the outstanding lien claimants until proper releases have been filed with the City Clerk.

2.13 LEGAL DISPUTES

A. General

Washington law shall govern the interpretation of the Contract. The state or federal courts located in Pierce County Washington shall be the sole venue of any mediation, arbitration, or litigation arising out of the Contract.

Respondents providing submittals from outside the legal jurisdiction of the United States of America will be subject to Tacoma’s City Attorney's Office (CAO) opinion as to the viability of possible litigation pursuant to a contract resulting from this Specification. If it is the opinion of the CAO that any possible litigation would be beyond reasonable cost and/or enforcement, the submittal may be excluded from evaluation.

B. Attorney Fees

For contracts up to $250,000, which become the subject of litigation or arbitration, the substantially prevailing party may be entitled to reasonable attorney fees, as provided in RCW 39.04.240. Provided, however, the attorney fee hourly rate for the City of Tacoma's assistant city attorneys is agreed to be $150 per hour or the same as the hourly rate for Contractor's legal counsel, whichever is greater.

2.14 DELIVERY

Prices must be quoted F.O.B. destination, freight prepaid and allowed with risk of loss during transit remaining with Contractor/Supplier (unless otherwise stated in these Specifications) to the designated address set forth in these Specifications.

Deliveries shall be between 9:00 a.m. and 3:30 p.m.; Monday through Friday only (except legal holidays of the City of Tacoma).

Legal holidays of the City of Tacoma are:

<table>
<thead>
<tr>
<th>Holiday</th>
<th>Date</th>
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<tbody>
<tr>
<td>New Year's Day</td>
<td>January 1</td>
</tr>
<tr>
<td>Martin Luther King's Birthday</td>
<td>3rd Monday in January</td>
</tr>
<tr>
<td>Washington's Birthday</td>
<td>3rd Monday in February</td>
</tr>
<tr>
<td>Memorial Day</td>
<td>Last Monday in May</td>
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<tr>
<td>Independence Day</td>
<td>July 4</td>
</tr>
<tr>
<td>Labor Day</td>
<td>1st Monday in September</td>
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<tr>
<td>Veteran's Day</td>
<td>November 11</td>
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<tr>
<td>Thanksgiving Day</td>
<td>4th Thursday of November</td>
</tr>
<tr>
<td>Day after Thanksgiving</td>
<td>4th Friday of November</td>
</tr>
<tr>
<td>Christmas Day</td>
<td>December 25</td>
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</tbody>
</table>

When any of these holidays occur on Saturday or Sunday, the preceding Friday or the following Monday, respectively, is a legal holiday for the City of Tacoma.

2.15 PACKING SLIPS AND INVOICES

A. Packing slips and shipping notices shall be sent to the specific City Division or Department receiving the item(s) at the address stated in City's Solicitation or as otherwise stated in the Contract and include complete description of items, contents of items if crated or cased, quantity, shipping point, carrier, bill of lading number and City of Tacoma purchase order.

B. Each invoice shall show City of Tacoma purchase order number, release number if applicable, quantity, unit of measure, item description, unit price and extended price for each line if applicable, services and deliverables provided if applicable. Line totals shall be summed to give a grand total to which sales tax shall be added, if applicable.

1. For transactions conducted in SAP Ariba, invoices shall be submitted through Ariba.
2. For invoices paid by ACH or by check, unless stated otherwise, invoices shall be electronically submitted by email with corresponding PO number listed in the subject line to accounts payable@cityoftacoma.org.
3. For invoices paid by credit card, invoices shall also display the last name of the cardholder and last four digits (only) of the card number (e.g., Jones/6311). Unless stated otherwise, invoices shall be electronically submitted by email with corresponding PO number listed in the subject line to (do not combine different POs into one invoice or charge) to pcardadmin@cityoftacoma.org.

2.16 APPROVED EQUALS

A. Unless an item is indicated as "No substitute", special brands, when named, are intended to describe the standard of quality, performance or use desired. Equal items will be considered by the City, provided that the respondent specifies the brand and model, and provides all descriptive literature, independent test results, product samples, local servicing and parts availability to enable the City to evaluate the proposed "equal".

B. The decision of the City as to what items are equal shall be final and conclusive. If the City elects to purchase a brand represented by the respondent to be an "equal", the City's acceptance of the item is conditioned on the City's inspection and testing after receipt. If, in the sole judgment of the City, the item is determined not to be an equal, the item shall be returned at the respondent's expense.

C. When a brand name or level of quality is not stated by the respondent, it is understood the offer is exactly as specified. If more than one brand name is specified, respondents must clearly indicate the brand and model/part number being bid.

2.17 ENTIRE AGREEMENTS

This written contract represents the entire Agreement between the parties and supersedes any prior oral statements, discussions or understandings between the parties.

2.18 CODE OF ETHICS

The City's Code of Ethics, Chapter 1.46, Tacoma Municipal Code, provides ethical standards for City personnel and prohibits certain unethical conduct by others including respondents and contractors. Violation of the City's Code of Ethics will be grounds for termination of this contract.

2.19 FEDERAL FINANCIAL ASSISTANCE

If federal funds, including FEMA financial assistance to the City of Tacoma, will be used to fund, pay or reimburse all or a portion of the Contract, Contractor will comply with all applicable Federal law, regulations, executive orders, FEMA policies, procedures, and directives and the following clauses will be incorporated into the Contract:

A. EQUAL EMPLOYMENT OPPORTUNITY During the performance of this Contract, Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following:

1. Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

2. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

3. The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee’s essential job functions discloses the compensation of such other
employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

4. The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

5. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

6. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

7. In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

8. The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance:

Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

B. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (B)(1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (B)(1) of this section, in the sum of $27 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.
3. Withholding for unpaid wages and liquidated damages. The City shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (B)(2) of this section.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (B)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (B)(1) through (4) of this section.

C. CLEAN AIR ACT

1. Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 et seq.

2. Contractor agrees to report each violation to the City and understands and agrees that the City will, in turn, report each violation as required to assure notification to the Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.

3. Contractor agrees to include these requirements in each subcontract exceeding $150,000 financed in whole or in part with Federal assistance provided by FEMA.

D. FEDERAL WATER POLLUTION CONTROL ACT

1. Contractor agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq.

2. Contractor agrees to report each violation to the City, understands, and agrees that the City will, in turn, report each violation as required to assure notification to the Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.

3. Contractor agrees to include these requirements in each subcontract exceeding $150,000 financed in whole or in part with Federal assistance provided by FEMA.

E. DEBARMENT AND SUSPENSION

1. This contract is a covered transaction for purposes of 2 C.F.R. pt. 180 and 2 C.F.R. pt. 3000. As such, the contractor is required to verify that none of the contractor’s principals (defined at 2 C.F.R. § 180.995) or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. § 180.940) or disqualified (defined at 2 C.F.R. § 180.935).

2. Contractor must comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into.

3. This certification is a material representation of fact relied upon by the City. If it is later determined that the contractor did not comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, in addition to remedies available to (insert name of recipient/subrecipient/applicant), the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.

4. Contractor agrees to comply with the requirements of 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.
F. BYRD ANTI-LOBBYING AMENDMENT

1. Contractors who apply or bid for an award of $100,000 or more shall file the required certification with City. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, officer or employee of Congress, or an employee of a Member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient who in turn will forward the certification(s) to the City.

2. If applicable, Contractor must sign and submit to the City the following certification:

APPENDIX A, 44 C.F.R. PART 18 – CERTIFICATION REGARDING LOBBYING

Certification for Contracts, Grants, Loans, and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, “Disclosure Form to Report Lobbying,” in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

The Contractor, ____________, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. Chap.38, Administrative Remedies for False Claims and Statements, apply to this certification and disclosure, if any.

________________________________________
Signature of Contractor’s Authorized Official

________________________________________
Name and Title of Contractor’s Authorized Official

___________ Date
G. PROCUREMENT OF RECOVERED MATERIALS

1. In the performance of this contract, the Contractor shall make maximum use of products containing recovered materials that are EPA-designated items unless the product cannot be acquired:
   a. Competitively within a timeframe providing for compliance with the contract performance schedule;
   b. Meeting contract performance requirements; or
   c. At a reasonable price.

2. Information about this requirement, along with the list of EPA-designated items, is available at EPA's Comprehensive Procurement Guidelines website, https://www.epa.gov/sum/comprehensive-procurement-guideline-cpg-program.

3. Contractor also agrees to comply with all other applicable requirements of Section 6002 of the Solid Waste Disposal Act.

[Section III is for contracts that involve construction and/or labor, and are not applicable to contracts solely for material/supply purchases.]

GENERAL PROVISIONS

SECTION III - CONSTRUCTION AND/OR LABOR CONTRACTS

SECTION III REQUIREMENTS APPLY ONLY TO CONSTRUCTION AND/OR LABOR CONTRACTS AND ARE IN ADDITION TO APPLICABLE REQUIREMENTS CONTAINED IN SECTION II CONTRACT REQUIREMENTS.

3.01 RESPONDENT'S DUTY TO EXAMINE

The Respondent agrees to be responsible for examining the site(s) and to have compared them with the Specifications and Contract Drawings, and to be satisfied as to the facilities and difficulties attending the execution of the proposed Contract (such as uncertainty of weather, floods, nature and condition of materials to be handled and all other conditions, obstacles and contingencies) before the delivery of his/her Proposal. No allowance will be subsequently made by the City on behalf of the Respondent by reason of any error or neglect on Respondent's part, for such uncertainties as aforesaid.

3.02 PERMITS

Except when modified by the Special Provisions, the Contractor shall procure and pay for all permits and licenses necessary for the completion of this Contract including those permits required by the City of Tacoma. The City will obtain county or state road crossing permits if required. In the event a necessary permit is not obtained, the Contractor will not be permitted to work on items subject to said permit and any delays caused thereby will not be subject to extra compensation or extensions.

3.03 NOTIFICATION OF OTHER GOVERNMENTAL AGENCIES AND UTILITIES WHEN UNDERGROUND WORK IS INVOLVED

The Contractor shall notify all other affected governmental agencies and utilities whenever underground work is done under the terms of this Contract. The Contractor is required to obtain permission of the appropriate public and private utilities and governmental agencies before performing underground work pursuant to the terms of this Contract. The Contractor is required to call "one call" at 1-800-424-5555 for all work involving excavation or digging more than 12 inches beneath ground or road surface.

The City may have indicated on the plans and specifications the existence of certain underground facilities that are known to the City department responsible for this Contract. It is the Contractor's responsibility to fully comply with the Underground Utility Locate Law, Chapter 19.122 RCW. If the site conditions are "changed or differing" as defined by RCW 19.122.040(1), the Contractor may pursue the party responsible for not properly marking or identifying the underground facility. The Contractor agrees not to file any claim or legal action against the City (department responsible for this Contract) for said "changed or differing" conditions unless said City department is solely responsible for the delay or damages that the Contractor may have incurred.
3.04 TRENCH EXCAVATION BID ITEM

In the event that "trench excavation" in excess of four feet requires a safety system pursuant to Washington State law and safety shoring, sloping, sheeting, or bracing is used, a separate bid item should be set forth in the Proposal for this work. If a separate bid item is not set forth in the Proposal pages, said installed safety system shall be paid at $3.00 per lineal foot of trench, which unit price includes both sides of the trench.

3.05 SAFETY

A. General

The Contractor shall, at all times, exercise adequate precautions for the safety of all persons, including its employees and the employees of a Subcontractor, in the performance of this Contract and shall comply with all applicable provisions of federal, state, county and municipal safety laws and regulations. It is the Contractor's responsibility to furnish safety equipment or to contractually require Subcontractors to furnish adequate safety equipment relevant to their responsibilities.

The Contractor shall obtain the necessary line clearance from the inspector before performing any work in, above, below or across energized Light Division circuits.

The Inspector and/or Engineer may advise the Contractor and the Safety Officer of any safety violations. It is the Contractor's responsibility to make the necessary corrections. Failure to correct safety violations is a breach of this Contract and, as such, shall be grounds for an order from the Safety Officer, Inspector or Engineer to cease further work and remove from the job site until the condition is corrected. Time and wages lost due to such safety shutdowns shall not relieve the Contractor of any provisions of Section 3.14 of this Specification and shall be at the sole cost of the Contractor. The purpose of this authority to stop work is to enforce the contract and not to assume control except to the extent necessary to ensure compliance with the provisions of this contract.

Any of the above actions by employees of the City of Tacoma shall in no way relieve the Contractor of his/her responsibility to provide for the safety of all persons, including his/her employees.

B. Work Hazard Analysis Report

The Contractor will be required to complete a work hazard analysis report. This report shall outline how the Contractor proposes to satisfy all safety laws and regulations involved in performing the work. This report shall be completed and submitted to the City Safety Officer before the pre-construction conference. A copy of the report shall be maintained at the work site (accessible to the supervisor).

3.06 PROTECTION OF WORKERS AND PROPERTY

The Contractor shall erect and maintain good and sufficient guards, barricades and signals at all unsafe places at or near the work and shall, in all cases, maintain safe passageways at all road crossings, and crosswalks, and shall do all other things necessary to prevent accident or loss of any kind.

The Contractor shall protect from damage all utilities, improvements, and all other property that is likely to become displaced or damaged by the execution of the work under this Contract.

The Contractor is responsible for all roads and property damaged by his/her operations as shall be determined by the Engineer administering this Contract. The Contractor shall be responsible for repairing all damage to roads caused by his/her operations to the satisfaction of the particular governmental body having jurisdiction over the road.

3.07 CONTRACTOR - SUPERVISION AND CHARACTER OF EMPLOYEES

A. Superintendent to Supervise Contractor's Employees

The Contractor shall keep on his/her work, during its progress, a competent superintendent and any necessary assistants, all of whom must be satisfactory to the City of Tacoma. The Contractor's superintendent shall not be changed except with the consent of the City of Tacoma, unless the Contractor's superintendent proves to be unsatisfactory to the Contractor and ceases to be in his/her employ. The Contractor's superintendent shall represent the Contractor in his/her absence and all directions given to him/her shall be binding as if given to the Contractor directly. The Contractor shall give efficient supervision to the work, using his/her best skill and attention.
B. Character of Contractor's Employees
The Contractor shall employ only competent, skillful, faithful and orderly persons to do the work, and whenever the Engineer administering the Contract shall notify the Contractor in writing that any person on the work is, in his or her opinion, incompetent, unfaithful, disorderly or otherwise unsatisfactory, the Contractor shall forthwith discharge such persons from the work and shall not again employ him or her on this Contract.

3.08 CONTRACTOR'S COMPLIANCE WITH THE LAW

A. Hours of Labor
The Contractor and Subcontractors shall be bound by the provisions of RCW Chapter 49.28 (as amended) relating to hours of labor. Except as set forth in the Special Provisions, eight (8) hours in any calendar day shall constitute a day's work on a job performed under this Contract.

In the event that the work is not performed in accordance with this provision and in accordance with the laws of the State of Washington, then this Contract may be terminated by the City of Tacoma for the reason that the same is not performed in accordance with the public policy of the State of Washington as defined in said statutes.

B. Prevailing Wages

If federal, state, local, or any applicable law requires Supplier to pay prevailing wages in connection with a Contract, and Supplier is so notified by the City, then Supplier shall pay applicable prevailing wages.

If applicable, a Schedule of Prevailing Wage Rates and/or the current prevailing wage determination made by the Secretary of Labor for the locality or localities where the Contract will be performed is attached and made of part of the Contract by this reference. If prevailing wages do apply to the Contract, Supplier and its subcontractors shall:

1. Be bound by and perform all transactions regarding the Contract relating to prevailing wages and the usual fringe benefits in compliance with the provisions of Chapter 39.12 RCW, as amended, the Washington State Prevailing Wage Act and/or the Davis-Bacon Act (40 U.S.C. 3141- 3144, and 3146-3148) and the requirements of 29 C.F.R. pt. 5 as may be applicable, including the federal requirement to pay wages not less than once a week,

2. Ensure that no worker, laborer or mechanic employed in the performance of any part of the Contract shall be paid less than the prevailing rate of wage specified on that Schedule and/or specified in a wage determination made by the Secretary of Labor (unless specifically preempted by federal law, the higher of the Washington state prevailing wage or federal Davis-Bacon rate of wage must be paid) and Additionally, in compliance with applicable federal law, contractors are required to pay wages not less than once a week.

3. Immediately upon award of the Contract, contact the Department of Labor and Industries, Prevailing Wages section, Olympia, Washington and/or the federal Department of Labor, to obtain full information, forms and procedures relating to these matters. Per such procedures, a Statement of Intent to Pay Prevailing Wages and/or other or additional documentation required by applicable federal law, must be submitted by Contractor and its subcontractors to the City, in the manner requested by the City, prior to any payment by the City hereunder, and an Affidavit of Wages Paid and/or other or additional documentation required by federal law must be received or verified by the City prior to final Contract payment. In the event any dispute arises as to what are the prevailing rates of wages for work of a similar nature and such dispute cannot be adjusted by the parties in interest, including labor and management representatives, the matter shall be referred for arbitration to the Director of the State of Washington, Department of Labor and industries whose decision shall be final, conclusive and binding on all parties involved in the dispute.
3.09 COPELAND ANTI-KICKBACK ACT

For contracts subject to Davis Bacon Act the following clauses will be incorporated into the Contract:

A. Contractor. The contractor shall comply with 18 U.S.C. § 874, 40 U.S.C. § 3145, and the requirements of 29 C.F.R. pt. 3 as may be applicable, which are incorporated by reference into this contract.

B. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clause above and such other clauses as FEMA may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all of these contract clauses.

C. Breach. A breach of the contract clauses above may be grounds for termination of the contract, and for debarment as a contractor and subcontractor as provided in 29 C.F.R. § 5.12.

3.10 CHANGES

A. In Plans or Quantities

The City of Tacoma, without invalidating this Contract, or any part of this Contract, may order extra work or make reasonable changes by altering, adding to or deducting from the materials, work and labor and the Contract sum will be adjusted accordingly. All such work and labor shall be executed under the conditions of the original Contract except that any claim for extension of time caused thereby shall be adjusted at the time of ordering such change. When work or bid items are deducted, reduced or eliminated, it is agreed that no payment will be made to Contractor for anticipated profit.

B. Extra Work

Any claim or order for extra materials, work and labor made necessary by alterations or additions to the plans or by other reasons for which no price is provided in this Contract, shall not be valid unless the Contractor and Engineer administering the Contract have agreed upon a price prior to commencing extra work, and the agreement has been signed by the Contractor and approved by the Superintendent or his/her designee, and approved by the payment and performance bond surety.

C. Extra Work - No Agreed Price

If it is impracticable to fix an increase in price definitely in advance, the order may fix a maximum price which shall not under any circumstances, be exceeded, and subject to such limitation, such alteration, modification, or extra shall be paid for at the actual necessary cost as determined by the City of Tacoma, which cost (including an allowance for profit) shall be determined as the sum of the following items (1) to (7) inclusive:

1. Labor, computed at regular wage scale, including premium on compensation insurance and charge for social security taxes, and other taxes, pertaining to labor; no charge for premium pay shall be allowed unless authorized by the Engineer administering the Contract;
2. The proportionate cost of premiums on comprehensive general liability and other insurance applicable to the extra work involved and required under this Contract;
3. Material, including sales taxes pertaining to materials;
4. Plant and equipment rental, to be agreed upon in writing before the work is begun; no charge for the cost of repairs to plant or equipment will be allowed;
5. Superintendence, general expense and profit computed at 20 percent of the total of paragraphs (1) to (4) inclusive;
6. The proportionate cost of premiums on bonds required by this Contract, computed by 1 1/2 percent of the total of paragraphs (1) to (5) inclusive.
7. The City of Tacoma reserves the right to furnish such materials as it may deem expedient, and no allowance will be made for profit thereon.

Whenever any extra work is in progress, for which the definite price has not been agreed on in advance, the Contractor shall each day, report to the Engineer the amount and cost of the labor and material used, and any other expense incurred in such extra work on the preceding day, and no claim for compensation for such extra work will be allowed unless such report shall have been made.
The above-described methods of determining the payment for work and materials shall not apply to the performance of any work or the furnishing of any material, which, in the judgment of the Engineer administering the Contract, may properly be classified under items for which prices are established in the Contract.

D. Claims for Extra Work

If the Contractor claims that any instructions by drawings or otherwise, involve extra cost under this Contract, he/she shall give the City of Tacoma written notice thereof within 30 days after receipt of such instruction, and in any event before proceeding to execute the work, except in an emergency endangering life or property, and the procedures governing the same shall be as provided for immediately above in this paragraph. The method in these paragraphs is the only method available to the Contractor for payment of claims for extra work performed under the terms of this Contract.

3.11 CLEANING UP

The Contractor shall at all times, at his/her own expense, keep the premises free from accumulation of waste materials or debris caused by any workers or the work, at the completion of the work the Contractor shall remove all his waste materials from and about the site and all his/her equipment, sanitary facilities and surplus materials. In the case of dispute, the City of Tacoma may remove the debris and charge the cost to the Contractor as the City of Tacoma shall determine to be just. All material that is deposited or placed elsewhere than in places designated or approved by the Engineer administering the Contract will not be paid for and the Contractor may be required to remove such material and deposit or place it where directed.

3.12 PROGRESS PAYMENT

Progress payments will be made up to the amount of ninety-five percent (95%) of the actual work completed as shall be determined by the Engineer administering the Contract.

The Contractor may request that an escrow account be established as permitted by law, in which event the Contractor will earn interest on the retained funds.

When the time for construction, services and/or installation will exceed thirty (30) days, the Contractor may request, by invoice, to be paid a progress payment based on percentage of work completed. The Engineer will review and approve the progress payment request on a monthly basis.

3.13 FINAL PAYMENT

The final payment of five percent (5%) of the Contract price shall be approved on final acceptance of the work under this Contract by the Superintendent or his/her designee. In addition, before final payment is made, the Contractor shall be required to:

A. Provide a certificate from the Washington State Department of Revenue that all taxes due from the Contractor have been paid or are collectible in accordance with the provisions of Chapter 60.28 and Title 82 of the Revised Code of Washington;

B. Provide the General Release to the City of Tacoma on the form set forth in these Contract documents;

C. Provide a release of any outstanding liens that have been otherwise filed against any monies held or retained by the City of Tacoma;

D. File with the City Director of Finance, and with the Director of the Washington State Department of Labor and Industries, on the state form to be provided, an affidavit of wages paid;

E. File with the City Director of Finance, on the state form to be provided, a statement from the State of Washington, Department of Labor and Industries, certifying that the prevailing wage requirements have been satisfied.

F. File with the City Director of Finance, on the state form to be provided, a statement of release from the Public Works Contracts Division of the State of Washington, Department of Labor and Industries, verifying that all industrial insurance and medical aid premiums have been paid.

If there is a fee assessed to the City for any certificate, release or other form required by law, the contractor agrees that the fee amount may be passed on to the Contractor and deducted from the monies paid to the Contractor.
3.14 FAILURE TO COMPLETE THE WORK ON TIME

Should the completion of the work required under the Contract be delayed beyond the expiration of the period herein set for the completion of said work, or such extension of said period as may be allowed by reason of unavoidable delays, there shall be deducted from the total Contract price of work, for each calendar day by which such completion shall be delayed beyond said period of such extension thereof the sum of $300 or a sum of money as set forth hereinafter in these Specifications, as the amount of such deduction per calendar day.

Said sum shall be considered not as a penalty, but as liquidated damages, which the City will suffer by reason of the failure of the Contractor to perform and complete the work within the period, herein fixed or such extensions of said period as may be allowed by reason of unavoidable delays.

Any money due or to become due the Contractor may be retained by the City to cover said liquidated damages, and should such money not be sufficient to cover such damages, the City shall have the right to recover the balance from the Contractor or his/her Sureties.

The filing of any bid for the work herein contemplated shall constitute acknowledgment by the Respondent that he/she understands, agrees and has ascertained that the City will actually suffer damages to the amount hereinabove fixed for each and every calendar day during which the completion of the work herein required shall be delayed beyond the expiration of the period herein fixed for such completion or such extension of said period as may be allowed by reason of unavoidable delays.

3.15 CITY RESERVES RIGHT TO USE FACILITIES PRIOR TO ACCEPTANCE

The City of Tacoma hereby reserves the right to use the facilities herein contracted prior to final acceptance under this Contract. The use of said facilities, as mentioned herein, shall not be construed as a waiver or relinquishment of any rights that the City of Tacoma has under this Contract.

3.16 LIST OF SUBCONTRACTORS

Bid proposals for construction, alteration or repair of any building or other public works that may exceed $1,000,000 including tax shall satisfy the following requirement: Respondent shall submit as part of the bid, the names of the subcontractors, with whom the respondent, if awarded the contract, will subcontract performance of the work of heating, ventilation and air conditioning, plumbing as described in chapter 18.106 RCW, and electrical as described in chapter 19.28 RCW, or to name itself for the work. The respondent shall not list more than one subcontractor for each category of work identified, unless subcontractors vary with bid alternates, in which case the respondent must indicate which subcontractor will be used for which alternate. Failure to comply with this provision or the naming of two or more subcontractors to perform the same work shall require the City (pursuant to state law RCW 39.30.060) to determine that respondent’s bid is nonresponsive; therefore, the bid will be rejected.
PART 4

CITY OF TACOMA

LOCAL EMPLOYMENT AND APPRENTICESHIP TRAINING PROGRAM (LEAP) REGULATIONS FOR PUBLIC WORKS CONTRACTS
LOCAL EMPLOYMENT AND APPRENTICESHIP TRAINING PROGRAM (LEAP)
INSTRUCTIONS AND GOAL FORM

LEAP REQUIREMENTS & PROCEDURES:

The LEAP office enforces post-award mandatory requirements. Bidders do not have to submit any information in the bid submittal package to be in compliance with LEAP.

Post-award Submittals:

- **Prime Contractor LEAP Utilization Plan** - This form is to be completed and presented at the Pre-Construction Meeting.
- **LEAP Apprentice Verification Form** - This form is to be completed for every qualifying Apprentice employee.

The forms above, LEAP Program Requirements, and all related LEAP documents can be accessed on the City of Tacoma LEAP website by navigating to LEAP Forms at the following link: [http://cityoftacoma.org/leap](http://cityoftacoma.org/leap).

The City of Tacoma’s LEAP office enforces two mandatory goals on City projects above certain monetary thresholds.

The Local Employment Utilization Goal requires the Prime Contractor performing a qualifying public works project to ensure that 15 percent of the total labor hours worked on the project are performed by residents of the City of Tacoma or Economically Distressed Areas of the Tacoma Public Utilities Service Area.

The Apprentice Utilization Goal requires the Prime Contractor performing a qualifying public works project to ensure that 15 percent of the total labor hours worked on the project are performed by Apprentices who are residents of the City of Tacoma or Tacoma Public Utilities Service Area. The accompanying LEAP Regulations, forms, and maps are included in these specifications.

*Exceptions: If the project is located outside of the retail service area of the Tacoma Public Utilities Service Area, then Apprentices may come from the county in which the work is performed.*

This project is below $1 million and is thusly subject to the:

1. **15% Local Employment Utilization Goal**

LEAP staff can assist contractors in the recruitment, screening and selection of qualified City of Tacoma residents, Economically Distressed Area residents, and Apprentices. Contractors may obtain further information by contacting the City’s LEAP Office at (253) 591-5826. The LEAP Office is located in the Tacoma Municipal Building, 747 Market Street, Room 808, Tacoma, WA 98402.

11/2020
Chapter 1.90
LOCAL EMPLOYMENT AND APPRENTICESHIP TRAINING PROGRAM

Sections:
1.90.010 Purpose.
1.90.020 Scope.
1.90.030 Definitions.
1.90.040 LEAP goals.
1.90.050 Repealed.
1.90.060 Effect of program on prime contractor/subcontractor relationship.
1.90.070 Apprentice utilization requirements – Bidding and contractual documents.
1.90.080 Enforcement.
1.90.090 Compliance with applicable law.
1.90.100 Review and reporting.
1.90.105 Authority
1.90.110 Interpretation.

1.90.010 Purpose.
The purpose of this Chapter is to establish a means of providing for the development of a trained and capable workforce possessing the skills necessary to fully participate in the construction trades.
(Ord. 26301 § 1; passed Oct. 6, 1998)

1.90.020 Scope.
The provisions of this Chapter shall apply to all Public Works or Improvements funded in whole or in part with City funds or funds which the City expends or administers in accordance with the terms of a grant.
(Ord. 26301 § 1; passed Oct. 6, 1998)

1.90.030 Definitions.
As used in this chapter, the following terms shall have the following meanings:

A. “Apprentice” shall mean a person enrolled in a course of training specific to a particular construction trade or craft, which training shall be approved by the Washington State Apprenticeship and Training Council established pursuant to RCW 49.04.010.

B. “Building Projects” shall mean all Public Works or Improvements having an Estimated Cost greater than $750,000.00, and for which a building permit must be issued pursuant to Chapter 1 of the current edition of the state building code (Uniform Building Code).

C. “City” shall mean all divisions and departments of the City of Tacoma, and all affiliated agencies, provided, however, that the Tacoma Community Redevelopment Authority shall not be included within this definition.

D. “Civil Projects” shall mean all Public Works or Improvements that are not defined as a “Building Project,” provided that those projects having an Estimated Cost of less than $250,000.00 shall not be included in this definition.

E. “Contractor or Service Provider” means a person, corporation, partnership, or joint venture entering into a contract with the City to construct a Public Work or Improvement.

F. “Director” shall mean the Director of Community and Economic Development, or the Director’s Designee.

G. “Economically Distressed ZIP Codes” shall mean ZIP codes in the Tacoma Public Utilities Service Area that meet two out of three (2/3) of the thresholds of:
   1. High concentrations of residents living under 200% of the federal poverty line in terms of persons per acre (69th percentile)
   2. High concentrations of unemployed people in terms of persons per acre (45th percentile)
3. High concentrations of people 25 years or older without a college degree in terms of persons per acre (75th percentile)

Said thresholds shall be updated within 30 days following any Prevailing Wage updates issued by the Washington State Labor and Industry. All updates are to be published on the first business day in August and in February of each calendar year.

H. “Electrical Utility” and “Water Utility” shall mean, respectively, the Light Division of the Department of Public Utilities of the City of Tacoma, and shall include the electrical and telecommunications services of that Division, and the Water Division of the Department of Public Utilities of the City of Tacoma.

I. “Estimated Cost” shall mean the anticipated cost of a Public Work or Improvement, as determined by the City, based upon the expected costs of materials, supplies, equipment, and labor, but excluding taxes and contingency funds.

J. “Estimated Labor Hours” shall mean the anticipated number of Labor Hours determined by the City to be necessary to construct a Public Work or Improvement and set forth in the specifications for the project, or as may be subsequently revised due to contract or project adjustment, or pursuant to an agreed upon change order.

K. “Existing Employee” shall mean an employee whom the Contractor or Service Provider can demonstrate was actively employed by the Contractor or Service Provider for at least 1000 hours in the calendar year prior to bid opening plus one month following bid opening, and who was performing work in the construction trades.

L. “Labor Hours” shall mean the actual number of hours worked by workers receiving an hourly wage who are employed on the site of a Public Work or Improvement, and who are subject to state or federal prevailing wage requirements. The term “Labor Hours” shall include hours performed by workers employed by the Contractor or Service Provider and all Subcontractors, and shall include additional hours worked as a result of a contract or project adjustment or pursuant to an agreed upon change order. The term “Labor Hours” shall not include hours worked by workers who are not subject to the prevailing wage requirements set forth in either RCW 39.12 or the Davis-Bacon Act - 40 U.S.C. 276 (a).

M. “LEAP Coordinator” shall mean the City of Tacoma staff member who administers LEAP.

N. “LEAP Program” or “Program” shall mean the City of Tacoma’s Local Employment and Apprenticeship Training Program, as described in this chapter.

O. “LEAP Regulations” or “Regulations” shall mean the rules and practices established in this document.

P. “LEAP Utilization Plan” shall mean the document submitted by the Contractor to the LEAP Coordinator which outlines how the associated goals will be met on the project.

Q. “Priority Hire Resident” shall mean any resident within the Economically Distressed ZIP Codes.

R. “Project Engineer” shall mean the City employee who directly supervises the engineering or administration of a particular construction project subject to this chapter.

S. “Public Work or Improvement” shall have the same meaning as provided in Section 39.04.010 RCW, as that Section may now exist or hereafter be amended.

T. “Resident of Tacoma” shall mean any person, not defined as a Resident of the Economically Distressed ZIP Codes within the Tacoma Public Utilities Service Area, who continues to occupy a dwelling within the boundaries of the City of Tacoma, has a present intent to continue residency within the boundaries of the City, and who demonstrates the genuineness of that intent by producing evidence that the person’s presence is more than merely transitory in nature.

U. “Service Area - Electrical” or “Electrical Service Area” shall mean that area served with retail sales by the Electrical Utility of the City of Tacoma at the time a bid is published by the Electrical Utility for a Public Work or Improvement to be performed primarily for the Electrical Utility.

V. “Service Area - Water” or “Water Service Area” shall mean that area served with retail sales by the Water Utility of the City of Tacoma at the time a bid is published by the water utility for a Public Work or Improvement to be performed primarily for the Water Utility.
W. “Service Contract” shall mean all City contracts relating to a Public Work or Improvement which utilize labor at a City site and which are not within the exceptions to nor defined as “Building Projects” or “Civil Projects.”

X. “Subcontractor” means a person, corporation, partnership, or joint venture that has contracted with the Contractor or Service Provider to perform all or part of the work to construct a Public Work or Improvement by a Contractor.

Y. “Tacoma Public Utilities Service Area” shall mean every ZIP code listed by Tacoma Public Utilities as an area that either receives services or maintains infrastructure to provide services.

Z. Washington State Labor and Industry Prevailing Wage shall mean the hourly wage, usual benefits and overtime, paid in the largest city in each county, to the majority of workers, laborers, and mechanics. Prevailing wages are established, by the Department of Labor & Industries, for each trade and occupation employed in the performance of public work. They are established separately for each county, and are reflective of local wage conditions.

AA. “Tacoma Public Utilities” means the City of Tacoma, Department of Public Utilities.


1.90.040 LEAP goals.

A. Utilization Goals.

1. All Contractors constructing Civil Projects or Building Projects, and all Service Providers involved with the construction of a Public Work or Improvement, shall ensure that at least 15 percent of the total Labor Hours actually worked on the Project are performed by persons having their residence within the boundaries of the City of Tacoma or Economically Distressed ZIP Codes, whether or not any such person is an Apprentice.

a. The thresholds for this section shall be $250,000.00 for Civil Projects and $750,000.00 for Building Projects.

2. Fifteen percent (15%) of the Total Labor Hours on contracts above one-million dollars ($1,000,000.00) shall have work performed by Apprentices who are residents of the Tacoma Public Utilities Service Area consistent with RCW 39.04.320(1)(a), subject to waiver based on exceptions as specified in RCW 39.04.320(2)(a), (b), and (c).

3. Labor Hours performed by non-residents of the State of Washington will be deducted from a project’s total Labor Hours for purposes of determining compliance with the requirements of this chapter.

4. All Contractors and Service Providers shall submit a LEAP Utilization Plan as provided for in the regulations adopted under this chapter, and shall meet with the LEAP Coordinator to review said Plan prior to being issued a Notice to Proceed. Failure to submit a LEAP Utilization Plan may be grounds for the City to withhold remittance of a progress payment until such Plan is received from the responsible Contractor or Provider. A meeting with the LEAP Coordinator prior to issuance of a Notice to Proceed shall be excused only when the LEAP Coordinator is unavailable to meet prior to the scheduled date for issuance of the Notice to Proceed and the Contractor and the LEAP Coordinator have otherwise scheduled a meeting for the coordinator to review the Contractor’s or Provider’s plan.

The Contractor or Service Provider shall be responsible for meeting the LEAP utilization goal requirements of the contract, including all amendments and change orders thereto, and shall be responsible for overall compliance for all hours worked by Subcontractors. To the extent possible, the Contractor or Service Provider shall recruit Apprentices from multiple trades or crafts.

B. Failure to Meet Utilization Goal.

1. Contracts for the construction of Building projects or Civil Projects and Service Contracts shall provide that Contractors or Service Providers failing to meet the LEAP utilization goals shall be assessed an amount for each hour that is not achieved. The amount per hour shall be based on the extent the Contractor or Service Provider met its goal. The amount per hour that shall be assessed shall be as follows:
<table>
<thead>
<tr>
<th>Percent of Goal Met</th>
<th>Assessment per unmet hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>$ 0.00</td>
</tr>
<tr>
<td>90% - 99%</td>
<td>$ 2.00</td>
</tr>
<tr>
<td>75% to 89%</td>
<td>$ 3.50</td>
</tr>
<tr>
<td>50% to 74%</td>
<td>$ 5.00</td>
</tr>
<tr>
<td>1% to 49%</td>
<td>$ 7.50</td>
</tr>
<tr>
<td>0%</td>
<td>$10.00</td>
</tr>
</tbody>
</table>

When determining the percent of goal that is met, all rounding shall be down to the nearest whole percent. No penalty shall be waived by the City unless it is determined by the Director to be in the best interests of the City, which determination shall be made after consultation with the LEAP Coordinator.

2. Deposit of Assessments. All assessments imposed pursuant to this section shall be deposited into a separate account and utilized to support the City’s pre-apprenticeship and training program. The policies and regulations adopted by the City Manager and Director of Utilities pursuant to this chapter shall address issues pertaining to a Contractor’s existing workforce. Contributions need not be made for Labor Hours that have been adjusted in accordance with Section 1.90.040(E).

C. LEAP Reports. Notwithstanding the provisions of TMC 1.90.100, the Director shall, not less than annually, publish a LEAP report setting forth Contractor compliance with this chapter. Said report shall include information on all contracts and all Contractors to which this chapter applies, and shall detail the level and nature of LEAP participation by contract and by Contractor, The Director’s LEAP report may include such other information as may be helpful to assuring fair and accurate representation of the contracts, Contractors or projects covered in the report. The Director’s LEAP reports may be considered by the Board of Contracts and Awards in its determinations as to bidder responsibility.

D. LEAP Goal Adjustments.

1. LEAP utilization goals may be adjusted prior to bid opening and/or as a result of a contract amendment or change order on a Building Project, Civil Project, or Service Contract.

a. If LEAP utilization goals are adjusted prior to bid opening, they shall be set forth in the bid or Request For Proposal advertisement and specification documents or in an addendum timely provided to prospective bidders, provided that such adjustment shall be based upon a finding by the Project Engineer that the reasonable and necessary requirements of the contract render LEAP utilization unfeasible at the required levels. The Director shall concur with the Project Engineer’s finding, provided that should the Project Engineer and the Director fail to reach agreement on the Project Engineer’s finding, then in that circumstance the matter shall be referred to the City Manager or the Director of Utilities, as appropriate, for ultimate resolution. Notwithstanding any other provision of this chapter to the contrary, the decision of the City Manager or the Director of Utilities with regard to LEAP goal adjustment may not be appealed.

b. If LEAP utilization goals are adjusted due to contract amendment or change order, the amount of adjustment shall be consistent with the utilization goals set forth in this chapter and shall be determined pursuant to regulations adopted pursuant to this chapter for administration of LEAP utilization goal adjustments.

2. The methodology of determining the appropriate adjustments to LEAP utilization goals shall be determined in consultation with the LEAP Advisory Committee, established pursuant to this ordinance for so long as the LEAP Advisory Committee remains in existence.

3. LEAP utilization goals shall not apply to those portions of a project that are funded by sources other than (a) City funds, or (b) funds which the City expends or administers in accordance with the terms of a grant to the City, provided that the Project Engineer shall notify the Director of such non-application prior to bid advertisement. For the purposes of this paragraph, credits extended by another entity for the purpose of providing project funding shall not be considered to be City funds.

E. Utilization - Electrical Projects Outside Electrical Service Area. Civil Projects or Building Projects that are constructed primarily for the benefit or use by the City’s Electrical Utility, which are wholly situated outside the
Electrical Service Area, and for which the estimated cost is less than $1,000,000.00, are exempt from the requirements of this chapter.

F. Utilization - Water Projects Outside Water Service Area. Civil Projects or Building Projects that are constructed primarily for the benefit or use by the City’s Water Utility, which are wholly situated outside the Water Service Area, and for which the estimated cost is less than $1,000,000.00 are exempt from the requirements of this chapter.

G. Utilization –Projects Outside Tacoma Public Utilities Service Area. Civil Projects or Building Projects that are constructed primarily for the benefit or use by Tacoma Public Utilities, which are wholly situated outside the retail service area of the Tacoma Public Utilities Service Area, and for which the estimated cost is less than $1,000,000.00 are exempt from the requirements of this chapter. Projects wholly situated outside the Tacoma Public Utilities Service Area, and for which the estimated cost is more than $1,000,000.00, shall be exempt from 15% utilization goal specified in subsection A1. of this section. The 15% utilization goal specified in subsection A2. of this section may be met if project work is performed by Apprentices who are enrolled in a course of training specific to a particular construction trade or craft, provided such training has been approved by the Washington State Apprenticeship and Training Council in accordance with Chapter 49.04, RCW.

H. Emergency. This chapter shall not apply in the event of an Emergency. For the purposes of this section, an “Emergency” means unforeseen circumstances beyond the control of the City that either: (a) present a real, immediate threat to the proper performance of essential functions; or (b) will likely result in material loss or damage to property, bodily injury, or loss of life if immediate action is not taken.

I. Conflict with State or Federal Requirements. If any part of this chapter is found to be in conflict with federal or state requirements which are a prescribed condition to the allocation of federal or state funds to the City, then the conflicting part of this chapter is inoperative solely to the extent of the conflict and with respect to the City departments directly affected. This provision does not affect the operation of the remainder of this chapter. Administrative rules or regulations adopted under this chapter shall meet federal and state requirements which are a necessary condition to the receipt of federal or state funds by the City.


1.90.050 Good faith efforts. Repealed by Ord. 27368.
(Ord. 27368 § 3; passed Jun. 21, 2005: Ord. 26698 § 3; passed Sept. 12, 2000: Ord. 26301 § 1; passed Oct. 6, 1998)

1.90.060 Effect of program on prime contractor/service provider - subcontractor relationship. The LEAP Program shall not be construed so as to modify or interfere with any relationship between any Contractor or Service Provider and Subcontractor. The LEAP Program shall not grant the City any authority to control the manner or method of accomplishing any construction work that is additional to any authority retained by the City in a Public Works or Improvement contract.
(Ord. 26698 § 4; passed Sept. 12, 2000: Ord. 26301 § 1; passed Oct. 6, 1998)

1.90.070 Apprentice utilization requirements – Bidding and contractual documents. All packages of bid documents for every Building Project and every Civil Project shall incorporate provisions satisfactory to the City Attorney so as to allow enforcement of the provisions contained in this Chapter. Such contractual provisions may include liquidated damages, calculated to reimburse the City for the Contractor’s breach of these performance requirements, which shall be published with the City’s call for bids.
(Ord. 26301 § 1; passed Oct. 6, 1998)

1.90.080 Enforcement. A. The Director shall review the Contractor’s or Service Provider’s and all Subcontractor’s employment practices during the performance of the work for compliance with LEAP Program requirements. On-site visits may be conducted as necessary to verify compliance with the requirements of the LEAP Program. The Contractor, Service Provider, or Subcontractors shall not deny to the City the right to interview its employees, provided that the Director shall make reasonable efforts to coordinate employee interviews with employers.
B. Any knowing failure or refusal to cooperate in compliance monitoring may disqualify the defaulting Contractor, Service Provider, or Subcontractor from eligibility for other City contracts.

C. The making of any material misrepresentation may disqualify the defaulting Contractor, Service Provider, or Subcontractor from eligibility for other City contracts.

D. Any action by the City, its officers and employees, under the provisions of this Chapter may be reviewed by the Board of Contracts and Awards, upon written application of the party so affected. Application shall be made within twenty (20) days of the date of the action upon which the appeal is based, and provided to the City by certified mail or by personal service. Any action taken by the Board of Contracts and Awards may be appealed to the City Council or Public Utility Board, as appropriate, and thereafter if desired, to the Superior Court of Pierce County, Washington, within fifteen (15) days of the previous decision.

(Ord. 26698 § 5; passed Sept. 12, 2000; Ord. 26301 § 1; passed Oct. 6, 1998)

1.90.090 Compliance with applicable law.
Nothing in this Chapter shall excuse a Prime Contractor, Service Provider, or Subcontractor from complying with all relevant federal, state, and local laws.

(Ord. 26698 § 6; passed Sept. 12, 2000; Ord. 26301 § 1; passed Oct. 6, 1998)

1.90.100 Review and reporting.
The City Manager and Director of Utilities shall review the Program on or before January 1, 2000, and every two (2) years thereafter, and shall report to the City Council and Public Utility Board the Manager’s and Director’s findings, conclusions, and recommendations as to the continued need for the Program, and any revisions thereto that should be considered by the Council and Board.

(Ord. 26301 § 1; passed Oct. 6, 1998)

1.90.105 Authority.
The City Manager and the Director of Utilities shall have authority to jointly adopt policies and regulations consistent with this chapter to implement the LEAP program.

(Ord. 26698 § 7; passed Sept. 12, 2000; Ord. 26301 § 1; passed Oct. 6, 1998)

1.90.110 Interpretation.
This Chapter shall not be interpreted or construed so as to conflict with any state or federal law, nor shall this Chapter be enforced such that enforcement results in the violation of any applicable judicial order.

(Ord. 26301 § 1; passed Oct. 6, 1998)
LEAP

Document Submittal Schedule

In the attached packet, you will find the LEAP forms that are required to be submitted by the Prime and Sub Contractors.

- **LEAP Instructions and Goal Form**: brief overview of LEAP Program requirements
- **Prime Contractor LEAP Utilization Plan**: to be submitted at or by the Pre-Construction Meeting *(Required by Prime Contractor Only)*
- **LEAP Apprentice Verification Form**: to be submitted on an ongoing basis for each qualified Apprentice employee via LCP Tracker
- **Tacoma Public Utilities Service Area List, Economically Distressed ZIP Codes List**: for your reference on LEAP-qualified zoning areas

In addition, the LEAP Office will also require from the Prime Contractor and all its Subcontractors:

- **Weekly Certified Payrolls**: to be submitted weekly, biweekly or monthly via LCP Tracker
- **Document Verification**: provide required information when requested from LEAP Office

Please submit above documents as instructed by the Project Manager.

If you have any questions or request further information, please feel free to contact the City of Tacoma’s LEAP Program at (253) 591-5826, Fax (253) 591-5232, or email **carmstrong@cityoftacoma.org**.
No Work Performed (NWP) Report

Prime/Sub Contractor: ___________________________________________________________

Specification Number: ___________________________________________________________

Project Description: _____________________________________________________________

Payroll Week Ending Date: __________________________           Payroll Number: __________

NO WORK PERFORMED

I, the undersigned, do hereby certify under penalty of perjury, that the information contained herein is true and correct.

_________________________         ______________________       __________
Signature of Responsible Officer     Title              Date
PRIME CONTRACTOR
LEAP UTILIZATION PLAN

Failure to submit this plan at the Pre-Construction Meeting may result in Progress Payments being withheld.

Part A

<table>
<thead>
<tr>
<th>Contractor:</th>
<th>Date:</th>
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<tbody>
<tr>
<td>Specification Number:</td>
<td>Contract/Work Order Number(s):</td>
</tr>
<tr>
<td>Project Description:</td>
<td>Notes:</td>
</tr>
</tbody>
</table>

Part B

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<thead>
<tr>
<th>Trade or Craft</th>
<th>City of Tacoma Resident</th>
<th>Economic Distressed Area Resident</th>
<th>Tacoma Public Utilities Service Area Apprentice Resident</th>
<th>WA State Apprentice <em>(Contracts outside of TPU Service Area Only)</em></th>
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<td>hrs.</td>
<td>hrs.</td>
<td>hrs.</td>
<td>hrs.</td>
</tr>
</tbody>
</table>

Part C

Provide a description of how the Contractor plans to ensure that the LEAP Utilization Goals on the project will be met. *(Use additional sheets if necessary)*
General Instructions for completing Prime Contractor LEAP Utilization Plan

**Part A**
*Contractor/Contract Information Section:* The Prime Contractor is responsible for completing this section. Failure to submit this plan at the Pre-Construction Meeting may result in Progress Payments being withheld.

**Part B**
*Planned LEAP Hours Section:* This section should be completed by the Prime Contractor. The information required in Part B is described below.

**Trade or Craft:** Indicate the Trade or Craft being used.

**LEAP Employee Categories:** Indicate the number of hours that will be utilized by the Prime Contractor and all Sub Contractors for each craft and broken down by City of Tacoma Resident, Economically Distressed Area Resident, Tacoma Public Utilities Service Area Apprentice Resident, WA State Apprentice *(Contracts outside of TPU Service Area Only).

**Totals:** Total the number of hours in each of the five (5) columns.

**Part C**
*Description of how the Contractor plans to ensure fulfillment of the LEAP Utilization Goal:* This section is to be completed by the Prime Contractor. Please describe how you plan to satisfy the LEAP Utilization Goal on this project. Provide a summary of your outreach and recruitment procedures to hire LEAP Qualified Employees to work on this project.
### Economically Distressed ZIP Codes

<table>
<thead>
<tr>
<th>Zip Code</th>
<th>200% Pov</th>
<th>Unemployed</th>
<th>25+ College</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>98002</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td>Auburn</td>
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<tr>
<td>98030</td>
<td>Y</td>
<td>Y</td>
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<td>Kent</td>
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<tr>
<td>98032</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td>Kent</td>
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<tr>
<td>98198</td>
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<td>Y</td>
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<td>Seattle</td>
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<tr>
<td>98304</td>
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<tr>
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<td>Y</td>
<td></td>
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<td>Y</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Easton</td>
</tr>
</tbody>
</table>

“200% Pov” = People at or below 200% of the federal poverty line. (69th percentile)
“Unemployed” = Unemployment rate (45th percentile)
“25+ College” = People at or above 25 years old without a college degree. (75th percentile)
Apprentices may come from any of the ZIP codes listed under this page. If an apprentice lives in an Economically Distressed ZIP code, they may count towards those labor hours as well. Journeyman must be from the Economically Distressed ZIP codes.