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LYON

Improving
Island
Life

October 30, 2015

Department of Health
Environmental Management Division
Solid and Hazardous Waste Branch
PO Box 3378
Honolulu, Hawaii 96801

Dear Director Virginia Pressler, M.D.:

On behalf of PVT Land Company, Ltd. LYON hereby transmits the PVT's Solid Waste Management Permit renewal application for the PVT Integrated Solid Waste Management Facility situated at (1) 8-7-009:025 and (1) 8-7-021:026 in the Waianae District on the island of Oahu.

Enclosed is check for the filling fee ($1800) made out to the State of Hawaii. In accordance with the fee schedule, the filing fee includes:

- A. Solid Waste Disposal Facilities
    - 1. Landfills Greater than twenty tons/day ($1000)
- B. Solid Waste Storage, Handling and Processing Facilities
    - 2. Recycling and materials recovery facilities ($50)
- C. Solid Waste Reclamation Facilities
    - 2. Remediation ($250)
- D. Special Wates Facilities
    - 1. Special waste landfill ($500)

If there are any questions, please contact: Stephen Joseph of PVT Land Company at steve@pvtland.com or Karl Bromwell of LYON at Karl.Bromwell@LYON.US.com.

Mahalo,

Karl B. Bromwell

Karl Bromwell
Vice President / LYON Director of Environmental Services

LYON.US.com
45 North King Street, #501
Honolulu, HI 96817
Tel: (808) 536-6621
Fax: (808) 523-1738

## Solid Waste Management Permit

Prepared in Accordance with the requirements of Hawaii Administrative Rules (HAR), Title 11, Chapter 58.1

# PVT Integrated Solid Waste Management Facility – Expanded Recycling, Landfill Grading and Renewable Energy Project

Waianae District, Oahu, Hawaii
TMKs: (1) 8-7-009:025 and (1) 8-7-021:026

October 30, 2015

The Solid Waste Management Permit and all ancillary documents were prepared under the signatory's direction or supervision, and the information submitted, to the best of the signatory's knowledge, fully addresses document content requirements as set forth in HAR, Title 11, Chapter 58.1, as applicable.

Stephen E Joseph

| | |
|---|---|
| | October 30, 2015 |
| Stephen Joseph Leeward Land, LLC | Date |

Prepared For:

PVT LAND COMPANY LIMITED

87-2020 Farrington Highway
Waianae, Hawaii 96792

Prepared By:

LYON

45 North King Street, Suite 501
Honolulu, Hawaii 96817

# STATE OF HAWAII
# DEPARTMENT OF HEALTH
# ENVIRONMENTAL MANAGEMENT DIVISION
# SOLID AND HAZARDOUS WASTE BRANCH

## PERMIT APPLICATION FOR SOLID WASTE MANAGEMENT FACILITY (NOT FOR PERMIT BY RULE)

This permit application was developed in accordance with the requirements of Hawaii Administrative Rules (HAR), Title 11, Chapter 58.1. **In order for this application to be considered complete, completed Attachments P-1 through P-6 and filing fee must accompany this application form.** Please read the general instructions before completing.

I. Type of Application (check all that apply)

A. ________ Permit to establish a new facility
B. ________ Permit to modify an existing facility
C. ________ Permit renewal with no modification
D. ✓ Permit renewal with modification
E. ________ Change in ownership
F. ________ Other
Describe________________________________________

II. Existing pollution control permits and/or variances issued to facility:
See attached list

III. General Information

A. Name and address of the owner of the solid waste facility:
PVT Land Company, LTD.
87-2020 Farrington Highway
Waianae, Hawaii 96792 Telephone: 808-668-4561

B. Name and address of the operator of the solid waste facility:
PVT Land Company, LTD.
87-2020 Farrington Highway
Waianae, Hawaii 96792 Telephone: 808-668-4561

C. Name and address of individual authorized to act for the owner and operator:
Stephen Joseph
87-2020 Farrington Highway
Waianae, Hawaii 96792 Telephone: 808-668-4561

D. Name and address of landowner (If landowner is other than the owner/operator of the solid waste facility, include Attachment P-6):
PVT Land Company, LTD.
87-2020 Farrington Highway
Waianae, Hawaii 96792 Telephone: 808-668-4561

E. Name and address of lessee, if appropriate:
Not Applicable.

Telephone:

F. Facility Name and Location:

Name: PVT Integrated Solid Waste Management Facility
Address: 87-2020 Farrington Highway Waianae, Hawaii 96792

Tax Map Key: (1) 8-7-009:025 and (1) 8-7-021:026

(if appropriate)

| | | | |
|---|---|---|---|
| Latitude: | 21° | 23' | 31.20" N |
| Longitude: | 158° | 08' | 50.12" W |

UTM Coordinates: Zone 4 East 588,000 North 2,366,300

G. Type of Facility (check all that apply)

1. Landfill
   - MSW (daily tonnage ______) ______
   - C&D (daily tonnage 3000) ✓
2. Incinerator (daily tonnage ______) ______
3. Solid Waste Processing
   - Transfer Station (daily tonnage ______) ______
   - Recycling/materials recovery ✓
   - Salvage ______
4. Reclamation Facility
   - Composting ______
   - Remediation ✓
5. Special Waste
   - Special waste landfill ✓
   - Medical waste ______
   - Foreign waste ______
   - Other Non-Specified Technology ______
   - Please briefly explain AES ash, and ash/slag from renewable energy sources in excess of 20% condition for beneficial use
6. Waste Treatment/Processing/Storage for Disposal ✓

IV. Normal Operating Schedule

A. Shifts Worked: HOURS OF DAY

1. From: 7:00am To: 4:00pm Monday-Saturday
2. From: To:
3. From: To:

B. Days per week: 6
C. Weeks per year: 52
D. Operation is seasonal or irregular, describe:

V. For Permit Renewals and Modifications: Is the existing facility in compliance with Hawaii Revised Statutes (HRS) 342G, 342H and 342I; and Hawaii Administrative Rules (HAR), Title 11, Chapter 58.1, "Solid Waste Management Control"?

Yes ✓ No_____

If the existing facility is not in compliance with HRS 342G, H and/or I; and/or HAR, Title 11, Chapter 58.1, "Solid Waste Management Control", provide a detailed implementation plan as an attachment to the application. The implementation plan should include but is not limited to areas of noncompliance, reason for noncompliance, proposed actions towards achieving compliance, and implementation schedule, as an attachment to the application.

VI. Certification by owner and operator:

We, Albert Shigemura (name), President (title) (owner)

and Stephen Joseph (name), Vice President (title) (operator)

certify that we have knowledge of the facts hereby submitted and that the same are true and correct to the best of our knowledge and belief, and that all information not identified as confidential in nature shall be treated by the Department of Health as public record. We further state that we will assume responsibility for the construction, modification, operation, maintenance, closure and post-closure of the facility in accordance with Hawaii Revised Statutes, 342G, H and I; and Hawaii Administrative Rules, Title 11, Chapter 58.1, and any permit issued thereof. As co-permittees, we understand that we share joint and several liability for compliance with aforementioned statutes, regulations, and permits.

If the owner/operator is a partnership or group other than a corporation or a county, one individual who is a member of the group shall sign the application. If the applicant is a corporation or a county, an officer of the corporation, general manager of the facility, or an authorized representative of the county shall sign the application.

Date: 10/26/15

Owner:
Signature:
Title: President
Company Name: PVT Land Company LTD.
Address: 87-2020 Farrington Highway Waianae, Hawaii 96792
Telephone: 808-668-4561

Date: 10/26/15

Operator:
Signature: Stephen E Joseph
Title: Vice President
Company Name: PVT Land Company LTD.
Address: 87-2020 Farrington Highway Waianae, Hawaii 96792
Telephone: 808-668-4561

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DO NOT WRITE BELOW ----- FOR AGENCY USE ONLY

VII. Date application received: 11/2/15

VIII. Received by: L. Ofu

IX. Application number: LF - 0061-15

X. Evaluating Official: K. KIHARA

XI. Filing fee attached: Yes ✓ No____ # 21062: $1800.00

XII. Plans and specifications attached: Yes____ No____

Attachment P-1 Yes____ No____
Attachment P-2 Yes____ No____
Attachment P-3 Yes____ No____
Attachment P-4 Yes____ No____
Attachment P-5 Yes____ No____
Attachment P-6 Yes____ No____

XIII. Action on application: Approved:____
Disapproved:____
Conditional Approved:____

XIV. Date of action on application:____

XV. Permit number:____

**Existing pollution control permits and/or variances issued to facility:**

- Solid Waste Management Permit No. LF-0152-09 for a construction and demolition waste landfill, recycling and materials recovery, and solidification operations.
- Non-covered Source Permit No. 0651-01-N for a rock crusher and soil screener.
- National Pollutant Discharge Elimination System Notice of General Permit Coverage File No. HI R50B941.
- Conditional Use Permit No. 85/CUP-6, as modified, for land use.

# ATTACHMENT P-1

# ATTACHMENT P-1
# LOCATION DRAWING AND SITE PLAN
# LANDFILL FACILITIES
# SOLID WASTE PERMIT APPLICATION

The following facility drawings shall be submitted, drawn to a reasonable scale and showing the following information (show north arrow and scale drawing):

## 1. Location Drawing(s)

Provide location drawing(s) indicating the property involved, topographic data, the zoning of the property, and the outline of all structures, access, and fences. Identify property lines plainly. Indicate the location of the property and equipment in relation to nearby streets and all adjacent properties. The location drawing should also identify the name, nature of business, and zoning of all properties adjacent to the applicant's property lines (Private residences may be identifies as residences, unless they are also used as a place of business).

Using USGS Quadrangle Maps, identify all drainage systems and bodies of surface or marine waters, or other sensitive environmental areas within 500 feet of the property lines; and any active groundwater resources with 1000 feet of the facility.

## 2. Site Plan

Provide a site plan identifying property lines, all solid waste activities, structures and equipment on the property, ingress/egress to the solid waste operations, and vehicle queing area. Locate waste screening, storage and disposal areas; environmental control systems (i.e. ditches, basins, monitoring systems); and maintenance area. Indicate limits of proposed permitted limit of waste disposal, limits of currently placed waste, and locations of special waste disposal areas (i.e. animal carcasses, asbestos). If the facility is a municipal solid waste management facility, also indicate the limits of waste placed prior to October 9, 1993. If the facility is a construction and demolition waste landfill, also indicate the limits of waste placed prior to January 13, 1994.

# ATTACHMENT P-1
# LOCATION DRAWING AND SITE PLAN
***PVT Integrated Solid Waste Management Facility***
***Solid Waste Permit Renewal***

## 1.0 LOCATION DRAWING(S)

*Figure 1 - Location Map 1* shows the subject property lines, tax map key (TMK) numbers, and zoning information for the subject and adjacent properties. The name and nature of business at the adjacent properties are also shown.

*Figure 2 - Location Map 2* shows the property involved, topographic data, bodies of surface and marine water on and near the subject property, and active groundwater resources within 1,000 feet of the facility. Groundwater in the site vicinity is brackish (greater than 250 parts per million chloride) and not used for drinking water. As shown below on Table 1, groundwater wells within 1,000 feet of the facility are used for irrigation and industrial purposes or are unused. Table 2 shows the location of PVT-owned groundwater monitoring wells that are not listed in the DLNR database.

**Table 1: Registered Wells within 1,000 feet of the Site**

| Well Number | Well Name | Year Drilled | Owner / User | Ground Evel. (ft.) | Well Depth (ft.) | Initial Head (ft. amsl) | Max Chloride (ppm) | Use |
|---|---|---|---|---|---|---|---|---|
| 2308-02 | Lualualei-PVT | 1952 | PVT Holdings | 115 | 154 | 3.7 | 292 | Unused |
| 2308-03 | Lualualei-PVT | 1990 | PVT Holdings | 136 | 200 | 7.0 | 900 | Irrigation |
| 2308-04 | Perimeter Rd. | 2003 | PVT Land Co. | 66 | 110 | 0.47 | 3400 | Other |
| 2408-01 | Lualualei | 1949 | Kakazu | 33 | 55 | 2.0 | 1410 | Unused |
| 2408-04 | Lualualei | 1951 | Oshiro | 42 | 63 | 2.1 | 1700 | Unused |
| 2408-06 | Lualualei | 1962 | Perm Cement | 40 | 93 | NL | NL | Industrial |
| 2409-05 | Lualualei | 1951 | Kameya | 49 | 76 | 1.4 | 1520 | Irrigation |
| 2409-06 | Lualualei | 1951 | Kameya | 49 | 64 | 1.4 | 1150 | Unused |

NL = Not Listed in the DLNR database

**Table 2: Groundwater Monitoring Wells within 1,000 feet of the Site**

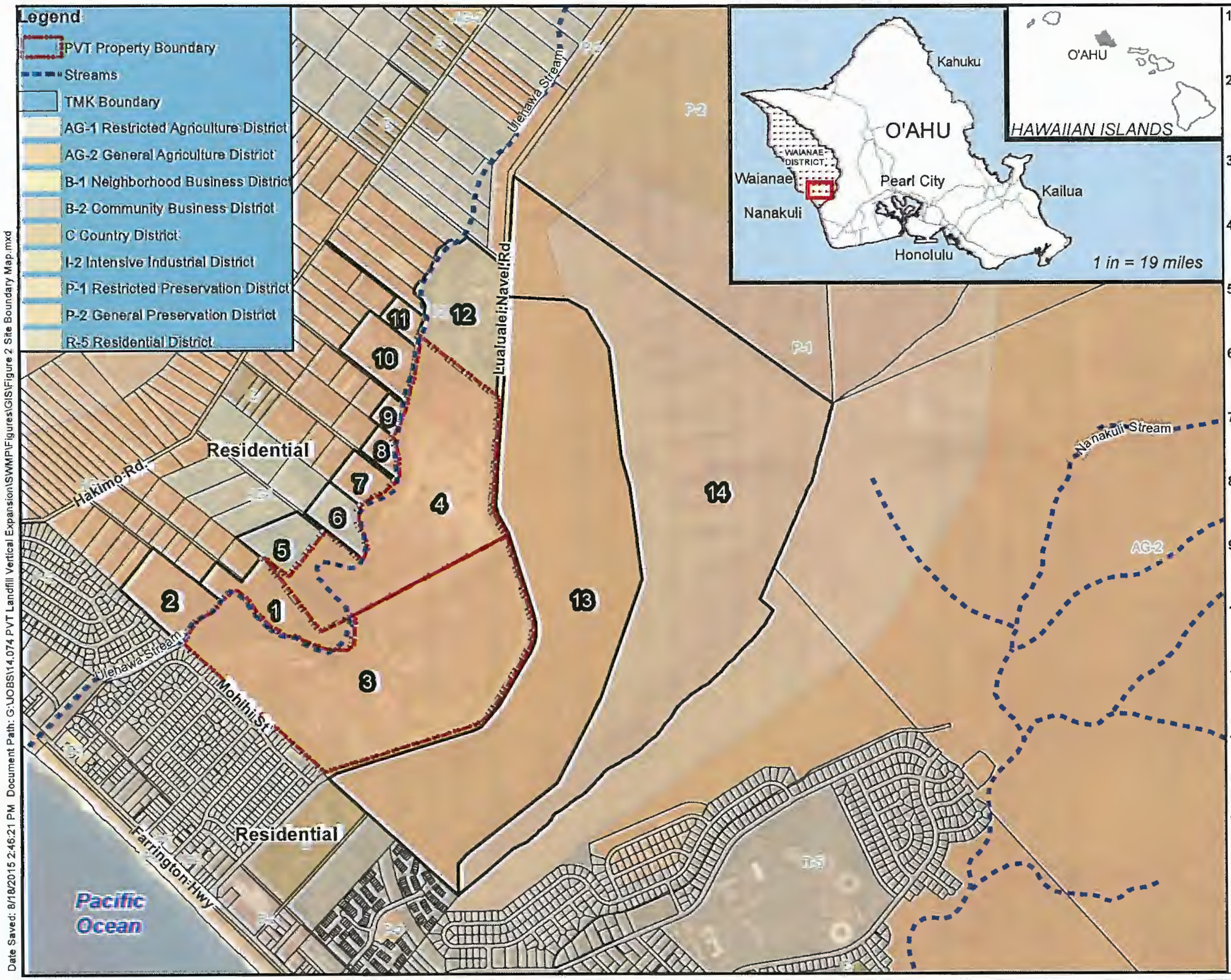
| Well Number | Well Name | Status | Location |
|---|---|---|---|
| MW-1B | Monitoring Well 1B | In-use | Within Project Site |
| MW-1C | Monitoring Well 1C | In-use | Within Project Site |
| MW-2 | Monitoring Well 2 | In-use | Within Project Site |
| MW-1 | Monitoring Well 1 | Sealed | Within Project Site |
| MW-1A | Monitoring Well 1A | Sealed | Within Project Site |
| MW-3 | Monitoring Well 3 | In-use | Within 1000 feet radius |

*Figure 2 - Location Map 2* also shows the fence line and other natural buffers that control access to PVT ISWMF. Access is restricted by Ulehawa stream in the west and by a fence in the north, east, and south boundaries of the site. PVT does not dispose C&D debris within the 750 feet of the makai (ocean) property line per the existing Solid Waste Management Permit and maintains a dust screen and green belt along the makai property boundary.

## 2.0 SITE PLAN

*Figure 3 - Site Plan* identifies property lines, all solid waste activities, structures, stationary equipment and equipment staging and/or maintenance areas, ingress and egress to the solid waste operations, and vehicle queuing area. Waste screening, storage and disposal areas and environmental control systems (sediment basins and NPDES permitted discharge points and sampling areas) are also identified. Permitted limits of waste disposal and location of special waste disposal areas, including the asbestos waste disposal area and solidification area, are clearly marked. Phase I consists of 49 acres within the historical landfill area that received waste prior to October 9, 1993. Phase I was built under HAR-11-58, which was in effect from November 27, 1981 to January 12, 1994.

*Figure 4 – Location of Process Modifications* identifies the location of the proposed changes in PVT operations and equipment. PVT proposes to (1) expand its recycling operations in the existing Materials Recovery Area, (2) increase the site grade on the mauka portion of the landfill to reach a maximum elevation of 255 ft. amsl, and (3) use renewable energy (gasification and solar energy) to provide power to the Materials Recycling Facility. A proposed gasification unit would be located in the Materials Recovery Area and the photovoltaic (PV) panels would be placed on unused landfill slopes of Cell 9B and/or Phase I along Lualualei Naval Road. No changes in the horizontal boundaries of the landfill or to ongoing landfill operations are proposed.



1. **Owner: PVT Land Company Ltd.**
   **Use: Vacant Land**
   **TMK: (8)-7-009:026**
   **Zoning: AG-2**
2. Owner: George Grace, III
   Use: Equipment Storage and Residence
   TMK: (8)-7-009:003
   Zoning: AG-2
3. **Owner: PVT Land Company Ltd.**
   **Acre: 113.066**
   **TMK: (8)-7-009:025**
   **Zoning: AG-2**
4. Owner: PVT Land Company Ltd.
   Acre: 75.335
   TMK: (8)-7-009:026
   Zoning: AG-2
5. **Owner: Johrei Hawaii**
   **Use: Field Crop**
   **TMK: (8)-7-021:025**
   **Zoning: AG-1**
6. Owner: Ulehawa Farm Incorporated
   Use: Livestock Farm (pigs)
   TMK: (8)-7-021:020
   Zoning: AG-1
7. **Owner: PVT Land Company Ltd.**
   **Use: Vacant Land**
   **TMK: (8)-7-009:026**
   **Zoning: AG-2**
8. Owner: Glenn Arakaki
   Use: Household Dwelling
   TMK: (8)-7-021:047
   Zoning: AG-2
9. **Owner: Joseph I O'Brien**
   **Use: Vacant Land**
   **TMK: (8)-7-021:046**
   **Zoning: AG-2**
10. Owner: Ernesto M Anacieto
    Use: Livestock Farm (dairy, poultry)
    TMK: (8)-7-021:007
    Zoning: AG-2
11. **Owner: Leonard Olsen**
    **Use: Household Dwelling**
    **TMK: (8)-7-021:046**
    **Zoning: AG-2**
12. Owner: Pine Ridge
    Use: West Oahu Aggregate for rock crushing and material processing
    TMK: (8)-7-021:035
    Zoning: I-2
13. **Owner: Leeward Land Company, Ltd.(as PVT)**
    **Acre: 179.109**
    **TMK: (8)-7-009:007**
    **Zoning: AG-2**
14. Owner: Leeward Land Company, Ltd.
    Acre: 219.329
    Use: Unused Land
    TMK: (8)-7-009:001
    Zoning: AG-2, P-1

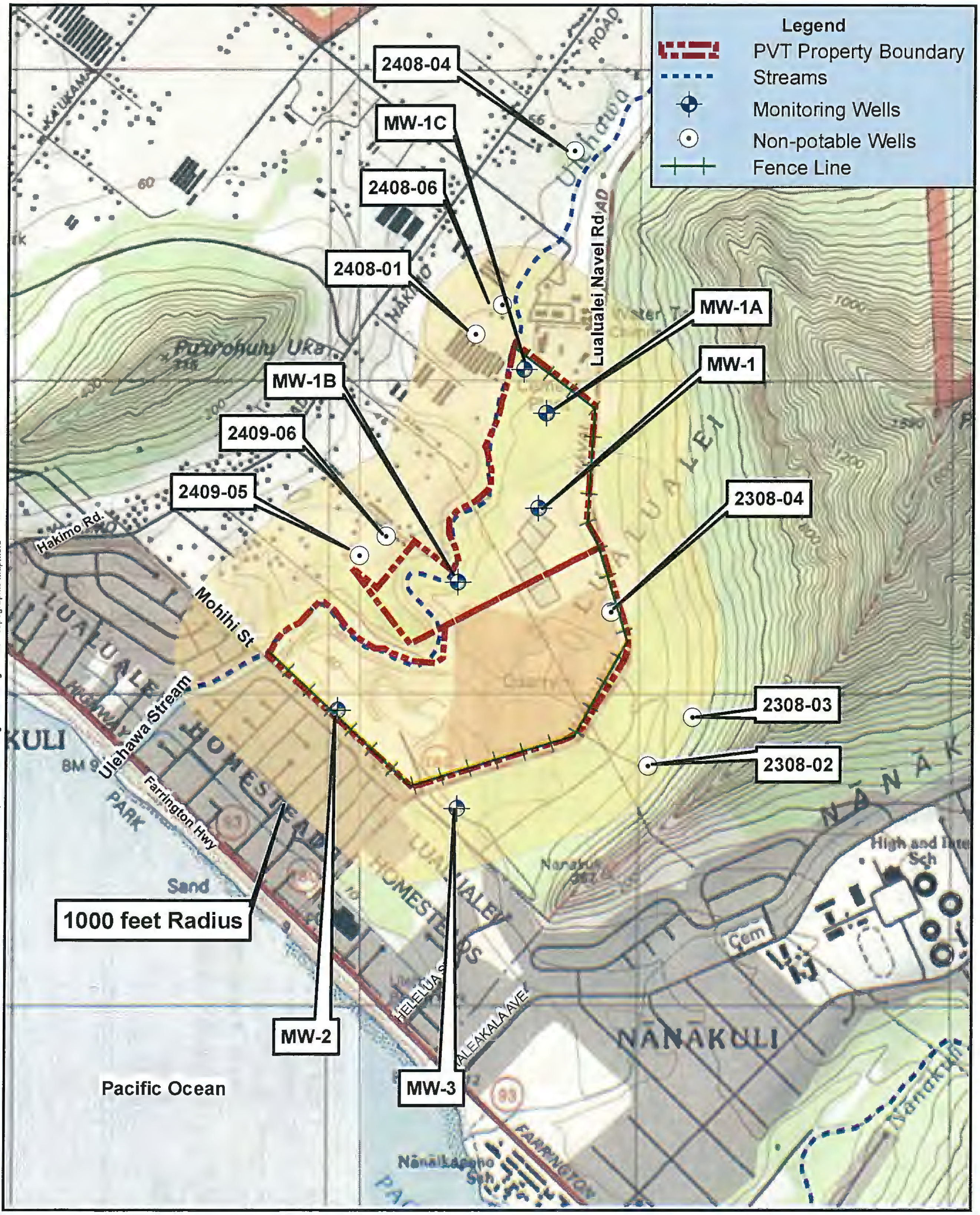
Date Saved: 8/18/2015 2:46:21 PM Document Path: G:\JOBS\14.074 PVT Landfill Vertical Expansion\SWMP\Figures\GIS\Figure 2 Site Boundary Map.mxd

Feet
0 1,250 2,500
0 210 420
Meters

**Figure 1**
Location Map 1
PVT Integrated Solid Waste Management Facility

LYON
N W E S

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics,



Feet
0 750 1,500
0 140 280
Meters

**Figure 2**
Location Map 2
PVT Integrated Solid Waste Management Facility

LYON

Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed

Date Saved: 8/18/2015 2:43:43 PM Document Path: G:\JOBS\14.074 PVT Landfill Vertical Expansion\SWMP\Figures\GIS\Figure 3-1 - Topographic Map.mxd

Date Saved: 8/7/2015 3:20:33 PM Document Path: G:\JOBS\14.074 PVT Landfill Vertical Expansion\FIGURES\GIS\EIS - Figure\Figure 2\Figure 2-3 - Site Plan.mxd

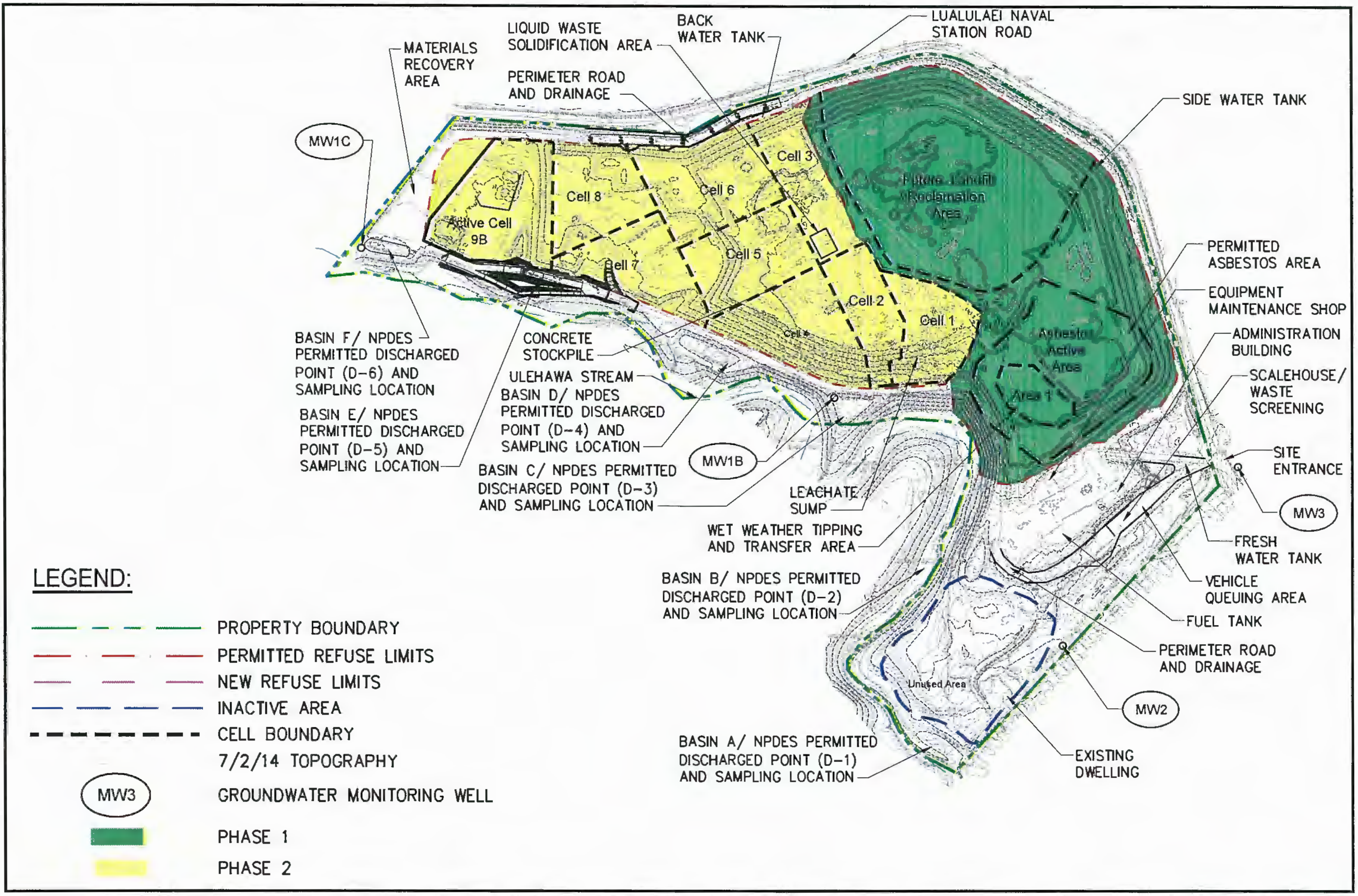


**Figure 3**
Site Plan
PVT Integrated Solid Waste
Management Facility

LYON

Service Layer Credits: PVT Land Company, 2015

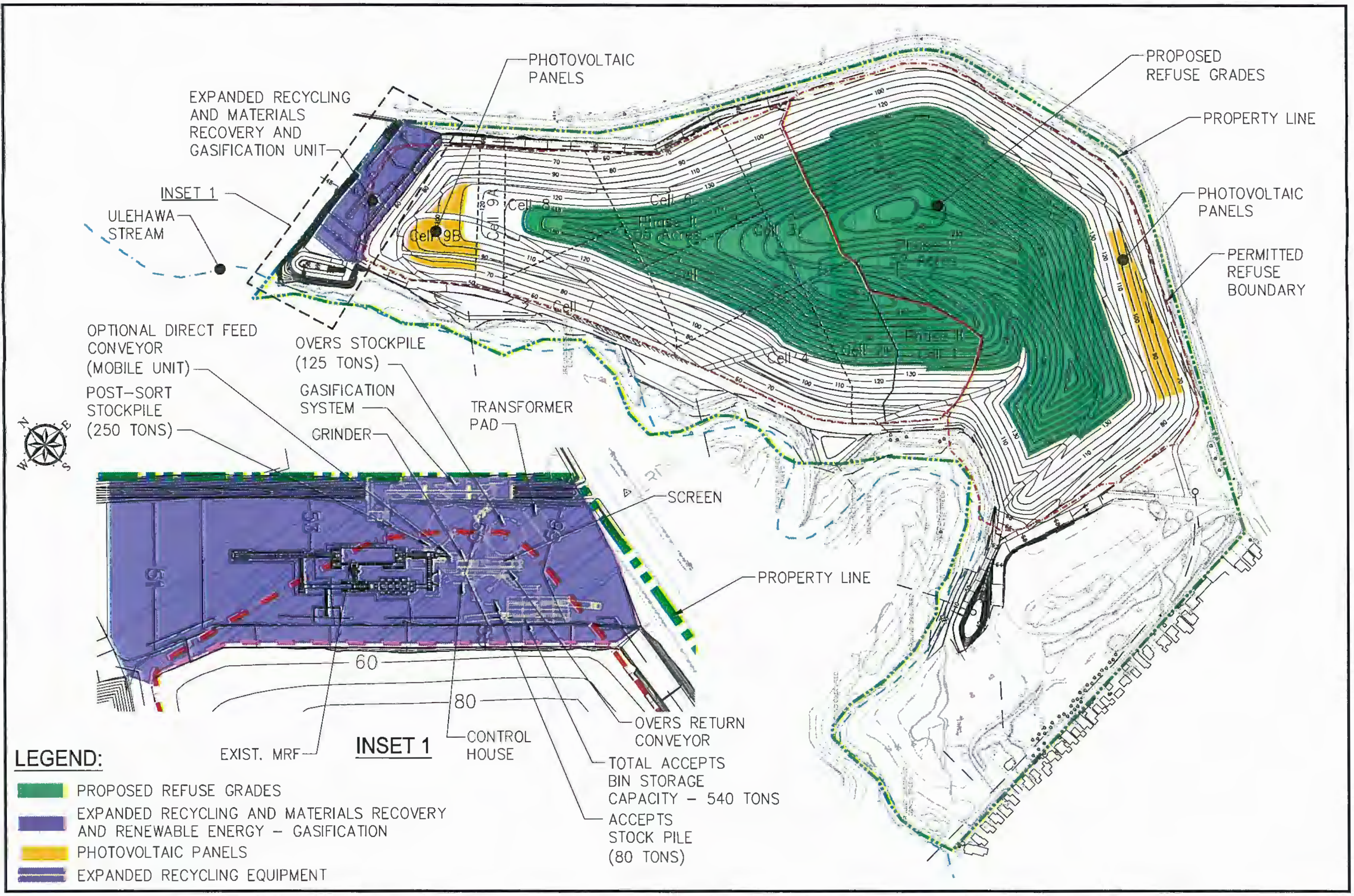


**Figure 4**
Location of Process Modifications
PVT Integrated Solid Waste
Management Facility

Service Layer Credits: PVT, 2015

Date Saved: 9/23/2015 3:41:14 PM Document Path: G:\JOBS\14.074 PVT Landfill Vertical Expansion\FIGURES\Drawings\Gasification Drawings\Figure 4 - Location of the Proposed Gasification.mxd

# ATTACHMENT P-2

# ATTACHMENT P-2
# PUBLIC INTEREST
# PVT Integrated Solid Waste Management Facility
# Solid Waste Permit Renewal

## 1.0 ENVIRONMENTAL IMPACT OF THE PROPOSED ACTION

PVT Integrated Solid Waste Management Facility (PVT ISWMF) is a comprehensive solid waste management facility for construction and demolition (C&D) material and other recyclable products. It does not accept hazardous waste or municipal solid waste (MSW). It embodies three types of waste management facilities defined in Hawaii Administrative Rules (HAR) 11-58.1:

- A reclamation facility, defined as "a location used for the handling, processing, or storage of recoverable material, including but not limited to composting and remediation". Recoverable material is defined as "material that can be diverted from disposal for recycling or bioconversion."
- A materials recovery facility; and
- A C&D waste landfill.

The current operations at the site would continue under the renewed permit, as follows:

- Segregation of incoming loads into materials for processing, recycling, on-site usage or disposal;
- Mixed waste sorting to remove and separate recyclable materials;
- Processing to produce feedstock for renewable energy producers;
- Production of aggregate materials including rock, gravel and crushed asphalt;
- Solidification of liquid wastes;
- Reclamation of previously landfilled C&D waste to minimize the potential of fire, prevent settlement, minimize leachate potential, and remove voids;
- Storage and marketing of recyclable materials; and
- Landfill disposal of residual non-recoverable waste materials, including primarily composition/asphalt roofing shingles, tile, gypsum board, lead-painted concrete and cementitious siding.

PVT proposes to modify its State Department of Health (DOH) Solid Waste Management Permit (SWMP) No. LF-0152-09 to expand recycling operations and expand the mauka portion of the landfill to a final height of 255 feet (ft.) above mean sea level (amsl). Recycling is anticipated to reduce the volume of C&D material that is landfilled. PVT proposes to accept AES ask and ash/slag from renewable energy sources as a special waste in quantities above the 20% condition of the SWMP. Finally, PVT plans to install renewable energy to power its operations.

The objectives of the process modifications are as follows:

- Expand recycling operations to beneficially reuse and recycle incoming C&D debris and C&D debris from the older sections of the landfill.
- Expand recycling operations with additional equipment to generate and process the recycled feedstock, which will be used as a fuel by alternate energy producers.
- Reduce the volume of C&D debris that is disposed of in the on-site landfill through recycling and reclamation, thereby maximizing the operational life of the landfill in support of the construction industry and disaster preparedness.
- Increase the capacity of the facility, while meeting State (HAR Title 11) regulations.
- Use renewable energy to provide power to the recycling operations to reduce dependence on fossil fuel with a goal of energy self-sufficiency.
- Operate the proposed facility in a sustainable, financially feasible manner to ensure that the life of the landfill is maximized.

PVT completed an Environmental Impact Statement (EIS) to assess the potential impacts of the process modifications on the environment and community. A copy of the Final EIS is attached to this permit for your review. This attachment briefly summarizes the findings of the Final EIS.

### 1.1 Need for Service

Privately owned and operated, the PVT ISWMF is a critical component of the Oahu Integrated Solid Waste Management Plan (ISWMP). The City continues to ban C&D waste from Waimanalo Gulch Landfill and directs haulers to the PVT ISWMF, the only publically-accessible C&D landfill facility on Oahu. The PVT ISWMF is also designated as an area for disposal of disaster debris in the City's disaster relief plan. Without the PVT ISWMF, there would be an increased potential for unauthorized dumping of C&D waste and associated public health issues.

By 2030, it is anticipated there will about 0.2 million tons of C&D waste per year. New landfills and horizontal expansions are challenging with respect to permits, approvals and public opinion. The City continues to explore options for recycling and alternative technologies to reduce the volume of solid waste; however, there will continue to be a need for landfills. A new solid waste disposal facility, which could include C&D waste management, is being planned; however, the site and opening date have not been determined by the City and County of Honolulu.

The purpose of the process modifications is to expand recycling and reclamation efforts, create feedstock for renewable energy, and maximize the use and energy efficiency of the existing PVT ISWMF. The need is to support the construction industry, support renewable energy providers and postpone the need for a new C&D landfill or horizontal expansion of existing facilities to the extent practical. The process modifications would increase landfill capacity and increase the diversion of C&D waste from landfill disposal to recycling, both of which maximize the use of existing facilities.

## 1.2 Population and Area Served

Primary users of the PVT ISWMF are C&D contractors and waste haulers on Oahu, including federal, state, and local agencies. PVT prequalifies all customers by requiring establishment of an approved account prior to delivering any material to the site. Customers are notified in advance that all material brought to the ISWMF for disposal will be inspected to ensure it is acceptable. Special accounts and review procedures are required for customers proposing to dispose of contaminated soils, asbestos contaminated wastes, or liquid wastes for solidification.

## 1.3 Material Characteristics

PVT ISWMF is permitted to accept the following general types of materials: C&D material, wood, miscellaneous material for recycling or reclamation, asbestos contaminated waste, contaminated soils, liquid waste for solidification, inert material, and coal ash from the AES power plant. The characteristics of each material type are described below.

***Construction and Demolition Material.*** C&D material is generated primarily by contractors and government agencies involved in the construction or demolition of houses, commercial buildings, pavements, and other structures. It may include any of the following types of materials:

- Concrete and asphalt rubble;
- Steel and nonferrous metal;
- Wood;
- Glass and plastic scrap;
- Dirt and rock; and
- Brush, wood, roots, stumps, dirt and rocks from clearing and grubbing activities.

C&D material is notably dry and generally inert. Based on a review of characteristics, it has been determined that C&D material creates no significant odor issue. The potential for leachate generation is low and, given the waste exclusion and load checking programs implemented by PVT, its potential for a release of toxic or hazardous materials to air or water is minimal.

***Wood.*** PVT accepts segregated loads of wood materials for recycling. Such materials, including pallets, packing crates, or other wood products, may also be sorted out from mixed C&D loads. Most wood will be processed as a feedstock for alternate energy producers. Alternatively, wood may be processed or shipped in bulk to off-site recyclers. If recycling the material is determined to be economically infeasible, PVT may also landfill the material, with or without processing it in a shredder to reduce its size and achieve maximum compaction.

***Asbestos Containing Material.*** Asbestos containing material (ACM) is accepted and managed in accordance with the requirements of State DOH SWMP and applicable regulations including Chapter 342H, Hawaii Revised Statutes (HRS) and 40 CFR Part 61, National Emission Standards for Hazardous Air Pollutants. The site accepts both friable and non-friable asbestos containing products, primarily consisting of roofing, ceiling, siding, and insulating materials. All friable asbestos contaminated waste received at the site is managed as friable asbestos, requiring it to be double bagged or double wrapped with plastic before being delivered to the site. Asbestos waste is accepted only on Tuesdays and Thursdays with 24-hours prior notice and disposed in the Asbestos Pit, unless arrangements are made for extended delivery times. Non-friable asbestos for disposal is accepted in the Asbestos Pit as well.

***Contaminated Soils.*** Contaminated soils, primarily petroleum contaminated soils, are received primarily from site remediation projects associated with cleanup of leaks or spills from underground or aboveground storage tanks. Other contaminated soils resulting from C&D activities may be accepted, provided they are not hazardous waste or Toxic Substances Control Act (TSCA)-regulated waste. Generators must submit a Soil Profile Sheet describing the source of the material and containing analytical test results for specified contaminants.

***Solidified Liquid Wastes.*** PVT operates a contaminated soils storage and liquid waste solidification process on the ISWMF property, pursuant to its SWMP. Under the terms of the permit, soil materials resulting from mixing soils with petroleum-contaminated liquids, with liquids originating from C&D activities, or with other liquids approved by the State DOH, may be disposed in the PVT ISWMF.

***Clean Inert Waste.*** PVT accepts segregated clean loads of inert material, primarily concrete rubble, asphalt rubble, and cold-planed asphalt material. Most of these materials are stored in stockpiles until needed for on-site construction of roads, wet-weather deck surfacing, storm water management facilities, or other beneficial uses. PVT may also use inert materials in the ISWMF, as part of fire break construction between waste cells or disposed as common C&D waste. If specified by the design engineer, inert materials may also be used in structural fill in and outside the landfill footprint.

***AES Coal Ash.*** The DOH has approved the acceptance of fly ash and bottom ash from the AES Hawaii coal-fired power plant at PVT ISWMF. Ash is currently approved for beneficial use as:

- Operations Layer - Ash may be used as a substitute for soil in the protective soil layer placed above newly installed liner systems in new disposal cells.
- Fire barrier - Ash may be placed as a subsurface barrier between Phase I and Phase II, or between adjacent disposal cells in Phase II or within disposal cells. The purpose of the barrier is to limit the spread of any potential future subsurface fire to minimize potential damage to landfill liner systems. The ash is used for vertical and horizontal fire barrier layers.
- Void Space Filling – Ash may be used for void space filling for fire prevention.
- Solidification-Ash may be used in the solidification of liquids.
- Upon approval by DOH, for daily cover and interim daily cover. PVT has conducted a demonstration project and submitted a Human Health Risk Assessment for use of AES ash for daily cover, void space fill, interim daily cover and absorption of liquids.

***Excluded Wastes.*** The PVT ISWMF shall not accept municipal solid waste, commercial and industrial waste (excluding C&D waste from commercial/industrial generators), regulated hazardous waste, and TSCA-regulated PCB contaminated materials.

Excluded wastes include the following:

- Household waste, garbage, commercial solid waste or industrial solid waste as defined in HAR 11-58.1-03.
- All regulated hazardous wastes and TSCA-regulated PCB contaminated materials;
- Pesticide containers other than incidental empty small containers classified as C&D waste;
- Bulk green waste (grass, leaves, tree trimmings, etc.) or loads of land clearing debris or C&D waste containing more than 10 percent green waste.
- Whole tires (or car parts).
- Free liquids and liquids products, including paints, solvents, sealers or adhesives (liquids are accepted for solidification only);
- Asbestos waste that is not properly packaged;
- White goods except incidental appliances;
- Contaminated C&D loads;
- Lead-acid batteries

## 1.4 Material Quantities

Under the current SWMP, PVT ISWMF may accept up to 2,000 tons per day of C&D waste and 500 tons per week of ACM.

## 1.5 Source of Materials

The source of materials coming into and being sorted at the PVT ISWMF will be as stated in Sections 1.2 and 1.3 above.

## 1.6 Use and Distribution of Processed Materials and Residue Disposal

The use and distribution of the materials processed depends on the material received. Upon receipt at the scalehouse, all incoming loads are designated as either C&D waste or non C&D material for recycling. Loads are then directed to one of the following designated areas for processing and/or disposal:

- Mixed materials sorting, recycling and materials recovery area
- Bioconversion feedstock process area
- Aggregate production area
- Scrap metal storage area
- Liquid waste solidification area
- Contaminated soil storage area
- Asbestos disposal area
- C&D landfill

The use and distribution of the processed materials and details on residue disposal are described below.

***Mixed Material Sorting, Recycling and Materials Recovery.*** PVT's existing recycling and materials recovery operation consists of: (1) reclamation of the Phase I landfill; and (2) the Materials Recovery Facility (MRF). The six acre Materials Recovery Area is used to recover and recycle incoming waste streams and is the location of the MRF.

Recyclable Materials Stream - PVT recycles and/or reuses up to 80% of the C&D debris that is brought to the landfill. The major waste materials processed for recycling and reclamation include: (1) mixed C&D waste; (2) source-separated wood waste; (3) source-separated rock, concrete and asphalt rubble; (4) source-separated scrap metal; and (5) other products suitable for feedstock.

Processing - PVT directs loads that are source-separated or that contain significant quantities of recyclable materials to the recycling area for further sorting, stockpiling and/or transfer to off-site recyclers.

Directed loads of C&D debris are off-loaded in the Materials Recovery Area west of the existing MRF. An excavator sorts through the debris to remove large materials. Large pieces of metal and other recyclables are placed into bins or temporary stockpiles. Non-recyclable materials are gathered and transported to the active landfill face.

A second excavator feeds the pre-sorted C&D debris into the MRF for further sorting and processing. The MRF consists of a series of vibrating screens, magnets, and two manual sorting lines staffed by approximately 20 employees to recover recyclable materials. Metals are sorted into separate bins for off-site recycling by a permitted facility. Debris suitable for feedstock is ground and shredded into pieces of uniform size and stored until a suitable purchaser is identified (see the *Feedstock Production* Section below). Dust control measures are implemented at all stages to minimize fugitive dust generation and dispersal.

Products - The material is reused for roads, recycled as scrap metal and processed into feedstock to generate fuel and electricity. Of the 1,775 tons of material diverted each 8-hour day, approximately:

- 40 tons of metals are recycled;
- 840 tons of concrete, rock, and dirt are recycled or reused on-site; and
- 900 tons of wood, plastic, paper, and other organic materials are suitable for feedstock.

Storage – Materials are transferred from the sorting facility to storage areas as follows:

- Wood, yard waste and miscellaneous organic materials are moved to the feedstock production area or stored as described in the *Feedstock Production* Section below.
- Metals are moved to ferrous and non-ferrous storage areas. These are open bays defined by concrete blocks or K-rails, with separate bays for ferrous metal, aluminum and other non-ferrous metals or bins.
- Rock, concrete and asphalt rubble are moved to the aggregate materials process area.

Residual Wastes – Non-recyclables and minor amounts of wood, dirt and other material unsuitable for feedstock are separated from the product in the MRF. This material is either disposed in the landfill or transported to the feedstock area for primary shredding to reduce its volume.

### ***Feedstock Production.***

Feedstock Material Stream - PVT ISWMF estimates sixty percent (60%) of the total incoming material streams are suitable for reclamation and conversion into feedstock for renewable energy. PVT's existing MRF generates approximately 800-900 tons of unprocessed feedstock per day, as described above. This feedstock is woody in nature (lacking green and wet wastes) and has an uncharacteristically low moisture content of approximately 9%. This eliminates the need for energy-intensive drying and is an ideal feedstock.

Processing - The feedstock produced by the MRF may be further processed to meet the requirements of the purchaser. Per the SWMP, primary processing includes shredding with a 10 inch (in.) minus, 4 in. nominal shredder and trommel screen. Secondary processing includes a 2 in. minus, 3/8 in. nominal shredder and additional screener. Appropriate dust and environmental controls are implemented. These activities are permitted by PVT's State DOH Noncovered Source Permit No. 0651-04.

Products - PVT may use a portion of the feedstock product to feed a small on-site gasifier to power its recycling operations (see the *Small Scale Gasification* section below.

Storage - Feedstock will continue to be stored in accordance with their SWMP, Section C, Number 13 – Storage of processed feedstock. PVT will store feedstock in outdoor stockpiles with adequate environmental controls, covered containers (as described in Section 2.6.1 of the EIS) and other approved containment methods. Aboveground storage of processed feedstock is limited to 5,000 tons (includes primary and secondary shredded feedstock) and stockpile storage is limited to a 15 ft. height with 20 ft. access lanes between piles. PVT also places partially processed feedstock in Phase II of the C&D landfill for future recovery.

Residual Wastes - Once materials have been sorted from the mixed stream for feedstock production, only minimal quantities of residual waste are expected from the feedstock system.

### ***Aggregate Materials Production.***

Feedstock Material Stream - PVT ISWMF processes rock, concrete, and asphalt rubble to produce crushed aggregate materials for use in permanent and temporary landfill construction. Primary sources of these materials are land clearing and excavation, building demolition, and road/highway construction and maintenance.

Processing – Diverted rock, concrete and asphalt is directed to the aggregate production area and crushed.

Products - Typical products from the aggregate production operation include: 6-inch minus mixed rubble for use in on-site roads or structural fill; 1.5 inch minus crushed rock drainage media for landfill construction or off-site sale; 1.5 inch or 2 inch minus mixed rock, concrete and asphalt rubble for surfacing on-site roads; 1.5 inch minus mixed material for use as landfill interim cover; and scrap reinforcing steel, wire mesh reinforcing and other scrap ferrous metal. Other products may be produced in response to changing or new needs of on-site operations or off-site customers.

Storage - Separate stockpiles are maintained in this area for rock, concrete without rebar, concrete with rebar, and asphalt rubble.

Residual Wastes - Minor amounts of wood, dirt and other material unsuitable for the aggregate materials are separated from the product at the grizzly screen. This material is either disposed in the landfill or used as interim landfill cover.

**Landfill Reclamation.** C&D waste disposal operations in the Phase I area of the PVT ISWMF prior to approximately 1995 achieved low compaction densities and produced a fill that has been determined to contain substantial amounts of void spaces. As a result, the landfill has been unusually prone to subsurface fires due to the intrusion of oxygen into the void space. PVT ISWMF is authorized through its SWMP to: (1) remove previously buried debris; (2) process the debris to recover recyclable materials; and (3) replace any unrecyclable materials in the landfill.

This ongoing operation provides a number of benefits, including:

- Recovery of materials for the aggregate production and feedstock process;
- Recovery of excess soil used in the original landfill operation;
- Replacement of the removed loosely compacted fill with new well-compacted waste fill, eliminating void spaces, minimizing long-term settlement issues, minimizing the generation of landfill gases, and reducing risk of subsurface fires and associated odor issues; and
- Extension of the useful life of the C&D landfill.

Process- The landfill reclamation operation is conducted using an excavator, a bulldozer, and several dump trucks. The refuse and cover soil is excavated and loaded directly into trucks for transport to the processing area. The bulldozer pushes cover soil from the area being prepared for excavation to a stockpile, and spreads interim cover soil over areas that have been partially excavated.

Excavated material from the landfill reclamation area is delivered to the MRF for processing. If necessary, it is processed through a preliminary screen to remove excess soil before loading it to the vibrating screen and sort line. From that point the reclaimed material is processed along with other mixed material.

Products - Products recovered and produced from reclaimed landfill material include primarily: wood and other feedstock materials; rock, concrete, and asphalt paving aggregates; ferrous and non-ferrous metals; and soil.

Residual Wastes – Dirt and other material unsuitable for recycling are separated from the product through the MRF, manual sorting and/or screening. This material is disposed in the landfill or, if suitable, used as interim landfill cover.

***Solidification of Liquid Wastes.*** Liquid wastes are solidified using soils contaminated with acceptable levels of petroleum hydrocarbons. Soil is placed in the solidification cells as received. When a liquid waste is accepted for solidification, a bulldozer is used to create a shallow basin in the center of the soil stockpile. Liquid is discharged to the basin and allowed to infiltrate into the soil. After free liquid has been absorbed in the soil, the bulldozer works and mixes the soil pile to distribute the moisture as evenly as possible. The soil is allowed to dry, with additional mixing as needed. Solidified liquid-soil mixtures are disposed in the landfill or are used as interim cover soil in the landfill. There are no residual wastes from the process.

***Disposal of Asbestos Containing Material.*** ACM is accepted and managed in accordance with the requirements of State DOH SWMP and applicable regulations including Chapter 342H, HRS and 40 CFR Part 61, National Emission Standards for Hazardous Air Pollutants. Friable ACM that is double bagged or double wrapped with plastic and non-friable ACM are immediately disposed in the Asbestos Pit and covered. There are no residual wastes from the process.

***Miscellaneous Recyclables.*** Although most materials received at PVT ISWMF are in the form of mixed C&D materials, occasional loads of concentrated source-separated recyclable materials may be received under the SWMP. Examples of such materials include: tires, mattresses, carpet, and other materials with organic content suitable for feedstock. These materials are handled on a case by case basis, and may be introduced into the major reclamation processes to remove undesirable materials, reduce or classify the material by particle size, or otherwise prepare them for delivery to markets or end users.

## 1.7 Waste Management System Improvements

The current waste management system at PVT ISWMF includes the processes and materials discussed above in Sections 1.1 through 1.6. The proposed operational changes are described in this section.

***Volume.*** PVT proposes an increase of acceptable of C&D waste quantities to 3,000 tons per day, approximately 1,000 tons per day of which will be landfilled. This volume is based on the current daily average measured in tons of material landfilled, plus source separated loads for recycling. In addition, approximately, 1 to 1.5 million cubic yards of material will be excavated from Phase I of the C&D landfill and processed; 40% of evacuated material is returned to the landfill.

***Residual Waste from Renewable Energy Sources.*** PVT proposes to accept ash or slag from renewable energy sources, which is similar to AES ash in its beneficial uses. Acceptance of these materials is contingent upon testing to verify they are not hazardous wastes as defined in US Environmental Protection Agency (EPA) or Hawaii DOH regulations. PVT proposes to reuse ash from its on-site gasification facility for the beneficial purposes listed in the "AES Coal Ash" section above; contingent upon initial testing to verify it is not hazardous waste as defined in USEPA or Hawaii DOH regulations. As expanded recycling is anticipated to reduce the volume of C&D material that is landfilled, PVT proposes to accept AES ash and ash or slag from renewable energy sources as a special waste in quantities above the 20% condition of the SWMP.

***Increased Landfill Grade.*** The landfill grade follows the contours of the site, ranging from 60 ft. amsl at the makai boundary of the site to a maximum of 135 ft. amsl at the mauka portion of the PVT ISWMF. PVT's CUP, as modified, currently authorizes a maximum landfill elevation of 135 ft. amsl.

The proposed maximum permitted elevation of the landfill would be 255 ft. amsl, which represents an increase of 120 ft. above the existing maximum elevation. This is the maximum vertical limit attainable on the existing footprint of the facility. The proposed grading would primarily take place in the relatively flat top deck areas of the landfill in the mauka portion of the site. No changes in horizontal limits or boundaries are proposed.

The increased elevation and revised fill plan will add approximately 4,500,000 cubic yards of disposal capacity to the site over the remaining life of the landfill. The additional capacity gives PVT the necessary flexibility to expand the reuse, recycling, and material recovery operation and provide sufficient onsite maneuver area flexibility for the reclamation of materials from the Phase I.

PVT will also install final cover on existing perimeter refuse slopes in accordance with state and federal regulations. The final cover will include landscaping that blends landfill slopes into the surrounding scenery.

***Mixed Material Sorting, Recycling and Materials Recovery.*** PVT ISWMF proposes to expanded recycling operation to increase the facility's processing capacity, including: (1) installation and operation of an additional vibrating tapers lot screen and ten-person manual sorting line in the MRF; (2) operation of an additional excavator to sort large waste and feed the MRF; and (3) additional equipment needed to process and/or store reclaimed combustible material for feedstock, such as storage bins. The expanded recycling operations, MRF and storage bins will be located in the existing Materials Recovery Area.

***Feedstock Production.*** The expanded MRF capacity would increase PVT's recycling operations and increase the generation of feedstock from approximately 800-900 tons of feedstock per day to approximately 1,500 tons.

PVT proposes to use 40 Unit Storage Bins, or an equivalent system, to store feedstock in the Materials Recovery Area. The enclosed, steel storage bins are approximately 20 ft. long, 15 ft. wide, and 46 ft. tall and are fed by a vacuum or enclosed conveyor belt to reduce dust.

***Small-Scale Gasification.*** PVT proposes to use a modular gasification system to create syngas that will power the expanded MRF. The primary function of the gasification system is to convert the photosynthetic energy stored in biomass materials (organic materials) into a clean, synthetic fuel gas that can be converted by engines and generators into electricity.

Material Stream – A portion of the feedstock generated on-site will be diverted to the on-site gasification unit.

Process- The gasification system will consist of three BioMax® 100kWh modules that operate in tandem, or an equivalent system. The standard 20-ft. module typically includes:

- Feedstock processing and feeding
- Gas generation and cooling
- Gas filtering
- Power generation

The gasification process is fully automated and is designed to operate 24 hours a day, seven days a week. The gasifier converts biomass to a low Btu (120-160 Btu/cubic foot) syngas that consists of a mixture of energy gases including hydrogen (~17%), carbon monoxide (~20%) and methane (~8%). The balance of the syngas is mostly nitrogen. The gasifier uses a dry system to cool and remove particulates from the syngas, which is then converted to electricity by an internal combustion engine – gas is ignited in the cylinders and the crankshaft spins an electrical generator with up to 40% efficiency.

The gasification unit located in the Materials Recovery Area.

Products - The total power generation capacity of the three-module BioMax® system is 300kWh. The energy will be used on-site to power the expanded MRF. There is a potential for excess energy to be provided to Hawaiian Electric Company's (HECO) grid system during evening hours when other renewable energy production is low (i.e. solar and wind) and the demand is high. This is consistent with the 2015 updates to the State's clean energy initiative and renewable portfolio standards that set a goal of one hundred per cent renewable energy generation by 2045.

Storage –Feedstock used to feed the gasification system will be stored in Peerless 30 Unit Storage Bins in the Materials Recovery Area. The enclosed, steel storage bins are approximately 20 ft. long, 15 ft. wide, and 46 ft. tall and are fed by a vacuum or enclosed conveyor belt to reduce dust. Residual ash and char is stored in drums within the closed gasification unit.

Residual Wastes – The gasifier generates few wastes and emissions. Wet scrubbers are not used in the process, eliminating the need to dispose of large quantities of contaminated water.

Solids are automatically collected and are processed as follows:

- Ash and char are automatically extracted and stored in drums for easy handling. PVT proposes to use non-hazardous char/ash for the following beneficial uses on-site:
  - Operations layer
  - Fire barrier
  - Void space filling
  - Solidification ash for the solidification of liquids
  - Daily cover and interim daily cover, if approved.
- Expended dry fabric filters are stored and periodically combusted (CPC, 2014b).

The proposed gasification system is a closed system with no exhaust except for the internal combustion engine. No flue or smoke stack is needed. Syngas generates very low levels of tar, < 1 ppm particulates, nitrogen oxide, carbon monoxide and volatile organic compounds compared to fossil fuel combustion.

***Solar Power Production.*** PVT is evaluating two possible types of solar photovoltaic (PV) systems to install on closed portions of the landfill: (1) traditional silicon PV panels on mounted racks and (2) dual-purpose geomembrane with integrated thin film PV. A brief description of these PV technologies and auxiliary facilities are described below.

Process- PVT proposes to install and operate a two acre solar array on closed areas of the landfill.

A typical PV system is made up of several key components including:

- PV Modules – PVT is evaluating two potential PV modules: crystalline silicon solar cells and combined flexible geomembrane and thin film PV technology.
- Inverter – Inverters convert DC electricity from the PV array into AC and can connect seamlessly to the electricity grid. Inverter efficiencies can be as high as 98.5%. Safety features are built into all grid-connected inverters in the market, which sense the utility power frequency and synchronize the PV-produced power to that frequency.
- Balance-of-System Components – Balance-of-system components include mounting racks and hardware for the modules and wiring for electrical connections.

Traditional solar cells are made from silicon, which is abundant and nontoxic, and has been demonstrated as a consistent and high-efficiency technology. Silicon modules have typical power-production warranties in the 25-30 year range but can continue producing energy beyond this timeframe. Anchored racks secure the panels to the side of the landfill and angle panels at the necessary 10o angle.

The combined flexible geomembrane and thin film PV technology is a dual-purpose system used to close unused portions of the landfill and generate solar energy. The geomembrane is made of thermoplastic polyolefin, similar to the material used on commercial white roofs, and contours to the shape of the landfill. Flexible 144-watt solar PV panels are factory bonded to the geomembrane, unrolled on-site, and welded together into a solid cover. The PV panels are Teflon-coated, durable enough to walk on, and connected by a wire to inverters that send the surplus solar energy onto the grid.

Products - Output per acre varies greatly depending on the type of collector and the location of the solar array. Output ranges from approximately 900-1,600 kW per acre, with the greatest efficiency obtained by panels facing true south. The energy will be used on-site to power the expanded MRF. There is a potential for excess energy to be provided to HECO.

Location/ Storage – Two alternative sites are proposed and were specifically sited interior of the PVT ISWMF at maximum practicable distance from residential neighborhoods. The first location is along the southeast facing slopes of the landfill along Lualualei Naval Road. The second location is at lower elevations on the northern slope of landfill Cell 9B. Located at the mauka portion of the site near the materials recovery area, the panels would be angled towards the south, away from farms and residents located west and north of the Project Site. The inverter will be located on a concrete pad in the Materials Recovery Area. The exact location and size of the solar array would be designed to maximize efficiency and minimize potential visual impacts to neighboring properties and air navigation.

Residual Waste – The PV system does not generate residual wastes.

### 1.8 Environmental Cost/Benefits of the Proposed Action

The proposed PVT ISWMF process modifications would continue the existing permitted C&D landfill operations and increase reclamation, recycling and renewable energy generation activities for an overall benefit to the environment. The environmental benefits include:

- More material (approximately 80% of the incoming material stream (C&D and other)) will be diverted from landfill disposal to recycling. Recycling and reclamation of solid wastes and producing feedstock for alternate energy generation provides an added benefit in that it recycles materials for reuse, reduces materials to be landfilled, provides a feedstock for production of energy for local consumption; thereby, reducing the island's dependence on fossil fuels.

- Landfill disposal will be limited to residual non-recoverable waste materials, including primarily composition/asphalt roofing shingles, tile, gypsum board, lead painted concrete, and cementitious siding. It is estimated that non-recoverable residual waste will be less than twenty percent (20%) of the sorted C&D stream. C&D material is notably dry and generally inert. Based on a review of material characteristics, it has been determined that C&D material creates no significant odor issue and its potential for creation of leachate is low.
- Previously landfilled C&D waste will continue to be reclaimed to recover material for aggregate production and feedstock, to minimize the potential of fire and associated odor issues, to minimize long-term settlement issues, to minimize leachate potential, to minimize the generation of landfill gases, and to remove voids.
- PVT ISWMF continued operation and increased capacity minimizes the risk of unauthorized dumping of clearing, grubbing, demolition, and construction waste material would occur, creating unsanitary conditions, habitats for vectors, and adverse public health impacts.
- Expanded MRF operations would provide approximately 27 new full and part time jobs, for which Waianae Coast residents will get priority.
- The renewable energy generated will support the State's goal of 100% renewable energy production by 2045. Energy would be generated and used onsite to support ongoing PVT ISWMF operations. Existing onsite power generators would retired and used in emergencies only. Excess power generation would be available to the HECO distribution system for use in the evenings, during peak consumer demand. The generation of feedstock in excess of what is used onsite would be available to other renewable energy producers.
- The landfill continues to reclaim areas for near-term economic productivity and social benefit and long-term beneficial reuse potential.

The environmental costs of the C&D ISWMF existing and proposed use will continue to be avoided and minimized through implementation of operations and management plans, and adherence to permit conditions. Specifically, the stormwater, leachate, dust, and erosion management plans are designed and implemented to effectively minimize environmental costs. Unavoidable impacts are described in Section 2.

### 1.9 Impacts on Current and Future Land Use

There would be no horizontal expansion or change in land use designations. The site is designated as Urban under State Land Use classification and zoned as Agricultural by the City and County of Honolulu (City). Once the C&D landfill reaches capacity, the land can be used as open or recreational space or for light industrial that are compatible with the City Land Use Ordinance and the Waianae Sustainable Community Plan.

## 2.0 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

### 2.1 Air Emissions

Section 3.7 of the EIS, Air Quality, describes historic air quality at the Project Site and assesses potential health impacts of fugitive dust on residents downwind of PVT operations, including dust concentrations (i.e. TSP, PM10 and PM2.5) and potentially harmful contaminates (i.e. metals). This section summarizes the findings of several air quality studies, including:

- Air Monitoring, PVT Land Company, Monthly Summary Reports, November 2009 through November 2010 (Morrow, 2010);
- Baseline Air Monitoring, PVT Land Company, Airborne Metals Analysis, October-November 2010 and May-June 2011 (Morrow, 2011a; Morrow, 2011b);
- Human Health Risk Assessment of Fugitive Dust and Surface Soils, PVT Landfill, June 2005 (AMEC Earth and Environmental, Inc. [AMEC], 2005);
- PVT Landfill, Human Health Risk Assessment of AES Conditioned Ash, February 2010 (AMEC, 2010);
- PVT Landfill, Limited Human Health Risk Assessment, Construction Debris Recycling, July 2010 (Environmental Risk Analysis LLC, 2010);
- PVT Landfill, Human Health Risk Assessment, Construction Debris Recycling and Material Recycling Facility, April 2015 (Environmental Risk Analysis LLC, 2015) (EIS Appendix C);
- Nanakuli Dust Study Technical Evaluation and Recommendations, December 2011 (Tetra Tech EM Inc., 2011); and
- Air Quality Impact Report, Proposed Operations Expansion PVT Integrated Solid Waste Management Facility, June 2015 (Morrow, 2015) (EIS Appendix D).

Cumulatively, these studies conclude that air emissions from PVT ISWMF are in compliance with National and State Ambient Air Quality Standards.

The process modifications are not anticipated to significantly alter air quality. The expanded recycling operations would increase traffic to the site from 200 to 300 trucks per day. The average daily traffic volume on Lualualei is 8,950 vehicles per day. The projected 300 total trucks per day are approximately 3% of the total vehicles on Lualualei Naval Road. This is not anticipated to significantly increase the amount of fugitive dust on the road. Once on-site, the dust controls measures will minimize fugitive dust.

The proposed gasification system is a closed system with no exhaust except for the internal combustion engine. Syngas generates very low levels of tar, particulates, nitrogen oxide, carbon monoxide and VOCs compared to fossil fuel combustion, which is currently used to power recycling operations.

The proposed photovoltaic system would replace the existing fossil-fuel powered generators at the existing MRF and avoid the use of generators for the expanded MRF. The result would be an overall beneficial reduction of exhaust emissions that result from power generation.

As described in Section 5.3.2 of the PVT Operations Plan, PVT implements best management practices (BMPs) to minimize dust per HAR §11-60.1-33(a), including:

- Paving and regularly cleaning permanent access and haul roads;
- Regular water truck spraying to unpaved roads and any disturbed surfaces that could be subject to dust generation;
- Applying water before and after placement of debris in the active landfill face to minimize dust generation and promote compaction;
- Landscaping of closed portions of the landfill area;
- Maintenance of a green belt in the 750 ft. buffer zone along the makai property boundary;
- Regularly applying soil cement to unused portions of the landfill area;
- Covering moving, open-bodied trucks transporting materials which may result in fugitive dust; and
- Covering or otherwise treating stockpiled materials or other surfaces which may result in fugitive dust.

Mitigation measures are necessary if the process modifications causes the discharge of visible fugitive dust beyond the property lot line on which the fugitive dust originates (HAR §11-60.1-33(b)). Site operations will enhance dust control programs as needed to maintain compliance with permit conditions relative to dust.

## 2.2 Leachate Generation

The leachate management system is described in the PVT Operations Plan, Section 4.4.6. The process modifications would not impact leachate generation or management.

## 2.3 Drainage

The site's stormwater management system (see Attachment P-1, Figure 3) is designed and constructed to manage runoff from a 25-year, 24-hour storm. Runoff is collected in a system of surface ditches, channels, pipes and ponds designed by PVT's engineering consultants. As designed, the system will carry runoff from the design storm without flooding or excessive erosion from the site, and will retain a significant volume of water to minimize off-site runoff impacts and allow sediment in the runoff to be intercepted and removed before discharge from the site.

Stormwater drainage leaving the site comes from areas containing no disposal material. In accordance with PVT's National Pollutant Discharge Elimination System (NPDES) permit (File No. HI R50B841) with the DOH Clean Water Branch, stormwater leaving the site is sampled annually, and the provisions of PVT's Storm Water Pollution Control Plan are followed. The drainage area usually dries up a couple of days after the rainfall event due to arid climate conditions. PVT has and will continue to have a NPDES general permit.

A small portion of the western side of the landfill is located adjacent to the flood limits for the Ulehawa Stream, according the Federal Emergency Management Agency (FEMA) Maps. Proper precautions have been taken to ensure that the potential flood areas are protected from erosion using rip rap in erosion-prone areas.

The process modifications would not adversely impact the existing stormwater management system.

## 2.4 Vector Problems

Vector control is addressed in Section 5.3.8 of the PVT Operations Plan. Since the facility accepts primarily inert materials, PVT ISWMF does not attract significant numbers of flies, rodents, birds or other pests. Proper application of cover material discourages use of the site by vectors. Equipment operators, spotters and other ISWMF personnel are directed to report to supervisors any sighting of rodents or other mammals, or unusual concentrations of insects or birds. A quarterly comprehensive site inspection includes checks of the active disposal area for the presence of vectors.

The process modifications would not impact vector control and additional BMPs are not warranted.

## 2.5 Fires

Surface and underground fires are addressed in Section 5.3.4 of the PVT Operations Plan. PVT ISWMF has developed a detailed Emergency Fire Plan that establishes detailed procedures for preventing surface and subsurface fires at the landfill, and for responding to fire incidents if they occur.

The process modifications would not impact fire management or risk.

## 2.6 Waste Storage and Processed Residue Disposal

Materials storage areas and residual waste disposal at the PVT ISWMF include the following:

- Wood, yard waste, miscellaneous organic materials and reclaimed organic material will be converted to feedstock. Temporary feedstock stockpiles will be monitored and turned as necessary to ensure against spontaneous combustion, or stored in covered bins.
- Metals will be stored in the ferrous and non-ferrous metal storage area in open bays defined by concrete blocks or K-rails, with separate bays for ferrous metal, aluminum, and other non-ferrous metals.
- Rock, concrete, and asphalt rubble will be stored in the aggregate materials process area in separate stockpiles for rock, concrete without rebar, concrete with rebar, and asphalt rubble. Aggregate material stockpiles will be maintained in a neat and orderly condition to facilitate placement and removal of material, and minimize undesirable mixing of different mixes and types of material.
- Areas used for storage of contaminated soils and solidification of liquid waste are lined using a combination of compacted soil and geomembrane liner material. From bottom to top, these areas are lined as follows:
    - Graded, moisture conditioned and compacted natural clay subgrade;
    - 40-mil HOPE geomembrane liner;
    - One-foot thick compacted clay liner using on-site clay materials; and
    - One-foot thick soil cement wearing layer, which is renewed periodically to maintain a 12-inch thickness and durable surface.
- Residual waste will be transported either directly to the C&D landfill disposal area, or to the feedstock area for primary shredding to reduce its volume prior to disposal. Non-hazardous char/ash from the gasification system is proposed for use on-site for beneficial uses.

## 2.7 Emergency Operating Procedures

The PVT Operations Plan, Section 5.4 details procedures to be undertaken in response to various emergencies such as fires, severe storms, earthquakes, hazardous material spills, and injury accidents. The procedures were developed to assure a quick response to an emergency and minimize detrimental environmental impacts. The emergency response procedures, as well as the overall landfill operation procedures, were prepared with the interest of maintaining the public health and safeguarding the environment while reclaiming quarry areas.

The process modifications would not impact emergency operating procedures.

## 3.0 ALTERNATIVES TO THE PROPOSED ACTION

Currently, there are no other permitted C&D landfills on Oahu. The only alternative for disposal of C&D materials accepted at PVT ISWMF would be to create another C&D landfill on Oahu or ship wastes to disposal facilities off island. Shipping materials off island would be cost prohibitive. Creating another landfill would be possible, but impractical considering the historical use of the PVT site. The best approach is to maximize the capacity of the existing C&D landfill.

An alternative to PVT ISWMF's process modifications to increase recycling and reclamation efforts and to provide feedstock for renewable energy would be to continue landfilling these materials. PVT is prepared to invest in equipment and labor to sort and process material that is currently being disposed of in the landfill. Recycling, reuse, and renewable energy uses are environmentally preferable to landfilling and provide a greater benefit to the community and economy. Therefore, the landfill alternative will be limited to only those materials that cannot be recycled, reused, or processed into feedstock.

Given the alternative, PVT ISWMF's process modifications to increase recycling and reclamation efforts, generate feedstock for renewable energy, increased landfill capacity and using of the landfill for only those materials that cannot be recycled, reused, or processed into feedstock is the Best Practical Technology.

## 4.0 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Currently, the entire island of Oahu depends on PVT ISWMF to manage C&D waste. Continued recycling and additional landfill capacity is needed to manage C&D debris on the island to reduce illegal dumping in rural areas, support the construction industry, and handle disaster debris.

The process modifications would continue to maintain and enhance the long-term utility of recycling C&D materials to maximize the efficiency (long-term productivity) of the existing landfill. PVT's Operations Plan and permit conditions outline the BMPs required to avoid and minimize the environmental impacts of the short-term use.

The proposed grading will provide additional landfill capacity of approximately 4,500,000 cubic yards over the remaining life of the landfill. The existing and new operations maximize the use of the landfill by diverting materials from the landfill and reclaiming landfilled materials. This will allow PVT to extend the capability for Oahu to dispose of non-hazardous non-recyclable C&D debris in an environmentally responsible way. In addition to increasing the capacity of the facility, there are socioeconomic benefits of the

PVT ISWMF associated with the creation of local jobs, contributions to the local economy and ongoing charitable giving to community organizations and schools.

While the process modifications will increase the lifespan of PVT ISWMF, the Project Site will be available for other productive uses once the facility is closed.

A Closure Plan has been prepared for the facility. This Plan states that the site will be sealed with a layer of low permeability soil material, with long-term groundwater monitoring. The Closure Plan was developed to mitigate the long-term effects of pollutants leaching from the site and assure monitoring of the affected environment. The historic use as a quarry and ongoing use of the land as an ISWMF does preclude some non-industrial future uses of the property. There are many options for beneficial reuse of the site once it is closed. The community would have an opportunity to comment on the long-term reuse and productivity of the site.

## 5.0 ANY IRREVERSIBLE AND IRREVERTABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IF THE PROPOSED ACTION IS IMPLEMENTED

Irreversible or irretrievable commitments of resources involved in continuing the C&D ISWMF include: land for the ISWMF; labor, equipment and fuel for ongoing operations; topsoil for landfill cover material and PVT's financial commitment to operate the ISWMF in an environmentally responsible manner.

Site preparation and development for the expanded recycling and renewable energy components of the project will utilize fiscal, manpower, material and energy resources for purposes of planning, engineering, design, construction, and operation and maintenance. However, these expenditures are offset by the increase in jobs, renewable energy, and recycled materials.

The Operations Plan outlines the BMPs required to avoid irreversible and irrevertable impacts to environmental resources and each BMP has a financial cost associated with it. Overall, the recycling, reuse and renewable energy objectives of the ISWMF are specifically designed to maximize the reversible and revertable commitments of spent resources transforming them into new resources.

## 6.0 OPTIMUM BALANCE BETWEEN ECONOMIC DEVELOPMENT AND ENVIRONMENTAL QUALITY

The process modifications and continuing use of the PVT ISWMF promote an optimum balance between economic development and environmental quality because:

- The generators of C&D materials have a viable, economical, and proper recycling and disposal option.

- PVT ISWMF provides an economical recycling and disposal option that ensures the maintenance of environmental quality through the proper handling of these materials.
- The C&D materials are being processed for recycling or disposed at an existing solid waste facility; there is no reduction in environmental quality at the PVT ISWMF due to the permit renewal and process modifications.
- The process modifications enhances environmental quality because more material is being recycled or reused and the remaining material to be landfilled is relatively inert, resulting in little environmental impact.
- Producing feedstock for renewable energy instead of landfilling these materials improves environmental quality by reducing the amount of material to be landfilled and by providing an energy alternative to burning fossil fuels.
- The economic benefits are shared by the community through job creation and philanthropy.

## 7.0 CONSISTENCY WITH THE STATE INTEGRATED SOLID WASTE MANAGEMENT ACT (HRS 342G) AND THE COUNTY'S APPROVED INTEGRATED SOLID WASTE MANAGEMENT PLAN

The recycling and reclamation process modifications and continuing use of the PVT ISWMF is consistent with the State Integrated Solid Waste Management Act and the County's Approved Integrated Solid Waste Management Plan (ISWMP), as highlighted below:

- The State Integrated Solid Waste Management Act, HRS 342G, states that:

  > "The Department and each county shall consider the following solid waste management practices and processing methods in their order of priority:
  > (1) Source reduction;
  > (2) Recycling and bioconversion, including composting; and
  > (3) Landfilling and incineration." (HRS 342G-2)

  PVT ISWMF ongoing operations and planned process modifications are consistent with these goals.

- The State's Hawaii 2000 Plan for Integrated Solid Waste Management (July 2000) states that C&D makes up a significant proportion of the waste stream in Hawaii. Studies show that up to 80 percent of this waste could potentially be diverted from landfills, depending upon the nature and location of the construction site. The Plan states that C&D waste diversion clearly merits investigation for reuse, increased recycling, and reduced landfilling in Hawaii. The Plan further states that the C&D stream includes many recoverable items with potential market value; thus, efforts should be made to recover these potentially marketable items. Specifically, the Plan recommends the following:

1. Encourage diversion of these materials by the construction industry.
2. Support growth and development of businesses recovering C&D materials.
3. Discourage disposal of C&D wastes.
4. Use government to take a leadership role in modeling best practices and creating partnerships to promote C&D materials recovery.
5. Conduct further study of treated wood.

PVT ISWMF's planned process modifications are in line with the plan recommendations to divert C&D wastes for reuse, increase recycling, and reduce landfilling in Hawaii.

- In October 2008 the City and County of Honolulu prepared an Integrated Solid Waste Management Plan Update. The primary objective that was used to design an integrated solid waste management system for the City was to maximize the recovery of solid waste through reuse, recycling, composting, and energy conversion, in order to minimize the amount of waste that requires landfill disposal. PVT ISWMF's process modifications are consistent with these objectives.

  In addition, the Plan Update stated that the City will continue to direct C&D material to the PVT landfill for disposal. Having an aggressive program to divert as much of the C&D material as possible is an important management strategy for the City. The Plan Update further states that because of the adequacy of the PVT disposal option, the City has banned the disposal of C&D materials at its facilities. Disposal of asbestos at PVT is also part of the City's Plan Update. Another key component of the City's proposed solid waste management system is to reduce dependency on fossil fuel, which PVT's production of feedstock for renewable energy will help implement.

## 8.0 PUBLIC INPUT RELATING TO THE IMPACT OF THE FACILITY ON PUBLIC HEALTH AND THE ENVIRONMENT

PVT works closely with the community to discuss any concerns they may have. Residents are invited to tour the ISWMF and talk directly with the management staff. PVT continues to pursue new ways to address public concerns.

In addition, the Environmental Impact Statement had public involvement requirements. In preparation of the permitting process, PVT developed a rigorous early consultation and community engagement program. The program included frequent engagement with federal, state and county agencies, community leaders, adjacent property owners, and other interested individuals and organizations via direct mail/email, the PVT ISWMF website, social media, and in-person meetings. This included a "talk story" session prior to publication of the Draft EIS and a neighborhood board presentation (Nanakuli-Maili), in which community members voiced questions and concerns regarding the Proposed Action. As a result of PVT's ongoing efforts to engage the community, the Nanakuli-Maili Neighborhood Board voted 8 to 1 in support the project.

# ATTACHMENT P-3

# ATTACHMENT P-3
# SITE ANALYSIS, FACILITY DESIGN, OPERATIONS PLAN AND GROUNDWATER MONITORING PLAN
# CONSTRUCTION & DEMOLITION WASTE LANDFILL FACILITIES
# SOLID WASTE PERMIT APPLICATION

Submit a Site Analysis, Engineering Report, Operations Plan and Groundwater Monitoring Plan for the facility. Any information requested below that is not applicable should be justified.

1. **Site Analysis.** Submit a site analysis of the facility demonstrating that the landfill is not or will not be constructed in an environmentally inappropriate location. At a minimum the following topics shall be addressed: floodplains, wetlands, fault areas, unstable areas, and areas near potable water supplies.

2. **Facility Design (Engineering Report).** Submit an engineering report that describes the basis of design, with supporting engineering calculations, construction drawings and specifications. The engineering report, and construction plans and specifications shall be prepared under the supervision of a professional engineer licensed in the state of Hawaii. The engineering report should document that the facility design meets the requirements of HAR 11-58.1-19 and includes at a minimum discussions of the following:

   a. A general description of the facility, including site description; site utilization; proposed size, capacity, estimate life, and disposal rate of the landfill; types of waste to be accepted; landfill user population; vehicle access, and other relevant design concepts.

   b. Landfill grades. Discussion should include proposed side slopes, landfill stability, and fill sequencing.

   c. Liner and leachate collection system, including subgrade preparation and operations layer design that meets the requirements of HAR 11-58.1-19(c). The liner and leachate collection system design shall be based on the hydrogeological and climatic conditions of the site. Provide detailed information regarding the hydrogeological and climatic conditions of the site, and leachate generation and liner performance modeling to support the proposed design. Please be aware that the department will require the collection of climatic data to validate leachate generation models.

   d. Leachate and surface water management systems. Discussion should include how the collected leachate will be managed. Surface water management systems should be designed and constructed to prevent surface water flow onto the active protion of the landfill during the peak discharge from a 25-year storm, and to collect and control surface water from the active portion of the landfill from a minimum 24-hour, 25-year storm event.

3. **Operations Plan.** Submit an operations plan that provides detailed procedures for landfill operators that complies with the requirements outlined in HAR 11-58.1-19. At a minimum, the Operations Plan shall contain the following elements:

   a. General site description and operation, which shall include information on the location, size, elevation and waste limits of the facility; types of and quantities of waste accepted and received per day; users of the facility; description on the overall utilization of the site; traffic flow, unloading procedures, and method of operation at the landfill; and discussions on the climate and site conditions.

   b. Equipment and personnel requirements should be detailed to include the number and type of equipment and the personnel with their respective titles needed to operate the facility at nominal and peak disposal rates. The facility shall have a Site Manager and Environmental Compliance Officer who should be identified by name and their duties described. Describe the types of annual training provided to all employees.

c. Hazardous and non-C&D waste exclusion and special waste screening program. The screening program shall identify procedures and personnel responsible for identifying hazardous waste, non-C&D waste and special waste, by testing or reviewing data submitted by waste generators, and/or visually at the workface. The screening procedures should discuss the use of signs, transporter notices, pre- and post-load receipt screening methods and management of detected unacceptable waste.

   The hazardous waste exclusion program shall exclude and properly manage regulated hazardous waste (defined by 40 CFR Part 261, HAR 11-261), and regulated TSCA waste (defined by 40 CFR Part 761). The landfill shall also exclude the acceptance of waste that does not meet the definition of C&D waste as defined in HAR 11-58.1-03, but may accept friable asbestos containing material provided that it complies with the latest 40 CFR Part 61 regulations and non-hazardous/non-TSCA petroleum contaminated soil in accordance with HAR 11-58.1-19(d).

   The program should also specify special handling procedures for identified special wastes, which include and are not limited to the following waste subgroups:
   (1) Asbestos (procedure should be in accordance with 40 CFR Part 61);
   (2) Petroleum and other contaminated soils;
   (3) Petroluem fuel contaminated debris;
   (4) Sandblast grits;
   (5) Paint waste from removal, construction and demolition;
   (6) Treated poles and lumber;
   (7) Empty containers;
   (8) Other contaminated solid waste that are non-hazardous, non-TSCA regulated waste.

d. Greenwaste diversion and exclusion program. Submit a plan to ban or require source separation of green waste from entering the landfill. If, based on data submitted, 75% of all commercially generated greenwaste and 50% of all residential green waste are not achieved, then all commercial and residential greenwaste shall be banned for the landfill.

e. Liquids restrictions. In accordance with HAR 11-58.1-19(d), liquid wastes are restricted from disposal. Liquid waste is waste that contain free liquids as defined by Method 9095, Paint Filter Liquids Test, described in EPA publication SW-846. Explain the procedures that will be taken to ensure liquid wastes are not accepted.

f. Temporary storage and final disposition of unacceptable items may be provided at the facility. Discuss whether temporary storage will be provided, for what types of waste, the maxiumum capacity and duration of the storage, how the waste will be stored, and the final disposition of each type of waste stream.

g. Cover material requirements of HAR 11-58.1-19(d) requires the placement of a minimum six inches of earthen material as interim cover. The department currently requires the placement of interim cover whenever the surface area of the workface is approximately one acre in size or once a week, whichever comes first. Explain the source of interim cover material, and the means to ensure adequate quantity and placement of interim cover material.

h. Disease vector control. The landfill shall provide measure to evaluate, prevent or control on-site populations of disease vectors and minimize nuisance conditions. Identify the equipment and methods to be used.

i. Access control shall be provided to control public access, prevent unauthorized vehicular traffic and illegal dumping of wastes. Explain how facility access will be controlled.

j. Stormwater management systems should be maintained to prevent surface water flow onto the active protion of the landfill during the peak discharge from a 25-year storm, and to collect and control surface water from the active portion of the landfill from a minimum 24-hour, 25-year storm event. Provide designs drawings, a waste sequencing plan, and written procedures to ensure these control systems are properly designed, constructed and maintained. The applicant is responsible for obtaining permits and maintaining compliance with any state or federal clean water regulations. Explain whether the landfill is required to meet any requirements of state or federal clean water regulations and generally what procedures and/or structures will be utilized to ensure compliance with these requirements.

k. Leachate collection systems should be monitored and maintained to ensure proper operation. Explain the monitoring and maintence procedures, including frequency, that will be utilized. Discuss the testing, handling and disposal of any collected leachate.

l. Litter control mechanisms shall be designed and implemented to minimize free litter in the landfill and prevent its occurrence beyond the property line of the facility. Identify methods and equipment to be utilized. At a minimum, explain the:
   1. Design and use of any litter containments and collection system, and
   2. Procedures for litter prevention and cleanup during the course of a normal workday, and in the event of a major windstorm or other incident in which litter escapes the litter containment systems.

m. Mud and dust prevention program that minimizes the tracking of mud onto public roads, and the generation of dust from vehicular traffic and landfill operations, shall be developed. The program should contain measures related to on-site road maintenance and cleaning, wet-weather disposal area, and truck washdown or truck wheel cleaning area to remove mud prior to leaving the site. Possible methods include rumble strips, drive-through tire wash, trash clean-out pad or wash pad. Describe the method(s), equipment and procedures that will be utilized to prevent off-site tracking of mud and the generation of dust.

n. Odor control program that details procedures for monitoring, documenting, and mitigating odors at the landfill should be developed. Explain the procedures and equipment that will be used to prevent and mitigate odors at the landfill.

o. Emergency operating procedures should be prepared for the following minimum situations:

   1. Above ground fires,
   2. Below ground fires,
   3. Rain and inclement weather, and
   4. Hazardous material spills.

   Explain the procedures that will be followed to prevent and respond to these situations, including emergency contact names and numbers. If these procedures requires the use of equipment or supplies, discuss the availability of these equipment/supplies and maintenance of such equipment to ensure its proper function. Discuss how explosive gases will be monitored and controlled.

r. Recordkeeping requirements. The facility is required to maintain daily operating records. At a minimum, these records shall include the volume or weight of each type of waste received, rejected, and/or disposed; the source of waste; the number of vehicles disposing of waste; the name of the transporter; the management of the accepted waste if required special handling; quantities of leachate generated and how it was disposed; and major incidents, such as fires, explosions or heavy rain conditions, and procedures taken. Discuss how this information will be collected and maintained. An annual report summarizing this information will be required to be submitted to the department. In addition, quarterly reporting with solid waste disposal surcharge payments in accordance with HRS 11-342G-62, is required.

4. **Groundwater Monitoring Plan**. Submit a groundwater monitoring plan that provides detailed procedures that complies with the requirements outlined in HAR 11-58.1-19 and the *Hawaii Landfill Groundwater Monitoring Guidance Document*, dated September 2002. The guidance document may be found at http://www.state.hi.us/health/environmental/waste/sw/index.html. The groundwater monitoring plan should be prepared by a qualified groundwater scientist. The plan shall clearly describe and justify the validity of the monitoring well network, including the number of wells, locations and depths; monitoring well construction; boring log for each montoring well; provisions for well head protection and security; and the basis for justifying that the system is representative of groundwater quality.

   The plan shall also describe the monitoring programs and corrective action steps. The monitoring programs shall include specific procedures to be followed, including by not limited to, sample collection, sample preservation and shipment, list of analytes, analytical procedures, chain of custody control, quality assurance and quality control, sample frequency, result validation, result evalution and statistical assessment. The corrective action plan shall include but is not limited to procedures relating to notification, selection of remedy, schedule, and financial assurance mechanisms for corrective action.

# ATTACHMENT P-3
# SITE ANALYSIS, FACILITY DESIGN, OPERATIONS PLAN AND GROUNDWATER MONITORING PLAN CONSTRUCTION & DEMOLITION WASTE LANDFILL FACILITIES
***PVT Integrated Solid Waste Management Facility***
***Solid Waste Permit Renewal***

## 1.0 SITE ANALYSIS

PVT ISWMF is not located in an environmentally inappropriate location. The following required topics are addressed: floodplains, wetlands, fault areas, unstable areas, and areas near potable water supplies.

### 1.1 Floodplains

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map identifies the Project Site as lying within Zone X, Zone AE and a floodway (Hawaii National Flood Insurance Program [NFIP], 2014) (Figure 3-8). These zones are defined by the Hawaii NFIP, as follows:

- Zone X - An area determined to be outside of the 0.2% annual chance floodplain.
- Zone AE – The flood insurance rate zone that corresponds to the 100-year floodplains.
- Floodway - The channel of a stream plus any adjacent areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

Ulehawa Stream, i.e. floodway, is in the upper reaches of Lualualei Valley and intermittent in the lower part of this valley. Recently, the makai section of this stream was replaced with a concrete drainage channel designed to handle a 100-year storm. The threat of flood hazard was reduced by this measure. No site development or operations will occur within Ulehawa Stream.

### 1.2 Wetlands

No wetlands occur on the site. Ulehawa Stream borders PVT ISWMF to the west. Ulehawa Stream is an intermittent drainage path for the Ulehawa watershed and discharges to the ocean approximately 1,600 ft. southwest of the site. No site development or operations will occur within Ulehawa Stream.

### 1.3 Fault Areas

No known fault zones have been identified on or near the landfill site.

### 1.4 Unstable Areas

The PVT site is not on or near unstable areas as defined by HAR 58.1-03 (poor foundation conditions, areas susceptible to mass movement or Karst terrains).

The USGS International Building Code (IBC) rates seismic hazards in six seismic zones. These zones are rated from Seismic Zone 0 to 4, with 0 being the lowest level for potential seismicinduced ground movement. Oahu is classified as Seismic Zone 2a, defined as having a 10% probability of exceeding a peak ground acceleration of 0.15 g in 50 years. USGS earthquake hazard maps estimate the peak horizontal ground acceleration in western Oahu to be 0.25 g with a 2% probability of occurrence in 50 years. A probability of exceedance of 2% in 50 years is approximately equivalent to an event occurring one time in 2,400 years.

Although this is an unlikely event, PVT ISWMF is designed to withstand the maximum horizontal acceleration due to an earthquake. The static and seismic stability analysis conducted as part of the original PVT ISWMF engineering design demonstrates that the containment structures of the landfill are designed to withstand such an event.

### 1.5 Potable Water Supplies

A Geology, Hydrogeology, and Water Quality Assessment (Juturna LCC, 2015) was conducted for the PVT ISWMF as part of their 2015 Environmental Impact Statement. PVT ISWMF is not sited on or upgradient of potable water supplies.

According to the aquifer identification and classification for Oahu (Mink and Lau, 1990), three aquifers occur in the vicinity of the Project Site: Aquifer 30302116; Aquifer 30302122; and Aquifer 30302112. All three aquifers are classified within the Lualualei Aquifer System of the Waianae Aquifer Sector.

West of Lualualei Naval Road, PVT ISWMF is underlain by two aquifers: a sedimentary caprock aquifer and a volcanic aquifer.

- Aquifer 30302116 – Underlays PVT ISWMF, west of Lualualei Naval Road. It is an unconfined basal aquifer that is weakly influenced by tidal fluctuations. It is currently used for purposes other than drinking water, such as irrigation or industrial purposes. The aquifer is not classified as ecologically important and salinity is moderate (1,000-5,000 milligrams per liter (mg/l) of chloride). The aquifer is also classified as irreplaceable and highly vulnerable to contamination. Based on measurements taken from the groundwater monitoring wells at PVT ISWMF, the water level or head in this aquifer is approximately 1-3 ft. amsl (approximately 30-70 ft. below the ground surface).
- Aquifer 30302122 - Occurs within volcanic rocks directly beneath Aquifer 30302116 at depths on the order of 300 ft. It is confined by the sedimentary materials lying above it, and contains dike-impounded basal water. The aquifer is not currently used; however, it does have potential for use as a source of non-drinking water. The salinity of this aquifer is moderate (1,000 -5,000 mg/l chloride) and the aquifer is not classified as ecologically important. This aquifer is classified as replaceable with a low vulnerability to contamination.
- Aquifer 30302112 - Occurs beneath the undeveloped property east of PVT ISWMF and along the upper slopes of Puu Heleakala. This aquifer is a basal aquifer, which means that fresh water is in contact with sea water. The aquifer is unconfined, where the water table is the upper surface of the saturated aquifer, and the aquifer occurs in volcanic rocks within compartments formed by dikes. This aquifer is classified as having potential

use but not as a source of drinking water, nor is it considered ecologically important. The aquifer is classified as having a moderate salinity (1,000-5,000 mg/l chloride). The aquifer is also classified as replaceable with a high vulnerability to contamination since there is no overlying aquifer. PVT ISWMF's well PW-1 is located in this aquifer. Based on measurements taken at well PW-1, the groundwater surface is 132 ft. below the ground surface at an elevation of approximately 4 ft. amsl.

Figure 2 in Attachment P-1 shows the locations of groundwater withdrawal wells in the vicinity of the PVT ISWMF property that are registered with the DLNR, Commission on Water Resources Management and the locations of PVT ISWMF's monitoring wells. Based on information provided by DLNR (2008), no drinking water wells are located on, downgradient of, or within one mile of the subject property. The closest drinking water well is located more than one mile northwest and upgradient of the site. Wells in the site vicinity are used for irrigation, industrial purposes, or are currently sealed or unused (DLNR, 2008). Table 1 provides information on registered wells within 1000 ft. of the site.

The City Board of Water Supply (BWS) also defined a "pass/no pass line" in the 1970s to regulate ground disposal of wastewater and other sources of contamination. "Pass" zones are where sedimentary caprock is thick enough to prevent contaminants from leaching into the underlying basalt, and "no pass" zones are where certain types of facilities are restricted.

DOH also has Underground Injection Control (UIC) regulations that are intended to protect the state's potable groundwater resources from pollution by subsurface wastewater disposal. The UIC line is a geographic divider that distinguishes areas DOH considers suitable for injection well installation. Subject to agency approval, wastewater injection into the subsurface is permitted in coastal regions makai of the UIC line, while injection is not permitted inland, or mauka, of the UIC line. The groundwater makai of the UIC line generally has a high salinity concentration and is not considered to be an "underground source of drinking water," whereas aquifers mauka of the UIC line are considered underground sources of drinking water.

In the vicinity of the Project Site the "pass/no pass" line and the UIC line are one in the same. PVT ISWMF is located makai of the "pass/no pass" and UIC line.

## 2.0 FACILITY DESIGN (ENGINEERING REPORT)

Attached to this permit renewal application is the updated engineering design report for PVT ISWMF. This updated report replaces the engineering report previously submitted to DOH. The engineering report documents that the facility design meets the requirements of HAR 11-58.1-19.

In addition, the attached Operations Plan contains detailed information on the facility design. See Sections 4.3 and 4.4 of the Operations Plan.

## 3.0 OPERATIONS PLAN

Attached to this permit renewal application is the updated operations plan for PVT ISWMF. This updated report complies with the requirements outlined in HAR 11-58.1-19 and replaces the operations plan previously submitted to DOH.

## 4.0 GROUNDWATER MONITORING PLAN

Attached to this permit renewal application is the updated Groundwater Monitoring Plan for PVT ISWMF. This updated plan replaces the Groundwater Monitoring Plan, dated August 31, 2004, previously submitted to DOH. The plan was prepared by a qualified groundwater scientist in accordance with the requirements outlined in HAR 11-58.1-19 and the *Hawaii Groundwater Monitoring Guidance Document*.

# ATTACHMENT P-3

# FACILITY DESIGN REPORT

# PVT INTEGRATED SOLID WASTE MANAGEMENT FACILITY

Prepared for

PVT LAND COMPANY
87-2020 Farrington Highway
Waianae, Hawaii 96792

Presented by

A-Mehr, Inc.
23016 Mill Creek Drive
Laguna Hills, California

October 2015

# TABLE OF CONTENTS

## FIGURES

## APPENDICES

# PVT INTEGRATED SOLID WASTE MANAGEMENT FACILITY
# FACILITY DESIGN REPORT

## 1. SUMMARY

The landfill component of the PVT Integrated Solid Waste Management Facility is currently permitted to dispose construction and demolition waste within an area of 104 acres on the west side of Lualualei Naval Road. The site's Conditional Use Permit and approved preliminary Closure/Post-Closure Plan are based on a maximum refuse fill elevation of approximately 135 feet above sea level.

PVT Land Company has requested an increase of 115 feet in the maximum elevation of the refuse fill, increasing it to 250 feet above sea level. No change in landfill refuse limits or boundaries is proposed. The increased elevation and revised fill plan will add approximately 4,500,000 cubic yards of disposal capacity to the site and increase its useful life.

Current facility operations and plans for waste diversion by pre-disposal sorting and recycling, and by excavating and processing existing landfilled waste, will not be affected by the proposed new fill plan and maximum elevation. The increased maximum height will provide needed flexibility to accommodate the needs of the landfill reclamation program and allow the existing material recovery and recycling operation to remain in its current location, which is within the approved 104-acre disposal footprint.

The proposed regrade will have no impact on the environment or surrounding areas other than the increased life of the landfill and visual appearance due to the increased height, as discussed in Section 6 below. There will be no change in the type or quantity of waste, traffic, or other facility operations or impacts.

## 2. SITE DESCRIPTION

### 2.1 Site Location

PVT Integrated Solid Waste Management Facility (PVT ISWMF) is located in the community of Nanakuli near the southwestern coast of the island of Oahu, as shown on Figure 1, Site Location Map. The facility property begins approximately 1600 feet northeast of the intersection of Farrington Highway and Lualualei Naval Road, and extends northerly approximately one mile along Lualualei Naval Road.

The currently developed PVT ISWMF operating area consists of 200 acres on the west side of Lualualei Naval Road. Figure 2 shows the existing topography of the property as of July 2, 2014.

The west 200 acres lies along approximately 1 mile of Lualualei Naval Road, with a width ranging from 1,000 to 1,800 feet between the road and Ulehawa Stream. Elevations of the site prior to development of the existing PVT ISWMF range from 40 to 50 feet above sea level. Approximately 104 acres are designated for waste disposal, with a maximum elevation of approximately 135 feet above sea level.

### 2.2 Major Facility Components and Operations

PVT ISWMF is a comprehensive solid waste management facility for construction and demolition waste and other recyclable waste products. It does not accept hazardous waste or municipal solid waste as defined in state regulations. It embodies three types of waste management facilities defined in HAR 11-58.1:

- A reclamation facility, defined as "a location used for the handling, processing, or storage of recoverable material, including but not limited to composting and remediation". Recoverable material is defined as "material that can be diverted from disposal for recycling or bioconversion."
- A materials recovery facility; and
- A construction and demolition waste landfill

The primary existing and future planned operations at the site are the following:

- Segregation of incoming loads into materials for processing, recycling, on-site usage or disposal.
- Mixed waste sorting to remove and separate recyclable materials;
- Processing to produce feedstock for renewable energy;
- Production of aggregate materials including rock, gravel and crushed asphalt;
- Solidification of liquid wastes;
- Reclamation of previously landfilled construction and demolition waste to recover useful materials, minimize the potential of fire, prevent settlement, minimize leachate potential, and remove voids;
- Storage for up to two weeks of recyclable materials and marketing of recyclable materials; and
- Landfill disposal of residual non-recoverable waste materials, including primarily composition/asphalt roofing shingles, tile, gypsum board, lead painted concrete and cementitious siding

Figure 2 is a site map showing the general location of the major operations as of July 2014.

## 2.3 Types and Quantities of Waste

### 2.3.1 General

PVT ISWMF accepts the following types of material for processing or disposal:

- Construction and demolition waste;
- Scrap metal;
- Asbestos contaminated wastes;
- Liquid wastes for solidification; and
- Contaminated soil for disposal or use in solidification of liquid wastes and sludge.

PVT ISWMF is the only disposal site on Oahu permitted to receive construction and demolition (C&D) waste. Its current Solid Waste Facility Permit allows acceptance of up to 2,000 tons per day of C&D waste and 500 tons per day of asbestos contaminated waste.

### 2.3.2 Construction and Demolition Waste

C&D waste is generated primarily by contractors and government agencies involved in the construction or demolition of houses, commercial buildings, pavements and other structures. It may include any of the following types of materials:

- Concrete and asphalt rubble
- Steel and nonferrous metal
- Wood, glass, masonry, tile, roofing, siding, and plaster
- Waste plumbing, mechanical and electrical building components
- Dirt and rock
- Brush, wood, roots, stumps, dirt and rocks from clearing and grubbing activities

A significant volume of C&D waste is diverted for on-site use or recycling. PVT uses almost all the rock, dirt, concrete and asphalt for on-site roads and construction of the wet weather pad. In addition, PVT directs source separated and select loads of C&D waste containing significant quantities of scrap metal or wood to the recycling area for sorting, stockpiling and transfer to off-site recyclers.

C&D waste is notably dry and generally inert. Based on a review of characteristics, it has been determined that C&D waste creates no significant odor issue. Its potential for creation of leachate is low and, given the waste exclusion and loadchecking programs implemented by PVT, its potential for a release of toxic or hazardous materials to air or water is minimal.

### 2.3.3 Wood

PVT accepts source-separated loads of wood materials for recycling. Such materials, including pallets, packing crates, or other wood products, may also be sorted out from mixed C&D loads. Most wood will be processed as a feedstock for renewable energy. Alternatively, wood may be processed or shipped in bulk to off-site recyclers. PVT may also store the material, with or without processing it in a shredder to reduce its size and achieve maximum compaction.

### 2.3.4 Miscellaneous Wastes for Recycling or Reclamation

The following categories of waste are accepted in segregated loads or are separated from mixed C&D loads:

- Wood furniture, mattresses and other material that can be processed into feedstock;
- Scrap metal or materials containing large quantities of scrap metal;
- Glass products other than HI-5 recyclable glass containers; and
- Waste plastics other than recyclable PET bottles

### 2.3.5 Asbestos Contaminated Waste

Asbestos contaminated waste is accepted and managed in accordance with the requirements of DOH Permit No. LF-0152-09 and applicable regulations including

Chapter 342H, Hawaii Revised Statutes and 40 CFR Part 61, National Emission Standards for Hazardous Air Pollutants. The site accepts both friable and non-friable asbestos containing products, primarily consisting of roofing, ceiling, siding and insulating materials. All friable asbestos contaminated wastes received at the site are managed as friable asbestos, requiring it to be double bagged or double wrapped with plastic before being delivered to the site. Asbestos waste is accepted only on Tuesdays and Thursdays with 24-hours prior notice and disposed in the Asbestos Pit. Non-friable asbestos for disposal is accepted in the Asbestos Pit as well.

### 2.3.6 Contaminated Soils

Contaminated soils, primarily petroleum contaminated soils, are received primarily from site remediation projects associated with cleanup of leaks or spills from underground or aboveground storage tanks. Other contaminated soils resulting from construction / demolition activities may be accepted, provided they are not hazardous waste or TSCA-regulated waste.

### 2.3.7 Solidified Liquid Wastes

PVT operates a contaminated soils storage and liquid waste solidification process on the ISWMF property, pursuant to Solid Waste Management Permit No. LF-0152-09. Under the terms of the permit, soil materials resulting from mixing soils with petroleum-contaminated liquids, with liquids originating from construction and demolition activities, or with other liquids approved by HDOH, may be disposed in the PVT ISWMF.

### 2.3.8 Clean Inert Waste

PVT accepts segregated clean loads of inert material, primarily concrete rubble, asphalt rubble and cold-planed asphalt material. Most of these materials are stored in stockpiles until needed for on-site construction of roads, wet-weather deck surfacing, stormwater management facilities, or other beneficial uses. At the company's option, unused inert materials may also be disposed in the ISWMF as part of fire break construction between waste cells or as common C&D waste. If specified by the design engineer, inert materials may also be used in structural fill in and outside the landfill footprint.

### 2.3.9 AES Coal Ash

The Hawaii Department of Health has approved the acceptance at PVT ISWMF of fly ash and bottom ash from the AES Hawaii coal-fired power plant. Ash is currently approved for beneficial use as:

- Fire barrier – Ash may be placed as a subsurface barrier between Phase I and Phase II, or between adjacent disposal cells in Phase II or within disposal cells. The purpose of the barrier is to limit the spread on any potential future subsurface fire to minimize potential damage to landfill liner systems. The ash is used for vertical and horizontal fire barrier layers.

- Ash may be used for void space fill, and absorption of liquids.

- Operations Layer - Ash may be used as a substitute for soil in the protective soil layer placed above newly installed liner systems in new disposal cells.

### 2.3.10 Excluded Wastes

Solid wastes other than those described above are not accepted for disposal at PVT ISWMF. Excluded wastes for processing or landfill disposal include the following:

- Household waste, garbage, commercial solid waste or industrial solid waste as defined in HAR 11-58.1-03.
- All regulated hazardous wastes and TSCA-regulated PCB contaminated materials;
- Pesticide containers other than incidental empty small containers classified as C&D waste;
- Bulk green waste (grass, leaves, tree trimmings, etc.) or loads of land clearing debris or C&D waste containing more than 10 percent green waste.
- Whole tires or car parts;
- Free liquids and liquids products, including paints, solvents, sealers or adhesives (liquids are accepted for solidification only as described in Section 2.16);
- Asbestos waste that is not properly packaged.
- White goods except incidental appliances
- contaminated C&D loads;
- Lead-acid batteries

PVT ensures that excluded wastes are not accepted by its notices to customers, customer prequalification procedures, and inspections of loads at the scalehouse and at the disposal active face.

# 3. LANDFILL DESIGN

## 3.1 Liner and Leachate Management Systems

### 3.1.1 Phase I and II C&D Landfill Liner

As a facility permitted and used only for the disposal of inert construction and demolition (C&D) waste, PVT Landfill was not initially required to construct liner systems in disposal areas. Accordingly, Phase I of the landfill was developed with waste materials placed on native ground. Once PVT started development of Phase II of the landfill, Hawaii State regulations HAR 58.1-19, began requiring C&D landfills to be built with prescriptive liner systems consisting of 2 feet of soil with a maximum hydraulic conductivity of 5 x $10^{-5}$ cm/sec.

PVT Land Company decided to construct disposal areas in Phase II using liner systems that exceeded the Hawaii and Federal requirements for C&D landfills, and constructed liner systems equivalent to those typically used in municipal solid waste landfills. These systems consist of:

- A lower component of geosynthetic clay liner with hydraulic conductivity of 5 x $10^{-9}$ cm/sec;
- An upper component of 60-mil HDPE geomembrane;
- A leachate collection and removal system consisting of a granular drainage layer with perforated HDPE pipes; and
- Geotextile

The first lined disposal cell in Phase II, Cell 1, was placed in service in mid-2004, and the last lined cell, Cell 9B was constructed in 2015.

Appendix B contains a Seismic Stability Analysis demonstrating the adequacy of the containment system to resist the maximum horizontal acceleration from the design earthquake, meeting the Federal and State requirements of HAR 11-58.1-13(e).

Leachate removed from leachate collection sumps in Phase II is returned to the landfill as provided in 40 CFR 258.40(a)(2) and HAR 58.1-15(i), in areas of the site equipped with a composite liner and leachate collection system. Leachate is sprayed as a dust control agent on the working face and to aid in compaction of Phase II.

### 3.1.2 Soil Storage / Liquid Waste Solidification Area Liner

Areas used for storage of contaminated soils and solidification of liquid waste are lined using a combination of compacted soil and geomembrane liner material. From bottom to top, these areas are lined as follows:

- Graded, moisture conditioned and compacted natural clay subgrade;
- 40-mil HDPE geomembrane liner;
- One-foot thick compacted clay liner using on-site clay materials
- One-foot thick soil cement wearing layer

The soil cement wearing layer is renewed periodically to maintain a 12-inch thickness and durable surface.

## 3.2 Surface Water Management System

Stormwater is managed by controlled grading on the surface of the landfill and by maintaining an engineered system of drainage ditches, channels, pipes and basins. Drainage is managed to:

- prevent run-on of surface water to the active disposal face or uncovered refuse;
- minimize erosion in all areas of the site;
- maintain roads and other ancillary facilities in useable condition under all weather conditions; and
- prevent excessive runoff or sedimentation impacts to neighboring properties.

The landfill top deck and other areas in the vicinity of active disposal areas are graded at a slope of 2% to 5% away from the active area. Diversions are constructed upgradient of the active area if needed to prevent run-on from contacting the leachate, and divert drainage around any exposed waste. Similarly, diversions are constructed downgradient of exposed waste to prevent the runoff of any precipitation that has contacted waste. Such water is retained within the waste, for collection and management as leachate.

The site's stormwater management system is designed and constructed to manage runoff from a 25-year, 24-hour storm. Runoff is collected in a system of surface ditches, channels, pipes and ponds designed by PVT Land Company's engineering consultants. As designed, the system will carry runoff from the design storm without flooding or excessive erosion from the site, and will retain a significant volume of water to minimize off-site runoff impacts and allow sediment in the runoff to be intercepted and removed before discharge to the Ulehawa Stream that borders the west boundary of the site.

Figure 2 shows the location of existing basins for collection of stormwater and removal of silt. To date, Basins A, B, C, D, E and F have been constructed. Appendix A contains a hydrology study demonstrating the adequacy of the system as constructed to manage the required design storm.

# 4. LANDFILL RECLAMATION

## 4.1 Purpose

C&D waste disposal operations in the Phase I area of the PVT ISWMF prior to approximately 1995 achieved low compaction densities and produced a fill that has been determined to contain substantial amounts of void spaces. As a result, the landfill has been unusually prone to subsurface fires due to the intrusion of oxygen into the void space. PVT ISWMF is currently excavating, processing and reclaiming materials from a large portion of the Phase I area. This operation provides a number of benefits, including:

- Recovery of materials for the aggregate production and feedstock process;
- Recovery of excess soil used in the original landfill operation;
- Replacement of the removed loosely compacted fill with new well-compacted waste fill, eliminating void spaces, minimizing long-term settlement issues, minimizing the generation of landfill gases, and reducing risk of subsurface fires and associated odor issues; and
- Extension of the useful life of the C&D landfill.

## 4.2 Location and Reclamation Volume

Figure 2 shows the general area where PVT ISWMF is reclaiming materials from the Phase I C&D landfill. Approximately 1.5 million cubic yards of material will be excavated and processed.

## 4.3 Reclamation Procedures

The landfill reclamation operation is conducted using excavators, a bulldozer, dump trucks and a screening system. The excavator excavates the refuse and loads it to trucks, which deliver the material to a preliminary screening system. Small particles of soil are screened and hauled to a soil stockpile for use as intermediate soil cover for waste disposal operations. Material larger than approximately 9 to12 inches in size are hauled to the mixed C&D waste processing area, and intermediate-sized material are either disposed or processed by an air classifier to recover material suitable for use as feedstock.

The bulldozer pushes cover soil from the area being prepared for excavation to a stockpile, and spreads interim cover soil over areas that have been partially excavated.

## 4.4 Products and Residual Wastes

Products recovered and produced from reclaimed landfill material include primarily:

- Wood and other feedstock materials;
- Rock, concrete, and asphalt paving aggregates;
- Ferrous and non-ferrous metals; and
- Soil

Non-recyclable waste materials are disposed in the C&D landfill.

## 5. EXISTING AND PROPOSED LANDFILL CAPACITY AND LIFE

Figure 3 shows the currently approved final refuse grades for the ISWMF landfill, with a maximum elevation of 135 feet above mean sea level (amsl). Figure 2 shows existing elevations as of July 2, 2014.

Phase I of the landfill area is generally filled to near its final permitted elevations. To date Cells 1 through 9B in Phase II have been constructed. The remaining life of the constructed area (Cells 1 through 9B) is difficult to estimate as it will be determined by the success of the recycling operations.

PVT has requested approval of an increase in the maximum refuse disposal elevation. Figure 4 shows the proposed new final grading plan, with a maximum elevation of 250 ft amsl. This final grade regrading will provide additional capacity of approximately 4,500,000 cubic yards.

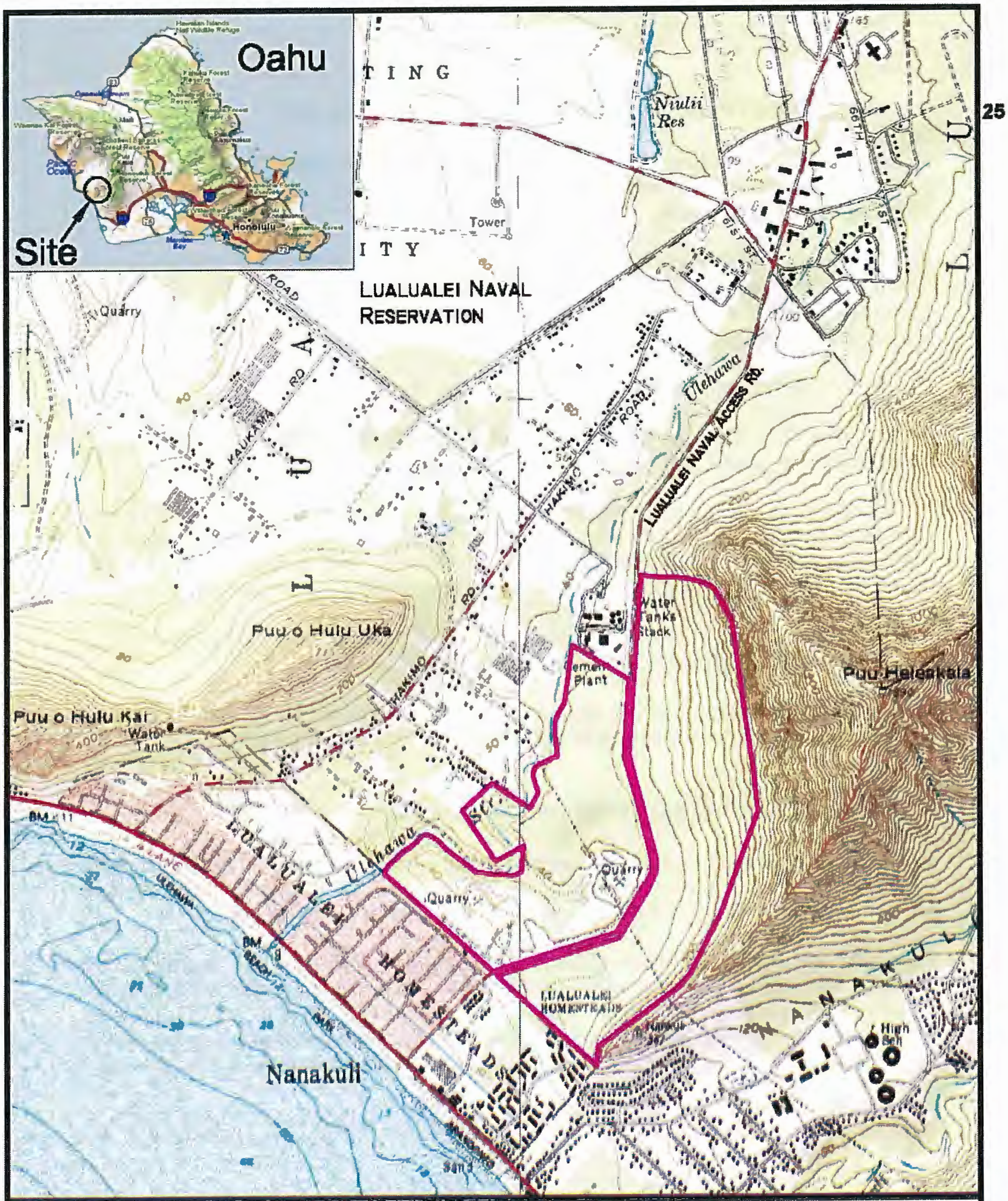
In addition to the increase in site life, the revised final grades will provide PVT with necessary flexibility to keep the material recovery operation in the existing location and ensure that the reclamation of materials from the Phase I area can be completed. The development sequence following approval of the new grading plan would be:

- Continue filling in Phase 2, Cells 1 through 9B until the Phase I reclamation is sufficiently advanced to allow disposal operations; then
- Continue filling in both Phase I and Phase II areas until the revised final refuse grades are achieved in Phase I and Phase II, Cells 1 through 9B.

## 6. POTENTIAL IMPACTS OF PROPOSED REGRADE

The increased maximum refuse grades will be a change in the visual appearance of the landfill when viewed from surrounding areas. Figures 7A-7F present representative photographic simulations of the site as viewed from several nearby locations.

Air quality will not be adversely affected by the height increase. Site operations will continue litter and dust control programs as needed to maintain compliance with permit conditions relative to litter and dust. Available measures include additional litter screens, increased water sprays, and use of portable windbreak screens upwind of the active disposal area. These readily available mitigation measures can ensure that increased dust or litter impacts do not occur.



PVT Property Boundaries

0 2000 4000

Scale in Feet

Reference: DeLorme, 2002.

N

Project: 060024

Approved by: JKH

Drawn by: LSM

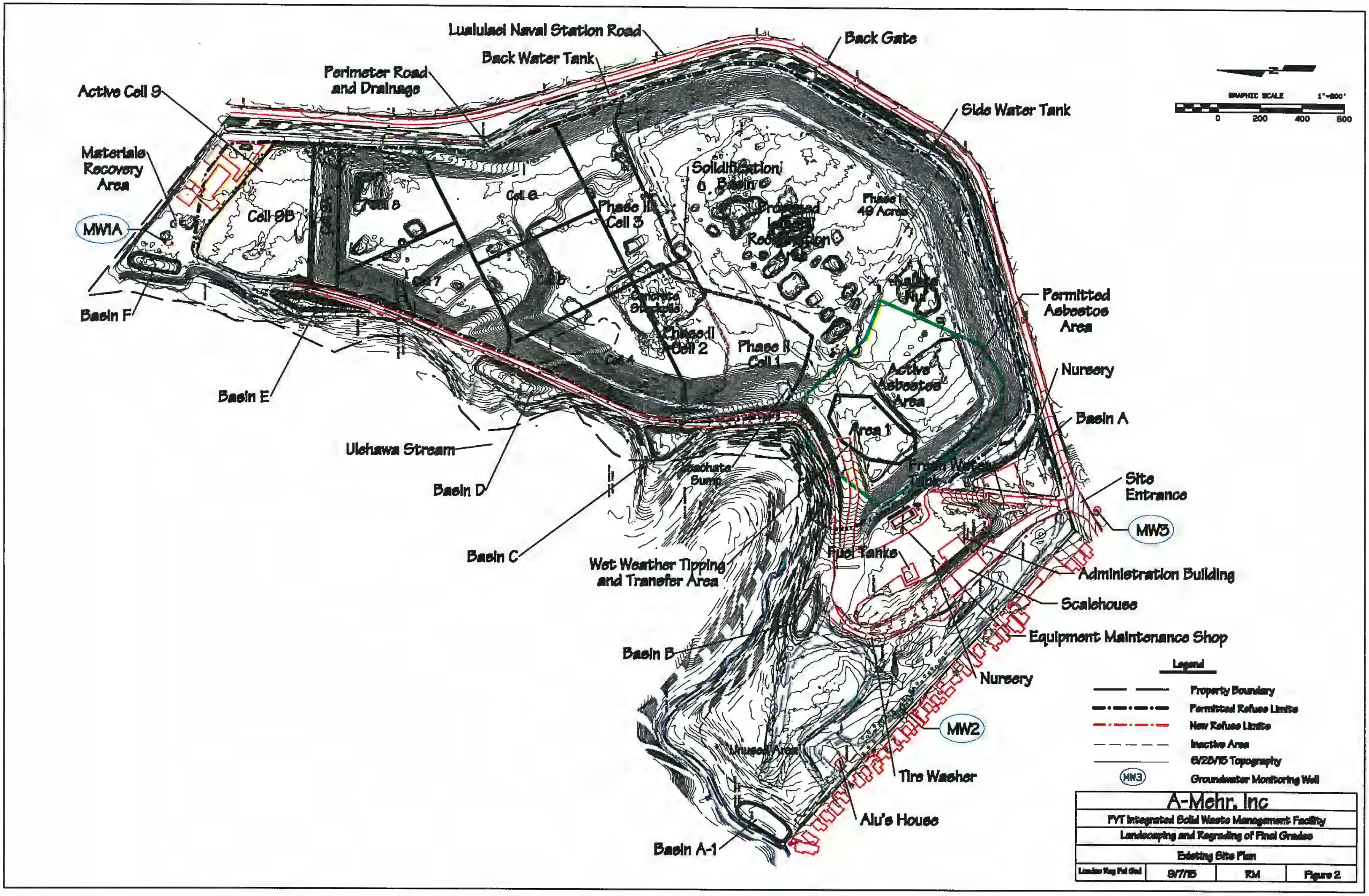
Date: August 2009

## Figure 1
## Site Location Map

Regrading of Final Grades

PVT Integrated Solid Waste Management Facility
Nanakuli, Oahu, Hawaii

element environmental, llc
environmental engineering water resources



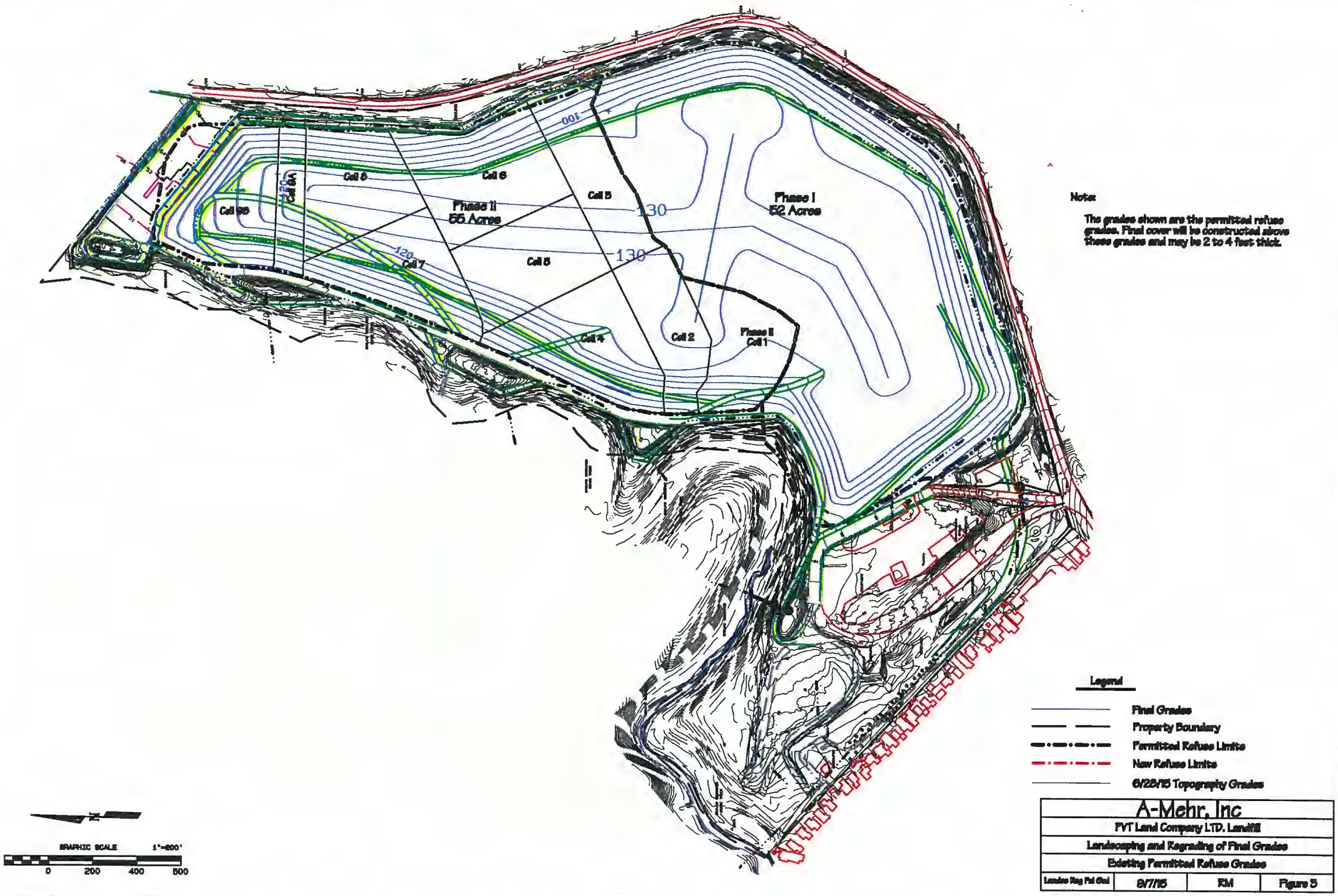
A-Mehr, Inc

PVT Integrated Solid Waste Management Facility

Landscaping and Regrading of Final Grades

Existing Site Plan

| | | | |
|---|---|---|---|
| Landsc Reg Fnl Grd | 8/7/15 | RM | Figure 2 |



Notes

The grades shown are the permitted refuse grades. Final cover will be constructed above these grades and may be 2 to 4 feet thick.

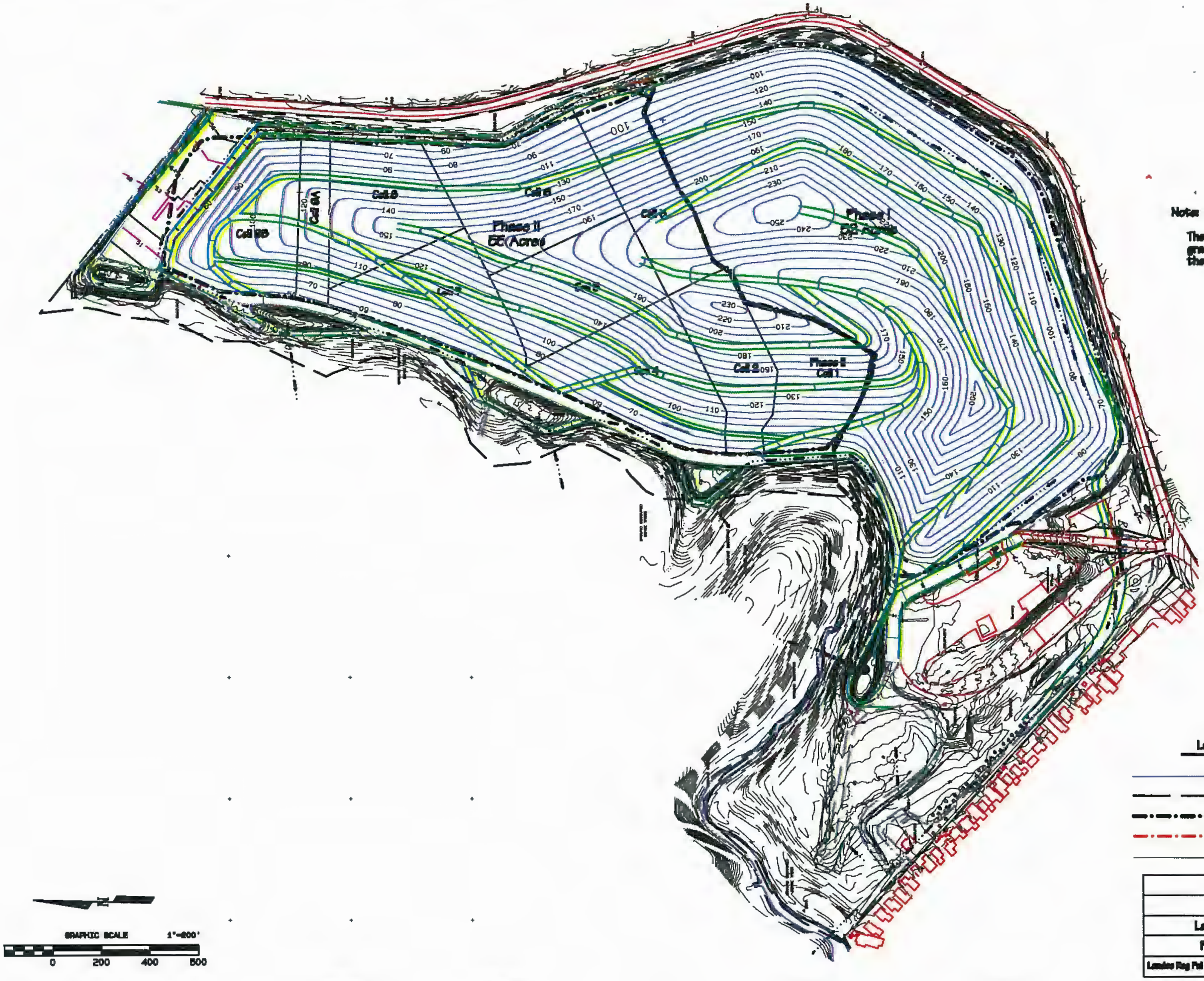
A-Mehr, Inc

PVT Land Company LTD. Landfill

Landscaping and Regrading of Final Grades

Existing Permitted Refuse Grades

| | | | |
|---|---|---|---|
| Landsc Rag Fnl Grd | 8/7/15 | RM | Figure 5 |



**Note:**

The grades shown are the permitted refuse grades. Final cover will be constructed above these grades and may be 2 to 4 feet thick.

**Legend**

- Final Grades
- Property Boundary
- Permitted Refuse Limits
- New Refuse Limits
- 6/22/15 Topography Grades

A-Mehr, Inc
PVT Land Company LTD. Landfill
Landscaping and Regrading of Final Grades
Proposed Final Refuse Grades 250' amsl

| | | | |
|---|---|---|---|
| Landsc Reg Fnl Grd | 8/7/15 | KM | Figure 4 |

Note:

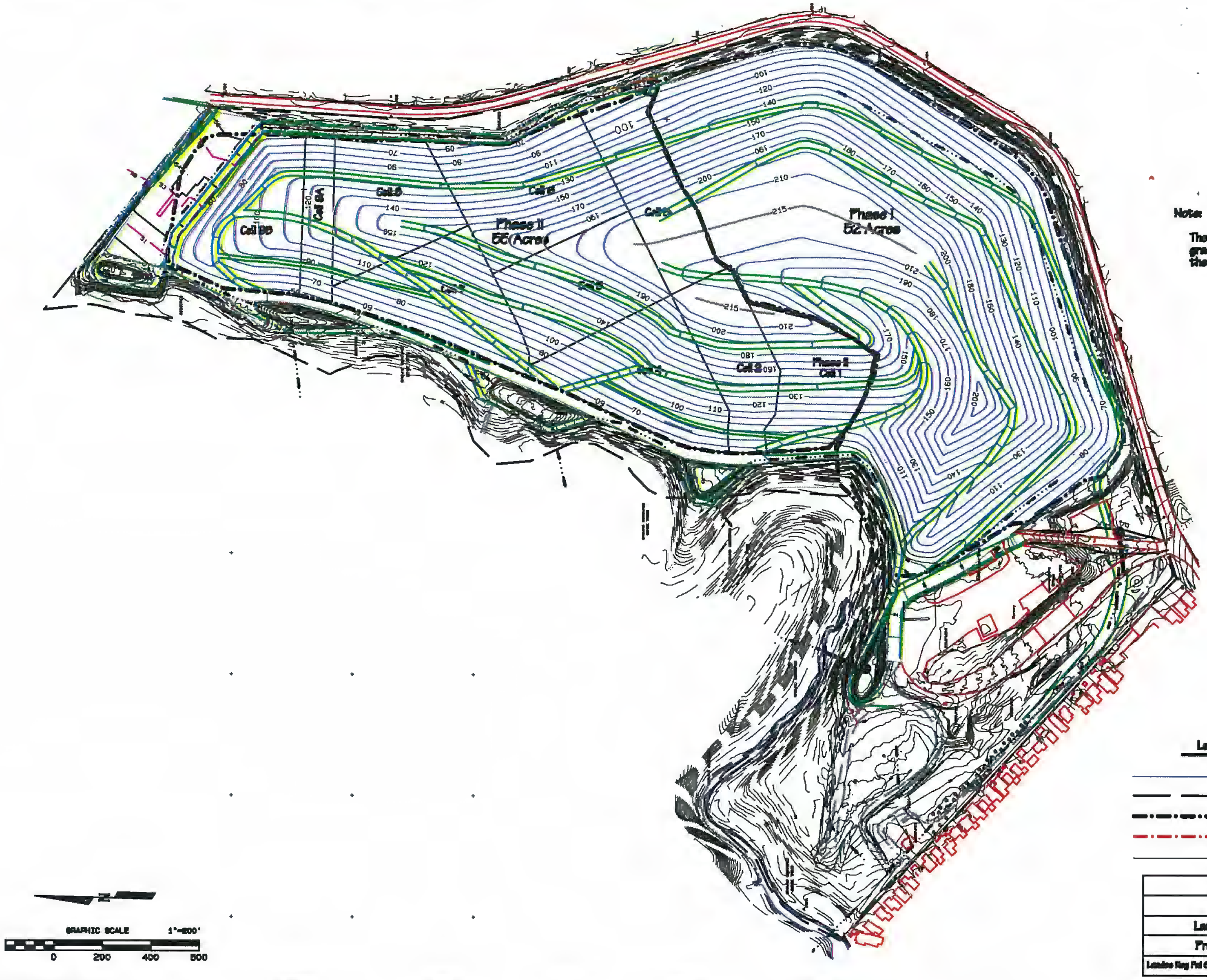
The grades shown are the permitted refuse grades. Final cover will be constructed above these grades and may be 2 to 4 feet thick.

**Legend**

Phase II Liner Grades
Phase II Interim Final Grades
Property Boundary
Permitted Refuse Limits
New Refuse Limits
6/25/15 Topography Grades

A-Mehr, Inc
PVT Land Company LTD. Landfill
Landscaping and Regrading of Final Grades
Phase II Base Grades / Phasing Plan

| | | | |
|---|---|---|---|
| Landscape Reg Fnl Grd | 8/7/15 | RM | Figure 5 |



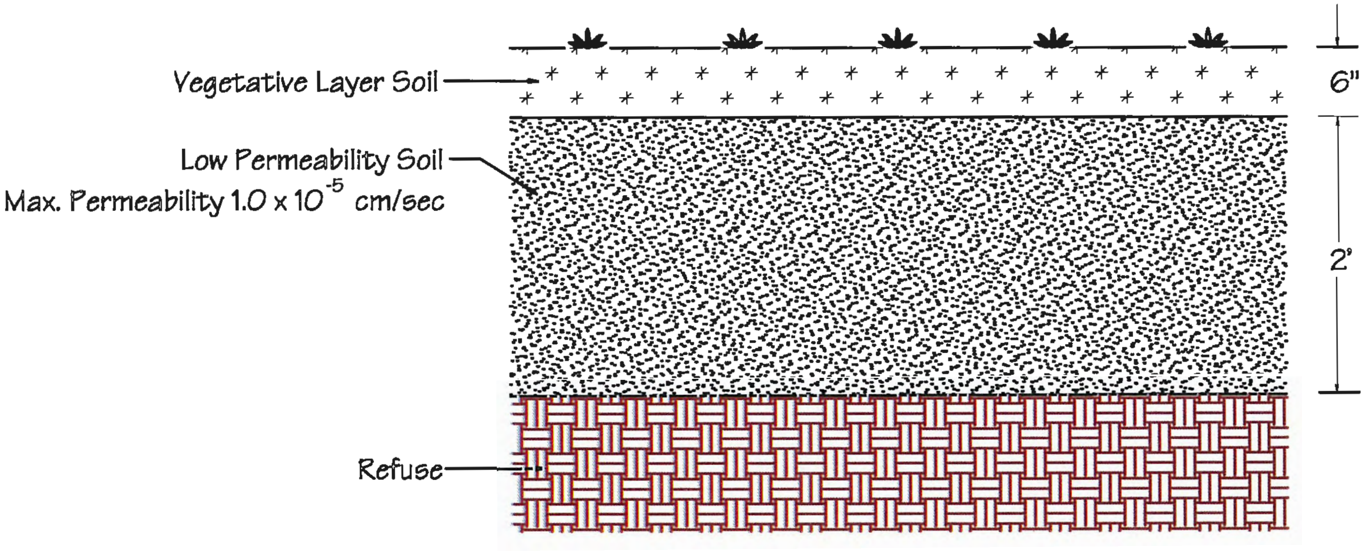
Note:

The grades shown are the permitted refuse grades. Final cover will be constructed above these grades and may be 2 to 4 feet thick.

**Legend**

- Final Grades
- Property Boundary
- Permitted Refuse Limits
- New Refuse Limits
- 6/26/15 Topography Grades

| | | | |
|---|---|---|---|
| A-Mehr, Inc | | | |
| PVT Land Company LTD. Landfill | | | |
| Landscaping and Regrading of Final Grades | | | |
| Proposed Interim Refuse Grades 215' amsl | | | |
| Landso Reg Fnl Grd | 8/7/15 | RM | Figure 6 |



Final Cover Detail

A-Mehr, Inc
PVT Land Company LTD. Landfill
Landscaping and Regrading of Final Grades
Final Cover Cross Section

| | | | |
|---|---|---|---|
| Landsc Reg Fnl Grd | 9/25/15 | RM | Figure 8 |

# APPENDIX A
# HYDROLOGY STUDY
# PVT INTEGRATED WASTE MANAGEMENT FACILITY
# May 2013

## INTRODUCTION

This report evaluates the proposed surface water management system for the PVT Integrated Waste Management Facility at proposed final grades of the landfill component. It provides a conceptual design for future improvements to manage surface water as the facility proceeds toward final buildout. Proposed new and improved drainage structures are designed based on hydrologic analysis using the analytical model TR-55 developed by the Natural Resources Conservation Service (NRCS), a branch of the U.S. Department of Agriculture. TR-55 is recognized as a suitable computer model for hydrologic analysis of small watersheds.

## MODEL DESCRIPTION

TR-55 is a single-event rainfall-runoff small watershed hydrologic model. The model generates hydrographs from multiple user-defined watershed subareas and at selected points along the user-defined stream system. Hydrographs are routed downstream through channels and/or reservoirs. Each watershed subarea has a hydrograph generated from the land area based on land and climate characteristics supplied by the user. Reaches (stream segments) can be designated as either channel reaches where hydrographs are routed based on physical characteristics, or as storage reaches where hydrographs are routed through a reservoir based on temporary storage and outlet characteristics. Hydrographs are combined as needed to accumulate flow as water moves from upland areas to the watershed outlet.

## SITE DRAINAGE SYSTEM

Figure 1 shows the proposed drainage facilities for the site at full development to final grades of the landfill. Drainage is collected from the landfill top deck and slopes in shallow channels constructed on benches and roads, and conveyed to perimeter channels that drain to six sedimentation basins along the west perimeter of the site. The basins retain flow and discharge it to the Ulehawa Stream. Each basin is equipped with an overflow weir for peak flows and a floating skimmer that collects water from the top surface of the basin and discharges it through a dewatering pipe.

At the present time, all six basins (Basins A, B, C, D, E and F) have been constructed and are in use. The west side perimeter channel system is substantially complete, and the east side perimeter system is functional with improvements scheduled to improve its capacity. Drainage conveyances on the landfill interior slopes and top deck will be developed as temporary structures during the active life of the site, and improved as permanent channels and roads at the time of site closure.

## MODEL INPUTS

The primary data required for the TR-55 hydrologic model include the following:

- Watershed subarea descriptions including area, land use, slope, runoff curve number (CN) and identification of the reach (channel) into which it drains;
- Reach descriptions including length, cross-section, Manning "n" friction coefficient, slope and reach or structure into which the reach drains;
- For reservoirs, stage-storage data and description of the outfall structure; and
- Storm data including rainfall distribution type and 24-hour rainfall amounts for return periods ranging from 2 to 100 years.

Figure 1 shows the subareas and reaches defined to model site hydrology using TR-55. The drawing lists acreage of each subarea and length and slope of each reach. Details of each subarea and reach are contained in Attachment 1, the TR-55 output files.

All subareas for the site were evaluated using runoff curve number 84, corresponding to open space with at least 50% grass coverage in clay soils (Hydrologic Soil Group "D"), corresponding to expected conditions of the site during the landfill post-closure period.

Storm data is taken from the publication "Rainfall-Frequency Atlas of the Hawaiian Islands" (Technical Paper No. 43, U.S. Department of Commerce Weather Bureau, 1962). Twenty-four hour rainfall amounts for the site are as follows for the selected return periods:

| | |
|---|---|
| 2 Years | 4 inches |
| 5 years | 6 inches |
| 10 years | 8 inches |
| 25 years | 9 inches |
| 50 years | 10 inches |
| 100 years | 12 inches |

The design storm according to HAR 11-58.1-15(g) is the twenty-four hour storm with a 25-year return frequency, with a total rainfall of 9 inches.

Rainfall distribution is assumed to be the Type I storm as designated by NRCS for the West Pacific area including Hawaii (TR-55 Users Guide, Appendix B).

## TR-55 RESULTS

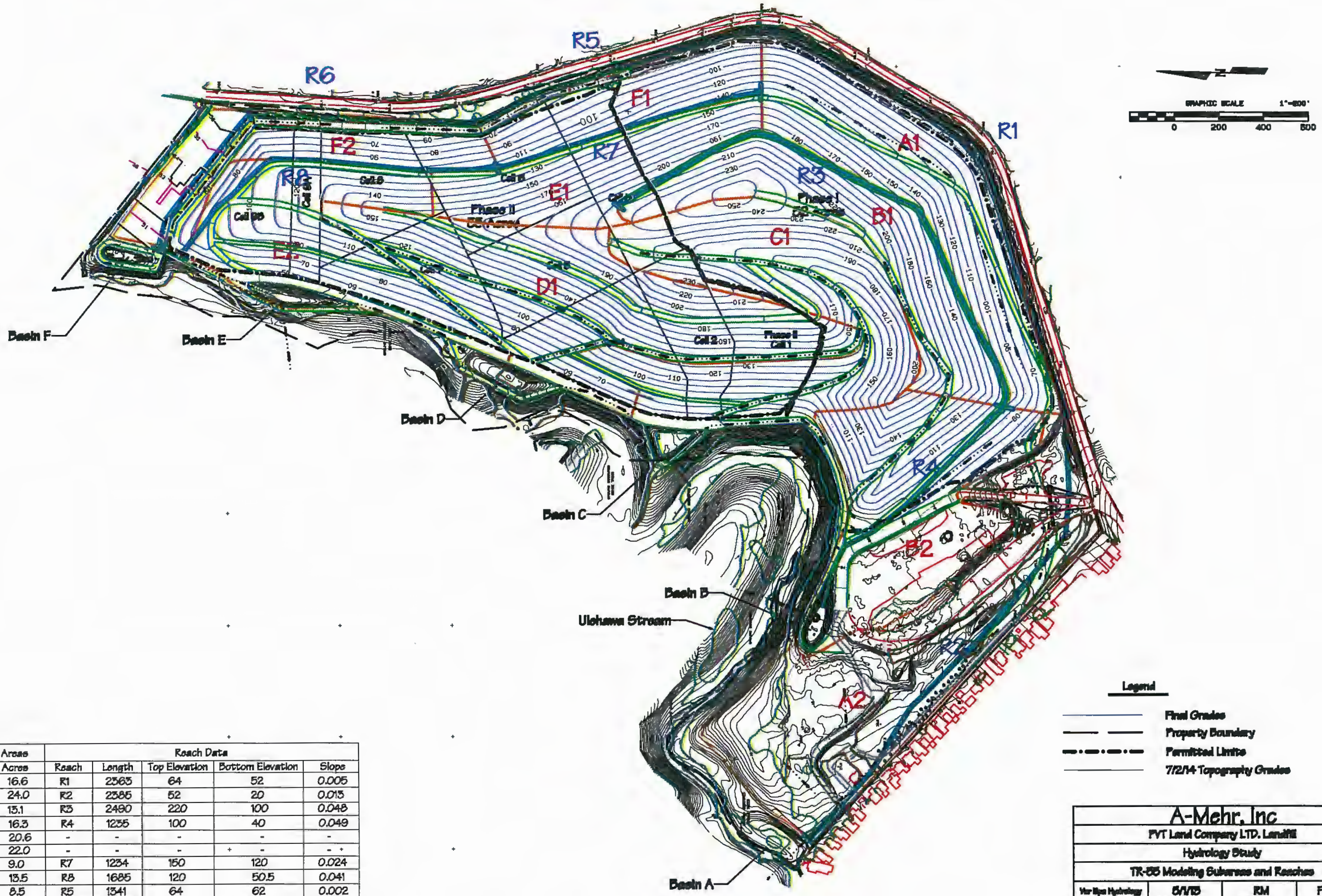
The peak flows and depths in each channel segment during the 25-year return storm are presented in Table 1 below. It indicates that all channels and basins have capacity to manage the design storm prescribed by Hawaii solid waste regulations.

# TABLE 1
# PEAK FLOWS AND DEPTHS
# 25-YEAR STORM

| REACH | FLOW (CFS) | DEPTH (FT)[1] |
|---|---|---|
| R1 | 90 | 0.7 |
| R2 | 210 | 1.1 |
| R3 | 78 | 0.4 |
| R4 | 171 | 0.5 |
| R5 | 47 | 0.3 |
| R6 | 90 | 0.6 |
| R7 | 50 | 0.5 |
| R8 | 50 | 0.5 |
| Basin A | 201 | 1.9 |
| Basin B | 158 | 1.5 |
| Basin C | 96 | 2.1 |
| Basin D | 98 | 1.2 |
| Basin E | 116 | 1.2 |
| Basin F | 78 | 1.2 |

---

[1] Depth listed for basins is depth of water above base of overflow spillway weir.



| Drainage Areas | | Reach Data | | | | |
|---|---|---|---|---|---|---|
| Area | Acres | Reach | Length | Top Elevation | Bottom Elevation | Slope |
| A1 | 16.6 | R1 | 2563 | 64 | 52 | 0.005 |
| A2 | 24.0 | R2 | 2385 | 52 | 20 | 0.013 |
| B1 | 13.1 | R3 | 2490 | 220 | 100 | 0.048 |
| B2 | 16.3 | R4 | 1235 | 100 | 40 | 0.049 |
| C1 | 20.6 | - | - | - | - | - |
| D1 | 22.0 | - | - | - | - | - |
| E1 | 9.0 | R7 | 1234 | 150 | 120 | 0.024 |
| E2 | 13.5 | R8 | 1685 | 120 | 50.5 | 0.041 |
| F1 | 8.5 | R5 | 1341 | 64 | 62 | 0.002 |
| F2 | 7.8 | R6 | 1464 | 62 | 50 | 0.008 |

A-Mehr, Inc
PVT Land Company LTD. Landfill
Hydrology Study
TR-55 Modeling Subareas and Reaches

| | | | |
|---|---|---|---|
| Ver Ilpa Hydrology | 5/1/15 | RM | Figure 1 |

# TR-55 REPORTS

```
                    WinTR-55 Current Data Description
                     --- Identification Data ---

User:      A-Mehr Inc                         Date:        4/30/2013
Project:   PVT Landfill                       Units:       English
SubTitle:  Basins A, B & C                    Areal Units: Acres
State:     Hawaii
County:    Honolulu
Filename:  C:\Users\Glen\AppData\Roaming\WinTR-55\PVT Basins A, B & C.w55

                            --- Sub-Area Data ---
Name           Description              Reach        Area(ac)     RCN    Tc
-------------------------------------------------------------------------------
A1                                      R1           16.6         89    .148
A2                                      R2           24           89    .207
B1                                      R3           13.1         89    0.1
B2                                      R4           16.3         89    0.1
C1                                      Basin C      20.6         89    .148

Total area: 90.60 (ac)

                            --- Storm Data  --
                     Rainfall Depth by Rainfall Return Period

   2-Yr       5-Yr       10-Yr      25-Yr      50-Yr      100-Yr      -Yr
   (in)       (in)       (in)       (in)       (in)       (in)       (in)
--------------------------------------------------------------------------------
   4.0        6.0        8.0        9.0        10.0       12.0        .0


Storm Data Source:              User-provided custom storm data
Rainfall Distribution Type:     Type I
Dimensionless Unit Hydrograph:  <standard>
```

```
A-Mehr Inc                        PVT Landfill
                                Basins A, B & C
                            Honolulu County, Hawaii

                                   Storm Data

                     Rainfall Depth by Rainfall Return Period

   2-Yr       5-Yr       10-Yr      25-Yr      50-Yr      100-Yr      -Yr
   (in)       (in)       (in)       (in)       (in)       (in)       (in)
--------------------------------------------------------------------------------
   4.0        6.0        8.0        9.0        10.0       12.0        .0


Storm Data Source:              User-provided custom storm data
Rainfall Distribution Type:     Type I
Dimensionless Unit Hydrograph:  <standard>
```

```
A-Mehr Inc                          PVT Landfill
                                 Basins A, B & C
                              Honolulu County, Hawaii

                                Watershed Peak Table


 Sub-Area              Peak Flow by Rainfall Return Period
 or Reach        25-Yr
Identifier       (cfs)
--------------------------------------------------------------------------------
--
SUBAREAS
A1                91.25

A2               121.65

B1                77.77

B2                96.76

C1               113.23


REACHES
R1                91.25
    Down          90.52

R2               210.60
    Down         209.84

R3                77.77
    Down          77.71

R4               171.32
    Down         171.21

Basin C          113.23
    Down          95.76

Basin A          209.84
    Down         201.16

Basin B          171.21
    Down         157.62


OUTLET           422.69
```

```
A-Mehr Inc                           PVT Landfill
                                   Basins A, B & C
                               Honolulu County, Hawaii
                           Hydrograph Peak/Peak Time Table

 Sub-Area       Peak Flow and Peak Time (hr) by Rainfall Return Period
 or Reach        25-Yr
Identifier       (cfs)
              (hr)
--------------------------------------------------------------------------------
SUBAREAS
A1               91.25
              9.96
A2              121.65
             10.00
B1               77.77
              9.93
B2               96.76
              9.93
C1              113.23
              9.96

REACHES
R1               91.25
              9.96
    Down         90.52
             10.03
R2              210.60
             10.02
    Down        209.84
             10.08
R3               77.77
              9.93
    Down         77.71
              9.96
R4              171.32
              9.94
    Down        171.21
              9.95

Basin C         113.23
              9.96
    Down         95.76
             10.04
Basin A         209.84
             10.08
    Down        201.16
             10.12
Basin B         171.21
              9.95
    Down        157.62
             10.00

OUTLET          422.69
```

```
A-Mehr Inc                          PVT Landfill
                                  Basins A, B & C
                               Honolulu County, Hawaii

                                Structure Output Table

Reach              Peak Flow (PF), Storage Volume (SV), Stage (STG)
 Identifier                by Rainfall Return Period
Structure
 Identifier        25-Yr
--------------------------------------------------------------------------------
--
Reach: Basin C
Weir : Basin C
 11(ft)
  PF   (cfs)        95.76
  SV (ac ft)         1.05
  STG   (ft)         2.10

Reach: Basin A
Weir : Basin A
 27(ft)
  PF   (cfs)       201.16
  SV (ac ft)          .88
  STG   (ft)         1.91

Reach: Basin B
Weir : Basin B
 30(ft)
  PF   (cfs)       157.62
  SV (ac ft)          .85
  STG   (ft)         1.48
```

```
A-Mehr Inc                          PVT Landfill
                                  Basins A, B & C
                               Honolulu County, Hawaii

                                Sub-Area Summary Table

 Sub-Area  Drainage     Time of     Curve  Receiving     Sub-Area
Identifier   Area    Concentration Number    Reach      Description
             (ac)        (hr)
--------------------------------------------------------------------------------
A1           16.60      0.148        89    R1
A2           24.00      0.207        89    R2
B1           13.10      0.100        89    R3
B2           16.30      0.100        89    R4
C1           20.60      0.148        89    Basin C

Total Area:   90.60 (ac)
```

```
A-Mehr Inc                       PVT Landfill
                               Basins A, B & C
                           Honolulu County, Hawaii

                             Reach Summary Table


               Receiving     Reach        Routing
  Reach          Reach       Length       Method
Identifier     Identifier     (ft)
---------------------------------------------------------------------

  R1             R2           2363        CHANNEL
  R2             Basin A      2385        CHANNEL
  R3             R4           2490        CHANNEL
  R4             Basin B      1235        CHANNEL
  Basin C        Outlet                   STRUCTURE(Basin C)
  Basin A        Outlet                   STRUCTURE(Basin A)
  Basin B        Outlet                   STRUCTURE(Basin B)
```

```
A-Mehr Inc                       PVT Landfill
                               Basins A, B & C
                           Honolulu County, Hawaii

                    Sub-Area Time of Concentration Details


 Sub-Area      Flow            Manning's    End     Wetted               Travel
Identifier/   Length    Slope       n       Area   Perimeter   Velocity   Time
               (ft)    (ft/ft)             (sq ft)    (ft)     (ft/sec)   (hr)
--------------------------------------------------------------------------------
A1
  SHEET          100   0.0330    0.150                                    0.120
  SHALLOW        100   0.0330    0.050                                    0.009
  SHALLOW        200   0.0330    0.050                                    0.019

                                                 Time of Concentration     .148
                                                                        ========

A2
  SHEET          100   0.0200    0.150                                    0.146
  SHALLOW        200   0.0200    0.050                                    0.024
  SHALLOW        300   0.0200    0.050                                    0.037

                                                 Time of Concentration     .207
                                                                        ========

B1
  SHEET          100   0.3300    0.150                                    0.048
  SHALLOW        100   0.3300    0.050                                    0.003

                                                 Time of Concentration      0.1
                                                                        ========
```

```
B2
  SHEET         100   0.3300     0.150                                  0.048
  SHALLOW       200   0.3300     0.050                                  0.006
  SHALLOW       200   0.1500     0.050                                  0.009

                                         Time of Concentration           0.1
                                                                     ========

C1
  SHEET         100   0.0330     0.150                                  0.120
  SHALLOW       100   0.0330     0.050                                  0.009
  SHALLOW       200   0.0330     0.050                                  0.019

                                         Time of Concentration          .148
                                                                    ========

A-Mehr Inc                          PVT Landfill
                                  Basins A, B & C
                              Honolulu County, Hawaii

                    Sub-Area Land Use and Curve Number Details

 Sub-Area                                             Hydrologic   Sub-Area
Curve
Identifier          Land Use                             Soil         Area
Number
                                                  Group       (ac)
--------------------------------------------------------------------------------
A1         CN directly entered by user              -        16.6         89

           Total Area / Weighted Curve Number                 16.6        89
                                                              ====        ==

A2         CN directly entered by user              -        24           89

           Total Area / Weighted Curve Number                  24         89
                                                               ==         ==

B1         CN directly entered by user              -        13.1         89

           Total Area / Weighted Curve Number                 13.1        89
                                                              ====        ==

B2         CN directly entered by user              -        16.3         89

           Total Area / Weighted Curve Number                 16.3        89
                                                              ====        ==

C1         CN directly entered by user              -        20.6         89

           Total Area / Weighted Curve Number                 20.6        89
                                                              ====        ==
```

```
A-Mehr Inc                       PVT Landfill
                               Basins A, B & C
                            Honolulu County, Hawaii
                         Reach Channel Rating Details
  Reach        Reach        Reach          Friction       Bottom       Side
 Identifier    Length      Manning's        Slope         Width        Slope
                (ft)          n             (ft/ft)        (ft)
--------------------------------------------------------------------------------
  R1            2363        0.015           0.005          20          2 :1
  R2            2385        0.03            0.013          20          2 :1
  R3            2490        0.015           0.048          20          2 :1
  R4            1235        0.015           0.049          20          2 :1
  Basin C      (This reach is a structure: Basin C)
  Basin A      (This reach is a structure: Basin A)
  Basin B      (This reach is a structure: Basin B)

  Reach                                      End          Top       Friction
 Identifier     Stage          Flow          Area         Width       Slope
                 (ft)          (cfs)        (sq ft)       (ft)       (ft/ft)
--------------------------------------------------------------------------------
  R1             0.0           0.000           0           20        0.005
                 0.5          44.602        10.5           22
                 1.0         143.550          22           24
                 2.0         471.093          48           28
                 5.0        2441.121         150           40
                10.0        9436.569         400           60
                20.0       41488.084        1200          100

  R2             0.0           0.000           0           20        0.013
                 0.5          35.959        10.5           22
                 1.0         115.734          22           24
                 2.0         379.807          48           28
                 5.0        1968.095         150           40
                10.0        7608.005         400           60
                20.0       33448.763        1200          100

  R3             0.0           0.000           0           20        0.048
                 0.5         138.195        10.5           22
                 1.0         444.773          22           24
                 2.0        1459.627          48           28
                 5.0        7563.538         150           40
                10.0       29238.139         400           60
                20.0      128546.127        1200          100

  R4             0.0           0.000           0           20        0.049
                 0.5         139.627        10.5           22
                 1.0         449.382          22           24
                 2.0        1474.753          48           28
                 5.0        7641.919         150           40
                10.0       29541.133         400           60
                20.0      129878.247        1200          100

  Basin C      (This reach is a structure: Basin C)
  Basin A      (This reach is a structure: Basin A)
  Basin B      (This reach is a structure: Basin B)
```

A-Mehr Inc

PVT Landfill
Basins A, B & C
Honolulu County, Hawaii
Structure Description - User Entered

| Reach Identifier | Surface Area @ Crest (ac) | Height Above Crest (ft) | Surface Area @ Ht Above (ac) | Pipe Diameter (in) | Head on Pipe (ft) | Weir Length (ft) |
|---|---|---|---|---|---|---|
| Basin C | 0.50 | 0 | 0.54 | | | 11 |
| Basin A | 0.44 | 1 | 0.46 | | | 27 |
| Basin B | 0.55 | 1 | 0.58 | | | 30 |

A-Mehr Inc

PVT Landfill
Basins A, B & C
Honolulu County, Hawaii

**Structure Rating Details - Computed**

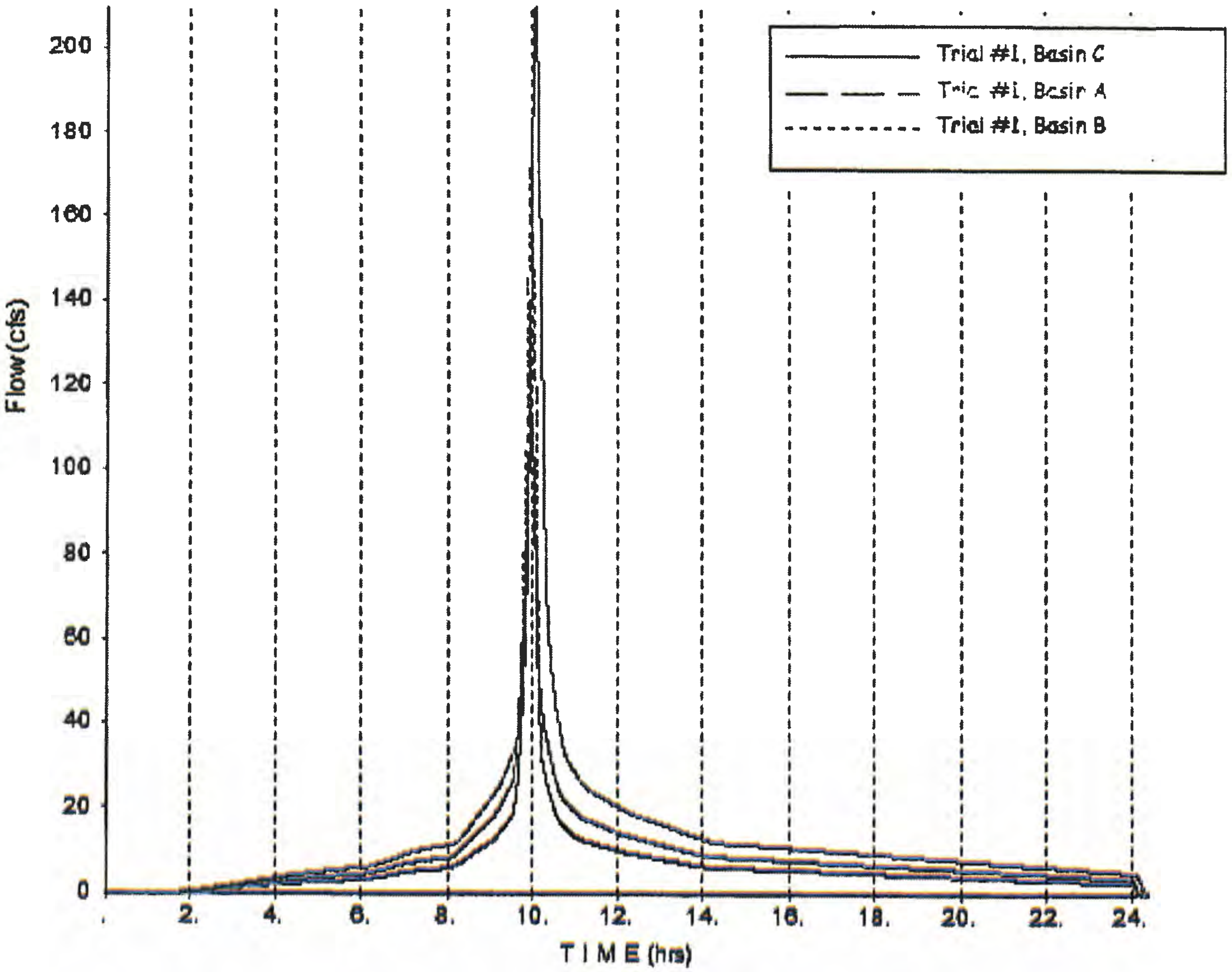
| Reach Identifier | Stage (ft) | Pool Storage (ac ft) | Flows (cfs) @ Weir Length Length #1 11ft | Length #2 ft | Length #3 ft |
|---|---|---|---|---|---|
| Basin C | 0 | 0.00 | 0.000 | | |
| | 0.5 | 0.25 | 10.889 | | |
| | 1 | 0.50 | 30.800 | | |
| | 2 | 1.00 | 87.116 | | |
| | 5 | 2.50 | 344.354 | | |
| | 10 | 5.00 | 973.982 | | |
| | 20 | 10.00 | 2754.836 | | |

| Reach Identifier | Stage (ft) | Pool Storage (ac ft) | Flows (cfs) @ Weir Length Length #1 27ft | Length #2 ft | Length #3 ft |
|---|---|---|---|---|---|
| Basin A | 0 | 0.00 | 0.000 | | |
| | 0.5 | 0.22 | 26.729 | | |
| | 1 | 0.45 | 75.600 | | |
| | 2 | 0.92 | 213.829 | | |
| | 5 | 2.45 | 845.234 | | |
| | 10 | 5.40 | 2390.682 | | |
| | 20 | 12.80 | 6761.870 | | |

| Reach Identifier | Stage (ft) | Pool Storage (ac ft) | Flows (cfs) @ Weir Length |  |  |
|---|---|---|---|---|---|
|  |  |  | Length #1 30ft | Length #2 ft | Length #3 ft |
| Basin B | 0 | 0.00 | 0.000 |  |  |
|  | 0.5 | 0.28 | 29.698 |  |  |
|  | 1 | 0.56 | 84.000 |  |  |
|  | 2 | 1.16 | 237.588 |  |  |
|  | 5 | 3.12 | 939.149 |  |  |
|  | 10 | 7.00 | 2656.313 |  |  |
|  | 20 | 17.00 | 7513.188 |  |  |

**WinTR-55 Output Hydrograph** **Project: PVT Landfill** **4/30/2013**
**Upstream**

**Reaches: (Basin C, Basin A, Basin B) Storm: 25-Yr**
C:\Users\Glen\AppData\Roaming\WinTR-55\PVT Basins A, B & C.w55



```
                        WinTR-55 Current Data Description
                         --- Identification Data ---

User:      A-Mehr Inc                                Date:        4/30/2013
Project:   PVT Landfill                              Units:       English
SubTitle:  PVT Basins D, E & F                       Areal Units: Acres
State:     Hawaii
County:    Honolulu
Filename:  C:\Users\Glen\AppData\Roaming\WinTR-55\PVT Basins D, E & F Rev 2.w55


                             --- Sub-Area Data ---

Name          Description                 Reach         Area(ac)      RCN      Tc
--------------------------------------------------------------------------------
D1                                       Basin D         22            84     0.1
E1                                       R7              9             84     0.1
E2                                       Basin E         13.5          84     0.1
F1                                       R5              8.5           84     0.1
F2                                       R6              7.8           84     0.1

Total area: 60.80 (ac)

                             --- Storm Data  --

                    Rainfall Depth by Rainfall Return Period

   2-Yr        5-Yr        10-Yr       25-Yr       50-Yr       100-Yr       -Yr
   (in)        (in)        (in)        (in)        (in)        (in)         (in)
----------------------------------------------------------------------------------
    4.0         6.0         8.0         9.0         10.0        12.0          .0


Storm Data Source:              User-provided custom storm data
Rainfall Distribution Type:     Type I
Dimensionless Unit Hydrograph:  <standard>

A-Mehr Inc                         PVT Landfill
                               PVT Basins D, E & F
                             Honolulu County, Hawaii
                                  Storm Data
                      Rainfall Depth by Rainfall Return Period

   2-Yr        5-Yr        10-Yr       25-Yr       50-Yr       100-Yr       -Yr
   (in)        (in)        (in)        (in)        (in)        (in)         (in)
----------------------------------------------------------------------------------
    4.0         6.0         8.0         9.0         10.0        12.0          .0


Storm Data Source:              User-provided custom storm data
Rainfall Distribution Type:     Type I
Dimensionless Unit Hydrograph:  <standard>
```

```
A-Mehr Inc                          PVT Landfill
                                PVT Basins D, E & F
                              Honolulu County, Hawaii

                                Watershed Peak Table


 Sub-Area           Peak Flow by Rainfall Return Period
 or Reach      25-Yr
Identifier     (cfs)
--------------------------------------------------------------------------------
--
SUBAREAS
D1            122.15

E1             49.96

E2             74.93

F1             47.18

F2             43.31


REACHES
Basin D       122.15
    Down       97.86

R7             49.96
    Down       49.92

R8             49.92
    Down       49.83

R5             47.18
    Down       47.15

Basin E       118.50
    Down      115.66

Basin F        89.58
    Down       78.04

R6             89.90
    Down       89.58


OUTLET        287.11
```

```
A-Mehr Inc                            PVT Landfill
                                  PVT Basins D, E & F
                                Honolulu County, Hawaii
                              Hydrograph Peak/Peak Time Table

 Sub-Area       Peak Flow and Peak Time (hr) by Rainfall Return Period
 or Reach      25-Yr
Identifier     (cfs)
            (hr)
--------------------------------------------------------------------------------
SUBAREAS
D1             122.15
            9.93
E1              49.96
            9.93
E2              74.93
            9.93
F1              47.18
            9.93
F2              43.31
            9.93


REACHES
Basin D        122.15
            9.93
    Down        97.86
           10.01
R7              49.96
            9.93
    Down        49.92
            9.95
R8              49.92
            9.95
    Down        49.83
            9.98
R5              47.18
            9.93
    Down        47.15
            9.94
Basin E        118.50
            9.95
    Down       115.66
            9.98
Basin F         89.58
            9.98
    Down        78.04
           10.03
R6              89.90
            9.94
    Down        89.58
            9.98

OUTLET         287.11
```

```
A-Mehr Inc                       PVT Landfill
                             PVT Basins D, E & F
                           Honolulu County, Hawaii

                            Structure Output Table

Reach            Peak Flow (PF), Storage Volume (SV), Stage (STG)
 Identifier                by Rainfall Return Period
Structure
 Identifier      25-Yr
-------------------------------------------------------------------------------
--
Reach: Basin D
Weir : Basin D
 25(ft)
  PF   (cfs)      97.86
  SV (ac ft)       1.11
  STG   (ft)       1.22

Reach: Basin E
Weir : Basin E
 31(ft)
  PF   (cfs)     115.66
  SV (ac ft)        .37
  STG   (ft)       1.18

Reach: Basin F
Weir : Basin F
 20(ft)
  PF   (cfs)      78.04
  SV (ac ft)        .62
  STG   (ft)       1.22
```

```
A-Mehr Inc                       PVT Landfill
                             PVT Basins D, E & F
                           Honolulu County, Hawaii

                            Sub-Area Summary Table

 Sub-Area   Drainage     Time of     Curve   Receiving     Sub-Area
Identifier    Area    Concentration  Number   Reach       Description
              (ac)        (hr)
-------------------------------------------------------------------------------
D1           22.00       0.100        84    Basin D
E1            9.00       0.100        84    R7
E2           13.50       0.100        84    Basin E
F1            8.50       0.100        84    R5
F2            7.80       0.100        84    R6

Total Area:   60.80 (ac)
```

```
A-Mehr Inc                        PVT Landfill
                              PVT Basins D, E & F
                            Honolulu County, Hawaii

                              Reach Summary Table


              Receiving      Reach       Routing
  Reach         Reach        Length      Method
Identifier    Identifier      (ft)
------------------------------------------------------------------------

  Basin D       Outlet                   STRUCTURE(Basin D)
  R7            R8             1234      CHANNEL
  R8            Basin E        1685      CHANNEL
  R5            R6             1341      CHANNEL
  Basin E       Outlet                   STRUCTURE(Basin E)
  Basin F       Outlet                   STRUCTURE(Basin F)
  R6            Basin F        1464      CHANNEL
```

```
A-Mehr Inc                        PVT Landfill
                              PVT Basins D, E & F
                            Honolulu County, Hawaii

                  Sub-Area Time of Concentration Details


 Sub-Area     Flow               Mannings's   End     Wetted                Travel
Identifier/  Length    Slope         n        Area   Perimeter   Velocity    Time
              (ft)    (ft/ft)               (sq ft)    (ft)      (ft/sec)    (hr)
------------------------------------------------------------------------------------
D1
  SHEET        100    0.3300      0.150                                      0.048
  SHALLOW      200    0.3300      0.050                                      0.006
  SHALLOW      300    0.3300      0.050                                      0.009

                                              Time of Concentration           0.1
                                                                        ========

E1
  SHEET        100    0.3300      0.150                                      0.048
  SHALLOW      150    0.3300      0.050                                      0.004

                                              Time of Concentration           0.1
                                                                        ========

E2
  SHEET        100    0.2500      0.150                                      0.053
  SHALLOW      200    0.2500      0.050                                      0.007

                                              Time of Concentration           0.1
                                                                        ========
```

```
F1
  SHEET          100   0.3300     0.150                                   0.048
  SHALLOW        100   0.3300     0.050                                   0.003

                                          Time of Concentration          0.1
                                                                     ========

F2
  SHEET          100   0.3300     0.150                                   0.048
  SHALLOW        100   0.3300     0.050                                   0.003

                                          Time of Concentration          0.1
                                                                     ========


A-Mehr Inc                           PVT Landfill
                                 PVT Basins D, E & F
                               Honolulu County, Hawaii

                       Sub-Area Land Use and Curve Number Details

 Sub-Area                                                   Hydrologic   Sub-Area
Curve
Identifier               Land Use                               Soil        Area
Number
                                                       Group         (ac)
---------------------------------------------------------------------------------
D1         CN directly entered by user                  -            22         84

           Total Area / Weighted Curve Number                        22         84
                                                                     ==         ==

E1         Open space; grass cover 50% to 75%   (fair)   D            9         84

           Total Area / Weighted Curve Number                         9         84
                                                                      =         ==

E2         Open space; grass cover 50% to 75%   (fair)   D         13.5         84

           Total Area / Weighted Curve Number                      13.5         84
                                                                   ====         ==

F1         Open space; grass cover 50% to 75%   (fair)   D          8.5         84

           Total Area / Weighted Curve Number                       8.5         84
                                                                    ===         ==

F2         Open space; grass cover 50% to 75%   (fair)   D          7.8         84

           Total Area / Weighted Curve Number                       7.8         84
                                                                    ===         ==
```

A-Mehr Inc

PVT Landfill
PVT Basins D, E & F
Honolulu County, Hawaii

## Reach Channel Rating Details

| Reach Identifier | Reach Length (ft) | Reach Manning's n | Friction Slope (ft/ft) | Bottom Width (ft) | Side Slope |
|---|---|---|---|---|---|
| Basin D | (This reach is a structure: Basin D) | | | | |
| R7 | 1234 | 0.015 | 0.024 | 10 | 1 :1 |
| R8 | 1685 | 0.015 | 0.02 | 10 | 1 :1 |
| R5 | 1341 | 0.015 | 0.041 | 20 | 2 :1 |
| Basin E | (This reach is a structure: Basin E) | | | | |
| Basin F | (This reach is a structure: Basin F) | | | | |
| R6 | 1464 | 0.015 | 0.008 | 20 | 2 :1 |

| Reach Identifier | Stage (ft) | Flow (cfs) | End Area (sq ft) | Top Width (ft) | Friction Slope (ft/ft) |
|---|---|---|---|---|---|
| Basin D | (This reach is a structure: Basin D) | | | | |
| R7 | 0.0 | 0.000 | 0 | 10 | 0.024 |
| | 0.5 | 48.010 | 5.3 | 11 | |
| | 1.0 | 152.372 | 11 | 12 | |
| | 2.0 | 489.684 | 24 | 14 | |
| | 5.0 | 2450.670 | 75 | 20 | |
| | 10.0 | 9241.367 | 200 | 30 | |
| | 20.0 | 39881.598 | 600 | 50 | |
| R8 | 0.0 | 0.000 | 0 | 10 | 0.02 |
| | 0.5 | 43.827 | 5.3 | 11 | |
| | 1.0 | 139.096 | 11 | 12 | |
| | 2.0 | 447.018 | 24 | 14 | |
| | 5.0 | 2237.145 | 75 | 20 | |
| | 10.0 | 8436.176 | 200 | 30 | |
| | 20.0 | 36406.752 | 600 | 50 | |
| R5 | 0.0 | 0.000 | 0 | 20 | 0.041 |
| | 0.5 | 127.721 | 10.5 | 22 | |
| | 1.0 | 411.064 | 22 | 24 | |
| | 2.0 | 1349.004 | 48 | 28 | |
| | 5.0 | 6990.308 | 150 | 40 | |
| | 10.0 | 27022.221 | 400 | 60 | |
| | 20.0 | 118803.793 | 1200 | 100 | |
| Basin E | (This reach is a structure: Basin E) | | | | |

```
 Basin F       (This reach is a structure: Basin F)

 R6              0.0        0.000          0           20         0.008
                 0.5       56.418       10.5           22
                 1.0      181.578         22           24
                 2.0      595.890         48           28
                 5.0     3087.801        150           40
                10.0    11936.420        400           60
                20.0    52478.737       1200          100
```

```
A-Mehr Inc                     PVT Landfill
                           PVT Basins D, E & F
                        Honolulu County, Hawaii

                  Structure Description - User Entered

            Surface     Height     Surface
  Reach     Area @      Above      Area @       Pipe      Head on     Weir
Identifier   Crest      Crest     Ht Above    Diameter     Pipe      Length
             (ac)        (ft)       (ac)        (in)       (ft)        (ft)
-------------------------------------------------------------------------------

 Basin D
              0.90         2        0.94                                 25


 Basin E
               .30         2         .32                                 31


 Basin F
                .5         2         .52                                 20
```

A-Mehr Inc

PVT Landfill
PVT Basins D, E & F
Honolulu County, Hawaii

Structure Rating Details - Computed

| Reach Idendifier | Stage (ft) | Pool Storage (ac ft) | Flows (cfs) @ Weir Length | | |
|---|---|---|---|---|---|
| | | | Length #1 25ft | Length #2 ft | Length #3 ft |
| Basin D | 0 | 0.00 | 0.000 | | |
| | 0.5 | 0.45 | 24.749 | | |
| | 1 | 0.91 | 70.000 | | |
| | 2 | 1.84 | 197.990 | | |
| | 5 | 4.75 | 782.624 | | |
| | 10 | 10.00 | 2213.594 | | |
| | 20 | 22.00 | 6260.990 | | |

| Reach Idendifier | Stage (ft) | Pool Storage (ac ft) | Flows (cfs) @ Weir Length | | |
|---|---|---|---|---|---|
| | | | Length #1 31ft | Length #2 ft | Length #3 ft |
| Basin E | 0 | 0.00 | 0.000 | | |
| | 0.5 | 0.15 | 30.688 | | |
| | 1 | 0.31 | 86.800 | | |
| | 2 | 0.62 | 245.507 | | |
| | 5 | 1.63 | 970.454 | | |
| | 10 | 3.50 | 2744.857 | | |
| | 20 | 8.00 | 7763.628 | | |

| Reach Idendifier | Stage (ft) | Pool Storage (ac ft) | Flows (cfs) @ Weir Length | | |
|---|---|---|---|---|---|
| | | | Length #1 20ft | Length #2 ft | Length #3 ft |
| Basin F | 0 | 0.00 | 0.000 | | |
| | 0.5 | 0.25 | 19.799 | | |
| | 1 | 0.51 | 56.000 | | |
| | 2 | 1.02 | 158.392 | | |
| | 5 | 2.63 | 626.099 | | |
| | 10 | 5.50 | 1770.875 | | |
| | 20 | 12.00 | 5008.792 | | |

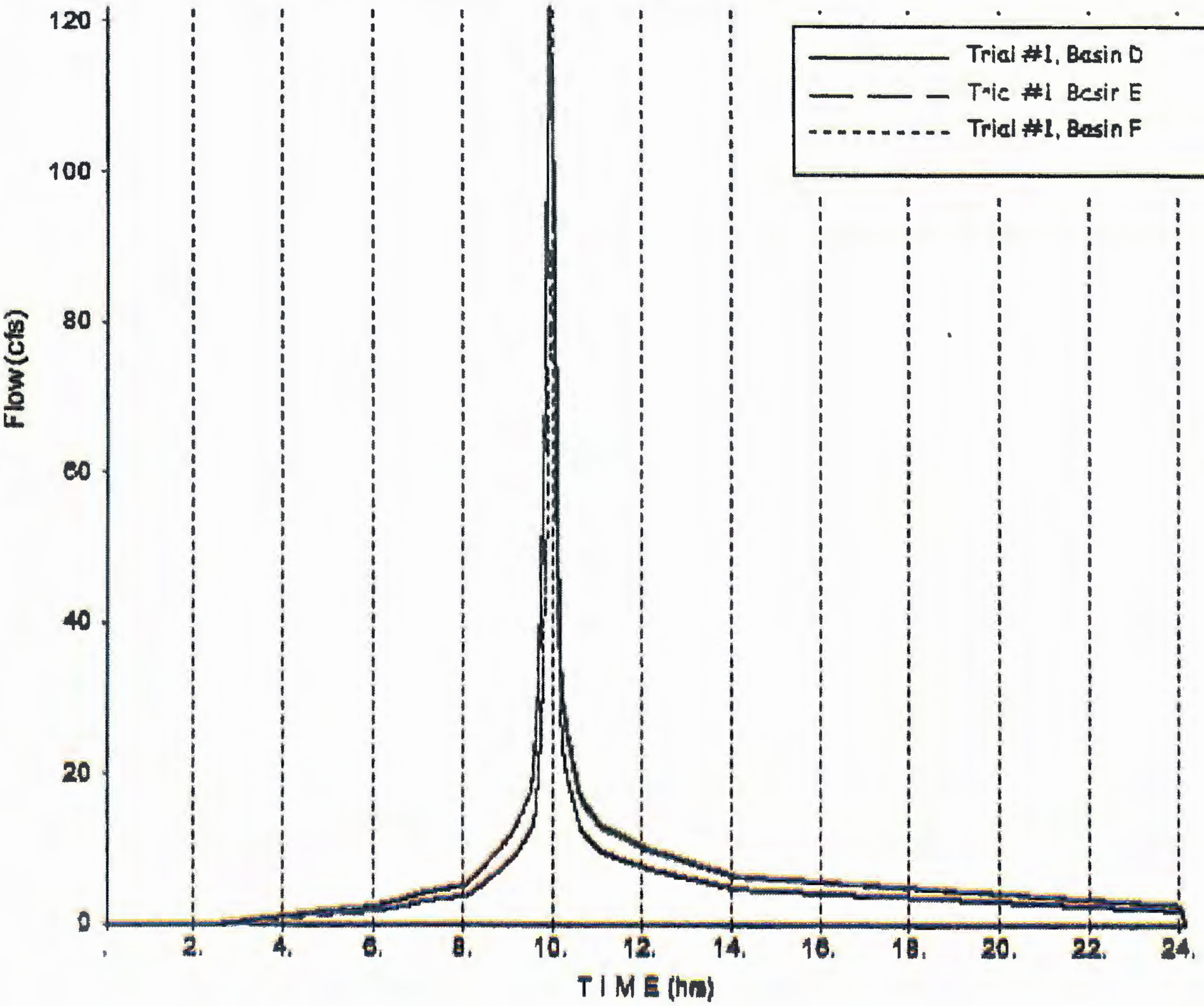
**WinTR-55 Output Hydrograph**
**Upstream**

# Project: PVT Landfill

**4/30/2013**

**Reaches: (Basin D, Basin E, Basin F) Storm: 25-Yr**

C:\Users\Glen\AppData\Roaming\WinTR-55\PVT Basins D, E & F Rev 2.w55



# Static and Seismic Stability Analysis
# PVT Integrated Solid Waste Management Facility
April 2015

## Introduction

The PVT Landfill site is located within a "seismic impact zone", defined by Hawaii Administrative Rules (HAR) Section 11-58.1-13(e), as an area with a ten percent or greater probability of experiencing a horizontal acceleration, due to seismic shaking, of more than 0.10 g in a 250 year period. The United States Geological Survey (USGS) has classified the island of Oahu in UBC Seismic Zone 2A, defined as having a ten percent probability of exceeding a peak ground acceleration of 0.15 g in 50 years. (USGS, 2004a) USGS earthquake hazard maps estimate the peak horizontal ground acceleration in western Oahu to be 0.25 g with a 2% probability of occurrence in 50 years (See Figure 1). A probability of exceedance of 2% in 50 years is approximately equivalent to a probability of 10% in 250 years (USGS, 2004b), and represents an event expected to occur one time in approximately 2,400 years. (USGS, 1996)

HAR 1.58.1-13(e) prohibits municipal solid waste landfills to be constructed or expanded in a seismic impact zone unless the landfill operator or owner demonstrates that the containment structures of the landfill are designed to withstand the maximum horizontal acceleration due to an earthquake. A-Mehr, Inc. has prepared the following analysis to make the required demonstration.

## Methodology

The analysis is based on a slope stability analysis of the landfill at the time when the landfill has reached its maximum refuse elevation of 250 feet above mean sea level (Figure 4). A-Mehr, Inc. used the slope stability analysis computer program PCSTABL5 to compute the static and pseudo-static factors of safety for five (5) critical cross-sections, as shown on Figures 2-6. The program uses the Modified Bishop Method and Modified Janbu Method to determine the location of the lowest factor of safety for failure planes through the liner system for static and pseudostatic conditions.

The analysis was conducted according to procedures specified in the document "RCRA Subtitle D (248) Seismic Design Guidance for Municipal Solid Waste Facilities (U.S. Environmental Protection Agency, April 1995). The document provides a straightforward procedure for evaluating the seismic stability of refuse slopes, as follows:

- Establish cross-sections and assign appropriate shear strength parameters
- Conduct static stability analyses, using appropriate programs to search for the most critical locations in the cross-section to determine the lowest static factor of safety.
- Determine the seismic coefficient, $k_s$. The recommended value for $k_s$ is 50% of the peak horizontal acceleration during the design earthquake.
- Conduct pseudo-static stability analyses of the most critical locations for each cross-section, determining lowest pseudostatic factor of safety at a horizontal load equivalent to the seismic coefficient.
- If the resulting pseudo-static factor of safety is greater than 1.0, the seismic stability analysis is complete.

## Input Data

The analysis requires shear strength properties to be assigned to each material in the system. Table 1 lists the components that form the liner – waste system. Table 2 lists the properties for each component and interface.

The seismic coefficient used in the pseudo-static stability analysis is 50% of the peak horizontal acceleration due to the design earthquake or 0.5 x 0.25 = 0.125g.

**Table 1**
**System Components – From Bottom to Top**

| |
|---|
| Prepared subgrade |
| Geosynthetic Clay Liner (GCL) |
| 80-mil HDPE geomembrane, textured both sides |
| 16 ounce/square yard nonwoven geotextile |
| 12 inches leachate collection sand or gravel (floor only) |
| 16 ounce/square yard nonwoven geotextile |
| 2 ft. protective soil (operations layer) |
| Solid waste |

**Table 2**
**Shear Strength Properties for Stability Analysis**

| Material | Friction Angle | Cohesion | Unit Weight | Reference |
|---|---|---|---|---|
| Bedrock | 45° | 1,000 psf | 140 pcf | MFA, 2008 |
| Compacted Fill | 35° | 400 psf | 125 pcf | A-Mehr, Inc., 2000 |
| Waste | 36° | 0 | 85 pcf | USEPA, 1995 |
| (80-mil textured HDPE / Geosynthetic Clay Liner (GCL) interface | 17° | 0 | 63 pcf | A-Mehr, Inc., 2008 |
| Phase 1 Landfill Clay Liner | 25.0 | 200 | 110 pcf | MFA, 2008 |

## Results

Based on the design earthquake (2% probability of occurrence in 50 years) of 0.25 g, the seismic coefficient $k_s$ is 0.125g.

The computer output sheets for the PCSTABL5 stability analyses are summarized in Table 3. Appendix A contains the computer input data information and output sheets.

**Table 3**
**Stability Analysis Results**

| Cross-Section | Lowest Static Factor of Safety | Lowest Pseudo-Static Factor of Safety |
|---|---|---|
| 1-1' | 1.71 | 1.21 |
| 2-2' | 1.94 | 1.25 |
| 3-3 | 1.91 | 1.25 |
| 4-4' | 2.98 | 2.58 |
| 5-5 | 1.93 | 1.33 |

As shown in Table 3, the static factor of safety for all cross-sections exceeds 1.5, the generally accepted critical value for static slope stability. All cross-sections have a pseudo-static factor of safety greater than 1.0, thereby meeting the USEPA guideline for acceptable seismic performance.

With a seismic factor of safety greater than 1.0, it can be concluded there will be no permanent deflection of the liner system during the design seismic event.

Based on this analysis, we conclude that the containment system for the landfill is stable and it is designed to resist the maximum horizontal acceleration from the design earthquake, and therefore meets the Federal and State requirements of HAR 11-58.1-13(e).

Respectfully Submitted,

M. Ali

A-MEHR, INC.
M. Ali Mehrazarin, P.E.
Principal Engineer

## References

A-Mehr, Inc., 2008. Interface Shear Strength Test Results for Geosynthetic Clay Liner in Contact with 80-mil and 60-mil Textured HDPE Geomembranes. Tests performed by Precision Geosynthetic Laboratories. February 13, 2008.

Masa Fujioka and Associates, 2008. Personal Communication, Masa Fujioka, P.E.

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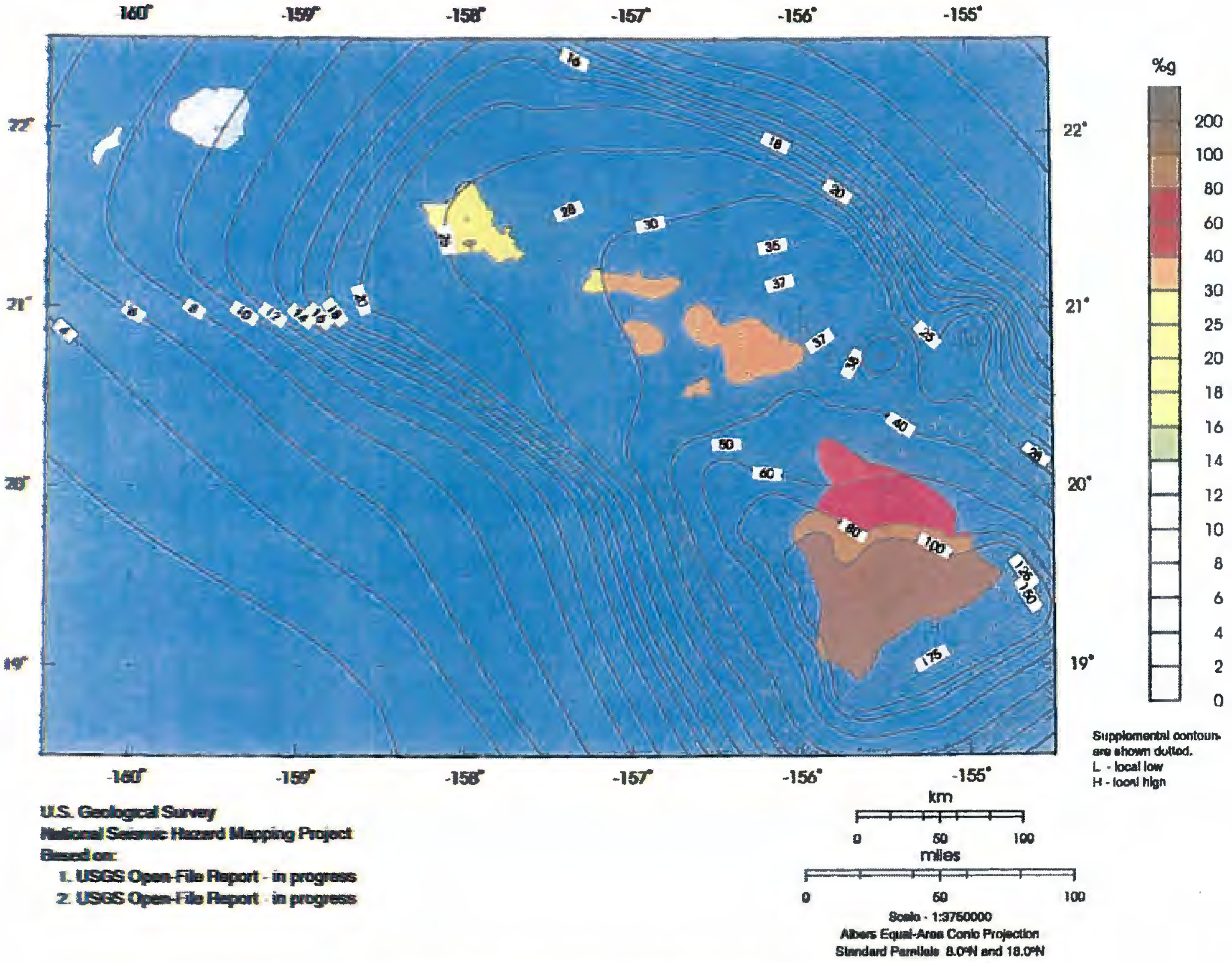
USGS, 2004a. Earthquake Hazards and Zoning in Hawaii. http://hvo.wr.usgs.gov/earthquakes/hazards/. June 2004.

USGS, 2004b. Frequently Asked Questions (FAQ) About Return Periods. http://equhazmaps.usgs.gov/faq/. United States Geological Survey website accessed September 2004.

USGS, 1996. Hawaii Hazard Maps 1996. http://eqhazmaps.usgs.gov/html/his.html. United States Geological Survey website accessed June 2004

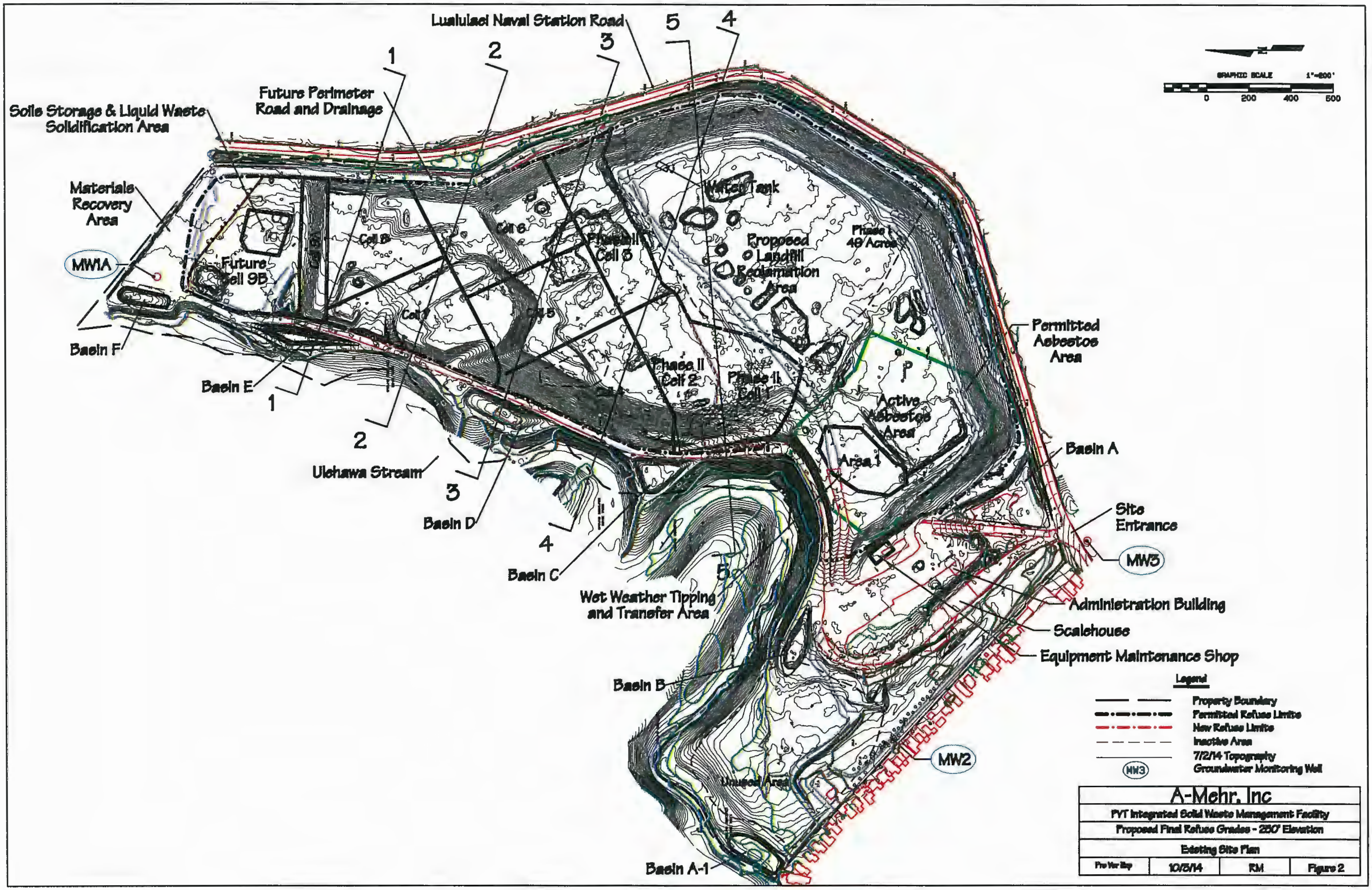
# FIGURES



U.S. Geological Survey
National Seismic Hazard Mapping Project
Based on:
1. USGS Open-File Report - in progress
2. USGS Open-File Report - in progress

Horizontal Ground Acceleration (%g)
With 2% Probability of Exceedance in 50 Years
Firm Rock - 760 m/sec shear wave velocity

**FIGURE 1**



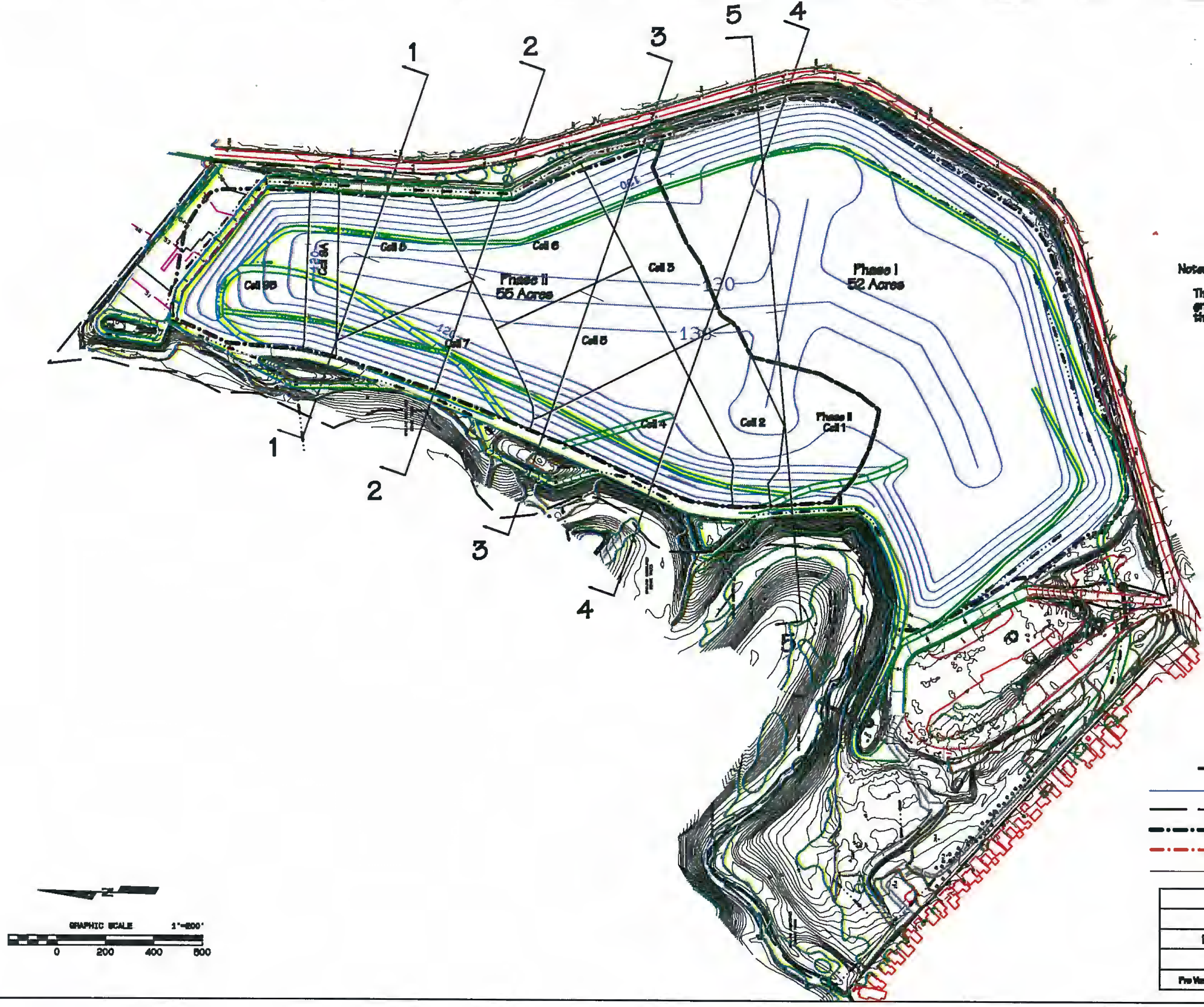
A-Mehr, Inc

PVT Integrated Solid Waste Management Facility

Proposed Final Refuse Grades - 250' Elevation

Existing Site Plan

| | | | |
|---|---|---|---|
| Pre Ver Exp | 10/3/14 | RM | Figure 2 |



Note:

The grades shown are the permitted refuse grades. Final cover will be constructed above these grades and may be 2 to 4 feet thick.

Legend

| | |
|---|---|
| ━━━━ | Final Grades |
| —— —— | Property Boundary |
| ▬ · ▬ · ▬ | Permitted Refuse Limits |
| ▬ · ▬ · ▬ | New Refuse Limits |
| ──── | 7/2/14 Topography Grades |

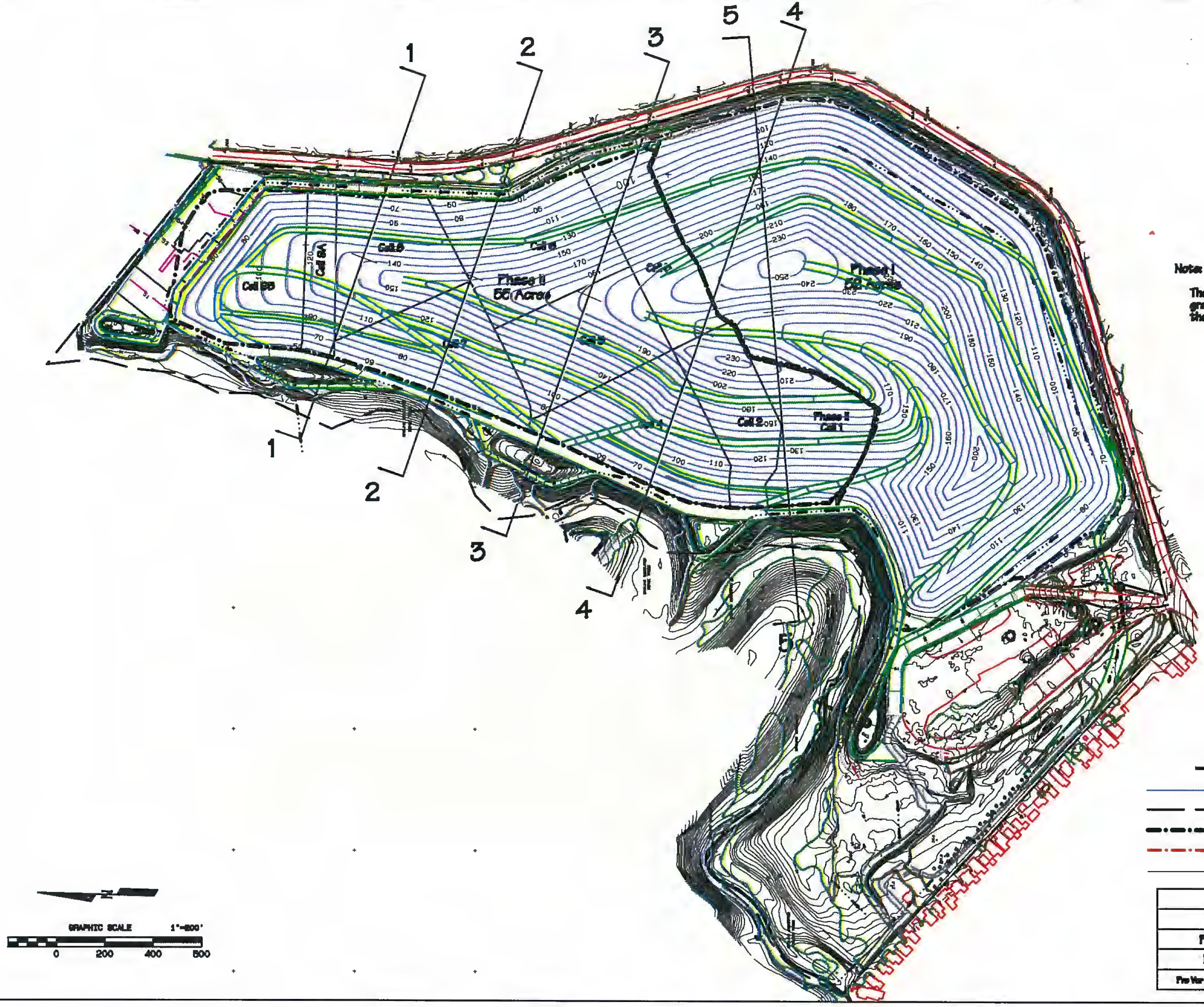
**A-Mehr, Inc**

PVT Land Company LTD. Landfill

Proposed Final Refuse Grades - 250' Elevation

Existing Permitted Refuse Grades

| | | | |
|---|---|---|---|
| Pre Ver Exp | 10/3/14 | RM | Figure 5 |



Note:

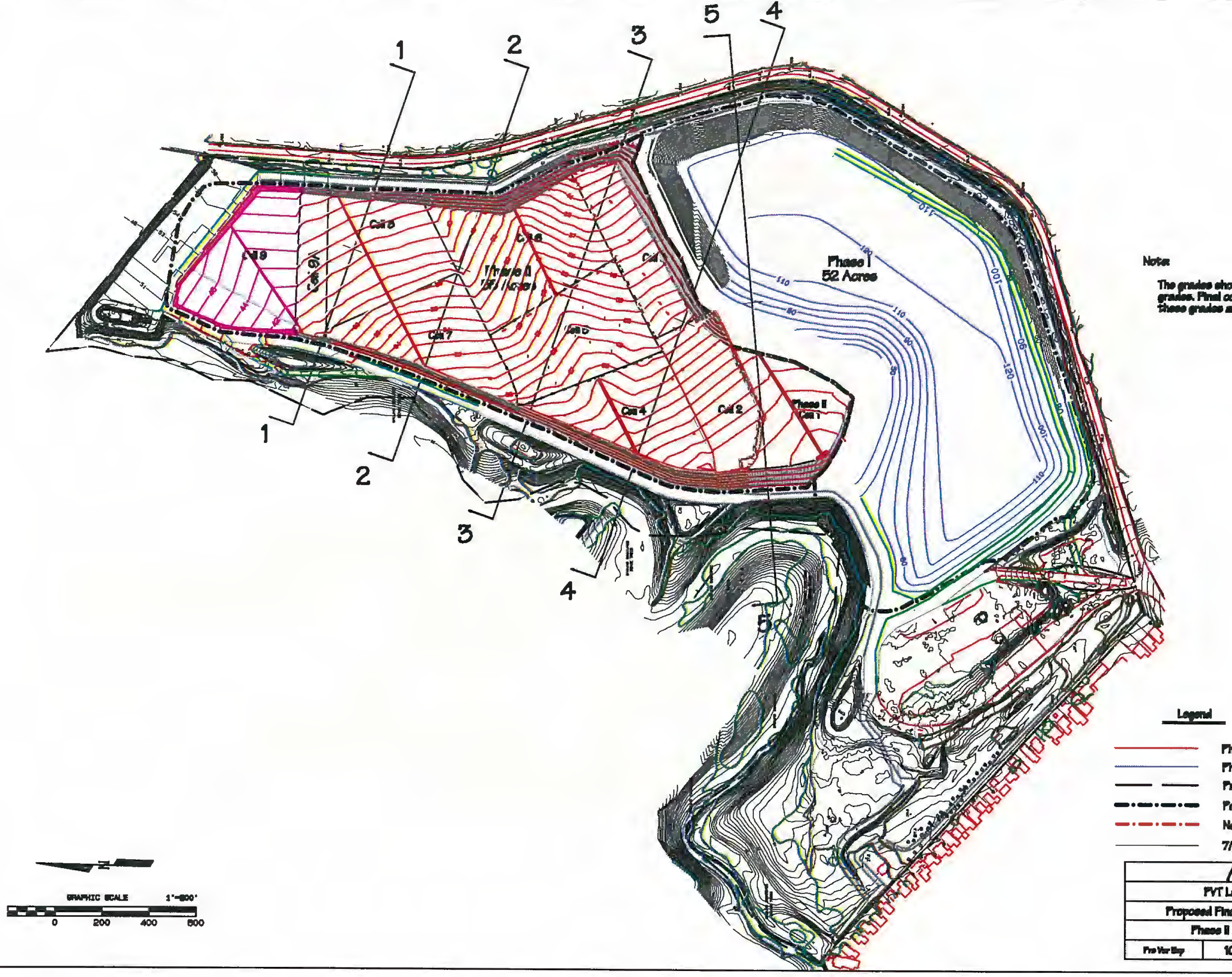
The grades shown are the permitted refuse grades. Final cover will be constructed above these grades and may be 2 to 4 feet thick.

Legend

| | |
|---|---|
| ─── | Final Grades |
| — — | Property Boundary |
| ━ • ━ • ━ | Permitted Refuse Limits |
| ━ • ━ • ━ | New Refuse Limits |
| ─── | 7/2/14 Topography Grades |

A-Mehr, Inc
PVT Land Company LTD. Landfill
Proposed Final Refuse Grades - 250' Elevation
Proposed Final Refuse Grades to 250' AMSL

| | | | |
|---|---|---|---|
| Pro Ver Esp | 10/3/14 | KM | Figure 4 |



Note:

The grades shown are the permitted refuse grades. Final cover will be constructed above these grades and may be 2 to 4 feet thick.

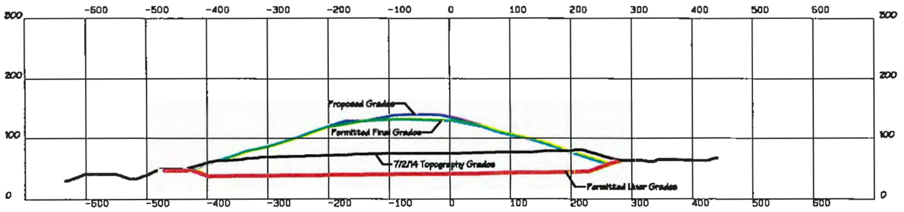
A-Mehr, Inc

FVT Land Company LTD. Landfill

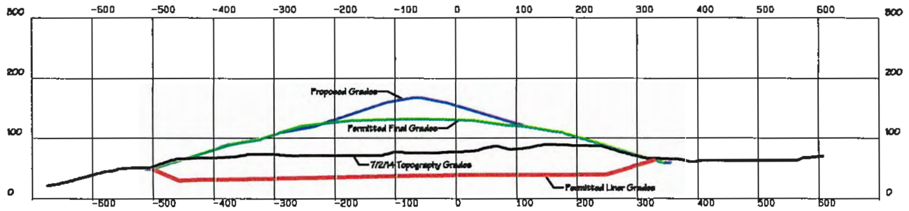
Proposed Final Refuse Grades - 250' Elevation

Phase II Base Grades / Phasing Plan

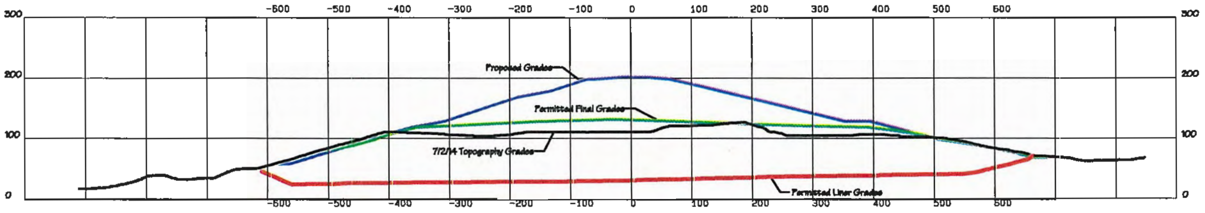
| | | | |
|---|---|---|---|
| Pro Ver Bkp | 10/3/14 | RM | Figure 5 |



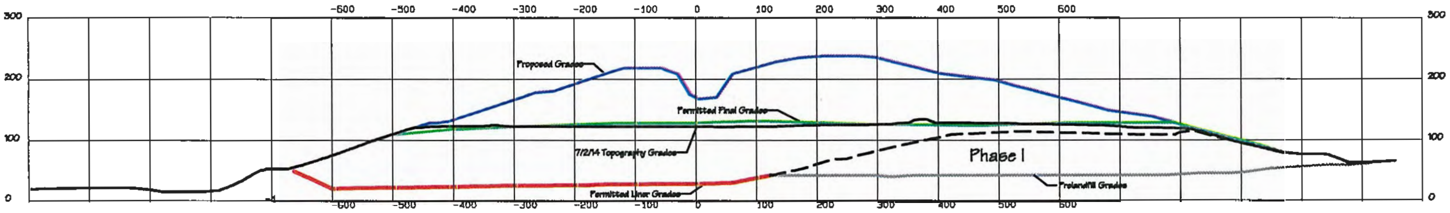
Cross-Section 1-1



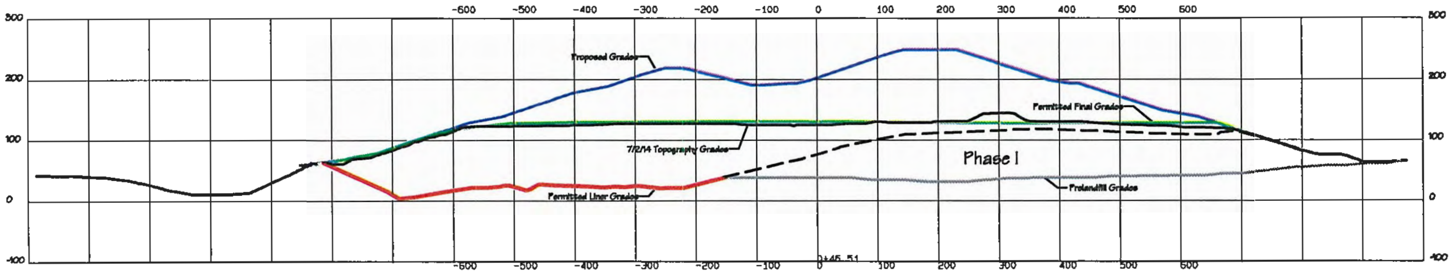
Cross-Section 2-2



Cross-Section 3-3



Cross-Section 4-4



Cross-Section 5-5

A-Mehr, Inc

PVT Land Company LTD. Landfill

Proposed Final Refuse Grades - 250' Elevation

Cross-Section 1-1 through 5-5

| | | | |
|---|---|---|---|
| Pre Ver Exp | 4/20/15 | KM | Figure 6 |

# APPENDIX A

# DETAILED STABILITY ANALYSIS OUTPUT SHEETS

# PVT Final Refuse Grades - 250' Elev. Cross-Section 1-1' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve2-b.pl2 Run By: Username 4/23/2015 02:05PM

| # | FS |
|---|---|
| a | 1.71 |
| b | 1.74 |
| c | 1.75 |
| d | 1.76 |
| e | 1.78 |
| f | 1.84 |
| g | 1.96 |
| h | 1.98 |
| i | 2.13 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

PCSTABL5M/si FSmin=1.71

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 1-1' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve2-bes.pl2 Run By: Username 4/23/2015 02:06PM

| # | FS |
|---|---|
| a | 1.21 |
| b | 1.22 |
| c | 1.22 |
| d | 1.29 |
| e | 1.31 |
| f | 1.36 |
| g | 1.36 |
| h | 1.40 |
| i | 1.46 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

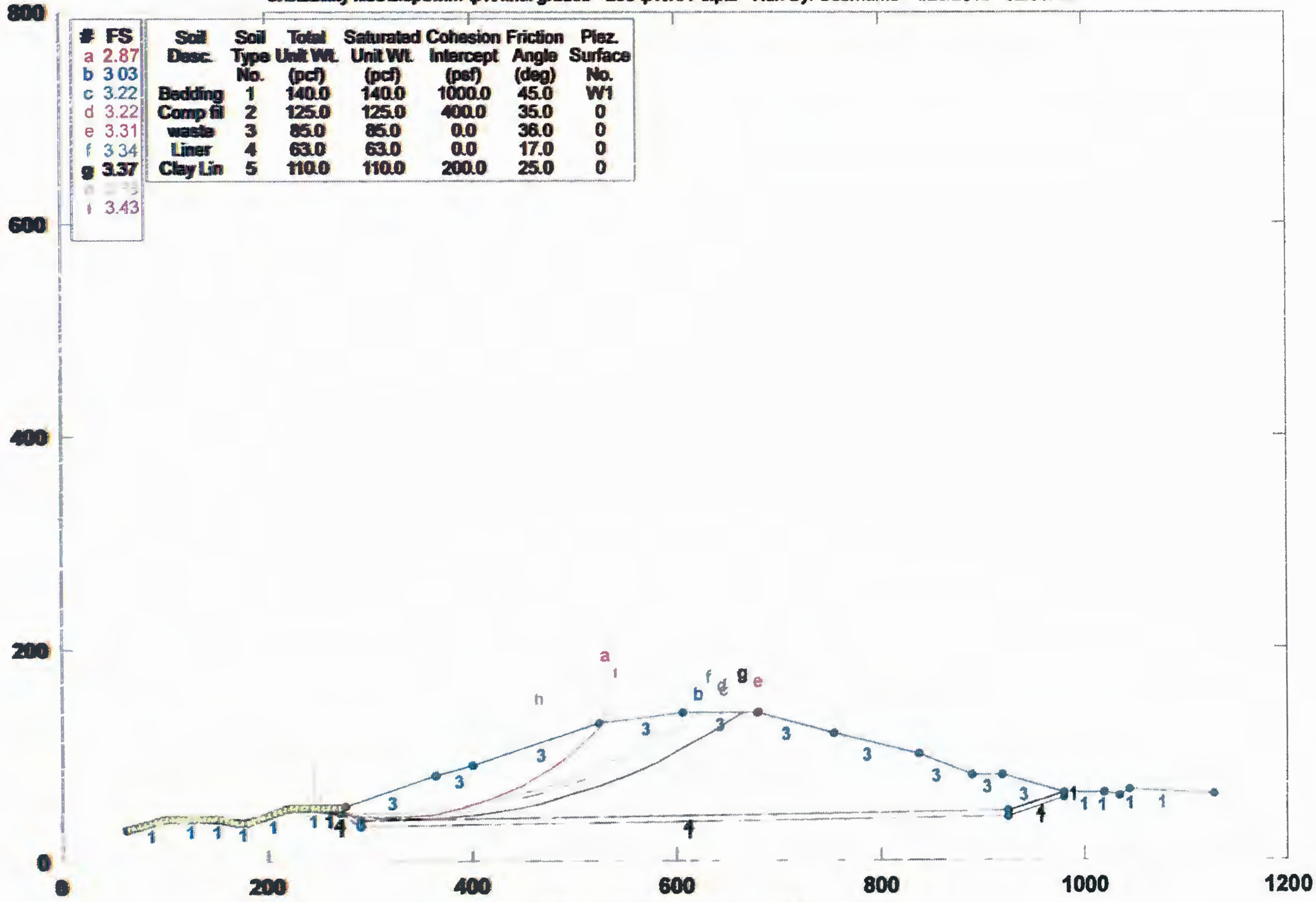
**PCSTABL5M/si FSmin=1.21**

**Safety Factors Are Calculated By Spencer's Method**

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 1-1' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve1-c.pl2 Run By: Username 4/23/2015 02:01PM



| # | FS |
|---|---|
| a | 2.87 |
| b | 3 03 |
| c | 3.22 |
| d | 3.22 |
| e | 3.31 |
| f | 3 34 |
| g | 3.37 |
| h | [illegible] |
| i | 3.43 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

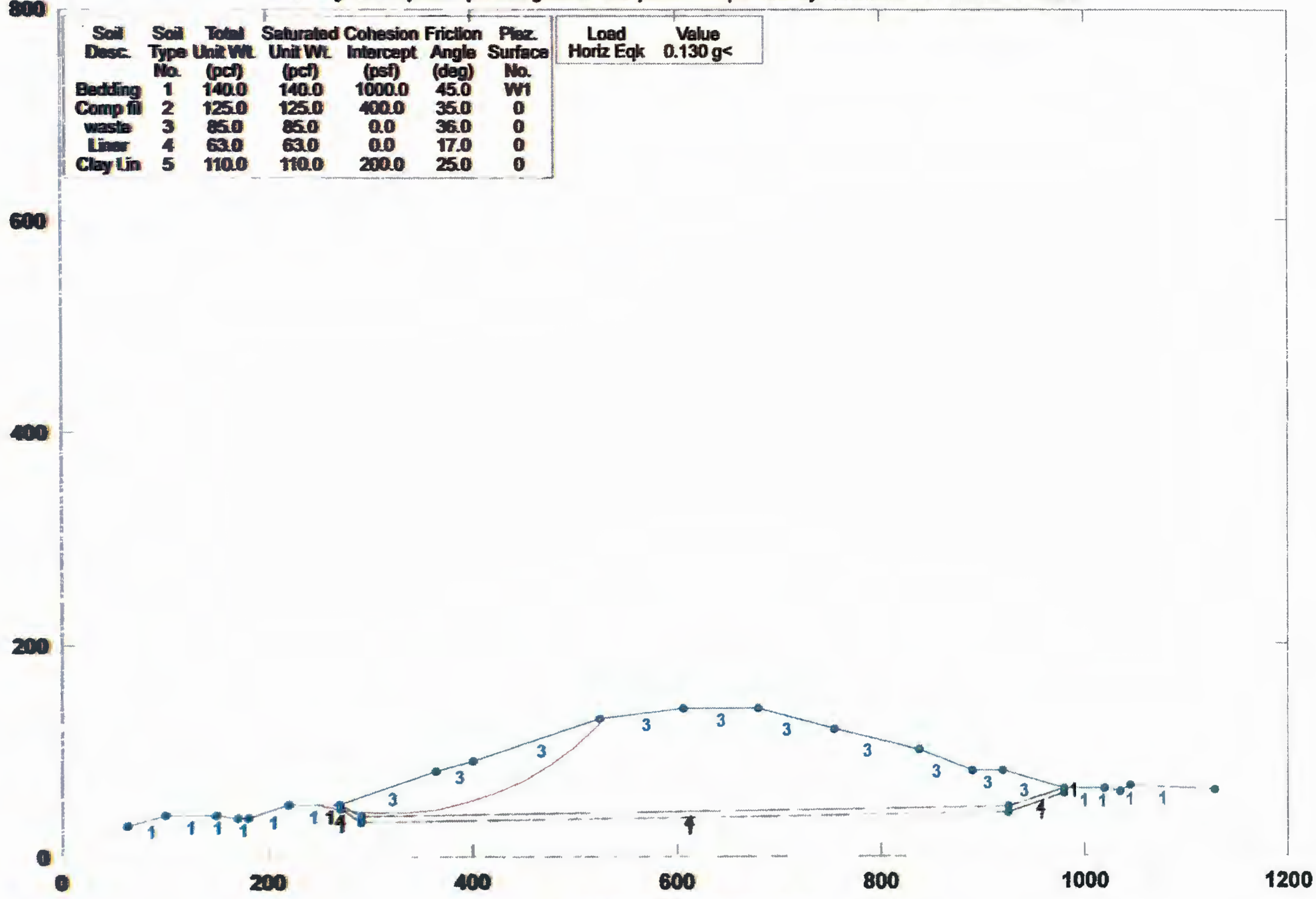
PCSTABL5M/si FSmin=2.87

Safety Factors Are Calculated By The Modified Bishop Method

STED

## PVT Final Refuse Grades - 250' Elev. Cross-Section 1-1' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve1-ces.plt Run By: Username 4/23/2015 02:02PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

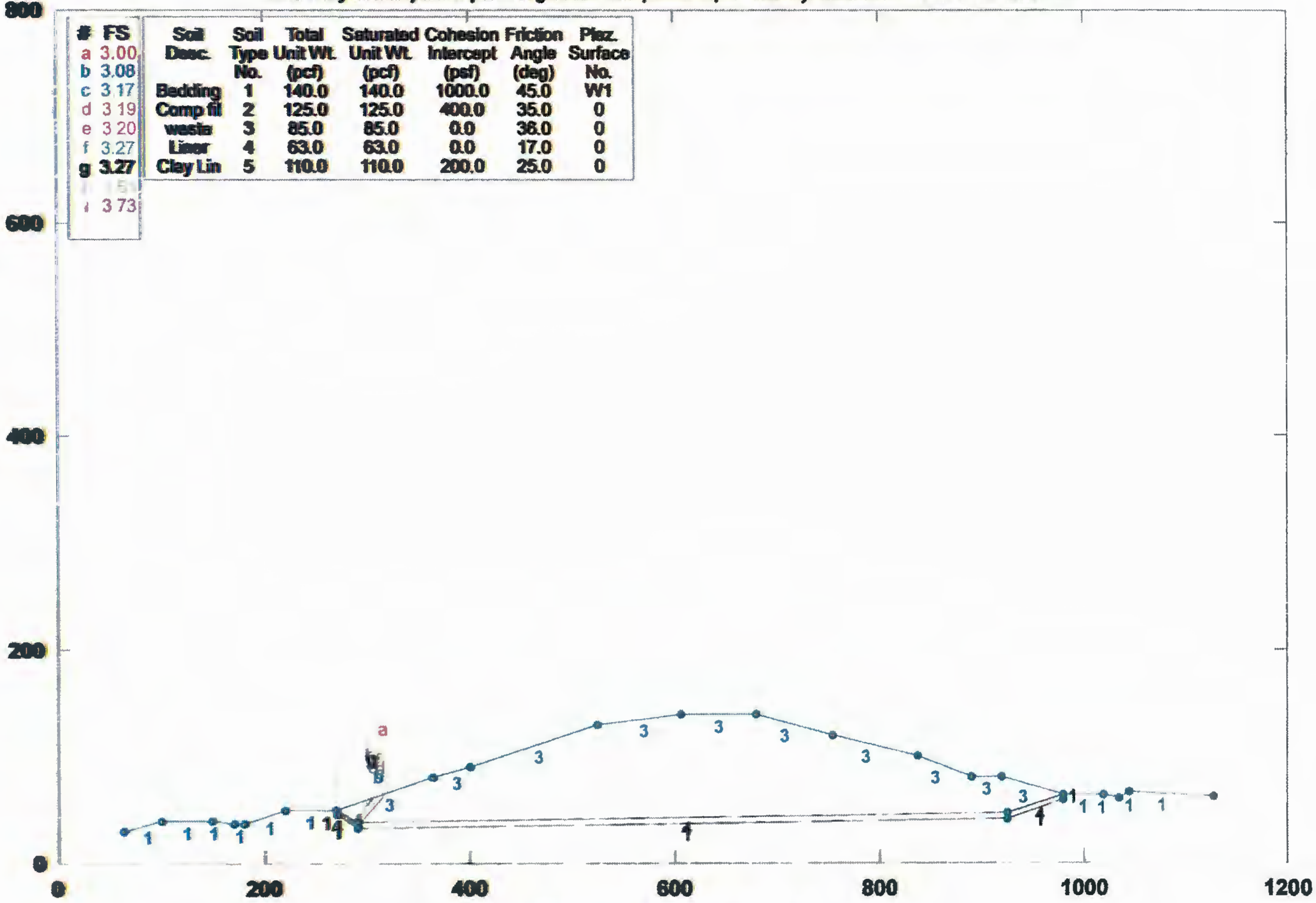
PCSTABL5M/si FSmin=1.94

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 1-1' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve3-b.pl2 Run By: Username 4/23/2015 02:07PM



| # | FS |
|---|---|
| a | 3.00 |
| b | 3.08 |
| c | 3.17 |
| d | 3.19 |
| e | 3.20 |
| f | 3.27 |
| g | 3.27 |
| h | [illegible] |
| i | 3.73 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

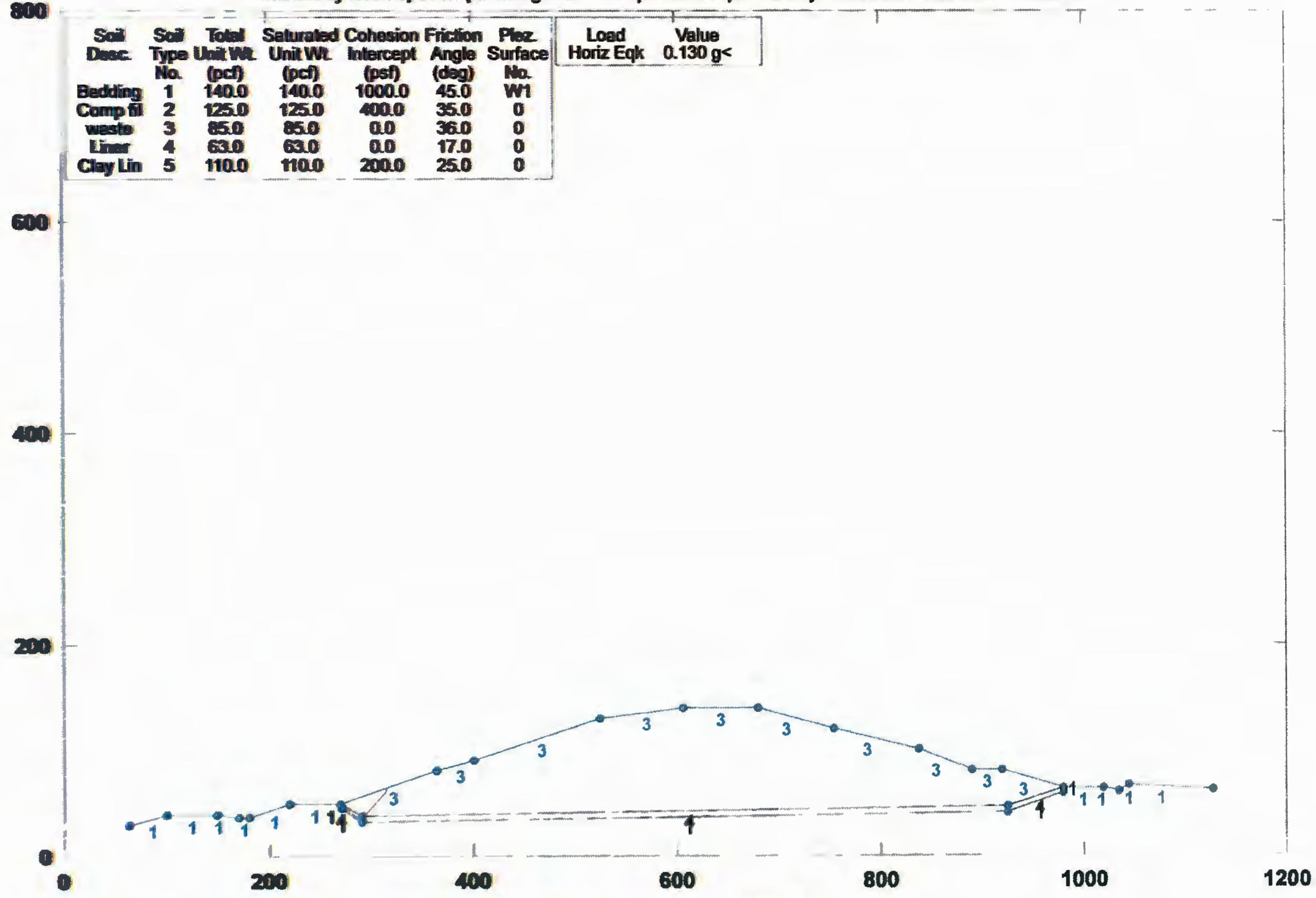
PCSTABL5M/si FSmin=3.00

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 1-1' (Pesudo-Static)

e:\stabillity files\slopewin7\pvt final grades - 250'\pvtve3-bes.plt Run By: Username 4/23/2015 02:08PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

PCSTABL5M/si FSmin=2.97

Factor Of Safety Is Calculated By Spencer`s Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 1-1' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve1-b.pl2 Run By: Username 4/23/2015 02:51PM

| # | FS |
|---|---|
| a | 15.00 |
| b | 16.20 |
| c | 16.69 |
| d | 16.89 |
| e | 20.36 |
| f | 21.99 |
| g | 22.51 |
| i | 25.07 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

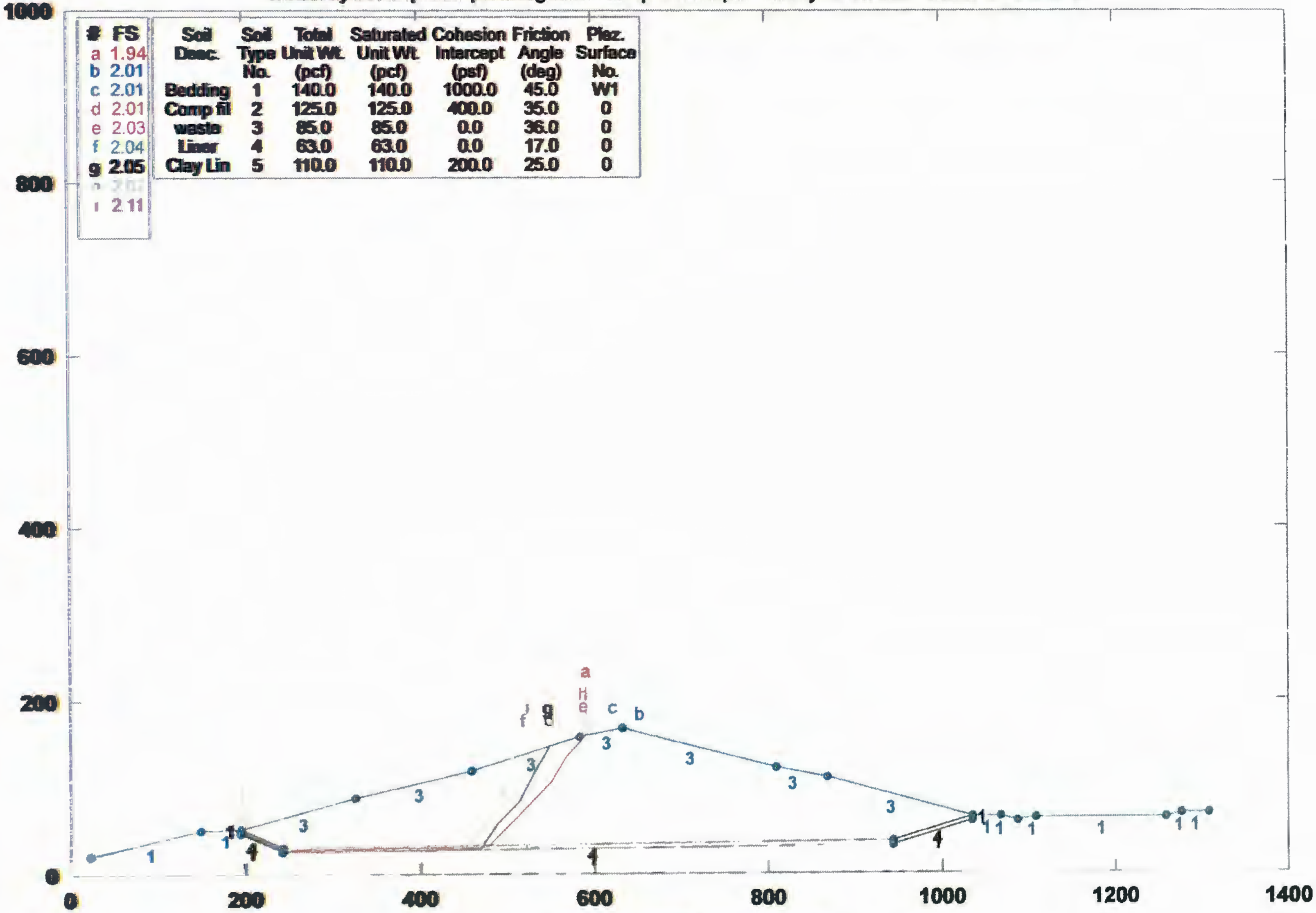
PCSTABL5M/sl FSmin=15.00

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 2-2' (Static)

e:\stabillity files\slopewin7\pvt final grades - 250'\pvtve22-b.pl2 Run By: Username 4/23/2015 01:55PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

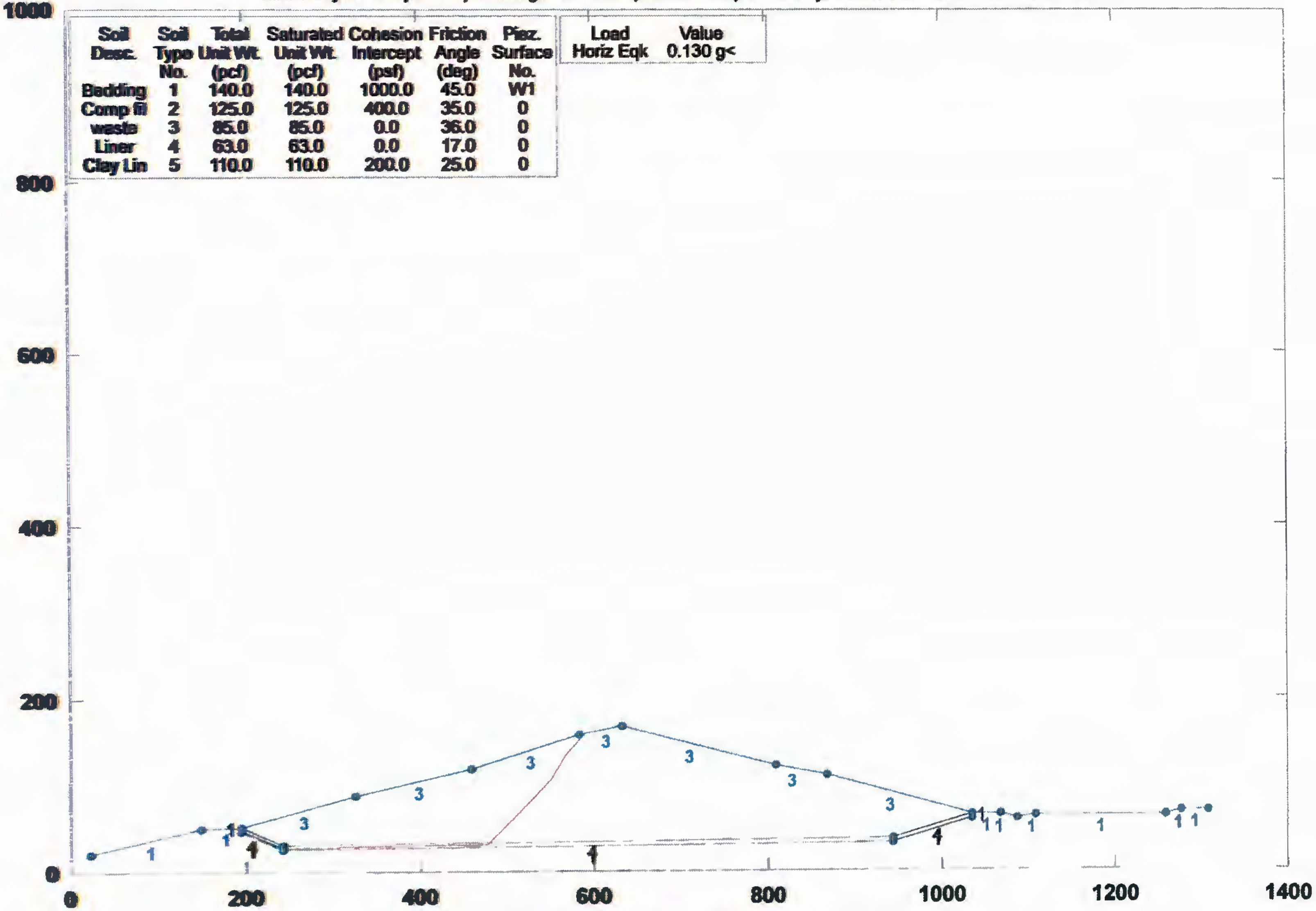
PCSTABL5M/si FSmin=1.94

Safety Factors Are Calculated By The Modified Janbu Method

**STED**

# PVT Final Refuse Grades - 250' Elev. Cross-Section 2-2' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve22-bes.plt Run By: Username 4/23/2015 01:56PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

PCSTABL5M/sl FSmin=1.25

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 2-2' (Static)

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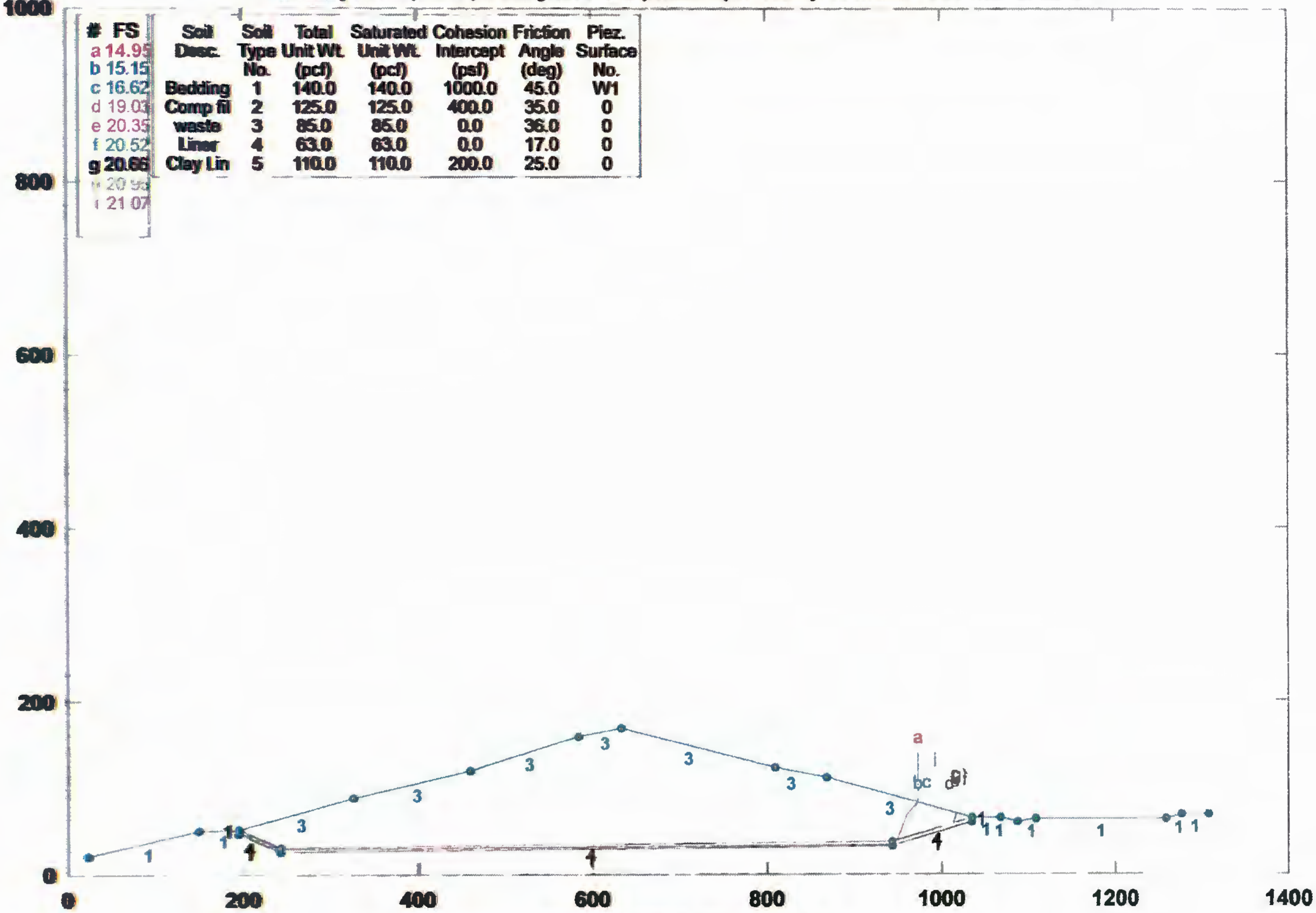


| # | FS |
|---|---|
| a | 14.95 |
| b | 15.15 |
| c | 16.62 |
| d | 19.03 |
| e | 20.35 |
| f | 20.52 |
| g | 20.66 |
| h | 20.95 |
| i | 21.07 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

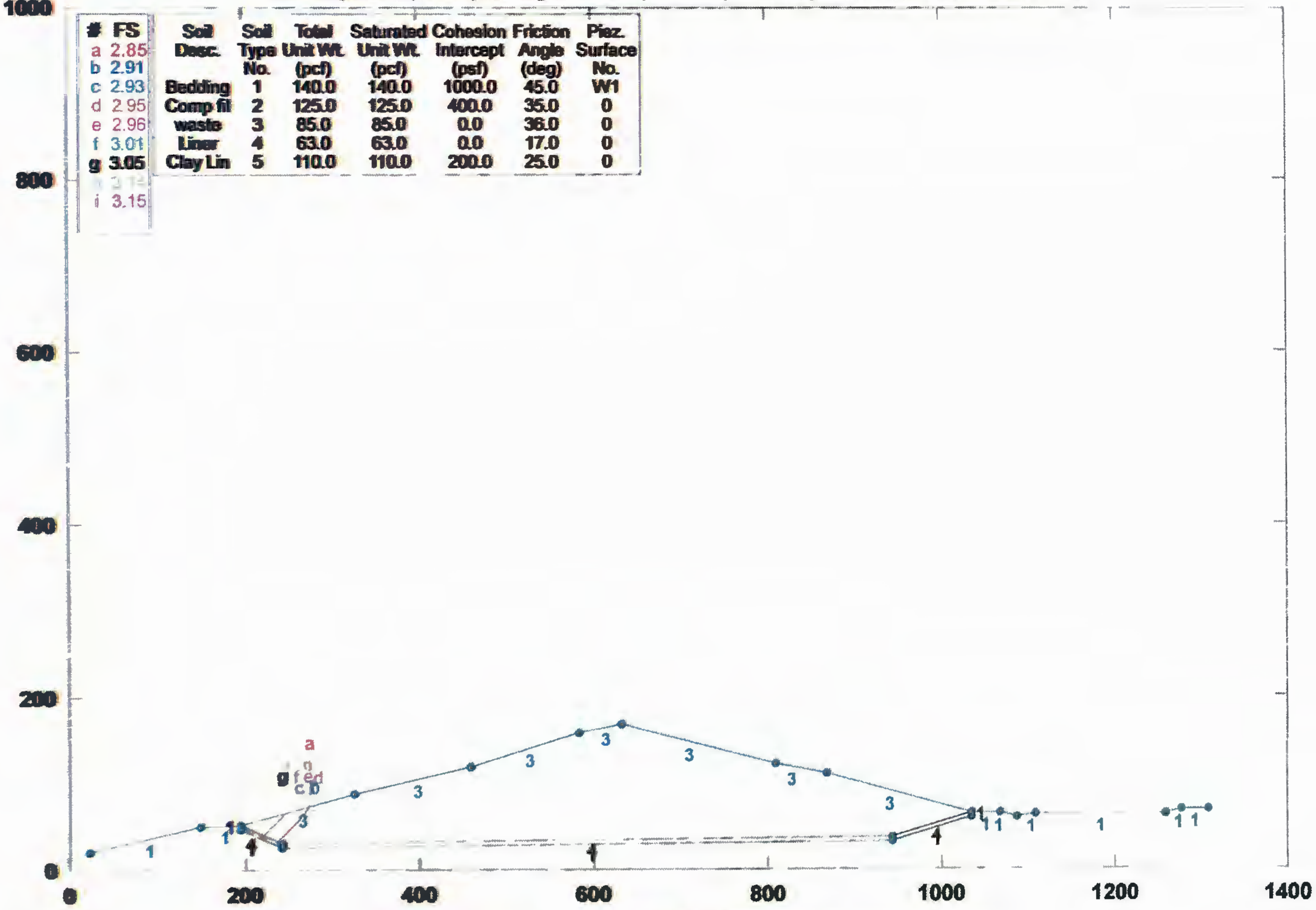
PCSTABL5M/si FSmin=14.95

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 2-2' (Static)

e:\stabillity files\slopewin7\pvt final grades - 250'\pvtve23-b.pl2 Run By: Username 4/23/2015 01:58PM



| # | FS |
|---|---|
| a | 2.85 |
| b | 2.91 |
| c | 2.93 |
| d | 2.95 |
| e | 2.96 |
| f | 3.01 |
| g | 3.05 |
| h | 3.14 |
| i | 3.15 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

PCSTABL5M/si FSmin=2.85

Safety Factors Are Calculated By The Modified Janbu Method

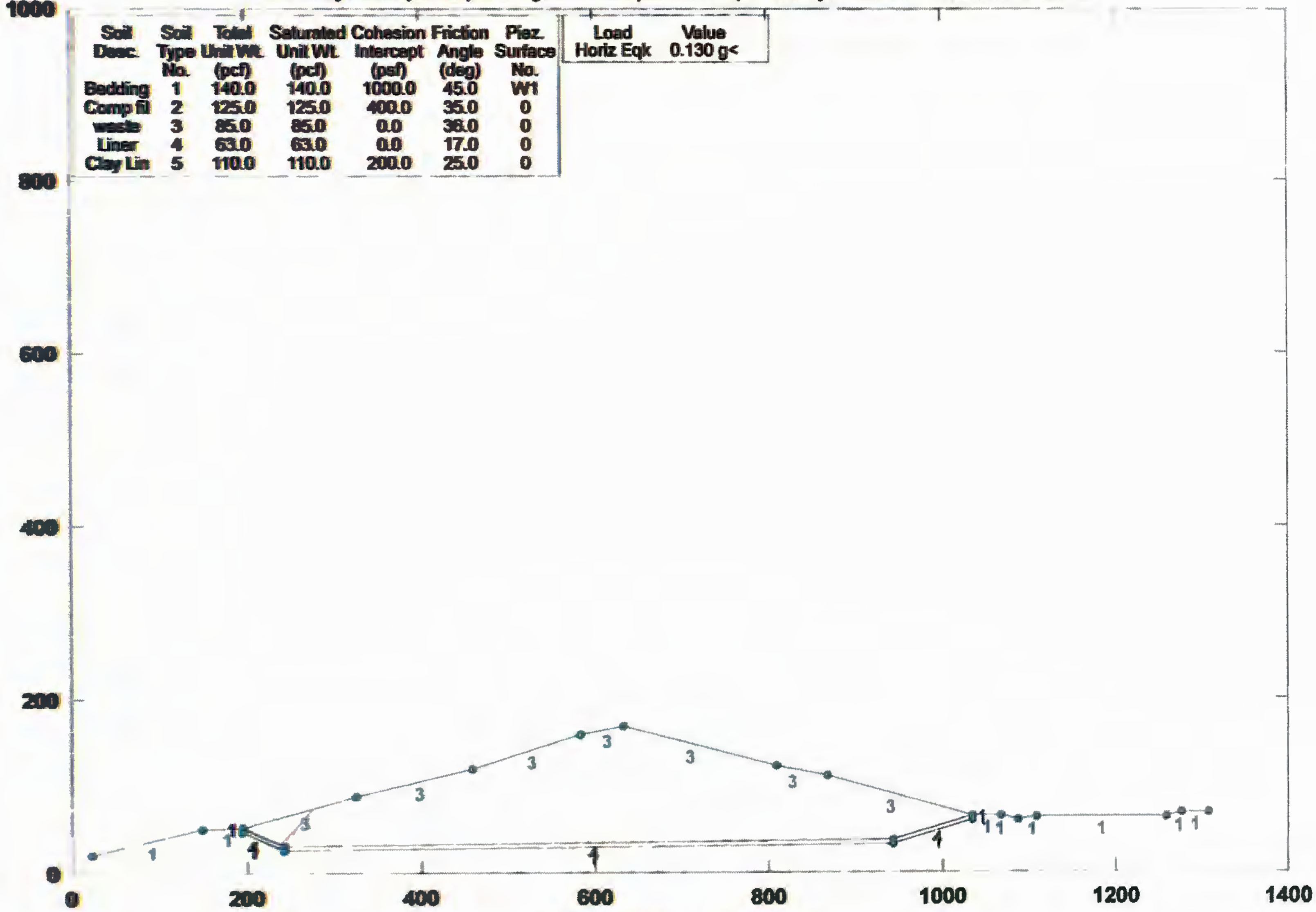
STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 2-2' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve23-bes.plt Run By: Username 4/23/2015 01:59PM

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |



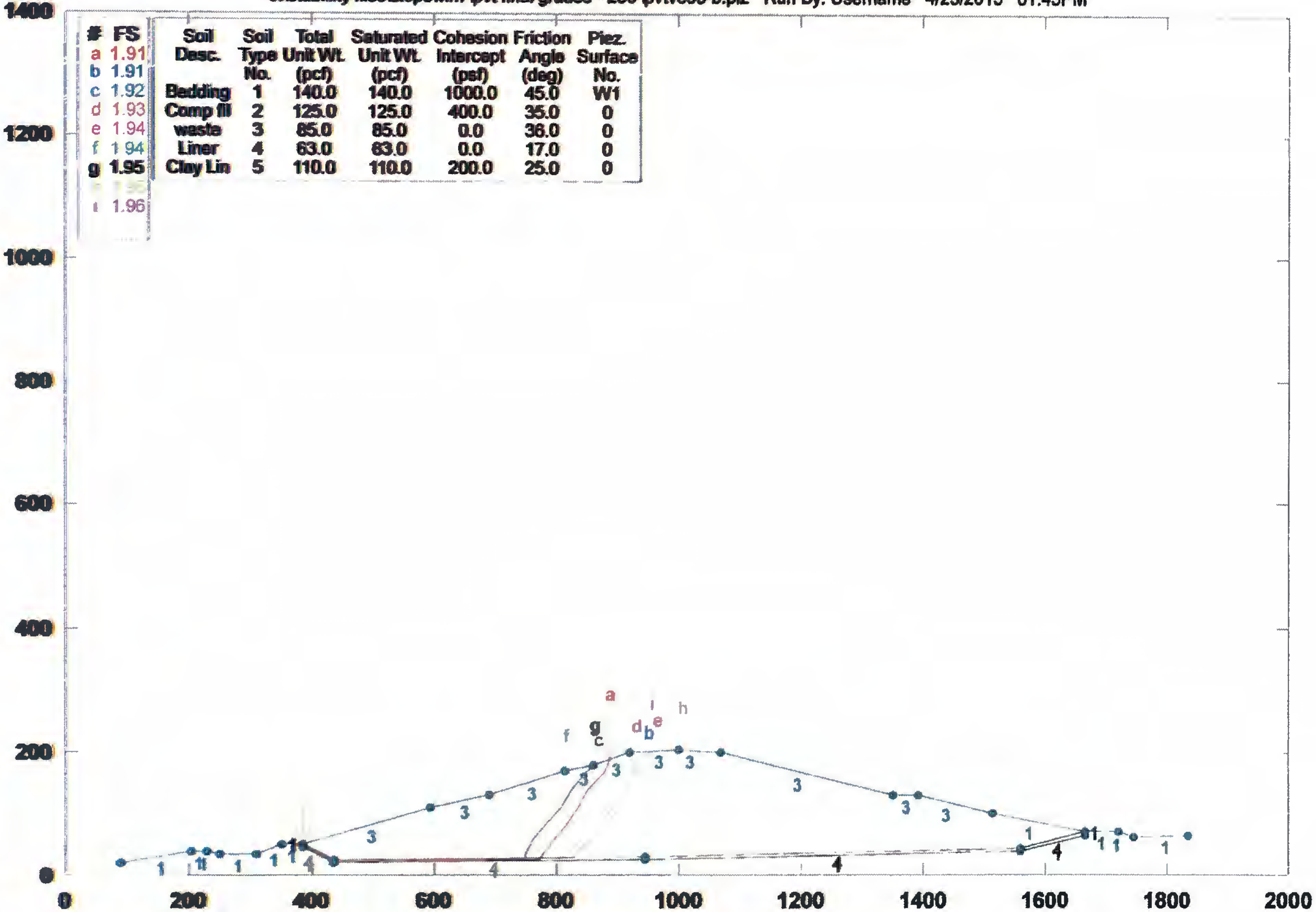
PCSTABL5M/sl FSmin=2.20

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 3-3' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve33-b.pl2 Run By: Username 4/23/2015 01:45PM



| # | FS |
|---|---|
| a | 1.91 |
| b | 1.91 |
| c | 1.92 |
| d | 1.93 |
| e | 1.94 |
| f | 1.94 |
| g | 1.95 |
| h | 1.95 |
| i | 1.96 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fill | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

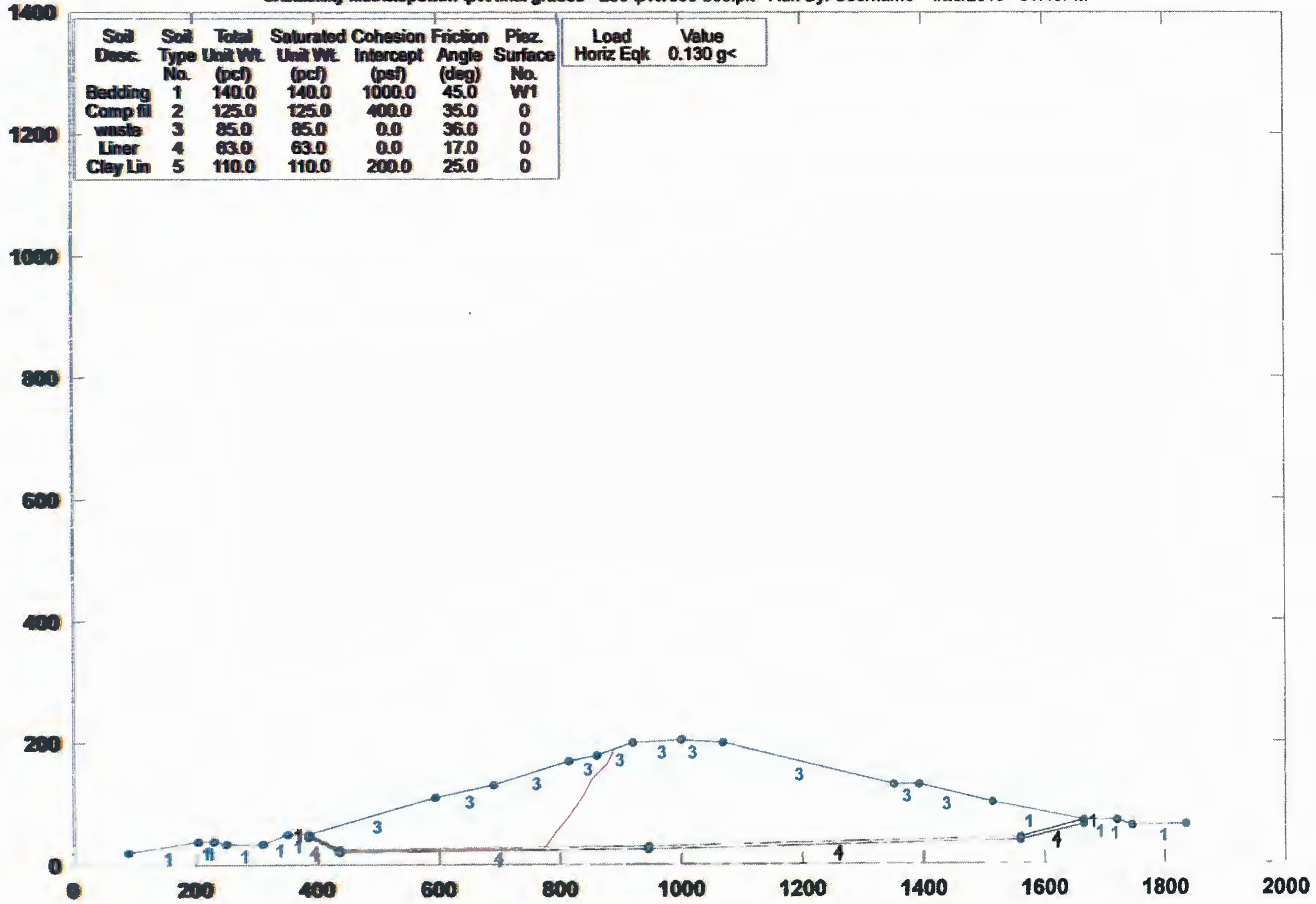
PCSTABL5M/si FSmin=1.91

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 3-3' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve33-bes.plt Run By: Username 4/23/2015 01:46PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

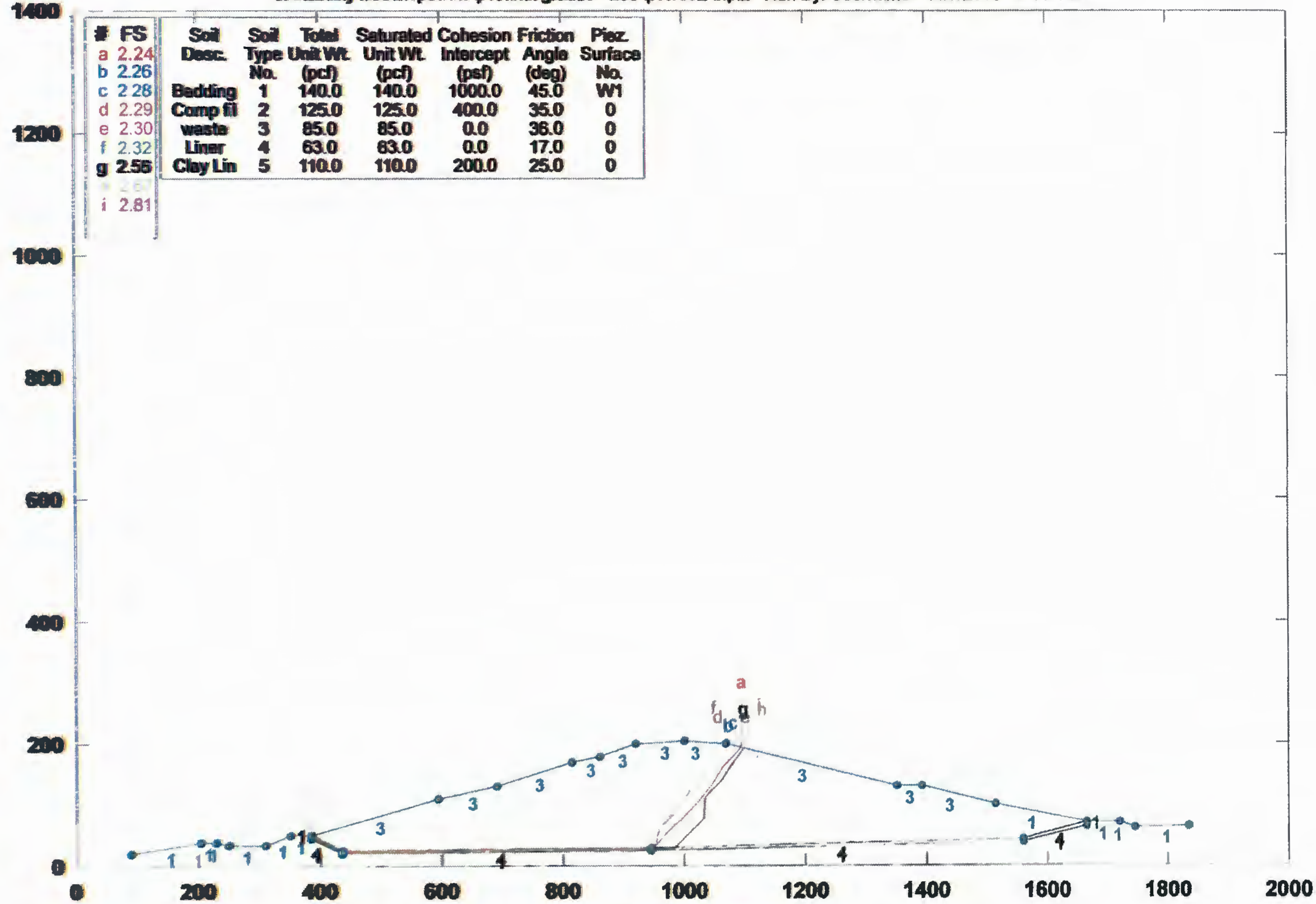
PCSTABL5M/si FSmin=1.25

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 3-3' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve32-b.pl2 Run By: Username 4/23/2015 01:47PM



| # | FS |
|---|---|
| a | 2.24 |
| b | 2.26 |
| c | 2.28 |
| d | 2.29 |
| e | 2.30 |
| f | 2.32 |
| g | 2.56 |
| h | 2.67 |
| i | 2.81 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

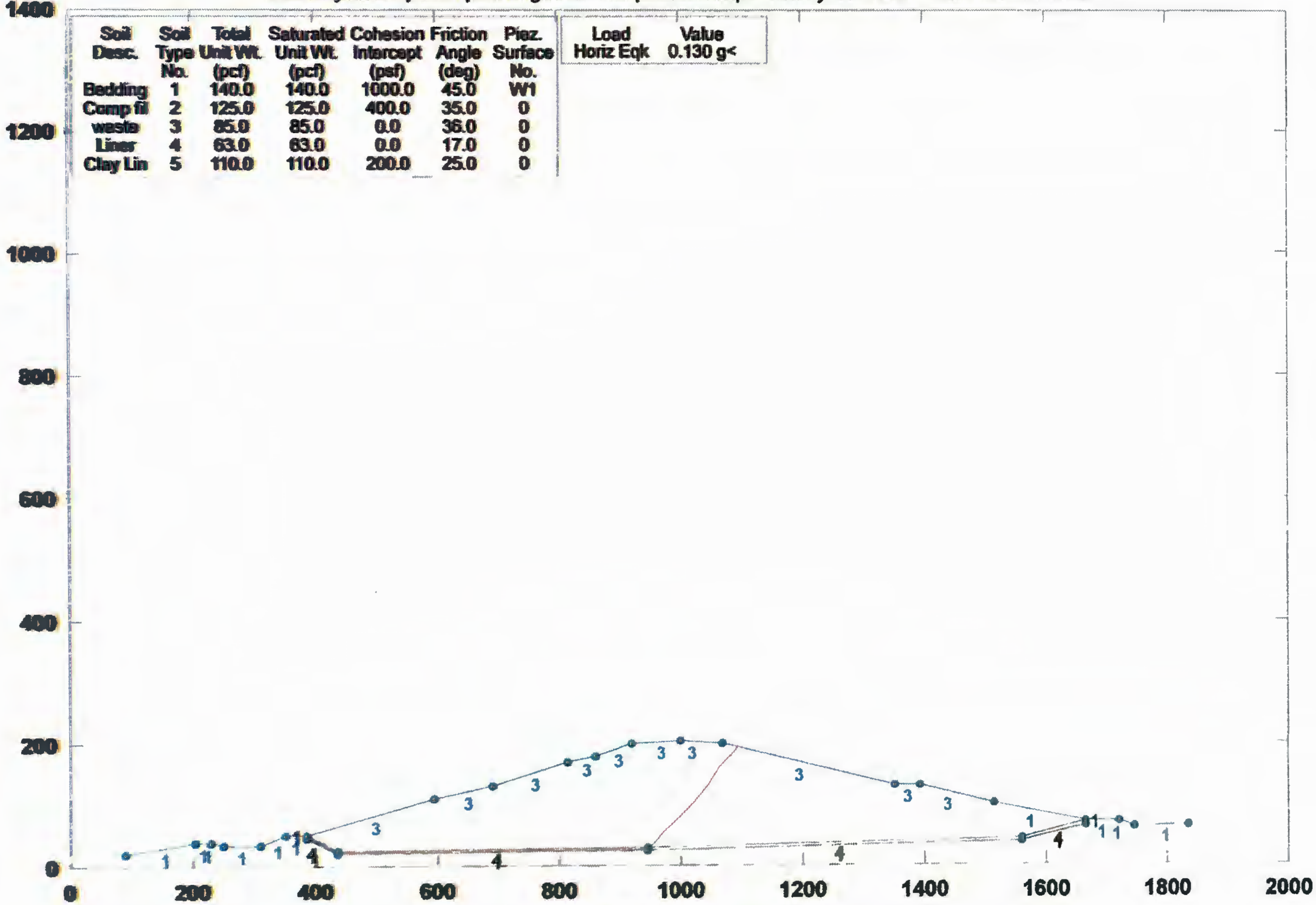
PCSTABL5M/si FSmin=2.24

Safety Factors Are Calculated By The Modified Janbu Method

STED

## PVT Final Refuse Grades - 250' Elev. Cross-Section 3-3' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve32-bes.plt Run By: Username 4/23/2015 01:49PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

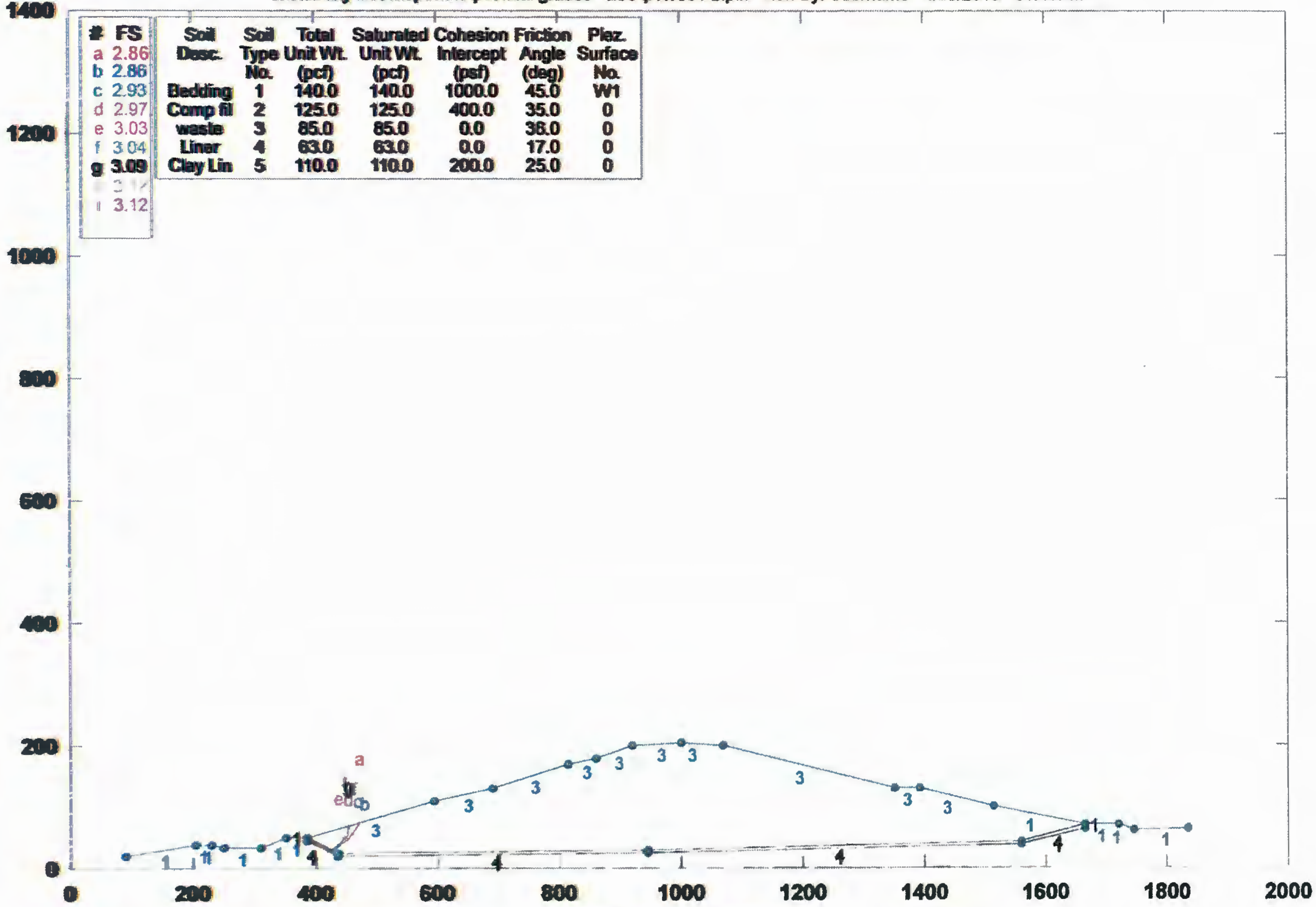
PCSTABL5M/si FSmin=1.33

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 3-3' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve34-b.pl2  Run By: Username  4/23/2015  01:49PM



| # | FS |
|---|---|
| a | 2.86 |
| b | 2.86 |
| c | 2.93 |
| d | 2.97 |
| e | 3.03 |
| f | 3.04 |
| g | 3.09 |
| [illegible] | [illegible] |
| i | 3.12 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

PCSTABL5M/si FSmin=2.86

Safety Factors Are Calculated By The Modified Janbu Method

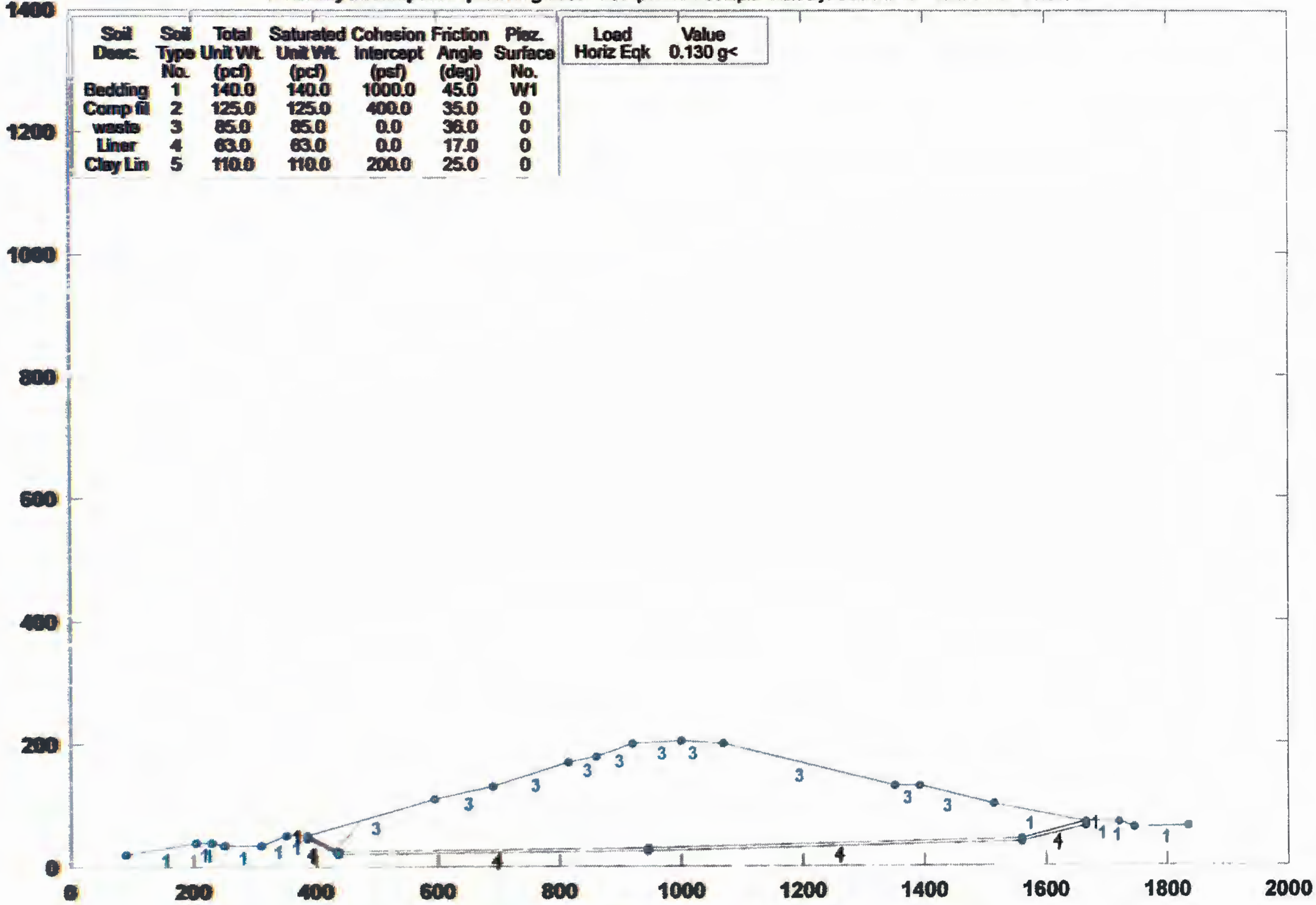
**STED**

# PVT Final Refuse Grades - 250' Elev. Cross-Section 3-3' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve34-bes.plt Run By: Username 4/23/2015 01:51PM

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |



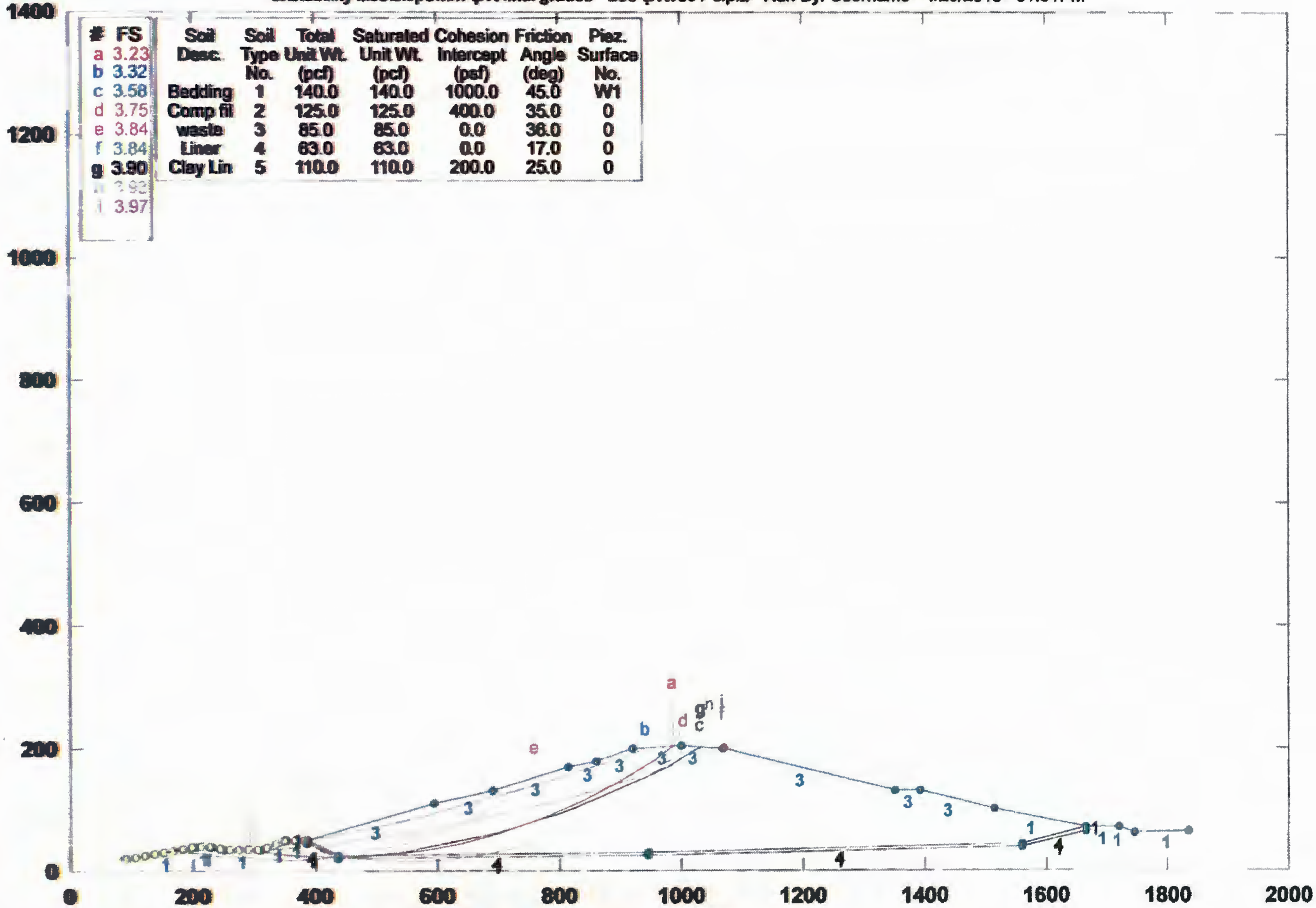
PCSTABL5M/si FSmin=2.27

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 3-3' (Static)

e:\stabillity files\slopewin7\pvt final grades - 250'\pvtve31-c.pl2 Run By: Username 4/23/2015 01:51PM



| # | FS |
|---|---|
| a | 3.23 |
| b | 3.32 |
| c | 3.58 |
| d | 3.75 |
| e | 3.84 |
| f | 3.84 |
| g | 3.90 |
| h | 3.93 |
| i | 3.97 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

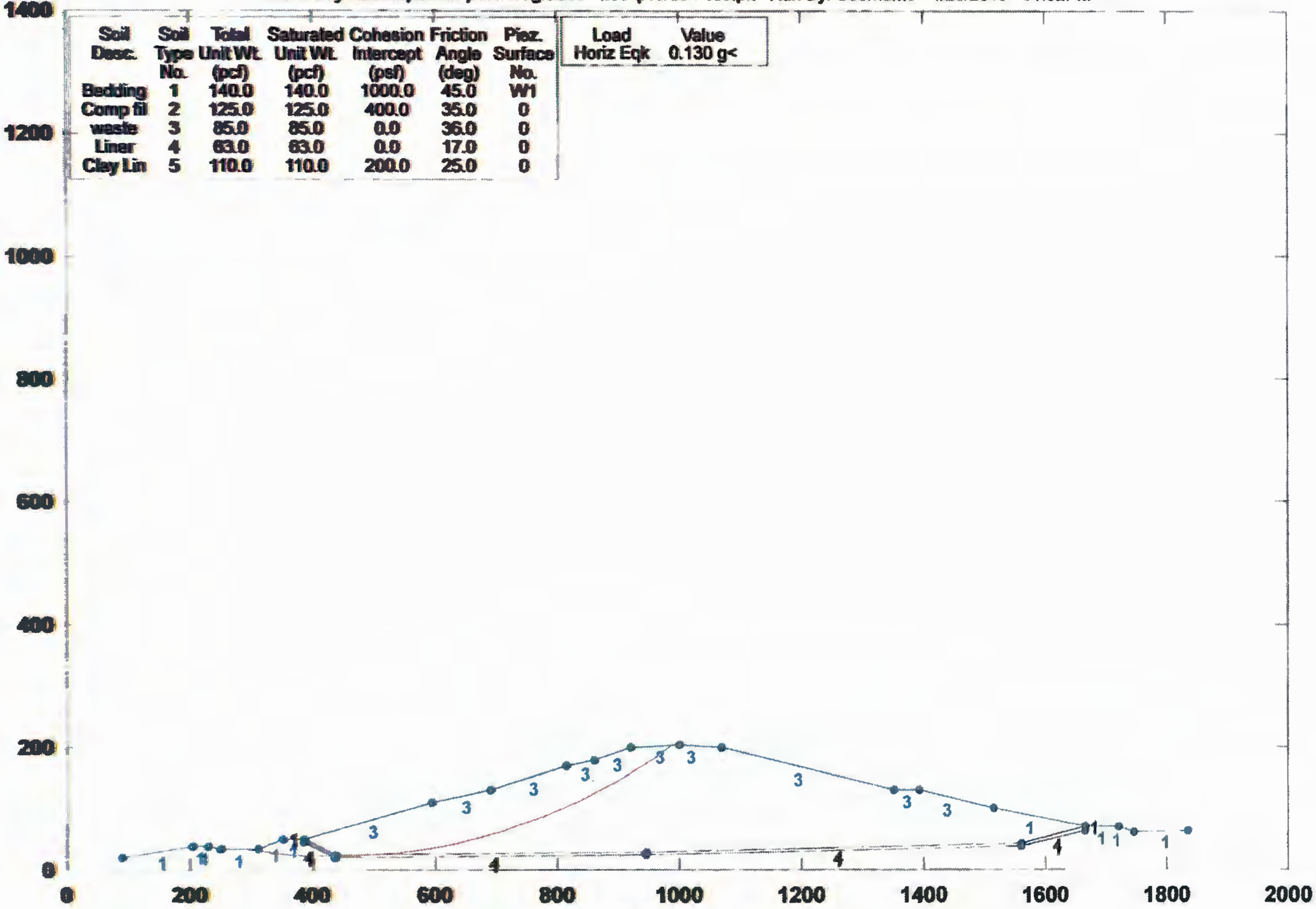
PCSTABL5M/si FSmin=3.23

Safety Factors Are Calculated By The Modified Bishop Method

**STED**

# PVT Final Refuse Grades - 250' Elev. Cross-Section 3-3' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve31-ces.plt Run By: Username 4/23/2015 01:52PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

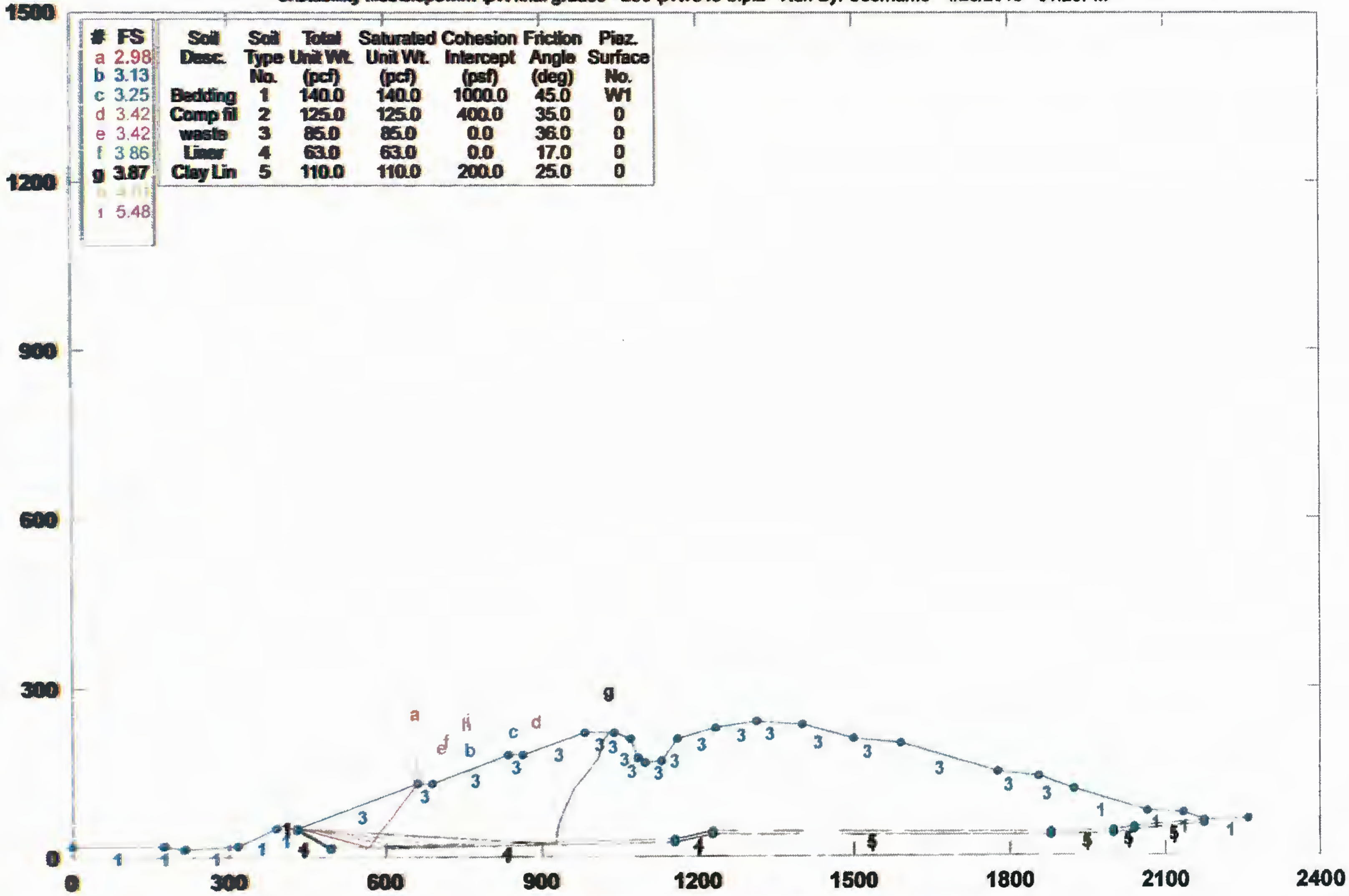
| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

PCSTABL5M/si FSmin=2.07

Factor Of Safety Is Calculated By Spencer's Method of Slices

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve46-b.pl2 Run By: Username 4/23/2015 01:26PM



| # | FS |
|---|---|
| a | 2.98 |
| b | 3.13 |
| c | 3.25 |
| d | 3.42 |
| e | 3.42 |
| f | 3.86 |
| g | 3.87 |
| h | [illegible] |
| i | 5.48 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

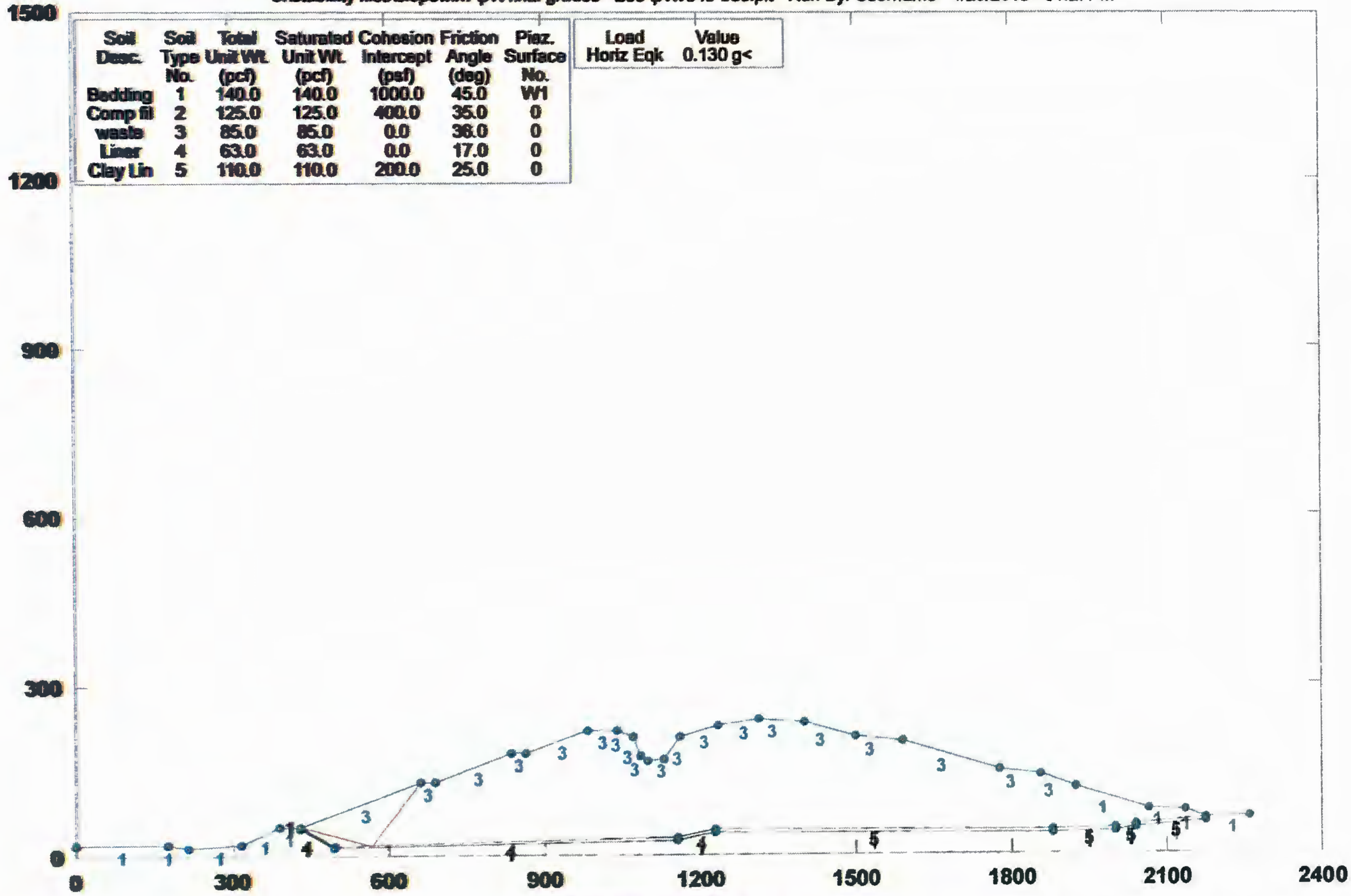
PCSTABL5M/si FSmin=2.98

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve46-bes.plt Run By: Username 4/23/2015 01:27PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

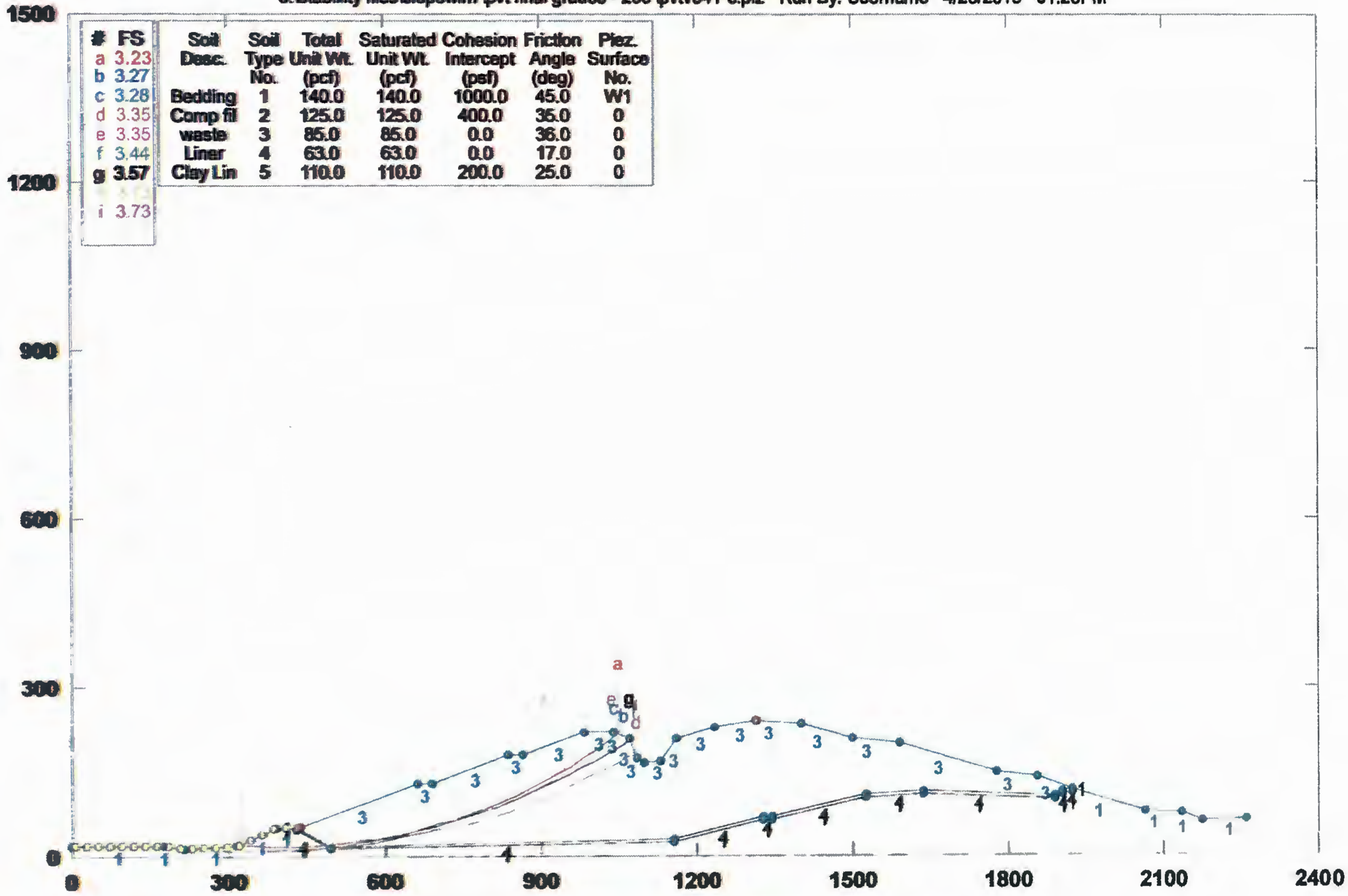
PCSTABL5M/si FSmin=2.58

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve41-c.pl2 Run By: Username 4/23/2015 01:28PM



| # | FS |
|---|---|
| a | 3.23 |
| b | 3.27 |
| c | 3.28 |
| d | 3.35 |
| e | 3.35 |
| f | 3.44 |
| g | 3.57 |
| [illegible] | [illegible] |
| i | 3.73 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 36.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

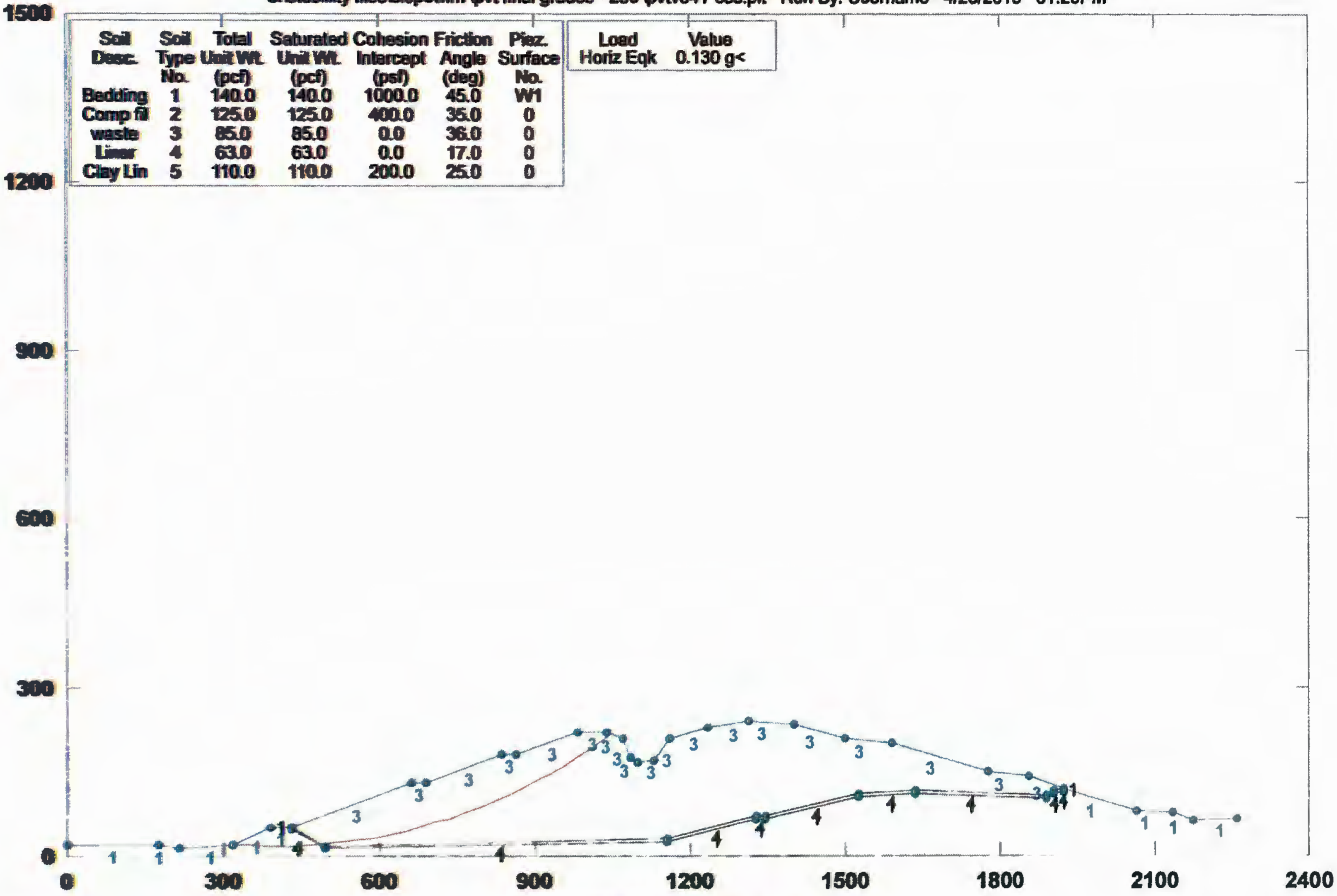
PCSTABL5M/si FSmin=3.23

Safety Factors Are Calculated By The Modified Bishop Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve41-ces.plt Run By: Username 4/23/2015 01:29PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

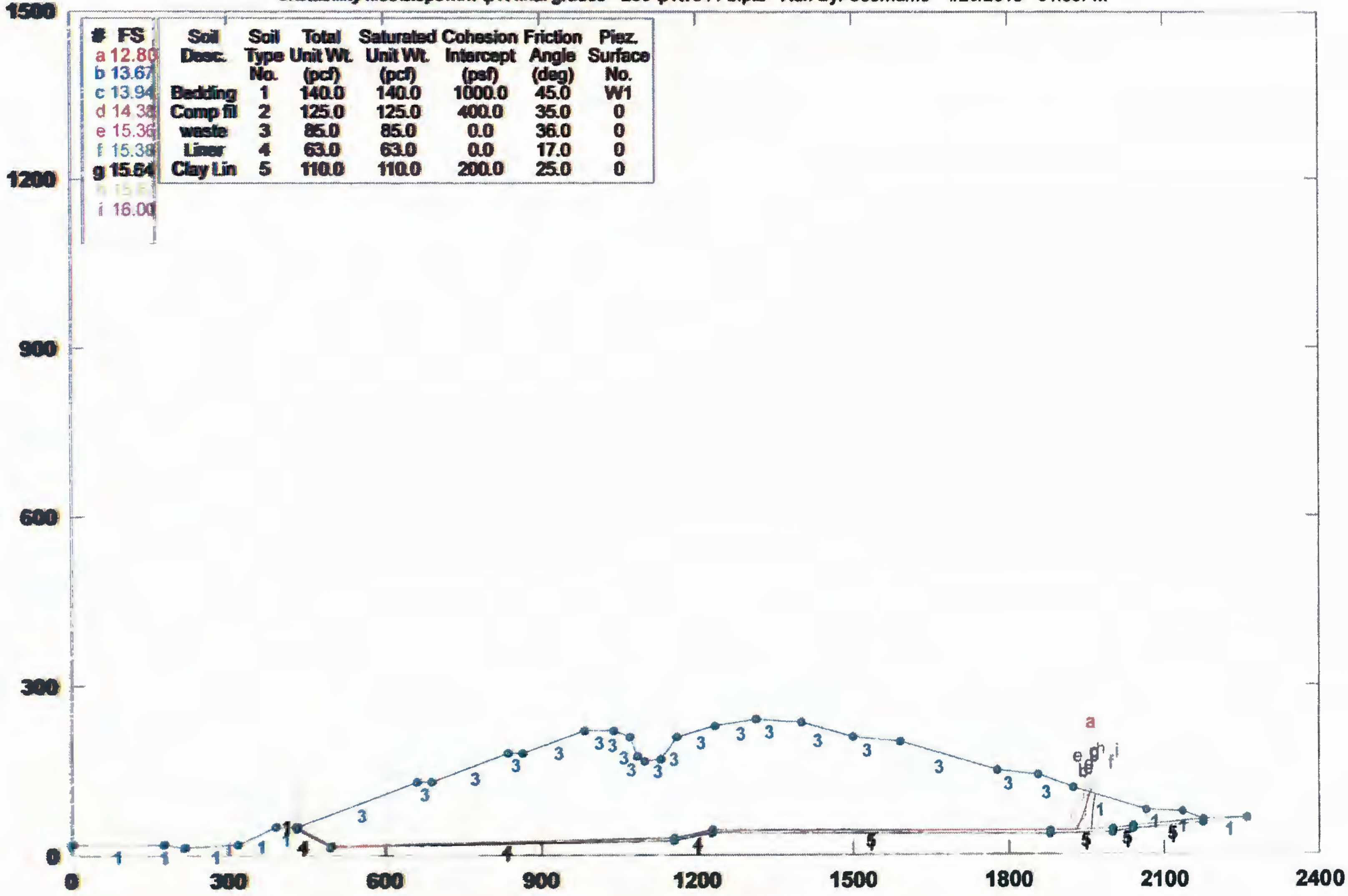
PCSTABL5M/si FSmin=2.12

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

## PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve44-b.pl2 Run By: Username 4/23/2015 01:33PM



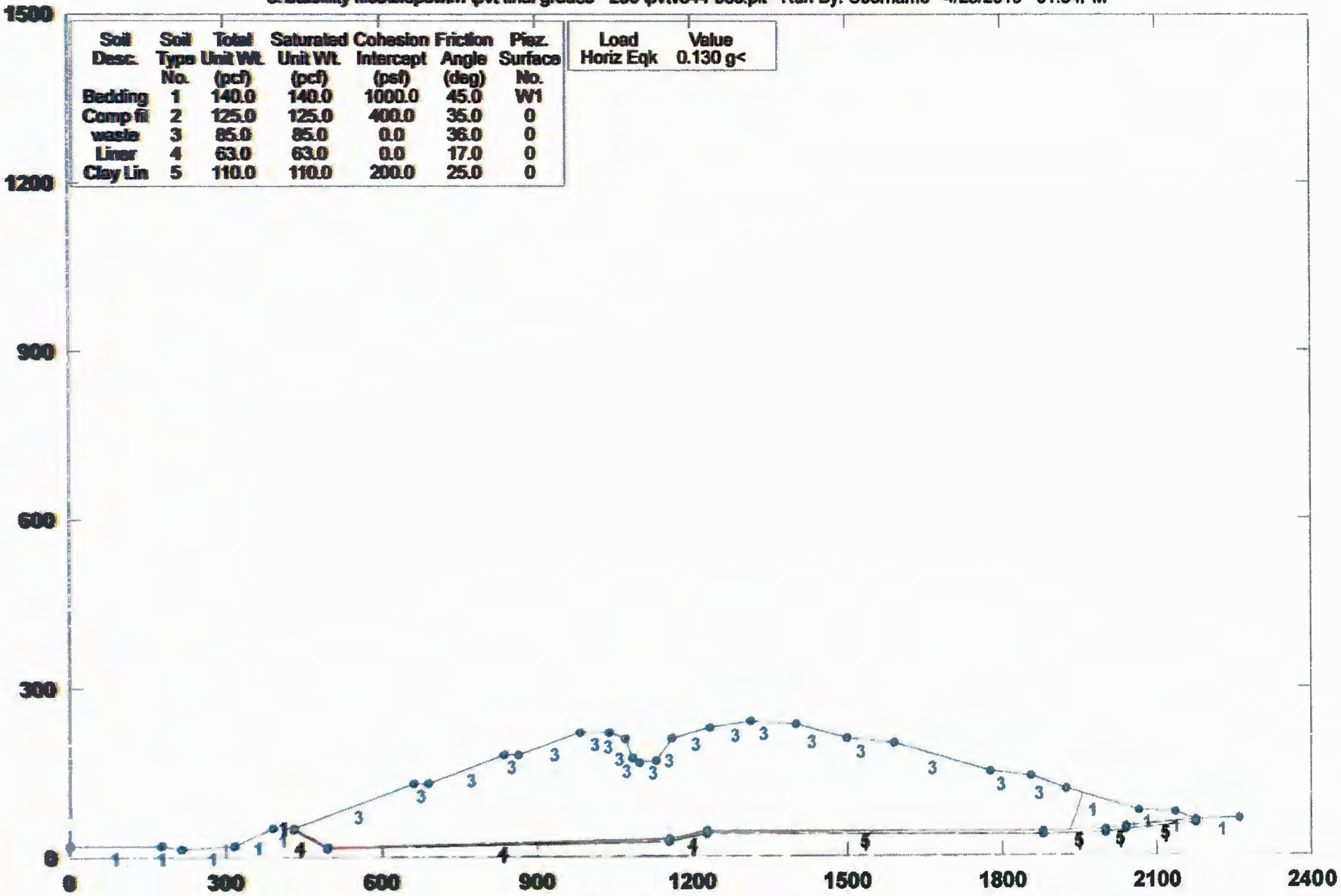
| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

PCSTABL5M/si FSmin=12.80
Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve44-bes.plt Run By: Username 4/23/2015 01:34PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

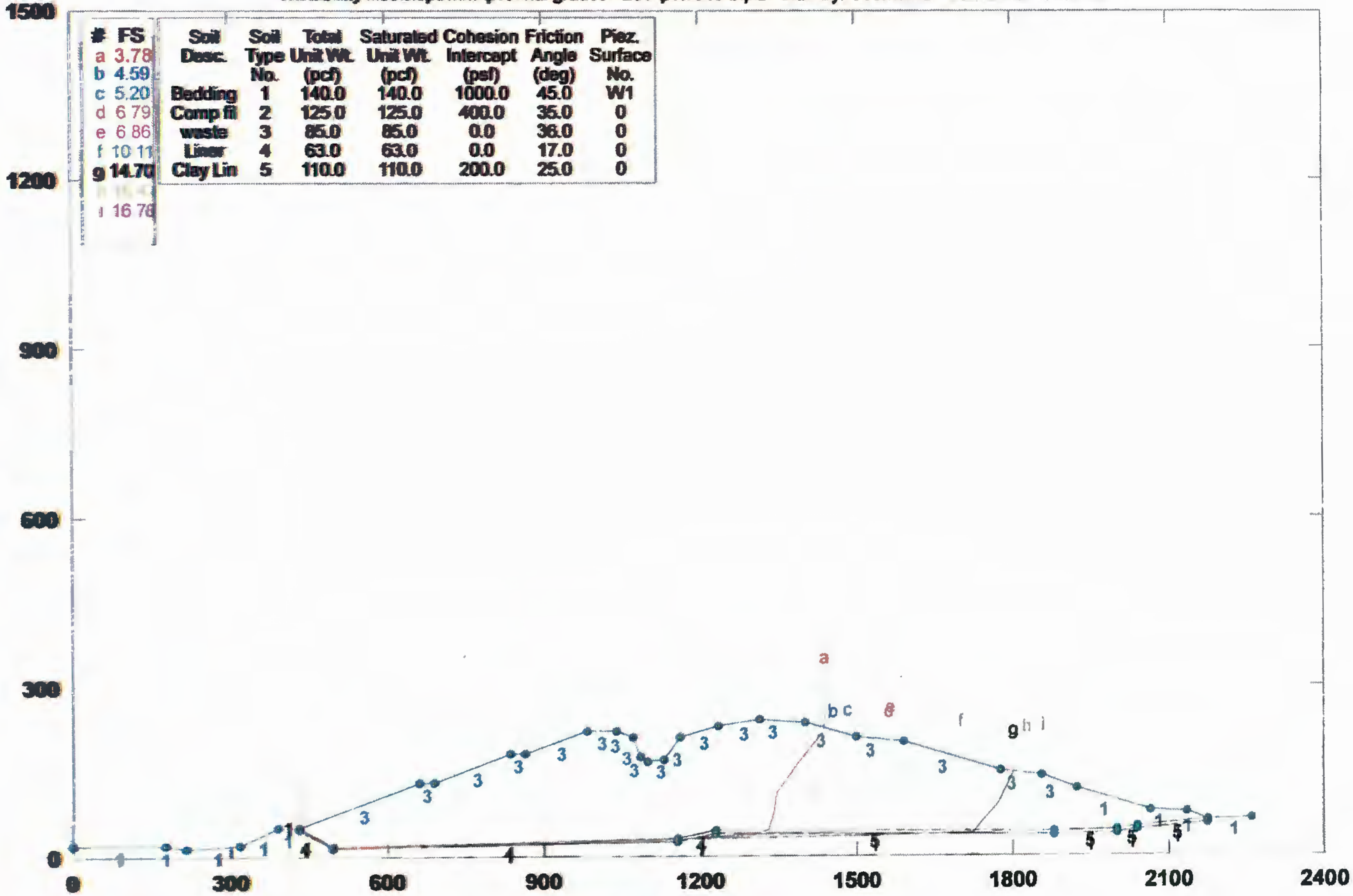
PCSTABL5M/si FSmin=2.59

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve45-b.pl2 Run By: Username 4/23/2015 01:31PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

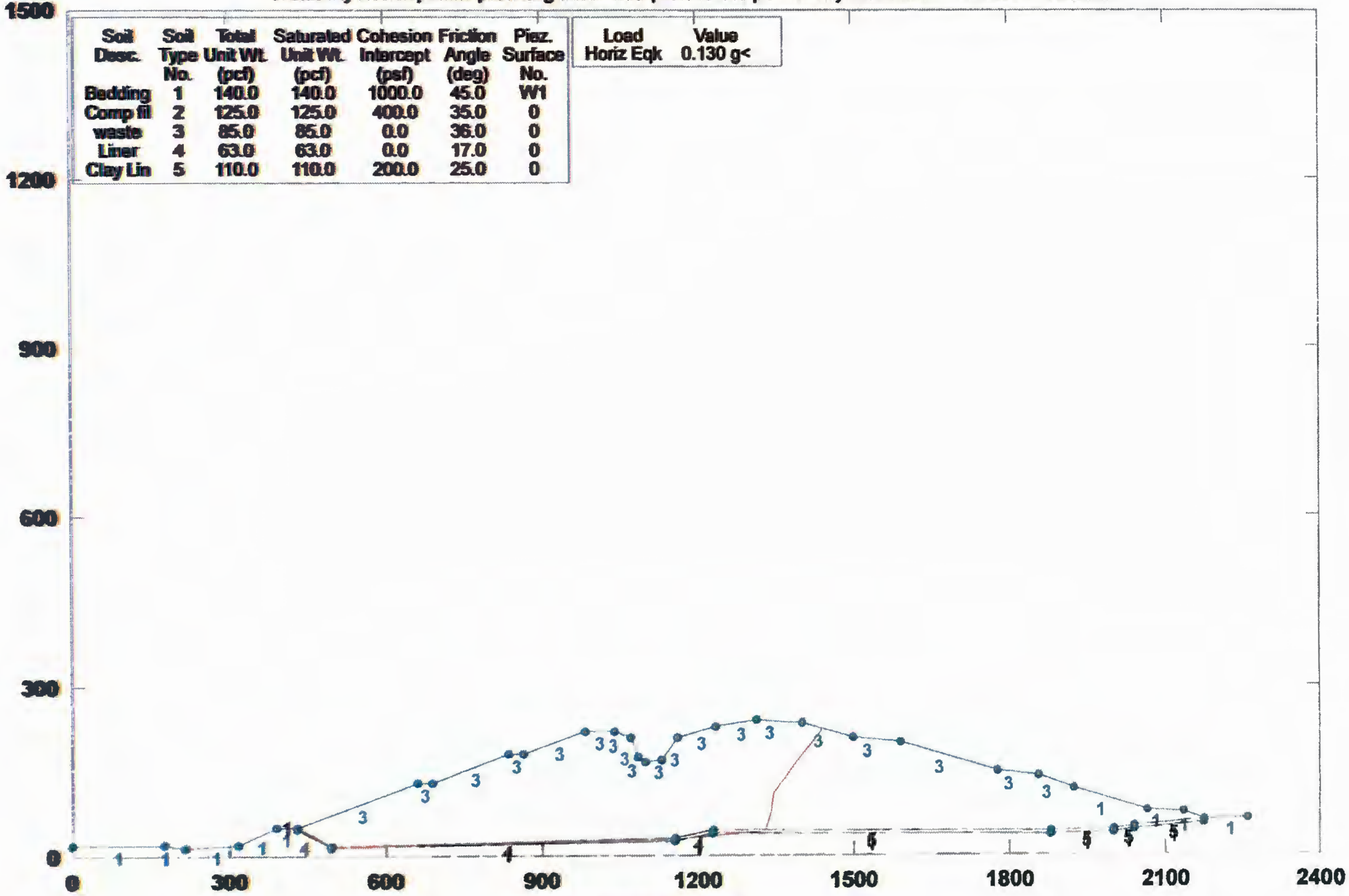
PCSTABL5M/si FSmin=3.78

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve45-bes.plt Run By: Username 4/23/2015 01:32PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

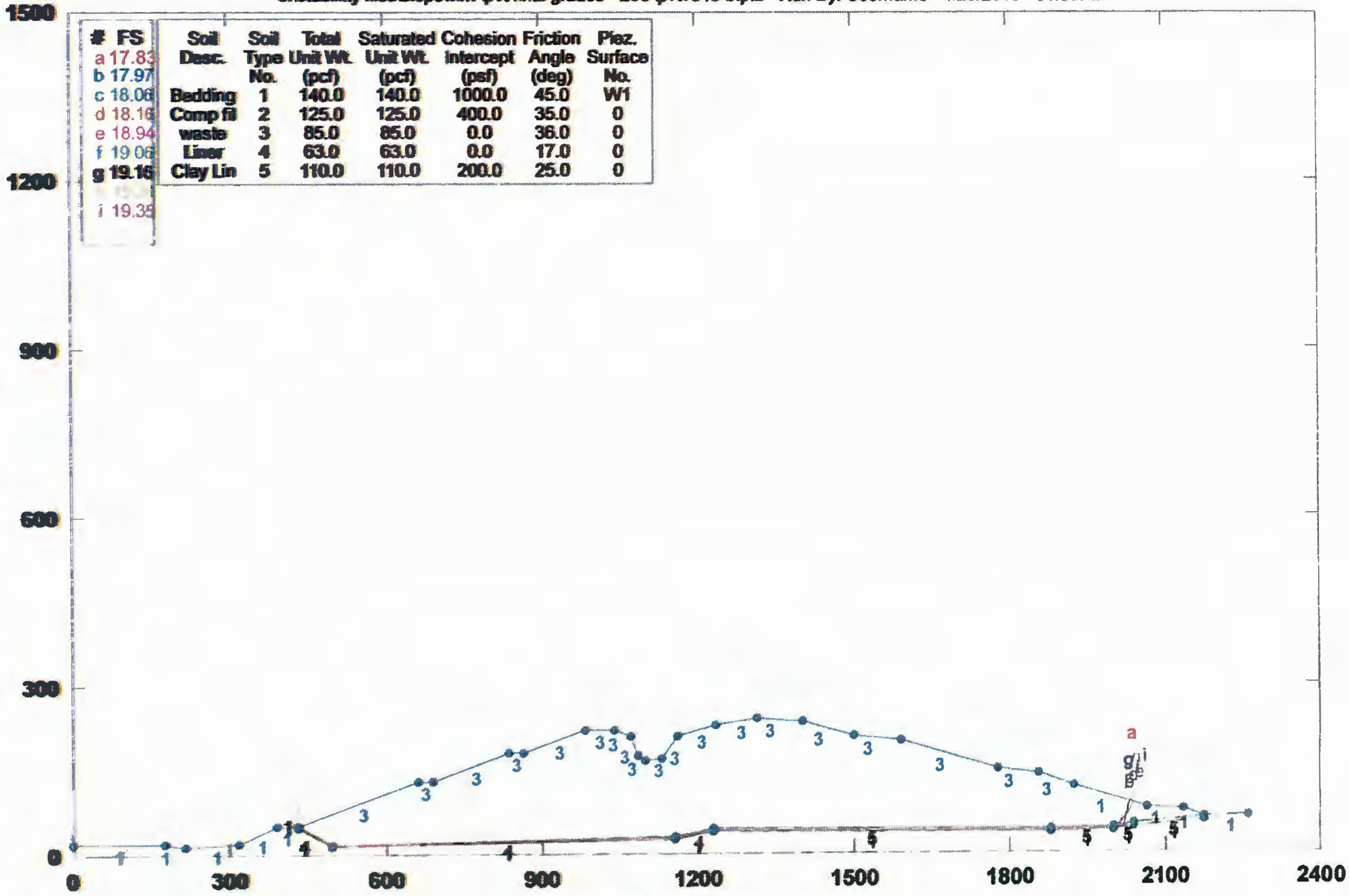
PCSTABL5M/si FSmin=2.12

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Static)

e:\stabillity files\slopewin7\pvt final grades - 250'\pvtve43-b.pl2 Run By: Username 4/23/2015 01:35PM



| # | FS |
|---|---|
| a | 17.83 |
| b | 17.97 |
| c | 18.06 |
| d | 18.16 |
| e | 18.94 |
| f | 19.06 |
| g | 19.16 |
|  | [illegible] |
| i | 19.35 |

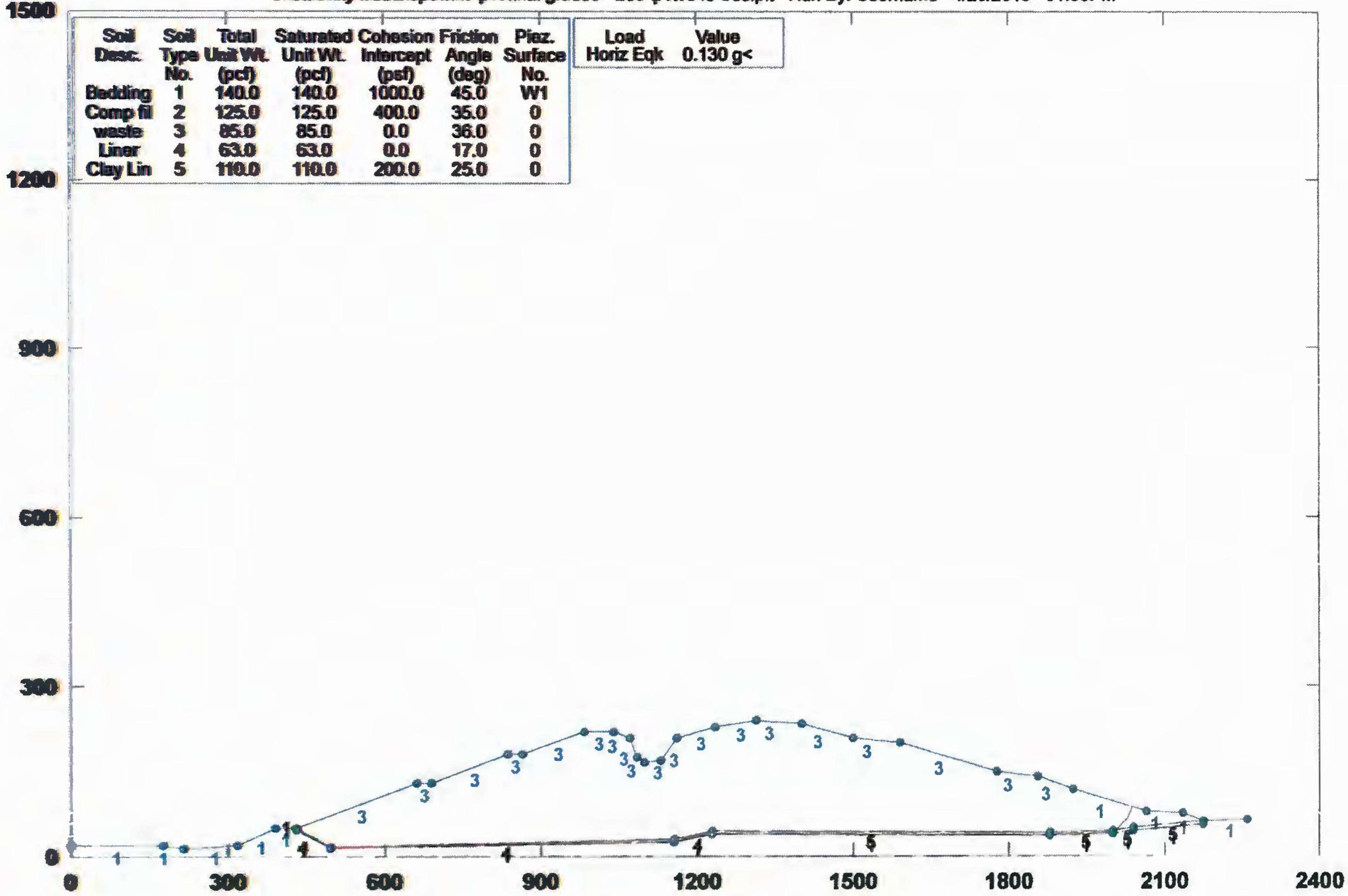
| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

PCSTABL5M/si FSmin=17.83

Safety Factors Are Calculated By The Modified Janbu Method

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve43-bes.plt Run By: Username 4/23/2015 01:36PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

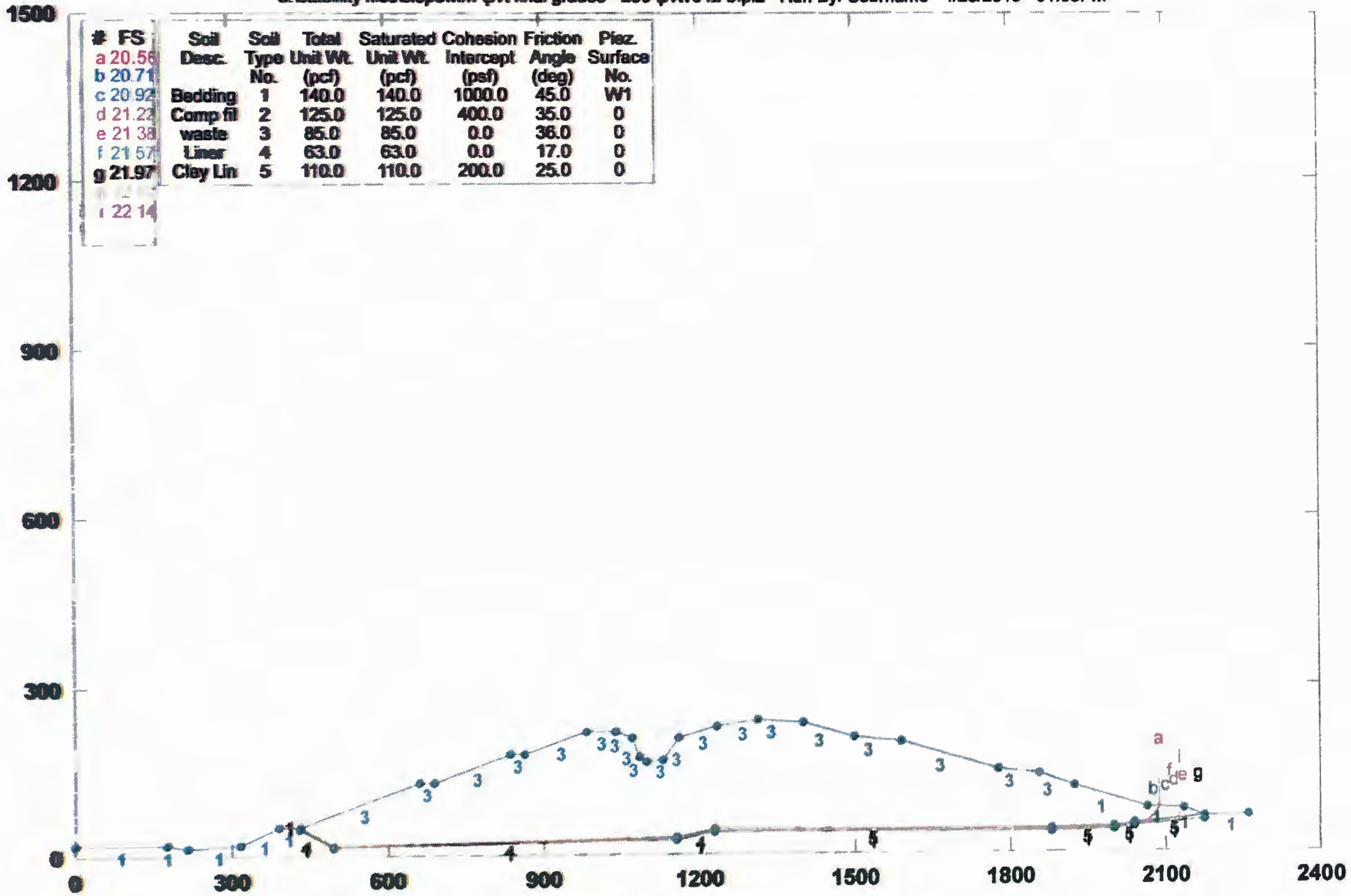
PCSTABL5M/si FSmin=2.68

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve42-b.pl2 Run By: Username 4/23/2015 01:38PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Cley Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

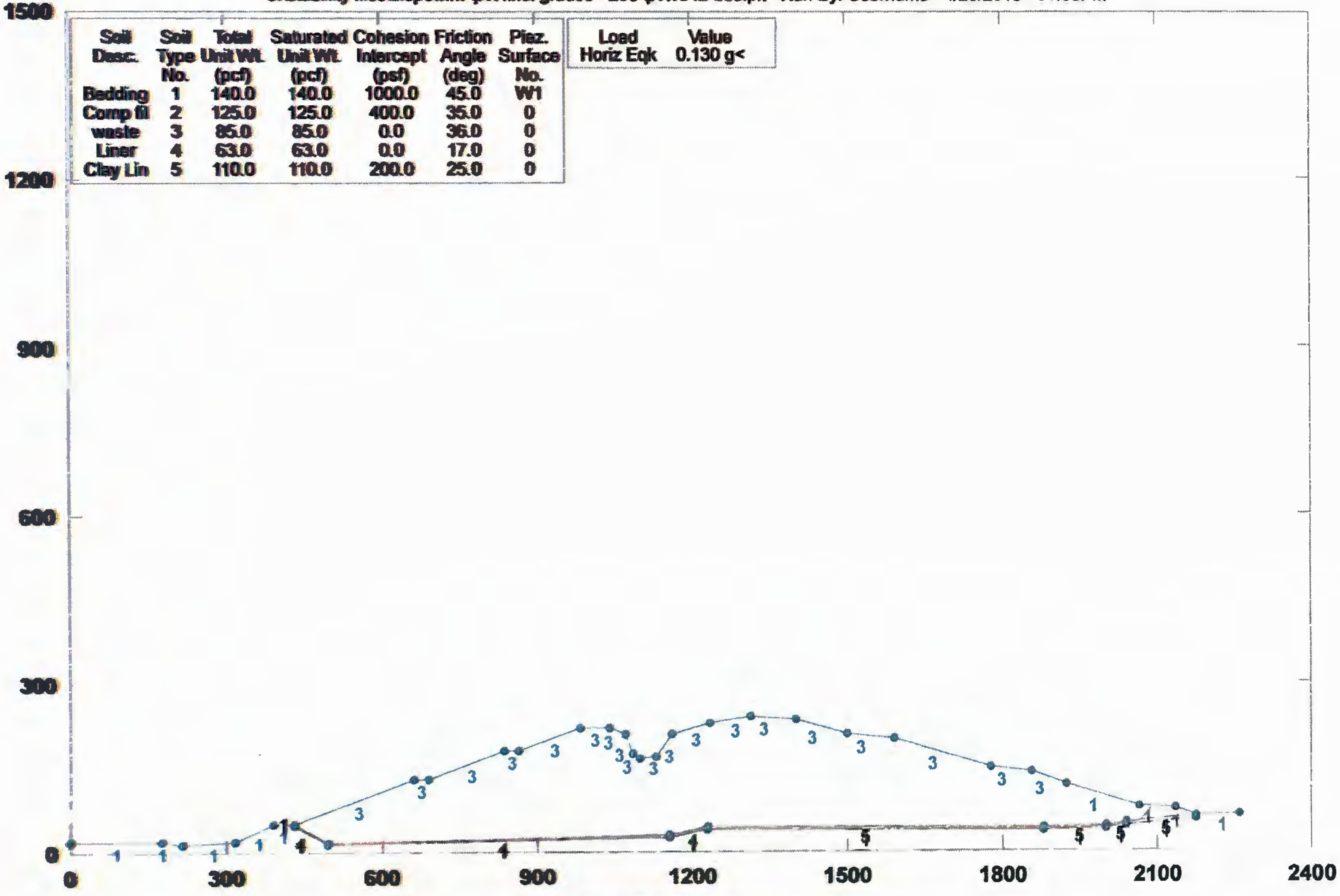
PCSTABL5M/si FSmin=20.56

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve42-bes.plt Run By: Username 4/23/2015 01:38PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

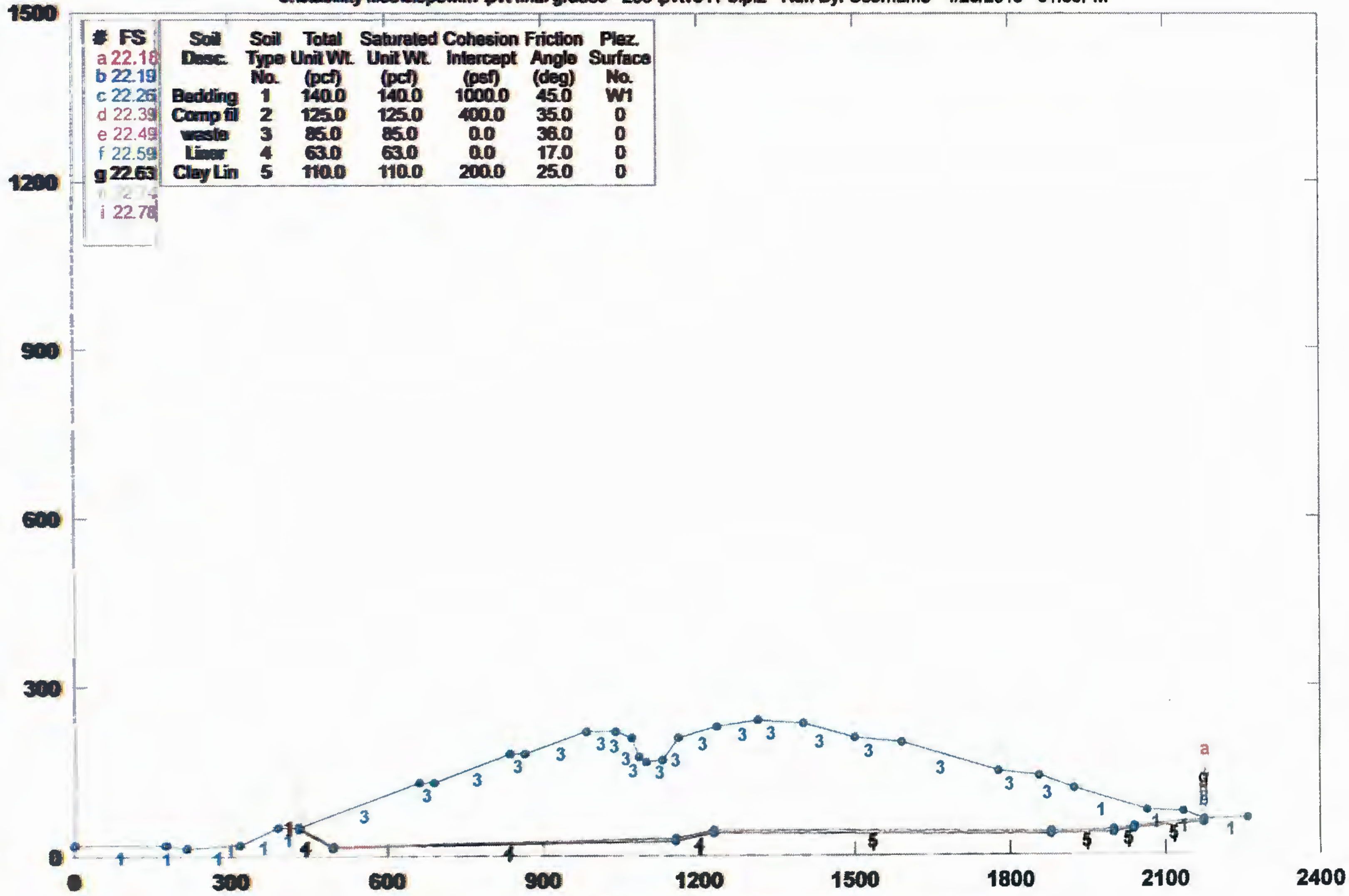
PCSTABL5M/si FSmin=1.70

Factor Of Safety Is Calculated By Spencer`s Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Static)

e:\stabillity files\slopewin7\pvt final grades - 250'\pvtve41-b.pl2 Run By: Username 4/23/2015 01:39PM



| # | FS |
|---|---|
| a | 22.18 |
| b | 22.19 |
| c | 22.26 |
| d | 22.39 |
| e | 22.49 |
| f | 22.59 |
| g | 22.63 |
| h | 22.74 |
| i | 22.78 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

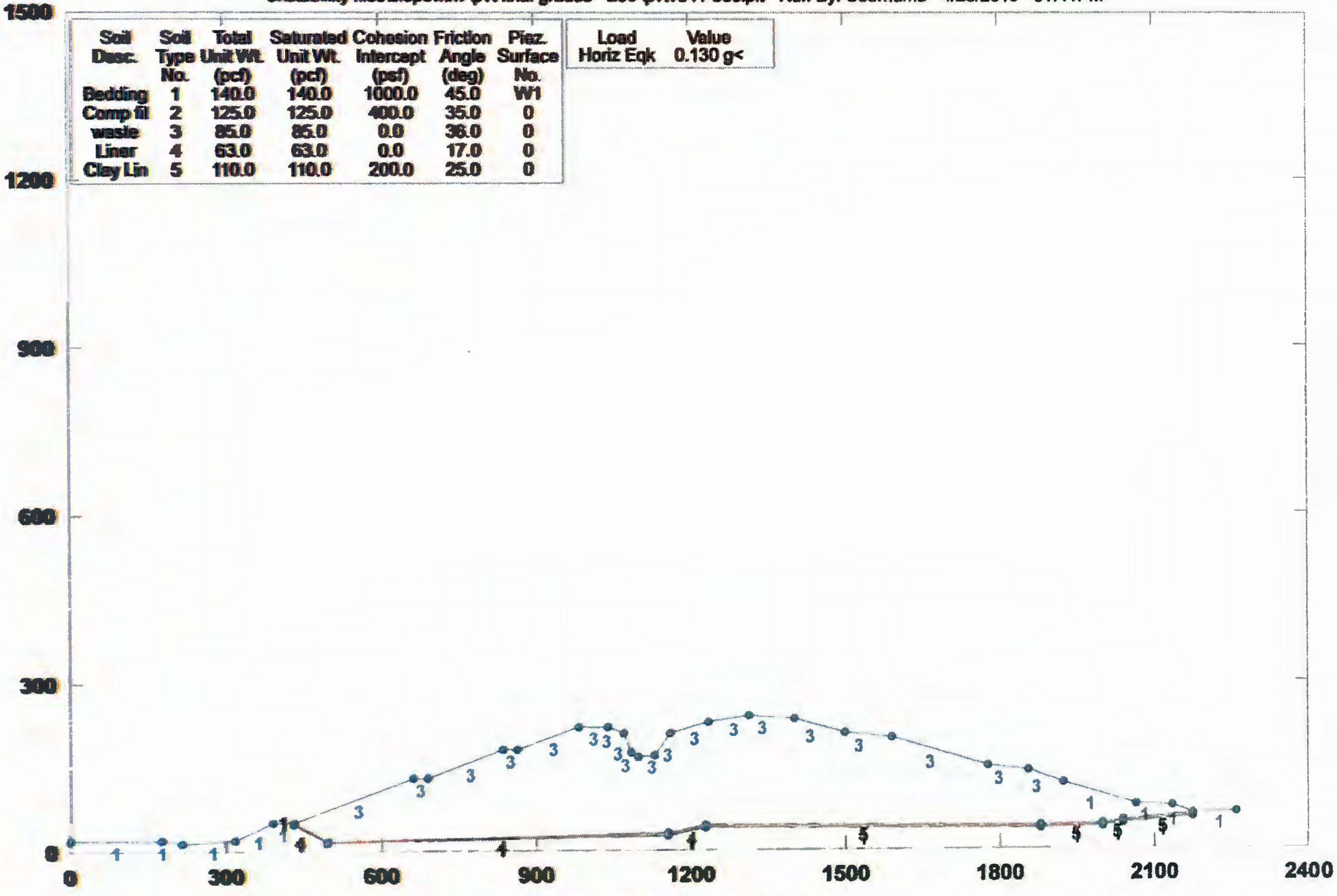
PCSTABL5M/si FSmin=22.18

Safety Factors Are Calculated By The Modified Janbu Method

STED

## PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve41-bes.plt Run By: Username 4/23/2015 01:41PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

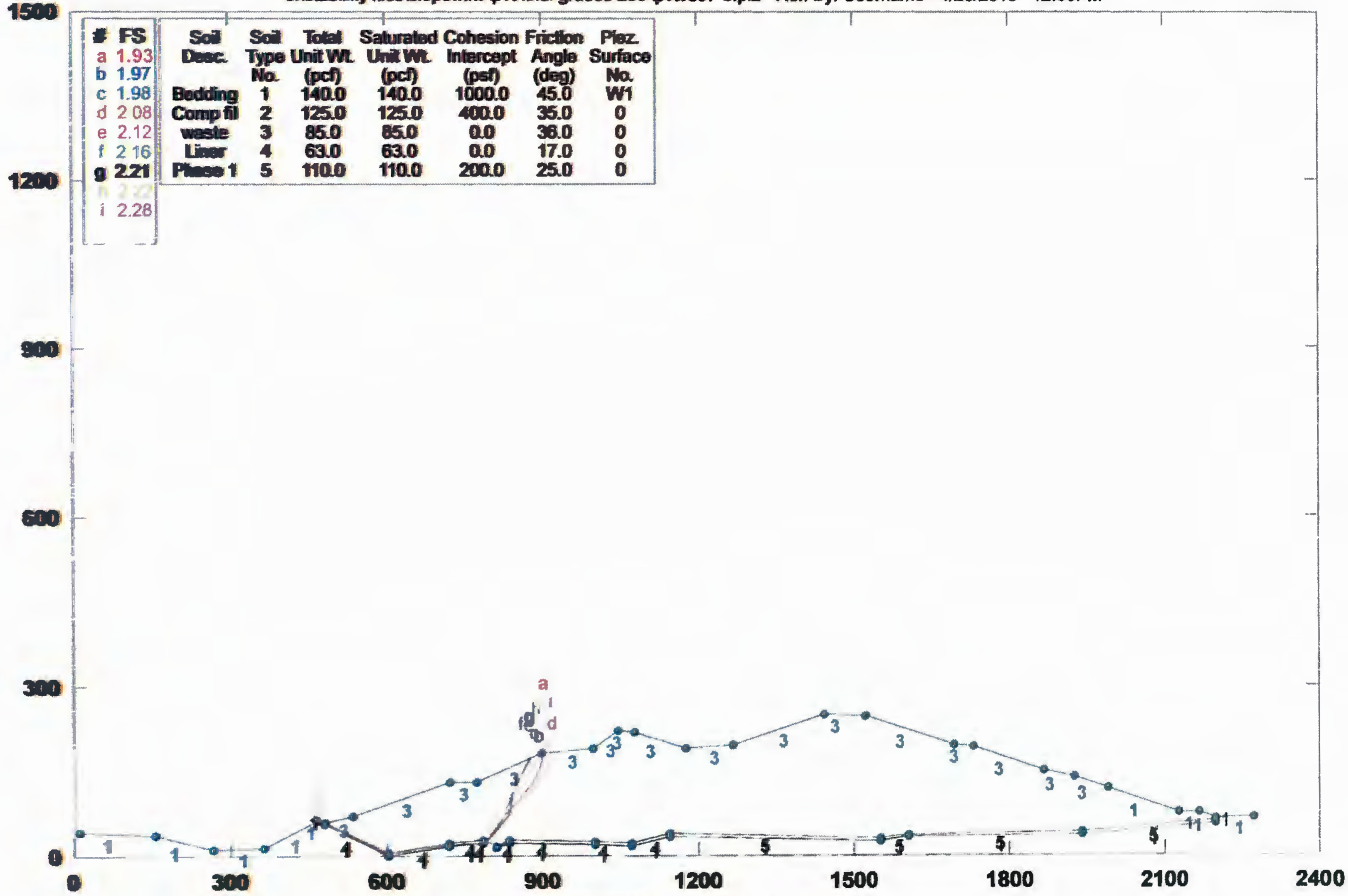
PCSTABL5M/si FSmin=2.41

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stability files\slopewin7\pvt final grades 250'\pvtve57-b.pl2 Run By: Username 4/23/2015 12:30PM



| # | FS |
|---|---|
| a | 1.93 |
| b | 1.97 |
| c | 1.98 |
| d | 2.08 |
| e | 2.12 |
| f | 2.16 |
| g | 2.21 |
| h | 2.22 |
| i | 2.28 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Phase 1 | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

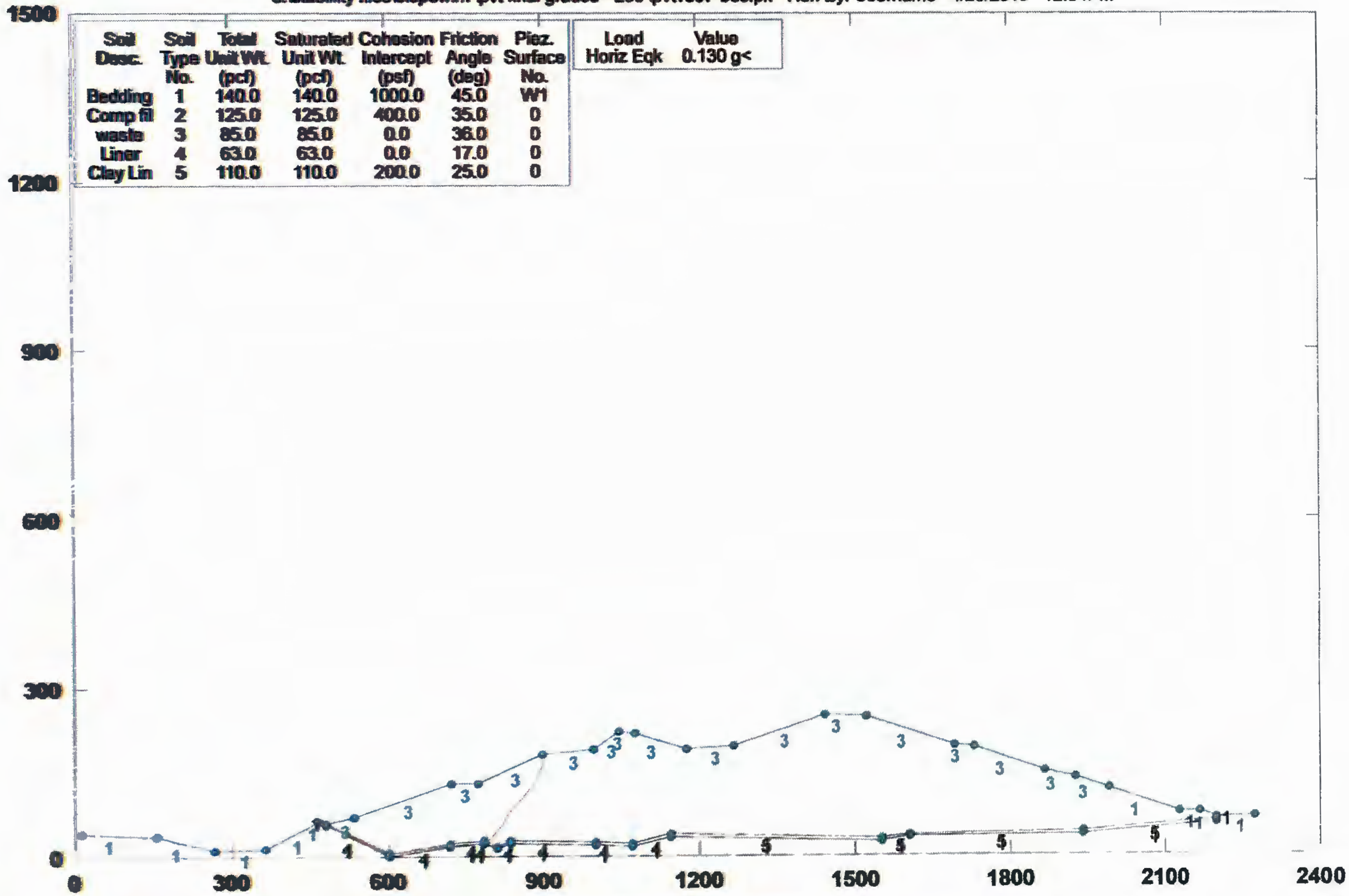
PCSTABL5M/si FSmin=1.93

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve57-bes.plt Run By: Username 4/23/2015 12:34PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

PCSTABL5M/si FSmin=1.33

Factor Of Safety Is Calculated By Spencer`s Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve55-b.pl2 Run By: Username 4/23/2015 12:42PM

| # | FS |
|---|---|
| a | 1.94 |
| b | 1.96 |
| c | 1.99 |
| d | 2.08 |
| e | 2.13 |
| f | 2.23 |
| g | 2.23 |
| h | 2.24 |
| i | 2.28 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

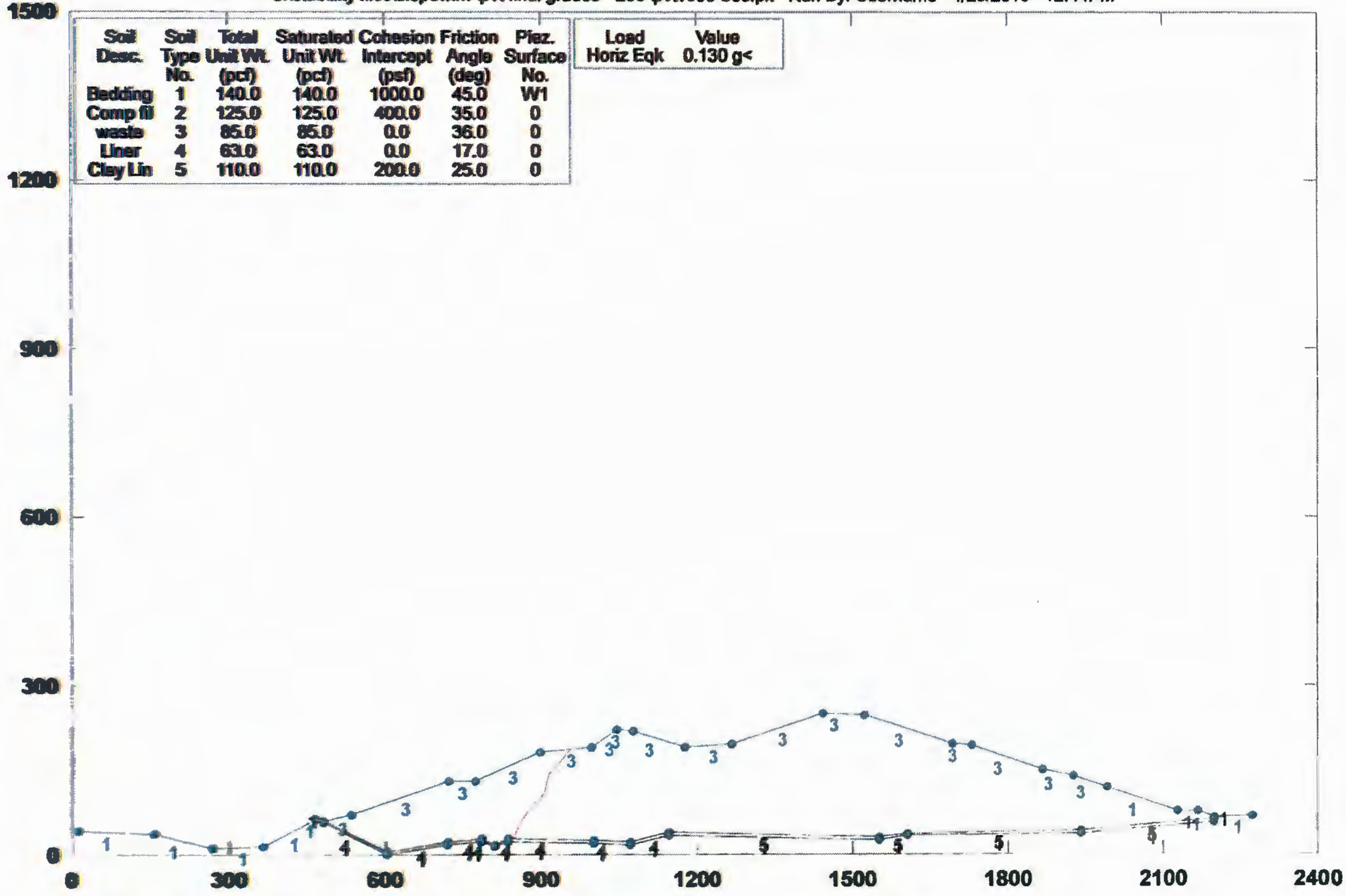
PCSTABL5M/si FSmin=1.94

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve55-bes.plt Run By: Username 4/23/2015 12:44PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

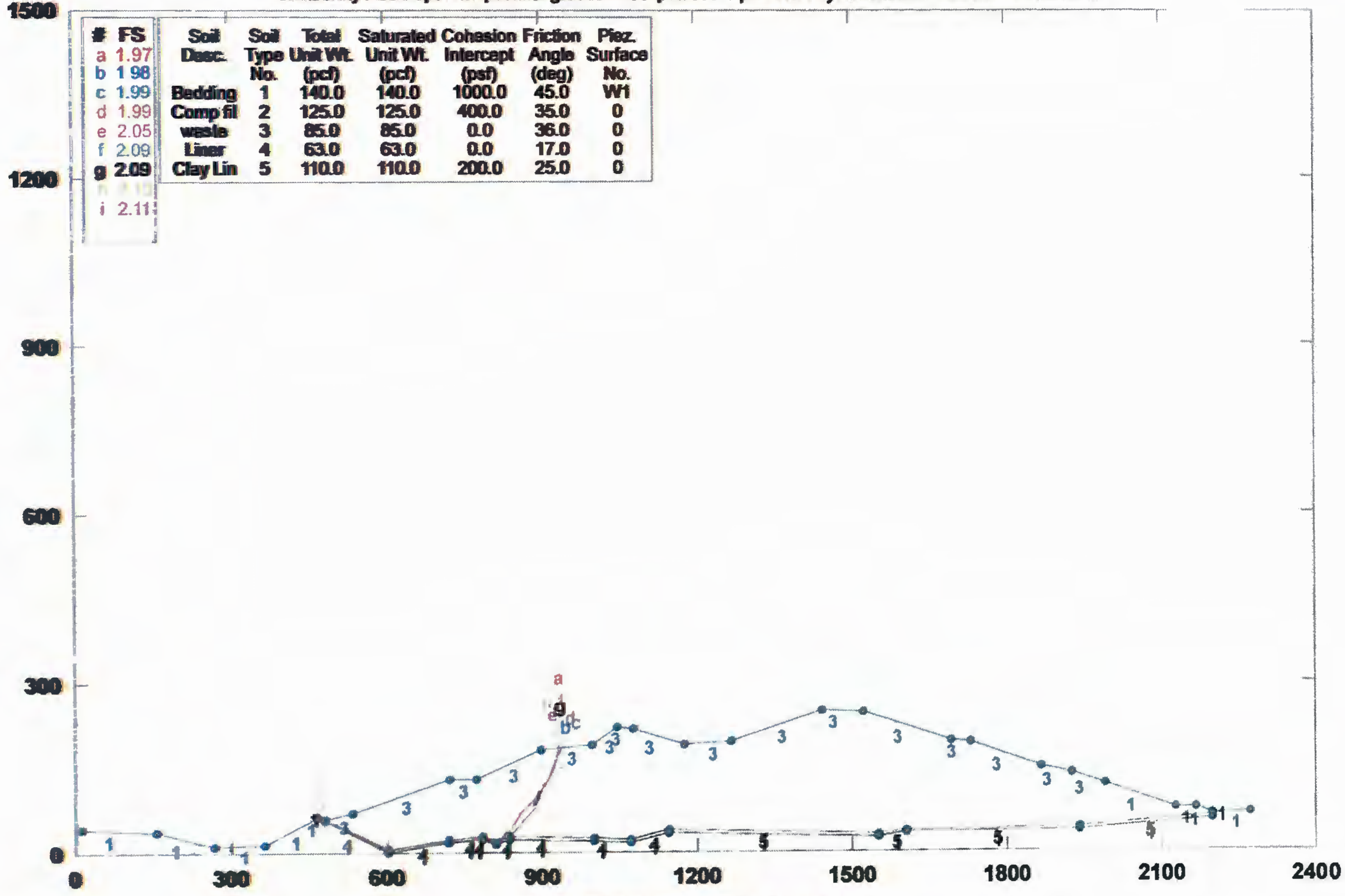
**PCSTABL5M/si FSmin=1.39**

**Factor Of Safety Is Calculated By Spencer`s Method of Slices**

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve56-b.pl2 Run By: Username 4/23/2015 12:48PM



| # | FS |
|---|---|
| a | 1.97 |
| b | 1.98 |
| c | 1.99 |
| d | 1.99 |
| e | 2.05 |
| f | 2.09 |
| g | 2.09 |
| h | 2.10 |
| i | 2.11 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

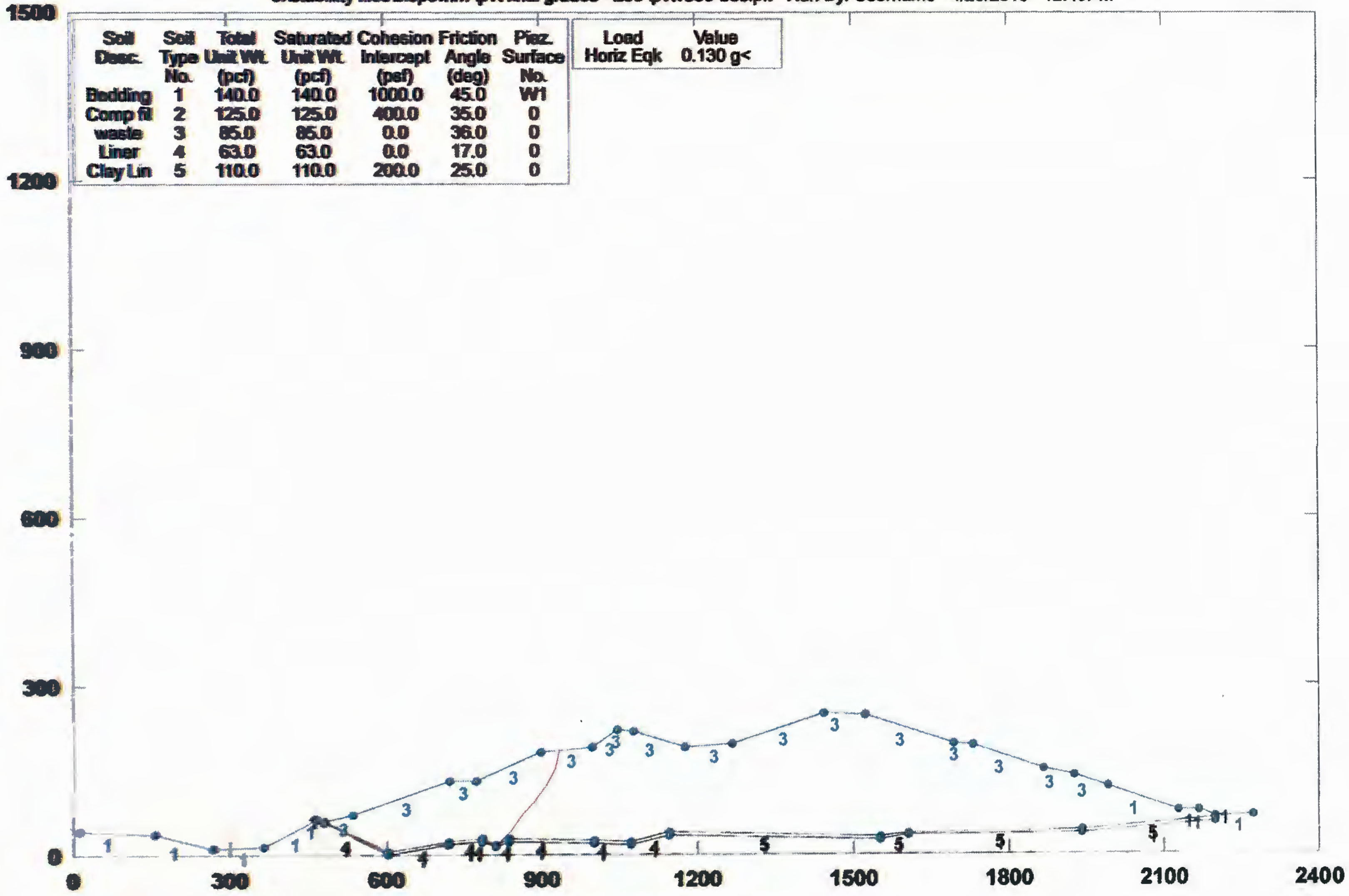
PCSTABL5M/si FSmin=1.97

Safety Factors Are Calculated By The Modified Janbu Method

STED

## PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve56-bes.plt Run By: Username 4/23/2015 12:49PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

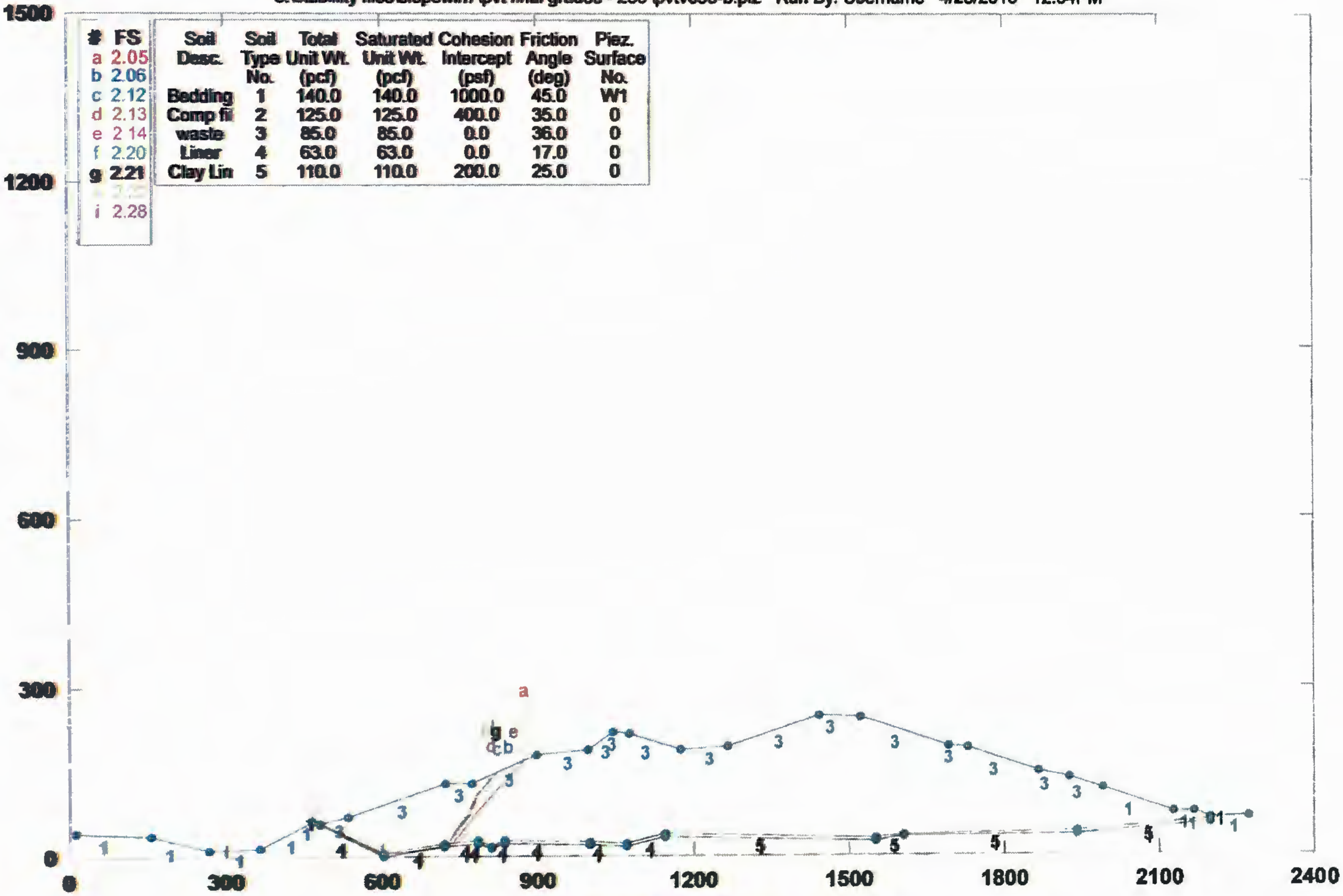
PCSTABL5M/si FSmin=1.38

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve58-b.pl2   Run By: Username   4/23/2015   12:54PM



| # | FS |
|---|---|
| a | 2.05 |
| b | 2.06 |
| c | 2.12 |
| d | 2.13 |
| e | 2.14 |
| f | 2.20 |
| g | 2.21 |
| h | 2.25 |
| i | 2.28 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fi | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

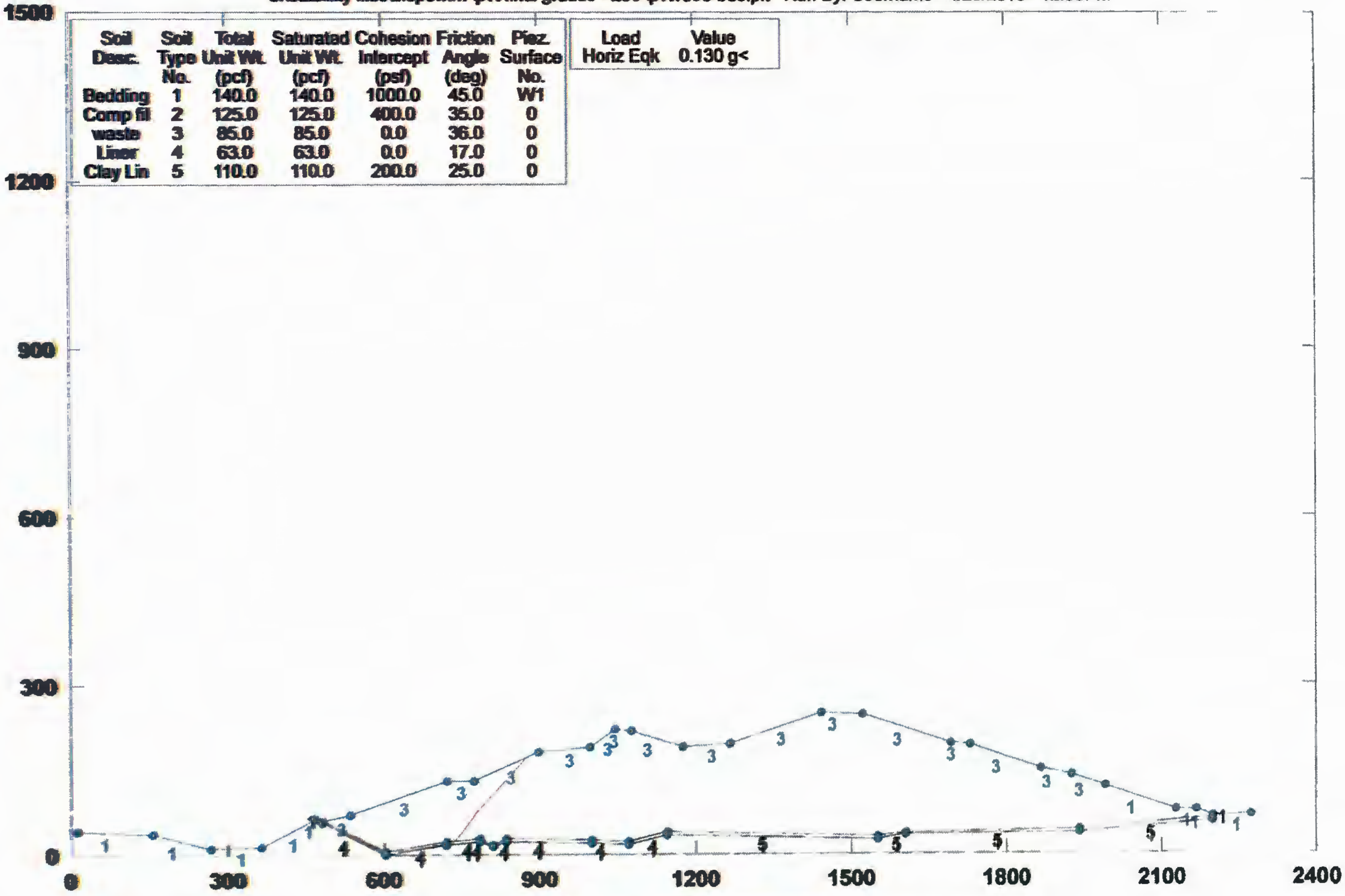
PCSTABL5M/si FSmin=2.05

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve58-bes.plt Run By: Username 4/23/2015 12:55PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturatad Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

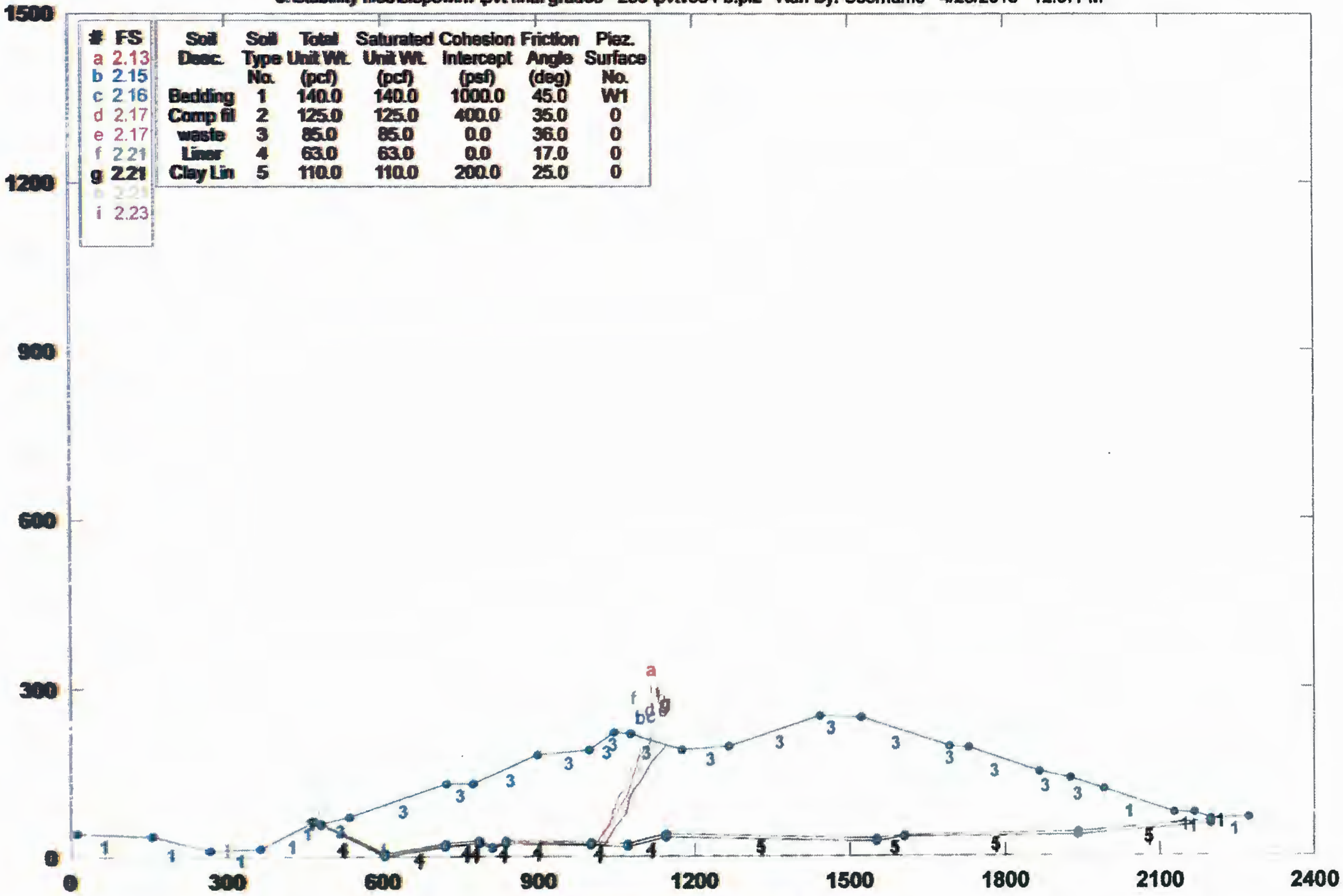
PCSTABL5M/si FSmin=1.40

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

## PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve54-b.pl2   Run By: Username   4/23/2015   12:57PM



| # | FS |
|---|---|
| a | 2.13 |
| b | 2.15 |
| c | 2.16 |
| d | 2.17 |
| e | 2.17 |
| f | 2.21 |
| g | 2.21 |
| h | 2.21 |
| i | 2.23 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

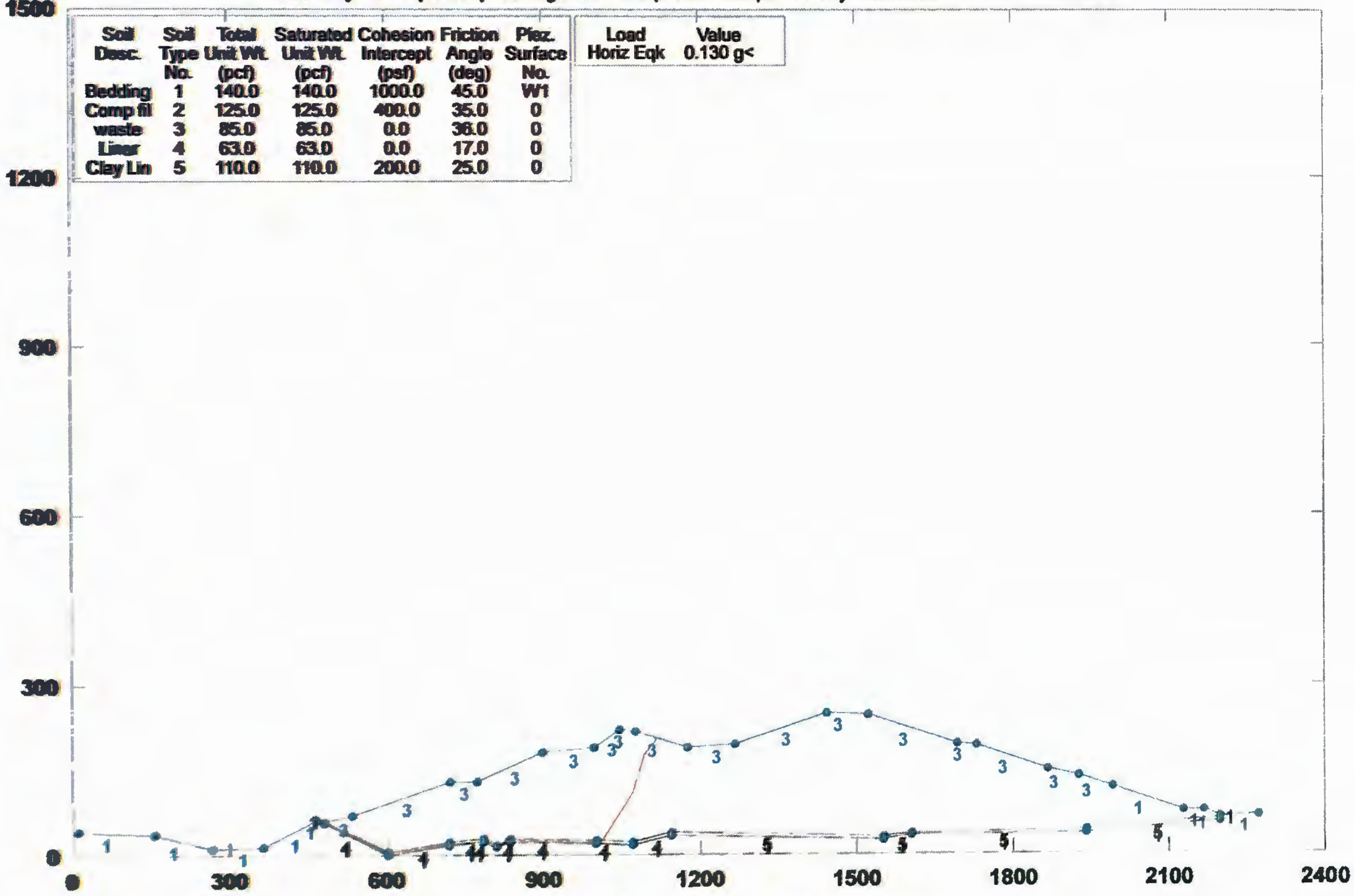
PCSTABL5M/si FSmin=2.13

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve54-bes.plt Run By: Username 4/23/2015 12:59PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

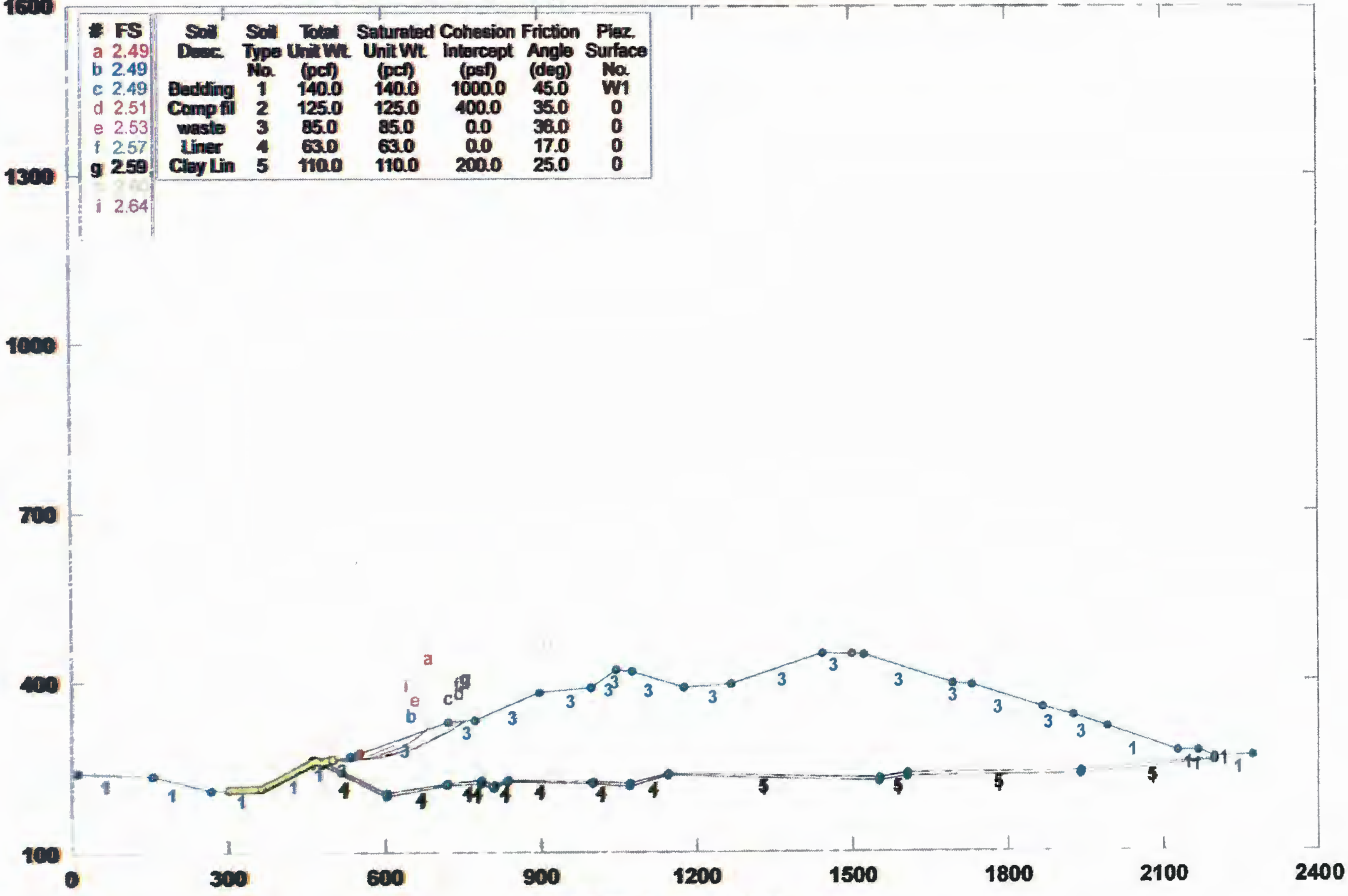
PCSTABL5M/si FSmin=1.40

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve59-c.pl2 Run By: Username 4/23/2015 01:01PM



| # | FS |
|---|---|
| a | 2.49 |
| b | 2.49 |
| c | 2.49 |
| d | 2.51 |
| e | 2.53 |
| f | 2.57 |
| g | 2.59 |
|  | 2.60 |
| i | 2.64 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

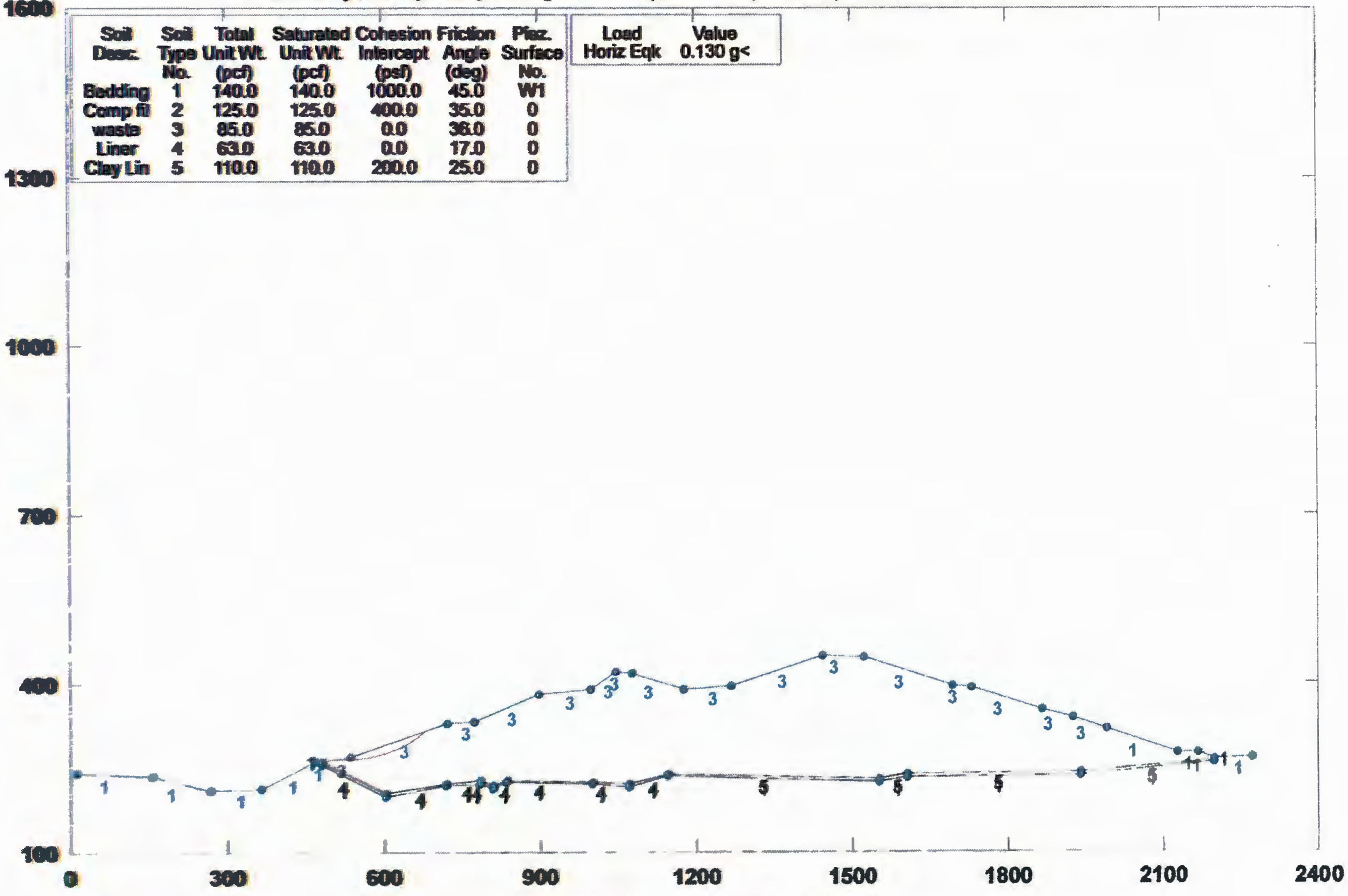
PCSTABL5M/si FSmin=2.49

Safety Factors Are Calculated By The Modified Bishop Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve59-ces.plt Run By: Username 4/23/2015 01:04PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

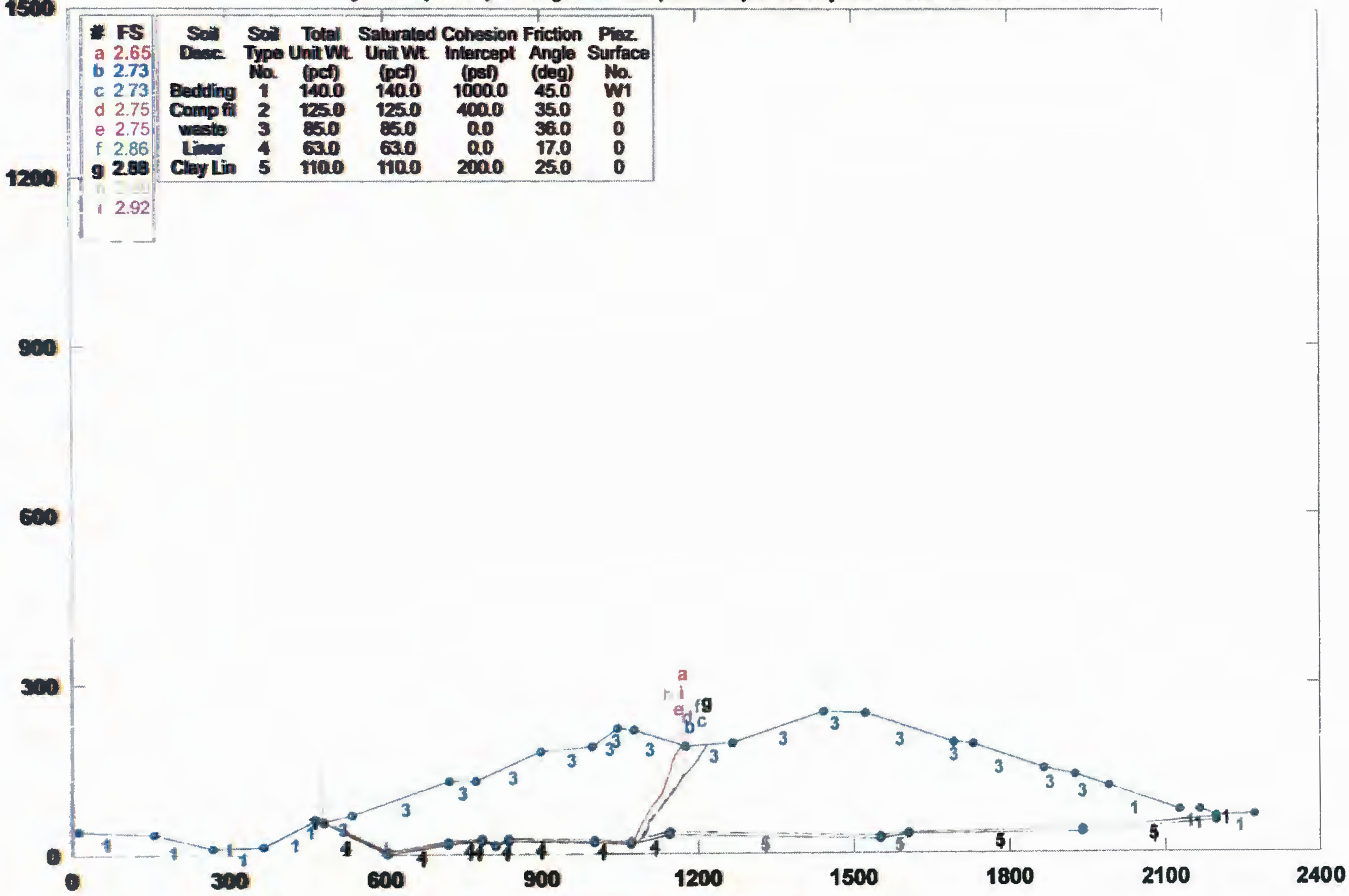
PCSTABL5M/si FSmin=1.50

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve53-b.pl2 Run By: Username 4/23/2015 01:06PM



| # | FS |
|---|---|
| a | 2.65 |
| b | 2.73 |
| c | 2.73 |
| d | 2.75 |
| e | 2.75 |
| f | 2.86 |
| g | 2.88 |
| h | [illegible] |
| i | 2.92 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

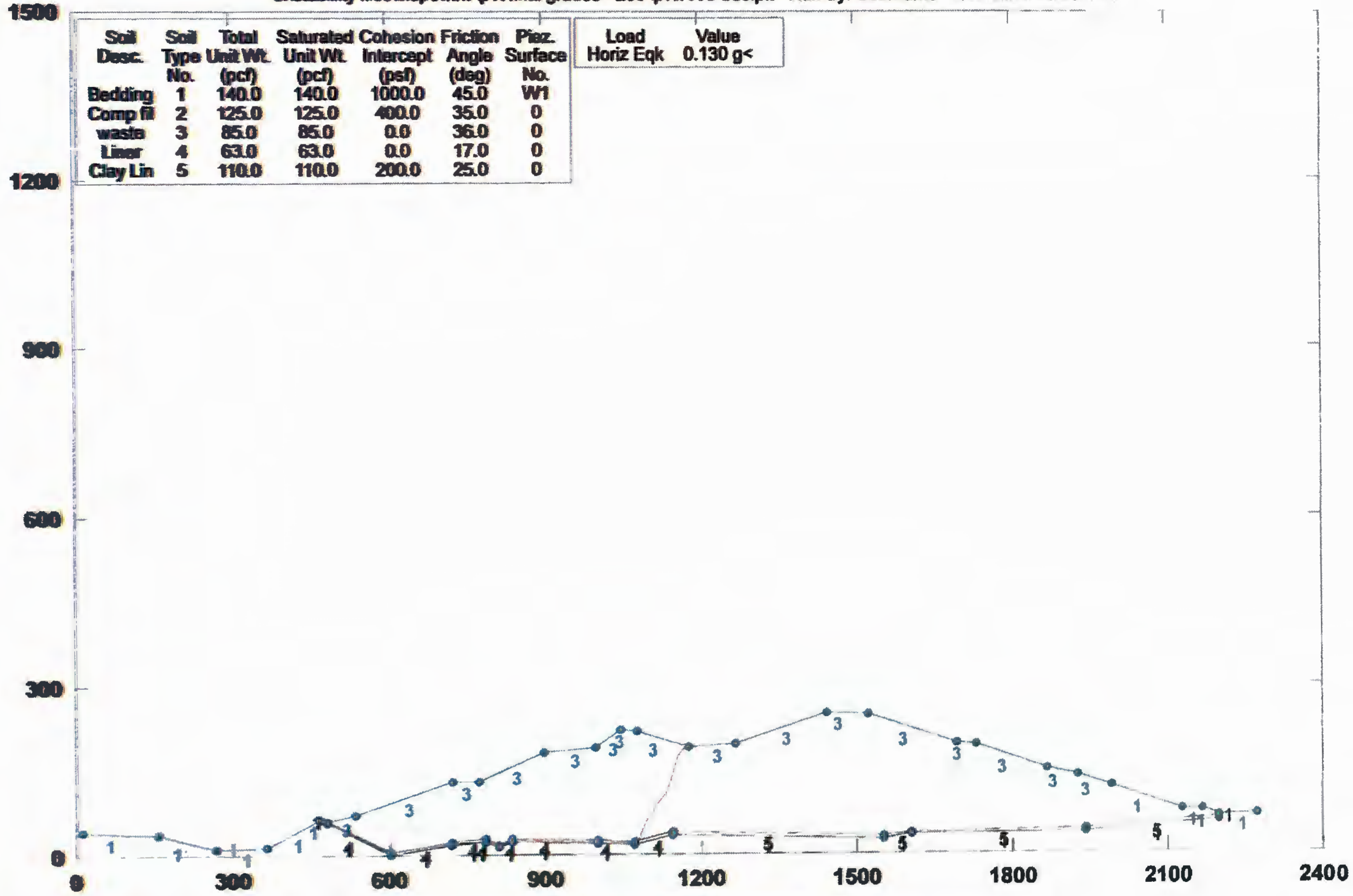
PCSTABL5M/si FSmin=2.65

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve53-bes.plt Run By: Username 4/23/2015 01:07PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

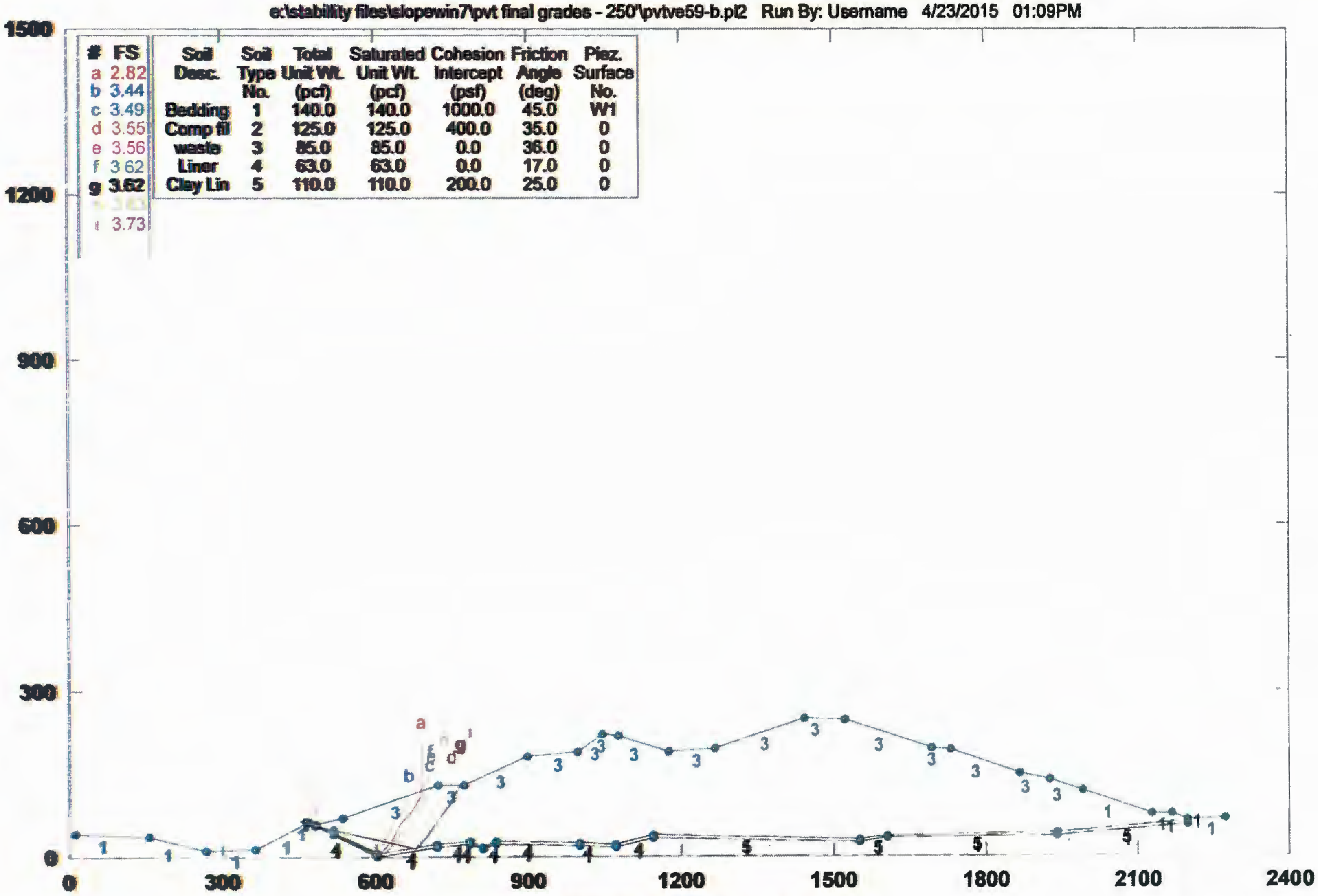
PCSTABL5M/si FSmin=1.59

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve59-b.pl2 Run By: Username 4/23/2015 01:09PM



| # | FS |
|---|---|
| a | 2.82 |
| b | 3.44 |
| c | 3.49 |
| d | 3.55 |
| e | 3.56 |
| f | 3.62 |
| g | 3.62 |
| [illegible] | [illegible] |
| i | 3.73 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

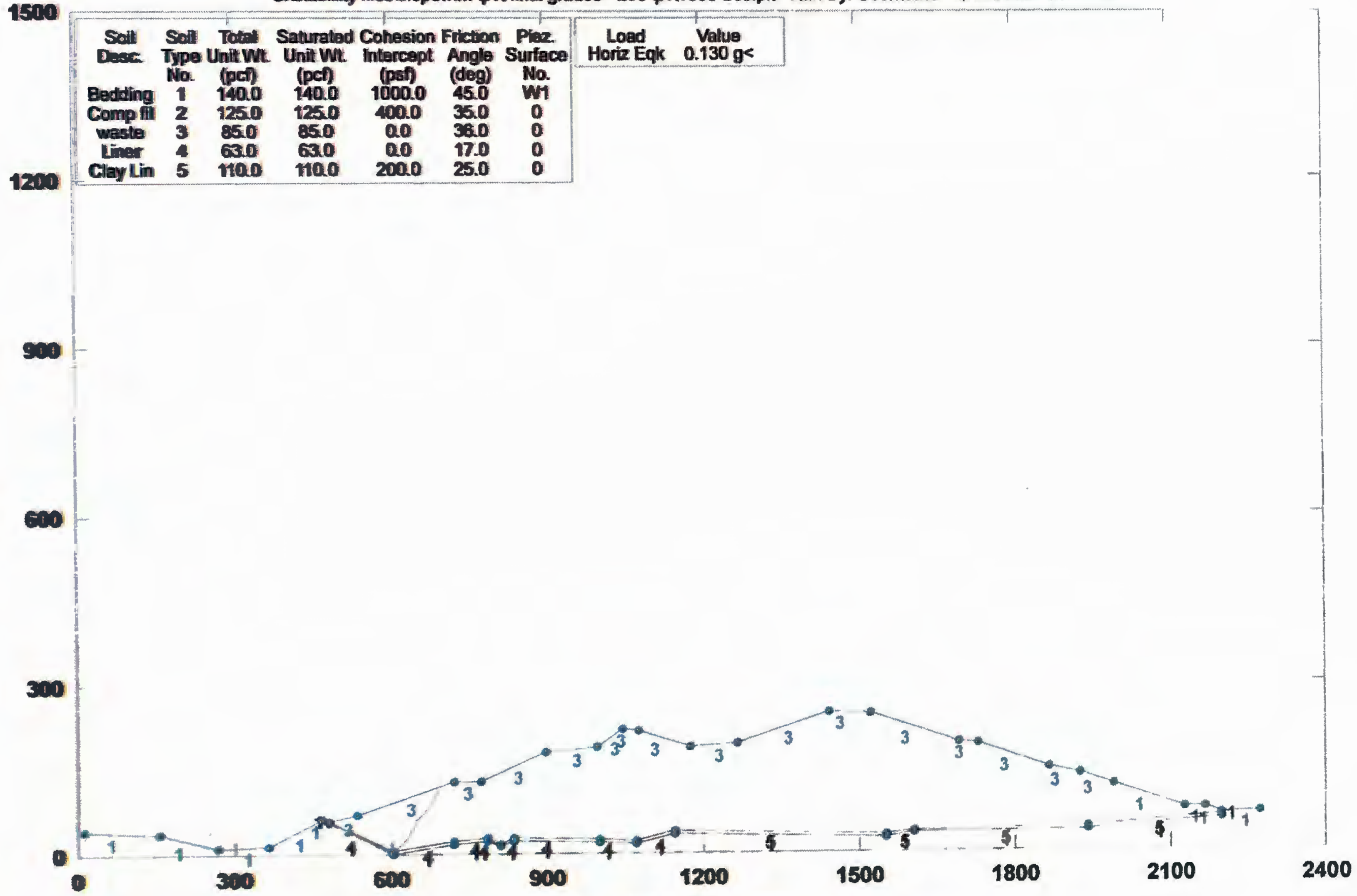
PCSTABL5M/si FSmin=2.82

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stabillity files\slopewin7\pvt final grades - 250'\pvtve59-bes.plt Run By: Username 4/23/2015 01:11PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

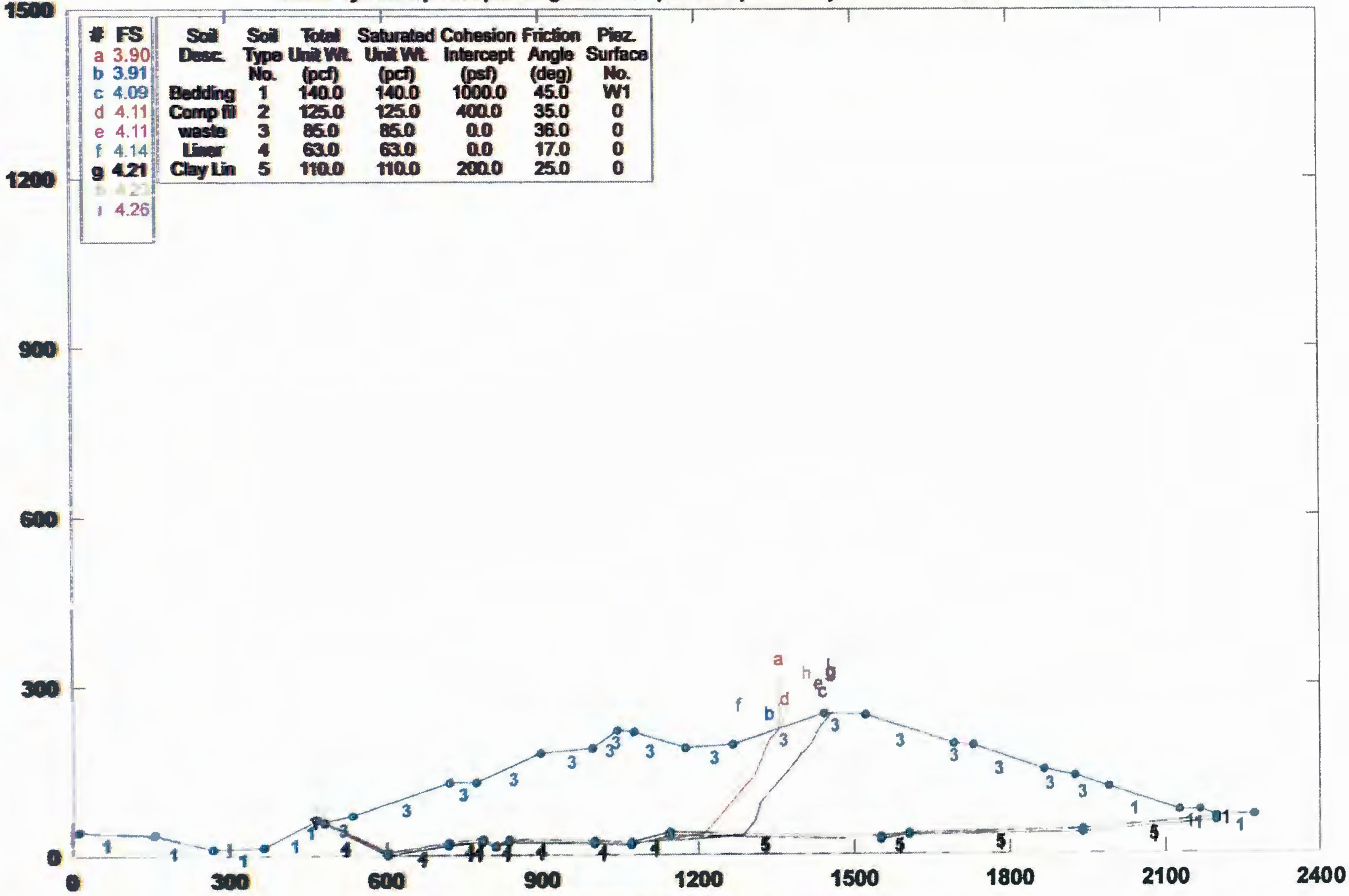
PCSTABL5M/si FSmin=2.45

Factor Of Safety Is Calculated By Spencer`s Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve52-b.pl2   Run By: Username   4/23/2015   01:13PM



| # | FS |
|---|---|
| a | 3.90 |
| b | 3.91 |
| c | 4.09 |
| d | 4.11 |
| e | 4.11 |
| f | 4.14 |
| g | 4.21 |
| h | 4.23 |
| i | 4.26 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

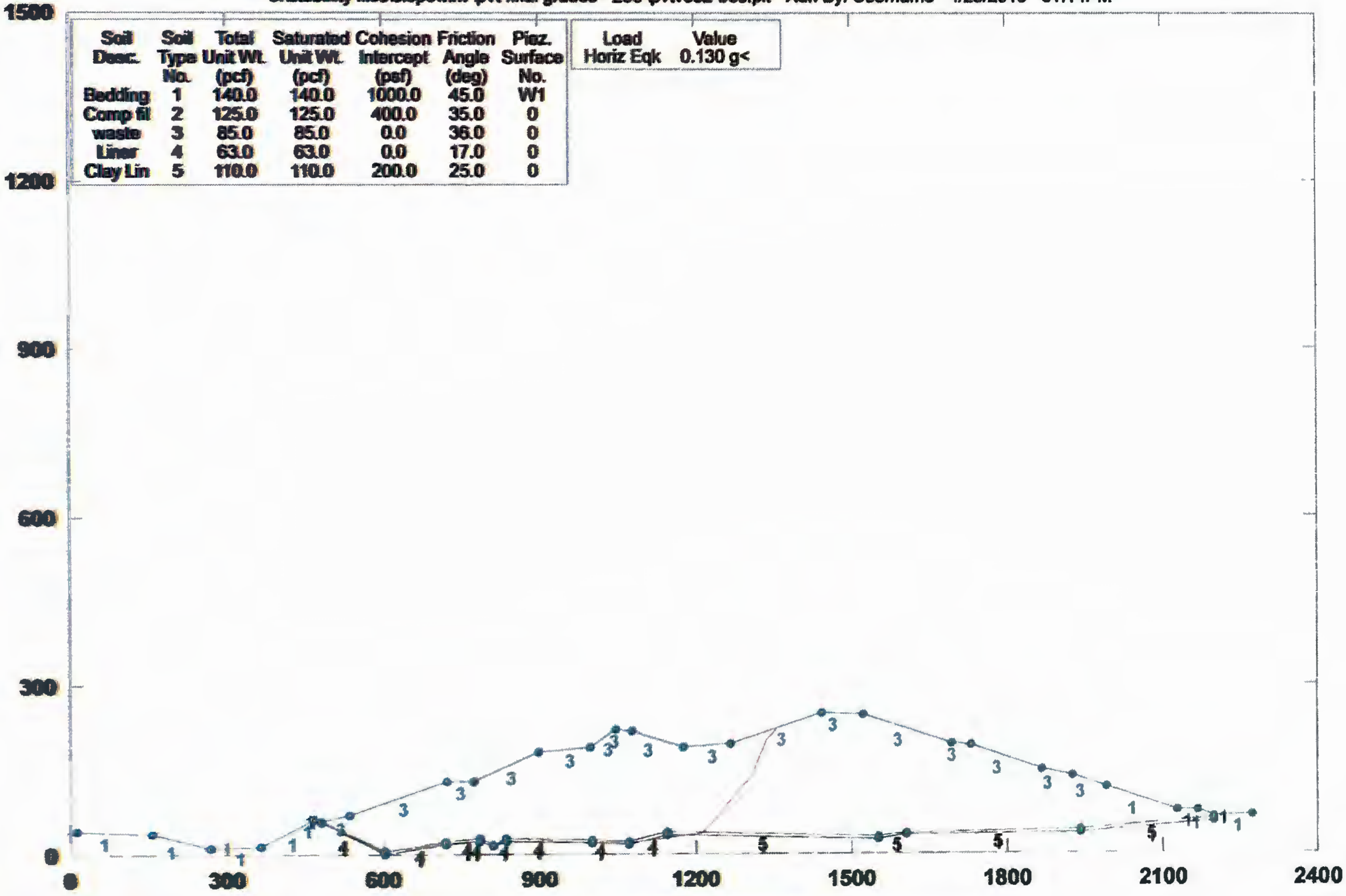
PCSTABL5M/si FSmin=3.90

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve52-bes.plt Run By: Username 4/23/2015 01:14PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

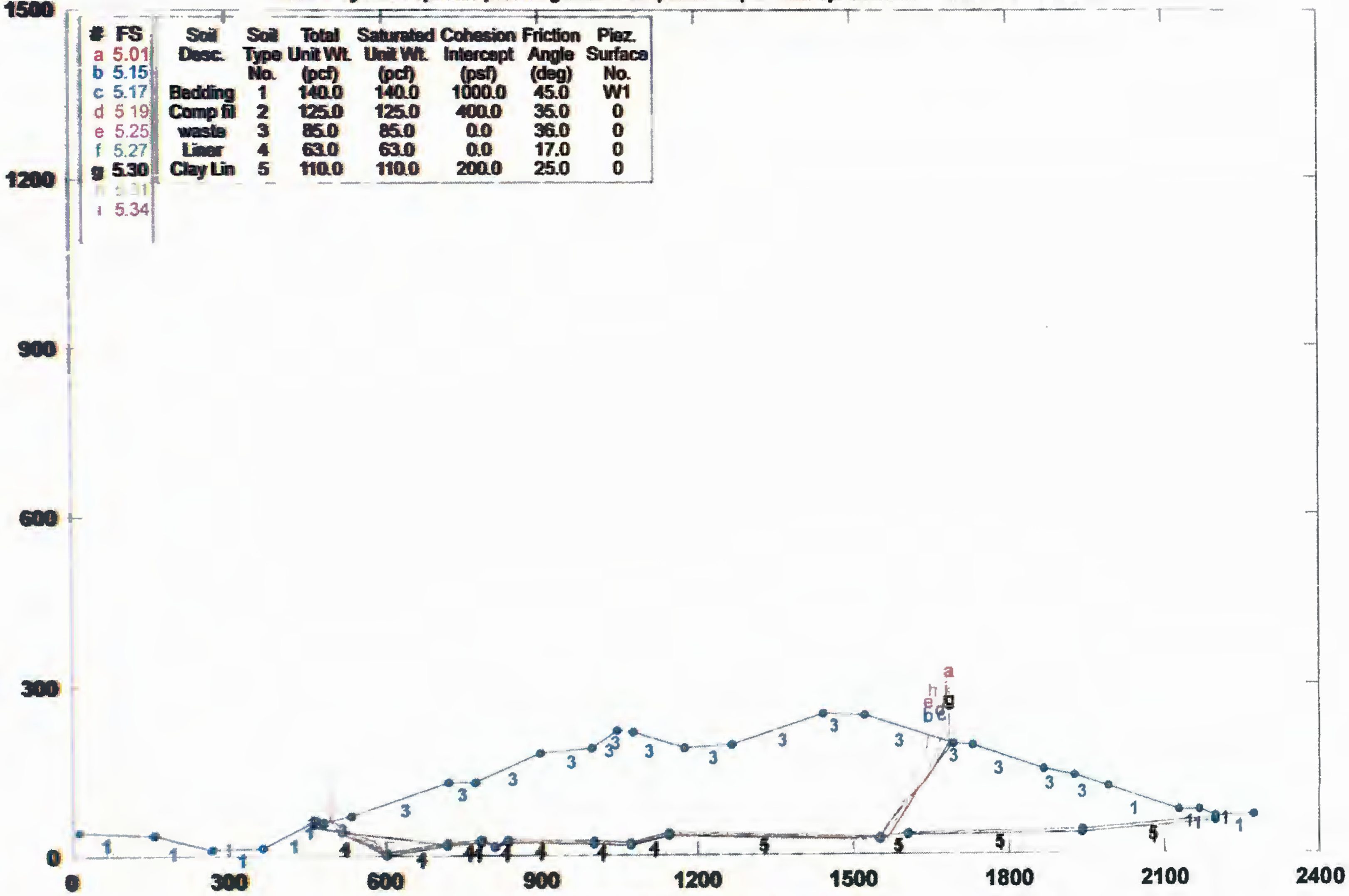
PCSTABL5M/si FSmin=2.16

Factor Of Safety Is Calculated By Spencer`s Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stabillity files\slopewin7\pvt final grades - 250'\pvtve51-b.pl2 Run By: Username 4/23/2015 01:15PM



| # | FS |
|---|---|
| a | 5.01 |
| b | 5.15 |
| c | 5.17 |
| d | 5.19 |
| e | 5.25 |
| f | 5.27 |
| g | 5.30 |
| h | 5.31 |
| i | 5.34 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

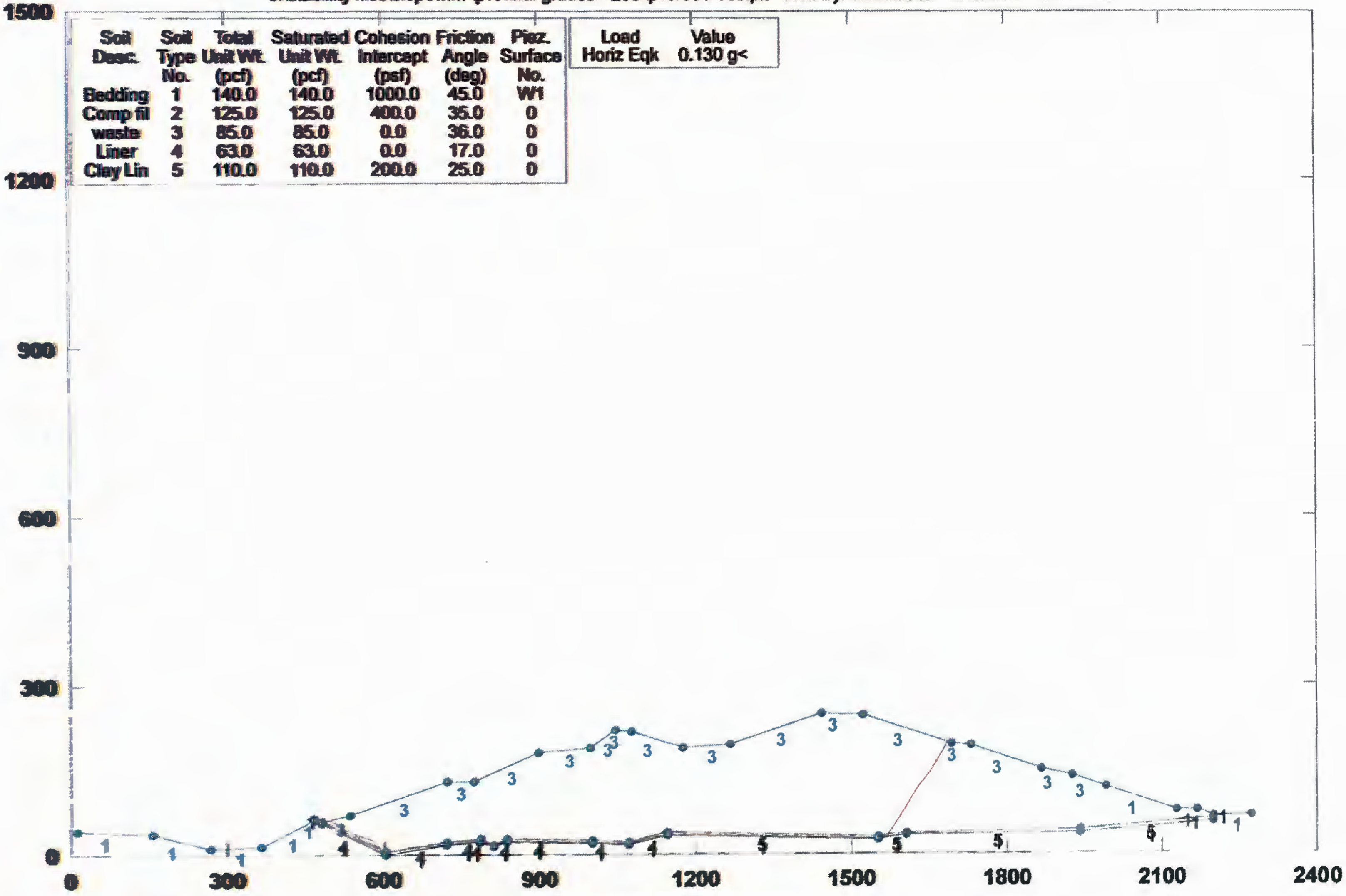
PCSTABL5M/sl FSmin=5.01

Safety Factors Are Calculated By The Modified Janbu Method

**STED**

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve51-bes.plt Run By: Username 4/23/2015 01:17PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

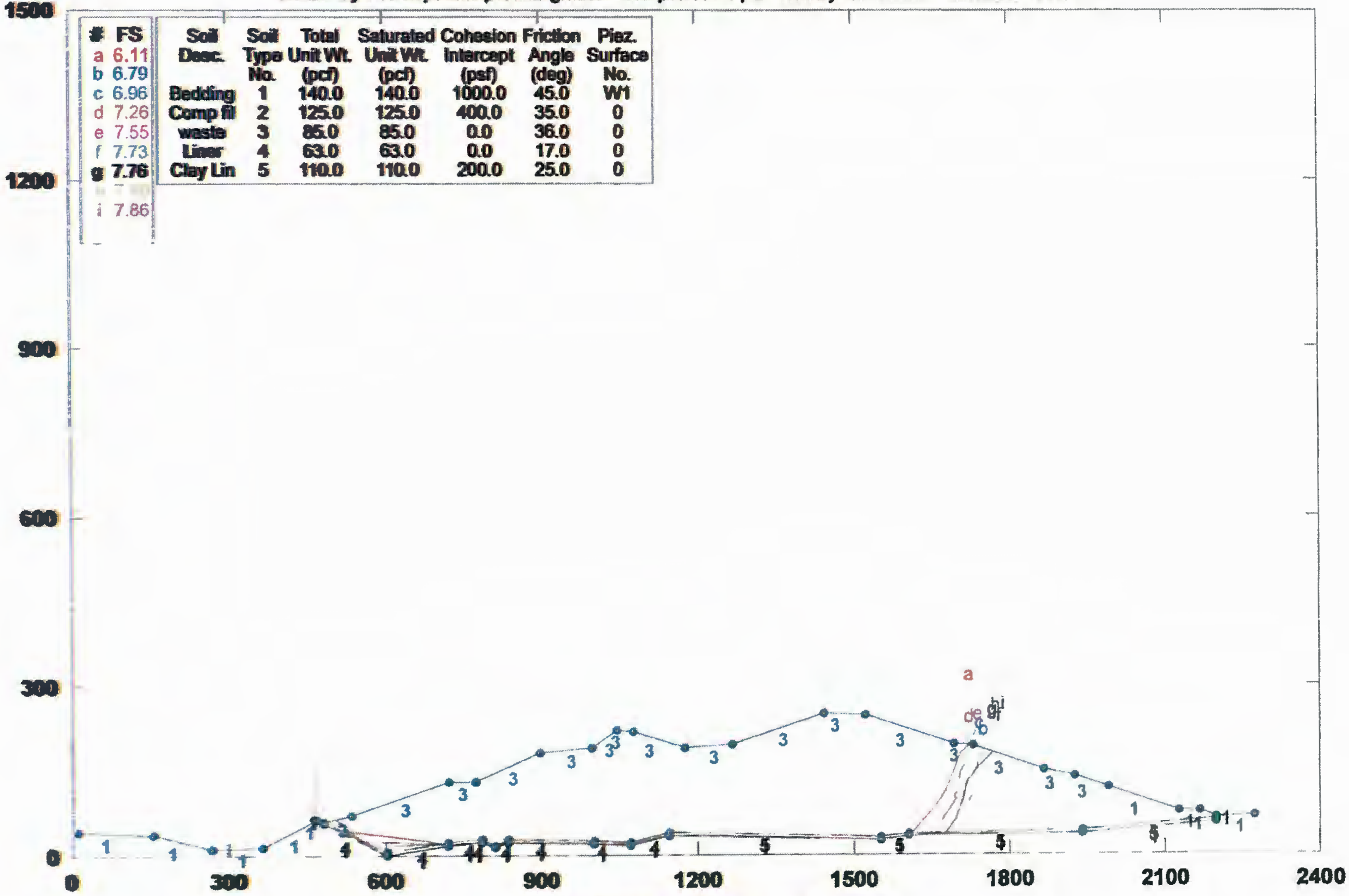
PCSTABL5M/si FSmin=2.24

Factor Of Safety Is Calculated By Spencer`s Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve50-b.pl2 Run By: Username 4/23/2015 01:19PM



| # | FS |
|---|---|
| a | 6.11 |
| b | 6.79 |
| c | 6.96 |
| d | 7.26 |
| e | 7.55 |
| f | 7.73 |
| g | 7.76 |
| [illegible] | [illegible] |
| i | 7.86 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

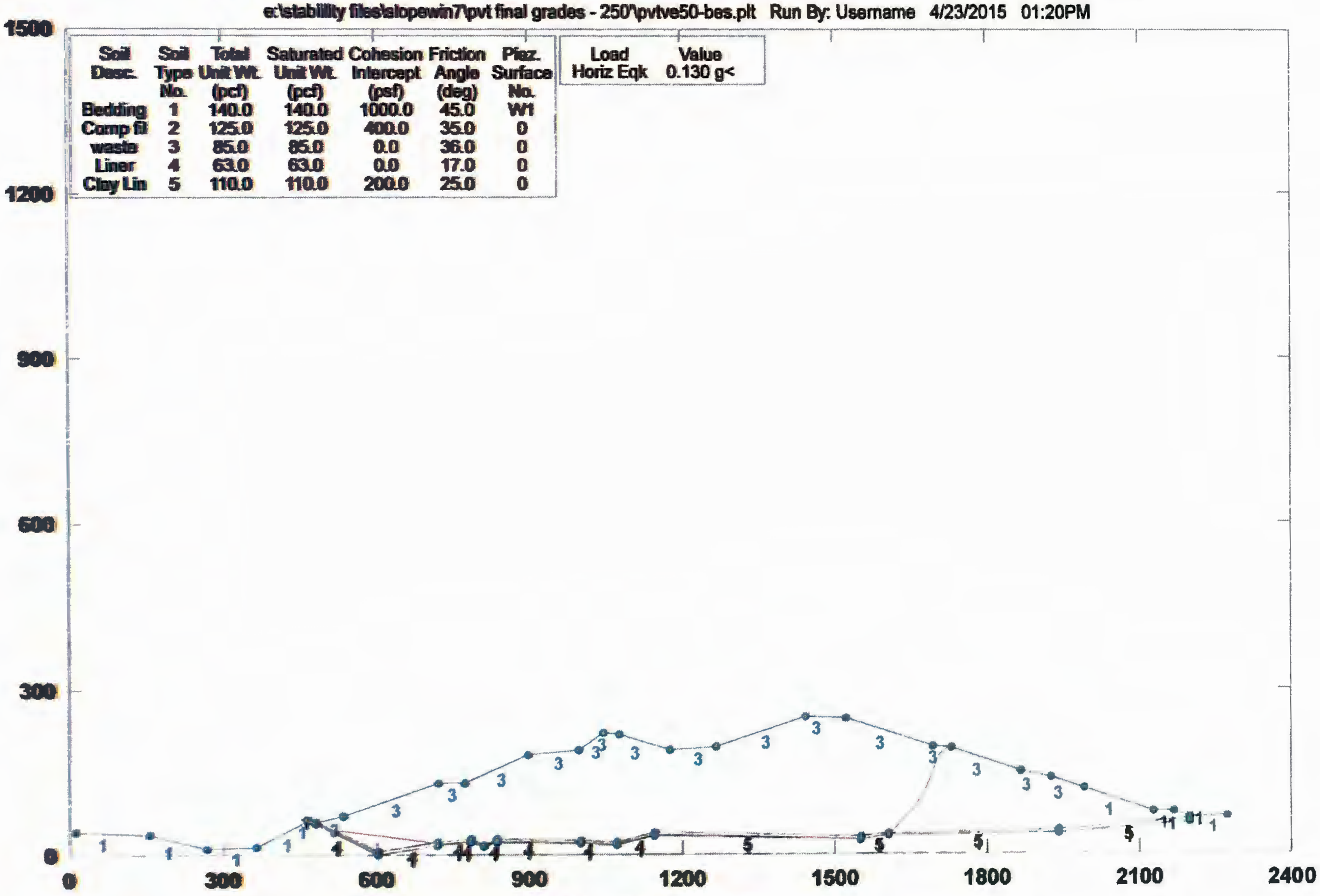
PCSTABL5M/si FSmin=6.11

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stabillity files\slopewin7\pvt final grades - 250'\pvtve50-bes.plt Run By: Username 4/23/2015 01:20PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

**PCSTABL5M/si FSmin=2.37**

**Factor Of Safety Is Calculated By Spencer's Method of Slices**

STED

# OPERATIONS PLAN

# PVT INTEGRATED SOLID WASTE MANAGEMENT FACILITY

Prepared for

PVT LAND COMPANY
87-2020 Farrington Highway
Waianae, Hawaii 96792

Presented by

A-Mehr, Inc.
23016 Mill Creek Drive
Laguna Hills, California

February 2010
Revised July 2010
Revised November 2011
Revised October 2014
Revised April 2015
Revised October 2015

## TABLE OF CONTENTS

## FIGURES

## APPENDICES

# OPERATIONS PLAN
# PVT INTEGRATED SOLID WASTE MANAGEMENT FACILITY

## 1. INTRODUCTION

### 1.1 Purpose

This Operations Plan has been prepared pursuant to Hawaii Administrative Rules, Title 11, Chapter 58.1 (HAR 11-58.1), Solid Waste Management Control. It responds to requirements of the following sections of HAR 11-58.1 relative to the solid waste facility types in operation at the PVT Integrated Solid Waste Management Facility:

§11-58.1-32 Recycling and Materials Recovery Facilities
§11-58.1-19 Construction and Demolition Solid Waste Landfills

This Operations Plan replaces the Operational Plan for the PVT ISWMF dated September 2009, as revised in November 2011 and April 2015. It is intended to fulfill two primary functions:

- To describe and define site operational parameters as a reference for regulatory personnel of the Hawaii Department of Health; and
- To serve as an operations manual for personnel of the PVT Integrated Solid Waste Management Facility.

### 1.2 General Facility Description

#### 1.2.1 Location

PVT Integrated Solid Waste Management Facility (hereafter, "PVT ISWMF") is located in the community of Nanakuli near the southwestern coast of the island of Oahu, Hawaii, as shown on Figure 1, Site Location Map. The facility property begins approximately 1600 feet northeast of the intersection of Farrington Highway and Lualualei Naval Road, and extends northerly approximately one mile along Lualualei Naval Road.

#### 1.2.2 Site Description

The PVT ISWMF property covers a total of 200 acres. The currently developed operating area consists of 200 acres on the west side of Lualualei Naval Road. A parcel of 179 acres located east of the road is used for soil borrow, water supply and drainage control. Figure 1 shows the existing topography of the properties.

The PVT ISWMF lies along approximately 1 mile of Lualualei Naval Road, with a width ranging from 1,000 to 1,800 feet between the road and Ulehawa Stream. Elevations of the site prior to development of the existing PVT ISWMF range from 40 to 50 feet above sea level. Approximately 104 acres are designated for waste disposal (49 acres for Phase I and 55 acres for Phase II), with a maximum elevation of approximately 250 feet above sea level under existing permits. Final refuse grades are shown in Figure 7.

### 1.2.3 Major Facility Components and Operations

PVT ISWMF is a comprehensive solid waste management facility for construction and demolition waste and other recyclable waste products. It does not accept hazardous waste or municipal solid waste as defined in state regulations. It embodies three types of waste management facilities defined in HAR 11-58.1:

- A reclamation facility, defined as "a location used for the handling, processing, or storage of recoverable material, including but not limited to composting and remediation". Recoverable material is defined as "material that can be diverted from disposal for recycling or renewable energy."
- A materials recovery facility; and
- A construction and demolition waste landfill

The primary existing and future planned operations at the site are the following:

- Segregation of incoming loads into materials for processing, recycling, on-site usage or disposal;
- Mixed waste sorting to remove and separate recyclable materials;
- Processing to produce feedstock for renewable energy of organic wastes;
- Production of aggregate materials including rock, gravel and crushed asphalt;
- Solidification of liquid wastes;
- Reclamation of previously landfilled construction and demolition waste to minimize the potential of fire, to prevent settlement, to minimize leachate potential, and to remove voids;
- Storage for recyclable materials and marketing of recyclable materials; and
- Landfill disposal of residual non-recoverable waste materials, including primarily composition/asphalt roofing shingles, tile, gypsum board, lead painted concrete and cementitious siding.

Figure 2 is a site map showing the general location of the major operations. Figure 3 is a flow chart illustrating the flow of materials between operations. Details of each facility component operation are provided in Sections 3 and 4.

### 1.2.4 Types and Quantities of Waste

PVT ISWMF will accept the following types of material for processing or disposal:

- Construction and demolition waste;
- Waste furniture, mattresses and other organic-containing material that can be processed into feedstock for renewable energy;
- Scrap metal;
- Liquid wastes for solidification; and
- Contaminated soil for disposal or use in solidification of liquid wastes and sludge.

Detailed descriptions of these materials are contained in Section 2.

PVT ISWMF is permitted under its Solid Waste Facility Permit to accept a maximum of 2,000 tons per day of C&D waste and 500 tons per week of asbestos contaminated waste.

### 1.2.5 Climate

The Nanakuli area receives approximately 14 inches of rainfall per year, based on data from the on-site weather station at PVT ISWMF. Most of the annual precipitation falls between October and April. During this period, rainfall averages 1 to 2 inches per month, with less than 1 inch per month generally falling in the rest of the year.

Typical daily temperatures range from the low 60's to the upper 70's during the winter, and from the lower 70's to the upper 80's during the summer.

### 1.2.6 Surrounding Area

The ISWMF site is bordered by industrial, residential, agricultural and undeveloped property. The Pine Ridge Farms trucking facility is adjacent to the northern boundary of the site. Ulehawa Stream separates the ISWMF from residential areas to the west and northwest. Residences to the south along Mohini Street are separated from ISWMF operations by a minimum 100-foot wide landscaped buffer zone. The nearest of these residences is approximately 750 feet from the southernmost end of the Phase I disposal area. The land east of the site, across Lualualei Naval Road, is undeveloped property owned by Leeward Land Company, Inc.

## 1.3 Site Utilization Concept

Figure 2 shows the site plan showing the location of existing and future processing storage and disposal areas and ancillary facilities located on the west side of the Lualualei Naval Road, including:

- Entrance area with scalehouse and administrative offices
- Waste segregation and sorting area
- Recyclable materials storage area
- Renewable energy feedstock production area
- Liquid waste solidification area
- Contaminated soils storage areas
- C&D landfill including asbestos disposal area and landfilled waste reclamation area
- All-weather access roads
- Drainage facilities

Detailed descriptions of these facilities are contained in Sections 3 and 4.

## 1.4 User Population

Primary users of the PVT ISWMF are construction and demolition contractors and waste haulers on Oahu, including agents of federal military or other government agencies. PVT prequalifies all customers by requiring establishment of an approved account prior to delivering any waste to the site. Customers are notified in advance that all material brought to the ISWMF for disposal will be inspected to ensure it is acceptable waste. Special accounts and review procedures are required for customers proposing to dispose of contaminated soils, asbestos contaminated wastes or liquid wastes for solidification.

## 1.5 Hours of Operation

The facility scalehouse currently is open to receive customers during the following hours:

| | |
|---|---|
| Monday – Friday | 7:00 a.m. to 3:30 p.m. |
| Saturday | 7:00 a.m. to 1:00 p.m. |
| Sunday | Closed |

Asbestos contaminated waste is received only on Tuesdays and Thursdays, from 7:00 to 3:00 p.m.

Hours may change from time to time in response to customer needs. On-site activities including cover application, construction and maintenance generally continue after the posted hours for waste receipts.

## 2. WASTE ACCEPTANCE PROCEDURES

### 2.1 Acceptable Waste Types

PVT ISWMF accepts the following general waste types: construction and demolition (C&D) waste, asbestos contaminated waste, liquid waste for solidification; contaminated soil, and ash from the AES power plant, and ash or slag from renewable energy providers. The characteristics of each waste type are described below.

### 2.1.1 Construction and Demolition Waste

C&D waste is generated primarily by contractors and government agencies involved in the construction or demolition of houses, commercial buildings, pavements and other structures. It may include any of the following types of materials:

- Concrete and asphalt rubble
- Steel and nonferrous metal
- Wood, glass, masonry, tile, roofing, siding, and plaster
- Waste plumbing, mechanical and electrical building components
- Dirt and rock
- Brush, wood, roots, stumps, dirt and rocks from clearing and grubbing activities
- Mattresses, furniture and other furnishings resulting from whole-building demolition

Mixed C&D loads may contain incidental bulky items such as tires. If accepted (at the discretion of PVT), tires are pulled from the load and temporarily stored on site until they are hauled to a licensed tire recycler. As a community service, PVT also collects and temporarily stores tires that have been illegally dumped along the road next to the landfill. No more than 150 tires will be stored before shipment offsite. Depending on the rate at which tires are accumulated, tires are removed from the site at 3 to 6 month intervals. In the future, tires may be shredded and recycled.

A significant volume of C&D waste is diverted for on-site use or recycling. PVT uses almost all the rock, dirt, concrete and asphalt for on-site roads and construction of the wet weather pad. In addition, PVT directs source separated and select loads of C&D waste containing significant quantities of scrap metal or wood to the recycling area for sorting, stockpiling and transfer to off-site recyclers.

C&D waste is notably dry and generally inert. Based on a review of characteristics, it has been determined that C&D waste creates no significant odor issue. Its potential for creation of leachate is low and, given the waste exclusion and loadchecking programs implemented by PVT, its potential for a release of toxic or hazardous materials to air or water is minimal.

### 2.1.2 Wood

PVT will accept source-separated loads of wood materials for recycling. Such materials, including pallets, packing crates, or other wood products, may also be sorted out from mixed C&D loads. Most wood, including both treated and untreated wood, will be processed as a feedstock for renewable energy providers. Alternatively, wood may be processed or shipped in bulk to off-site recyclers. If recycling the material is determined to be economically infeasible, PVT may also dispose the material, with or without processing it in a shredder to reduce its size and achieve maximum compaction.

### 2.1.3 Miscellaneous Wastes for Recycling or Reclamation

The following categories of waste will be accepted in segregated loads or will be separated from mixed C&D loads:

- Wood furniture, mattresses and other organic-containing material that can be processed into feedstock for renewable energy providers;
- Scrap metal or materials containing large quantities of scrap metal;
- Glass products other than HI-5 recyclable glass containers; and
- Waste plastics other than recyclable PET bottles

### 2.1.4 Asbestos Contaminated Waste

Asbestos contaminated waste is accepted and managed in accordance with the requirements of DOH Permit No. LF-0152-09 and applicable regulations including Chapter 342H, Hawaii Revised Statutes and 40 CFR Part 61, National Emission Standards for Hazardous Air Pollutants. The site accepts both friable and non-friable asbestos containing products, primarily consisting of roofing, ceiling, siding and insulating materials. All friable asbestos contaminated wastes received at the site are managed as friable asbestos, requiring it to be double bagged or double wrapped with plastic before being delivered to the site. Asbestos waste is accepted only on Tuesdays and Thursdays with 24-hours prior notice and disposed in the Asbestos Pit. Non-friable asbestos for disposal is accepted in the Asbestos Pit as well.

### 2.1.5 Contaminated Soils

Contaminated soils, primarily petroleum contaminated soils, are received primarily from site remediation projects associated with cleanup of leaks or spills from underground or aboveground storage tanks. Other contaminated soils resulting from construction / demolition activities may be accepted, provided they are not hazardous waste or TSCA-regulated waste.

Detailed procedures for accepting and managing contaminated soils are described in Section 2.3.4.

### 2.1.6 Solidified Liquid Wastes

PVT operates a contaminated soils storage and liquid waste solidification process on the ISWMF property, pursuant to DOH Permit No. LF-0152-09. Under the terms of the permit, soil materials resulting from mixing soils with petroleum-contaminated liquids, with liquids originating from construction and demolition activities, or with other liquids approved by HDOH, may be disposed in the PVT ISWMF.

### 2.1.7 Clean Inert Waste

PVT accepts segregated clean loads of inert material, primarily concrete rubble, asphalt rubble and cold-planed asphalt material. Most of these materials are stored in stockpiles until needed for on-site construction of roads, wet-weather deck surfacing, stormwater management facilities, or other beneficial uses. At the company's option, unused inert materials may also be disposed in the ISWMF as part of fire break construction between waste cells or as common C&D waste. If specified by the design engineer, inert materials may also be used in structural fill in and outside the landfill footprint.

### 2.1.8 AES Ash and Ash/Slag from Renewable Energy Providers

The Hawaii Department of Health has approved the acceptance at PVT ISWMF of fly ash and bottom ash from the AES Hawaii coal-fired power plant. Upon approval by DOH, PVT ISWMF may accept ash and/or slag from renewable energy providers. Ash is currently approved for beneficial use as:

- Operations Layer - Ash may be used as a substitute for soil in the protective soil layer placed above newly installed liner systems in new disposal cells.

- Fire barrier – Ash may be placed as a subsurface barrier between Phase I and Phase II, or between adjacent disposal cells in Phase II or within disposal cells. The purpose of the barrier is to limit the spread on any potential future subsurface fire to minimize potential damage to landfill liner systems. The ash is used for vertical and horizontal fire barrier layers, as described in Section 4.4 3.1.

- Void Space Filling – Ash may be used for void space filling for fire prevention.

- Solidification-Ash may be used in the solidification of liquids.

- Upon approval by DOH, for daily cover and interim daily cover. PVT has conducted a demonstration project and submitted a Human Health Risk Assessment for use of AES ash for daily cover, void space fill, interim daily cover and absorption of liquids.

## 2.2 Excluded Wastes

Solid wastes other than those described in Section 2.1 are not accepted for disposal at PVT ISWMF. Excluded wastes for processing or landfill disposal include the following:

- Household waste, garbage, commercial solid waste or industrial solid waste as defined in HAR 11-58.1-03;
- All regulated hazardous wastes and TSCA-regulated PCB contaminated materials;
- Pesticide containers other than incidental empty small containers classified as C&D waste;
- Bulk green waste (grass, leaves, tree trimmings, etc.) or loads of land clearing debris or C&D waste containing more than 10 percent green waste;
- Whole tires (except as provided in Section 2.1.1) or car parts;
- Free liquids and liquids products, including paints, solvents, sealers or adhesives (liquids are accepted for solidification only as described in Section 2.16);
- Asbestos waste that is not properly packaged;
- White goods except incidental appliances;
- Contaminated C&D loads; and
- Lead-acid batteries.

## 2.3 Acceptance Procedures

Appendix B contains copies of disposal agreements and manifest forms required by PVT for all customers delivering C&D waste, asbestos waste, contaminated soil and liquid wastes to the site for disposal. The same agreements and forms will be required for customers delivering recyclable materials to the site for processing.

PVT ensures that excluded wastes are not accepted by its notices to customers, customer prequalification procedures, and inspections of loads at the scalehouse and at the disposal active face.

This section describes the procedures implemented for acceptance of the major waste types managed at PVT ISWMF. Each section also includes procedures for excluding unacceptable wastes. Acceptable wastes include the following:

- Construction and demolition waste
- Source-separated waste accepted for recycling or renewable energy, including:
    - Wood
    - Plastic
    - Glass
    - Furniture
    - Mattresses
    - Scrap metal
    - Concrete, rock and asphalt rubble
- Asbestos-containing waste
- Contaminated soil

### 2.3.1 C&D Waste Acceptance

All C&D customers are subject to PVT ISWMF prequalification procedures. Customers are required to execute a disposal agreement and submit a Request for Clearance Number Form to PVT, generally 7 days in advance of the date when the customer proposes to begin transporting waste to the ISWMF. Following the inspection, PVT issues a clearance number which is referenced for each load from the job site.

Waste generators are responsible for determining and reporting to PVT that wastes proposed for management are not regulated hazardous waste. PVT requires special testing for several categories of C&D waste, including debris containing lead paint, and sand blast sand and soil. These materials must be tested using the Toxicity Characteristic Leaching Procedure (TCLP) and meet the following maximum criteria:

| | | |
|---|---|---|
| Lead Paint Debris | Lead | 5.0 mg/L |
| Sand Blast Sand and Soil | Arsenic | 5.0 mg/L |
| | Barium | 100.0 |

|  |  |
|---|---|
| Cadmium | 1.0 |
| Chromium | 5.0 |
| Lead | 5.0 |
| Mercury | 0.2 |
| Selenium | 1.0 |
| Silver | 5.0 |

Fiberglass or steel waste storage tanks proposed for disposal must be certified clean by a qualified environmental contractor.

Customers are required to submit test results and certifications for these materials before PVT issues a Clearance Number authorizing acceptance of the waste for disposal.

When waste transporters arrive at the ISWMF scalehouse, if the scale attendant has any doubt or concern regarding the acceptability of the material, site supervision is summoned to the scalehouse to inspect the load and determine its acceptability. Appendix E contains the Unacceptable Waste Exclusion Program used to prevent the disposal of unacceptable wastes, including the materials listed in Section 2.2 above.

A minimum of one load of C&D waste is selected each day for a random inspection according to procedures detailed in Appendix E. If unacceptable waste is found, the material is reloaded in the customer's vehicle and removed from the site. Records are maintained of unacceptable wastes observed during inspections.

Once a waste load has been determined acceptable, it is weighed and the data entered into the scalehouse records, and the customer is directed to the appropriate processing or disposal area.

### 2.3.2 Source-Separated Waste Accepted for Recycling

Segregated loads of wood, plastic, glass, furniture, mattresses, scrap metal, concrete, asphalt, rock and other waste materials accepted for recycling or reclamation will be inspected at the scalehouse to verify they do not contain unacceptable materials. PVT ISWMF personnel at the designated processing area where the loads are discharged will observe the material as it is dumped to identify any unacceptable materials.

### 2.3.3 Asbestos Waste Acceptance

All asbestos waste customers are required to sign an agreement specifying the terms and conditions of PVT ISWMF's asbestos disposal service. All friable asbestos containing wastes are required to be contained in metal or plastic drums or barrels, or be double wrapped or double bagged in plastic with a minimum thickness of six millimeters. Each load must be accompanied by a properly executed Asbestos Waste Shipment Record manifest form. Asbestos customers are also required to provide a certificate of insurance naming PVT Land Company as an additional insured for purposes of liability.

Asbestos loads are accepted only on designated days of the week, presently Tuesday and Thursday, before 2:45 p.m. Asbestos contractors are required to notify the ISWMF at least 24 hours before delivery, and have all paperwork including a manifest and PVT authorized clearance number, with each load. No more than 500 tons of asbestos containing waste may be accepted in any week, unless arrangements are made for extended delivery times.

### 2.3.4 Contaminated Soil Acceptance

Generators must submit a Soil Profile Sheet describing the source of the material and containing analytical test results for specified contaminants. Unless exempted by PVT based on generator knowledge, soils will be tested for the following:

- TCLP metals including TCLP cadmium, TCLP chromium, and TCLP lead;
- Ignitability;
- Total metals including total cadmium and total lead;
- Total petroleum hydrocarbons (TPH) as gasoline (C6-C12), diesel (C12-C24) and oil (C24-C30);
- Benzene, toluene, ethylbenzene, and xylenes;
- Polynuclear aromatic hydrocarbons (not applicable to material solely contaminated with gasoline);
- PCBs (not applicable to material solely contaminated with gasoline or diesel fuel);
- Halogenated volatile organic compounds (not applicable to material solely contaminated with gasoline or diesel fuel); and
- Pesticides

Additional testing may be requested on a case-by-case basis. Soils containing TSCA-regulated polychlorinated biphenyls (PCBs) are not accepted. Soils may not be hazardous waste.

All soils proposed for disposal at PVT must be tested according to test procedures and methods set forth in the disposal agreement. PVT reserves the right to reject any load it has cause to believe contains unacceptable contaminants or levels of contaminants in excess of approved concentrations. Customers are required to provide certificates of insurance naming PVT Land Company as an additional insured for liability protection.

# 3. WASTE RECLAMATION AND RECYCLING OPERATIONS

This section describes the processes used by PVT ISWMF to recover resources and materials from C&D and other waste materials. Each major process category is discussed including information on waste types, equipment, labor and product handling.

## 3.1 Materials Processed for Reclamation

The major categories of waste materials processed to recover materials for recycling and reclamation include:

- Mixed C&D waste;
- Source-separated wood waste;
- Source separated rock, concrete and asphalt rubble; and
- Source-separated scrap metal, discarded furniture, mattresses and other products suitable for processing to incorporate into renewable energy feedstock.

## 3.2 Reclamation Processes Overview

Figure 3 is a schematic flow diagram of the PVT ISWMF materials reclamation facility, illustrating the major process steps:

- All incoming loads are classified on arriving at the scalehouse, and directed to the appropriate area for discharge.
- Mixed loads are sorted to separate major categories of recoverable and non-recoverable materials.
- Sorted material is shredded to reduce volume.
- Material designated for renewable energy feedstock is additionally processed to requirements of user.
- Rock, concrete and asphalt rubble is crushed to produce aggregate products.
- Existing disposed mixed C&D waste is excavated and processed as mixed C&D to reclaim materials.
- Liquid wastes are solidified by mixing with soil for disposal or use as interim landfill cover.
- Materials reclaimed or recycled for off-site uses are stored and transported to markets.

These processes are detailed in the following sections.

## 3.3 Material Prescreening and Segregation on Receipt

Upon receipt at the scalehouse, all incoming loads are designated as either C&D waste or non C&D material for recycling. Loads are then directed to one of the following designated areas for dumping and processing:

- Mixed materials sorting area
- Feedstock processing area
- Aggregate production facility
- Scrap metal storage area
- Liquid waste solidification area
- Contaminated soil storage area
- C&D landfill (C&D waste only)

PVT anticipates that approximately 70%-80% of the total incoming material will be directed to recycling or processing areas, and 20% to 30% will be sent directly to the C&D landfill for disposal. Signage at the site provides clear direction for customers to access the designated area for discharge of their load.

## 3.4 Mixed Material Sorting

Most loads of mixed C&D and other material are processed at the mixed load sorting area to separate the waste into the following categories:

- Wood;
- Metal;
- Concrete, rock, asphalt and other inert material;
- Soil;
- Plastic, paper and other organic materials suitable for use in feedstock; and
- Non-recoverable residual waste.

PVT generally sorts and processes material as it is delivered, with minimum stockpiling or storage prior to processing. Stockpiles shall not exceed a height of 15 feet with 20-foot lanes between piles.

Receipt, stockpiling and processing of material are coordinated in order to comply with permit conditions requiring that all C&D material received at the MRD is handled so that no material remains in its' stockpile for more than two weeks.

### 3.4.1 Equipment

Figure 3 is a schematic flow diagram of the mixed waste sort facility, illustrating the following equipment arrangement:

- Mixed C&D material in the incoming stockpile will be initially sorted by one or more excavators. The excavators break up any large assemblies into manageable pieces, and will remove large rocks, concrete chunks, logs or stumps, and oversize metal objects to separate stockpiles.

- After large items have been removed by the excavator, the remaining mixed C&D material will be transferred by an excavator to the primary screen, which separates it into two size fractions, nominally above and below a maximum particle size of six (6) to ten (10) inches. The smaller material (6" to 10"-minus) is transferred by conveyor to a separate sorting line (the "B line" for processing, while the larger material (6" to 10"-plus) proceeds to the primary sort line ("A line") for sorting.

- The A Line sorting conveyor is elevated above the surrounding concrete pad. A series of storage bays are delineated on both sides of the conveyor by steel walls. Roll-off bins may be placed in some bays to facilitate transfer of material from the storage bay to the next stage of processing. Personnel remove the following materials from the waste stream as it moves along the conveyor, and drop them into the storage bays or bins:

    - Inert material (concrete, rock, asphalt, etc.)
    - Ferrous and non-ferrous metals
    - Non-recoverable residual waste.

  Wood, plastic, paper, carpet, yard waste and other organic materials suitable for use in feedstock are left on the sorting belt and transferred to a conveyor discharging to the primary shredder or a stockpile for transport to underground storage.

- The B Line sorting system consists of the following components to process the 6" to 10"-minus material:

    - An overhead belt magnet that collects and transfers ferrous metal from the conveyor belt to a bin;
    - A secondary screen that removes material smaller than one inch in size (1"-minus) and transfers it to a bin or stockpile;

  - An air classifier that separates the remaining material into light (wood, paper, plastic) and heavy fractions, transferring the heavy material to the A Line rock bin and the light fraction to the B Line sorting conveyor;
  - A sorting conveyor where personnel remove remaining ferrous and non-ferrous metals, and any other material not suitable for use as feedstock; and
  - A transfer conveyor discharging to the primary shredder or stockpile.

- The final transfer conveyor of the B Line is fitted with a chute for loading pre-sorted clean wood (pallets, lumber assemblies, etc.) directly onto the conveyor for processing in the primary shredder.

- Materials are removed from storage bays and bins by the front-end loader or rolloff truck and transported to the applicable storage area or next stage of processing.

The mixed C&D waste system is designed to process approximately 80 to 100 tons per hour of material.

### 3.4.2 Labor Requirements

The mixed waste sort line is generally staffed by two to four equipment operators and from ten to 18 persons removing material from the sorting conveyors.

### 3.4.3 Residual Wastes

Non-recoverable residual waste is generally less than twenty percent (20%) of the sorted C&D waste stream. Residual wastes consist primarily of the following materials:

- Composition / asphalt roofing shingles
- Tile
- Gypsum board scrap
- Cementitious siding and tile
- Glass
- Floor tiles
- Fiberglass insulation
- Ceiling tiles
- PVC pipe and siding

Combined with the 20% to 30% of incoming material sent to the landfill directly from the scalehouse, the residual waste from recycling is expected to produce a total disposed tonnage of approximately 35% to 45% of the total material received at the facility.

### 3.4.4 Storage

Materials are transferred from the sorting facility to storage areas as follows:

- Wood, yard waste and miscellaneous organic materials are moved to the feedstock production area or stockpiled underground.

- Metals are moved to ferrous and non-ferrous storage areas. These are open bays defined by concrete blocks or K-rails, with separate bays for ferrous metal, aluminum and other non-ferrous metals or bins.

- Rock, concrete and asphalt rubble are moved to the aggregate materials process area. Separate stockpiles are maintained in this area for rock, concrete without rebar, concrete with rebar, and asphalt rubble.

- Residual waste is transported either directly to the C&D landfill disposal area, or to the feedstock area for primary shredding to reduce its volume prior to disposal.

## 3.5 Feedstock Production

PVT estimates that approximately 60% of the total incoming material streams are suitable for reclamation and conversion into feedstock for renewable energy providers. The feedstock will be processed into the physical form required by off-site facilities, and transported to them under supply agreements that will be developed as the anticipated facilities are constructed and placed into service. The following information describes the feedstock production system as currently planned.

### 3.5.1 Feedstock Material Stream

Approximately 80 percent of the material stream converted to feedstock will be wood, consisting of lumber, pallets, panel board and other processed wood materials. The balance will be made up of yard waste, paper, plastic, carpet and other miscellaneous materials with organic content suitable for feedstock.

### 3.5.2 Equipment

The feedstock production facility includes three major pieces of stationary equipment:

- A primary shredder, which reduces the material to a nominal dimension of four inches, with a maximum of ten inches and a minimum of 3 inches. The system includes a magnet to remove small ferrous metal items from the shredded material stream. The primary shredder is usually located at the end of the A Line and B Line conveyor systems to shred material left on the conveyer belt. Under some circumstances it may be located elsewhere for loading by a front-end loader or an excavator.

- A secondary shredder to reduce the feedstock material to the maximum particle size required by the renewable energy process, which may range from 3/8 inch to two inches in its largest dimension.

- A screening system to ensure the final product meets the specified particle size, with oversize material returned to the secondary shredder for reprocessing.

Components in the system are generally sized for a production rate of approximately 100 tons per hour, depending on the type of material being processed.

Material is loaded to the primary shredder by conveyor, front-end loader or excavator. Shredded material is handled on conveyors or by front-end loaders.

### 3.5.3 Labor Requirements

The feedstock production system generally requires two equipment operators. The excavator operator feeding the primary shredder is responsible for blending material from material stockpiles to produce the required blend of wood and other materials established for the feedstock product.

### 3.5.4 Environmental Controls

Dust will be controlled, during material sorting shredding and screening by fixed and mobile water spray systems. PVT will monitor operations on a daily basis and adjust the controls as needed to prevent excessive dust emissions.

### 3.5.5 Products

Material that has been processed only through the primary shredder may be supplied to H-Power or other facilities utilizing mass-burn or similar technology suitable for using feedstock as auxiliary fuel.

The major users of feedstock from the secondary grinding and sorting system will be facilities utilizing renewable energy technology.

### 3.5.6 Residual Wastes

Once materials have been sorted from the mixed stream for feedstock production, only minimal quantities of residual waste are expected from the feedstock system.

### 3.5.7 Storage

Under normal conditions, feedstock will be removed from the site as it is produced in order to provide steady flow to the facilities using it. Limited stockpile quantities of less than 5,000 tons of feedstock may be accumulated. Shredded material stockpiles would be in linear form, 15 feet or less high with 20-foot access lanes between piles. As much as 700 linear feet of stockpile could be needed to store 5,000 tons of shredded feedstock.

Temporary feedstock stockpiles will be monitored and turned as necessary to ensure against spontaneous combustion, and may be covered with tarps to protect the material against rain or creation of dust during dry periods.

In the event PVT produces more feedstock than customers can use, PVT may store partially shredded material (from the primary shredder) underground in a designated area of the Phase II C&D landfill. The selected area is delineated by cones or stakes, and no C&D waste is placed within the area. Shredded feedstock material is placed in maximum 20 ft high lifts within the area, and covered with a minimum 2 feet of ash or soil to create a fire barrier before placing another lift. No C&D waste will be placed above the stockpiled material.

After a facility is ready to receive feedstock, PVT will excavate the stored material, complete its processing using a trommel screen and the secondary grinder, and transport it to market. Material mixed with AES ash or soil used for fire barrier or cover will either be disposed, or screened to remove the ash or soil before processing it in the secondary grinder.

## 3.6 Aggregate Materials Production

### 3.6.1 Processed Materials

PVT ISWMF processes rock, concrete and asphalt rubble to produce crushed aggregate materials for use in permanent and temporary landfill construction. Primary sources of these materials are land clearing and excavation, building demolition, and road/highway construction and maintenance.

### 3.6.2 Equipment

Equipment required for the production of aggregate materials from C&D materials includes:

- Excavator with a concrete pulverizer attachment to reduce concrete chunks to 12 inches maximum size and remove large pieces of reinforcing steel;
- Grizzly screen to remove fine materials from rock, concrete and asphalt rubble prior to crushing;
- Impact crusher to reduce material to desired sizes;
- Screen plant to classify materials to produce specific mixes of particle size;
- Conveyors to move materials between stages of the processing system; and
- Front-end loader to load and transfer materials to and from stockpiles.

### 3.6.3 Labor Requirements

The aggregate production system ordinarily requires two operators, one for the concrete pulverizer and one for the front-end loader. A third operator and second loader may be required during periods when product material is being loaded from stockpiles into trucks for onsite or offsite use.

### 3.6.4 Products

Typical products from the aggregate production operation include:

- 6-inch minus mixed rubble for use in on-site roads or structural fill;
- 1½ inch minus crushed rock drainage media for landfill construction or off-site sale;
- 1½ inch or 2 inch minus mixed rock, concrete and asphalt rubble for surfacing on-site roads;
- ½ inch minus mixed material for use as landfill interim cover; and
- Scrap reinforcing steel, wire mesh reinforcing and other scrap ferrous metal.

Other products may be produced in response to changing or new needs of on-site operations or off-site customers.

### 3.6.5 Residual Wastes

Minor amounts of wood, dirt and other material unsuitable for the aggregate materials will be separated from the product at the grizzly screen. This material will be either disposed in the landfill or used as interim landfill cover, depending on the amount of paper, plastic or other materials in it that are unsuitable in interim cover soil.

### 3.6.6 Storage

Unprocessed aggregate materials may be stored prior to crushing, in separate stockpiles for rock, concrete and asphalt. Stockpiles would typically be less than 20 feet high, covering an area less than 200 feet in the largest dimension.

Processed aggregate material stockpiles will be maintained in a neat and orderly condition to facilitate placement and removal of material, and minimize undesirable mixing of different mixes and types of material.

## 3.7 Landfill Reclamation

### 3.7.1 Purpose

C&D waste disposal operations in the Phase I area of the PVT ISWMF prior to approximately 1995 achieved low compaction densities and produced a fill that has been determined to contain substantial amounts of void spaces. As a result, the landfill has experienced subsurface fires due to the intrusion of oxygen into the void space. PVT ISWMF plans to excavate, process and reclaim materials from a large portion of the Phase I area. This operation will provide a number of benefits, including:

- Recovery of materials for the aggregate production and feedstock process;
- Recovery of excess soil used in the original landfill operation;
- Replacement of the removed loosely compacted fill with new well-compacted waste fill, eliminating void spaces, minimizing long-term settlement issues, minimizing the generation of landfill gases, and reducing risk of subsurface fires and associated odor issues; and
- Extension of the useful life of the C&D landfill.

### 3.7.2 Location and Expected Reclamation Volume

Figure 2 shows the general area where PVT ISWMF plans to reclaim materials from the Phase I C&D landfill. Approximately 1 to 1.5 million cubic yards of material will be excavated and processed.

### 3.7.3 Equipment

The landfill reclamation operation will be conducted using an excavator, a bulldozer and several dump trucks. The excavator will excavate the refuse and cover soil and load it directly into a tracked screener, which separates into material larger than 6-10", material 1" to 6-10", and material which is 1" or less in size (1" minus). The 1" minus material is reused as daily cover. The 1" to 6-10" material is loaded directly into trucks, which will deliver the material to the mixed C&D processing area. The 6-10"+ material is sorted with an excavator and loader to remove concrete, asphalt, carpet, large pieces of metal, and another materials that need to be recycled or reburied. The balance of the material is loaded on haul trucks to be delivered to the mixed C&D recycling area. The bulldozer will push cover soil from the area being prepared for excavation to a stockpile, and spread interim cover soil over areas that have been partially excavated.

### 3.7.4 Reclamation Processes

The excavation of existing landfilled waste will be done in segments across the Phase I area to be reclaimed. Once identified, the area will be staked and excavated in the following manner:

- Beginning at an outside slope, interim cover soil will be scraped and removed from an area estimated to be capable of excavation during one week's time, not to exceed one acre in size. The soil will be pushed by a bulldozer to a stockpile located outside the projected work area.
- The excavator will remove a full lift of waste, down to the level of underlying interim cover, and load it into trucks for delivery to the processing area. Each removal lift is expected to be 10 to 15 feet high.
- At the end of each work week, the previously removed and stockpiled cover soil will be used to cover any bare spots in the excavated area with a minimum six inches of soil.
- A minimum grade of approximately 2-3 percent will be maintained in the excavated area, to provide positive surface water drainage.
- A new area of excavation will be cleared and excavated the following week, and the process continued until a complete horizontal slice across the reclamation area has been completed. A new horizontal slice will then be initiated.
- A slope gradient of 3:1 (horizontal:vertical) will be maintained at the interior limits of the reclamation area, and a minimum of 12 inches of interim cover soil will be applied to the slope of the excavated area.
- If the entire designated reclamation area is excavated to native ground, then a liner system meeting DOH requirements for C&D landfills will be installed and new C&D residual waste will be placed in the landfill.

Excavated material from the landfill reclamation area will be delivered to the mixed C&D sort area for processing. If necessary to remove excess soil, excavated material may be screened at the active workface, or it may be processed through a preliminary screen to remove excess soil before loading it to the vibrating screen and sort line. From that point the reclaimed material will be processed along with other mixed waste.

### 3.7.5 Products and Residual Wastes

Products expected to be recovered and produced from reclaimed landfill material include primarily:

- Wood and other feedstock materials;
- Rock, concrete, and asphalt paving aggregates;
- Ferrous and non-ferrous metals; and
- Soil

Non-recyclable waste materials will be disposed in the Phase II area or reburied in the Phase I area of the C&D landfill.

### 3.7.6 Security and Monitoring

Access to the landfill is controlled as described in Section 5.2. PVT employs a security guard during nights and weekends to prevent vandalism and theft.

Reclamation operations will be monitored and controlled to minimize dust emissions and fire potential. A water truck or portable spray/misting system will be used as needed to control dust. Any appearance of smoke or odor of burning will be immediately investigated as potential evidence of a subsurface fire in accordance with the site's fire plan. Application of cover soil to the reclamation area on a weekly basis will minimize the potential for fire.

## 3.8 Solidification of Liquid Wastes

### 3.8.1 Location

The liquid waste solidification area consists of several areas excavated slightly below surrounding grades and lined using a combination of compacted soil and geomembrane liner material. From bottom to top, these areas are lined as follows:

- Graded, moisture conditioned and compacted natural clay subgrade;
- 40-mil HDPE geomembrane liner;
- One-foot thick compacted clay liner using on-site clay materials

- One-foot thick soil cement wearing layer

The soil cement wearing layer is renewed periodically to maintain a 12-inch thickness and durable surface.

### 3.8.2 Process Description

Liquid wastes may be solidified using soils contaminated with acceptable levels of petroleum hydrocarbons, soil from construction and demolition operations and AES ash. Soil or ash is placed in the solidification cells as received. When a liquid waste is accepted for solidification, an excavator is used to create a shallow basin in the center of the stockpile. Liquid is discharged to the basin and allowed to infiltrate into the soil or ash. After free liquid has been absorbed, the excavator works and mixes the pile to distribute the moisture as evenly as possible. The soil or ash is allowed to dry, with additional mixing as needed, until it is either removed from the solidification cell for disposal or use as landfill interim cover, or additional liquids are added and solidified by mixing with the soil or ash.

### 3.8.3 Products and Residual Wastes

Solidified liquids soil mixtures are disposed in the landfill or, if soil is used, maybe used as interim cover soil in the PVT C&D landfill. There are no residual wastes from the process.

## 3.9 Miscellaneous Recyclables

Although most material received at PVT ISWMF are in the form of mixed C&D material, occasional loads of source-separated recyclable materials are received. Examples of such materials may include:

- Ferrous and non-ferrous metals
- Concrete, rock and asphalt rubble
- Wood, wood pallets, and wood shipping containers
- Tires
- Mattresses
- Carpet
- Other materials with organic content suitable for feedstock

These materials are handled on a case by case basis, and may be introduced into the major reclamation processes to remove undesirable materials, reduce or classify the material by particle size, or otherwise prepare them for delivery to markets or end users.

# 4. LANDFILL OPERATIONS

## 4.1 Waste Characteristics

Landfill operations of PVT ISWMF may manage by disposal any of the acceptable C&D waste materials described in Section 2.1 above, and does not dispose excluded wastes identified in Sections 2.2 and 2.3.

## 4.2 Landfill Siting Restrictions

As required by permit, the facility is not located in areas susceptible to flooding, in wetlands, close to potable water supplies, near fault areas, or in any other unstable location. Each of these restrictions is addressed below.

### 4.2.1 Floodplains

The Federal Emergency Management Agency publishes a Flood Insurance Rate Map that classifies areas of the State according to their proximity to floodplains. The applicable map for Oahu classifies the PVT ISWMF site as "Zone D", an area in which flood hazards are not determined. The FEMA map identifies the limit of the 100-year floodplain associated with the Ulehawa Stream to be within the defined stream banks. No landfill development will occur within the Ulehawa Stream.

### 4.2.2 Wetlands

No wetlands occur on the site, and site development will not disturb the Ulehawa Stream, which is an intermittent drainage path for runoff from upland areas.

### 4.2.3 Potable Water Supplies

The currently developed landfill west of Lualualei Naval road is located below the DOH underground injection control line. Groundwater below the site is tidal-influenced brackish water. There are no potable water supply wells in the landfill vicinity.

### 4.2.4 Fault Areas

Seismic hazards related to ground shaking could potentially occur at the site. The site is not located within 200 feet of a fault so the risk of fault rapture is low per HAR §11-58.1-13(d) (2013, p. .58.1-33).

The PVT ISWMF site is located within a "seismic impact zone", defined by Hawaii Administrative Rules (HAR) Section 11-58.1-13(e), as an area with a ten percent or greater probability of experiencing a horizontal acceleration, due to seismic shaking, of more than 0.10 g in a 250 year period. The United States Geological Survey (USGS) has classified the island of Oahu in UBC Seismic Zone 2A, defined as having a ten percent probability of exceeding a peak ground acceleration of 0.15 g in 50 years. (USGS, 2004a) USGS earthquake hazard maps estimate the peak horizontal ground acceleration in western Oahu to be 0.25 g with a 2% probability of occurrence in 50 years. A probability of exceedance of 2% in 50 years is approximately equivalent to a probability of 10% in 250 years (USGS, 2004b), and represents an event expected to occur one time in approximately 2,400 years. (USGS, 1996).

HAR 1.58.1-13(e) prohibits municipal solid waste landfills to be constructed or expanded in a seismic impact zone unless the landfill operator or owner demonstrates that the containment structures of the landfill are designed to withstand the maximum horizontal acceleration due to an earthquake. While the PVT ISWMF is not a municipal solid waste landfill, A-Mehr, Inc. has prepared stability analysis to demonstrate that PVT Landfill meets the State requirements of HAR 11-58.1-13(e).

### 4.2.5 Unstable Areas

The PVT site is not on or near unstable areas as defined by HAR 58.1-03 (poor foundation conditions, areas susceptible to mass movement or Karst terrains).

## 4.3 Landfill Design

### 4.3.1 Phased Development Plan

Figure 5 shows the sequence of developing new lined cells in the Phase II landfill area. To date all cells in Phase II have been constructed. No additional cells will be constructed. When the Phase I landfill reclamation area has been excavated, disposal operations may move into it.

### 4.3.2 Liner and Leachate Management Systems

#### *4.3.2.1 Phase I C&D Landfill Liner*

The Phase I C&D landfill area is constructed with a native soil liner meeting the requirements of HAR 11-58.1-19 for construction and demolition solid waste landfills. As required by the regulation, the waste is underlain by a minimum two feet thick layer of soil with a maximum permeability of 1.0 x $10^{-5}$ cm/sec. The planned Phase I landfill reclamation area will be lined to this same standard after its excavation is complete, and before new waste is placed in the area.

#### 4.3.2.2 *Phase II C&D Landfill Liner*

The 55-acre Phase II disposal area was constructed with impermeable liners and a leachate collection and removal system (LCRS). The liner and LCRS consist of the following components, as shown on Figure 4 and listed below in order from bottom to top:

- A prepared subgrade including a minimum of 6 inches of recompacted fine-grained clayey-silty soil with less than 12 percent calcareous material (containing calcium carbonate).
- Geosynthetic clay liner (GCL), consisting of bentonite clay imbedded in a geotextile matrix, with a permeability of approximately 5 x $10^{-9}$ cm/sec.
- 60-mil high density polyethylene (HDPE) geomembrane
- 16-ounce per square yard non-woven geotextile
- A leachate collection drainage layer on the floor, consisting of 12 inches of granular drainage media (gravel), overlain by another layer of 16 ounce per square yard non-woven geotextile. Gravel used for the drainage layer have a maximum particle size of 2 inches or less. Perforated pipes are placed in trenches in the LCRS, conducting leachate to sumps from which liquids will be pumped into a truck-mounted holding tank.
- Two feet of protective cover (AES ash or soil) placed over the geotextile on the floor and side slopes
- Four to six feet of select waste containing no large rigid objects that could penetrate the liner system, to be documented during placement

All liner construction and repair is conducted by experienced geosynthetics installers under the supervision of qualified construction quality assurance (CQA) consultants. No waste was placed in a newly constructed cell until a qualified professional engineer has certified its construction and the Department of Health engineer was notified to inspect the project. Record drawings and CQA documentation are maintained at the ISWMF office.

#### 4.3.2.3 *Soil Storage / Liquid Waste Solidification Area Liner*

Areas used for storage of contaminated soils and solidification of liquid waste are in Phase 2. These areas are lined using a combination of compacted soil and geomembrane liner material. From bottom to top, these areas are lined as follows:

- Graded, moisture conditioned and compacted natural clay subgrade;
- 40-mil HDPE geomembrane liner at operator's option;
- One-foot thick compacted clayey soil using on-site clay materials; and
- One-foot thick soil cement wearing layer.

The soil cement wearing layer is renewed periodically to maintain a 12-inch thickness and durable surface.

### 4.3.3 Surface Water Management System

Stormwater is managed by controlled grading on the surface of the landfill and by maintaining an engineered system of drainage ditches, channels, pipes and basins. Drainage is managed to:

- prevent run-on of surface water to the active disposal face or uncovered refuse;
- minimize erosion in all areas of the site;
- maintain roads and other ancillary facilities in useable condition under all weather conditions; and
- prevent excessive runoff or sedimentation impacts to neighboring properties.

The landfill top deck and other areas in the vicinity of active disposal areas are graded at a slope of 2% to 5% away from the active area. Diversions are constructed upgradient of the active area if needed to prevent run-on from contacting the leachate, and divert drainage around any exposed waste. Similarly, diversions are constructed downgradient of exposed waste to prevent the runoff of any precipitation that has contacted waste. Such water is retained within the waste, for collection and management as leachate.

The site's stormwater management system is designed and constructed to manage runoff from a 25-year, 24-hour storm. Runoff is collected in a system of surface ditches, channels, pipes and ponds designed by PVT Land Company's engineering consultants. Figure 2 shows the surface water management system design at final development. As designed, the system will carry runoff from the design storm without flooding or excessive erosion from the site, and will retain a significant volume of water to minimize off-site runoff impacts and allow sediment in the runoff to be intercepted and removed before discharge from the site.

Figure 2 shows the location of the six (6) existing basins for collection of stormwater and removal of silt.

## 4.4 Landfill Operations

### 4.4.1 Landfill Operating Equipment

Equipment available for landfill operations at PVT ISWMF include the following

| | |
|---|---|
| Compactor | 2 |
| Bulldozer | 5 |
| Front-end Loader | 3 |
| Dump Truck | 2 |
| Water Truck | 3 |
| Excavator | 3 |

Consistent with permit conditions, PVT always operates the active disposal area with a minimum of one bulldozer of size D-8 or equal, one loader, one water truck, a recycle bin and one spotter. Disposal operations beyond 1,200 tons per day require the addition of one dozer and one spotter.

PVT may also use the primary or secondary shredder associated with the feedstock processing operation to reduce the size of material being disposed in the landfill, in order to improve compaction and reduce the risk of fires.

PVT will replace equipment or add additional equipment in the future as needed to improve operational efficiency, dust control, leachate management or other functions.

### 4.4.2 Landfill Operating Personnel

PVT Land Company, Ltd. will provide trained personnel to manage the incoming waste volume safely and efficiently. The current staff as listed below is sufficient to handle up to 2,000 tons per day of disposed waste:

| | | |
|---|---|---|
| Personnel: | Operations Manager | 1 |
| | Scale Attendant | 2 |
| | Equipment Operator | 2 |
| | Spotter / Laborer | 2 |
| | Total Personnel | 7 |

Qualified personnel conduct annual training sessions for all employees to establish and maintain a high level of employee understanding of safety procedures, waste acceptance policies and emergency action plans. PVT also conducts monthly safety meetings.

### 4.4.3 Waste Placement and Compaction

#### *4.4.3.1 C&D Wastes*

C&D Waste Unloading and Compaction

Although most loads of mixed C&D material are directed to the materials recovery area, some loads of construction and demolition materials are directed to the primary disposal area. On arrival at the working face, spotters direct customers to back into specific locations for unloading. Generally, loads being unloaded by hand are directed to areas apart from those used by self-unloading trucks.

Spotters and equipment operators at the site are trained to observe waste as it is unloaded, and prevent customers from attempting to salvage waste materials. The site permit prohibits salvaging waste at the active disposal areas. Any unacceptable materials identified during unloading are required to be reloaded and removed by the customer. If the customer has already left the site, unacceptable waste is removed from the fill area and relocated to the appropriate temporary storage area before removal from the site. Materials are stored in closed containers, labeled as containing hazardous materials and located on containment pallets to prevent spills or releases to the environment.

After customer vehicles have been unloaded and left the unloading area, site equipment pushes the waste from the unloading deck to the active face for compaction. PVT uses primarily a bulldozer to push and compact waste into a lift ten to fifteen feet in height. A bulldozer or compactor passes over the waste a minimum of three times to break up and compact the waste, and level the lift to facilitate the placement of cover soil.

PVT ISWMF personnel and trucks will deliver residual waste materials from the materials recovery area to the disposal working face throughout the day for incorporation into the waste fill. PVT ISWMF personnel recover recyclable material, principally wood, metal, and concrete, from the working face for recycling. This material is loaded in bins for shipment to the materials recovery area.

Fire Barrier Placement

As noted in Section 2.1.3, AES ash may be used to create fire barriers between Phase I and Phase II, or between adjacent disposal cells in Phase II. Contaminated soil may also be placed as a fire barrier to minimize the potential for subsurface fires to begin or to spread within the landfill.

Fire barriers constructed of AES ash or soil are a minimum of two feet thick and a maximum of five feet thick. The material will be moistened and compacted as needed to control dust emissions until it is covered by waste or interim cover soil. The exposed area of fire barriers constructed of ash must not be greater than 0.5 acre at any time.

Temporary Wet Weather Deck

During wet weather conditions, access to the designated C&D disposal area may be impeded by wet and slippery road surfaces. During such conditions, C&D material may be unloaded and stored temporarily in designated areas shown on Figure 2. Both alternative wet weather tipping areas cover approximately one acre of previously filled area that has been surfaced with approximately 12 inches of crushed asphalt or similar surfacing material to provide a durable all-weather surface.

The area designated as Area 1, located on the landfill above the mechanic's maintenance area, is underlain by approximately 12 inches of low-permeability clay liner constructed above existing C&D waste and interim cover soil. The area is surrounded by an earthen berm to retain stormwater and prevent runoff that has contacted waste from leaving the area.

The material recycling area may also be used as a temporary wet weather tipping and storage area for C&D waste. This area must be maintained with a minimum 12 inches of low-permeability clay soil if used as a wet weather pad. During wet conditions, C&D loads may be directed to one of the wet weather tipping areas for unloading. At the end of the rainy period, after sufficient drying has occurred to permit safe and normal operation on access roads and the surface of the active C&D disposal cell, the waste will be loaded to PVT trucks by front-end loader, and transported to the active area for disposal. Waste will be removed from the area and transferred to the disposal cell within one week following the end of a rain event if it is safe to do so. Weather permitting, the wet weather tipping area will not be in continuous use for more than 14 consecutive days without removing material to the disposal area. The cover layer of crushed asphalt will be renewed from time to time as needed to replace material that may be lost during the process of loading C&D material into trucks for transfer.

No asbestos or contaminated soil will be discharged to the wet weather deck.

### 4.4.3.2 *Asbestos Waste*

Asbestos Waste Acceptance

All asbestos waste customers are required to sign an agreement specifying the terms and conditions of PVT ISWMF's asbestos disposal service. All friable asbestos containing wastes are required to be contained in metal or plastic drums or barrels, or be double wrapped or double bagged in plastic with a minimum thickness of six mils. Each load must be accompanied by a properly executed Asbestos Waste Shipment Record manifest form. Asbestos customers are also required to provide a certificate of insurance naming PVT Land Company as an additional insured for purposes of liability.

Asbestos loads are accepted only on designated days of the week, presently Tuesday and Thursday, before 2:45 p.m. Asbestos contractors are required to notify the ISWMF at least 24 hours before delivery, and have all paperwork including a manifest and PVT authorized clearance number, with each load. No more than 500 tons of asbestos containing waste may be accepted in any week.

Asbestos Waste Unloading and Covering

Friable asbestos loads are inspected at the scalehouse to verify they are contained or double-wrapped or double-bagged as required, then directed to the designated asbestos disposal area. Both friable and non-friable asbestos are disposed in the Asbestos Pit area, which is set apart from the C&D active area and is delineated by signs at approximately 300 ft. intervals around its perimeter in conformance with 40 CFR 61.154.

Asbestos waste is not compacted or otherwise disturbed by equipment after being unloaded, in order to maintain the integrity of the double wrapping. It is covered at the end of each working day when asbestos material is received with a minimum of 6 inches of soil. Cover soil is delivered by truck and spread by a front-end loader or bulldozer. Equipment wheels or tracks are not operated in contact with the asbestos waste, but on a layer of soil placed or pushed over the waste before driving over it.

Landfill personnel are given training in asbestos handling and hazard management. Training topics include manifest requirements, unloading and covering procedures, safety measures, and emergency procedures. These and other topics are covered in annual refresher training sessions required of personnel. Training records are maintained in the site's operating record.

In addition to the general emergency procedures described in Section 4.6 of this Operational Plan, the following contingencies unique to the asbestos area are covered in training for personnel working in asbestos disposal:

Asbestos material spills are to be treated generally as a hazardous material spill, as described in Section 5.7.4, with the following refinements:

- A manager or supervisor with asbestos experience is to direct all cleanup activities.

- After isolating the spill area with cones or flags, the material is inspected to determine the extent of damage to plastic wrapping or other containment, and whether the material appears to be friable or non-friable asbestos.

- If the material is non-friable, site personnel wearing gloves and respirator masks may repackage the material in plastic or in drums, and load it for transport to the asbestos pit.

- If the material is friable and the packaging is substantially damaged, the load must be covered by a plastic tarp and secured, and a licensed asbestos contractor called in to repackage the spilled material and deliver to the asbestos pit for disposal. PVT personnel are not to participate in handling friable asbestos waste until it has been properly repackaged and placed in the disposal area.

- A full report of the incident, including a description of the cleanup activity, will be placed in the daily operating log.

Mismanaged asbestos deliveries are incidents where undocumented loads of asbestos might be accepted for disposal, or loads containing asbestos waste are mistakenly accepted as C&D waste and are directed to the C&D general disposal area. C&D area spotters and equipment operators are trained to recognize such loads and prevent their disposal outside the asbestos area. Appropriate responses to mismanaged asbestos loads include the following:

- If a load shows up at the asbestos pit without proper asbestos paperwork (a manifest approved by the scale attendant), the spotter is to deny it access to the dumping area, and direct the driver to return to the scalehouse.

- If spotters or equipment operators at the C&D disposal area identify an asbestos containing load before it is dumped, they are to check the driver's paperwork, and if it is in order and the day is one on which asbestos is being accepted, they will direct the load to the asbestos area after informing the asbestos spotter it is being sent. If the asbestos area is not in operation, a site supervisor will determine whether to reject the load entirely or open the asbestos area as a special occurrence. If the load does not have appropriate paperwork, the driver will be directed back to the scalehouse.

- If asbestos waste is identified during or after the time a load is dumped, it will be treated as an asbestos material spill. The area will be cordoned off by cones or flags and the regular C&D operation will be relocated away from the area.

#### *4.4.3.3 Contaminated Soil*

Contaminated Soil Acceptance

Generators must submit a Soil Profile Sheet describing the source of the material and containing analytical test results for specified contaminants. Unless exempted by PVT based on generator knowledge, soils will be tested for the following:

- TCLP metals including TCLP cadmium, TCLP chromium, and TCLP lead;
- Ignitability;
- Total metals including total cadmium and total lead;
- Total petroleum hydrocarbons (TPH) as gasoline (C6-C12), diesel (C12-C24) and oil (C24-C30);
- Benzene, toluene, ethylbenzene, and xylenes;
- Polynuclear aromatic hydrocarbons (not applicable to material solely contaminated with gasoline);
- PCBs (not applicable to material solely contaminated with gasoline or diesel fuel); and
- Halogenated volatile organic compounds (not applicable to material solely contaminated with gasoline or diesel fuel).

Additional testing may be requested on a case-by-case basis. Soils containing TSCA-regulated polychlorinated biphenyls (PCBs) are not accepted. Soils may not be hazardous waste.

Soils proposed for disposal at PVT must be tested according to test procedures and methods set forth in the disposal agreement. PVT reserves the right to reject any load it has cause to believe contains unacceptable contaminants or levels of contaminants in excess of approved concentrations. Customers are required to provide certificates of insurance naming PVT Land Company as an additional insured for liability protection. Each contaminated soil shipment may be accompanied by a manifest form.

## Contaminated Soil Handling

Depending on the type and amount of contaminants as determined by the soil profile and test results, PVT determines the disposition of each soil material as follows:

- Soils classified as regulated hazardous waste or TSCA regulated waste are not accepted;
- Soils that may be used on-site for interim landfill cover, for intermediate landfill cover, or for solidification of liquid wastes; and
- Soils that must be disposed in the landfill.

### Soils Used On-Site for Interim Landfill Cover, for Intermediate Landfill Cover, or for Solidification of Liquid Wastes

Soils meeting the criteria listed in Table 1 will be placed in the soils storage area, where they will be held for subsequent use either as interim cover in the C&D landfill, as intermediate cover in the C&D landfill, or as the solidification media in the liquid waste solidification process. Additionally, PVT may opt to use the soils for fill material in the landfill.

Table 1: Acceptance Criteria for Soils Used On-Site

| | |
|---|---|
| TPH gasoline | 2,000 mg/kg |
| TPH diesel (C12–C24) | 5,000 mg/kg |
| TPH oil (C24–C30) | 5,000 mg/kg |
| Bioaccessible arsenic | 95 mg/kg |
| Toxicity Equivalent (TEQ) dioxins | 1,800 mg/kg |
| Technical chlordane | 65 mg/kg |
| All other chemicals | State of Hawaii Environmental Action Levels (EALs) |

PVT operates two or more soil storage stockpiles at a time. PVT uses a bulldozer to push soil unloaded by customer vehicles into one of the stockpiles, which are located in a designated area. Soil is held in the stockpiles until used for interim cover, for intermediate cover, or in the liquid waste solidification process. Soils used in the liquid waste solidification process may be used for interim cover or intermediate cover.

Soils meeting the Hawaii residential EALs may be used as final cover material. (These soils are classified as uncontaminated).

Soils Disposed in the Landfill

Soils with concentrations in excess of those listed in Table 1 are placed in the C&D landfill and covered with appropriate cover soil the same day.

These materials must be disposed under the following special procedures:

- All truck loads should be covered.
- Wastes are discharged in a designated location at the active working face.
- If the soil is dry, a water truck must be on hand to wet it down as it is dumped, to prevent blowing dust. At the end of each working day, the water truck will spray down the top layer of soil.
- Special contaminated soil may not be dumped or handled under conditions of high winds, with speeds in excess of 30 mph as measured by the on-site weather station. Disposal operations will also be stopped immediately if any significant dust emissions occur due to high wind. Any incidents of operations stopped due to high wind will be recorded in the daily operating log, together with information on the wind speed and direction at the time.
- At the end of the working day the soil will be covered by C&D waste and/or cover soil as required for the general C&D waste fill area.
- PVT personnel will measure and record the coordinates of special contaminated soil using the site's GPS instrument. The GPS coordinates must be entered on the permanent records associated with the waste shipment.

### 4.4.4 Interim Cover Plan

#### *4.4.4.1 Materials*

Interim cover materials may consist of clean soil excavated from the PVT soil borrow and drainage control area located east of Lualualei Naval Road or from future landfill cell areas in the Phase II area. Additional cover materials are received from contractors and other customers delivering segregated loads of soil, rock, and concrete or asphalt rubble. The following categories of contaminated soils may also be used as daily or interim cover:

- Contaminated soils meeting the concentrations listed in Table 1; and
- Solidified liquid waste soils meeting the concentrations listed in Table 1.

Incoming inert material suitable for interim cover is segregated and stockpiled by type in order to facilitate selection and use as cover, road base or other needs of the site. At PVT's option, mixed inert loads may be screened or otherwise processed to produce cover with desired properties.

Any of the materials listed above may be used as interim cover for C&D wastes. Only clean soil or contaminated soil may be used to cover asbestos contaminated waste contained in the Asbestos Pit.

#### *4.4.4.2 Procedures*

Interim cover material is placed over the C&D waste fill at least once per week, or whenever the surface area of exposed C&D waste fill exceeds one acre, whichever occurs first. Cover material is delivered to the active area by truck or loader, and spread over the waste in a layer a minimum of six (6) inches thick, using the site's bulldozer.

An additional six inches of soil must be placed over inactive areas (outside the maximum 1 acre active area) to achieve a total thickness of 12 inches of soil. At PVT's option, part of the interim cover may be removed and stockpiled for future reuse when an additional lift of waste is placed over a previously inactive area. Areas covered with 12 inches of interim cover will be inspected and maintained at least once a year to ensure the cover is intact and not subject to erosion or standing water.

#### *4.4.4.3 Procedures for Asbestos Wastes*

Only clean soil or contaminated soil may be used to cover asbestos contaminated waste contained in the Asbestos Pit. A minimum of six inches of cover soil is placed over asbestos contaminated waste at the end of each working day when asbestos material is received. Care is taken not to damage the double-wrapped plastic film covering on asbestos wastes when placing interim cover.

### 4.4.5 Final Cover

Final cover will be placed above filled areas that have reached approved final grades, in accordance with the site's approved Closure and Post-Closure Plan.

Final cover for PVT Landfill has been designed and will be constructed to meet the State (HAR 58.1-19) and Federal (40 CFR 258.60(a)) prescriptive permeability requirements for bottom liner systems for C&D landfills. The final cover design contains the following prescriptive components:

a) an infiltration layer consisting of a minimum of two feet of earthen material and having a maximum permeability of 1 x $10^{-5}$ cm per sec.; and

b) an erosion layer above the infiltration layer, containing a minimum of six inches of soil capable of sustaining native plant growth

PVT Landfill will be using this prescriptive cover for Phase I and Phase II areas. The final cover will be constructed using certified quality assurance procedures. Final grades will be established and maintained to support effective surface water management, erosion control and revegetation.

### 4.4.6 Leachate Management Procedures

The volume of leachate to be generated at PVT ISWMF is expected to be extremely low due to the dry climate and inert nature of the waste. In addition, any leachate generated is anticipated to contain relatively low levels of contaminants, due to the small volume of organic material in the waste stream. As a result, PVT ISWMF is an ideal site for a leachate management strategy based on reintroduction to the landfill as provided in 40 CFR 258.28, which allows leachate to be returned to the same landfill unit from which it is generated.

Leachate generated within the disposal cells of Phase II is collected in the gravel leachate collection system and flows by gravity to a leachate collection sump. The sump is designed to contain leachate to a depth of four (4) feet below the adjacent cell floor. By permit, the depth of leachate is not allowed to exceed 12 inches (one foot) outside the sump. Therefore, the compliance level for leachate collected in the sump is five (5) feet. A Non-Compliance Report will be filed at any time when the leachate level measured in the sump exceeds 5 feet.

The following procedures are implemented to ensure compliance with leachate management permit requirements:

- Each leachate sump is inspected weekly and after major rain events (more than one inch in 24 hours). More frequent inspections will be made whenever significant leachate volumes are being generated. The inspection will consist of lowering an electronic sounding device to the bottom of the sump to determine liquid level in the sump.

- If more than 30 inches of liquid is measured in the sump, a portable submersible pump is lowered into the sump (unless a permanently installed pump is present), and as much leachate as possible pumped into a truck-mounted tank. Care should be taken when using an electric submersible pump without float-actuated controls, in order to avoid running the pump empty after the maximum amount of liquid has been withdrawn. (For example, the Goulds 45J03 pump used by PVT requires a minimum of approximately 28 inches of liquid depth when standing vertically in the bottom of the sump.) PVT also has available a low-capacity air-actuated pump that can draw the leachate depth down to approximately 16 inches, without danger of damaging the pump when the minimum level has been reached.

- Leachate is stored in the truck-mounted tank, or transferred to a stationary holding tank if necessary. Storage tanks and connector piping will be situated within the limits of the Phase II landfill, or within secondary containment. The storage tanks will be maintained at all times.
- Leachate is spread over the C&D waste by spraying it at the active working face, to aid in dust control and compaction, in a manner that does not expose landfill customers or personnel to leachate. Leachate must be sprayed, not be dumped in a manner that would be considered bulk disposal.
- Leachate is returned only to areas within Phase II that are equipped with liners and LCRS.
- Leachate will not be returned to the landfill during periods of rain.
- Each occasion of leachate withdrawal and return is documented, including information on the volume of leachate, the sump from which it is withdrawn, and the area of the landfill to which it was returned. Records of leachate withdrawal and return will be summarized in the annual operating report.
- If the leachate collection system is inoperable, steps will be taken to rectify the problem and, if necessary, contingency measures will be implemented to comply with the permit conditions. The DOH will be notified if required by permit conditions

Samples of leachate will be collected and analyzed on an annual basis during scheduled water quality monitoring events, as described in Section 6.3 Leachate Monitoring.

# 5. SITEWIDE OPERATIONAL PROCEDURES

## 5.1 Administrative Procedures

### 5.1.1 Record Keeping

PVT ISWMF will maintain an operating record in a designated area of the ISWMF office, including the categories of records and documents listed below. Unless otherwise specified, the records listed below will be retained for a minimum of five years.

Daily Operating (Scalehouse) Records

Each load of refuse delivered to the site is documented in terms of the customer identity, type of waste, source of waste, and weight. Records of each load are maintained on a daily basis and are accumulated for monthly and annual reports. Scalehouse records, including waste manifest forms, are archived and retained for a minimum of five years.

Daily Log

Any unusual occurrence at the site is documented in a daily log record maintained at the site. Operations personnel are trained to report and document incidents of unacceptable waste being identified in incoming loads, accidents, severe weather conditions, fires or other unusual events.

In addition to noting unusual occurrences in the daily log, PVT personnel are responsible for maintaining two types reports of unusual events with the Department of Health, as described in Section 5,~~5~~ 2 below.

Records Related to Hazardous Waste Exclusion

PVT maintains records of the date, content and names of employees attending annual training events related to the hazardous waste exclusion program. Any reports or other detail related to waste load inspections or incidents of unacceptable waste discovered at the landfill, in addition to information in the daily log, are placed in the Hazardous Waste Exclusion files.

Materials Recycling Data

PVT will maintain records of recyclable material recovered from C&D material. Information recorded will include the weights and destinations of outbound loads of metal, wood or other materials shipped to off-site markets, and the weights of inbound loads of clean soil, concrete or asphalt material diverted directly from the scalehouse to stockpile areas for use as cover material or construction of on-site roads or wet weather tipping pads. Incidental quantities of asphalt or concrete removed from mixed loads for on-site use will not be recorded.

### Litter Control Program Records

Daily information will be maintained on litter control activities, including records of the number of personnel employed for litter control, locations where litter is collected, and the volume of litter picked up from the site and adjacent areas. Litter control program requirements are described in Section 5.~~5~~3.6.

### Odor Control Records

Records will be maintained of any odor complaints received, measures taken to respond to complaints, and of any unusually odorous wastes received for disposal. Records of complaints will include a description of meteorological conditions during the period of concern. Odor control program requirements are described in Section 5.~~5~~3.7.

### Vector Control Records

Records will be maintained of activities associated with control of insects, rodents or birds. Information to be recorded will include service visits by outside pest control contractors, results of inspections, bird control activities by PVT personnel, and any complaints received from the public. Vector control program requirements are described in Section 5.~~5~~3.8.

### Leachate Management Records

Records will be maintained of all leachate withdrawals from sumps, including dates, volumes and disposition of each load pumped. Separate records will be maintained for each sump. Results of any testing of leachate for pollutant constituents will also be maintained. Leachate management program requirements are described in Section 5.6. missing

### Asbestos Records

In addition to daily volume and acceptance data for all asbestos loads, records will be maintained of any mismanaged asbestos deliveries and any asbestos material spills.

Groundwater Monitoring Data

In addition to the Groundwater Monitoring Program, PVT will place in the operating record and maintain all results of groundwater monitoring for the life of the site.

Closure and Post-closure Plans and Data

The operating record includes copies of the current closure plan and post-closure plan, plus records related to any actual closure or partial closure activity. Such records include engineering plans, construction inspection reports and certifications related to closure activities. Additionally, records pertaining to financial assurance for closure and post-closure will be maintained, including cost estimates and documentation of financial assurance mechanisms.

### 5.1.2 Signs

A large sign is posted at the facility entrance to inform all customers of the site's operating hours and waste acceptance policies. The current lettering of the sign reads as follows:

**PVT Land Company Ltd.**
87-2020 Farrington Hwy., Waianae, HI 96792
**(808) 668-4561 ww.pvtland.com**

ACCEPTING: CONSTRUCTION DEBRIS, ASBESTOS, SOIL

UNACCEPTABLE MATERIAL: HOUSEHOLD DEBRIS, TIRES, ALL CAR PARTS, PAPER WASTE, APPLIANCES, BARRELS, DRUMS, PAINTS/SOLVENTS, LIQUIDS, FLAMMABLE, EXPLOSIVE, RADIOACTIVE MATERIALS

**Hours of Operation**
MON – FRIDAY 7:00 AM TO 3:30 PM
SATURDAY 7:00 AM TO 1:00 PM
SUNDAYS & HOLIDAYS – CLOSED
SUBJECT TO CHANGE

In addition to the front gate sign, directional signs are provided at appropriate locations on the site to direct customers to designated areas for disposal or discharge of various waste and recyclable materials, including:

- Construction and demolition waste
- Asbestos waste
- Contaminated soil
- Cover material including dirt, rock, concrete and asphalt concrete rubble
- Recyclable material

Other signs inform customers of exit routes and on-site speed limits. Signage is modified whenever conditions change on site, such as changes in operating hours or the location of disposal areas or access routes.

### 5.1.3 Safety Procedures

PVT Land Company provides training and strict enforcement of a comprehensive program to ensure the safety of customers and employees. Access routes are clearly marked, and an on-site speed limit of 15 miles per hour is enforced. Customers are directed by spotters to specific locations for unloading, with traffic managed to avoid accidents.

Employees are equipped with personal protective equipment including reflective vests and hard hats. Safety devices on equipment include seat belts, roll-over protective cabs, audible reverse warning devices and fire extinguishers. Additional detail is contained in Appendix C, the facility's Employee Safety Plan. Appendix D contains the outline of the training course given to all PVT employees regarding safety and other aspects of ISWMF operation.

### 5.1.4 Non-Compliance and Incident Reports

By permit, PVT must notify the Department of Health of unusual events by filing an Incident Report or Non-Compliance Report, described as follows:

An Incident Report must be submitted to notify DOH of any event which could threaten human health or the environment. Such incidents would include fire, explosion, or a release of regulated material/waste. Incidents must be reported by phone or fax within 8 hours if possible, but no longer than 24 hours after the occurrence. A written report must be filed within seven (7) calendar days to provide information on the event as prescribed in the PVT solid waste management permit (Appendix A), General Condition 9.

A Non-Compliance Report is submitted to notify DOH of any occurrence during which PVT is unable to comply with any condition or limitation specified in the Solid Waste Permit. A verbal report is required by telephone within 24 hours, and a written report must be submitted to DOH within seven (7) calendar days to document the nature of the incident, its cause, the expected period of non-compliance, and steps being taken to resolve and prevent recurrence of the non-compliance.

### 5.1.5 Annual Operating Report

An annual report is due to the Department of Health by July 31 of each year for the operating year ending June 30. The contents of the report must include the information required by Special Conditions B.77 and C.18 of the PVT Solid Waste Management Permit (Appendix A).

## 5.2 Access and Traffic Control

### 5.2.1 Access Control

The only vehicular access to the site is the main gate at Lualualei Naval Road. Unauthorized access is prevented by the fence and drainage ditch along the road, and by the natural topographic barrier of the Ulehawa Stream on the west side of the site. The main gate is locked after hours.

### 5.2.2 Traffic Control

Signs direct customers from the front gate to the scalehouse, and from the scalehouse to designated areas for unloading. Signs also are posted to inform customers of on-site speed limits (15 miles per hour). Spotters are posted at key locations as needed to direct traffic to the C&D disposal area, and to direct customers to specific locations for unloading at the active disposal face.

All access roads used by customers are maintained as all-weather roads by surfacing with rock, asphalt or concrete rubble. Roads are graded and watered as needed to maintain them in a smooth condition with minimum dust generation.

## 5.3 Maintenance and Control

This section sets forth the policies and procedures to be followed by PVT ISWMF employees to maintain the site and control dust, fire, stormwater, erosion, litter, odor, vectors and explosive gas.

### 5.3.1 Access Roads

All access roads used by PVT customers must be maintained as all-weather roads by surfacing with rock, gravel, or concrete/asphalt rubble. They are graded as needed to maintain safe operating conditions, and are watered during dry periods to control dust.

Roadside drainage ditches or culverts are cleaned or otherwise maintained at least annually to prevent road washouts due to inadequate drainage control.

Two-way access roads have a minimum width of thirty (30) feet, and one-way roads are to be at least 15 feet wide. Roads are to be constructed with a maximum grade of 8 percent except for short distances where less steep grades cannot be achieved.

Temporary roads used only by PVT personnel and vehicles may be constructed as other than all-weather roads, provided they are not needed for maintenance of drainage facilities or emergency access.

### 5.3.2 Dust

PVT personnel are responsible for controlling the emission of excessive dust from the facility. The site's water trucks (4,000 gallons and 2,000 gallons capacity) are used during dry weather to spray water on access roads and other areas generating wind-blown dust. The volume of water and frequency of spraying is increased as needed during particularly dry and windy conditions. The water trucks are filled from two standpipes located on the site perimeter near Lualualei Naval Road. One standpipe is filled by a 4-inch pipeline from two 25,000 gallon storage tanks located on Leeward Land property east of Lualualei Naval Road, which are in turn filled by non-potable brackish water from an on-site well. The other standpipe is connected to a portable 10,000-gallon storage tank which is filled by non-potable brackish water from a second on-site well located on PVT property west of Lualualei Naval Road.

Dust will be controlled in the material recovery area primarily by use of water sprays at locations prone to dust generation. One or more portable "Dust Boss" misters will be located strategically to knock down dust before it is emitted from the work area. If necessary, fixed water sprays will be located at key transfer points or other locations. Processing operations that create substantial dust will be suspended in the event of high wind events if the water mist controls are insufficient to prevent excessive dust emissions from the operations.

### 5.3.3 Mud

PVT will implement a program to minimize tracking of mud onto public roads during periods of wet weather, including:

- Maintaining on-site haul roads in good condition with surface paved with asphalt, gravel, and cold-plane asphalt or other rubble;
- Periodic washing of on-site asphalt roads;
- Placement of rumble strips on exit roads;
- Operation of a truck wheel wash near the site exit; and

- Maintenance of a hard-surface wet-weather tipping pad to minimize truck exposure to muddy areas while loads are being dumped at the active disposal area.

### 5.3.4 Fire

PVT ISWMF has developed a detailed Emergency Fire Plan that establishes detailed procedures for preventing surface and subsurface fires at the landfill, and for responding to fire incidents if they occur. Key preventive elements of the Fire Plan are summarized below. Fire response procedures are summarized in Section 5.4.1.

Personnel at the scalehouse and unloading areas are trained and directed to notice any smoldering or burning material in incoming waste, and prevent it from contacting other combustible material or being buried in the disposal area before all combustion is extinguished. Fire extinguishers are provided in all buildings and vehicles at the site for use in extinguishing small fires, and equipment or water is used to put out larger fires in incoming waste loads.

Effective covering of the waste is an essential element of the program for preventing subsurface fires, by minimizing the intrusion of oxygen into the waste mass. In addition, fire barriers consisting of 3 feet or more of soil or ash material have been placed at the interface between the Phase I and Phase II areas, and between adjacent cells in the Phase II area. The cover and fire barrier measures help prevent the occurrence of fires, and limit the spread should a subsurface fire occur.

Inspection and monitoring of the landfill are critical for detection of subsurface fires. The site is inspected daily to detect any signs of a subsurface fire, including unusual odors, sinkholes, smoke, stressed vegetation, or fissures in the landfill surface. Gas probes placed within the landfill limits are monitored periodically for temperature and carbon monoxide, the primary precursors of a subsurface fire. If high levels of carbon monoxide are detected, the probes are used as injection points for liquid carbon dioxide as a preventive measure for subsurface fires.

Any incident of fire will be recorded in the site operating record and reported to DOH per § 5.1.4 above.

### 5.3.5 Stormwater

Different stormwater management strategies are employed in the C&D landfill disposal area, the petroleum contaminated soil / liquid waste solidification area, and the material recovery area, as described below.

C&D Disposal Area

Stormwater is managed by controlled grading on the surface of the landfill and by maintaining an engineered system of drainage ditches, channels, pipes and basins. Drainage is managed to:

- prevent run-on of surface water to the active disposal face or uncovered refuse;
- minimize erosion in all areas of the site;
- maintain roads and other ancillary facilities in useable condition under all weather conditions; and
- prevent excessive runoff or sedimentation impacts to neighboring properties.

The landfill top deck in the vicinity of active disposal areas is graded at a slope of 2% to 5% away from the active area. Diversions should be constructed upgradient of the active area to prevent run-on from contacting the waste, and divert drainage around any exposed waste. Similarly, diversions should be constructed downgradient of exposed waste to prevent the runoff of any precipitation that has contacted waste. Such water must be retained within the waste, for collection and management as leachate.

As described in Section 4.3, the site's stormwater management system is designed and constructed to manage runoff from a 25-year, 24-hour storm.

The stormwater control system should be inspected and maintained as needed after each significant storm event. Inspections should focus on locating and repairing any areas of excessive erosion, ensuring that skimmers installed in sedimentation basins are working properly, and that no pipe inlets are plugged or blocked with sediment or debris. Sediment should be removed from ditches and basins at least once each year.

PCS / Liquid Waste Solidification Area

The area used for storage of petroleum contaminated soils and liquid waste is located in a lined area as described in Section 3.8. Berms are placed around the perimeter of the area to retain stormwater and prevent its discharge to the surrounding areas of the site. All rainwater falling on the solidification cells is evaporated or incorporated into the solidified waste.

Material Recovery Area

To the extent practical, the material recovery operation will minimize contact between rainfall and runoff with unprocessed C&D material and feedstock in the material recovery area. Receipt and processing of C&D material will be suspended during periods of significant rain, and stockpiles of unprocessed material will be minimized. Whenever possible, tarps will be used to cover processed feedstock, to avoid increasing its moisture content and net fuel value as well as to prevent leaching into runoff.

The material recycling and recovery area is located above fine-grained native coral soils that minimize potential for percolation of surface water, and approximately 50 percent of the area is paved with concrete or asphalt. The area is graded to drain toward sedimentation Basin F.

Erosion

Erosion is controlled primarily by the stormwater management system, which incorporates diversion berms, sandbag checkdams and similar measures to control and reduce the velocity of runoff. Side slopes will be inspected periodically, and eroded areas repaired. Silt fences may be installed on bare slopes subject to erosion. Areas of the site, including slope areas that are near final grades, that are not scheduled to receive additional waste fill for a year or more may be covered with mulch or hydroseeded with grass to provide additional erosion control.

Selected slope areas along Lualualei Naval Road and the Ulehawa Stream are protected from erosion by installation of netting with embedded grass seed to promote establishment of grass cover. This erosion control method is also applied to the interior slopes of sedimentation basins.

### 5.3.6 Litter

C&D waste does not typically contain a large amount of paper and plastic materials subject to becoming wind-blown litter. Some litter material is present, however, and PVT therefore implements a program to maintain the site in a clean condition and prevent litter from leaving the property.

Site operational personnel are assigned on a daily basis to pick up litter, including loose paper, plastic, cardboard or other potentially wind-blown items, from the C&D disposal area. Litter anywhere on the site shall be picked up as noticed. A complete litter survey and cleanup of the site will be made at the end of each week.

PVT will also install and maintain temporary plastic litter fence along the downwind (under prevailing winds) perimeter of the landfill top deck to prevent litter from leaving the area. The fencing material will be a minimum 36 inches high, and will be relocated as necessary. Litter trapped by the fence will be collected on a weekly basis for disposal prior to placement of interim cover.

A daily record will be maintained to document litter control activities. Information to be recorded will include the number of personnel and equipment involved in litter control, total manhours, and the volume of litter picked up.

### 5.3.7 Odor

Odor is ordinarily not an issue at PVT ISWMF due to the inert nature of waste accepted at the site. Any noticeable odor will be investigated to determine its source, and dealt with accordingly. Potential odor sources may include waste containing decomposing organic matter or vegetative material, or some types of petroleum contaminated soil.
Any unusually odorous loads are identified at the scalehouse, and operations staff prepare for special handling by preparing an area at the active working face where the material can be deposited and immediately covered with non-odorous refuse or soil.

Records will be maintained of odor complaints, investigations and complaint response activities. The daily log should also reflect the disposal of any unusually odorous waste loads. Information on odor incidents should also include data on weather conditions at the time, including wind speed and direction.

### 5.3.8 Vectors

Since the facility accepts primarily inert materials, PVT ISWMF does not attract significant numbers of flies, rodents, birds or other pests. Proper application of cover material will discourage use of the site by vectors. Equipment operators, spotters and other ISWMF personnel are directed to report to supervisors any sighting of rodents or other mammals, or unusual concentrations of insects or birds.

The quarterly comprehensive site inspection includes checks of the active disposal area for the presence of vectors. The inspection checklist is contained in Appendix F. Records will be maintained of vector control activities, including observations of vectors on the site, control activities by on-site personnel, and service calls by pest control contractors.

### 5.3.9 Explosive Gas

The rate and volume of methane gas generated by decomposition of C&D waste is extremely low compared to municipal solid waste landfills. The organic material in the waste is limited primarily to waste wood and clearing and grubbing debris, which decays slowly. To date, the site has not generated measurable quantities of methane.

## 5.4 Emergency Procedures

This section describes actions and procedures to be implemented by PVT Land Co. personnel in the event of unusual or emergency situations that may occur at the site, including fires, severe storms, earthquakes, hazardous material spills or injury accidents.

### 5.4.1 Fire

Procedures detailed in the site's Emergency Fire Plan (Appendix G), as summarized below, will be followed for potential emergencies involving fire, including waste fires on the landfill surface, brush fires in the buffer zone, and structure fires.

Landfill Surface Fire. The following actions will be taken if a fire occurs in a refuse fill area prior to application of interim cover or near the surface.

- Burning refuse will be excavated and separated from the fill area and extinguished using fire extinguishers, water or by covering with on-site soil.
- The local Fire Department will be summoned if site personnel and equipment can not extinguish the fire or if it exceeds a surface area of 5,000 square feet.

PVT ISWMF maintains two water trucks with capacities of 4000 gallons and 2000 gallons, and a bulldozer that are available 24-hours per day for use in fire fighting.

Buffer Zone Fire. The following actions will be taken if a fire occurs in the buffer zone areas surrounding the landfill. Maximum effort will be made to prevent the fire from reaching refuse fill areas by utilizing on-site assets.

- Maintain existing fire breaks between waste fill areas and surrounding vegetation.
- Excavate additional fire breaks between the landfill and the oncoming fire. Excavated soils will be bermed on the fire side of the fire break for additional protection.
- Water down areas between the fire break and the disposal area using the on-site water trucks.
- Call 911 emergency services.

Structure Fire. The following actions will be taken if a fire occurs in a site structure.

- Evacuate building.
- Call 911 emergency services.
- Prevent fire from spreading to surrounding areas by using on-site equipment to construct fire breaks, and by using the water truck to wet down adjacent areas.
- Avoid entering a burning structure for any reason.

Subsurface Fire

Subsurface fires will generally be controlled by excavating the area, removing burning material and extinguishing it by spreading and wetting it. Before excavating the area, liquid carbon dioxide or water will be injected to cool the fire, limit its spread and reduce the oxygen content of surbsurface gases prior to excavation. After the burning material is removed, the excavated area will be filled with moist soil, a tight earth cover will be installed, and the area will be monitored for a period of three months to ensure the fire does not reoccur. Large subsurface fires may be monitored longer, and additional injections of carbon dioxide may be made to further ensure the fire does not reignite.

### 5.4.2 Severe Storms

The following measures will be taken to protect against excessive erosion, flooding and wind damage before and during severe storms.

Prior to a forecast storm, site personnel will inspect all drainage structures on the site and verify they are in working order. Excessive silt in ditches and basins will be removed; and the condition of pipes and discharge structures from basins will be verified. Diversion berms will be constructed around the current disposal area as needed to prevent run-on from upgradient areas from entering the waste fill, and to prevent runoff from the waste fill to downgradient areas of the site. Interim cover will be placed over exposed waste at the end of the working day prior to the forecast beginning of a severe storm.

At the discretion of PVT Land Company management, the site may be closed for business during storm periods. In this event, customers will be informed of the impending closure, and only trucks already in route at the time of announcement will be allowed into the site. After the last truck en route is received and its load discharged, the working face will be closed and covered with interim cover, and graded to discharge runoff to the site surface water drainage system. Temporary diversion berms will be constructed as necessary to prevent run-on to any areas of exposed waste.

Facility personnel will periodically inspect site drainage systems during any prolonged storm involving extensive rain, and correct or repair as needed any conditions with potential to cause damage to on-site or off-site facilities.

### 5.4.3 Earthquake

In the unlikely event of a significant earthquake, defined here as one that produces any sign of damage in on-site structures, including but not limited to overturned furniture, wall cracks, or structural shifts, the following procedures will be implemented:

- Immediately cease or limit landfilling operations.
- Promptly conduct a visual survey of the site to identify any slope failures, fires, or other conditions that could threaten worker or public safety. Notify the Department of Health of any such condition by filing an Incident Report as provided in Section 5.1.5.
- Follow the procedures set forth in Section 5.7.1 if any fires occur.
- Follow the procedures set forth in Section 5.7.5 if any injuries occur.

In the event telephone systems are inoperable, notification of the appropriate agencies/businesses will be accomplished in the most expedient manner available (cellular phones, person to person, overnight mail, etc.). In the event power is lost, ISWMF personnel will notify the appropriate local utility companies.

Notify PVT's landfill design consulting Engineer in the event of any earthquake resulting in ground acceleration on Oahu of 0.25 g or greater. Conduct any visual observations or other investigations requested by the Engineer, who will incorporate them in a stability analysis review of the landfill liner system and waste fill. The Engineer's report will be retained in the landfill operating record for a minimum of five years and will be provided to the Department of Health upon request.

### 5.4.4 Hazardous Material Spills

As a C&D landfill, PVT ISWMF has a low potential for spills of hazardous materials, but incidents are possible in the event vehicle accidents or malfunctions that could cause spills of coolant, fuel or lubricants. Actions to be taken in the event of a spill are described below.

The first step in responding to an oil or substance release incident is to keep the material separated from water to minimize migration and the resulting potential increase in human and environmental exposure. Every effort should be made to prevent spills and emphasize substance containment at the source rather than resort to separation of the material from expanded portions of the environment or downstream waters.

Discovery of a Release

The person discovering a release of material from a container, tank, or operating equipment should initiate the following actions immediately.

- Extinguish any sources of ignition. Until the material is identified as nonflammable and noncombustible, all potential sources of ignition in the area should be removed. Vehicles should be turned off. If the ignition source is stationary, attempt to move spilled material away from the ignition source. Avoid sparks and movement creating static electricity.

- Attempt to stop the release at its source. **Assure that no danger to human health exists first.** Simple procedures (turning valves, plugging leaks, etc.) may be attempted by the discoverer if there is no health or safety hazard and there is a reasonable certainty of the origin of the leak. No site personnel shall come into contact with unknown or hazardous substances illegally brought into the facility.

- Initiate spill notification and reporting procedures. Report the incident immediately to a supervisor. If there is an immediate threat to human life (e.g. a fire in progress or fumes overcoming workers), an immediate alarm should be sounded to evacuate the building, and the fire department should be called. Request the assistance of the fire department's hazardous materials response team if an uncontrollable spill has occurred and/or if the spill has migrated beyond the site boundaries.

Containment of a Release

- Attempt to stop the release at the source. If the source of the release has not been found; if special protective equipment is necessary to approach the release area; or if assistance is required to stop the release, the fire department should be called to halt the discharge at its source. Facility personnel should be available to guide the fire department's efforts.

- Contain the material released into the environment. Following proper safety procedures, the spill should be contained by absorbent materials and dikes using shovels and brooms. Consult applicable material safety data sheets for material compatibility, safety, and environmental precautions.

- Obtain outside contractors to clean up the spill, if necessary.

Spill Cleanup

- Recover or cleanup the material spilled - As much material as possible should be recovered and reused where appropriate. Material that cannot be reused must be declared waste. Liquids absorbed by solid materials shall be shoveled into open top, 55-gallon drums; or if the size of the spill warrants, into a roll-off container(s). When drums are filled after a cleanup, the drum lids shall be secured and the drums shall be appropriately labeled (or re-labeled) identifying the substance(s), the date of the spill/cleanup, and the facility name and location. Combining non-compatible materials can cause potentially dangerous chemical and/or physical reactions or may severely limit disposal options. Compatibility information can be found on material safety data sheets.

- Cleanup of the spill area - Surfaces that are contaminated by the release shall be cleaned by the use of an appropriate substance or water. Cleanup water must be minimized, contained and properly disposed. Occasionally, porous materials (such as wood, soil, or oil-dry) may be contaminated; such materials will require special handling for disposal.

- Decontaminate tools and equipment used in cleanup - Even if dedicated to cleanup efforts, tools and equipment that have been used must be decontaminated before replacing them in the spill control kit.

- Arrange for proper disposal of any waste materials. - The waste material from the cleanup must be characterized, transported and disposed according to State and Federal Regulations.

### 5.4.5 Injury Accidents

Site management personnel are to be notified immediately if an injury accident occurs. First aid kits are maintained in site offices and vehicles for use as needed. If the nature of an injury requires additional treatment, the local emergency response provider is to be notified by dialing 911. The person making the call should inform the operator of the nature and location of the emergency, what first aid measures have been initiated, and the need for any special equipment, i.e. hazardous materials response, confined space rescue, or vehicle extrication.

Persons with major injuries should never be moved without professional assistance. Major injuries would include second or third degree burns; unconsciousness; severe bleeding; obviously broken limbs; and any head, back, or neck injury.

Additional details on procedures for preventing and responding to accidents are contained in Appendix C, the Employee Safety Plan.

Records of all site accidents and first aid treatments will be maintained at the PVT ISWMF office. Accident reports will be filed with insurance companies and state agencies as required.

After the situation has stabilized, site management will arrange for investigation of the cause of the accident. A complete investigation report should be completed within seven days of the incident. The report should include a review of the actions leading up to the incident, factors that contributed to or mitigated the severity of the incident, and provide recommendations to prevent reoccurrence.

## 6. MONITORING PLANS

This section outlines the facilities and procedures used for monitoring groundwater, surface water, leachate and meteorological data at PVT ISWMF.

### 6.1 Groundwater Monitoring Plan

PVT routinely monitors groundwater quality in accordance with the site's Groundwater Monitoring Plan dated October 2015 or as it may be amended in the future. A copy of the Plan is maintained at the site office for review.

### 6.2 Surface Water Monitoring

PVT ISWMF has received approval from the Hawaii Department of Health to discharge stormwater to the Ulehawa Stream under the General Permit of the National Pollutant Discharge Elimination System (NPDES). Under the terms of the Notice of General Permit Coverage, PVT must collect and test a sample of stormwater from each discharge point on an annual basis. The sample must be collected during a representative storm event that (1) accumulates more than 0.1 inch of rainfall and (2) occurs at least 72 hours after the previous measurable (0.1 inch) rainfall event. Ordinarily this should be the first rain event of the winter.

Procedures for monitoring stormwater are detailed in the site's Storm Water Pollution Control Plan dated October 2015 and associated amendments. A copy of this plan is maintained at the site office for review.

### 6.3 Leachate Monitoring

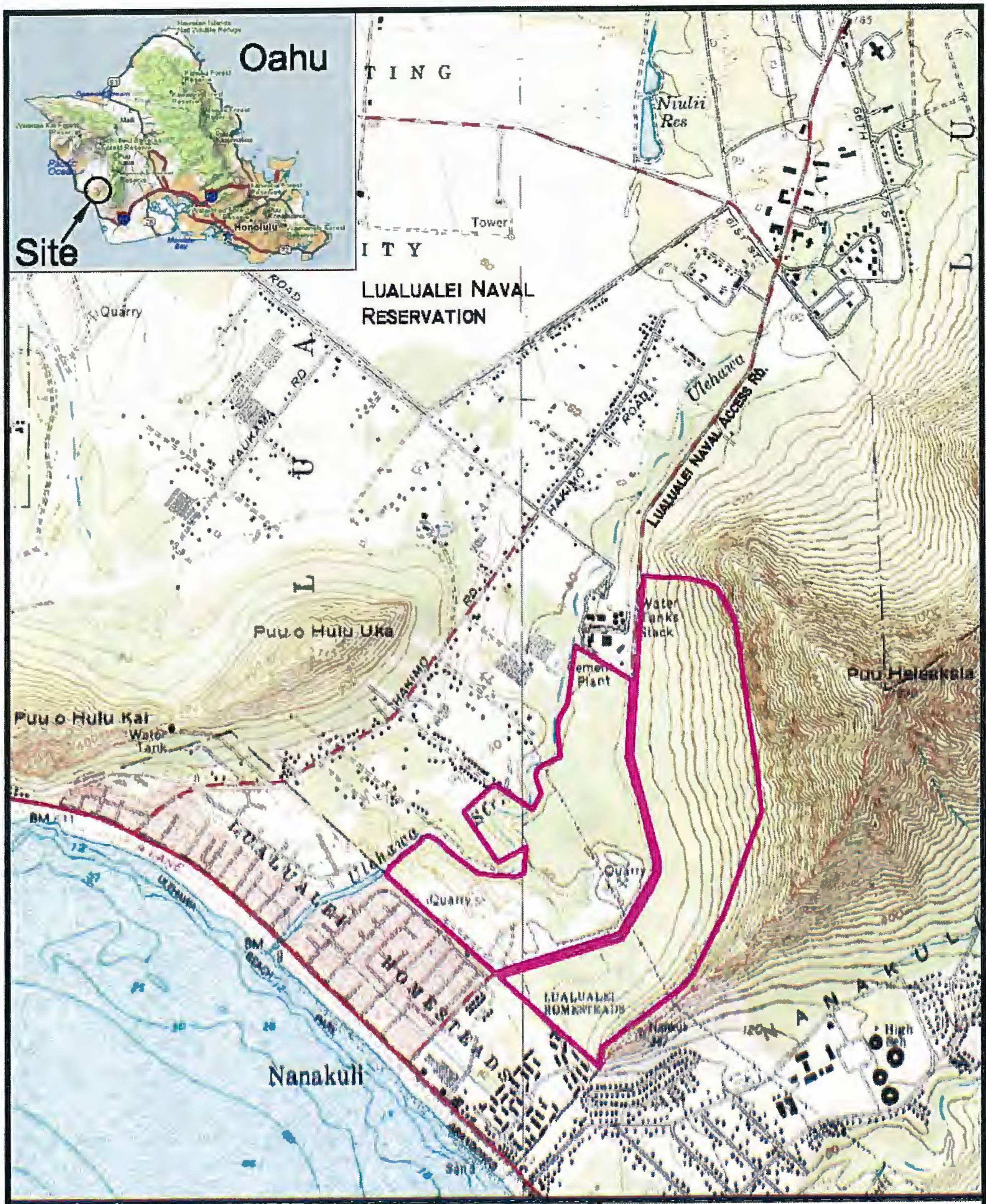
In addition to regular checking of leachate levels in leachate collection sumps in the Phase II disposal area (Leachate Management Plan, Section 4.4.6), leachate samples will be collected and tested on an annual basis concurrently with one of the groundwater monitoring events. Leachate monitoring procedures are described in the Groundwater Monitoring Plan dated October 2015 and as it may be amended.

Leachate monitoring results will be included in the applicable annual or semi-annual monitoring report.

### 6.4 Meterorological Data Collection

In conformance with the requirements of Solid Waste Permit No. LF-0152-09, PVT has established a system of collecting and recording meteorological information useful for annual evapotranspiration modeling using the HELP model. The following data is collected, logged and recorded from a remote continuous monitoring weather station on the site:

Rainfall
Wind speed and Direction
Humidity
Temperature
Solar Radiation



Reference: DeLorme, 2002.

Project: 060024

Approved by: JKH

Drawn by: LSM

Date: August 2006

**Figure 1**
**Site Location Map**

Operation Plan
PVT Integrated Solid Waste Management Facility
Nanakuli, Oahu, Hawaii

element environmental, llc
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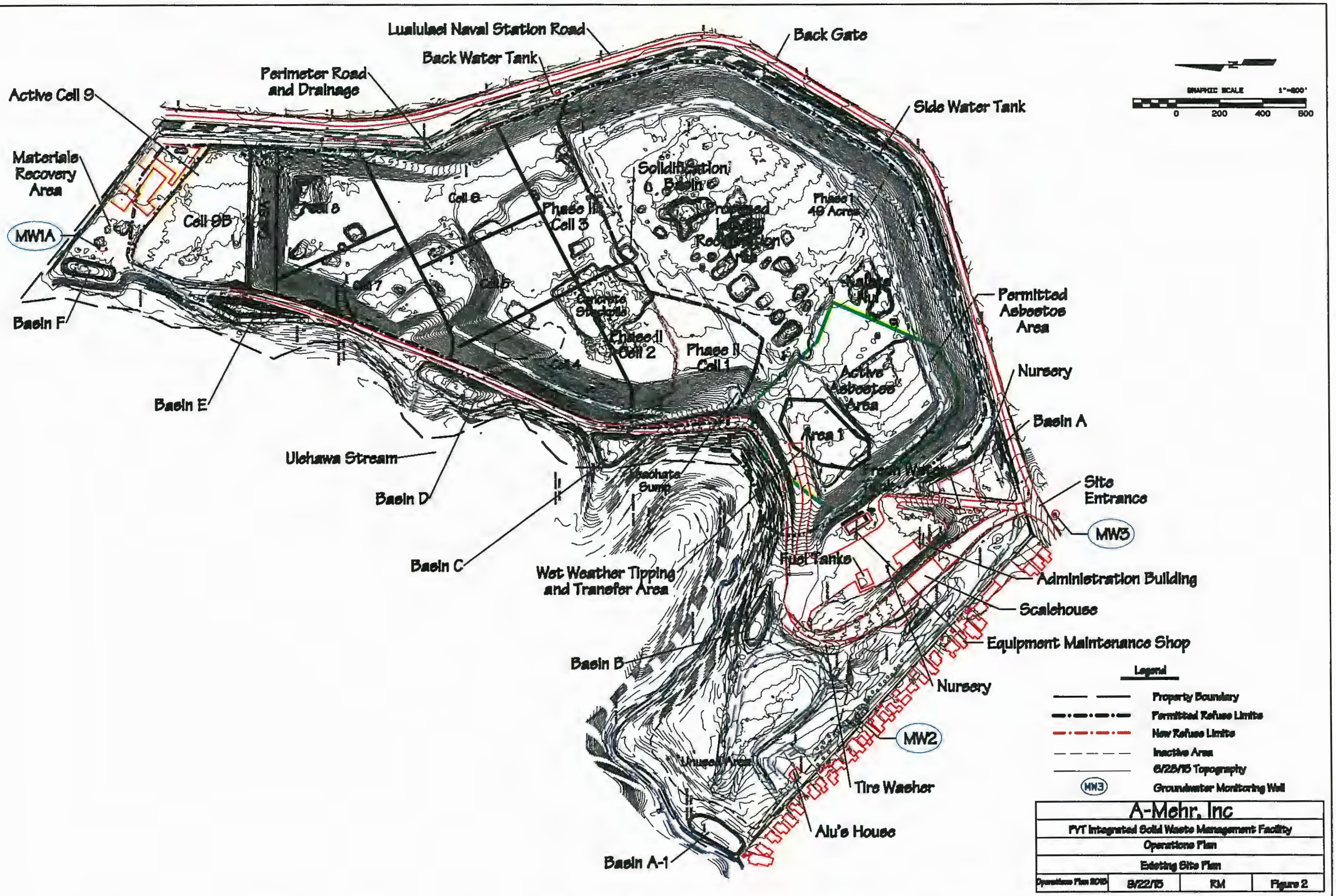


A-Mehr, Inc

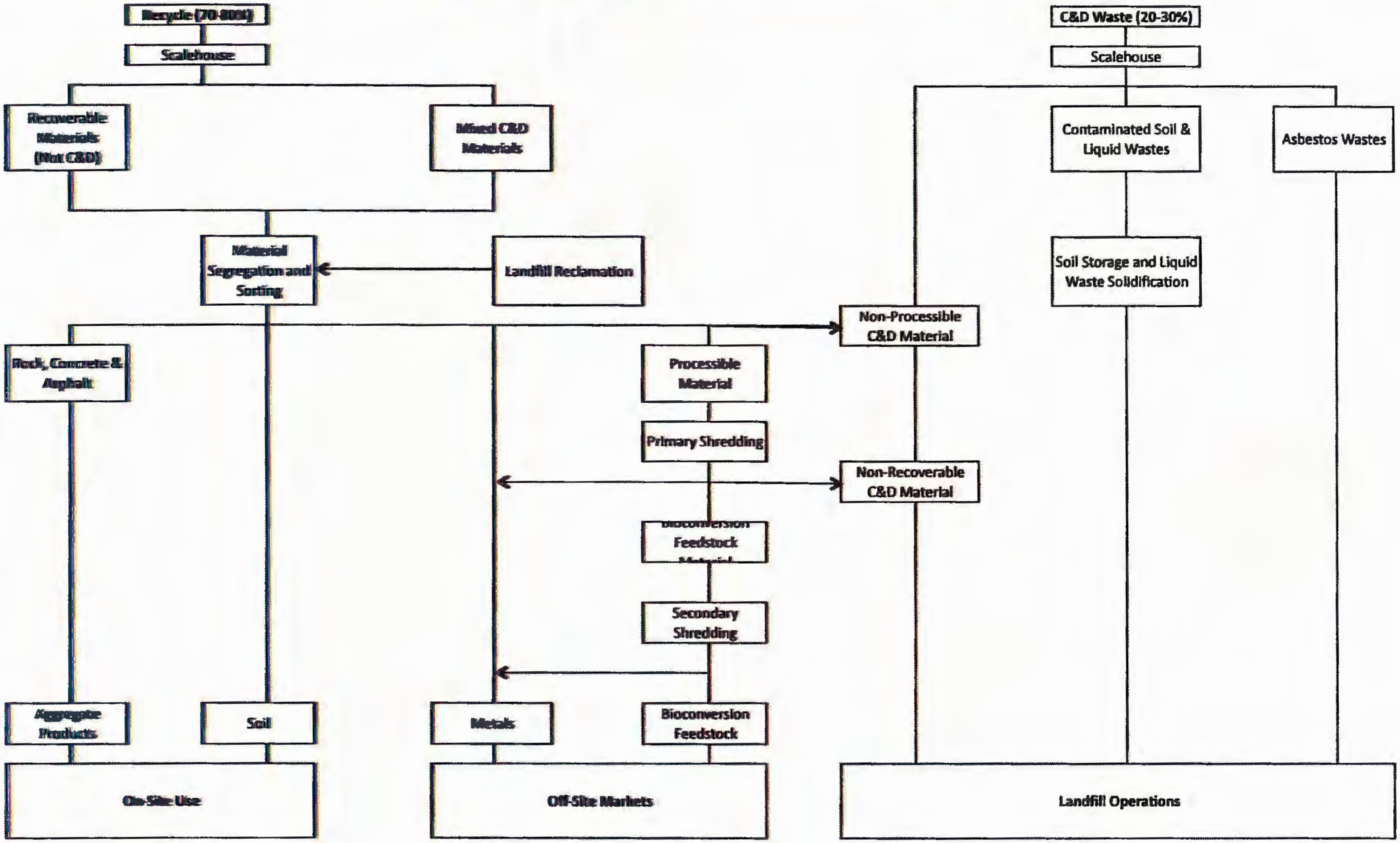
PVT Integrated Solid Waste Management Facility

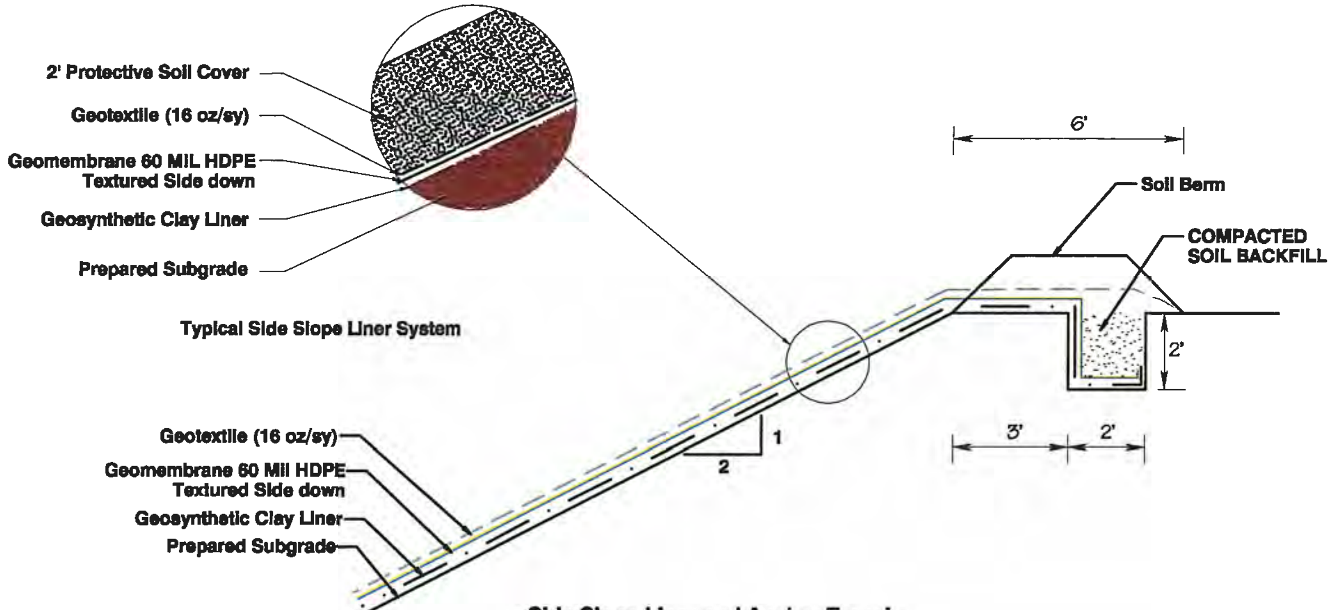
Operations Plan

Existing Site Plan

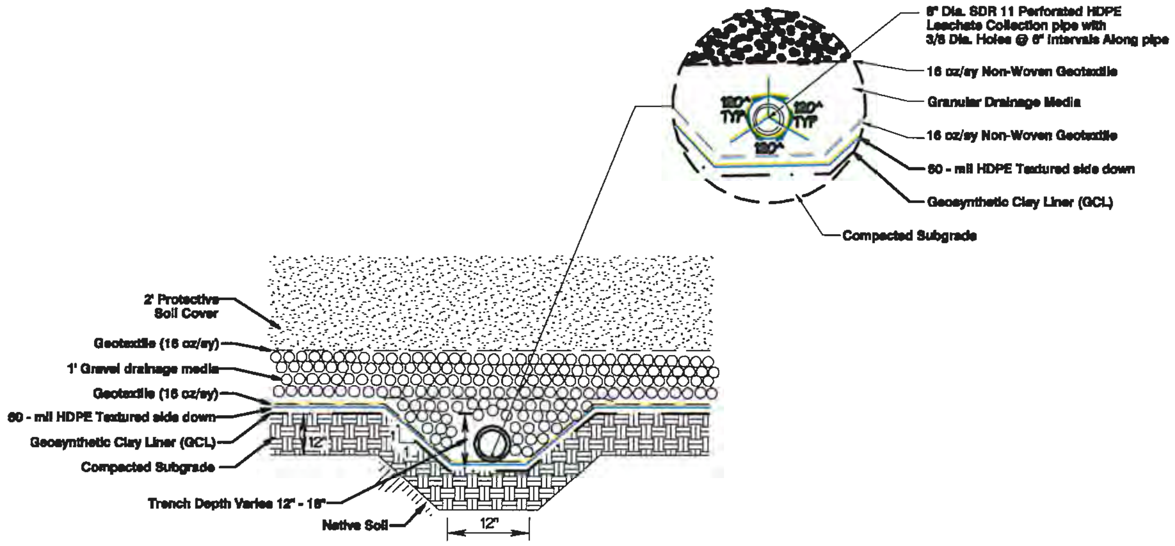
| | | | |
|---|---|---|---|
| Operations Plan 2015 | 8/22/15 | RM | Figure 2 |

# FIGURE 3
# PVT INTEGRATED WASTE MANAGEMENT FACILITY MATERIALS FLOW



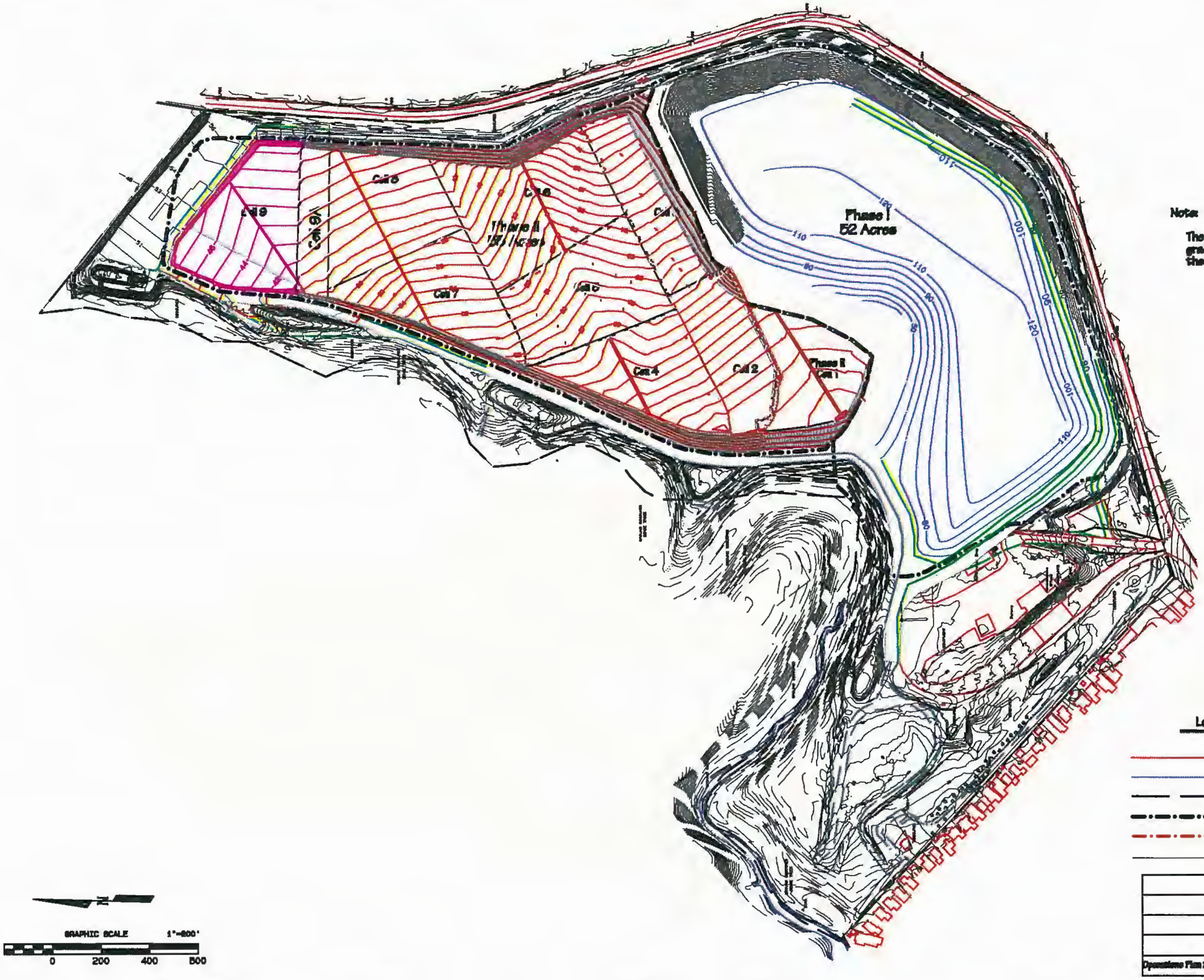


Side Slope Liner and Anchor Trench



Floor Liner and Typical LCRS Trench & Pipe

# Figure 4
# Phase II C&D Landfill Liner System



Note:

The grades shown are the permitted refuse grades. Final cover will be constructed above these grades and may be 2 to 4 feet thick.

**Legend**

| | |
|---|---|
| ━━ | Phase II Liner Grades |
| ━━ | Phase II Interim Final Grades |
| — — | Property Boundary |
| —·—·— | Permitted Refuse Limits |
| —·—·— | New Refuse Limits |
| —— | 6/28/15 Topography Grades |

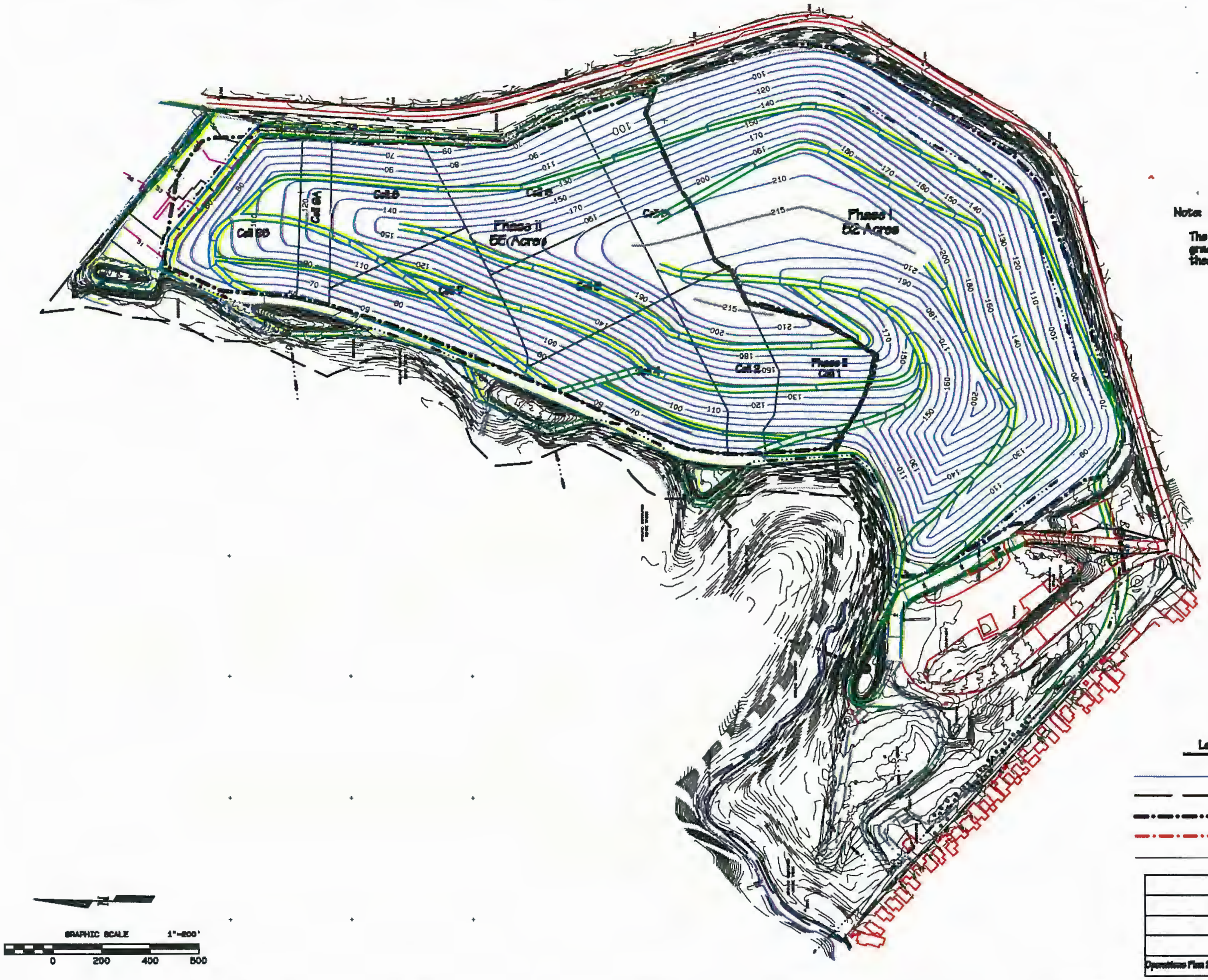
A-Mehr, Inc

PVT Land Company LTD. Landfill

Operations Plan

Phase II Base Grades / Phasing Plan

| | | | |
|---|---|---|---|
| Operations Plan 2015 | 9/22/15 | KM | Figure 5 |



Note:

The grades shown are the permitted refuse grades. Final cover will be constructed above these grades and may be 2 to 4 feet thick.

**Legend**

| | |
|---|---|
| ━ (blue) | Final Grades |
| — — | Property Boundary |
| ▬ • ▬ • ▬ | Permitted Refuse Limits |
| ▬ • ▬ • ▬ (red) | New Refuse Limits |
| ─ | 6/28/15 Topography Grades |

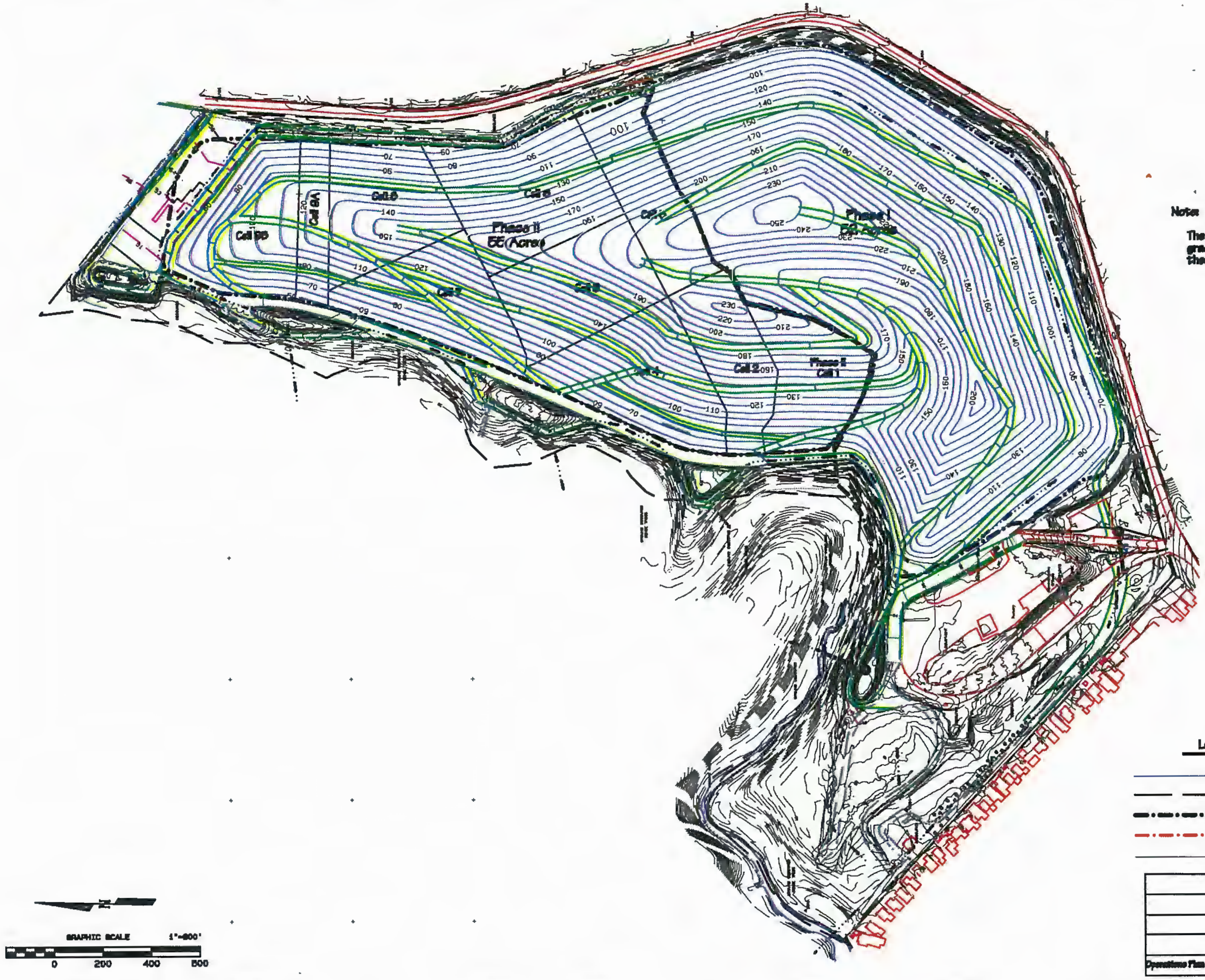
A-Mehr, Inc

PVT Land Company LTD. Landfill

Operations Plan

Interim Refuse Grades 215' amsl

| | | | |
|---|---|---|---|
| Operations Plan 2015 | 9/22/15 | RM | Figure 6 |



Note:

The grades shown are the permitted refuse grades. Final cover will be constructed above these grades and may be 2 to 4 feet thick.

| A-Mehr, Inc | | | |
|---|---|---|---|
| PVT Land Company LTD. Landfill | | | |
| Operations Plan | | | |
| Final Refuse Grades 250' amsl | | | |
| Operations Plan 2015 | 9/22/15 | KM | Figure 7 |

# APPENDIX A
# PERMITS

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File:

May 5, 2011

S0513JKF

**CERTIFIED MAIL NO. 7010 2780 0000 4780 7432**
**RETURN RECEIPT REQUESTED**

Mr. Stephen Joseph
PVT Land Company, Ltd.
87-2020 Farrington Highway
Waianae, Hawaii 96792

Dear Mr. Joseph:

SUBJECT: Solid Waste Management Permit No. LF-0152-09
PVT Integrated Solid Waste Management Facility, Including
Landfill, Recycling and Materials Recovery, Solidification Operations
Waianae, Oahu, Hawaii

This letter is in response to your application for a solid waste management permit to operate a solid waste management facility at the subject site. The facility is comprised of a construction and demolition landfill with asbestos disposal area, recycling and materials recovery operations, and solidification operations. The application has been reviewed and approved, except for our April 6, 2011 comment to your October 13, 2010 Proposed Operations Plan Revision submittal.

The enclosed permit is issued under the provisions of Hawaii Revised Statutes (HRS), Chapter 342H, "Solid Waste Pollution," and Hawaii Administrative Rules (HAR), Title 11, Chapter 58.1, "Solid Waste Management Control." The permit is in its final version, as you have reviewed via email dated on or about May 3, 2011. As you are aware, it incorporates limited revisions to the draft permit published prior to public hearing, by clarifying requirements, and addressing comments received in the September 2, 2010 public hearing and associated public comment period. It also includes revisions to address outstanding information that have not been incorporated into your Operations Plan.

The permittee may appeal to the Director of Health any of the conditions to the subject permit. The appeal must be in writing and submitted to the Director of Health within twenty (20) days after the receipt of this notice.

If you have any questions, please contact Mr. Steven Chang of our Solid and Hazardous Waste Branch at (808) 586-4226.

Sincerely,

STUART YAMADA, P.E., CHIEF
Environmental Management Division

Enclosure: Solid Waste Management Permit No. LF-0152-09

c: Lisa Munger, Goodsill Anderson Quinn & Stifel
Joshua Strickler, Department of Business, Economic Development and Tourism
DOH, Clean Water Branch
DOH, Hazard Evaluation and Emergency Response Office
DOH, Clean Air Branch
Wade Hargrove, Department of the Attorney General

| | | |
|---|---|---|
| **PERMITTEE:** | **PERMIT NUMBER:** | LF-0152-09 |
| **OWNER/OPERATOR:** | **DATE OF ISSUE:** | May 5, 2011 |
| PVT Land Company Ltd | **EXPIRATION DATE:** | May 4, 2016 |
| 87-2020 Farrington Highway | **Page:** | 1 of 34 |
| Waianae, Hawaii 96792 | | |

## SOLID WASTE MANAGEMENT PERMIT

This solid waste management permit modification and renewal is issued under the provisions of Chapters 342H, "Solid Waste Pollution" Hawaii Revised Statutes (HRS), and Title 11, Chapter 58.1, "Solid Waste Management Control" Hawaii Administrative Rules (HAR). The above-named permittee is hereby authorized to construct and to operate the facility shown on the application received September 21, 2009, additional submittals received March 3, March 24, March 31, July 27, July 29, August 5, 2010, October 13, 2010, March 30, 2011, and other documents on file with the Department of Health as follows:

**To Construct and Operate:** The PVT Integrated Solid Waste Management (ISWM) Facility. The facility is comprised of a construction and demolition landfill with asbestos disposal area, recycling and materials recovery operations, and solidification operations.

Landfill

The facility may dispose of construction and demolition waste (C&D), petroleum-contaminated soil, and contaminated soil associated with C&D operations, in the landfill. The landfill may accept up to 2,000 tons per day of C&D and 500 tons per week of asbestos contaminated waste. The facility shall not accept municipal solid waste, commercial and industrial waste (excluding C&D waste from commercial/industrial generators), regulated hazardous waste, and TSCA-regulated PCB contaminated materials.

The C&D landfill is comprised of Phase I and Phase II, Cells 1-9, and the asbestos disposal area. Phase I consists of areas that received waste prior to October 9, 1993. Phase I consists of 49 acres within the historical landfill area. Soil under this site consists of layers of clay, silt, dense coral, silty-sand, and silty-clayey gravel. Phase I was built under HAR 11-58, Solid Waste Management Control, which was in effect from November 27, 1981 to January 12, 1994.

Phase II consists of 104 acres of lined landfill Cells 1-9. The bottom liner consists of a 60-mil HDPE underlain by geosynthetic clay liner of $5x10^{-9}$ cm/s permeability, provided it is constructed as described in the *Design Report, Phase II, Cell 1* by A-Mehr, Inc., dated January 2003. Phase II includes a leachate collection system designed to maintain less than a thirty-centimeter leachate depth over the liner, and a minimum 36-inch protective layer measured from the top surface of the liner to protect the liner system. The protective layer is overlain with a minimum 6-foot select waste layer.

Recycling and Materials Recovery Operations

The facility may accept and recycle C&D and, subject to conditions, source separated tires, mattresses, and furniture. The facility may segregate scrap metal for recycling, process inert waste (non-lead based painted concrete, cured asphalt, and other clean aggregate) into inert fill, and process combustible C&D into feedstock. The feedstock shall be transported to a DOH-permitted recycling facility allowed and willing to accept such feedstock.

The facility may also recover previously disposed of C&D by mining Phase I of the landfill. The mined material shall be sorted for recycling, disposal, or production into secondary shredded feedstock.

Solidification Operations

The facility may accept liquid waste for solidification. Since liquid wastes may not be disposed of in landfills, this operation solidifies liquid waste with soil and AES ash. Liquids may be solidified with ash, provided the ash is beneficially used at the landfill. Depending on the source of liquid waste and soil, as well as the contaminant concentrations, the resultant solidified waste may be beneficially reused at the landfill or disposed at PVT Landfill or Waimanalo Gulch Sanitary Landfill.

**IN ACCORDANCE WITH:** The permit modification/renewal application and supporting submissions received September 21, 2009, March 3, 2010, March 24, 2010, March 31, 2010, July 27, 2010, July 29, 2010, August 5, 2010, and approved subsequent submissions. Should there be any discrepancies in the aforementioned documents, HRS 342H, HAR 11-58.1 and the conditions of this permit shall take precedence.

**LOCATED AT:** 87-2020 Farrington Highway, Waianae, Oahu, Hawaii.
TMK Nos. 8-7-021:026, 8-7-009:025

**SUBJECT TO:** HRS 342H; HAR 11-58.1; and Part I - Standard Conditions and Part II - Special Conditions of this permit.

Acceptance of this permit constitutes an acknowledgement and agreement that the holder will comply with all rules, regulations, and orders of the Department and the conditions precedent to the granting of this permit.

This permit supercedes the Solid Waste Management Permit Numbers LF-0089-04 issued April 10, 2006, and WT-0040-03 issued July 18, 2005 in their entirety.

DIRECTOR OF HEALTH
State of Hawaii

The Solid Waste Management Facility is subject to HRS Chapter 342H, *Solid Waste Pollution,* HRS Chapter 342I, *Special Wastes Recycling,* and HAR Chapter 11-58.1, *Solid Waste Management Control*, and the following conditions:

## PART I - STANDARD CONDITIONS

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions" and as such are binding upon the permittee and enforceable, pursuant to the authority of HRS §342H. The department will review this permit periodically and may initiate enforcement action for any violation of the "Permit Conditions" by the permittee, its agents, employees, servants, representatives, contractors, or subcontractors. If any term or condition of this permit becomes invalid as a result of a challenge to a portion of this permit, the other terms and conditions of this permit shall not be affected and shall remain valid.

2. This permit:

   a. shall not in any manner affect the title of the premises upon which the facility is or will be located;
   b. does not release the permittee from any liability for any loss due to personal injury or property damage caused by, resulting from, or arising out of the design, installation, construction, operation, maintenance, closure, or post-closure of the facility;
   c. does not release the permittee from compliance with other applicable statutes and regulations of the State of Hawaii or with applicable federal or local laws, regulations, or ordinances;
   d. in no way implies or suggests that the State of Hawaii, or its officers, agents, or employees assumes any liability, directly or indirectly, for any losses due to personal injury or property damage caused by, resulting from, or arising out of the design, construction, operation or maintenance of the facility; and
   e. shall not constitute nor be construed to be an approval of the design, construction, operation, maintenance, closure and post-closure of the facility beyond the regulatory requirements mandated by HRS §342H and HAR §11-58.1.

3. Issuance of this permit does not preclude the responsibility of the permittee to obtain any and all necessary approvals and permits from the appropriate federal, state, and local agencies, including zoning clearances, prior to the start of operations. If there are any discrepancies between these permit conditions and other federal, state, or local laws, regulations, ordinances, or requirements, the permittee shall notify the department in writing.

4. Unless the submitted documents and other information secured by the department from the permittee contain confidential information, such as secret processes or methods of manufacture, they shall be made available for inspection by the public

(HRS §342H-14). The permittee shall be responsible for identifying, in writing, the specific information asserted to be confidential. The department shall review the assertion made by the permittee and determine if confidentiality is indeed warranted.

5. This permit is valid only for the specific processes and operations applied for and indicated in the submitted application and additional submissions approved by the department. Any unauthorized deviation that affects the facility's design, operations or procedures, or which could threaten human health and the environment, from the submitted application, approved drawings, operations manual, and additional submissions or conditions of this permit may constitute grounds for modification, suspension, or revocation of this permit, and/or enforcement action by the department. Should there be any discrepancies between the submitted documents and the permit conditions, the permit conditions shall take precedence. A copy of the submitted application and additional submissions shall be maintained at the facility.

6. This permit is non-transferable whether by operation of law or otherwise, either from one location to another, from one solid waste disposal operation to another, or from one person to another without the written approval of the director [HAR §11-58.1-04(e)(2)].

7. This permit shall be kept at or near the construction and operation site for which the permit is issued and shall be available upon request [HAR §11-58.1-04(f)]. A request for a duplicate permit shall be made in writing to the director within ten (10) days after the destruction, loss, or defacement of this permit. A fee of $50 shall be charged and submitted with the request [HAR §11-58.1-04(h)(3)].

8. The permittee shall at all times properly operate and maintain the facility and systems of treatment, process, and control (and related appurtenances), as applicable to the facility, that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by department rules. The facility shall be designed, constructed, and equipped in accordance with best practicable technology so as to operate without causing a violation of applicable rules and regulations.

9. Incident Notification Requirements. The permittee shall notify the department, in writing or facsimile, whenever there are incidents such as fire, explosion, or release of regulated material/waste, which could threaten human health or the environment (i.e., air, soil, or surface and subsurface waters). Initial notification may be by phone (586-4226 during regular hours or such numbers as the department may provide) or fax (586-7509) and reported within eight (8) hours, whenever possible, and no more than twenty-four (24) hours. The notification report shall be completed and submitted by a responsible official within seven (7) calendar days and shall include:

    a. name, address, and telephone number of the owner and operator;

b. name, address, and telephone number of the facility at which the incident occurred;
c. date, time, and type of incident (i.e., fire, explosion, release, etc.);
d. name and quantity of material(s) involved;
e. the extent of injuries, if any;
f. an assessment of actual or potential hazards to human health or the environment, where this is applicable;
g. estimated quantity and disposition of recovered and unrecovered material that resulted from the incident;
h. evaluation of the circumstances that led to the incident;
i. steps being taken to reduce, eliminate, and prevent recurrence, including an implementation schedule; and
j. other information or monitoring of the incident as required by the department

Notification requirements for releases only apply to releases of a quantity equal or exceeding the reportable quantity (RQ) listed in HAR §11-451.

10. Noncompliance Notification Requirements. If, for any reason, the permittee does not comply with, or will be unable to comply with, any condition or limitation specified in the permit, the permittee shall notify the department orally within twenty-four (24) hours followed by a written report within seven (7) calendar days of the verbal notification. The written report shall be completed and submitted by a responsible official and contain the following information:
    a. description and cause of noncompliance;
    b. period of noncompliance, including exact dates and times; and, if not corrected, the anticipated duration that the noncompliance is expected to continue;
    c. steps that will be taken to correct the area of noncompliance;
    d. steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance, including an implementation schedule; and
    e. other information as required by the department.

    The permittee may be subject to enforcement action by the department, penalties, or revocation of this permit.

    The use of an electronic facsimile device (FAX) for notifications is acceptable. Any data transmission or detailed explanations transmitted shall be accompanied by regular mail submittals. Failure to notify in accordance with this requirement may initiate enforcement action.

11. Monitoring and Recordkeeping Requirements. The permittee shall comply with the following monitoring and recordkeeping requirements:

    a. Upon request, the permittee shall furnish all records (e.g., transaction reports, disposal receipts, sampling, and testing results) and plans required by the department. The retention period for all records shall be a minimum of five (5) years unless otherwise specified in Standard Conditions, Item 11.c; however, there shall be an indefinite retention period for all records associated with any unresolved enforcement action as determined by the department.

b. The permittee(s) shall retain at the facility or other location designated by this permit, records of all monitoring information (including all calibration and maintenance records and all original recordings of monitoring instrumentation) required by this permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. The retention period shall be a period_of five (5) years.

c. The permittee(s) shall retain construction reports, information regarding the content within the landfill, and leachate/groundwater monitoring reports for the life of the facility, through closure and post-closure periods.

12. Should the permittee decide to modify the permit or continue operation of the solid waste facility beyond the expiration date of the permit, the permittee shall submit a complete permit modification or renewal application at least one hundred eighty (180) days (one year for municipal solid waste landfills) prior to the modification or the date of permit expiration. Any submission for permit modification does not affect these permit conditions until such modification becomes final in accordance with HAR §11-58.1-04, or as approved by the department.

13. The director may, in accordance with HRS §342H-6, enter and inspect the facility for the purpose of

a. investigating an actual or suspected source of solid waste or other pollution;
b. ascertaining compliance or noncompliance with any rule, regulation, permit condition, or standard promulgated by the department; and
c. conducting tests in connection therewith (including collecting soil, water, air, ash, and any other material or samples).

The permittee, by accepting this permit, specifically agrees to allow authorized department personnel, upon presentation of credentials or other documents as may be required by law, access to the premises. The permittee may conduct testing (including collecting soil, water, air, ash, and any other material or samples) simultaneously.

14. The department may require the permittee to provide such facilities as are necessary for sampling and testing to determine the degree of pollution from the solid waste facility in accordance with HAR 11-58.1-04(c)(6)(B).

15. When requested by the department, the permittee shall within a reasonable time, as specified by the department, furnish any information required by law, which is needed to determine compliance with the permit. If the permittee becomes aware

that relevant facts were not submitted or were incorrect in the permit application or in any report to the department, such facts or information shall be submitted or corrected promptly. Upon the written request of the permittee, the deadline for submission of information may be extended, if the department determines that reasonable justification exists for the extension.

16. If the department determines that the permittee has violated or is violating any provision of HRS §342H, HAR §11-58.1, or these permit conditions, the department may pursue enforcement action in accordance with HRS §342H-7, *Enforcement*; §342H-9, *Penalties*; §342H-10, *Administrative Penalties*; §342H-11, *Injunctive and other relief*; or any other pertinent rules.

17. The department may, on its own motion, modify, suspend, or revoke a permit if, after affording the applicant a hearing in accordance with HRS 91, the department determines that any permit condition, rule, or provision of HRS §342H has been violated or that such is in the public interest [HAR §11-58.1-04(d)].

18. If the governor or the director determines that an imminent peril to the public health and safety is, or will be, caused by the disposal of solid waste or any combination of discharges of other waste that requires immediate action, the governor or the director, without a public hearing, may order the permittee to immediately reduce or stop the disposal, discharge, or process, and may take any and all other actions as may be necessary (HRS §342H-8).

19. The facility shall be designed, built, and equipped with the best practicable technology so as to operate without causing a violation of applicable rules and regulations.

## PART II - SPECIAL CONDITIONS I

### Section A. General Facility Conditions

1. The permittee shall construct and operate the facility in accordance with HRS 342H; HRS 342I; HAR §11-58.1; the application received September 21, 2009, additional information received March 3, 2010, March 24, 2010, March 31, 2010, October 13, 2010, approved subsequent submissions; and the conditions of this permit. Should there be any discrepancies among the aforementioned documents, HRS, HAR and permit conditions shall take precedence.

2. A permanent sign shall be posted at the facility entrance identifying the facility, the hours and days of operation, and the name and address of the operator, a telephone number, and other pertinent information.

3. The permittee may operate the facility during the normal operating hours of 7:00 am to 4:00 pm, Monday through Friday, and 7:30 am to 1:30 pm on Saturdays, or as otherwise submitted to the department. Asbestos waste may be accepted on Tuesdays and Thursdays, until 2:45 pm, or as otherwise submitted to the department. In the event that the facility proposes any waste acceptance and disposal outside normal operating hours, the permittee shall notify the department, in writing, of this event. The notification shall be provided at least twenty-four (24) hours in advance of the event. If the event is unanticipated, the permittee shall provide verbal notice of the event within four (4) hours and written notification within eight (8) hours of commencement of the event. A facsimile submission of the notification is acceptable. The written notification shall specify the dates and times affected, the nature and reason for the extended operations, identification of any considerations associated with the extended operations, and controls/procedures that will be implemented to mitigate any adverse impacts of the extended operations.

4. An all-weather access road shall be maintained into and out of the facility site, through the entrance facility and to and from the working area of the landfill, recycling and materials recovery operations, and solidification area. Access lanes shall be provided and maintained for fire response, vector control, or dust suppression.

5. The permittee is responsible for providing measures to control public access. The permittee shall provide and maintain controlled access to the facility in the form of fences and gates along the site perimeter where natural barriers do not provide a means of controlling access. When natural barriers no longer control access effectively, fences and gates shall be provided to meet the requirements of controlled access. All gates shall be kept locked when an attendant is not on duty.

6. Scavenging at the facility by the general public is prohibited.

a. Use of no greater than one (1) acre of open and uncovered surface area in Phase I for waste disposal and the mining and reclamation of material as described in Special Conditions, Section C, Item 15.

b. Use of no greater than one (1) acre of open and uncovered surface area in Phase II for waste disposal and partially processed feedstock storage activities and an additional one-half (1/2) acre of open and uncovered surface area in Phase II for the recovery of partially processed feedstock as described in Special Conditions, Section C, Items 14 and 15.

7. The facility shall have an Environmental Officer, who shall be knowledgeable of state solid waste laws, regulations, these permit conditions, and the permit application components, including the February 2010 Operations Plan, and approved subsequent submissions.

8. Emergency Procedures.

   a. The permittee shall implement the Emergency Procedures and Emergency Fire Plan, as provided in the February 2010 Operations Plan, and approved subsequent submissions.
   b. The permittee shall submit the post-earthquake Engineer's report, as described in Section 5.4.3 of the February 2010 Operations Plan, to the Department within thirty (30) days of completion of the report.

9. Should unacceptable waste be identified at the facility, the permittee shall separate the waste, manage, transport, and recycle/dispose of it in accordance with the February 2010 Operations Plan, approved subsequent submissions, and applicable laws and rules. Unacceptable waste identified at the landfill shall not be disposed of at the landfill. Unacceptable waste shall be transported from the facility as soon as practicable and prior to becoming a health and safety risk.

10. Suitable methods and procedures shall be used at the facility to reduce and control the generation and release of litter, odors, vector, or other nuisances. The facility shall maintain a neat and orderly appearance and shall be screened and buffered to minimize nuisances to neighboring properties in accordance with HAR.

11. The permittee shall minimize the generation of dust onsite. Dust control measures shall include, but are not limited to, applying water sprays. If measures do not adequately minimize the generation of dust, the permittee shall apply additional dust control measures, such as dust screens, shrouds, covers, or other means, or implement operational changes or restrictions as necessary.

12. The permittee shall maintain a phone number to receive calls from the neighboring community.

13. The permittee shall implement the February 2010 Operations Plan and approved subsequent submissions. If the permittee provides spoken notification of a proposed plan revision within seven (7) days prior to submission and the Department does not respond to the proposed plan revisions within thirty (30) days of plan submission, the request is considered to be approved. The Department may require revisions to the Operations Plan pursuant to law.

14. The permittee may conduct the following activities subject to the following restrictions on the total amount of surface area open and uncovered at any one time, unless otherwise approved by the Department:

**Section B - Construction and Demolition Landfill Operations**

1. The C&D landfill operations shall be in accordance with Figure 2, Site Plan, prepared by A-Mehr, Inc., dated May 27, 2010 (see Exhibit 1). The permitted C&D landfill includes approximately 49 acres for Phase I, 104 acres for Phase II, and 12.8 acres for asbestos disposal.

2. The dimensions of the landfill shall be limited by those designated for landfill use under the Conditional Use Permit (CUP)85/CUP-6, and any subsequent amendments or permits, issued by the City and County of Honolulu, Department of Planning and Permitting. The landfill shall be limited to a height of approximately 135 feet above mean sea level, or as approved by the City and County of Honolulu, Department of Planning and Permitting.

3. No construction of additional disposal cells or modification of the lateral or vertical extent of disposal cells beyond the limits referenced in Special Conditions, Section B, items 1 and 2, shall occur without written approval by the Department. Any modification requests shall be submitted in accordance with Standard Conditions, item 12, at least one hundred eighty (180) days prior to commencement of the proposed construction or modification. The construction and design plans shall be prepared and certified by a professional engineer, with at least five (5) years experience in designing landfills, and registered in the State of Hawaii.

4. C&D disposal shall not occur within a buffer area 750 feet from the makai property line. Provisions for dust, litter, and nuisance controls shall include the installation and maintenance of a dust screen and green belt along the makai boundary.

5. The permittee shall comply with the financial assurance requirements in HAR 11-58.1-18 for closure of the C&D landfill, post-closure care, and corrective action, if required.
    a. The permittee shall maintain a copy of the detailed written estimates and documentation of financial assurance for department review.
    b. The permittee shall provide affirmation of financial assurance on an annual basis.

<u>Construction and Maintenance</u>

6. The permittee shall maintain the integrity of the liner system and leachate collection and control system as designed and constructed, or implement equivalent or better alternative environmental controls, as approved by the department.

7. The permittee shall construct and maintain Cells 6-9 in accordance with the February 2010 Operations Plan and *Design Report, Phase II, Cell 1* by A-Mehr, Inc., dated January 2003, except the base grades and refuse limits shall be in accordance with Figure 3 of the *Closure and Post-Closure Plan* by A-Mehr, Inc.,

dated May 27, 2010. The permittee shall submit *Contract Documents and Construction Quality Assurance Plans* at least thirty (30) days prior to anticipated construction.

8. A leachate collection system and manhole, designed to maintain less than a thirty-centimeter depth of leachate over the liner, shall be installed and maintained in the Phase II area in accordance with the *Design Report, Phase II, Cell 1* by A-Mehr, Inc., dated January 2003 and *Report of Construction Quality Assurance (CQA) for Phase II, Cell 1*, dated September 2004.

9. The permittee shall submit proposed changes affecting the design or structural integrity of the installed liner system or leachate collection system in writing, at least thirty (30) days prior to commencement of the proposed change. At a minimum, the written proposal shall include:.

    a. Identification of affected cells;
    b. Reason for the proposed change;
    c. Engineering design;
    d. Implementation schedule; and
    e. Other pertinent information.

    The department may also require additional information. If the proposed change is to install an alternative liner system or leachate collection and control systems, a modification application shall be submitted in accordance with Standard Conditions, Item 12.

10. Installation of any geosynthetic liner shall be performed by an experienced installer who has installed a minimum of 500,000 square feet of similar type liners or shall be performed under the supervision of the manufacturer. An experienced quality assurance/quality control (QA/QC) landfill inspector with at least five (5) years of experience in landfill construction quality assurance (CQA) responsible to a professional engineer shall observe liner installation and grade elevations. The permittee shall notify the Department, in writing, five (5) days prior to any liner installation work.

11. The permittee is responsible for obtaining the services of a registered land surveyor or an approved alternate method to provide a minimum second order of accuracy on: triangulation, traverse, leveling and baseline measurements of the base grade as shown on the approved drawings. The liner contractor and installer shall certify the base grade in writing. This written certification shall be included in the CQA report described in Special Conditions, Section B, Item 13.

12. The permittee shall retain a professional engineer registered in the State of Hawaii for the supervision of the construction of this project, and upon the completion, the engineer shall submit a CQA report to the Department as to the complete conformity

of the construction to the plans and specifications as approved. The CQA Report is described in Special Conditions, Section B, Item 13.

13. The permittee shall prepare and submit a CQA report(s) to the Department.
    a. The CQA report shall be submitted to the Department prior to placement of select waste in the cell.
    b. A professional engineer, with at least five (5) years experience in designing landfills, and registered in the State of Hawaii shall prepare the CQA report.
    c. At a minimum, the CQA report shall include the same content as the *Report of Construction Quality Assurance for PVT Landfill, Phase II, Cell 5,* prepared by A-Mehr, Inc., dated August 2009.
    d. The CQA report shall include written certification by the professional engineer that the liner system, leachate collection system, and any other associated items were installed in accordance with the approved documents.

14. The permittee shall afford the opportunity for an inspection of each new cell or sector by the Department prior to select waste placement, with the presence of the CQA engineer and on-site facility operator.

15. Upon department request, the permittee shall utilize their GPS system to determine the boundaries and elevations of waste disposal at the site, and to demonstrate compliance with permitted grades and boundaries.

Acceptance Criteria

16. The permittee is authorized to accept C&D wastes, as defined in HAR 11-58.1-03 and HAR 11-58.1-19, petroleum-contaminated soil, and contaminated soil from C&D operations for disposal, in accordance with the February 2010 Operations Plan, approved subsequent submissions, and the conditions of this permit.

17. The permittee shall implement the Unacceptable Waste Exclusion Program, as provided in the February 2010 Operations Plan, and approved subsequent submissions

18. The permittee is authorized to accept asbestos waste for disposal, in accordance with the February 2010 Operations Plan, and approved subsequent submissions.

19. The permittee is authorized to accept coal ash from AES Hawaii, Inc. (AES Hawaii), clean inert fill and other approved materials for beneficial use, in accordance with the February 2010 Operations Plan, approved subsequent submissions, and the conditions of this permit. The coal ash shall only be accepted for beneficial use in accordance with Special Conditions, Section B, Item 29, and shall not be accepted for disposal in the C&D landfill. Clean inert fill includes concrete rubble and asphalt.

20. The permittee shall implement the Contaminated Soil Acceptance Program, as provided in the February 2010 Operations Plan and approved subsequent submissions. A notice of Contaminated Soil Acceptance shall be submitted to the Department prior to receipt of contaminated soil with concentrations that exceed the levels in Special Conditions, Section B, Item 36. The use of facsimile submissions is acceptable. The notice shall include: acceptance date(s), quantity and description of contaminated soil, and any special management and handling procedures. The permittee shall provide a copy of the PVT-approved profile sheet and analytical data upon department request.

Operation of the Landfill

21. **Climatic Information.** Climate information shall be collected on a daily basis and shall include information on daily rainfall, solar radiation, wind speed and direction, humidity, temperature, and other meteorological data, as applicable, for use in annual modeling of evapotranspiration and leachate generation with the HELP Model at the landfill. The permittee shall minimize any weather equipment downtimes. Data shall be provided to the department upon request.

22. **Program for Regular Training.** The permittee shall provide training to landfill operators annually, or more frequently, as needed, to ensure that the operators are familiar with the February 2010 Operations Plan, approved subsequent submissions, and these permit conditions. Training presentations shall be performed in accordance with the Operations Plan and approved subsequent submissions.

23. **Mud and Dust Prevention Program.** The permittee shall provide measures for minimizing the tracking of mud onto public roads, and the generation of dust on site.
    a. The mud tracking prevention measures shall include the installation and maintenance of wet weather pads and access routes constructed of material (such as cold plane material or asphalt/concrete rubble) that will minimize the exposure of vehicles to excessive muddy conditions. The permittee shall maintain the drive-through tire wash on the exit lane of the facility.
    b. A wet weather deck within the limits of the active landfill or on the low permeability clay liner at the recycling/materials recovery area shall be present to allow for safe and temporary disposal of C&D during wet weather or muddy conditions. If neither area is accessible, the permittee during wet weather or muddy conditions may use the wet weather deck outside the limits of the active landfill (identified as Area 1 on Exhibit 1), provided the area is maintained with at least 1-foot of compacted, low permeability clay, the area is surrounded by berms, and the area is operated in accordance with the February 2010 Operations Plan and approved subsequent submissions. The permittee shall orally notify the DOH of the use of Area 1.
    c. Recycled aggregate, asphalt and/or concrete used outside the limits of the waste footprint or used to control or direct stormwater shall be uncontaminated and meet the definition of inert fill in HRS 342H-1.

d. No asbestos waste or contaminated soil slated for disposal shall be placed on the wet weather deck.

e. For dust control, in addition to complying with Special Conditions, Section A, Item 11, the permittee shall follow other methods described in the February 2010 Operations Plan, and approved subsequent submissions.

f. If measures do not adequately minimize the tracking of mud on to public roads or generation of dust from onsite vehicular traffic or other sources, the permittee shall implement additional mud prevention and dust control measures.

24. **Odor Control.** The permittee shall prevent or control odors from the facility. If odor control measures are not adequate, the permittee shall implement additional odor controls measures. The permittee shall maintain records of odor complaints in accordance with the February 2010 Operations Plan, and approved subsequent submissions.

25. **Disease Vector Control.** The permittee shall minimize or control on-site populations of disease vectors, including but not limited to rodents and flies. The permittee shall comply with, and maintain records in accordance with the February 2010 Operations Plan, and approved subsequent submissions. If vector control measures are not adequate, the permittee shall implement additional vector controls measures.

26. **Litter Control.** The permittee shall confine litter to the working face area and minimize litter from leaving the facility. The permittee shall implement the litter control provisions of the February 2010 Operations Plan, and approved subsequent submissions.

27. **Fire Control.** The permittee shall take measures to minimize surface and subsurface fires. Such measures may include fire barriers. A fire barrier shall be maintained between Phases I and II. The barrier shall be of sufficient thickness to minimize the movement of fire conditions from one phase to the other.

28. If utilized, fire barriers shall be installed and maintained to minimize the movement of fire conditions within the landfill.
    a. Vertical barriers or sectoring of the waste cells may be provided to minimize fire movement between cells in the Phase II area.
    b. Fire barriers shall be comprised of soil or approved alternate material.
    c. Fire barriers may be two (2) to five (5) feet thick, in accordance with the February 2010 Operations Plan, and approved subsequent submissions.
    d. The fire barrier shall consist of a soil of appropriate physical properties or alternate material of appropriate physical and chemical properties.

29. **Ash.** Conditioned ash from AES Hawaii, Inc. (AES Hawaii) may be accepted for beneficial use, provided it meets the beneficial use requirements of AES' solid waste management permit. Ash from AES Hawaii shall not be disposed in the landfill.

a. Conditioned ash from AES Hawaii may be accepted and used in accordance with the February 2010 Operations Plan and approved subsequent submissions, for the following beneficial use purposes:
   i. Operations layer;
   ii. Void space filling for fire prevention; and
   iii. Fire barrier in accordance with Section 4.4.3.1 of the February 2010 Operations Plan and approved subsequent submissions.

b. The volume of ash shall not exceed 20% of the volume of waste on an annual basis, when the ash is used as void space filling and fire barriers.

c. The permittee may use the ash as void space fill and/or fire barriers, provided less than 0.5 acres of ash is exposed.

d. The permittee shall maintain annual records, documenting the:
   i. Volume of C&D disposed, and
   ii. Volume and weight of ash used for beneficial use.

e. The permittee shall not commence the use of ash for other purposes, prior to receiving written approval from the department. The department may request information as necessary to make such a determination. If such uses are considered acceptable, the department will issue written approval for other specific uses.

f. Ash may only be beneficially used in Phase II. AES ash shall not be used for beneficial use in Phase I.

g. Ash shall be accepted at the Phase II active workface or at the Solidification Pits, in accordance with Special Conditions, Section D, Item 7. The ash shall be monitored to ensure complete chemical reaction prior to beneficial use.

h. The maximum storage capacity of ash at the active workface shall not exceed one day's worth of ash for beneficial use, not including ash that will be used for construction of the operations layer.

30. **Soil as cover.** The permittee shall make available adequate soil material necessary for interim, intermediate, and final cover for landfill operations at Phases I and II. The soil from the borrow pit, identified as Phase III, may be made available for use as interim, intermediate and final cover; however, the permittee is not limited to this location as its only source of cover material.

<u>Waste Disposal</u>

31. The nominal operating rate of the landfill 1,200 tons per day. The disposal rate shall not exceed 2,000 tons per day, except as may be designated during a state-declared emergency.

32. The permittee shall provide adequate equipment and personnel to operate the landfill facility, including provisions for back-up personnel and equipment. The following equipment and personnel requirements shall be met at the active workface, unless otherwise approved by the Department.

a. At an average operating rate of up to 1,200 tons per day of C&D, the disposal workface shall have a minimum of one bulldozer of D8 size or equal, one loader, one water truck, a dump truck, and a spotter.
b. At an average operating rate of 1,200-2,000 tons per day of C&D, the disposal workface shall have an additional dozer and spotter.

33. The permittee shall inform drivers/operators of non-household vehicles to cover their loads.

34. Asbestos Waste. The permittee shall manage asbestos-containing waste in accordance with the February 2010 Operations Plan, other landfill operating conditions in this permit, approved subsequent submissions, and the following.

a. The approved limits of the asbestos landfill is defined by the survey reference in Special Conditions, Section B, Items 1 and 2.
b. The asbestos landfill may accept a maximum of 500-tons per week of asbestos-containing waste for final disposal.
c. Other types of special waste may be disposed of at the asbestos landfill site, provided the waste type is specified in the Operations Plan and approved by the department.
d. Asbestos waste shall not be compacted or otherwise disturbed by equipment after it is unloaded.
e. Daily cover material shall be placed over asbestos-containing waste. Daily cover shall consist of 6 inches of earthen materials with contaminant levels below DOH EALs for unrestricted use. Care shall be taken not to damage the double wrapped film while placing cover material.
f. The disposal of asbestos waste and associated recordkeeping shall be in accordance with 40 CFR Part 61, National Emissions Standards for Hazardous Air Pollutants: Asbestos, and other applicable rules and regulations.
g. The asbestos landfill disposal work area shall be clearly delineated by the use of signs and flags.
h. The permittee shall document the quantity, type, and location of asbestos and other solid wastes disposed of in the asbestos landfill.
i. The permittee shall comply with the February 2010 Operations Plan and approved subsequent submissions for asbestos material spills and mismanaged asbestos deliveries. Records of such events shall be maintained.

35. Scrap metal and clean/unpainted concrete encountered at the active workface may be removed from the disposal waste stream and recycled in accordance with Special Conditions, Section C.

36. Contaminated soil with contaminant concentrations that meet the following criteria, or other criteria approved by the department, may be used for void space fill within the landfill working face and interim cover.
a. TPH gasoline below 2,000 ppm,

b. TPH, middle distillates and residual fuels below 5,000 ppm,
c. TPH levels above 5,000 ppm with written approval from the department,
d. TEQ dioxins below 1,800 ng/kg and cumulative risk less than $10^{-4}$,
e. Technical chlordane below 65 ppm and passes TCLP, and
f. Other contaminant levels below DOH EALs for commercial/industrial use.

37. The following controls shall apply to the disposal of contaminated C&D waste, including, but not limited to, contaminated soil with contaminant concentrations exceeding levels in Special Conditions, Section B, Item 36, for disposal.

    a. The permittee shall ensure that contaminated waste are disposed directly into the active workface, and excess amounts of contaminated waste are not remaining in the truck and transported from the site.
    b. The permittee shall only allow the disposal of contaminated waste when the wind speed is below 30 mph.
    c. The permittee shall implement dust control measures, such as water sprays and barriers, to adequately control dust during placement and covering of contaminated waste.
    d. By the end of the working day, the contaminated C&D waste and contaminated soil shall be covered with C&D waste and/or interim cover.
    e. GPS coordinates shall be provided for such materials.

38. The permittee shall place at least six (6) inches of earthen material (interim cover) on the active workface whenever the surface area of the working face is approximately one acre in size, or once a week, whichever comes first. The earthen material shall control disease vectors, fires, odors, blowing litter, nuisance conditions, and scavenging. The active workface shall be covered with interim cover on any non-workday.

39. The permittee shall maintain written documentation noting the date that interim cover was placed at the active workface.

40. The permittee shall cover all inactive waste areas with intermediate cover. Inactive waste areas are areas that are not part of the one-acre maximum, active work area.

41. The permittee shall cover any waste area receiving vehicular traffic with soil, gravel, asphalt, or concrete, regardless of the time period since last receiving waste.

42. Intermediate cover shall be a minimum of 12 inches of earthen material (may include 6 inches of interim cover), with contaminant levels below DOH EALs for unrestricted use (Table I-1). Intermediate cover shall be a material that prevents stormwater contact with covered waste and directs stormwater to collection systems. Intermediate cover shall also control disease vectors, fires, odors, blowing litter, nuisance conditions, and scavenging.

43. Intermediate cover shall be maintained to minimize erosion and cracking.

44. The permittee shall cease acceptance and disposal of waste in high wind conditions in accordance with the Operations Plan, and as determined by the foreman and Site Manager. The permittee shall maintain a log of such events, including the date, time of shutdown, and associated wind speed.

Surface Water Management

45. The permittee shall construct and maintain the stormwater containment structures, in accordance with the PVT Land Company LTD., Design Report, Phase II, Cell 1 by A-Mehr, Inc., dated January 2003, which incorporates stormwater controls for both Phase I and Phase II. Stormwater containment structures shall be designed for a minimum 25-year, 24-hour storm. Stormwater shall be managed in accordance with the NPDES permit.

46. The permitee shall comply with the February 2010 Operations Plan and approved subsequent submissions for stormwater management and erosion control.

Gas Monitoring

47. The permittee shall implement the Gas Monitoring Procedures in the Emergency Fire Plan, dated February 2010, and approved subsequent submissions. The permittee shall also include $H_2S$ in the gas monitoring events.

48. The permittee shall ensure that the field meters are factory calibrated in accordance with manufacturer's specifications. The permittee shall also field calibrate the meters prior to each monitoring event. The permittee shall conduct monitoring events only with equipment that has been properly calibrated and maintained.

Leachate Management

49. The permittee shall follow the Leachate Management Practices as provided in the February 2010 Operations Plan and approved subsequent submissions.

50. Leachate means water or other liquid that has percolated or passed through or emerged from solid waste and contains dissolved, soluble, suspended, or miscible materials removed from the waste or due to contact with solid waste or gasses therefrom.

51. The permittee may only use leachate for dust control at the Phase II active working face. Leachate shall be sprayed in a manner that does not expose landfill customers or personnel to leachate. Leachate may be sprayed as needed to control dust, shall not promote leachate infiltration, and shall not be applied in a manner that would be considered bulk disposal.

52. The permittee shall manage leachate to prevent any entry into the stormwater collection system.

53. The permittee shall maintain an elevation control point at the top of casing or other monument in the immediate vicinity of the sump, for the measurement of leachate in the sump. The elevation control point shall be surveyed every two years, unless there is damage to the sump, and clearly marked. The permittee shall also maintain a monument, showing benchmark elevation, located in a position off the landfill.

54. The permittee shall remove leachate from the landfill via the leachate sump, in a manner that maintains a maximum depth of 30 centimeters (12 inches) of leachate above any part of the liner in the cell, outside the sump area. The leachate sump compliance depth is five (5) feet.

55. The permittee shall maintain usable access to all groundwater monitoring wells and the leachate sump shown in the Groundwater and Leachate Monitoring Plan dated April 2004, and approved subsequent submissions.

56. The permittee shall maintain the integrity of the monitoring wells and sump, and protect them from damage, destruction, or vandalism. If repair or replacement is necessary to ensure proper management and monitoring, then the permittee shall notify the Department, in writing, within seven (7) calendar days and design and construct the necessary repairs and/or replacements in accordance with the Groundwater and Leachate Monitoring Plan and approved subsequent submissions. The permittee shall submit a well/sump completion report within thirty (30) days after construction. As applicable, the report shall include geological logs, surveyed location and elevation of well, and as-built drawings. Additional information may be required.

57. Leachate Monitoring, Storage, Transport, Removal, and Recordkeeping. The permittee shall manage leachate in accordance with the February 2010 Operations Plan, approved subsequent submissions, and the following conditions.

    a. The permittee shall manually inspect and measure leachate in the leachate sump weekly and after any major rain event (more than one inch in 24 hours). The permittee shall inspect the sump more frequently whenever significant leachate volumes are generated.
    b. The permittee shall transport leachate to a truck-mounted tank or stationary holding tank.
    c. The permittee shall maintain records of the leachate sump levels measured in Special Condition No. 57.a.

## Groundwater and Leachate Monitoring

58. Groundwater and leachate monitoring shall be conducted in accordance with the State of Hawaii Landfill Groundwater Monitoring Guidance Document Version 1.8 dated September 2002, or subsequent version, and the conditions of this permit.

59. The permittee shall implement the Groundwater and Leachate Monitoring Plan dated April 2004, approved subsequent submissions, and conditions of this permit. The Department may periodically require revisions to the plan pursuant to law.

60. All sample collection, handling, management, and analysis shall be conducted in accordance with EPA SW-846, *Test Methods for Evaluating Solid Waste.*

61. Groundwater samples shall be collected and analyzed on a semiannual basis, or otherwise approved by the department. Groundwater samples shall be analyzed for constituents listed in the approved Groundwater Monitoring Plan, or otherwise approved by the department. Groundwater samples shall also be analyzed for the constituents listed in HAR 11-58.1-19(e)(2) on an annual basis, or as approved by the department. The department may reduce the frequency of testing for the constituents listed in HAR 11-58.1-19(e)(2).

62. Leachate samples shall be collected and analyzed on an annual basis, or otherwise approved by the department. Leachate samples shall be analyzed for constituents listed in HAR 11-58.1-19(e)(2), Table 2 of the 2004 Groundwater Monitoring Plan, or otherwise approved by the department.

63. The permittee shall prepare and submit a Groundwater/Leachate Monitoring Report within ninety (90) days of sampling, or other applicable reporting period. The monitoring reports shall include:

    a. Identification of wells/manholes sampled during the event;
    b. Sample collection dates and methodology;
    c. Identification of third party entity that performed the sample analysis;
    d. Field measurements and analytical data, including copies of laboratory reports;
    e. Statistical evaluation of all analytical data (except field measurements);
    f. Identification of any deviations from the plan, reason for the deviation, and affect on the sampling results; and
    g. Statement of whether any statistically significant increases were identified.

64. In the event of a detection above the practical quantitation limit or a statistically significant exceedence, the permittee shall comply with the requirements of the Groundwater Monitoring Plan.

## Closure and Post-Closure Requirements

65. The permittee shall perform closure and post-closure activities in accordance with the *Closure and Postclosure Care Plan*, prepared by A-Mehr, Inc. revised March 2010, approved subsequent documents, HAR 11-58.1-17, and these permit

73. The permittee shall maintain the final cover system and postclosure care requirements in accordance with HAR 11-58.1-17, the Closure Plan and Postclosure Care Plan and approved subsequent submissions. During the postclosure care period, the permittee shall submit an annual report or documentation of changes and maintenance efforts, including any repairs to the final cover system.

Recordkeeping and Reporting Requirements

74. The permittee shall maintain records in accordance with HAR 11-58.1-19, Standard Conditions, Item 11, and the conditions of this permit. The permittee shall comply with the reporting requirements of HAR 11-58.1-19, and any other reporting requirements set forth in this permit. Copies shall be made available to the department for its use upon request.

75. The permittee shall submit reports in hardcopy and electronic format.

76. The permittee shall submit an Annual Operating Report (AOR), for the reporting period July 1 to June 30. The AOR shall be submitted by July 31 of each year to:

Solid and Hazardous Waste Branch
Environmental Management Division
Hawaii Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801-3378

77. The Annual Operating Report shall be submitted in hardcopy and electronic format, and shall include the following information:

a. Types and weight of solid waste received (wood, metal, concrete, asphalt, building materials, and asbestos waste).

b. Quantities of leachate (gallons) generated and managed. Water balance estimates of leachate generation by the use of the most recent EPA HELP model using climatic information collected in accordance with Special Conditions, Section B, Item 21.

c. The permittee shall submit an annual topographic survey of the site as prepared by a land surveyor or civil engineer registered in the state of Hawaii, aerial surveys, or an approved alternate method. The survey shall clearly show the horizontal and vertical dimensions of the landfill. The AOR shall also include written affirmation by the permittee that the waste fill areas of the landfill are in compliance with approved final grades. The permittee shall also submit biennial surveys of the leachate sump elevation control point, as required by Special Conditions, Section B, Item 53.

conditions. Should there be discrepancies between these documents, the HAR and these permit conditions take precedence.

66. The permittee shall submit closure construction plans and specifications at least six months prior to scheduled construction, including a proposed construction schedule. The construction plans and specifications shall be prepared and certified by a professional engineer, with at least five (5) years experience in designing landfills, and registered in the State of Hawaii.

67. The permittee shall provide written notice of intent to close each landfill unit at least ninety (90) days prior to initiating closure activities. The notice of intent shall include a schedule and shall also be placed in the operating record.

68. The permittee shall begin closure activities of each landfill unit in accordance with HAR 11-58.1-17.

69. Soil with contaminant concentrations above DOH EALs for unrestricted use shall not be used in the final cover system. Final cover shall be constructed in accordance with the *Closure and Postclosure Care Plan*, prepared by A-Mehr, Inc. revised March 2010. Modifications to the final cover plan are subject to approval from the department.

70. The permittee shall complete closure activities of each unit in accordance with HAR 11-58.1-17. The permittee shall retain a professional engineer registered in the State of Hawaii for the supervision of the closure construction quality assurance requirements, and upon the completion, the engineer shall submit a summary report to the department as to the complete conformity to the plans and specifications as approved. The summary report shall be submitted within sixty (60) days after closure activities are completed. The summary report shall include certification that the cover is constructed in accordance with the approved in the *Closure and Postclosure Care Plan*, prepared by A-Mehr, Inc., revised March 2010, or an approved alternative. The summary report shall also include a description of closure activities, as-built drawings, surveys of the final cover system, a documented control program of the final cover system construction, quality assurance/quality control testing procedures, laboratory analyses, and engineer's certification of construction conformity.

71. The Financial Assurance report shall be revised every five (5) years, or whenever facility plans are updated or changed. This is not withstanding the requirement to make adjustments for inflation on an annual basis.

72. Following closure, the permittee shall submit a copy of the notation on the deed to the landfill property in accordance with HAR 11-58.1-17 and 11-58.1-19(d)(3).

d. A Sequencing Plan, including a drawing, identifying the cell areas to be filled in the coming year and identification of the wet weather areas. The cell areas and wet weather area shall be provided to scale. The Sequencing Plan drawing shall also identify the locations of processing areas to be used in the coming year, in accordance with Special Conditions, Section C, Items 10 and 11.

e. A Sequencing Plan including a drawing, to scale, identifying the areas to be mined from Phase I in the coming year.

f. Final fill areas, intermediate fill areas, and future unused fill areas shall be identified for the coming year.

g. Volume of waste disposed on an annual basis, and associated volume of ash beneficially used for void space fill and fire barriers on an annual basis.

h. Weight and location of ash beneficially used for operations layer construction.

i. Written affirmation of financial assurance.

**Section C. C&D Processing for Disposal, Recycling and Materials Recovery Operations for Concrete, Scrap Metal, and Feedstock Production**

1. The permittee may shred C&D waste for disposal and operate a recycling and materials recovery operation, in accordance with Figure 2, Site Plan, dated May 27, 2010, the February 2010 Operations Plan; approved subsequent submissions, and the conditions of this permit. Should there be discrepancies between the Operations Plan and these conditions, these conditions shall take precedence.

2. The permittee is authorized to accept C&D waste, as defined in HAR 11-58.1-03 and HAR 11-58.1-19(a), for recycling and disposal.

3. Upon existence of a facility that is permitted to accept feedstock, the permittee is authorized to accept source-separated loads of mattresses, waste tires, furniture for recycling, and other waste approved by the Department. The permittee shall not accept source-separated loads of mattresses, waste whole tires, and furniture before the start of operations of the user facility.
   a. The source-separated loads of mattresses, tires, and furniture shall not be placed in the C&D landfill. If the user facility becomes unable to accept the waste, the waste shall be disposed of or recycled at a permitted solid waste management facility allowed to accept such waste. Whole tires shall not be disposed of in landfills.
   b. Source-separated loads shall be delivered to the feedstock process area, as described in Special Conditions, Section C, Item C.8.
   c. The permittee shall provide written notification to the department at least seven (7) days prior to the initial acceptance of these additional waste streams.

4. The permittee shall implement the Unacceptable Waste Exclusion Program, dated February 2010, and approved subsequent submissions. The permittee shall not shred asbestos-contaminated waste at the recycling/materials recovery area. If asbestos-contaminated waste is identified, it shall be separated and disposed of in accordance with Special Conditions, Section B, Item 34 and the February 2010 Operations Plan, and approved subsequent submissions.

5. Adequate drainage to prevent standing water and to control "run-on" and "run-off" of rainwater shall be provided for the entire recycling and materials recovery area. Any stormwater discharges from the facility shall be in accordance with applicable federal, state, and local laws and regulations.

6. The permittee shall require any person or vehicle operator who accepts feedstock material from the permittee to utilize adequate cover for loads of feedstock leaving the materials recovery area for the purpose of transporting that material off-site. The permittee shall not, however, be held responsible under this permit for the failure of

any person or vehicle operator to maintain adequate cover for feedstock once that load of feedstock has been taken off-site unless that person or vehicle operator is an employee of the permittee or acting under the permittee's direction.

7. Waste generated from the sorting operation shall be disposed of in accordance with applicable laws and regulations.

8. Waste delivered to the recycling and materials recovery area shall be managed as follows.
   a. Incoming waste shall be unloaded directly onto the low permeability clay liner, screened for unacceptable materials, and segregated for recyclables. The clay liner shall be maintained with at least two feet of 1x10$^{-5}$ cm/sec soil and in the area shown on Exhibit 2, excluding the stormwater system.
   b. Sorting shall be performed in accordance with the February 2010 Operations Plan, and approved subsequent submissions.
   c. All waste unloaded onto the clay liner shall be sorted by the end of the workweek. In the event of equipment breakdowns or other upset conditions, stockpiles shall be stored on the low-permeability clay liner referenced in item 8.a above, and in accordance with the Operations Plan and approved subsequent submissions. Stockpiles shall not exceed a height of 15 feet with 20-foot lanes between piles.

9. The permittee shall separate mixed waste into the following streams and deliver it as follows.
   a. Non-lead based painted concrete, cured asphalt, rock, and rubble for recycling at the aggregate production facility, as described in Special Conditions, Section C, Item 10.
   b. Ferrous and non-ferrous metal for recycling at the scrap metal recycling area, as described in Special Conditions, Section C, Item 11.
   c. Waste for feedstock production (wood, wood pallets, wood shipping containers, carpet, plastic, paper), to the feedstock process area, as described in Special Conditions, Section C, Item 12.
   d. Non-recoverable, residual waste (such as composition/asphalt roofing shingles, tile, gypsum board scrap, cementitious siding and tile, glass, floor tiles, fiberglass insulation, ceiling tiles, painted concrete, other non-burnable material, etc.) for disposal, in the C&D landfill, as described in Special Conditions, Section B.
   e. Alternative to separating into components described in subparagraphs c and d above, the permittee may shred (primary shred only) the combination of waste described in sections c and d for disposal into the landfill.

10. Non-lead based painted concrete, cured asphalt, and other clean aggregate may be processed into inert fill, as defined in HRS 342H-1, for reuse at the facility. Clean aggregate shall not contain contaminants above DOH EALs for unrestricted use. Any material that does not meet the inert fill material definition shall be disposed of in the C&D landfill. By-products from this operation, such as metal, shall be recycled and

disposed of as appropriate. The storage and processing shall be in accordance with the February 2010 Operations Plan and approved subsequent submissions. The aggregate processing/storage area shall be maintained in a designated recycling area, which shall be updated yearly in the Annual Operating Report.

11. Scrap metal recycling.
    a. The storage of scrap metal shall be limited to 500 tons, cumulatively for all metals.
    b. The scrap metal storage area shall be maintained in a designated recycling area, which shall be updated yearly in the Annual Operating Report.
    c. The scrap metal shall be recycled by the 500-ton limit, or at least once a year, whichever comes first. The scrap metal shall be transported to a permitted solid waste management facility allowed and willing to accept scrap metal or out-of-state markets.

12. Processing at Recycling and Materials Recovery Area.
    a. Storage of waste for feedstock production shall be on the low-permeability clay liner and in accordance with the February 2010 Operations Plan and approved subsequent submissions.
    b. Processing may include the use of a primary shredder (10-inch minus, 4-inch nominal), the secondary shredder (2-inch minus, 3/8-inch nominal), a trommel screen, one additional screener, and other equipment described in the February 2010 Operations Plan and approved subsequent submissions.
        i. Primary processing (primary shredder and trommel screen) may be performed upon receipt of this permit. Secondary Processing (secondary shredder and additional screener) may only be performed after a solid waste-permitted feedstock user facility is able to begin receiving feedstock and any required approvals are obtained from the Clean Air Branch; except that if any required approvals are obtained from the Clean Air Branch, batch testing of the secondary shredder and additional screener may be performed before issuance of a solid waste permit to a feedstock user facility.
        ii. The permittee shall submit a written update to the Operations Plan if additional processing equipment (such as additional conveyors, shredders, or screeners) is proposed for use at the facility. The update shall be provided at least thirty (30) days prior to proposed operation.
    c. Secondary processing shall be conducted outdoors with adequate environmental controls or within an enclosed building.

13. Storage of processed feedstock.
    a. The aboveground storage capacity of processed feedstock is limited to 5,000 tons (includes primary and secondary shredded feedstock).
    b. Secondary shredded feedstock shall be stored in outdoor stockpiles with adequate environmental controls, covered containers, or other approved containment methods.

c. Stockpile storage shall be stored on the low-permeability clay liner and in accordance with the February 2010 Operations Plan and approved subsequent submissions. Stockpile storage shall be limited to a 15-foot height with 20-foot access lanes between piles.
d. The stockpiles shall be turned as necessary to minimize spontaneous combustion. Watersprays, or other dust control measures, shall be used when stockpiles are being turned.
e. Feedstock shall be transported to a permitted solid waste management facility allowed and willing to accept such feedstock, or C&D processed feedstock may be disposed of in accordance with Special Conditions, Section B, prior to posing a fire, nuisance, dust, or public health/environmental concern.

14. The permittee may place partially processed C&D feedstock in Phase II of the C&D landfill for future recovery. If the permittee intends to recover the partially processed feedstock, the following disposal conditions shall apply:
   a. Feedstock that has been processed by the secondary shredder (2-inch minus, 3/8-inch nominal) shall not be recovered.
   b. Placement in the landfill shall be in accordance with the February 2010 Operations Plan, Special Conditions, Section B, and approved subsequent submissions.
   c. The permittee shall use GPS or other tracking system to document the placement of partially processed feedstock intended for recovery.

15. **Landfill Mining in Phase I and Recovery of Partially Processed Feedstock from Phase II.** The permittee may remove previously buried waste from Phase I of the landfill or partially processed feedstock from Phase II (Special Conditions, Section C, Item 14), subject to the following conditions.
   a. The mining of Phase I shall not exceed the limits of the Proposed Landfill Reclamation Area depicted on Figure 2, Site Plan, prepared by A-Mehr, Inc., dated May 27, 2010. Landfill mining for recycling shall not occur within 1,320 feet from the residences. (Excavation for fire control or other emergency purposes is allowed.)
   b. No excavated waste shall be stored at the active workface at the end of each workweek.
   c. Partially processed feedstock shall be managed in accordance with Special Conditions, Section C, Items 12 and 13. No partially processed feedstock shall be stored at the active workface at the end of each workweek.
   d. No processing (such as material separation or screening) shall occur away from the active workface, except at the recycling and materials recovery areas described in Special Conditions, Section C, Items 10-12.
   e. Replacement of waste into Phase I of the landfill shall be in accordance with Special Conditions, Section B, except that only one primary active disposal workface (at Phase I or Phase II) shall be open at any time.
   f. At the end of each workweek, a minimum of six inches of soil interim cover (as defined in Section B, Item 38) shall be applied to each excavation area. If the

area is not excavated within thirty (30) days, the permittee shall apply and maintain intermediate cover, in accordance with Special Conditions, Section B, Items 42 and 43.

g. If Phase I is excavated to native ground within Phase I, and the permittee proposes to refill Phase I, the permittee shall submit a modification request to install a liner system in Phase I. The permitee shall not dispose of waste in Phase I until the design is approved by the department and a permit modification is issued. If Phase I is not excavated to native ground, the permittee shall survey and document the elevation as well as the northings and eastings of the limits of Phase I area prior to refilling.

h. The permittee shall take necessary precautions to ensure protection of public health and the environment during mining activities, including providing adequate measures for slope stability, fire, dust, litter, odor, gas, vector, and nuisance controls.

### 16. Perimeter Sampling

a. The permittee started sampling for total suspended particulates (TSP) at three (3) stations along its fence with the makai community in November 2009. The sampling entails collection of TSP samples in accordance with EPA's 1/6 day schedule (24-hour, midnight to midnight).
    i. The permittee shall continue the TSP air sampling through October 2010 or the start of sampling under Item 16.a.ii, whichever comes first.
    ii. The permittee shall continue the TSP air sampling for a period of one year following the commencement of landfill mining activities in Phase I, provided that TSP sampling days include a representative number of landfill mining days.

b. RCRA 8 heavy metals. The permittee shall conduct sampling for TSP and RCRA 8 heavy metals, except silver, at three (3) stations along its fence with the makai community by collecting multiday samples in accordance with the following protocol:
    i. Prior to landfill mining activities in Phase I and secondary shredding, collect at least two (2) multiday samples covering at least ten (10) 24-hour periods when existing operations are occurring.
    ii. Over a 30-60 consecutive day period, or as approved by the department, at or near the start of landfill mining activities in Phase I, collect at least two (2) multiday samples covering at least ten (10) 24-hour periods when landfill mining is occurring.
    iii. Over a 30-60 consecutive day period, or as approved by the department, after the start of secondary shredded feedstock production, collect at least two (2) multiday samples covering at least ten (10) 24-hour periods when secondary shredding is occurring and preferably simultaneously with landfill mining.
    iv. Over a 30-60 consecutive day period, or as approved by the department, at the end of the first year of landfill mining activities in Phase I, collect at

least two (2) multiday samples covering at least ten (10) 24-hour periods when landfill mining is occurring.

c. For the required RCRA heavy metals sampling, the energy dispersive x-ray fluorescence (XRF) method shall be utilized.

d. Reports.
  i. The permittee shall submit quarterly reports on the TSP sampling. Reports shall be submitted within forty-five (45) days of the receipt of analytical data for the quarter.

  ii. The permittee shall submit a report for TSP and RCRA heavy metal sampling required in Condition 16.b. Reports shall be submitted within forty-five (45) days of the receipt of heavy metals analytical data.

  iii. The reports shall include the analytical results for the period. The reports shall include dates of sample collection, wind direction, and an evaluation of results.

    1. RCRA heavy metals reports shall indicate the operations conducted (landfill mining, secondary shredding, or both) on the sampling dates.

    2. The format of already submitted air reports is acceptable. Such reports include plots of all the data received and presentations of the ranges and averages over the sampling period.

<u>Recordkeeping and Reporting</u>

17. The permittee shall maintain records in accordance with HAR 11-58.1, Standard Conditions, Item 11, and the conditions of this permit. The permittee shall comply with the reporting requirements of HAR 11-58.1, and any other reporting requirements set forth in this permit. Copies shall be made available to the department for its use upon request. At a minimum, the records shall include, but is not limited to:

a. Source and type of waste received and the date and quantity received;
b. Screening documentation;
c. Tonnage of concrete accepted for recycling;
d. Tonnage and disposition of scrap metal transported from the facility;
e. Disposition and tonnage of feedstock transported from the facility;
f. Disposition and tonnage of residual waste and unacceptable materials; and
g. Copies of receipts of sale, recycling, disposal of material; and associated test analysis, if applicable.

18. Annual reports shall be prepared and submitted to the department. The report shall include the following information.

a. total tonnage of waste received;
b. total tonnage, type, and destination of separated waste (scrap metal, concrete/asphalt/aggregate, feedstock, and residual waste for disposal); and
c. information as required under HRS 342I-26.

The report is due on July 31 for the preceding twelve (12) months and shall be sent to the following address:

Solid and Hazardous Waste Branch
Environmental Management Division
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801-3378

**Section D - Solidification Operations**

1. Operations at the solidification area shall be in accordance with the permit application and Operations Manual received on December 24, 2003, September 18, 2008, Site Plan dated June 5, 2009, additional submissions received March 13 and 15, 2008, September 24, 2009, March 3, 2010, and approved subsequent submissions, unless otherwise specified in the permit conditions.

2. No regulated hazardous waste, in accordance with state hazardous waste laws and regulations, substances regulated by the Toxics Substances Control Act (TSCA), or infectious waste as defined in HAR 11-104.1 shall be accepted at the solidification area.

3. No radioactive materials licensed by the U.S. Nuclear Regulatory Commission, or the HAR Chapter 11-45, or any radioactive material above background level, shall be accepted at the solidification area.

4. The permittee may accept petroleum-contaminated soil (PCS), soil from construction and demolition operations (C&D soil), and AES ash for solidification.

   a. The PCS shall be limited to soils containing petroleum products (e.g. gasoline, diesel, or heavier fuel hydrocarbons). PCS shall not be hazardous waste or TSCA waste.
   b. Soil not meeting the requirements of Section B, Item 36 shall not be used for solidification.
   c. All soil not certified as meeting residential EALs by the generator, shall be tested prior to acceptance at the facility. Testing may be performed by the generator and shall be based on the origin and contaminants anticipated in the soil.
      i. Incoming PCS shall be tested for the following contaminants, or as determined by conditions at the site of generation: cadmium, chromium, lead, total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, xylene (BTEX), polynuclear aromatic hydrocarbons (PAHs), halogenated volatile organic compounds, and polychlorinated Biphenyls (PCBs).
      ii. Incoming C&D soil shall be tested for the following contaminants, or as determined by conditions at the site of generation: arsenic, cadmium, chromium, lead, technical chlordane, PAHs, and PCBs.
      iii. If the soil may be classified as PCS and C&D soil, all of the above analytes shall be included in the testing or as determined by conditions at the site of generation.
   d. Records of testing results, origin, and quantity of associated soil shall be maintained.

5. The permittee may accept liquid wastes containing only known sources of petroleum products for solidification, hereinafter referred to as "petroleum-based liquids."

a. All incoming petroleum-based liquids shall be tested prior to acceptance at the facility. Testing may be performed by the generator and shall be based on the origin and contaminants anticipated in the petroleum-based liquids.
b. Incoming petroleum-based liquids shall be tested for the following contaminants, or as determined by the site of generation: heavy metals (minimum of RCRA 8 total metals), volatile organic compounds, semivolatile organic compounds, PCBs, pesticides, herbicides, and TPH.
c. Generator knowledge of the incoming petroleum-based liquids may be used as appropriate.
d. Records of testing results, origin, and quantity of petroleum-based liquids shall be maintained.

6. The permittee may request the acceptance of liquid waste that does not meet the description for petroleum-based liquids set forth in Special Conditions, Section D, Item 5. The request shall be submitted a minimum of thirty (30) calendar days prior to the proposed acceptance date and shall include, at a minimum, the following information:

a. Description of liquid waste proposed for acceptance;
b. Generator knowledge and description of environmental contaminants that may be present in the liquid waste, and any analytical data for contaminants of concern;
c. Documentation of the generator's hazardous waste determination;
d. Description of operational procedures and controls, if necessary;
e. Identification of solidification area and methods to isolate the liquid waste, if necessary;
f. Back-end testing procedures for the solidified waste, if necessary; and
g. Identification of presumed recycling or disposal method, if necessary.

The department may require additional information as deemed necessary to evaluate the request. If the Department does not respond within thirty (30) days, the request shall be deemed approved. The permittee shall operate in accordance with the acceptance request, maintain records to show compliance with the acceptance request, and implement other conditions that may be required by the department. Records of testing results, origin, and quantity of liquids shall be maintained.

7. The permittee may accept and store AES ash in the solidification cells. Liquid waste may be added to the ash for solidification, provided the liquid waste contains contaminant levels that will allow the ash to be beneficially used in accordance with Special Conditions, Section B, Items 29 and 36.

## Operations

8. The solidification cells shall be maintained in accordance with the Operations Manual received December 24, 2003, September 18, 2008, and March 3, 2010, the

Site Plan dated June 5, 2009. The soil cement wearing layer shall be renewed periodically, to maintain a 12-inch thickness and durable surface.

9. The permittee shall place liquid waste atop soil/ash within the solidification cells and start incorporating the liquid waste by the end of the workday. The permittee shall process petroleum-based liquids/other liquid wastes by mixing it with soil or ash until solidification is complete and the solidified waste does not contain free liquids as defined by EPA method 9095 (Paint Filter Liquids test). No liquid waste shall be left in the solidification cell upon removal of the solidified waste.

10. The permittee shall minimize the accumulation of standing water in the solidification cells.

Use/Disposal of Solidified Waste

11. Waste that does not pass EPA Method 9095 (Paint Filter Liquids Test) shall be further solidified.

12. Solidified waste that is PCS, C&D soil, contains liquids associated with C&D activities, and AES ash shall be used/disposed of as follows.

    a. No solidified waste shall be used as intermediate or final cover.

    b. Solidified waste that consists of the combination of AES ash (in accordance with Special Conditions, Section D, Item 7) and fire foam, liquid waste from car wash operations, liquid waste from utility vaults from streets and similar liquid wastes, may be beneficially used in accordance with Special Conditions, Section B, Item 29, provided it meets the concentration requirements of Section B, Item 36.

    c. Solidified waste (not including AES ash) that consists of the combination of soil meeting the requirements of Special Conditions, Section B, Item 36 and fire foam, liquid waste from car wash operations, liquid waste from utility vaults from streets, and similar liquid wastes may be used as interim cover or disposed of as void space fill at the C&D landfill.

    d. Other solidified waste that does not contain AES ash shall be disposed of at the C&D landfill within seven (7) days.

Recordkeeping and Reporting

13. The permittee shall maintain liquid waste transaction invoices, profile sheets, and any generator test analysis and make them available to the department for its use upon request.

# APPENDIX B
# DISPOSAL AGREEMENTS AND FORMS

PVT LAND COMPANY, LTD.
87-2020 Farrington Highway
Waianae, Hawaii 96792-3749
Office: 808-668-4561 Fax: 808-668-1368

**Website: www.pvtland.com**

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## Landfill Policies and Procedures

**Landfill Hours:**

Subject to change without notice, landfill hours of operation shall be from 7:00 am to 4:00 pm, Monday through Friday. Last acceptable load of the day must be on the scale by 3:30 pm. All unloading must be completed by 3:45 pm; no exceptions. Unless otherwise notified, the landfill hours shall not include Saturdays, Sundays, federal and state holidays. Further, PVT reserves the right to close and deny access to the landfill at any time for any purpose; including, but not limited to repairs, maintenance and renovation of the landfill.

**Pre-Approval of All Demolition Sites and Bins:**

All materials to be land filled will require inspection by an authorized PVT inspector. All submittals shall be made in writing, see Request for Clearance Number form, and may be faxed to 808-668-1368 no less than (7) seven business days prior to the commencement of demolition and/or hauling. Failure to have a pre-approved account with PVT Land Company and failure to comply with any of the provisions of this paragraph will result in denial to dispose of materials at the landfill. All unacceptable loads will be returned to the hauler/contractor and will be subject to an additional service fee.

**Acceptable Material for Disposal:**

User may only dispose at the landfill, in accordance with permitted procedures, material which originate from construction or demolition sites, including concrete, hollow bituminous concrete, asphalt pavement, wood, glass masonry, roofing, siding, plaster, dirt, rock, stumps, boulders and brush as permitted by Chapter 342H, Hawaii Revised Statutes, and Title 11 Administrative Rules Chapter 58.1 Solid Waste Management Control and as they may be amended.

**User's responsibilities:**

User hereby acknowledges that PVT shall assume no responsibility for screening, examining or inspecting any or all loads delivered by User, except User shall permit, and hereby gives its consent, to allow PVT to examine, screen and/or inspect any or all loads at any time.

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# PVT LAND COMPANY, LTD.

## Unacceptable Material

User shall not dispose any materials prohibited under Chapter 342H, Hawaii Revised Statutes and Title 11 Administrative Rules Chapter 58.1 Solid Waste Management Control and as they may be amended. Also, User shall not dispose at the landfill household debris, petroleum contaminated materials, tires and all car parts, paper waste, appliances, barrels, drums, paints, solvents, asbestos, sealers, adhesives, polychlorinated biphenyl's ("PCB"), flammable explosives, radioactive materials, chemicals known to cause cancer or reproductive toxicity, pollutants, contaminants, hazardous wastes, toxic substances or related materials, including, but not limited to, any substances defined as or included in the definition of "hazardous substances," hazardous wastes," extremely hazardous wastes," "hazardous material" or "toxic substances," under any federal, state or local laws, ordinances or regulations, now or hereafter in effect, relating to environmental conditions, industrial hygiene or hazardous substances, including, but not limited to the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 U.S.C. Section 9601, et seq., the Hazardous Materials Transportation Act, 49 U.S.C. Section 7401, et seq., the Toxic Substances Control Act, 15 U.S.C. Sections 2601 through 2629, the Safe Drinking Water Act, 42 U.S.C. Sections 300f through 300j, the Clean Air Act, 42 U.S.C. Sections 7401 through 7626; and any similar federal, state and local laws' ordinances and regulations now or hereafter adopted, published and/or promulgated pursuant thereto ("Hazardous Substance Laws") User hereby accepts all responsibilities for screening, examining and inspecting all of User's loads to verify, ensure and guarantee that no load contains any aforementioned restricted and prohibited material.

**Household Hazardous Waste:**

If you want information on the proper disposal of these or other materials, please call the C&C, City Refuse Division at 808-523-4774. Be prepared to provide the type and quantity of the materials to be disposed. THESE WILL NOT BE ACCEPTED at PVT Land Company, Ltd. Landfill.

| Living Room | Kitchen | Bathroom | Storage Shed |
|---|---|---|---|
| glass cleaner | oven cleaner | toilet bowl cleaner | oil based paint |
| rug shampoo | ammonia | disinfectant | paint thinners |
| insecticides | drain cleaner | mildew remover | lacquer, varnish |
| flea collar | floor stripper | home perm. | adhesives, epoxies |
| flea bomb | metal polish | medicine | paint stripper |
| furniture polish | insect spray | nail polish remover | photographic chemicals |
| rubber cement | rodent killer | lice/flea shampoo | herbicides, pesticides |
| mothballs | roach poison | bleach | insect repellent |

**Garage:**

Motor oil, antifreeze, car batteries, brake/transmission fluid, engine degreasers, carburetor cleaners, gasoline, gunk remover, cleaning solvents of any type are all deemed unacceptable.

**Additional Unacceptable materials:**

Drums marked solvent
Industrial Waste-carbon activated ash
Lead contaminated soil above 5.0 ppm using TCLP test method
Materials containing PCB's that are Toxic Substances Control Act (TSCA) regulated

PVT LAND COMPANY, LTD.
87-2020 Farrington Hwy
Waianae, HI 96792
Tel: (808) 668-4561
Fax: (808) 668-1368

# AGREEMENT

This Agreement dated ______________________, by and between PVT LAND COMPANY LTD. ("PVT") and ______________________________________________, ("User"), whose principal business address is ____________________________________________, business telephone number is (_____)______________, and business fax number is (_____)______________will allow User to dispose acceptable demolition/construction waste material in PVT Landfill ("landfill") in accordance with the terms and conditions of this Agreement.

1. **LANDFILL HOURS.** Subject to change without notice, landfill hours of operation is from 7:00 a.m. to 4:00 p.m., Mondays through Fridays. The last load of the day must be on the scale by 3:30 p.m. All unloading must be completed by 3:45 p.m.; no exceptions. Landfill hours of operation on Saturdays are 7:30 a.m. to 1:30 p.m. The last load of the day must be on the scale by 1:00 p.m. All unloading must be completed by 1:15 p.m.; no exceptions. Unless otherwise notified, landfill hours shall not include Sundays and Federal & State holidays. Further, PVT reserves the right to close and deny disposing at the landfill at any time for any purpose, including but not limited to the purposes of repair, maintenance and renovation of the landfill.

2. **RATES.** The rates and charges for disposing of demolition/construction waste material at the landfill are available for inspection at PVT's office or may be requested by contacting PVT. User acknowledges that these rates and charges are subject to change by PVT without notice.

3. **RESTRICTED MATERIALS.** User may only dispose at the landfill, in accordance with permitted procedures, materials which originate from construction or demolition sites, including concrete, hollow tile, bituminous concrete, asphaltic pavement, wood, glass, masonry, roofing, siding, plaster, dirt, rock, stumps, boulders and brush, as permitted by Chapter 342H, Hawaii Revised Statutes, and Title 11 Administrative Rules Chapter 58.1 Solid Waste Management Control, and as they may be amended. User shall not dispose any materials prohibited under Chapter 342H, Hawaii Revised Statutes, and Title 11 Administrative Rules Chapter 58.1 Solid Waste Management Control, and as they may be amended. Also, User shall not dispose at the landfill household debris, petroleum-contained materials, tires and all car parts, paper waste, appliances, barrels-drums, paints/solvents, asbestos, sealers, adhesives, polychlorinated biphenyls ("PCB"), flammable explosives, radioactive materials, chemicals known to cause cancer or reproductive toxicity, pollutants, contaminants, hazardous wastes, toxic substances or related materials, including but not limited to, any substances defined as or included in the definition of "hazardous substances," "hazardous wastes," "extremely hazardous wastes," "hazardous materials," or "toxic substances," under any federal, state or local laws, ordinances or regulations, now or hereafter in effect, relating to environmental conditions, industrial hygiene or Hazardous Substances, including but not limited to the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 U.S.C. Section 9601, et seq., the Hazardous Materials Transportation Act, 49 U.S.C. Section 7401, et seq., the Toxic Substances Control Act, 15 U.S.C. Sections 2601 through 2629, the Safe Drinking Water Act, 42 U.S.C. Sections 300f through 300j, the Clean Air Act, 42 U.S.C. Sections 7401 through 7626; and any similar federal, state and local laws, ordinances and regulations now or hereafter adopted, published and/or promulgated pursuant thereto ("Hazardous Substance Laws"). User hereby accepts all responsibilities for screening, examining and inspecting all of User's loads to verify, ensure and guaranty that no load contains any aforementioned restricted and prohibited materials. User hereby acknowledges that PVT shall assume no responsibility for screening, examining or inspecting any or all loads delivered by User, except that User shall permit, and hereby gives its consent, to allow PVT to examine, screen and/or inspect any or all loads at any time. User agrees that if any load contains any restricted or prohibited materials, User shall be responsible for the payment of any such loads, at regular PVT rates, and shall also be responsible for any additional fees for the processing/return of such loads, as determined from time to time by PVT.

4. **INDEMNIFICATION.** As an integral part of this Agreement and as partial consideration for using the landfill, User hereby agrees to indemnify, exonerate, defend and hold PVT, its parent and affiliate companies as well as any and all directors, officers, employees, attorneys and agents thereof, harmless against and from and will reimburse PVT in respect of:

(a) Any and all liabilities, obligations, claims, demands, actions, losses, damages, injuries, deaths, costs and expenses (including, but not limited to, attorney's fees and costs) made against PVT which arise as a result of User's negligence, breach of contract, misconduct, acts or omissions in connection with User's use of the Landfill.

(b) Any and all damage or deficiency resulting from any misrepresentation, breach or nonfulfillment of any term or provision of the Agreement, or from any misrepresentation in or omission from any Request for Clearance form, document or other instrument furnished or to be furnished to PVT.

(c) Any and all claims, losses, damages, liabilities, fines, penalties, charges, administrative and judicial proceedings and orders, judgments, remedial action requirements, enforcement actions of any kind, and any and all costs and expenses incurred in connection therewith (including, but not limited to, attorney's fees and costs), arising directly or indirectly, in whole or in part, out of any disposing in the landfill of any restricted or prohibited materials stated in paragraph 3 above.

(d) Any and all actions, suits, proceedings, demands, claims, judgments and orders, including, but not limited to, attorney's fees and costs incident to this Agreement.

This Indemnification clause shall be enforceable and remain in force and effect during the duration of this Agreement and shall continue and remain in force and effect after the termination of this Agreement. At all times during the duration of and after the termination of this Agreement, the terms of this Indemnification clause shall be subject to all Hazardous Substance Laws now or hereafter in effect.

**USER HEREBY CERTIFIES THAT IT HAS READ, REVIEWED AND UNDERSTANDS THE SPECIFIC TERMS AND CONDITIONS OF THIS INDEMNIFICATION CLAUSE AND ALSO HEREBY EXPRESSLY AND SPECIFICALLY ACKNOWLEDGES, AGREES AND ACCEPTS THE TERMS AND CONDITIONS OF THIS INDEMNIFICATION CLAUSE AS INDICATED BY THE FOLLOWING INITIALS OF USER OR USER'S AUTHORIZED AGENT(S).**

INITIALS: ______________________ DATED: ______________________

INITIALS: ______________________ DATED: ______________________

This section needs to be initialed by the homeowner or an officer of the company.

5. **PRE-APPROVAL OF ALL DEMOLITION SITES.** All demolition sites must be approved by PVT prior to demolition. User shall submit to PVT the completed and executed Request for Clearance form (to be furnished by PVT) no less than seven (7) business days prior to commencement of the demolition. Failure to comply with any of the provisions of this paragraph may result in the denial of disposing at the landfill. User hereby consents to and authorizes PVT to inspect all demolition sites prior to the commencement of the demolition.

6. **COMPLIANCE WITH LANDFILL POLICIES AND PROCEDURES.** User agrees to comply with PVT's Landfill Policies and procedures which are available for inspection at PVT's offices or which may be requested by contacting PVT. User acknowledges that these policies and procedures may be changed by PVT without notice. Failure to comply with these policies and procedures may result in the denial of disposing at the landfill.

7. **PAYMENTS.** The terms of payment shall be governed by the Credit Agreement between PVT and User, the terms and conditions of which are incorporated herein by reference.

8. **DEFAULT.** Any default of any provision of this Agreement by User may result in the immediate suspension or termination, without notice, of this Agreement at the election of PVT. Further, in the event PVT is forced to hire a collection agency or attorney to collect any monies owed to PVT under this Agreement, PVT shall also be entitled to recover from User PVT's collection expenses, including, but not limited to, its attorney's fees and costs. Any suspension or termination, however, shall not relieve User of any and all outstanding obligations, responsibilities or duties under this Agreement, including, but not limited to, those obligations relating to indemnification and payments.

9. **TERMINATION.** This Agreement may be terminated by either party at any time for any reason. Any termination, however, shall not relieve User of any or all outstanding obligations, responsibilities or duties under this Agreement, including but not limited to those obligations relating to indemnification and payments.

10. **PVT'S RIGHT OF REJECTION.** PVT retains the right to reject any load where PVT has cause, for any reason, to believe said load may contain restricted or prohibited materials as stated in paragraph 3 above. Further, PVT reserves the right to reject any load which would be violative of any laws, ordinances or regulations (federal, state or local) now or hereafter in effect, or any load which would adversely impact the landfill.

11. **DELIVERY OF EXECUTED AGREEMENT VIA ELECTRONIC TRANSMISSION.** This Agreement, executed in whole or in counterparts, may be delivered through a facsimile machine or other electronic transmission and, if delivered in such manner, shall constitute the valid delivery of such executed Agreement and shall be legally binding upon the parties as if such executed Agreement were delivered in person.

**THE UNDERSIGNED HEREBY CERTIFIES THAT IT HAS REVIEWED AND READ THE FOREGOING TERMS, CONDITIONS AND PROVISIONS AND REPRESENTS THAT THE FOLLOWING SIGNATURE(S) ARE AUTHORIZED TO BIND USER AS TO ALL TERMS, CONDITIONS AND PROVISIONS OF THIS AGREEMENT.**

**ACKNOWLEDGED AND AGREED:**

______________________________________

"USER" (Print your Company's Name)

By ______________________________ Date ______________________
(Signature)
Its ______________________________
(Homeowner or Company Officer)

By ______________________________ Date ______________________
(Signature)
Its ______________________________
(Homeowner or Company Officer)

# PVT LAND COMPANY LTD.

87-2020 FARRINGTON HWY., WAIANAE, HAWAII 96792
TEL. NO. (808) 668-4561 FACSIMILE (808) 668-1368

## RELEASE AND INDEMNIFICATION AGREEMENT

The undersigned "USER", in consideration for certain services received from PVT LAND COMPANY LTD. and/or its employees, agents, officers, directors, insurers and assigns ("PVT"), including but not limited to PVT's assistance in unloading landfill materials from USER's vehicles, does for itself and its officer, directors, employees, agents and assigns, release, acquit and discharge PVT from and on account of any and all claims, actions, proceedings, expenses, damages, liabilities, including attorney's fees and costs, which USER may have against PVT arising out of the services received by USER from PVT, including but not limited to any damage to USER's vehicle or equipment.

USER understands and agrees that this is a full and final release of all claims, known or unknown, suspected or unsuspected, including without limiting the generality of the foregoing those now anticipated, unexpected or unknown, as well as those which have already developed and which are now known or anticipated, arising out of the services received by USER from PVT.

USER further agrees to indemnify, defend and hold PVT harmless from and against any and all claims, actions, proceedings, expenses, damages and liabilities, including attorney's fees and costs, arising out of the services received by USER from PVT. USER, upon notice from PVT, agrees to resist and defend any such action or proceeding by counsel reasonably satisfactory to PVT.

USER understands and agrees that this Agreement is intended to be as broad and inclusive as permitted by the laws of the State of Hawaii and that if any portion of this Agreement is held invalid, it is agreed that the balance of this Agreement shall, notwithstanding, continue in full legal force and effect.

USER acknowledges and agrees that this Agreement has been made without reliance upon any statement, representation or promise of PVT.

DATED: Honolulu, Hawaii, ______________________________.

______________________________________
"USER" (Print your Company's Name)

By ______________________________ By ______________________________
(Signature) (Signature)
Its ______________________ Its ______________________

# PVT LAND COMPANY, LTD.

87-2020 Farrington Hwy.
Waianae, HI 96792
TEL. NO. (808) 668-4561 / FAX NO. (808) 668-1368

## REQUEST FOR CLEARANCE NUMBER

PRINT CLEARLY

JOBSITE ADDRESS: ______________________________ ZIP CODE: __________

NAME OF PROPERTY OWNER: ______________________________

NAME OF DEMOLITION CONTRACTOR: ______________________________

ADDRESS: ______________________________ ZIP CODE: __________

PHONE: __________ FAX: __________ P.O.#: __________ JOB#: __________

* TRANSPORTER: ______________________________ PHONE: __________ FAX: __________

USE OF SITE: ☐ Residential ☐ Commercial ☐ Industrial ☐ Vacant Land ☐ City ☐ State ☐ Federal

JOB/PROJECT: ☐ Demo ☐ Renovation ☐ Roofing Only ☐ Other __________

WASTE MATERIAL: ☐ Canec ☐ Concrete ☐ Grub ☐ Mixed Waste ☐ Paint Chips ☐ Rock/Dirt ☐ Liquid Waste/Sludge ☐ Transite ☐ Other __________

Does the waste material contain ***Lead Based Paint?*** ☐ Yes ☐ No

If "Yes" to the above, was TCLP performed? ☐ Yes ☐ No

TCLP required for all residential and commercial demolition and all commercial renovation projects that contain lead base paint. Residential renovations are exempt from TCLP requirements.

DATE READY FOR INSPECTION: __________ DEMOLITION DATE: __________

Submit Additional Clearances as required: Asbestos Containing Material (ACM), Petroleum Contaminated Soil (PCS) Environmental Clearance Report, TCLP and check here ☐

**Certification**

**By signing this Clearance Request sheet, the undersigned certify:**

**a. This waste is not a "Hazardous Waste" as defined by EPA or the State of Hawaii.**

**b. This waste does not contain regulated radioactive materials or regulated concentrations of PCBs (Polychlorinated Biphenyls).**

**c. The statements and attachments contain true and accurate descriptions of the waste. All relevant information regarding known or suspected hazards in the possession of the undersigned has been disclosed.**

**d. The analytical data presented herein or attached hereto were derived from testing representative samples taken in accordance with the DOH Technical Guidance Manual for Underground Storage Tank Closure and Release Response (August 1992 and subsequent amendments/revisions) and EPA SW-846.**

**e. If any changes occur in the character of the waste, the undersigned shall notify a Nanakuli Landfill representative immediately.**

**f. The waste is not generated from a CERCLA site.**

**The undersigned hereby certify that the above information is true and correct:**

BILL CHARGES TO: ______________________________ DATE: __________
AUTHORIZED SIGNATURE: ______________________________ TITLE: __________

OWNER OF PROPERTY OR
AUTHORIZED AGENT: ______________________________ DATE: __________
AUTHORIZED SIGNATURE: ______________________________ TITLE: __________

DEMOLITION CONTRACTOR: ______________________________ DATE: __________
AUTHORIZED SIGNATURE: ______________________________ TITLE: __________

TRANSPORTER: ______________________________ DATE: __________
AUTHORIZED SIGNATURE: ______________________________ TITLE: __________

**FOR OFFICE USE ONLY**

Clearance No: __________ Entered by: __________ Date: __________

Inspection Date: __________ ( ) Approved ( ) Declined Initials: ______ Date: __________

Compuweigh: Entered by: ______ Date: __________ Filed by: __________

Comments: ______________________________

______________________________

Additional Information:

- A. All Clearance Numbers expire in 6 months; submit a new Clearance Form for approval prior to expiration date.
- B. No Clearance Number will be issued or authorized during the weekend (Saturday/Sunday)
- C. TCLP required for all demolition and renovation projects.
- D. ONLY residential renovations do not require TCLP.
- E. *For additional transporters please use the "Transporter Authorization Form"

Revised: 10/06/2011

**PVT LAND COMPANY, LTD.**
87-2020 Farrington Hwy.
Waianae, HI 96792
Telephone Number (808) 668-4561/ Fax Number (808) 668-1368

# REQUEST FOR CLEARANCE NUMBER EXTENSION

BILL CHARGES TO: ____________________

CONTACT: ____________________

PHONE: (   ) ____________ FAX: (   ) ____________

CLEARANCE NUMBER: ____________ WASTE MATERIAL: ____________

JOBSITE: ____________________

____________________

REASON FOR EXTENSION: ____________________

PRINT NAME: ____________________

AUTHORIZED SIGNATURE: ____________________

**FOR OFFICE USE ONLY**

Inspection Date: __________ ( ) Approved ( ) Declined Initials______ Date______

Original Expiration Date: __________ New Expiration Date: __________

Comments: ____________________

****Note: Approved extensions will be valid for an additional three months.**
**Extensions can only be approved once per clearance number.**

Revised: 11/17/2011

PVT LAND COMPANY LTD.
87-2020 Farrington Hwy.
Waianae, HI 96792
Phone: (808) 668-4561 Fax: (808) 668-1368

## TRANSPORTER AUTHORIZATION

______________________________________, a customer ("Customer") of PVT Land Company Ltd. (PVT"), hereby authorizes the following transporter(s) to charge our account for the following job(s).

1. Site Address ____________________________________________

   Clearance No: ____________________________________________

   Name of Transporter(s) ____________________________________________

2. Site Address ____________________________________________

   Clearance No: ____________________________________________

   Name of Transporter(s): ____________________________________________

**PVT reserves the right to deny any customer or transporter, who is not in good standing with PVT Land Co., Ltd., access to the landfill.**

**As an integral part of this Authorization and as partial consideration for using the Nanakuli Landfill, Customer hereby agrees to indemnify, exonerate, defend and hold PVT, its parent and affiliate companies as well as any and all directors, officers, employees, attorneys and agents thereof, harmless against and from any and all liabilities, obligations, claims, demands, actions, losses, damages, injuries, deaths, costs and expenses (including, but not limited to, attorney's fees and costs) which arise as a result of Transporter's negligence, breach of contract, misconduct, acts or omissions in connection with Transporter's use of the Landfill and will reimburse PVT in respect of any liabilities as is more fully described in that Agreement by and between Customer and PVT dated ________________________.**

**CUSTOMER HEREBY CERTIFIES THAT IT HAS READ, REVIEWED AND UNDERSTANDS THE SPECIFIC TERMS AND CONDITIONS OF THIS INDEMNIFICATION CLAUSE, AS WELL AS THAT CONTAINED IN THE AFOREMENTIONED AGREEMENT AND HEREBY ACKNOWLEDGES, AGREES AND ACCEPTS THE TERMS AND CONDITIONS OF THE INDEMNIFICATION CLAUSES AS INDICATED BY THE FOLLOWING SIGNATURE(S) OF CUSTOMER OR CUSTOMER'S AGENT(S) AUTHORIZED TO BIND CUSTOMER TO ALL TERMS, CONDITIONS AND PROVISIONS OF THIS AUTHORIZATION. CUSTOMER FURTHER ACKNOWLEDGES THAT FAILURE TO SUBMIT THIS AUTHORIZATION MAY RESULT IN THE LANDFILL DENYING ACCESS TO ANY NON-AUTHORIZED TRANSPORTERS.**

**ACKNOWLEDGED AND AGREED:**

______________________________________
**"Customer" (Print your Company's Name)**

**By** ________________________________
**(Signature)**

________________________________
**It's (Title)**

# ASBESTOS POLICIES

1. All contractors/haulers must have an active account with PVT Land Company, Ltd. (PVT). Contractor and hauler must provide a local telephone number for emergency purposes.

2. All asbestos contractors must comply with the following conditions:
    a. All asbestos containing material (ACM) that is brought into PVT is required to be prepared properly for disposal.
    b. All ACM must be thoroughly wet down or encapsulated prior to containment by the operator preparing the debris for disposal.
    c. All ACM is to be double bagged or double wrapped in a minimum of 6mm thick plastic. The operator shall make every reasonable effort to avoid the release of any ACM at the landfill while unloading.
    d. All properly contained ACM must display **asbestos hazard warning labels** as well as labels that have the owner's name, address and telephone number.
    e. Any chemical (e.g. solvent used to remove VAT mastic) added to the ACM waste is required to be pre-approved by PVT prior to acceptance for disposal.
    f. A properly executed Asbestos Waste Shipment Record must accompany all loads of ACM.
    g. All other applicable state and federal regulations concerning this waste stream must be met prior to acceptance of disposal. It is the responsibility of the generator to know and comply with these regulations.

3. Asbestos will be accepted on **Tuesday and Thursday only,** unless canceled because of inclement weather or for safety reasons. PVT may determine another day as needed.
4. All Asbestos loads must be scheduled at least 24 hours before delivery. PVT has the right to turn away any load that is not scheduled.
5. Each asbestos load must be accompanied by a manifest. The operator and the driver hauling the load must sign the manifest.

**NO MANIFEST=NO DUMPING**

6. Each asbestos load accepted for dumping will be escorted and directed where to dump. Escort is to stand a safe distance away from unloading area and truck, while viewing load disposal.
7. Only ACM, doubled wrapped in 6mm plastic will be allowed in the asbestos pit.
8. If the asbestos load breaks open upon disposal and ACM is exposed, the PVT escort will notify the contractor, who will then be required to send a qualified individual to the landfill to cover the exposed area before the end of that day.
9. Last asbestos loads must be on the scale by 1:00 pm. Last hand unloads for asbestos loads must be on the scale by 12:30 pm. Scheduled loads that are not received will require re-scheduling for future delivery and acceptance.
10. The Weigh Master for PVT will be responsible for signing asbestos waste manifest, printing tag and returning copies to driver. Each load of asbestos received will then be logged into the daily log sheet, identifying contractor and jobsite. All tags with proper manifest attached will be filed for record purposes.
11. All asbestos will be covered at the end of the day. No bags are left exposed.

# ASBESTOS-CONTAINING MATERIALS
# SPECIAL CONDITIONS

1. All asbestos-containing materials (ACM) that are brought into the landfill are required to be prepared for disposal as though the ACM were friable (even if it has been determined to be non-friable).

2. All ACM must be thoroughly wet down or encapsulated prior to containment by the operator preparing the debris for disposal.

3. All ACM is to be double-bagged or double wrapped in a minimum of 6mm thick plastic. The operator shall make every reasonable effort to avoid the release of any ACM at the landfill.

4. All bagged or wrapped ACM must display asbestos hazard warning labels as well as labels that have the owner's name, address and telephone number.

5. Any chemical (e.g. solvent used to remove VAT mastic) added to the ACM waste is required to be pre-approved by the landfill's Operation's Manager prior to acceptance for disposal.

6. All loads of ACM must be accompanied by a properly executed Asbestos Waste Shipment Record.

7. All other applicable State and Federal regulations concerning this waste stream must be met prior to acceptance of this waste stream for disposal. It is the responsibility of the generator to know and comply with these regulations.

PVT LAND COMPANY LTD.
87-2020 Farrington Hwy, Waianae, Hawaii 96792
Tel: (808) 668-4561 Fax: (808) 668-1368

## AGREEMENT (ASBESTOS)

This Agreement dated ______________________, by and between PVT LAND COMPANY LTD. ("PVT") and ______________________________________________________, ("User"), whose principal business address is ______________________________________________________, business telephone number is (_____)_____________, and business fax number is (_____)_______________will allow User to dispose acceptable asbestos material in PVT Landfill ("landfill") in accordance with the terms and conditions of this Agreement.

1. **LANDFILL HOURS.** Subject to change without notice, the landfill will only accept asbestos on Tuesdays and Thursdays from 7:00 a.m. to 1:00 p.m. unless canceled due to rain. All asbestos loads must be scheduled twenty-four (24) hours before delivery. PVT has the right to turn away any load that is not scheduled. Further, PVT reserves the right to close and deny disposing at the landfill at any time for any purpose, including but not limited to the purposes of repair, maintenance and renovation of the landfill.

2. **RATES.** The rates and charges for disposing of asbestos material at the landfill are available for inspection at PVT's office or may be requested by contacting PVT. User acknowledges that these rates and charges are subject to change by PVT without notice.

3. **WASTE MATERIAL DESCRIPTION AND SITE UTILIZATION.** Materials received at the landfill include friable asbestos, such as roofing, ceiling and insulating materials, and fixed asbestos. All asbestos containing material ("ACM") that is brought into landfill is required to be prepared for disposal as though the ACM were friable, even if it has been determined to be non-friable. All ACM must be thoroughly wet down or encapsulated prior to containment by the operator preparing the debris for disposal. All ACM will be double bagged or double wrapped in plastic with a minimum thickness of six (6) millimeters. The User will make every reasonable effort to avoid the release of any ACM at the landfill. All bagged or wrapped ACM must display asbestos hazard warning labels, as well as labels that have the owner's name, address and telephone number. Any chemical (e.g., solvent used to remove VAT mastic) added to the ACM waste must be pre-approved by the landfill's Operation Manager prior to acceptance for disposal. All loads of ACM must be accompanied by a properly executed Asbestos Waste Shipment Record. All other applicable State and Federal Regulations concerning this waste stream must be met prior to acceptance of this waste stream for disposal. It is the responsibility of the User to know and comply with these regulations.

User shall not dispose any materials prohibited under any federal, state or local laws, ordinances or regulations, as they may be amended. Also, User shall not dispose at the landfill household debris, petroleum-contained materials, tires and all car parts, paper waste, appliances, barrels-drums, paints/solvents, sealers, adhesives, polychlorinated biphenyls ("PCB"), flammable explosives, radioactive materials, chemicals known to cause cancer or reproductive toxicity, pollutants, contaminants, hazardous wastes, toxic substances or related materials, including but not limited to, any substances defined as or included in the definition of "hazardous substances," "hazardous wastes," "extremely hazardous wastes," "hazardous materials," or "toxic substances," under any federal, state or local laws, ordinances or regulations, now or hereafter in effect, relating to environmental conditions, industrial hygiene or Hazardous Substances, including but not limited to the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 U.S.C. Section 9601, et seq., the Hazardous Materials Transportation Act, 49 U.S.C. Section 7401, et seq., the Toxic Substances Control Act, 15 U.S.C. Sections 2601 through 2629, the Safe Drinking Water Act, 42 U.S.C. Sections 300f through 300j, the Clean Air Act, 42 U.S.C. Sections 7401 through 7626; and any similar federal, state and local laws, ordinances and regulations now or hereafter adopted, published and/or promulgated pursuant thereto ("Hazardous Substance Laws"). User hereby accepts all responsibilities for screening, examining and inspecting all of User's loads to verify, ensure and guaranty that no load contains any aforementioned restricted and prohibited materials. User hereby acknowledges that PVT shall assume no responsibility for screening, examining or inspecting any or all loads delivered by User, except that User shall permit, and hereby gives its consent, to allow PVT to examine, screen and/or inspect any or all loads at any time at User's expense. User agrees that if any load contains any restricted or prohibited materials, User shall be responsible for the payment of any such loads, at regular PVT rates, and shall also be responsible for any additional fees for the processing/return of such 'oads, as determined from time to time by PVT.

4. **INSURANCE.** As a condition to the approval of this Agreement by PVT, User hereby agrees to provide PVT with a Certificate of Insurance which demonstrates that PVT has been named as an additional insured on User's insurance policy. Also, User, or User's insurance company must notify PVT of any and all changes made to such policy.

5. **INDEMNIFICATION.** As an integral part of this Agreement and as partial consideration for using the landfill, User hereby agrees to indemnify, exonerate, defend and hold PVT, its parent and affiliate companies as well as any and all directors, officers, employees, attorneys and agents thereof, harmless against and from and will reimburse PVT in respect of:

(a) Any and all liabilities, obligations, claims, demands, actions, losses, damages, injuries, deaths, costs and expenses (including, but not limited to, attorney's fees and costs) made against PVT which arise as a result of User's negligence, breach of contract, misconduct, acts or omissions in connection with User's use of the landfill.

(b) Any and all damage or deficiency resulting from any misrepresentation, breach or nonfulfillment of any term or provision of the Agreement, or from any misrepresentation in or omission from any Asbestos Waste Shipment Record form, document or other instrument furnished or to be furnished to PVT.

(c) Any and all claims, losses, damages, liabilities, fines, penalties, charges, administrative and judicial proceedings and orders, judgments, remedial action requirements, enforcement actions of any kind, and any and all costs and expenses incurred in connection therewith (including, but not limited to, attorney's fees and costs), arising directly or indirectly, in whole or in part, out of any disposing in the landfill of any restricted or prohibited materials stated in paragraph 3 above.

(d) Any and all actions, suits, proceedings, demands, claims, judgments and orders, including, but not limited to, attorney's fees and costs incident to this Agreement.

This Indemnification clause shall be enforceable and remain in force and effect during the duration of this Agreement and shall continue and remain in force and effect after the termination of this Agreement. At all times during the duration of and after the termination of this Agreement, the terms of this Indemnification clause shall be subject to all Hazardous Substance Laws now or hereafter in effect.

**USER HEREBY CERTIFIES THAT IT HAS READ, REVIEWED AND UNDERSTANDS THE SPECIFIC TERMS AND CONDITIONS OF THIS INDEMNIFICATION CLAUSE AND ALSO HEREBY EXPRESSLY AND SPECIFICALLY ACKNOWLEDGES, AGREES AND ACCEPTS THE TERMS AND CONDITIONS OF THIS INDEMNIFICATION CLAUSE AS INDICATED BY THE FOLLOWING INITIALS OF USER OR USER'S AUTHORIZED AGENT(S).**

INITIALS:____________________ DATED:____________________

INITIALS:____________________ DATED:____________________

This section needs to be initialed by the homeowner or an officer of the company.

6. **ACCESS CONTROL.** The landfill will accept ACM on a prearranged basis only. An Asbestos Disposal Notification form must be completed and submitted to the PVT Office in advance of any ACM being accepted for disposal. All asbestos loads must be scheduled twenty-four (24) hours before delivery and accompanied by a properly executed Asbestos Waste Shipment Record. Additionally, each Asbestos Waste Shipment Record must be signed by both the operator and transporter hauling said load to landfill. No dumping will be allowed without the Asbestos Waste Shipment Record.

7. **COMPLIANCE WITH LANDFILL POLICIES AND PROCEDURES.** User agrees to comply with PVT's landfill policies and procedures which are available for inspection at PVT's offices or which may be requested by contacting PVT. User acknowledges that these policies and procedures may be changed by PVT without notice. Failure to comply with these policies and procedures may result in the denial of disposing at the landfill.

8. **PAYMENTS.** The terms of payment shall be governed by the Credit Agreement between PVT and User, the terms and conditions of which are incorporated herein by reference.

9. **DEFAULT.** Any default of any provision of this Agreement by User may result in the immediate suspension or termination, without notice, of this Agreement at the election of PVT. Further, in the event PVT is forced to hire a collection agency or attorney to collect any monies owed to PVT under this Agreement, PVT shall also be entitled to recover from User PVT's collection expenses, including, but not limited to, its attorney's fees and costs. Any suspension or termination, however, shall not relieve User of any and all outstanding obligations, responsibilities or duties under this Agreement, including, but not limited to, those obligations relating to indemnification and payments.

10. **TERMINATION.** This Agreement may be terminated by either party at any time for any reason. Any termination, however, shall not relieve User of any or all outstanding obligations, responsibilities or duties under this Agreement, including but not limited to those obligations relating to indemnification and payments.

11. **PVT'S RIGHT OF REJECTION.** PVT retains the right to reject any load where PVT has cause, for any reason, to believe said load may contain restricted or prohibited materials as stated in paragraph 3 above. Further, PVT reserves the right to reject any load which would be violative of any laws, ordinances or regulations (federal, state or local) now or hereafter in effect, or any load which would adversely impact the landfill.

12. **DELIVERY OF EXECUTED AGREEMENT VIA ELECTRONIC TRANSMISSION.** This Agreement, executed in whole or in counterparts, may be delivered through a facsimile machine or other electronic transmission and, if delivered in such manner, shall constitute the valid delivery of such executed Agreement and shall be legally binding upon the parties as if such executed Agreement were delivered in person.

**THE UNDERSIGNED HEREBY CERTIFIES THAT IT HAS REVIEWED AND READ THE FOREGOING TERMS, CONDITIONS AND PROVISIONS AND REPRESENTS THAT THE FOLLOWING SIGNATURE(S) ARE AUTHORIZED TO BIND USER AS TO ALL TERMS, CONDITIONS AND PROVISIONS OF THIS AGREEMENT.**

ACKNOWLEDGED AND AGREED:

______________________________
"USER" (Print your Company's Name)

By ______________________________
(Signature)
Its ______________________________
(Homeowner or Company Officer)

By______________________________
(Signature)
Its______________________________
(Homeowner or Company Officer)

# PVT Land Company, Inc.
## Asbestos Waste Shipment Record

1. Worksite & Mailing Address — Owner's Name — Owner's Phone No.

2. Operator's Name & Address — Operator's Phone No.

3. Waste Disposal Site (WDS) Name, Mailing Address & Location — WDS Phone No.
PVT Land Company, Inc.
87-2020 Farrington Hwy. Nanakuli, HI 96792
(808) 668-4561

4. Name & Address of Responsible Agency
Hawaii Department of Health - Clean Air Branch
919 Ala Moana Blvd. Honolulu, HI 96814
(808) 543-8200

| 5. Description of Materials | 6. Containers No. | Type | 7. Total Quantity Cm (Cyd) |
|---|---|---|---|
| **RACM** | | | |
| **Cat I ACM** | | | |
| **Cat II ACM** | | | |

8. Special Handling Instructions & Additional Information

9. OPERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.

Printed/Typed Name & Title — Signature — Mo / Day / Yr

10. Transporter 1 (Acknowledgement of Receipt of Materials)

Printed/Typed Name & Title — Signature — Mo / Day / Yr

Company Name & Address — Phone Number

11. Transporter 1 (Acknowledgement of Receipt of Materials)

Printed/Typed Name & Title — Signature — Mo / Day / Yr

Company Name & Address — Phone Number

12. Discrepancy Indication Space

13. Waste Disposal Site Owner or Operator

Certification of receipt of asbestos materials covered by this manifest except as noted in item 12.

Printed/Typed Name & Title — Signature — Mo / Day / Yr

## INSTRUCTIONS
ASBESTOS WASTE SHIPMENT RECORD

Waste Generator Section (Items 1-9)

1. Enter the name of the facility at which asbestos waste is generated and the address where the facility is located. In the appropriate spaces, also enter the name of the owner of the facility and the owner's phone number.

2. If a demolition or renovation, enter the name and address of the company and authorize agent responsible for performing the asbestos removal. In the appropriate space, also enter the phone number of the operator.

3. Enter the name, address and physical site location of the waste disposal site (WDS) that will be receiving the asbestos material. In the appropriate spaces, also enter the phone number of the WDS. Enter "on-site" if the waste will be disposed of on the generator's property.

4. Provide the name and address of the local, State or EPA Regional office responsible for administering the asbestos NESHAP program.

5. Indicate the types of asbestos waste materials generated. If from a demolition or renovation, indicate the amount of asbestos that is

   **-Friable asbestos material**
   **-Nonfriable asbestos material**

6. Enter the number of containers used to transport the asbestos materials listed in item 5. Also enter one of the following container codes used in transporting each type of asbestos material (specify any other type of container used I not listed below):

   **DM-Metal drums, barrels**
   **DP-Plastic drums, barrels**
   **BA-6 mil plastic bags or wrapping**

7. Enter the quantities of each type of asbestos material removed in units of cubic meters (cubic yards).

8. Use this space to indicate special transportation, treatment, storage or disposal or Bill of Lading information. If an alternate waste disposal site is designated, note if here. Emergency response telephone numbers or similar information may be included here.

NOTE: The waste generator must retain a copy of this form.

9. The authorized agent of the waste generator must read and then sign and date this certification. The date is the date of receipt by transporter.

Transporter Section (Items 10 & 11)

10. & 11. Enter name, address and telephone number of each transporter used, if applicable. Print or type the full name and title of person accepting responsibility and acknowledging receipt of material as listed on this waste shipment record for transport. Enter date of receipt and signature.

NOTE: The transporter must retain a copy of this form.

Disposal Site Section (Items 12 & 13)

12. The authorized representative of the WDS must note in this space any discrepancy between waste described on this manifest and waste actually received as well as any improperly enclosed or contained waste. Any rejected materials should be listed and destination of those materials provided. A site that converts asbestos-containing waste material to nonasbestos material is considered a WDS.

13. The signature (by hand) of the authorized WDS agent indicates acceptance and agreement with statements on this manifest except as noted in Item 12. The date is the date of signature and receipt of shipment.

NOTE: The WDS must retain a completed copy of this form. The WDS must also send a completed copy to the operator listed in item 2.

PVT LAND COMPANY LTD.
87-2020 Farrington Hwy, Waianae, Hawaii 96792
Tel: (808) 668-4561    Fax: (808) 668-1368

# PETROLEUM CONTAMINATED SOIL AGREEMENT

This Agreement dated ______________________, by and between PVT LAND COMPANY LTD. ("PVT") and ____________________________________________________, ("User"), whose principal business address is ____________________________________________________, business telephone number is (_____)______________, and business fax number is (_____)________________ will allow User to dispose acceptable Petroleum Contaminated Soil material in PVT Landfill ("landfill") in accordance with the terms and conditions of this Agreement.

1. **LANDFILL HOURS.** Subject to change without notice, the landfill will only accept Petroleum Contaminated Soil loads Mondays through Fridays from 7:00 a.m. to 3:30 p.m., unless canceled due to rain. All Petroleum Contaminated Soil loads must be scheduled twenty-four (24) hours before delivery. PVT has the right to turn away any load that is not scheduled. Unless otherwise notified, landfill hours shall not include Saturdays, Sundays, federal holidays and state holidays. Further, PVT reserves the right to close and deny disposing at the landfill at any time for any purpose, including but not limited to the purposes of repair, maintenance and renovation of the landfill.

2. **RATES.** The rates and charges for disposing of Petroleum Contaminated Soil material at the landfill are available for inspection at PVT's office or may be requested by contacting PVT. User acknowledges that these rates and charges are subject to change by PVT without notice.

3. **MINIMUM ANALYTICAL REQUIREMENT FOR INCOMING PETROLEUM-CONTAMINATED SOIL.**

(a) In accordance with the Department of Health (DOH) Office of Solid Waste Management (OSWM) permit RM-0029-95, only petroleum contaminated soil from known sources can be accepted for treatment. Generators must provide reliable documentation describing the nature and source of the contamination. Allowable petroleum contaminants are limited to the following petroleum products: gasoline, diesel or heavier oils. Soils containing other petroleum derived contaminants cannot be accepted into the facility. Soils containing greater than 1.0 ppm polychlorinated biphenyl's (PCB's) cannot be accepted for treatment.

(b) All incoming petroleum contaminated soil must be tested prior to acceptance for treatment. The primary purpose of this testing is to screen for potential constituents, such as metals, which could preclude acceptance for treatment. The secondary purpose of this testing is to provide an indication of the approximate magnitude of the contamination which is used by the facility for internal handling process treatment purposes. The testing protocol outlined below is not intended for use determining "clean" versus "contaminated" material. All soil which has been impacted by petroleum or has otherwise been generated as a result of a remedial activity for petroleum contamination will be considered contaminated and subject to applicable treatment and disposal fees prior to acceptance at the facility. The minimum requirements for sampling and chemical testing of incoming soil are as follows:

(i) **Sampling Frequency and Procedures:**

Samples for chemical testing must be collected and preserved in accordance with the DOH UST Technical Guidance Manual (August 1992) and EPA SE-846. Persons conducting the sampling must be qualified (experienced) environmental professionals. Sampling locations should generally be randomly selected to be representative of the soil, but should include any suspected "hot spots". Samples of stockpiled soil should be collected from interior portions of the stockpile as opposed to near the surface. Potential problems during our review of sampling procedures and laboratory test data may be minimized by discussing the sampling and testing procedures in advance with the environmental consultant for the treatment facility.

Representatives of the PVT Treatment Facility and the environmental consultant for the treatment facility shall be permitted to inspect prospective soil at the site of origin prior to delivery to the treatment facility.

<u>Sampling frequency for quantity of less than 200 tons</u>. At least one discreet representative soil sample per 25 tons shall be collected. Samples may be composited by the laboratory (not in the field) for testing at not less than one set of tests per 100 tons of soil (up to four samples per composite).

<u>Sampling frequency for quantity of 200 or more tons</u>. At least one discreet representative soil sample per 50 tons shall be collected. Samples may be composited by the laboratory (not in the field) for testing at no less than one set of test per 200 tons of soil.

Note: Overestimating tonnage for determining frequency of sampling and testing is recommended. All incoming soil is weighed upon arrival at the facility.

(ii) **Laboratory Testing Protocol:**

Samples must be delivered in a chilled state within 24 hours to a chemical testing laboratory. The chemical testing laboratory must be approved for use by the environmental consultant for the treatment facility. If the environmental consultant for the treatment facility is unfamiliar with the testing laboratory, a statement of qualifications and/or quality assurance documents may be required to be submitted from the laboratory for review.

The following chemical testing is required:

- Toxicity Characteristic Leaching Procedure (TCLP) metals including
  - TCLP cadmium (EPA method 1311 / 7130 or 6010),

-TCLP chromium (EPA method 1311 / 7190 or 6010), and
-TCLP lead (EPA method 1311 / 7420 or 6010;

- Ignitability;

- Total metals including
  - -Total cadmium (EPA 3050 / 6010 or 7130), and
  - -Total lead (EPA 3050 / 6010 or 7420;

- Total petroleum hydrocarbons (TPH) appropriate to the contaminant(s):
  - -TPH as gasoline (EPA method 5030 / 8015) and/or
  - -TPH as diesel (EPA method 3550 / 8015), and/or
  - -TPH as oil (EPA method 418.1 or 503E);

- Benzene, toluene, ethylbenzene, xylenes (BTEX;EPA method 5030 / 8020 or 8240);

- Polynuclear aromatic hydrocarbons (PAHs; EPA method 3550 / 8270 or 8310) [not applicable to soil solely contaminated with gasoline]:

- Polychlorinated biphenyl's (PCBs; EPA method 3550 / 8080) [not applicable to soil solely contaminated with gasoline or diesel fuel];

- Halogenated volatile organic compounds (HVOCs; EPA method 5030 / 8010) [not applicable to soil solely contaminated with gasoline or diesel fuel].

Additional testing and/or supplemental information on the soil may be requested on a case-by case basis.

(c) Laboratory test report should be submitted to the PVT Soil Reclamation facility for review along with a completed soil Profile Sheet prior to acceptance or rejection of soil for treatment. Laboratory test reports must be signed by a representative of the testing laboratory and include copies of chain-of-custody records. A description of the sampling procedures and site plot plan showing where the soil originated, and where samples were collected is also required. All test data for the material must be submitted, including any analytical data for constituents not listed above.
Discussions regarding suitability of soil for acceptance are made by the PVT Soil Reclamation facility and their environmental consultant based on the laboratory test data submitted and review of sampling procedures. PVT soil Reclamation facility reserves the right to accept or reject any soil for any reason. Conducting sampling and laboratory testing in accordance with the above requirements confers no rights to the person or persons undertaking the effort.

Questions regarding the above requirements may be directed to Mr. Steve Joseph of the PVT Soil Reclamation Facility at (808) 668-4561.

In addition, all other applicable State and Federal Regulations concerning disposal of Petroleum Contaminated Soil material must be met prior to acceptance of this material for disposal. It is the responsibility of the User to know and comply with these regulations.

(d) User shall not dispose any materials prohibited under any federal, state or local laws, ordinances or regulations, as they may be amended. Also, User shall not dispose at the landfill household debris, petroleum-contained materials, tires and all car parts, paper waste, appliances, barrels-drums, paints/solvents, sealers, adhesives, polychlorinated biphenyls ("PCB"), flammable explosives, radioactive materials, chemicals known to cause cancer or reproductive toxicity, pollutants, contaminants, hazardous wastes, toxic substances or related materials, including but not limited to, any substances defined as or included in the definition of "hazardous substances," "hazardous wastes," "extremely hazardous wastes," "hazardous materials," or "toxic substances," under any federal, state or local laws, ordinances or regulations, now or hereafter in effect, relating to environmental conditions, industrial hygiene or Hazardous Substances, including but not limited to the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 U.S.C. Section 9601, et seq., the Hazardous Materials Transportation Act, 49 U.S.C. Section 7401, et seq., the Toxic Substances Control Act, 15 U.S.C. Sections 2601 through 2629, the Safe Drinking Water Act, 42 U.S.C. Sections 300f through 300j, the Clean Air Act, 42 U.S.C. Sections 7401 through 7626; and any similar federal, state and local laws, ordinances and regulations now or hereafter adopted, published and/or promulgated pursuant thereto ("Hazardous Substance Laws"). User hereby accepts all responsibilities for screening, examining and inspecting all of User's loads to verify, ensure and guaranty that no load contains any aforementioned restricted and prohibited materials. User hereby acknowledges that PVT shall assume no responsibility for screening, examining or inspecting any or all loads delivered by User, except that User shall permit, and hereby gives its consent, to allow PVT to examine, screen and/or inspect any or all loads at any time at User's expense. User agrees that if any load contains any restricted or prohibited materials, User shall be responsible for the payment of any such loads, at regular PVT rates, and shall also be responsible for any additional fees for the processing/return of such loads, as determined from time to time by PVT.

4. **INSURANCE.** As a condition to the approval of this Agreement by PVT, User hereby agrees to provide PVT with a Certificate of Insurance which demonstrates that PVT has been named as an additional insured on User's insurance policy. Also, User, or User's insurance company must notify PVT of any and all changes made to such policy.

5. **INDEMNIFICATION.** As an integral part of this Agreement and as partial consideration for using the landfill, User hereby agrees to indemnify, exonerate, defend and hold PVT, its parent and affiliate companies as well as any and all directors, officers, employees, attorneys and agents thereof, harmless against and from and will reimburse PVT in respect of:

(a) Any and all liabilities, obligations, claims, demands, actions, losses, damages, injuries, deaths, costs and expenses (including, but not limited to, attorney's fees and costs) made against PVT which arise as a result of User's negligence, breach of contract, misconduct, acts or omissions in connection with User's use of the landfill.

(b) Any and all damage or deficiency resulting from any misrepresentation, breach or nonfulfillment of any term or provision of the Agreement, or from any misrepresentation in or omission from any form, document or other instrument furnished or to be furnished to PVT.

(c) Any and all claims, losses, damages, liabilities, fines, penalties, charges, administrative and judicial proceedings and orders, judgments, remedial action requirements, enforcement actions of any kind, and any and all costs and expenses incurred in connection therewith (including, but not limited to, attorney's fees and costs), arising directly or indirectly, in whole or in part, out of any disposing in the landfill of any restricted or prohibited materials stated in paragraph 3 above.

(d) Any and all actions, suits, proceedings, demands, claims, judgments and orders, including, but not limited to, attorney's fees and costs incident to this Agreement.

This indemnification clause shall be enforceable and remain in force and effect during the duration of this Agreement and shall continue and remain in force and effect after the termination of this Agreement. At all times during the duration of and after the termination of this Agreement, the terms of this indemnification clause shall be subject to all Hazardous Substance Laws now or hereafter in effect.

**USER HEREBY CERTIFIES THAT IT HAS READ, REVIEWED AND UNDERSTANDS THE SPECIFIC TERMS AND CONDITIONS OF THIS INDEMNIFICATION CLAUSE AND ALSO HEREBY EXPRESSLY AND SPECIFICALLY ACKNOWLEDGES, AGREES AND ACCEPTS THE TERMS AND CONDITIONS OF THIS INDEMNIFICATION CLAUSE AS INDICATED BY THE FOLLOWING INITIALS OF USER OR USER'S AUTHORIZED AGENT(S).**

INITIALS:____________________ DATED:____________________
INITIALS:____________________ DATED:____________________

This section needs to be initialed by the homeowner or and officer of the company.

6. **ACCESS CONTROL.** The landfill will accept Petroleum Contaminated Soil on a pre-arranged basis only. All loads must be scheduled twenty-four (24) hours before delivery and accompanied by a properly executed Uniform Solid Waste Manifest. No dumping will be allowed without the Uniform Solid Waste Manifest.

7. **COMPLIANCE WITH LANDFILL POLICIES AND PROCEDURES.** User agrees to comply with PVT's landfill policies and procedures which are available for inspection at PVT's office or which may be requested by contacting PVT. User acknowledges that these policies and procedures may be changed by PVT without notice. Failure to comply with these policies and procedures may result in the denial of disposing at the landfill.

8. **PAYMENTS.** The terms of payment shall be governed by the Credit Agreement between PVT and User, the terms and conditions of which are incorporated herein by reference.

9. **DEFAULT.** Any default of any provision of this Agreement by User may result in the immediate suspension or termination, without notice, of this Agreement at the election of PVT. Further, in the event PVT is forced to hire a collection agency or attorney to collect any monies owed to PVT under this Agreement, PVT shall also be entitled to recover from User PVT's collection expenses, including, but not limited to, its attorney's fees and costs. Any suspension or termination, however, shall not relieve User of any and all outstanding obligations, responsibilities or duties under this Agreement, including, but not limited to, those obligations relating to indemnification and payments.

10. **TERMINATION.** This Agreement may be terminated by either party at any time for any reason. Any termination, however, shall not relieve User of any or all outstanding obligations, responsibilities or duties under this Agreement, including but not limited to those obligations relating to indemnification and payments.

11. **PVT'S RIGHT OF REJECTION.** PVT retains the right to reject any load where PVT has cause, for any reason, to believe said load may contain restricted or prohibited materials as stated in paragraph 3 above. Further, PVT reserves the right to reject any load which would be violative of any laws, ordinances or regulations (federal, state or local) now or hereafter in effect, or any load which would adversely impact the landfill.

12. **DELIVERY OF EXECUTED AGREEMENT VIA ELECTRONIC TRANSMISSION.** This Agreement, executed in whole or in counterparts, may be delivered through a facsimile machine or other electronic transmission and, if delivered in such manner, shall constitute the valid delivery of such executed Agreement and shall be legally binding upon the parties as if such executed Agreement were delivered in person.

**THE UNDERSIGNED HEREBY CERTIFIES THAT IT HAS REVIEWED AND READ THE FOREGOING TERMS, CONDITIONS AND PROVISIONS AND REPRESENTS THAT THE FOLLOWING SIGNATURE(S) ARE AUTHORIZED TO BIND USER AS TO ALL TERMS, CONDITIONS AND PROVISIONS OF THIS AGREEMENT.**

ACKNOWLEDGED AND AGREED:

________________________________
**"USER"** (Print your Company's Name)

By ____________________________
(Signature)
Its ____________________________
(Homeowner or Company Officer)

By ____________________________
(Signature)
Its____________________________
(Homeowner or Company Officer)

# PVT Land Co. Ltd.
# NANAKULI LANDFILL FACILITY
## Soil Profile Sheet

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**1. Soil Generator Information**

a. Generator Name:__________
b. Generator Address:__________ c. Zip Code:__________
d. Address of Soil Generation: __________
e. Address of Soil Storage (if different from source address)__________
f. Type of Facility Soil Has Been Generated From:__________
g. State DOH Facility ID#:__________
h. Contact:__________ i. Phone: (_____) __________

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**2. Soil Information**

a. Name of Contaminant(s):__________
b. Amount of Soil (tons and/or cubic yards)__________
c. Type of Soil:__________
d. Soil Moisture: Wet:__________ Damp:__________ Dry:__________
e. Soil Color (Munsell Color Chart Code if available)__________
f. Strong incidental odor ? No ☐ Yes ☐ Describe:__________
g. pH __________
h. Is the soil ignitable? Yes ☐ No ☐

i. Describe the circumstances by which the soil has been generated.

__________

__________

---

**3. Transportation Information**

a. Method of Shipment: Bulk Solid__________ Drum/Box__________ Other__________
b. Transportation Company:

c. Is this a U. S. Department of Transportation (USDOT) Hazardous Material? Yes ☐ No ☐

**4. Chemical Contaminants** (Attach supplementary sheets if necessary)

| | | Range(Min-Max) |
|---|---|---|
| a. | __________ | _____ - _____ppm. |
| b. | __________ | _____ - _____ppm. |
| c. | __________ | _____ - _____ppm. |
| d. | __________ | _____ - _____ppm. |
| e. | __________ | _____ - _____ppm. |
| f. | __________ | _____ - _____ppm. |
| g. | __________ | _____ - _____ppm. |
| h. | __________ | _____ - _____ppm. |
| i. | __________ | _____ - _____ppm. |

Attach copies of analytical reports and chain of custody documentation.
Attach a description of the soil sampling procedures.
Attach a site plan showing where the soil originated, and where samples were collected.

Continued

j. Does the soil contain any of the following (provide concentration if known)

PCBs Yes ☐ No ☐ _______ppm
Cyanides Yes ☐ No ☐ _______ppm
Sulfides Yes ☐ No ☐ _______ppm
Asbestos Yes ☐ No ☐ _______%

k. Indicate method used to determine the presence or absence of items listed in section j.

l. Sampling Source(e.g., Drum, Pit, Pile, Insitu, etc.)________________

m. Does the waste represented by this profile contain any of the carcinogens that require OSHA notification? Yes ☐ No ☐
n. Does the waste represented by this profile contain dioxins? Yes ☐ No ☐ (List in Section 4)
o. Does the waste represented by this profile contain asbestos? Yes ☐ No ☐ If yes, friable ☐ non-friable ☐.
p. Does the waste represented by this profile contain benzene? Yes ☐ No ☐
q. Is the waste subject to RCRA Subpart CC Controls? Yes ☐ No ☐
r. Does the waste contain any Class I or Class II ozone-depleting substances? (Freons) Yes ☐ No ☐
s. Does the waste contain debris? Yes ☐ No ☐ (List, if yes)________________
t. Personal Protective Equipment Requirements:________________
u. Is this a state hazardous waste? Yes ☐ No ☐ (List, if yes)________________
v. Is the Waste from a CERCLA or state mandated clean-up? Yes ☐ No ☐ (If yes, provide relevant documentation.)
w. Does the waste represented by this waste profile contain concentrations of PCBs regulated by 40 CFR ? Yes ☐ No ☐
x. Does the waste represented by waste profile contain radioactive material or disposal regulated by the NRC? Yes ☐ No ☐
y. Does the waste profile and all attachments contain true and accurate descriptions of the waste material, and has all relevant information within the possession of the Generator regarding known or suspected hazards pertaining to the waste been disclosed to the contractor? Yes ☐ No ☐

**5. Generator's or Representative's Certification**

a. Print Sampler's Name:________________ b. Sample Date:________________
c. Sampler's Title:________________
d. Sampler's Employer (if other than Generator):________________

The sampler's signature certifies that any sample submitted is representative of the soil described above pursuant to the DOH Technical Guidance Manual for Underground Storage Tank Closure and Release Response (August 1992) and EPA SW-846.

e. Sampler's Signature:________________

Continued

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**6. Generator Certification**

By signing this soil profile sheet, the Generator certifies:

a. This soil is not a "Hazardous Waste" as defined by EPA or the State of Hawaii.

b. This waste does not contain regulated radioactive materials or regulated concentrations of PCBs (Polychlorinated Biphenyls).

c. The statements and attachments contain true and accurate descriptions of the soil. All relevant information regarding known or suspected hazards in the possession of the Generator has been disclosed.

d. The analytical data presented herein or attached hereto were derived from testing representative samples taken in accordance with the DOH Technical Guidance Manual for Underground Storage Tank Closure and Release Response (August 1992 and subsequent amendments/revisions) and EPA SW-846.

e. If any changes occur in the character of the soil, the Generator shall notify a Nanakuli Landfill representative immediately.

f. Signature____________________ g. Company____________________

h. Name and Title____________________ i. Date____________________

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**7. PVT Co. Ltd. Waste Disposal Decision (<u>For PVT Use Only</u>)**

a. Waste Disposal Decision ______ Accepted ______ Rejected

b. Disposal Method ______ Landfill ______ Asbestos Pit

c. Precautions, Special Handling Procedures, or Limitations on Approval: ____________________

d. Clearance No. ____________________ Date:____________________

e. Reviewed by ____________________ Date:____________________

f. Approved by ____________________ Date:____________________

g. Forwarded to DOH:____________________ Date:____________________

## Additional Information for Contaminated Soil Reviews

1. Is this a hazardous waste (RCRA C)? ☐ Yes ☐ No
2. Does this waste contain heavy metals? ☐ Yes ☐ No
If yes, explain & identify ______
3. Does the waste contain PCBs? ☐ Yes ☐ No
If yes, explain ______
4. Is the waste a TSCA waste? ☐ Yes ☐ No
If yes, explain & identify ______
5. Is the waste a CERCLA waste? ☐ Yes ☐ No
If yes, explain & identify ______
6. Regulatory agency & Contact ______
7. Generator ______
8. Type of Contamination ______
9. Consultant Name & Number ______
10. Review report attached ______

If this certification is made by a broker, the undersigned signs as authorized agent of the generator and has confirmed the information contained in this Sheet and additionally attached sheets from information provided by the generator and additional information as it has determined to be reasonably necessary.

Certification Signature: ______ Title: ______
Name (Type or Print): ______ Company: ______ Date: ______

## Submittal Instructions

The following are the items that should be in any review report, in the order noted.

1. List of regulatory agencies and regulations applicable to the project. Include Names and contact information (phone numbers) for all agencies involved for follow up.
2. Contact information: generator, type of contamination, and site history in narrative form.
3. Consultant information (i.e. Names, phone numbers) include the consultant that did the original investigation and subsequent investigations.
4. Report format for technical information.
   - A. Background information for site and processes.
   - B. Summary of investigative action. Including sampling and testing information pertinent to disposal.
   - C. Summary of remedial actions and how material being disposed was generated.
   - D. Rational for the determination that material is solid waste this should be based on applicable regulations.
   - E. Site location maps and site drawings.
   - F. Summary table of test data.
   - G. Laboratory data.

## Actions Taken

Date ______
Accepted ______ Rejected ______
Reason for rejection ______

# NANAKULI SOIL RECLAMATION FACILITY

A PVT LAND CO., LTD. FACILITY

**87-2020 FARRINGTON HIGHWAY**

**NANAKULI, OAHU, HAWAII 96792**

**(808) 668-4561**

## UNIFORM SOLID WASTE MANIFEST

1. Manifest Document No.

2. Page No

3. Generators Name and Mailing Address

4. Origin Facility Name and Location

5. Generator's Phone No.

6. Transporter Company Name

7. Transporter's Phone No.

8. Designated Facility Name & Site Address

**Nanakuli soil Reclamation Facility**

**87-2020 Farrington Highway, Nanakuli, Hawaii 96792**

9. Facility's Phone No.

(808) 668-4561

| 10. Description (Including Proper Shipping Name and Class) | 11. Containers No. | 11. Containers Type | 12. Total Quantity | 13. Unit Wt / Vol | 14. Waste Code |
|---|---|---|---|---|---|
| a. Soil bearing residual amounts of petroleum hydrocarbons<br>EPA hazardous waste exemption 40 CFR 261.4(b)10<br>DOT shipping name: Non RCRA Solid N.O.S. | | | | | |
| | | | | | |

15. Additional Descriptions for Materials Listed Above

Container Codes:
B = bulk
S = sacked
D = drummed

Waste Codes:
G = Soil w/Gasoline Residue
D = Soil w/Diesel Residue
O = Soil w/Motor Oil Residue

**16. Special Handling Instructions and Additional Information**

**17. Generator's Certificate:** I hereby declare that the contents of this consignment are fully and accurately describe above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway and / or sea-going vessel according to applicable international and national government regulations.

Print Name / Typed Name

Signature

Date

18. Transporter Acknowledge of Receipt of Materials

Print Name / Typed Name

Signature

Date

19. Designated Facility Acknowledgement of Material Received

Print Name / Typed Name

Signature

Date

PVT LAND COMPANY LTD.
37-2020 Farrington Hwy, Waianae, Hawaii 96792
Tel: (808) 668-4561 Fax: (808) 668-1368

# AGREEMENT (SOLIDIFICATION)

This Agreement dated _______________________, by and between PVT LAND COMPANY LTD. ("PVT") and ______________________________________________________________, ("User"), whose principal business address is ______________________________________________________________, business telephone number is _(_____)_______________, and business fax number is _(_____)________________will allow User to dispose acceptable bioremediation material in PVT Landfill ("landfill") in accordance with the terms and conditions of this Agreement.

1 **LANDFILL HOURS.** Subject to change without notice, the landfill will only accept solidification loads by prior approval Mondays through Fridays from 7:00 a.m. to 3:30 p.m., unless canceled due to rain. All solidification loads must be scheduled twenty-four (24) hours before delivery. PVT has the right to turn away any load that is not scheduled. Unless otherwise notified, landfill hours shall not include Saturdays, Sundays, federal holidays and state holidays. Further, PVT reserves the right to close and deny disposing at the landfill at any time for any purpose, including but not limited to the purposes of repair, maintenance and renovation of the landfill.

2. **RATES.** The rates and charges for disposing of solidification material at the landfill are available for inspection at PVT's office or may be requested by contacting PVT. User acknowledges that these rates and charges are subject to change by PVT without notice.

3. **MINIMUM ANALYTICAL REQUIREMENT FOR INCOMING SOLIDIFICATION MATERIAL.**

(a) In accordance with the Department of Health (DOH) Office of Solid Waste Management (OSWM) permit RM-0029-95, only liquids and sludges from known sources can be accepted for solidification. Generators must provide reliable documentation describing the nature and source of the liquid or sludge. Allowable petroleum contaminants are limited to the following petroleum products: gasoline, diesel or heavier oils. Liquids and sludges containing other petroleum derived contaminants can be accepted into the facility on a case by case basis. Liquids containing greater than 50 ppm polychlorinated biphenyl's (PCB's) cannot be accepted for solidification.

(b) All incoming liquids and sludges must be tested prior to acceptance for solidification. The primary purpose of this testing is to screen for potential constituents, such as metals, which could preclude acceptance for solidification and disposal. The secondary purpose of this testing is to provide an indication of the approximate magnitude of the contamination which is used by the facility for internal handling, process treatment and disposal purposes. The testing protocol outlined below is not intended for use determining "clean" versus "contaminated" material. All liquids and sludges which have been impacted by petroleum or have otherwise been generated as a result of site activity will be considered contaminated and subject to applicable treatment and disposal fees prior to acceptance at the facility. The minimum requirements for sampling and chemical testing of incoming liquids and sludges are as follows:

(i) **Sampling Frequency and Procedures:**

Samples for chemical testing must be collected and preserved in accordance with the DOH UST Technical Guidance Manual (August 1992) and EPA SE-846. Persons conducting the sampling must be qualified (experienced) environmental professionals. Sampling locations should generally be randomly selected to be representative of the liquid or sludge, but should include any suspected "hot spots". Samples of stored liquids or sludges should be collected from representative portions of the stored material as opposed to near the surface. Potential problems during our review of sampling procedures and laboratory test data may be minimized by discussing the sampling and testing procedures in advance with the staff of the treatment facility.

Representatives of the PVT Treatment Facility and the environmental consultant for the treatment facility shall be permitted to inspect prospective material for solidification at the site of origin prior to delivery to the treatment facility

Sampling frequency for quantity of less than 50 tons. At least one discreet representative material sample per 25 tons shall be collected. Samples may be composited by the laboratory (not in the field) for testing at not less than one set of tests per 100 tons of soil (up to four samples per composite).

Sampling frequency for quantity of 200 or more tons. At least one discreet representative material sample per 50 tons shall be collected. Samples may be composited by the laboratory (not in the field) for testing at no less than one set of test per 200 tons of material.

Note: Overestimating tonnage for determining frequency of sampling and testing is recommended. All incoming material is weighed upon arrival at the facility.

(ii) **Laboratory Testing Protocol:**

Samples must be delivered in a chilled state within 24 hours to a chemical testing laboratory. The chemical testing laboratory must be approved for use by the environmental consultant for the treatment facility. If the environmental consultant for the treatment facility is unfamiliar with the testing laboratory, a statement of qualifications and/or quality assurance documents may be required to be submitted from the laboratory for review.

The following chemical testing is required:

- Toxicity Characteristic Leaching Procedure (TCLP) metals including
  - TCLP cadmium (EPA method 1311 / 7130 or 6010),

-TCLP chromium (EPA method 1311 / 7190 or 6010), and
-TCLP lead (EPA method 1311 / 7420 or 6010;

- Ignitability;

- Total metals including
    - -Total cadmium (EPA 3050 / 6010 or 7130), and
    - -Total lead (EPA 3050 / 6010 or 7420;

- Total petroleum hydrocarbons (TPH) appropriate to the contaminant(s):
    - -TPH as gasoline (EPA method 5030 / 8015),and/or
    - -TPH as diesel (EPA method 3550 / 8015), and/or
    - -TPH as oil (EPA method 418.1 or 503E);

- Benzene, toluene, ethylbenzene, xylenes (BTEX;EPA method 5030 / 8020 or 8240);

- Polynuclear aromatic hydrocarbons (PAHs; EPA method 3550 / 8270 or 8310) [not applicable to material solely contaminated with gasoline]:

- Polychlorinated biphenyl's (PCBs; EPA method 3550 / 8080) [not applicable to material solely contaminated with gasoline or diesel fuel];

- Halogenated volatile organic compounds (HVOCs; EPA method 5030 / 8010) [not applicable to material solely contaminated with gasoline or diesel fuel].

Additional testing and/or supplemental information on the solidification material may be requested on a case-by case basis.

(c) Laboratory test report should be submitted to the PVT Solidification facility for review along with a completed a Solidification Profile Sheet prior to acceptance or rejection of material for solidification. Laboratory test reports must be signed by a representative of the testing laboratory and include copies of chain-of-custody records. A description of the sampling procedures and site plot plan showing where the material originated, and where samples were collected is also required. All test data for the material must be submitted, including any analytical data for constituents not listed above.
Discussions regarding suitability of material for acceptance are made by the PVT Solidification facility and their environmental consultant based on the laboratory test data submitted and review of sampling procedures. PVT solidification facility reserves the right to accept or reject any material for any reason. Conducting sampling and laboratory testing in accordance with the above requirements confers no rights to the person or persons undertaking the effort.

Questions regarding the above requirements may be directed to Mr. Steve Joseph of the PVT Solidification Facility at (808) 668-4561.

In addition, all other applicable State and Federal Regulations concerning disposal of solidification material must be met prior to acceptance of this material for disposal. It is the responsibility of the User to know and comply with these regulations.

(d) User shall not dispose any materials prohibited under any federal, state or local laws, ordinances or regulations, as they may be amended. Also, User shall not dispose at the landfill household debris, petroleum-contained materials, tires and all car parts, paper waste, appliances, barrels-drums, paints/solvents, sealers, adhesives, polychlorinated biphenyls ("PCB"), flammable explosives, radioactive materials, chemicals known to cause cancer or reproductive toxicity, pollutants, contaminants, hazardous wastes, toxic substances or related materials, including but not limited to, any substances defined as or included in the definition of "hazardous substances," "hazardous wastes," "extremely hazardous wastes," "hazardous materials," or "toxic substances," under any federal, state or local laws, ordinances or regulations, now or hereafter in effect, relating to environmental conditions, industrial hygiene or Hazardous Substances, including but not limited to the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 U.S.C. Section 9601, et seq., the Hazardous Materials Transportation Act, 49 U.S.C. Section 7401, et seq., the Toxic Substances Control Act, 15 U.S.C. Sections 2601 through 2629, the Safe Drinking Water Act, 42 U.S.C. Sections 300f through 300j, the Clean Air Act, 42 U.S.C. Sections 7401 through 7626; and any similar federal, state and local laws, ordinances and regulations now or hereafter adopted, published and/or promulgated pursuant thereto ("Hazardous Substance Laws"). User hereby accepts all responsibilities for screening, examining and inspecting all of User's loads to verify, ensure and guaranty that no load contains any aforementioned restricted and prohibited materials. User hereby acknowledges that PVT shall assume no responsibility for screening, examining or inspecting any or all loads delivered by User, except that User shall permit, and hereby gives its consent, to allow PVT to examine, screen and/or inspect any or all loads at any time at User's expense. User agrees that if any load contains any restricted or prohibited materials, User shall be responsible for the payment of any such loads, at regular PVT rates, and shall also be responsible for any additional fees for the processing/return of such loads, as determined from time to time by PVT.

4. **INSURANCE.** As a condition to the approval of this Agreement by PVT, User hereby agrees to provide PVT with a Certificate of Insurance which demonstrates that PVT has been named as an additional insured on User's insurance policy. Also, User, or User's insurance company must notify PVT of any and all changes made to such policy.

5. **INDEMNIFICATION.** As an integral part of this Agreement and as partial consideration for using the landfill, User hereby agrees to indemnify, exonerate, defend and hold PVT, its parent and affiliate companies as well as any and all directors, officers, employees, attorneys and agents thereof, harmless against and from and will reimburse PVT in respect of:

(a) Any and all liabilities, obligations, claims, demands, actions, losses, damages, injuries, deaths, costs and expenses (including, but not limited to, attorney's fees and costs) made against PVT which arise as a result of User's negligence, breach of contract, misconduct, acts or omissions in connection with User's use of the landfill.

(b) Any and all damage or deficiency resulting from any misrepresentation, breach or nonfulfillment of any term or provision of the Agreement, or from any misrepresentation in or omission from any form, document or other nstrument furnished or to be furnished to PVT.

(c) Any and all claims, losses, damages, liabilities, fines, penalties, charges, administrative and judicial proceedings and orders, judgments, remedial action requirements, enforcement actions of any kind, and any and all costs and expenses incurred in connection therewith (including, but not limited to, attorney's fees and costs), arising directly or indirectly, in whole or in part, out of any disposing in the landfill of any restricted or prohibited materials stated in paragraph 3 above.

(d) Any and all actions, suits, proceedings, demands, claims, judgments and orders, including, but not imited to, attorney's fees and costs incident to this Agreement.

This Indemnification clause shall be enforceable and remain in force and effect during the duration of this Agreement and shall continue and remain in force and effect after the termination of this Agreement. At all times during the duration of and after the termination of this Agreement, the terms of this Indemnification clause shall be subject to all Hazardous Substance Laws now or hereafter in effect.

**USER HEREBY CERTIFIES THAT IT HAS READ, REVIEWED AND UNDERSTANDS THE SPECIFIC TERMS AND CONDITIONS OF THIS INDEMNIFICATION CLAUSE AND ALSO HEREBY EXPRESSLY AND SPECIFICALLY ACKNOWLEDGES, AGREES AND ACCEPTS THE TERMS AND CONDITIONS OF THIS INDEMNIFICATION CLAUSE AS INDICATED BY THE FOLLOWING INITIALS OF USER OR USER'S AUTHORIZED AGENT(S).**

INITIALS:____________________ DATED:____________________

INITIALS:____________________ DATED:____________________

This section needs to be initialed by the homeowner or and officer of the company.

6. **ACCESS CONTROL.** The landfill will accept solidification material on a pre-arranged basis only. All loads must be scheduled twenty-four (24) hours before delivery and accompanied by a properly executed Uniform Solid Waste Manifest. No dumping will be allowed without the Uniform Solid Waste Manifest.

7. **COMPLIANCE WITH LANDFILL POLICIES AND PROCEDURES.** User agrees to comply with PVT's landfill policies and procedures which are available for inspection at PVT's office or which may be requested by contacting PVT. User acknowledges that these policies and procedures may be changed by PVT without notice. Failure to comply with these policies and procedures may result in the denial of disposing at the landfill.

8. **PAYMENTS.** The terms of payment shall be governed by the Credit Agreement between PVT and User, the terms and conditions of which are incorporated herein by reference.

9. **DEFAULT.** Any default of any provision of this Agreement by User may result in the immediate suspension or termination, without notice, of this Agreement at the election of PVT. Further, in the event PVT is forced to hire a collection agency or attorney to collect any monies owed to PVT under this Agreement, PVT shall also be entitled to recover from User PVT's collection expenses, including, but not limited to, its attorney's fees and costs. Any suspension or termination, however, shall not relieve User of any and all outstanding obligations, responsibilities or duties under this Agreement, including, but not limited to, those obligations relating to indemnification and payments.

10. **TERMINATION.** This Agreement may be terminated by either party at any time for any reason. Any termination, however, shall not relieve User of any or all outstanding obligations, responsibilities or duties under this Agreement, including but not limited to those obligations relating to indemnification and payments.

11. **PVT'S RIGHT OF REJECTION.** PVT retains the right to reject any load where PVT has cause, for any reason, to believe said load may contain restricted or prohibited materials as stated in paragraph 3 above. Further, PVT reserves the right to reject any load which would be violative of any laws, ordinances or regulations (federal, state or local) now or hereafter in effect, or any load which would adversely impact the landfill.

12. **DELIVERY OF EXECUTED AGREEMENT VIA ELECTRONIC TRANSMISSION.** This Agreement, executed in whole or in counterparts, may be delivered through a facsimile machine or other electronic transmission and, if delivered in such manner, shall constitute the valid delivery of such executed Agreement and shall be legally binding upon the parties as if such executed Agreement were delivered in person.

**THE UNDERSIGNED HEREBY CERTIFIES THAT IT HAS REVIEWED AND READ THE FOREGOING TERMS, CONDITIONS AND PROVISIONS AND REPRESENTS THAT THE FOLLOWING SIGNATURE(S) ARE AUTHORIZED TO BIND USER AS TO ALL TERMS, CONDITIONS AND PROVISIONS OF THIS AGREEMENT.**

**ACKNOWLEDGED AND AGREED:**

______________________________
"USER" (Print your Company's Name)

By ______________________________
(Signature)
Its ______________________________
(Homeowner or Company Officer)

By ______________________________
(Signature)
Its ______________________________
(Homeowner or Company Officer)

# PVT Land Company, Ltd.
## Solidification Profile Sheet

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**1. Generator Information**

a. Generator Name: ____________________

b. Generator Address: ____________________ c. Zip Code: __________

d. Address of Liquid Generation: ____________________

e. Address of Liquid Storage (if different from source address) ____________________

f. Type of Facility Liquid Has Been Generated From: ____________________

g. State DOH Facility ID#: ____________________

h. Contact: ____________________ i. Phone: (____) __________

---

**2. Liquid Information**

a. Name of Contaminant(s): ____________________

b. Amount of Liquid (tons and/or gallons) __________ Amount of Solid (tons and/or cu. yds) __________

c. Type of Liquid: ____________________

d. Free Liquid Range: __________ to __________ %

e. Liquid Color (Munsell Color Chart Code if available) ____________________

f. Strong incidental odor? No ☐ Yes ☐ Describe: ____________________

g. pH __________

h. Is the liquid ignitable? Yes ☐ No ☐

---

i. Describe the circumstances and process by which the liquid has been generated.

____________________

____________________

---

**3. Transportation Information**

a. Method of Shipment: Bulk Liquid __________ Drum __________ Other __________

b. Transportation Company:

---

c. Is this a U. S. Department of Transportation (USDOT) Hazardous Material? Yes ☐ No ☐

---

**4. Chemical Contaminants** (Attach supplementary sheets if necessary)

Range(Min-Max)

a. ____________________ ______ - ______ ppm or %.

b. ____________________ ______ - ______ ppm or %.

c. ____________________ ______ - ______ ppm or %.

d. ____________________ ______ - ______ ppm or %.

e. ____________________ ______ - ______ ppm or %.

f. ____________________ ______ - ______ ppm or %.

g. ____________________ ______ - ______ ppm or %.

h. ____________________ ______ - ______ ppm or %.

i. ____________________ ______ - ______ ppm or %.

Attach copies of analytical reports and chain of custody documentation.

Attach a description of the liquid sampling procedures.

Continued

j. Does the liquid contain any of the following (provide concentration if known)

| | | | |
|---|---|---|---|
| PCBs | Yes ☐ | No ☐ | _______ppm |
| Cyanides | Yes ☐ | No ☐ | _______ppm |
| Sulfides | Yes ☐ | No ☐ | _______ppm |
| Asbestos | Yes ☐ | No ☐ | _______% |

k. Indicate method used to determine the presence or absence of items listed in section j.

l. Sampling Source (e.g., Drum, Pit, Pond, etc.)____________________

m. Does the waste represented by this profile contain any of the carcinogens that require OSHA notification? Yes ☐ No ☐
n. Does the waste represented by this profile contain dioxins? Yes ☐ No ☐ (List in Section 4)
o. Does the waste represented by this profile contain asbestos? Yes ☐ No ☐ If yes, friable ☐ non-friable ☐.
p. Does the waste represented by this profile contain benzene? Yes ☐ No ☐
q. Is the waste subject to RCRA Subpart CC Controls? Yes ☐ No ☐
r. Does the waste contain any Class I or Class II ozone-depleting substances? (Freons) Yes ☐ No ☐
s. Does the waste contain debris? Yes ☐ No ☐ (List in Section 4)
t. Personal Protective Equipment Requirements:____________________
u. Is this a state hazardous waste? Yes ☐ No ☐ (List, if yes)____________________
v. Is the Waste from a CERCLA or state mandated clean-up? Yes ☐ No ☐ (if yes, provide relevant documentation.)
w. Does the waste represented by this waste profile contain concentrations of PCBs regulated by 40 CFR ? Yes ☐ No ☐
x. Does the waste represented by waste profile contain radioactive material or disposal regulated by the NRC? Yes ☐ No ☐
y. Does the waste profile and all attachments contain true and accurate descriptions of the waste material, and has all relevant information within the possession of the Generator regarding known or suspected hazards pertaining to the waste been disclosed to the contractor? Yes ☐ No ☐

**5. Generator's or Representative's Certification**

**a. Print Sampler's Name:____________________ b. Sample Date:____________________**
**c. Sampler's Title:____________________**
**d. Sampler's Employer (if other than Generator):____________________**

**The sampler's signature certifies that any sample submitted is representative of the liquid described above pursuant to the DOH Technical Guidance Manual for Underground Storage Tank Closure and Release Response (August 1992) and EPA SW-846.**

**e. Sampler's Signature:____________________**

Continued

---

**6. Generator Certification**

By signing this liquid profile sheet, the Generator certifies:

a. This liquid is not a "Hazardous Waste" as defined by EPA or the State of Hawaii.

b. This waste does not contain regulated radioactive materials or regulated concentrations of PCBs (Polychlorinated Biphenyls).

c. The statements and attachments contain true and accurate descriptions of the liquid. All relevant information regarding known or suspected hazards in the possession of the Generator has been disclosed.

d. The analytical data presented herein or attached hereto were derived from testing representative samples taken in accordance with the DOH Technical Guidance Manual for Underground Storage Tank Closure and Release Response (August 1992 and subsequent amendments/revisions) and EPA SW-846.

e. If any changes occur in the character of the liquid, the Generator shall notify a PVT Landfill representative immediately.

f. Signature____________________________ g. Company____________________

h. Name and Title________________________ i. Date____________________

---

**7. PVT Landfill Waste Disposal Decision (<u>For PVT Landfill Use Only</u>)**

a. Waste Disposal Decision ______ Accepted ______ Rejected

b. Disposal Method ______ Landfill ______ Non-hazardous Solidification

c. Precautions, Special Handling Procedures, or Limitations on Approval: ____________________

________________________________________

d. Clearance No. ____________________ Date:____________________

e. Reviewed by ____________________ Date:____________________

f. Approved by ____________________ Date:____________________

g. Forwarded to DOH:______________ Date:________

# NANAKULI SOLIDIFICATION FACILITY
A PVT LAND CO., LTD. FACILITY
**87-2020 FARRINGTON HIGHWAY**
**NANAKULI, OAHU, HAWAII 96792**
**(808) 668-4561**

**UNIFORM SOLID WASTE MANIFEST**

1. Manifest Document No.

2. Page No

3. Generators Name and Mailing Address

4. Origin Facility Name and Location

5. Generator's Phone No.

6. Transporter Company Name

7. Transporter's Phone No.

8. Designated Facility Name & Site Address

**Nanakuli Solidfication Facility**
**87-2020 Farrington Highway, Nanakuli, Hawaii 96792**

9. Facility's Phone No.
(808) 668-4561

| 10. Description (Including Proper Shipping Name and Class) | | 11. Containers No. | 11. Containers Type | 12. Total Quantity | 13. Unit Wt / Vol | 14. Waste Code |
|---|---|---|---|---|---|---|
| a. | Solidification and disposal of liquids & sludges with petroleum hydrocarbons EPA hazardous waste exemption 40 CFR 261.4(b)10 DOT shipping name: Non RCRA N.O.S. | | | | | |
| | | | | | | |

15. Additional Descriptions for Materials Listed Above

Container Codes:
B = bulk
S = sacked
D = drummed

Waste Codes:
G = Soil w/Gasoline Residue
D = Soil w/Diesel Residue
O = Soil w/Motor Oil Residue

**16. Special Handling Instructions and Additional Information**

17. **Generator's Certificate:** I hereby declare that the contents of this consignment are fully and accurately describe above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway and / or sea-going vessel according to applicable international and national government regulations.

| Print Name / Typed Name | Signature | Date |
|---|---|---|
| | | |

18. Transporter Acknowledge of Receipt of Materials

| Print Name / Typed Name | Signature | Date |
|---|---|---|
| | | |

19. Designated Facility Acknowledgement of Material Received

| Print Name / Typed Name | Signature | Date |
|---|---|---|
| | | |

# APPENDIX C
# EMPLOYEE SAFETY PLAN

# PVT LAND COMPANY, LTD.
# EMPLOYEE SAFETY RESPONSIBILITIES
July 28, 1998

As employees of PVT Land Company, Limited, Construction and Demolition Landfill, you are reminded of personal actions that are not tolerated. The following personal behavior is not acceptable. If employees do demonstrate such acts, they will be subject to immediate termination.

- Blatant disregard for the health and safety of themselves, fellow employees or clients or damage of a client's or PVT's property.
- Reporting for work under the influence of alcohol or controlled substances on a job site or on PVT property.
- Smoking in an area that is designated as Non-Smoking Area because of the possible presence of flammable or combustible materials.
- Behaviors, actions or statements of an offensive nature that are objectionable to another individual.

PVT Land Company, Ltd.
87-2020 Farrington Highway
Waianae, Hawaii 96792
Office: (808) 668-4561
Fax: (808) 668-1368

# TABLE OF CONTENTS

# GENERAL SAFETY RULES

PVT Land Company, Ltd. will ensure that all employees will be properly trained in areas and tasks that apply to their work, training requirements for various landfill duties and emergency response.

PVT shall promote positive safety attitude through its' line of managers, supervisors and employees.

Supervisors are responsible for recording and reporting injury and illnesses in accordance with 29CFR 1904 of OSHA standards.

Prior to starting work, all employees must undergo general safety orientation from Vice President of Operations and site safety indoctrination at the project site to which the employee is assigned.

At a minimum, safety meetings will be held once monthly. Tailgate safety meetings will be held weekly prior to the start of the work week.

Supervisors will instruct each employee in all safety rules and procedures that affect the employee on the job being performed.

Supervisors must point out the nearest fire extinguisher and other emergency equipment within the area where work is being performed.

Supervisors will make arrangements for medical treatment of employees and will have emergency numbers posted where they are readily available.

Supervisors will provide a continuous system of work inspections to detect and correct hazards, safety rule violations and unsafe conditions or work practices.

Alcohol, firearms and unauthorized drugs are not permitted on the landfill site. Employees may not report for work or perform duties while under the influence of intoxicants or drugs.

PVT Land employees must wear personal clothing that is safe and proper for the job. As a minimum, employees must wear shirts with sleeves, long trousers and steel toe work boots. All clothing must be in good repair. Canvas shoes, sneakers, house shoes, etc., are not considered appropriate.

Smoking is only permitted in posted designated areas.

Smoking is not permitted in vehicles.

The speed limit on roadways is posted by PVT. This posted limit must not be exceeded for any reason. If the speed is not posted, PVT has an established Speed Limit of 20 mph outside an operating unit and of 5 mph inside an operating unit, where in actual operation or not.

Every accident is to be reported to the supervisor immediately whether or not anyone is injured.

## PERSONAL PROTECTIVE EQUIPMENT

All employees must follow all standards and procedures concerning the use of personal protecting equipment.

As a minimum, all employees of PVT Land Company must wear the following personal protective equipment upon entering the work area:

- Workers must wear approved plastic hard hats that meet ANSI/NIOSH standards. Hard hats must not have a rolled up lip around the base of the hat that can catch liquids/chemicals.
- Workers must wear approved safety glasses that meet ANSI/NIOSH Z-87 standards.
- Workers must have the proper breathing protection equipment as directed in the health and safety plan, and that meet MSHA/NIOSH standards.
- Sleeves shirts and long pants.
- Safety shoes, e.g., steel toe shoes.
- Hand protection.
- Approved hearing and protection that meets ANSI/NIOSH standards must be carried at all times.
- Face shields and safety glasses or monogoggles must be worn where hazards of flying particles are present.

Other safety equipment may be required for a job to meet operating standards. Always check with the supervisor or any operating unit prior to starting a job or task.

## EQUIPMENT AND HAND TOOLS

The safe design of any tool must not be exceeded or modified in any manner that reduces its original safe capacity.

Defective tools must be removed from service immediately. The defective tool must be repaired prior to reuse. Operations supervisor is required to inspect and maintain tools and equipment supplied to the employees.

Power pneumatic and electrical tools must not have a lock-on power type control.

All electrical power tools must use ground fault circuit interrupters outdoors and at established project sites.

## VEHICLE SAFETY

Keep all motor vehicles and equipment in good working condition at all times. The driver of any motor vehicle or equipment is accountable for the operation of the vehicle. The operator/driver is also responsible for inspection of a vehicle prior to operation.

Vehicles must comply with all federal and state safety requirements.

Only three people may ride in the cab of a standard size ½ to ¾ ton pickup truck.

The maximum speed limit on a roadway is 20 mph, unless otherwise posted. In operating units, the limit is 5 mph.

Never haul materials that hang over the truck bed if avoidable. If the situation is unavoidable, attach a flag at the farthest point from the bed.

Riding on equipment is only permitted when adequate seats or platforms with safety rails designed for the specific purpose of protecting passengers are provided.

All motor vehicles and equipment must have a documented inspection prior to each daily and shift use.

Fire extinguishers must be installed and readily available on all motorized vehicles.

## EMERGENCY REPSONSE

These emergency procedures will be followed to call an ambulance, report a fire, a spill of hazardous material.

1. Contact the Site Office and state the type of emergency.
2. Give your name and exact location.
3. Stay on the phone/radio until your message is confirmed and your are released.
4. Have someone meet any emergency equipment at the nearest main roadway.

In the event of fire or hazardous spill anywhere on the landfill, the Operations Supervisor must ensure that all employees observe the following:

1. Shut down all equipment and leave the area.
2. Report to the designated assembly area, usually the edge of the operating unit limits.
3. Do not enter the unit or area until authorized by your supervisor or foreman in charge of the operating area.
4. The supervisor will notify the main office as soon as all employees are accounted for or if any employee that may have been in the area is missing.

Supervisors will ensure that employees know emergency signals and evacuation procedures in the area where they are working.

In the event of a fire or medical emergency, the following numbers can be called for assistance:

| | |
|---|---|
| • Fire | 911 |
| • Ambulance | 911 |
| • Hospital | 911 |
| • Police | 911 |

Paramedics should be summoned in the event of a serious injury; they will arrange to transport the victim to the Waianae Comprehensive Medical Center (Attachment B). A first aid kit will be available at the site for use in case of minor injuries. If direct contact with contaminants occurs, affected skin areas should be washed immediately with soap and water.

In the event of serious trauma or unknown chemical exposure, the employee should be stabilized by one group of employees while the emergency phone number list is consulted and an ambulance immediately requested.

Workers with suspected back or neck injuries are <u>NOT</u> to be moved until professional emergency assistance arrives.

## FIRE (See Emergency Fire Plan Attachment)

Type ABC fire extinguishers will be available onsite to contain and extinguish small fires. The local fire department should be summoned (911) in the event of surface fire. **Bioremediation Pit Area:** Given the site location, type of activity which will be conducted, and generally low concentrations of petroleum hydrocarbons in the soils, fire from the bioremediation activities is not considered likely to occur.

## COMMUNICATION

A communication network must be set up to alert site personnel of emergencies and to summon outside emergency assistance. A radio or portable phone should be used to communicate with outside agencies. Site personnel shall be trained to utilize CB radios to maintain emergency communication network.

## INCIDENT REPORT

In the event of an injury or illness, work is to be stopped until the Operations Supervisor or Foreman have determined the cause of the incident and have taken the appropriate action. Any injury or illness, regardless of severity, is to be reported on the accident report form (see Attachment C).

## OPERATION SHUTDOWN

Under certain extreme hazardous situations the Operations Supervisor or Foreman may request work be temporarily suspended while the underlying hazard is corrected or controlled. During operation shutdown, all personnel will be required to stand upwind to prevent exposure to fugitive emissions. The Operations Supervisor will have ultimate authority for operations shutdown and restart.

## HOUSEKEEPING

Orderliness and cleanliness are basic requirements and must be maintained at all times. Special attention will be given to maintaining clear walkways and roadways.

Trash and slipping and tripping hazards will be removed throughout the job. Work areas and equipment will be cleaned at least once on each working shift.

## HEAT STRESS

(SEE ATTACHMENT E)

Heat stress is caused by the body's inability to dissipate metabolic heat, and is affected by temperature, humidity, physical exertion and clothing.

Acclimatize yourself to the heat by slowly building up tolerance. Gradually increase workload and heat exposure to build up tolerance. Most workers require seven to ten working days of gradually increasing workload to become fully acclimated.

Heat stress can take the form of heat rash, heat cramps, heat exhaustion and heat stroke. Heat stroke is the most severe form of heat stress, and can result in death. Heat illnesses must be treated to minimize the potential for injury.

Work and break cycles and replacement of fluids are important in preventing heat stress.

# ACCIDENT REPORTING

All accidents, injuries and illnesses, no matter how minor are to be immediately reported to the employee's immediate supervisor or manager.

A report must be completed for all accidents or incidents including, but not limited to the following;

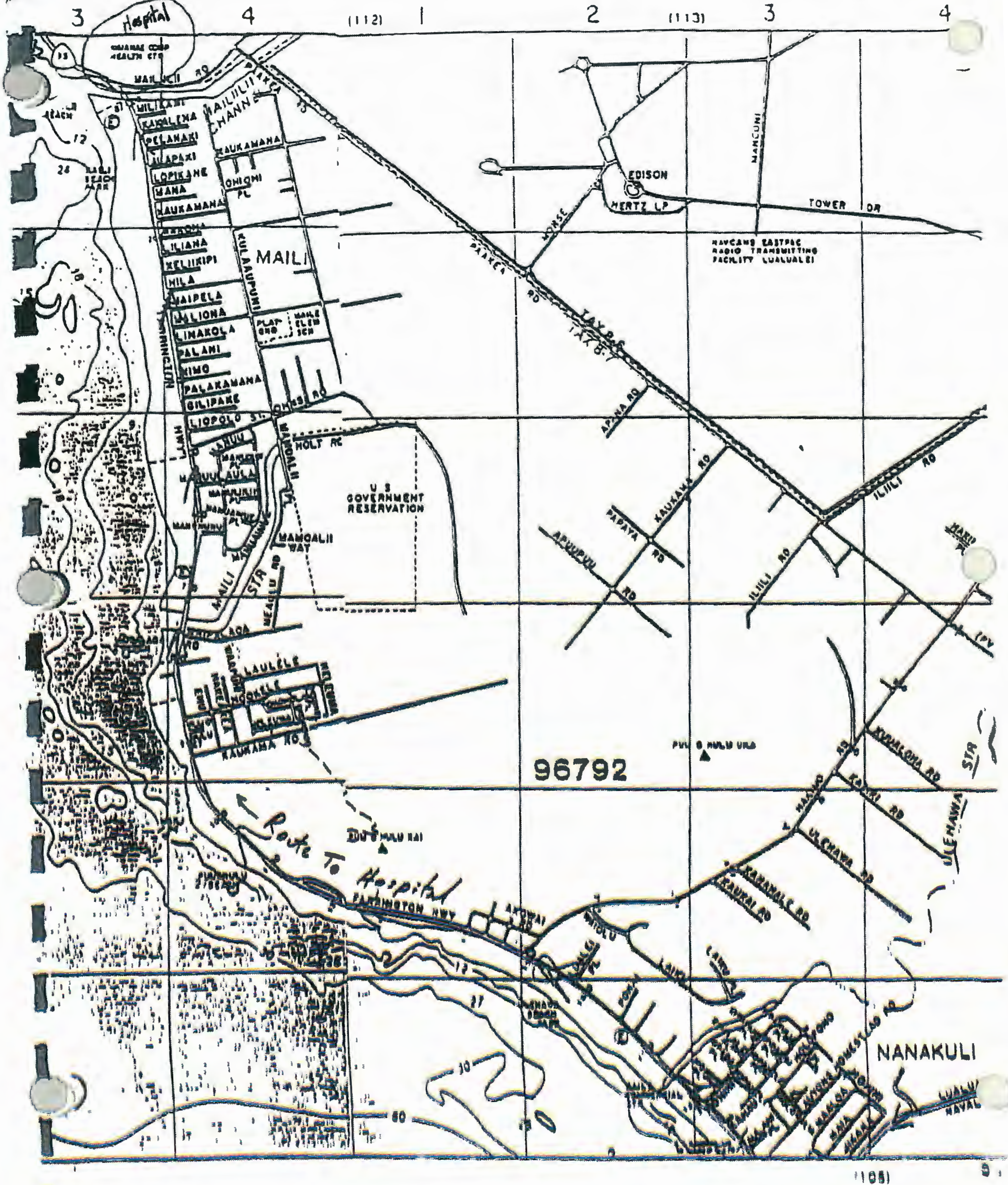
- Any work related injury involving sprains and strains
- All work related back injuries
- All work related chemical exposures
- Any work related injury or illness which involves first aid or medical treatment
- Any work related accident that results in the death of an employee
- Any incident that involves property damage
- Any near miss

The supervisor will report all accidents and near misses to management.

# ATTACHMENT B

# HOSPITAL ROUTE MAP

"B"


3
Hospital
4
(112)
1
2
(113)
3
4
WAIANAE COMP HEALTH CTR
MAILUNI RD
MAILI BEACH
MAILI BEACH PARK
MAILIILII CHANNEL
PAAKEA RD
MILILANI
KAKALENA
PELANAKI
HAPAKI
LOPIKANE
MANA
KAUKAMANA
OHIOMI PL
LILIANA
KELIIKIPI
HILA
HAIPELA
MALIONA
LINAKOLA
PALANI
KIMO
PALAKAMANA
GILIPAKE
LIOPOLO ST.
FARRINGTON HWY
KULAAUPUNI
MAILI
PLAYGND
MAILI ELEM SCH
HOLT RD
MAMOALII
MAMOALII WAY
MAILI STR
U S GOVERNMENT RESERVATION
LAULELE
KAUKAMA RD
EDISON
HERTZ LP
HORSE
MANCUNI
TOWER DR
NAVCAMS EASTPAC RADIO TRANSMITTING FACILITY LUALUALEI
TAXI 8-7
APUUPUU RD
PAPAYA RD
KAUKAMA RD
ILIILI RD
APAPA RD
PUU O HULU UKA
96792
PUU O HULU KAI
Route To Hospital
NANAKULI
ULEHAWA STR
ULEHAWA RD
KAUKAMOLE RD
KAUKAI RD
NANAKULI
LUALUALEI NAVAL
12
24
18
9
30
60
(105)
9

# ATTACHMENT C

# ACCIDENT REPORT FORM

# INCIDENT REPORT
## OCCUPATIONAL ACCIDENT, INJURY OR ILLNESS

Date of Incident/Investigation:__________________________________

Employee Involved:__________________________________

Supervisor on Duty:__________________________________

Investigation Conducted by: Ben Yamamoto

Time of Incident:__________________________________

Location:__________________________________

Event leading to this investigation, what occurred?____________________

Was anyone injured as a result of this incident?____________________

If yes, how severe were injuries and what steps were taken to provide help?__________

Any equipment damage?______________________________

Was safe work practice violated?______________________________

Was the unsafe condition corrected?______________________________

What steps will be taken to prevent future problems?____________________

Person responsible for corrective action: Hale Malaki

Date received by responsible person:______________________________

Comments:__________________________________

My signature below certifies that I have counseled the employee and completed the corrective action described

Employee:______________________________ _______________

Name/Signature Date

Supervisor:______________________________ _______________

Name/Signature Date

# EMPLOYEE'S INJURY REPORT

Name of Injured Employee: ______________________________

Address: ______________________________

Telephone: ______________ Birth Date: ______________

Occupation: ______________________________

Date and Time of Injury: ______________________________

Date Injury Reported: ______________________________

Name of Employer: FVT LAND COMPANY LTD.

Person Reported to: ______________________________

Witness(es), if any: ______________________________

Description of Injury:

a. How did this accident occur?

b. What were you doing when you got injured?

c. Object or substance that directly injured you?

d. Describe in detail the nature of the injury and the part of the body affected.

Disability Information:

Did you complete your shift on the date of the incident? ______________

Are you disabled or off work? ________ When did you become disabled? ______________

Who treated you (name and address)? ______________________________

______________________________

Who referred you to the doctor? ______________________________

When did you first see your doctor? ______________________________

Any medical slip? ______________________________

Employee's Signature: ______________ Date: ______________

Witness' Signature, if applicable: ______________ Date: ______________

Signature of Person Reported to: ______________________________

**NOTE: HAVE EMPLOYER FILE A WC-1 REPORT USING THE INFORMATION ABOVE**

4/98

# MEDICAL CERTIFICATE FORM

To: Injured Worker
(Please have treating physician complete this information and return to your supervisor or manager )

Injured Employee's Name: ____________________

Date of Injury: ____________ Date of First Visit: ____________

Body Part Injured: ____________________

Presenting Problems/Symptoms: ____________________

____________________

Diagnosis: ____________________

Prognosis: ____________________

Treatment Provided: ____________________

____________________

Time Frame: ____________________

Duration: ____________ Next Visit: ____________

<u>Return to Work:</u>

Regular Work? Yes ( ) No ( ) Light/Modified Work? Yes ( ) No ( )

Specify Time Frame for Light Duty: From: ____________ To: ____________

<u>Restrictions (Please check all that apply):</u>

_____ No climbing

_____ No prolonged standing/walking

_____ No bending/stooping

_____ Work at ground level only (firm footing)

_____ One-handed work only

_____ Sedentary work only/mostly sitting

_____ No work around moving machinery

_____ Restricted to 0-10 lbs. ( ) 10-20 lbs. ( ) 20-35 lbs. ( ) 35-50 lbs. ( )

_____ Currently on medication that prevents him/her from ____________

_____ Other restrictions, specify: ____________________

____________________

Physician's Name: ____________________ Phone: ____________

Physician's Signature: ____________________ Date: ____________

# ATTACHMENT E

# HEAT STRESS GUIDANCE

# PREVENTING HEAT STRESS

## *Keeping Cool In The Heat*

Excess heat can place an abnormal stress on your body. When your body temperature rises even a few degrees above normal (which is about 98.6° F), you can experience muscle cramps, become weak, disoriented, and dangerously ill unless you can help your body to cool down. If your body temperature rises above 105° F, your condition can be fatal. Persons who work in hot environments—foundries, kitchens, laundries, and the like—must take special care against heat stress. The following guidelines can help you keep your cool in the heat and avoid the dangerous consequences of heat stress.

### Adapt To The Heat

The National Institute for Occupational Safety and Health (NIOSH) suggests that all workers exposed to extreme heat gradually get used to their environment over a one-week period. This means that on your first day in a hot environment, you may only be able to do half the work that a fully-adapted worker would do. Each day, your workload increases slightly until you are able to operate at "full steam."

### Drink Water Frequently

Sweating is one of the ways your body cools itself down. Sweating results in water loss, and the only way to replace the loss (and help your body continue to cool itself) is to drink water frequently. Ideally, you should drink at least 8 ounces of water every 20-30 minutes while working in hot environments.

### Wear Personal Protective Equipment

Personal Protective Equipment (PPE) for hot environments can range from ordinary work clothes made from "breathable" fabrics to specially designed suits that are cooled by air, ice, and even portable air-conditioners. Check with your supervisor about the appropriate PPE for your specific task.

### Use Engineering Controls

Your employer may also provide engineering controls such as fans, ventilators, exhaust systems, and air-coolant or conditioning systems. These controls can help reduce worksite temperatures to more adaptable levels. Other controls such as using heat shields and insulating heat-producing machinery can also help lower the environmental temperature.

### Keep Cool

Persons who work in hot environments should become familiar with first aid techniques for heat stress. If you or someone you know suffers from heat exhaustion, cramps, or other signs of heat stress, get medical attention immediately. Keep your cool—heat stress is dangerous, but it's also preventable.

Drink at least 8 ounces of water every 20-30 minutes while working in hot environments.

PPE can range from work clothes made from "breathable" fabrics to specially designed "coolant" suits.

# APPENDIX D
# SAFETY TRAINING COURSE OUTLINE

# Employee Training Course Outline
# PVT Construction & Demolition Landfill, Nanakuli

## I. Introduction

a. Discussion of objectives and importance - Individual safety in operation of the landfill. Public safety, impacts to the environment, and health of the public. Air and groundwater issues.

b. Outline of day's course

## II. Operational Safety & Hazmat Recognition

a. Introduction

b. General Safety - Hard hats & steel toe boots, heat, slip, trip, and fall.

c. Hazmat issues

1. What is hazardous waste - Waste that is a health hazard to personnel or the public.

2. How to identify hazardous waste - Use of hazardous ID book for chemicals and friable asbestos.

3. How to deal with it - Do not open any container of unknown material, isolate unknown material if found in working face, call environmental specialists. If necessary to move unknown material, it should be placed in hazardous material storage area.

4. Importance of exclusion hazardous waste even in small quantities and all liquid waste.

## III. Landfill Design

a. Diagrams of design - components

b. How components operate and what is necessary to maintain components

1. Groundwater Wells - The groundwater monitoring system what it is, where the wells are located around the landfill and how it operates.

2. Sump - The sump is located at lowest point and designed to hold liquids that accumulate in the landfill (leachate). These will be pumped out and sampled prior to use for dust control or disposal.

2. HDPE Liner - High density plastic liner that covers the entire bottom of the landfill. It can be damaged or destroyed by equipment or fire.

3. Berms - These are used either to retain or exclude water from the landfill. We want to minimize inflow of water (stormwater, etc.)

4. Scales - All loads must go through the scales and all information recorded.

5. Water tanks - The water in these tanks will be used first for fires and second for dust control.

7. Site equipment - Importance of properly maintained equipment. Leaking equipment or trucks can have a serious impact on leachate from the landfill. Equipment should be operated carefully to avoid damage to the HDPE liner. If the liner is damaged, the damage should be documented and repaired immediately by an approved liner installer.

## IV Monitoring Requirements

a. "Solid Waste Manifest Form"

1. This form needs to be filled out for each project and for each truck that enters the landfill.

2. If one form is filled out for a principal project than an additional form is filled out for each truck and attached to the principal project form.

3. This form is filled out and retained, even if the load is unsigned and turned away.

b. "Daily Operating Records Form"

1. The daily "Solid Waste Manifest Forms" and weigh receipts are used to fill out the "Daily Operating Records Forms".

2. Monitoring of the type and quantities of waste material received

3. Number of vehicles disposing waste

4. Type (hazardous waste, liquid waste, etc.) and quantities of waste rejected (number of trucks).

5. Weather conditions at the site from the weather station are recorded on this form once a day.

6. Sump monitoring information is recorded on this form.

7. Major incidents are recorded on this form as well.

c. "Leachate Monitoring Record Form"

1. This form is filled out daily, even if no liquid is detected.

2. The level of leachate in the sump is record using a water level indicator meter.

3. If samples are taken the field results must be recorded on this form. The laboratory results should be reported when they are received.

d. "Lysimeter Monitoring Form"

1. This form should be filled out daily, even if no liquid is detected.

2. The level of liquid should be measured and recorded using a water level indicator meter.

3. If samples are taken the field results must be recorded on this form. The laboratory results should be reported when they are received.

e. "Major Incident Record Form"

1. This form should be filled out if any of the following incidents occur:

    a. Heavy rain storm - Amount of rain, onsite & offsite runoff, damage to landfill

    b. Explosion - Nature of explosion, damage to landfill, effect and response.

    c. Spill - Nature of spill, quantity, containment actions, damage to landfill, effect and response.

   - d. Accident - Nature of accident, summary of accident, damage to landfill.
   - d. Discovery of unpermitted material - type of waste (solid, liquid, hazardous, solvents, etc.), quantity, short term response, long term response, other actions.

2. Environmental impact of incident - explain impact, short and long term responses.

f. "Fire Incident Record Form"

1. This form needs to be filled out when a fire occurs on site.

2. The type of fire (surface or subsurface) and nature of the fire (type of material) need to be recorded, even if it is a small fire.

3. The location of the fire should be shown on a landfill map and actions taken to control the fire should be recorded.

4. The long term response (temperature probes, gas monitoring, etc.) and environmental impact to the landfill.

g. "Litter Control Program Monitoring Form"

1. This form needs to be completed weekly.

2. Observations are recorded such as blown litter beyond working face.

3. The location of wind blown litter should be located on a landfill map.

4. The actions taken to control and remediate the condition should be noted.

g. "Disease Vector Control Program Monitoring Form"

1. This form needs to be completed weekly.

2. Observations are recorded such as unusual presence of birds, rodents, and insects in the waste.

3. The location of birds, rodents, and insects should be located on a landfill map.

4. The actions taken to control and remediate the condition should be noted.

h. "Random Inspection Record Form"

1. This form should be completed on random loads during the day.

2. It is recommended that at least one load from each prequalified project be checked and that a large number of drive-in single loads be checked. If individuals do not want to be checked they should be turned away.

i. "Asbestos Inspection Record Form"

1. This form should be completed on asbestos loads during the day.

2. It is recommended that at least one load from each pre-qualified project be checked. Loads should be checked for proper handling and containment, as well as proper unloading and disposal actions.

## <u>V. Leachate Management</u>

a. Groundwater Monitoring System

1. The groundwater monitoring is designed to monitoring for any contamination in groundwater beneath the site.

2. There are four groundwater monitoring wells surrounding the site.

    a. The wells are 2-inch PVC pipes that extend 15 feet into groundwater. They are protected at the surface by a locked 12-inch steel casing.

3. During operations these pipes need to be protected at all costs. If the pipes are broken, they will be costly and difficult to impossible to replace. An entirely new monitoring may need to be installed.

4. This system is checked monthly and sampled semi-annually by PVT's groundwater monitoring consultant.

b. Leachate Collection System

1. The sump collects any liquids that accumulate in the landfill. These liquids will be from dust control, stormwater, or liquids in the waste.

   a. No liquids are allowed in the waste material. This is extremely important. If cans or containers are spotted in the waste, they should be removed immediately, if possible.

   b. Liquids in the waste will serious impact the water samples from the leachate collection system.

2. Berms are placed around the landfill and in the landfill to direct stormwater away from the liner and waste pile. Stormwater should not be allowed to flow into the sump.

3. The sump is connected to the surface by a 12 inch steel pipe and this pipe should be protected at all times. The water level in the sump is checked weekly without exception and recorded on the Leachate Monitoring Record Form.

4. When 12 inch of water has accumulate in the sump a sample will be sent to a laboratory and tested.
4. Depending on the results of the lab tests, the sump will then be pumped into the water truck for use in dust control or it will be pumped into a holding tank and sent to an appropriate disposal company. If the liquid in the sump is sent to a disposal company, it will cost in the thousands of dollars.

## VI Drainage Control

a. Soil berms are used to divert rainwater away from the landfill. In the landfill soil berms are used to minimize run-on to the liner and into the waste pile.

b. Water should not be allowed to contact the waste and then run-off the site or run-on to unlined portions of the site. This is very important and is a violation of the State and Federal regulations.

## VII. Vector Control

a. Due to the nature of the material in a C&D landfill, we do not expect to have a problem with birds, rodents, or insects.

b. If this should occur during burning of the adjacent cane fields, the waste should be covered with cover material to prevent breeding of birds, rodents, or insects.

## VIII. Dust and Litter Control

### a. Dust Control

1. Blowing dust should be control by the application of a minimum amount of water. The waste pile should not be saturated with water.

2. For dust control inside the lined portions of the landfill, water from the sump may be used if it has been tested and found to be non-hazardous.

3. Blowing dust should be documented in the "Daily Operating Records Form."

### b. Litter Control

1. Due to the nature of the C&D material litter is not expected to be a problem. If wind blown litter does occur, it should be picked up daily and put back into the landfill.

2. If it is found that wind blown litter is a continuing problem, then portable litter fences will be built and used next to the working face of the landfill.

3. Blowing litter should be documented in the "Litter Control Program Monitoring Form."

## IX. Asbestos Management Plan

(To be added)

## X. Emergency Fire Plan

### a. General Procedures

1. Due to the nature of the waste material no fires are expected. Possible fires are more likely associated with woody waste sections and on-site equipment. The water storage tank, water truck, and on-site fire extinguishers are available for fire fighting. A two-way radio is available in the office and on the working face for communication in case of fire. The telephone number and location of the nearest fire station is posted in the office.

2. The site should be checked daily for any olfactory or other signs of surface or subsurface fire.

3. Incidents should be reported immediately to the Department of Health, Solid Waste Branch (DOH) and should be recorded on the "Major Incident Record Form", the "Daily Operating Records Form" and the "Fire Incident Record Form".

4. A stockpile of cover material should be kept near the working face for use in case of fire.

5. If DOH determines that the released fumes are detrimental to public health, then a public notification will be necessary.

6. Following any fire incident, liner integrity will be checked. Damage caused to the liner by the fire will be repaired by a professional liner installer as soon as possible.

b. Minor Surface or Equipment Fire - extinguish immediately with on-site fire extinguishers or suffocate by direct burial and notify site office.

c. Major Surface Fire - In case of a major surface fire, the fire department should be contacted immediately; meanwhile on-site resources such as fire extinguishers and water should be mobilized to contain the fire. A minimum amount of water will be used to extinguish the fire to prevent generation of large amounts of leachate. If possible direct burial with stockpiled cover material is the preferred method of extinguishing the fire. The most critical item is the liner and prevention of damage by fire or heat. If water is not effective in immediately extinguishing the fire, it will be put out by burial beneath cover material.

d. Small Shallow Subsurface Fire - excavate, spread and extinguish with water or direct burial, notify site office. The fire area will be monitored against re-ignition by either temperature or gas monitoring probes.

e. Major Subsurface Fire - In case of a major subsurface fire, the fire department should be contacted immediately; meanwhile on-site resources such as fire extinguishers and water should be mobilized to contain the fire by wetting down the fire area or suffocate the effected area by placing cover material over it. If the fire is relatively shallow and covering a small area, the effected area may be excavated to expose the fire. In the case of a relatively large area $CO_2$ will be injected to control and extinguish the fire. The fire area will be monitored against re-ignition by either temperature or gas monitoring probes.

## X. Method of Operation

a. Access is restricted by a locked gate unless authorized personnel are on-site.

b. The landfill supervisor will be on site during working hours and will be responsible for maintaining records of daily activities at the landfill.

c. All incoming waste will be screened at the time of arrival by direct viewing of all loads. All loads will be categorized into percent of construction waste, demolition waste, land clearing debris, or other waste.

d. A solid waste manifest will be completed at the scales prior to unloading on all solid waste.

e. All loads will be weighed prior to unloading and again after unloading. These weighs will be recorded and made part of the "Daily Operating Record".

f. The waste will be categorized into groups for placement purposes. Asphalt, concrete, and rubble will be placed together but separately from wood and vegetative waste. Wood and vegetative waste will be placed separately and covered with a thin layer (approximately 6 inches) of cover material once every two weeks. Placement of wood and vegetative waste will moved to different areas of the landfill periodically to prevent a chimney or tunnel effect in case of subsurface fire.

g. All loads coming to the working face will be screened by the bulldozer operator during placement of the waste. Particular attention will be paid to the odor and color of soil loads by the scale and the bulldozer operators in an attempt to detect petroleum hydrocarbon contaminated soils. Non-friable lead paint on demolition material and non-friable asbestos can be accepted for deposal.

h. Random load checking will be done with special attention to loads that are single loads not prequalified. Random load checking will consist of dropping the load, spreading it, and viewing it prior to exit of the unloaded truck. A "Random Inspection Record Form" will be completed for each random load checked by the bulldozer operator.

i. If material is believed to be hazardous it will be turned away from the landfill and a record of the name and license number of the hauler will be made.

j. If material believed to be hazardous is accidentally accepted at the landfill, the material will be segregated and the landfill's environmental consultant will be notified immediately. If the material needs to be moved immediately will be placed on HDPE in a bermed and covered area for temporary storage.

k. A chemical identification book will be on-site at all times for use by the employees for identification of incoming waste.

l. If a breach of the liner occurs, it will be reported and an approved installer will immediately repair the breach by welding with an approved HDPE welding machine.

m. Any fires, explosions, spill, heavy rainfall, accident, discovery of unpermitted material, or other unusual occurrence will be reported and noted in the "Daily Operating Record" and the "Major Incident Record" forms.

# APPENDIX E
# UNACCEPTABLE WASTE EXCLUSION PROGRAM

# UNACCEPTABLE WASTE EXCLUSION PROGRAM

# PVT INTEGRATED WASTE MANAGEMENT FACILITY

**Including**
**Construction and Demolition Waste Landfill**
**Asbestos Landfill**
**Petroleum Contaminated Soil Treatment Facility**
**Materials Recovery Facility**

**PVT LAND COMPANY, LTD.**
**87-2020 Farrington Highway**
**Waianae, Hawaii 96792**

Prepared by
A-Mehr, Inc.
October 2011

# PVT LAND COMPANY, LTD.
# UNACCEPTABLE WASTE EXCLUSION PROGRAM

## TABLE OF CONTENTS

# PVT LAND COMPANY, LTD.
# UNACCEPTABLE WASTE EXCLUSION PROGRAM

## 1. Introduction

### 1.1 Purpose

The purpose of this waste exclusion program is to detect and prevent the disposal of unacceptable wastes at the PVT Land Company, Ltd. Landfill in Nanakuli, Waianae, Hawaii. The program applies to the PVT Construction and Demolition Landfill, the Asbestos Landfill, the Petroleum Contaminated Soil Treatment Facility, and the Materials Recovery Facility, all of which are located on the PVT Landfill property under common ownership and management.

### 1.2 Objective

This document has been developed to conform to federal and state requirements to implement a program for detecting and preventing the disposal of hazardous wastes at the Landfill. The federal requirements are found in 40 CFR Part 258, Section 258.20. The state requirements are set forth in the operating permits issued for the site by the Hawaii Department of Health.

## 2. Acceptable and Prohibited Wastes

### 2.1 Acceptable Wastes

Wastes that can be disposed at the landfill is limited to those allowed under applicable laws and regulations, and in the HDOH permits issued for each part of the site's operation, as follows:

<u>Construction and Demolition Waste Landfill and Materials Recovery Facility</u>

- Concrete, bituminous concrete and asphaltic concrete
- Wood, glass, masonry, tile, roofing, siding, plaster and similar building materials
- Dirt, rock, stumps, boulders, brush and similar land clearing debris
- Sheet steel, structural steel, siding, metal fencing and other metallic debris
- Waste plumbing, mechanical and electrical building components

<u>Asbestos Landfill</u>

- Properly packaged friable and non-friable asbestos-containing wastes including insulation, tile, shingles and other materials.

Soil Treatment Facility

- Soil contaminated with gasoline, diesel or heavier petroleum products, not containing non-petroleum hydrocarbons, and not containing TSCA-regulated PCB levels which currently is in excess of 50 part per million.

### 2.2 Prohibited Wastes

Wastes prohibited from disposal at the Landfill include:

- Hazardous wastes as defined in 40 CFR Part 261 and CCR, Title 22, Article 3, Section 66261.20
- PCB wastes as defined in 40 CFR Part 761, CCR
- Household waste, garbage, commercial solid waste or industrial solid waste as defined in Hawaii Administrative Rules Section 11-58.1-03
- Whole tires or car parts
- Electrical transformers with oil or PCBs or when generated from other than demolition projects
- Pesticide containers, unless they meet the requirements of 40 CFR 261.7 and 261.4(b) household waste
- Free liquids and liquid products, including paints, solvents, sealers, or adhesives; liquid wastes are accepted for solidification
- Soils contaminated with any hydrocarbon other than gasoline, diesel or heavier petroleum products
- Soils containing more than 50 parts per million of PCB
- Asbestos contaminated waste that is not properly packaged

Site personnel responsible for implementing this waste exclusion program are trained in the recognition and identification of prohibited wastes. The training program is described in Section 9 of this document.

## 3. Waste Exclusion Program Components

The waste exclusion program consists of the following components:

- Customer notification and public information
- Load checking/inspections
- Record-keeping
- Training
- Agency notification

Each of these is described in the following sections.

## 4. Customer Notification and Public Information

The customer notification and public information program for the Landfill consists of an initial notification (flyer and signs) listing acceptable and prohibited wastes, and the customer prequalification process. Every customer must sign a disposal agreement that includes a list of restricted materials as one of the terms and conditions of using the PVT Landfill.

The disposal agreement also informs customers that all loads are subject to a random load check. Customers who subsequently decline a load inspection are not allowed access to the Landfill.

Signs stating that the Landfill does not accept hazardous wastes are posted at the site.

## 5. Load Checking/Inspections

The load checking/inspection procedures include the following:

- Gate Monitoring
- Random Inspections
- Landfill Working Face Monitoring

### 5.1 Gate Monitoring

The scalehouse attendant is responsible for ensuring that each load of waste is accompanied by a solid waste manifest form, and that the generator has completed a PVT disposal agreement. The attendant also questions each incoming customer as to the source and contents of the load, and inspects the load visually before allowing it to leave the scales area. If any suspicious wastes are observed, the gate attendant will reject such wastes or summon trained site personnel to determine the acceptability of the waste. The vehicle may be directed to the side, the load uncovered, and the contents examined. If prohibited wastes are detected, the load will be rejected and the customer turned away. A copy of the load manifest form will be retained, with the notation that the load was rejected.

### 5.2 Random Inspections

A minimum of one load will be randomly inspected each day. Random inspections will be conducted as follows:

- The trained inspector will randomly choose a vehicle to be inspected.
- The selected vehicle will be directed to a specified area near the working face. Any driver who declines to have his load inspected will be directed to leave the site without dumping the load.
- The vehicle operator will be directed to dump the load and asked to remain at the area while the load is being inspected.

- For C&D loads, the deposited waste will be spread out using heavy equipment used at the landfill working face, and the inspector will visually inspect the load for prohibited wastes.
- For asbestos loads, the inspector will visually inspect the load before it is unloaded and while it is being unloaded, to verify that the packaging is intact and that the material conforms to the waste manifest.
- Observations of the inspection and other specific information will be recorded and entered into the facility's computer database.
- If unacceptable wastes are observed, the procedures described in Sections 6 and 7, respectively, will be followed.

### 5.3 Landfill and Recycling Area Working Face Inspections

Equipment operators and spotters at the Landfill's working face and including the site's recycling area will visually observe the refuse for prohibited wastes as it is being dumped and compacted. Should wastes that contain suspicious-looking materials be observed, trained personnel will be summoned to determine the acceptability of the waste. If the waste is determined to be unacceptable, the customer will be directed to reload the material into the truck and remove it from the site.

## 6. Management of Hazardous Wastes

This section describes the procedures for the handling, temporary storage, and disposal of hazardous wastes detected during the load checking/inspection process.

### 6.1 Hazardous or Prohibited Wastes Detected at the Landfill Gate

If hazardous or unacceptable wastes are found or observed in a vehicle during visual monitoring conducted at the landfill gate, Landfill personnel will reject the entire load and will complete a load rejection form. If possible, educational information on the proper disposal of rejected wastes will be provided to the customer.

### 6.2 Hazardous or Prohibited Wastes Detected at the Working Face

If hazardous or unacceptable wastes are discovered during a random load check or through visual observation during unloading, site personnel will reject such wastes, require the prohibited wastes to be reloaded onto the transporting vehicle, and enter the rejection and incident into the computer database for record keeping. The transporter is responsible for returning the rejected waste to the generator for disposal.

If a hazardous or unacceptable waste is discovered after a load has been dumped, while the transporter is still on site, the transporter will be directed to reload and remove the material from the site. If the source of the waste is known and the transporter has left the site, Landfill personnel will transport the waste to the temporary unacceptable waste storage area, and held for the customer to pick up at a future time. Customers will not be allowed to bring additional loads for disposal until they have removed unacceptable waste materials from the site.

If hazardous or prohibited wastes are detected at the working face, and the generator or transporter cannot be identified, the following steps will be taken:

1. If the hazardous or unacceptable waste is a general household hazardous waste (i.e., paint, solvents, motor oil, insecticides, pesticides, and automobile batteries), trained site personnel will remove these wastes from the face and transport them to the hazardous waste storage area. The waste will later be over-packed and transported off-site for proper disposal in accordance with federal and state regulations.

2. If the characteristics of the waste is unknown, or the waste is perceived to be a safety hazard, the following steps will be taken:

    - Notify the site supervisor of the situation.

    - Secure the immediate and surrounding areas of the waste to establish a safe zone. Other vehicles will be directed to dump in another location.

    - The Site Operations Manager will contact the site's environmental consultant listed in Attachment A to respond and manage the removal and disposal of the waste.

### 6.3 Temporary Storage of Hazardous Wastes

If household hazardous wastes are discovered at the site and cannot be immediately returned to the hauler or generator, trained personnel will containerize, label, mark and store the waste in a manner consistent with applicable local, state, and federal waste generator regulations. Waste will be stored in the area identified as the Hazardous Waste Storage Area.

- The Landfill has a USEPA hazardous waste generator identification number

- Hazardous wastes are tracked and stored at the site for a maximum of 90 days after accumulation of 220 pounds or more of waste (small quantity generator accumulation start date).

- Hazardous wastes are removed from the site by a licensed hazardous waste hauler under proper manifesting, and disposed or treated at a permitted facility.

## 7. Record Keeping

Records generated relative to this waste exclusion program will be filed in the Landfill's Operating Record and kept for a minimum of three years. Records will be available for inspection by regulatory agencies. Records include:

- Computer database Daily Log
- Employee Training Records

## 8. Training

Site personnel responsible for load checking or inspections will receive training in the identification of hazardous wastes, worker safety, and procedures to be followed should hazardous wastes be found. This training is included in the landfill's annual employee training program.

# ATTACHMENT A

## Hazardous Materials Emergency Response List of Contacts

# HAZARDOUS MATERIALS EMERGENCY RESPONSE PHONE NUMBERS

- CITY AND COUNTY OF HONOLULU ENVIRONMENTAL CONCERN LINE (808) 768-3300
- FIRE DEPARTMENT 911
- ENVIRONMENTAL CONSULTANT

**Latte Consulting LLC**
91-1051 Makahani Street
Kapolei, Hawaii 96707........................................(808) 497-1561

# APPENDIX F
# SITE INSPECTION CHECKLIST

PVT LAND COMPANY, LTD.

# FACILITY INSPECTION CHECKLIST

| LOCATION | NSPECTED BY | TODAY'S DATE |
|---|---|---|
| PVT C&D LANDFILL | | |

| 1. HOUSEKEEPING | S/U/NA | DATE CORRECTED |
|---|---|---|
| A. Yard and storage area orderly and well maintained | | |
| - Fluid materials (fuel , lubes, solvents, paints, etc.) stored in inside secondary containment | | |
| - Any drums stored outside are securely tarped. | | |
| - Closed containers provided for soiled rag disposal. | | |
| - All materials piled, racked or stored in a safe manner. | | |
| - Stairs in good condition with mid-rails and toe boards. | | |
| B. Scales are oil free. Oil dry is swept up and disposed of properly. | | |
| C. Scales calibrated properly (date of last calibration | | |
| D. Stormwater drains free of debris and discharge points shoveled as | | |
| E. Leachate tank levels acceptable. No visible leaks. | | |

| 2. FIRE PREVENTION / EMERGENCY EQUIPMENT | S/U/NA | DATE CORRECTED |
|---|---|---|
| A. Extinguishers inspected and serviced properly. | | |
| - Serviced a minimum of annually by licensed company. | | |
| - Checked monthly by designated company employee. | | |
| - Extinguishers accessible, location marked properly | | |
| - Tagged as to service date/repairman | | |
| - Hoses, standpipes, sprinkler heads in good condition | | |
| B. All equipment equipped with appropriate fire extinguishers or fire suppression systems | | |
| C. Smoking restrictions observed. | | |
| D. Fire blanket mounted and accessible. | | |
| E. Test fire, security detection / protection devices as required. | | |
| F. Test emergency lighting equipment if so equipped. | | |

| 3. SAFETY AND PERSONAL PROTECTIVE EQUIPMENT | S/U/NA | DATE CORRECTED |
|---|---|---|
| A. Eye and face protection available and used where required. | | |
| B. Hard hats worn where required. | | |
| C. Gloves available and used where required. | | |
| D. Proper safety shoes worn. | | |
| E. Hearing protection available. | | |
| F. Infectious Control Kit / PIMW Disposal Containers on site. | | |
| G. Approved First-Aid kits and supporting equipment well maintained and readily available (multiple locations). | | |
| H. Minimum of one person on site at all times with current CPR / First-Aid certification. | | |

PVT LAND COMPANY, LTD.

# FACILITY INSPECTION CHECKLIST

| 4. EQUIPMENT | | S/U/NA | DATE CORRECTED |
|---|---|---|---|
| | A. Regular preventive maintenance performed. | | |
| | B. Vehicle condition reports completed accurately . | | |
| | C. Equipment Washing. | | |
| | - washing service reclaims wash and rinse water. | | |
| | - area diked when washing equipment | | |
| | D. Equipment Inspection (monthly) | | |

| EQUIPMENT CHECKLIST | UNIT # | UNIT # | UNIT # | S/U/NA | DATE CORRECTED |
|---|---|---|---|---|---|
| 1. Seat belt in use. | | | | | |
| 2. Rollover protection system. | | | | | |
| 3. Backup alarm. | | | | | |
| 4. Horn | | | | | |
| 6. Gauges and alarms for oil, hydraulic, air pressure and coolant temperature functioning and accurate. | | | | | |
| 7. Hand holds, ladder or steps intact. | | | | | |
| 8. Walking surfaces free of slipping | | | | | |
| 8. On-board fire suppression system or portable fire extinguishers charged and certified. | | | | | |
| 9. Air conditioning and filtering system operating. | | | | | |
| 10. Tracks dug out after each shift and rollers free moving. | | | | | |
| 11. Work lights on front and rear functioning. | | | | | |
| 12. CB radio working. | | | | | |
| 13. Window glass in good condition. | | | | | |
| 14. Windshield wipers working properly | | | | | |
| 15. All brakes functioning properly | | | | | |

PVT LAND COMPANY, LTD.

# FACILITY INSPECTION CHECKLIST

| DISPOSAL AREAS INSPECTION CHECKLIST | S/U/NA | DATE CORRECTED |
|---|---|---|
| **ACTIVE DISPOSAL AREA** | | |
| A. Spotter on duty | | |
| B. Minimum of 1 bulldozer in operation | | |
| C. Water truck available and in operation as needed | | |
| D. Potential disease vectors are absent | | |
| - Flies. | | |
| - Rodents | | |
| - Other mammals | | |
| E. Litter is adequately controlled | | |
| F. Dust is adequately controlled | | |
| **INACTIVE DISPOSAL AREAS** | | |
| A. No standing water observed | | |
| B. All areas graded to drain | | |
| C. No smoke or other signs of subsurface fire. | | |
| D. No excessive erosion of sideslopes | | |
| E. Dust is adequately controlled | | |

**COMMENTS AND EXPLANATIONS**

**STORMWATER BASIN INSPECTION RECORD**

| Basin | | A | B | C | D | |
|---|---|---|---|---|---|---|
| Skimmer connected and working properly | Yes | | | | | |
| | No | | | | | |
| Basin floor has less than 1 foot of sediment | Yes | | | | | |
| | No | | | | | |
| Basin sideslopes in good condition with minimal erosion | Yes | | | | | |
| | No | | | | | |
| Comments | | | | | | |

PVT LAND COMPANY, LTD.

# FACILITY INSPECTION CHECKLIST

**LEACHATE SUMP INSPECTION RECORD**

| | | | | | | |
|---|---|---|---|---|---|---|
| Basin | | | | | | |
| Sump cover is securely in place | Yes | | | | | |
| | No | | | | | |
| Leachate depth in sump is less than 5 feet | Yes | | Leachate Depth ____________ feet | | | |
| | No | | Leachate Depth ____________ feet | | | |
| Comments | | | | | | |

**OVERALL INSPECTION SUMMARY AND COMMENTS**

| SIGNATURE | TODAY'S DATE |
|---|---|
| | |

# APPENDIX G
# EMERGENCY FIRE PLAN

# Emergency Fire Plan

## PVT Integrated Solid Waste Management Facility

Nanakuli, Oahu, Hawaii

Prepared for:

PVT Land Company, Ltd.
87-2020 Farrington Highway
Waianae, Hawaii 96792

**Prepared by:**

element environmental llc
environmental · engineering · water resources
98-030 Hekaha Street, Unit 9, Aiea, Hawaii 96701

March 2010

**Attachment H**

# *Table of Contents*

## LIST OF FIGURES

## LIST OF APPENDICES

Attachment H

# List of Acronyms

| | |
|---|---|
| C&D | construction and demolition |
| $CH_4$ | methane |
| CO | carbon monoxide |
| $CO_2$ | carbon dioxide |
| DOH | State of Hawaii, Department of Health, Office of Solid Waste Management |
| °F | degrees Fahrenheit |
| ft$^2$ | square feet |
| HAR | Hawaii Administrative Rules |
| $H_2S$ | hydrogen sulfide |
| HVOCs | halogenated volatile organic compounds |
| ISWMF | integrated solid waste management facility |
| LEL | lower explosive limit |
| $O_2$ | oxygen |
| ppm | parts per million |
| TPH | total volatile petroleum hydrocarbons |

# Section 1 Introduction

## 1.1 Purpose

The purpose of this emergency fire plan is to provide fire response procedures and courses of action to be followed in case of fire at PVT Integrated Solid Waste Management Facility (ISWMF) as a part of the facility's Operations Plan. This Fire Plan also addresses preventative measures taken at PVT ISWMF to reduce the risk of surface and subsurface fires.

Hawaii Administrative Rules (HAR) Section 11-58.1-32(b)(2)(C) requires recycling and materials recovery facilities to develop a fire plan to prevent and minimize fire hazards, and HAR Section 11-58.1-19(b)(2) requires construction and demolition (C&D) solid waste landfills to develop an emergency fire plan. In addition, the solid waste permit issued by the State of Hawaii, Department of Health, Office of Solid Waste Management (DOH) for the PVT C&D landfill requires that a written plan with record keeping shall be developed delineating a detection and response sequence (i.e., flow chart with emergency contact names and numbers, procedures to follow if a fire is detected, fire fighting and communication equipment) for a fire at the landfill. It states that both underground and surface fires shall be addressed in the plan (DOH, 2006).

This emergency fire plan encompasses PVT ISWMF's recycling and materials recovery area and the C&D solid waste landfill. The types of fires addressed are small surface or equipment fires (less than 5,000 square feet); major surface fires (greater than 5,000 square feet) including structure fires; small shallow subsurface fires (less than 5,000 square feet); and large subsurface fires (greater than 5,000 square feet). The procedures to be followed and possible options given each fire scenario are discussed along with the type of equipment and materials needed. A discussion of inspections, reports, and notification procedures for the DOH, the Fire Department, and the general public are included in this fire plan.

## 1.2 Site Background

PVT ISWMF is located in the community of Nanakuli near the southwestern coast of the island of Oahu, Hawaii, as shown on Figure 1, Site Vicinity Map. The facility property begins approximately 1,600 feet northeast of the intersection of Farrington Highway and Lualualei Naval Access Road, and extends northerly approximately one mile along Lualualei Naval Access Road. The facility is bordered to the east by the Lualualei Naval Access Road, to the west by Ulehawa Stream, to the south by a residential neighborhood, and to the north by the West Oahu Aggregate Facility. The general land use of the surrounding area is residential, industrial, and undeveloped properties.

PVT ISWMF property covers a total of 379 acres. The currently developed operating area consists of 200 acres on the west side of Lualualei Naval Access Road. A parcel of 179 acres located east of the road is used for soil borrow, water supply, and drainage control.

PVT ISWMF is a comprehensive solid waste management facility for C&D waste and other recyclable products. It does not accept hazardous waste or municipal solid waste as defined in state regulations. It embodies three types of waste management facilities defined in HAR Section 11-58.1:

Attachment H

Project: 080024

Approved by: JKH

Drawn by: LBM

Date: March 2010

**Figure 1**
**Site Vicinity Map**
Emergency Fire Plan
PVT Integrated Solid Waste Management Facility
Nanakuli, Oahu, Hawaii

element environmental, llc

Attachment H

- A reclamation facility, defined as "a location used for the handling, processing, or storage of recoverable material, including but not limited to composting and remediation". Recoverable material is defined as "material that can be diverted from disposal for recycling or bioconversion."
- A materials recovery facility; and
- A C&D waste landfill.

The primary existing and future planned operations at the site include the following:

- Segregation of incoming loads into materials for processing, recycling, on-site usage, or disposal.
- Mixed waste sorting to remove and separate recyclable materials;
- Processing to produce feedstock for bioconversion of organic wastes;
- Production of aggregate materials including rock, gravel, and crushed asphalt;
- Solidification of liquid wastes;
- Reclamation of previously landfilled C&D waste to minimize the potential of fire, to prevent settlement, to minimize leachate potential, and to remove voids;
- Storage for up to two weeks of recyclable materials and marketing of recyclable materials; and
- Landfill disposal of residual non-recoverable waste materials, including primarily composition/asphalt roofing shingles, tile, gypsum board, lead painted concrete, and cementitious siding.

PVT ISWMF will accept the following types of material for processing or disposal:

- C&D waste;
- Waste furniture, mattresses and other organic-containing material that can be processed into feedstock for bioconversion;
- Scrap metal;
- Liquid wastes for solidification; and
- Contaminated soil for disposal or use in solidification of liquid wastes and sludge.

The primary users of the facility are C&D contractors and waste haulers on Oahu, including agents of the federal military or other government agencies.

As a C&D facility, PVT ISWMF has minimal combustible material; the primary combustible material is wood and paper products. Though contaminated soil and liquid waste for solidification are accepted, no petroleum based products (such as gas, oils, and tar) are accepted. The production of methane gas, which is an explosive gas typically generated in landfills, is minimal because the types of waste accepted do not produce large amounts of methane gas during decomposition. PVT ISWMF's landfill does not expect elevated temperatures due to aerobic or anaerobic decomposition because of the inert nature of the C&D waste; thus, no fires are expected from spontaneous combustion. The most probable sources of fire are from on-site equipment or hot loads (i.e., loads with burned or burning debris).

All fires have three key requirements that must be present to support combustion. The first component is combustible materials; especially material with a low threshold of combustion such as petroleum based products, wood or paper products, and methane gas. The second component is elevated temperatures which are required to initiate combustion. Elevated temperatures can be generated during aerobic or anaerobic decomposition and can reach as high as 170 degrees Fahrenheit (°F). Elevated temperatures can also come from hot loads that have been dumped without the operator's knowledge. The third component essential for combustion is air or oxygen. Given the structure and nature of the landfill, the best element for control of subsurface fires is to control of the amount of oxygen entering the landfill by using cover material and injecting carbon dioxide to displace oxygen.

# Section 2 Preventative Fire Policies

## 2.1 General Policies

The following are general policies that help reduce the risk of surface and subsurface fires at the facility:

- Smoking is not permitted on the landfill or in the recycling and materials recovery area.
- Fire lanes are maintained for material storage areas.
- Roads are maintained for easy entry and exit from the facility.
- Fire extinguishers are provided in all buildings and vehicles at the site for use in extinguishing small fires.

## 2.2 Inspection of Landfill and C&D Waste

Personnel at the scalehouse and unloading areas are trained and directed to notice any smoldering or burning materials in incoming truck loads, and prevent them from contacting other combustible material or being buried in the disposal area. If a truck load with smoldering or burning material is encountered, it is rejected by the facility and removed from the property immediately. Debris coming from burned structures is first inspected before being brought to the facility. If the debris is accepted, it is also monitored by cameras as it is scaled in, and it is monitored by the spotter when it is dumped.

## 2.3 Recycling and Materials Recovery Area

As part of the daily operations, PVT ISWMF's recycling and materials recovery area is visually monitored for indications of unusual conditions, including fire, unusual odors, vectors, and other issues. PVT ISWMF employees are trained to report indications of fire if observed at any time. If evidence of a fire is observed, management is notified immediately and the fire responded to as described in Section 3.0, *Fire Management Procedures*.

Each material stockpile at the recycling and materials recovery area has a fire lane surrounding it to maintain access to the stockpile in case of fire. Fire access lanes are also maintained around all stationary equipment.

## 2.4 Inspection of Landfill

PVT ISWMF's C&D landfill is visually monitored daily to check for unusual odors, sinkholes, smoke, stressed vegetation, and fissures coming from the surface of the landfill. PVT ISWMF employees are trained to report indications of fire if observed at any time. If evidence of a surface or subsurface fire is observed, management is notified immediately and the fire responded to as described in Section 3.0, *Fire Management Procedures*. Visual monitoring allows the facility to respond to surface or subsurface fires before they turn into major fires.

## 2.5 Cover Material

Appling adequate cover material to the landfill minimizes the amount of oxygen entering the waste mass of the landfill. Minimizing oxygen in the waste mass decreases the chance of subsurface fires and/or the spread of subsurface fires. To minimize oxygen levels in the landfill, a minimum of six inches of interim cover soil is applied whenever the surface area of the working face is approximately one acre in size or once a week, whichever comes first. Void spaces within the waste mass are filled with general waste fill soil. In addition, at least 12 inches of intermediate cover are applied for areas of the landfill that are not in the active-work-area. The intermediate cover in inactive areas is maintained on a yearly basis.

The landfill also constructs subsurface fire barriers to limit the spread of potential future subsurface fires and to minimize potential damage to landfill liner systems. Subsurface fire barriers are placed between Phases I and II of the landfill, between adjacent disposal cells in Phase II, or within disposal cells. The thickness of the barrier is sufficient to prevent the movement of fire conditions from one phase or cell to the other. Fire barriers are a minimum of three feet thick and a maximum of five feet thick. The fire barrier consists of soil, ash, or an alternate material of appropriate physical or chemical properties as to not allow fire to pass through.

The DOH has approved AES ash for use as a fire barrier material and as a soil replacement in the landfill operational layer, subject to several conditions which are stipulated in a letter from DOH dated May 4, 2006. The May 4, 2006 DOH letter, contained in Appendix A, outlines the design specifications for using AES ash as a fire barrier and soil replacement in the operational layer. Use of AES ash at PVT ISWMF as a fire barrier or a soil replacement in the operational layer shall conform the design specifications stipulated in Appendix A.

## 2.6 Gas Monitoring

Steel gas probes approximately ten feet long by 2.5 inches in diameter are strategically placed around the landfill as needed for fire monitoring. The gas probes have one-half- to three-quarter-inch inlet holes along the length of the gas probe to allow landfill gases to enter the gas probe. If a subsurface fire is suspected, probes are placed in suspect areas. The probes are monitored for temperature and carbon monoxide gas at a minimum. A schematic drawing of a typical gas probe is shown in Figure 2 – Gas Probe Schematic.

Dräger® tubes, a GEM 2000 Plus landfill gas monitor, or an equivalent meter is used to measure carbon monoxide levels in parts per million (ppm), and a pyrometer is used to measure temperature. In addition to measuring carbon monoxide, the GEM 2000 Plus meter measures methane (both in percent volume and percent of the lower explosive limit (LEL)), oxygen, carbon dioxide, hydrogen sulfide, and balance gas which is primarily nitrogen. Gas in the gas probes is measured by inserting a rubber tube into the valve opening on each gas probe. The meter is then connected to the rubber tube and is allowed to run to purge air from the rubber tube and obtain an accurate reading from the gas probe. Once a steady reading is obtained from the meter, the values are recorded.

The gas monitoring procedure is similar using the Dräger® tubes, except that gas is purged from the rubber tubing using a hand pump. The Dräger® tube is then inserted into the hand pump and gas is drawn into the tube. After the gas from the gas probe has been pumped into the tube, the carbon monoxide measurement is recorded.

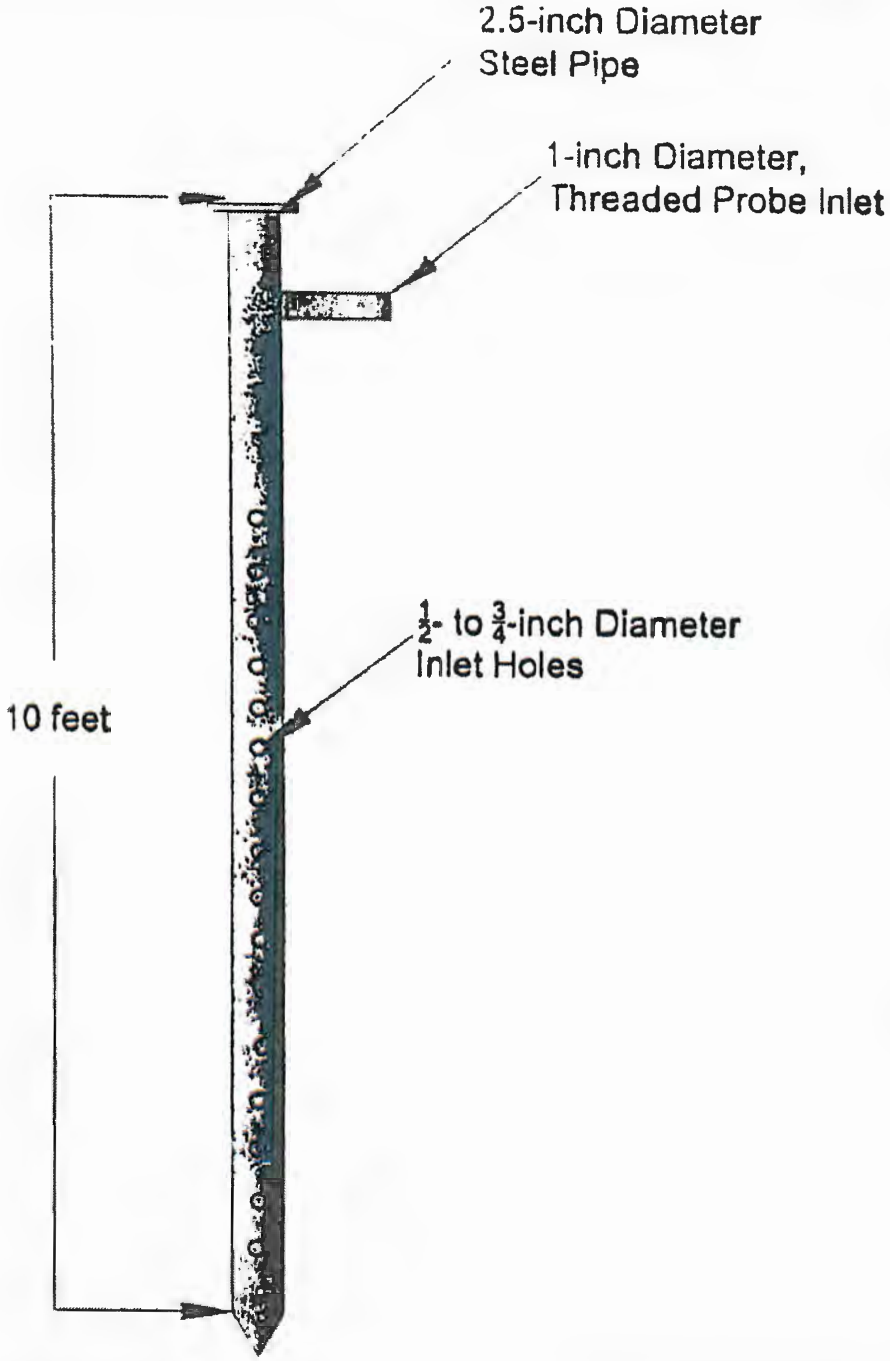
The pyrometer measures temperature in degrees Fahrenheit (°F). To measure the temperature inside the gas probes, the temperature probe is inserted into the gas probe valve and allowed to penetrate into the gas probe. The temperature is then recorded. Temperatures above 170°F indicate a possible subsurface fire.

Measurements are recorded on a gas monitoring form, an example of which is presented in Appendix B. If levels of carbon monoxide above 500 ppm are encountered in a probe, carbon dioxide is injected as soon as possible and cover material is placed over areas that could be potential sources of oxygen.

Periodically, levels of methane, oxygen, carbon dioxide, hydrogen sulfide, and balance gas are also monitored in the probes using a GEM 2000 Plus meter, or equivalent. Methane can be an explosive gas when the concentration is greater than 5% by volume coupled with oxygen levels greater than 4% by volume. Oxygen is monitored because high oxygen levels could allow fires to ignite and spread through the landfill or contribute to an explosive environment if methane levels are above the LEL. Carbon dioxide is monitored as an indication of how well the injected carbon dioxide is remaining in the waste fill material. Hydrogen sulfide is monitored because elevated concentrations of hydrogen sulfide can interfere with the carbon monoxide sensor resulting in elevated (false positive) carbon monoxide readings. Gas concentrations are recorded on the gas monitoring forms or equivalent.

## 2.7 Preventative Carbon Dioxide Injection

Carbon dioxide is injected into suspect areas of the landfill if gas monitoring indicates that a subsurface fire may be present (i.e., carbon monoxide concentrations over 500 ppm). Carbon dioxide is injected through the steel probes also used for gas monitoring. Carbon dioxide injection is followed by gas monitoring. Carbon dioxide may also be injected to provide a fire barrier between cells to prevent a fire from migrating through the landfill. Subsurface fire remediation using carbon dioxide injection is discussed in Section 3.5.



Project: 080024

Approved by: JKH
Drawn by: LBM

Date: March 2010

**Figure 2**
**Gas Probe Schematic**
Emergency Fire Plan
PVT Integrated Solid Waste Management Facility
Nanakuli, Oahu, Hawaii

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Attachment H

# Section 3
# Fire Management Procedures

## 3.1 Equipment

The fire fighting equipment at the landfill consists of two bulldozers, one excavator, two water trucks with capacities of 4,000 gallons and 2,000 gallons, one front-end loader, two large dump trucks and one backhoe. Two water tanks and fire extinguishers are located at the site. Water for the water trucks is accessible via two four-inch drop pipes and a two-inch water line. The four-inch drop pipes receive water from water storage tanks and a water production well. Water supplied to the two-inch line near the entrance of the landfill is potable water from the City and County of Honolulu. Water access and equipment locations are shown in Figure 3 - Site Use Description. All on-site vehicles are equipped with fire extinguishers. Hand-held, two-way radios and vehicle radios allow workers to communicate immediately in case of an emergency or fire.

Subsurface injection points (steel gas probes) have been designed and constructed for the injection of liquids and gases into the subsurface. The injection points are designed to allow injection of either liquid carbon dioxide or water into the subsurface and for gas monitoring as stated above. Figure 2 shows a schematic drawing of a gas probe. Carbon dioxide injection is conducted by an independent contractor who supplies the equipment needed to connect to and inject into the steel probes. About ten to twelve steel probes are typically kept on site for monitoring and injection, as needed.

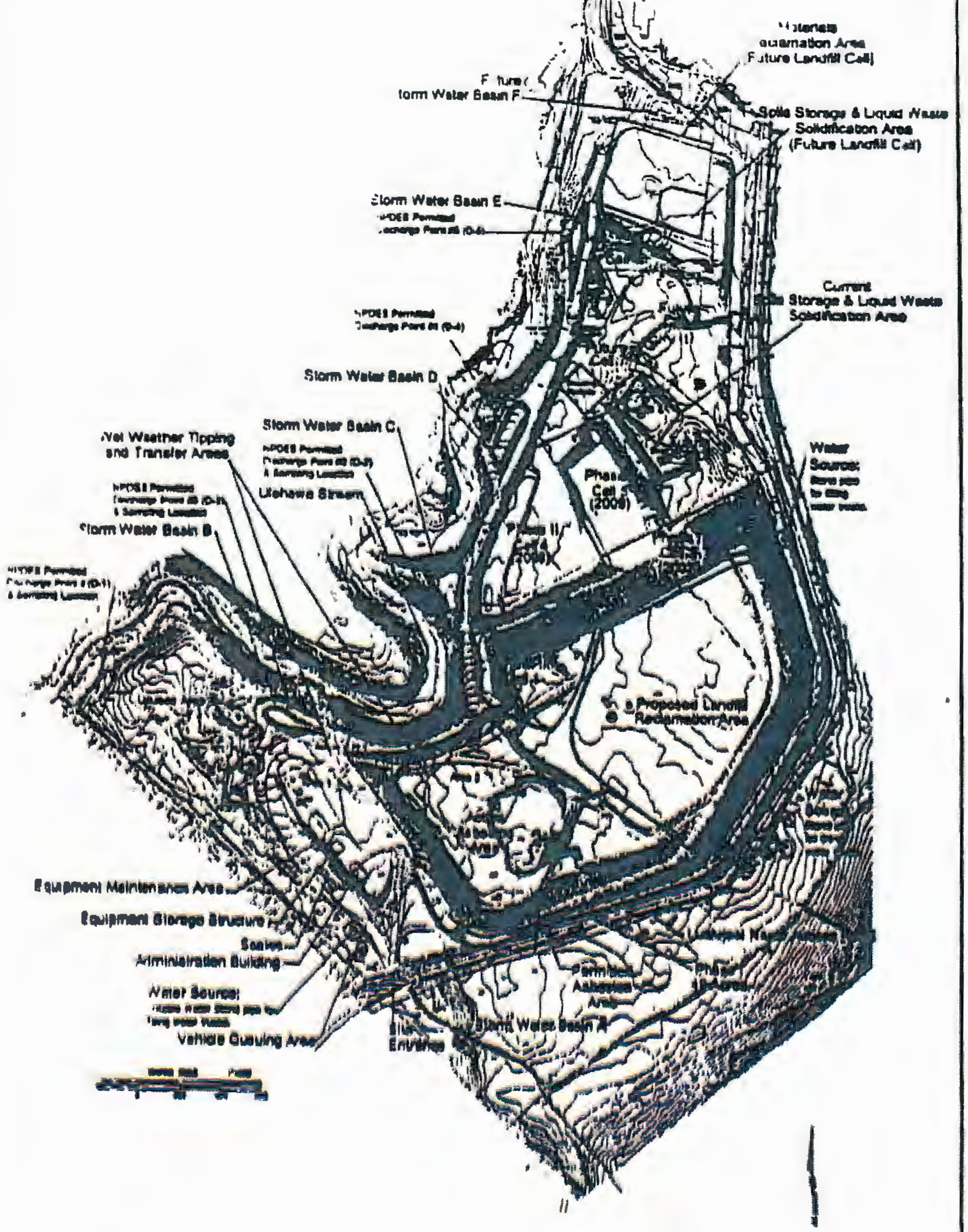
## 3.2 Training

As part of the fire training program, site personnel are trained in inspection of incoming loads. All incoming loads are inspected at the scales as well as at the working face for smoldering or burning loads. Efforts are made to minimize the possibility of smoldering or burning loads. Equipment operators are trained in the importance of maintaining a tight earth cover to minimize the introduction of oxygen into the waste mass. Site personnel are trained to maintain a stockpile of cover material close to the working face for use in extinguishing fires by direct burial.

Operators are trained to extinguish small fires and to follow the fire management procedures described in this section. The site is checked at least daily for any olfactory or other signs of surface or subsurface fire (such as steam, smoke, surface cracking, or subsidence).

## 3.3 Fire Notification Procedures

If a fire is observed on the landfill, the main office will be contacted without delay via radio or at 668-4561. If the fire is obviously a major surface fire, the fire department will be contacted immediately at 911. Once the office is contacted, the following PVT employees will be notified of the fire conditions:



Legend

Groundwater Monitoring Location
Primary Fill Area: Cells 1, 2, 3, 4, and 5 Phase II
Secondary Fill Area: Phase I
Property Boundary
Asbestos Disposal Area
Active Asbestos Disposal Area
Future Phase II Areas
Solidification Area
Paved Area
Wet Weather Tipping and Transfer Areas
Proposed Landfill Reclamation Area
Ⓦ Water Sources

Base Map: Sam O. Hirota Inc. 2006, Updated by Adams Inc. January 2016

Project: [illegible]
Approved by: [illegible]
Drawn by: [illegible]
Date: March 2016
Scale: As Shown

**Figure 3**
**Site Use Description**

Emergency Fire Plan
PVT Integrated Solid Waste Management Facility
Nanakuli, Oahu, Hawaii

Attachment H

- Steve Joseph, General Manager: 630-4592
- Moki Riposa, Operations Manager: 479-1585
- Albert Shigemura, President: 225-4949
- Ben Yamamoto, Vice President: 224-7891

If fire is observed after the office hours of 7:00 am to 3:30 pm Monday through Friday, or 7:00 am to 1:30 pm Saturday, the general manager, operations manager, and president will be contacted. Once the proper contacts have been made, the extent of the fire and whether it is a major or minor fire will be determined. Sections 3.4 and 3.5 describe actions to be taken to mitigate the fire. Figure 4 presents the Fire Response Flow Chart showing the step-by-step procedures for fire notification.

## 3.4 Surface Fires

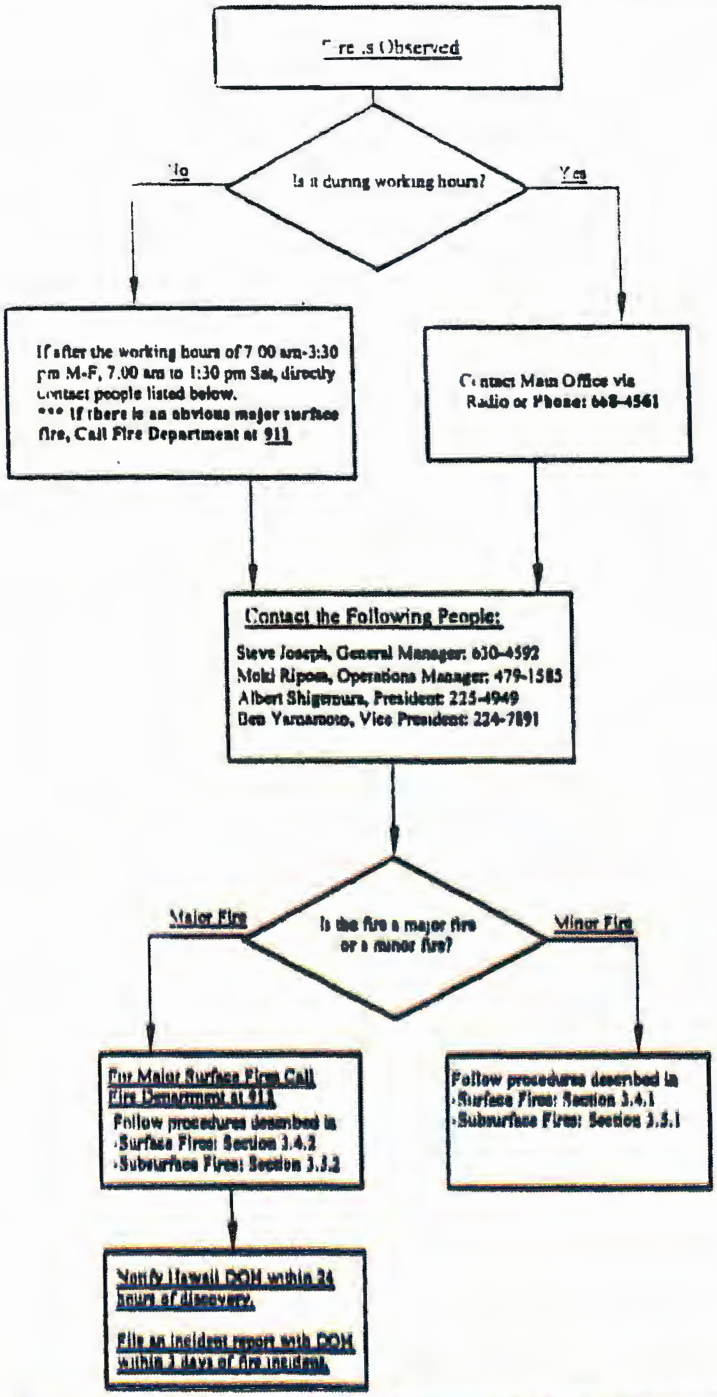
### 3.4.1 Minor Surface Fires

In case of minor surface or equipment fires (covering less than 5,000 square feet ($ft^2$)), the fire will be extinguished immediately with on-site fire extinguishers or water, or suffocated by direct burial. After the fire is extinguished, the area will be closely inspected, and wetted as necessary to ensure that the fire has not spread into the subsurface. In case of an equipment fire, after the fire is extinguished, the area beneath the equipment will be wetted and excavated, if necessary, to ensure that the fire has not ignited a subsurface fire. The main office will be notified, and the details of the fire will be entered into a fire incident report (Appendix B). The fire incident report will be maintained at the site office.

### 3.4.2 Major Surface Fires

In case of a major surface fire (greater than 5,000 $ft^2$), the fire department will be contacted immediately; meanwhile on site resources such as fire extinguishers, earth, and water will be mobilized immediately to contain the fire. The least amount of water possible will be used to extinguish the fire to prevent generation of large amounts of leachate. If possible, direct burial with stockpiled cover material is the preferred method of extinguishing the fire. If the fire is in waste material on the surface, the fire can be extinguished by spreading and wetting with a bulldozer or trash compactor. The most critical item is the liner and prevention of damage by fire or heat. If water or fire extinguishers are not effective immediately in extinguishing the fire, the fire will be put out by burial beneath cover material. After the fire is extinguished, it will be uncovered, inspected, and wetted before the extinguished materials are reburied.

Landfill personnel will monitor for release of toxic fumes that might endanger personnel working on the site or the adjoining properties. Landfill personnel will monitor for some or all of the following constituents, as necessary and applicable: temperature, carbon monoxide, oxygen, carbon dioxide, hydrogen sulfide, halogenated volatile organic compounds (HVOCs), methane, and total volatile petroleum hydrocarbons (TPH). Records will be maintained of monitoring results, and a fire report will be prepared for submittal to DOH on major fires.



Project: 080024

Approved by: JKH
Drawn by: LBM

Date: March 2010

**Figure 4**
**Fire Response Flow Chart**

Emergency Fire Plan
PVT Integrated Solid Waste Management Facility
Nanakuli, Oahu, Hawaii

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Attachment H

For major surface fires that occur in the buffer zone areas surrounding the landfill and for structure fires, the following actions will be taken.

<u>Buffer Zone Fire.</u> The following actions will be taken if a fire occurs in the buffer zone areas surrounding the landfill. Maximum effort will be made to prevent the fire from reaching refuse fill areas by utilizing on-site assets.

- Call 911 emergency services.
- Maintain existing fire breaks between waste fill areas and surrounding vegetation.
- Excavate additional fire breaks between the landfill and the oncoming fire. Excavated soils will be bermed on the fire side of the fire break for additional protection.
- Water down areas between the fire break and the disposal area using the on-site water trucks.

<u>Structure Fire.</u> The following actions will be taken if a fire occurs in a site structure.

- Evacuate building.
- Call 911 emergency services.
- Prevent fire from spreading to surrounding areas by using on-site equipment to construct fire breaks, and by using the water truck to wet down adjacent areas.
- Avoid entering a burning structure for any reason.

## 3.5 Subsurface Fires

The best appropriate efforts will be made to contain the fire by excavation, liquid carbon dioxide injection, water injection, wetting down the fire area, or suffocating the effected area by placing cover material over it. To aid in evaluating the extent of the fire, landfill probes will be inserted into the waste material to check for temperature and carbon monoxide levels.

### 3.5.1 Minor Subsurface Fires

If the fire is relatively shallow and covering a small area (less than 5,000 $ft^2$), one or all of the following options will be used to extinguish the fire.

1. The effected area will be excavated to establish the extent of the fire. Burning material will be excavated, wetted, and spread with a bulldozer or trash compactor. The burnt waste material will be inspected before it is reburied. The excavation will be inspected to be sure that no embers or hot material are left in the excavation before the excavation is backfilled. The excavation will be backfilled with moist cover material or a mixture of wetted trash and moist earth. A tight earth cover will be maintained over the area to minimize the chances of re-ignition of the burnt waste material and to prevent a chimney effect from drawing oxygen into the area. To maintain a tight cover, the earth material will be maintained in a highly moist condition.

Attachment H

2. The effected area will be injected with either liquid carbon dioxide or water prior to excavation of the fire area. The injection of water or liquid carbon dioxide will act to cool the fire, limit the extent of the fire, and lower the oxygen content of subsurface gases prior to excavation. The same procedures as item 1 will be followed during excavation of the fire area.

3. The effected area will be injected with either liquid carbon dioxide or water to help control and extinguish the fire. Figure 5 shows a schematic drawing of carbon dioxide or water injection. The injection of water or liquid carbon dioxide will act to cool the fire, limit the extent of the fire, and lower the oxygen content of subsurface gases. Liquid carbon dioxide or water will be injected at the perimeter of the fire to help suffocate and limit the spread of the subsurface fire to unaffected parts of the landfill.

4. The effected area will be monitored for temperature and carbon monoxide after extinguishing the fire. After the fire is controlled or extinguished, the temperature and carbon monoxide measurements should slowly return to normal. The area will be monitored for a period of three months after the fire is extinguished.

### 3.5.2 Major Subsurface Fire

In case of a relatively large area fire (5,000 ft$^2$ or more) or a deep subsurface fire, one or all of the following options will be used to extinguish the fire.

1. Initial temperature and carbon monoxide measurements will be taken by the landfill's environmental consultant and landfill personnel using landfill probes inserted into the trash in an attempt to evaluate the extent and location of the fire. The temperature and carbon monoxide levels will continue to be monitored as part of the ongoing efforts to control and extinguish the fire.

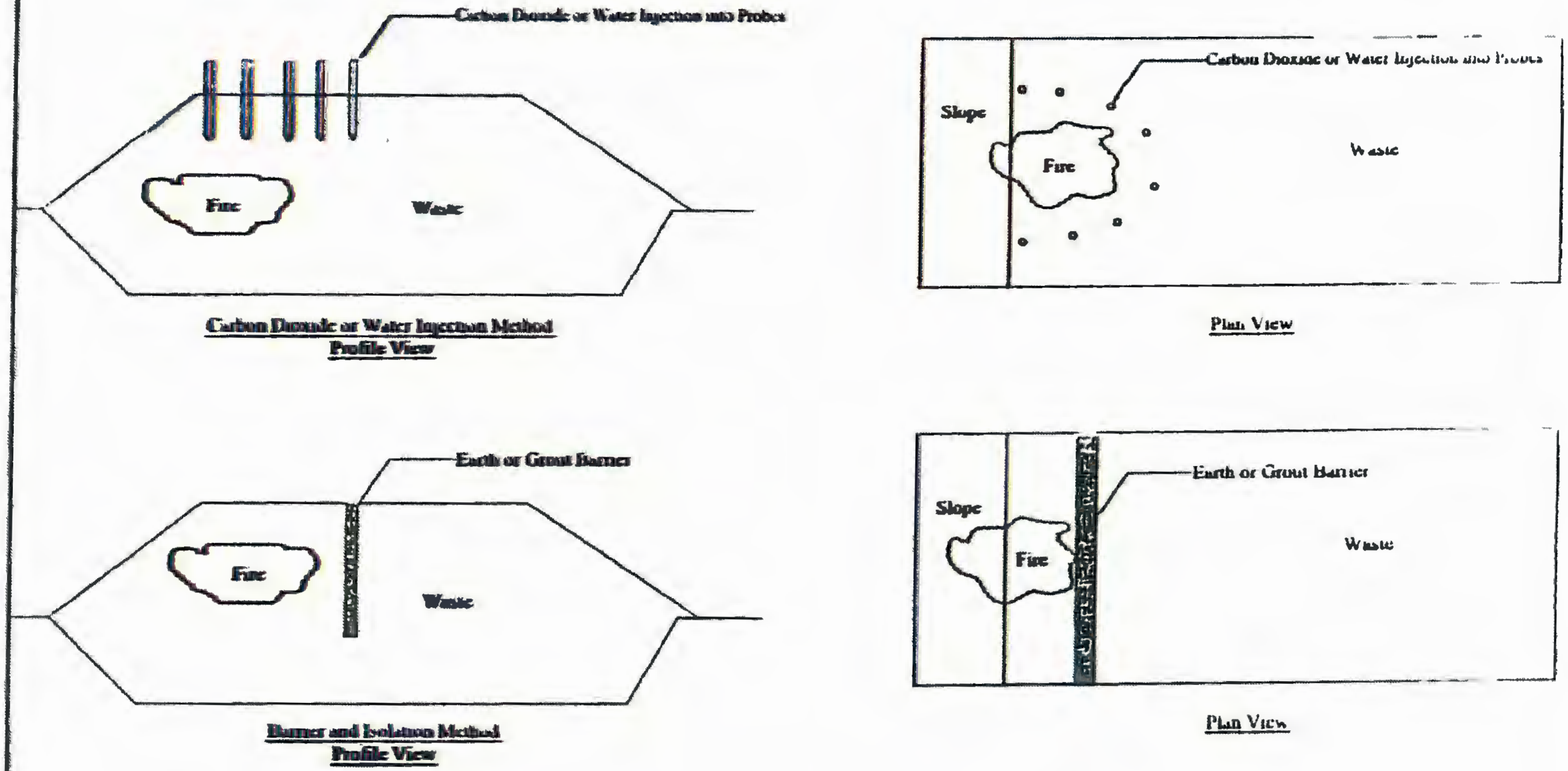
2. The effected area will be injected with either liquid carbon dioxide or water to help control and extinguish the fire. The injection of water or liquid carbon dioxide will act to cool the fire, limit the extent of the fire, and lower the oxygen content of subsurface gases. Liquid carbon dioxide or water will be injected at the perimeter of the fire to help suffocate and limit the spread of the subsurface fire to unaffected parts of the landfill.

3. A tight earth cover will be maintained over the area to minimize the spread of fire and to prevent a chimney effect from drawing oxygen into the burning area. A tight earth cover will be maintained on the sides as well to prevent or minimize the introduction of oxygen into the fire from adjoining areas of the landfill. To maintain a tight cover, the earth material will be maintained in a highly moist condition.

4. The effected area will be excavated and the limits of fire established. The burning material will be excavated, wetted, and spread with a bulldozer or trash compactor. The burnt waste material will be inspected before it is reburied. The excavation will be inspected to be sure that no embers or hot material are left in the excavation before the excavation is backfilled. The excavation will be backfilled with moist cover material or a mixture of wetted trash and moist earth. A tight earth cover will be maintained over the area to minimize the chances of re-ignition of the burnt waste material and to prevent a chimney effect from drawing oxygen into the area. To maintain a tight cover, the earth material will be maintained in a highly moist condition. The excavation and the reburied

burnt waste material will be monitored for temperature and carbon monoxide for possible re-ignition of the waste material.

5. Impermeable subsurface barriers will be established using either trenches backfilled with moist earth or grout injected boreholes. Typically the barrier works well if the fire is cornered in a confined portion of the landfill. Figure 5 shows a schematic drawing of an earth or grout barrier used to contain the fire. Liquid carbon dioxide may be injected into the barrier area to control and extinguish the fire. Temperature levels and levels of carbon monoxide, carbon dioxide, and oxygen (at a minimum) will be monitored to evaluate if the subsurface gases will support combustion. The subsurface gases will be maintained at levels that will not support combustion until temperatures fall to levels at which re-ignition cannot occur. Temperature and gas levels will be monitored in the fire area to detect potential re-ignition.



Carbon Dioxide or Water Injection Method
Profile View

Plan View

Barrier and Isolation Method
Profile View

Plan View

Project: 080024

Approved by: JKH
Drawn by: LBM

Date: March 2010

**Figure 5**
**Fire Control Methods**
Emergency Fire Plan
PVT Integrated Solid Waste Management Facility
Nanakuli, Oahu, Hawaii

element environmental

Attachment H

# Section 4 Reporting Requirements

## 4.1 Inspections and Reports

For major fires, a fire report documenting the actions taken and their results will be completed. The report will include the following information: data regarding levels of gases monitored within the landfill, personal air monitoring results, the amount of water or carbon dioxide used in fighting the fire, the amount of material excavated, and maps showing the location of the fire and monitoring points.

If the fire occurred in the vicinity of the liner, the liner integrity will be checked. The waste will be excavated and the liner physically inspected to evaluate the amount of damage, if any. A professional liner installer or the landfill operator, which ever is appropriate, will repair damage caused to the liner by the fire. The damage and repairs will be documented in pictures and in writing.

A record of major fires and the steps taken by site personnel to extinguish major fires will be kept at the site. This separate log for fire incidents at the site will be maintained by site personnel at the site office. A copy of a sample fire incident log is presented in Appendix B.

## 4.2 Notifications

All major fire incidents will be reported to DOH within 24 hours of their discovery. If the fire occurs during non-business hours, DOH will be notified by fax and then by phone on the next business day. DOH may assess release of toxic fumes from the burning material and determine the impact of the released fumes on public health. If DOH determines that released fumes might be detrimental to human health, the DOH and the landfill operator will post a public notification regarding the incident. An Incident Report will be submitted within three days of the incident and will include:

1. name, address, and telephone number of the landfill owner and operator;
2. name, address, and telephone number of the facility at which the incident occurred;
3. date, time and type of incident (i.e., fire, explosion, release, etc.);
4. name and quantity of material(s) involved;
5. the extent of injuries, if any;
6. an assessment of actual or potential hazards to human health or the environment, where applicable; and
7. estimated quantity and disposition of recovered and unrecovered material that resulted from the incident.

# Section 5 References

Spencer A. Gross, Inc., 2008. Topographic Site Plan with Updates from A-Mehr Inc, January 2010.

Delorme, 2002. 3-D TopoQuads, Schofield Barracks Quadrangle.

DOH, 2006. Solid Waste Permit, LF-0089-04. State of Hawaii Department of Health, Solid Waste Branch, April 13, 2006.

# Appendix A

May 4, 2006 Letter from DOH on Use of AES Ash

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HAWAII 96801-3378

CHIYOME L. FUKINO, M.D.
DIRECTOR OF HEALTH

In reply, please refer to:
[illegible]

May 4, 2006

S0515GS

Mr. Stephen E. Joseph
General Manager
PVT Nanakuli C & D Landfill
87-2020 Farrington Highway
Waianae, Hawaii 96792

File: LF-0089-04

Dear Mr. Joseph:

SUBJECT: Conditional Approval for use of AES Ash as Fire Barrier and Soil Replacement in Operational Layer
PVT Nanakuli Construction and Demolition Landfill

The Department of Health (DOH), Solid and Hazardous Waste Branch (SHWB) completed its review of the document and supporting appendix dated April 7, 2006, entitled "Reuse of AES Ash at PVT Landfill as a Fire Control Product." Conditional approval for use of AES ash in the fire barrier and as a soil replacement in the operational layer is granted under solid waste management permit LF-0089-04 subject to the following conditions:

1. Use as fire barrier is permitted in accordance with permit Special Conditions II-B, Item (6)(r), provided a minimum 3-foot thickness is maintained and erosion and dust are controlled by placement of a 6-inch soil layer over any exposed AES ash. The product mixture shall not exceed 70% fly ash and the moisture content shall not be lower than 14% for product workability and to control dusting. The product shall be subject to the liquids test as provided by the latest edition of SW-846, Test Methods for Evaluating Solid Waste. Recordkeeping on the product mixture and moisture content shall be maintained at the PVT Landfill.

2. Use as a soil replacement in the operational layer as required by permit Special Conditions II-A, Item 6, is allowed, provided that erosion and dust are controlled by placement of a 6-inch soil layer over any exposed AES ash. The product mixture shall not exceed 70% fly ash and the moisture content shall not be lower than 14% for product workability and to control dusting. The product shall be subject to the liquids test as provided by the latest edition of SW-846, Test

Attachment H

Methods for Evaluating Solid Waste. Recordkeeping on the product mixture and moisture content shall be maintained at the PVT landfill.

3. Placement of ash as fire barrier shall occur upon acceptance of ash. Stockpiling of AES ash for the operational layer shall be limited to 2000 tons within the lined Phase II area, with adequate distance from the workface, and only during the period of liner construction. Adequate dust control measures shall be implemented and documented. If the implemented control measures are not adequately controlling dust, the DOH may require additional measures to be implemented.

4. During the first twelve (12) months of operations using AES ash as a fire barrier or in the operations layer, PVT shall submit to DOH test results of not less than three (3) samples of fly ash/bottom ash mixtures used at the landfill. Tests shall include, but not be limited to, the following:

   a. ratio of fly ash to bottom ash in the AES ash mixture;
   b. moisture Content in accordance with ASTM D2216;
   c. particle Size in accordance with ASTM D1140 or D422;
   d. laboratory Hydraulic Conductivity in accordance with ASTM D5804;
   e. direct Shear Test in accordance with ASTM D3080; and
   f. chemical Analysis for the heavy metals listed in permit Special Conditions II-B, Item (6)(k).

   In addition, PVT Landfill shall perform laboratory hydraulic conductivity and direct shear test for varying fly/bottom ash product mixes to demonstrate the range of ash components that may be accepted at the landfill.

5. The SHWB may impose additional conditions or revoke approval in the use of AES ash at the landfill.

Approval for use as interim cover or void-space-fill material is withheld pending completion and acceptance by DOH an approved demonstration project under permit Special Conditions II-B, Item 6(d)(3). AES ash may not be used as intermediate cover.

DOH issues this conditional approval based on the following information submitted by PVT or independently determined by the Department:

<u>Material Properties</u>: Based on the geotechnical information submitted, AES ash is a silty-sand, suitable as a soil replacement.

Attachment H

Chemical Analysis: AES ash is an appropriate replacement for soil within a permitted landfill environment. The primary constituent of concern has been identified as arsenic. Arsenic levels in AES ash reportedly average 22 ppm, which is less than EPA Region 9 industrial Preliminary Remediation Goals (PRGs). PVT Landfill shall ensure heavy metal concentrations, including arsenic, remain less than EPA Region 9 Industrial PRGs.

Risk Assessment: The results of the evaluation and risk assessment done by AMEC Earth and Environmental, Inc. in 2005 indicate that activities associated with contaminated soil disposal do not pose a significant health risk to residents in the nearby community. The study considered 1) potential soil impacts to resident access roads during contaminated soil delivery, 2) potential soil impacts via wind dispersion during disposal operations, and 3) potential soil impacts via wind erosion of the landfill surface if contaminated deliveries are left uncovered following disposal. Chemical concentrations at receptor locations were estimated by modeling, using source concentrations based on the higher of the maximum chemical concentrations measured in soils previously delivered to PVT, or the EPA Region 9 Industrial PRGs. The risk assessment, based on site-specific measured data, demonstrates that the disposal of soil containing heavy metals and PCBs at previously accepted concentrations or their industrial PRGs is an acceptable practice that does not compromise public health. PVT Landfill shall ensure that the operations surrounding the use of the AES ash meet the assumptions made in the risk assessment.

Should there be any questions, please call Mr. Gary Siu of the Solid and Hazardous Waste Branch at (808) 586-4226.

Sincerely,

FOR THOMAS E. ARIZUMI, P.E, CHIEF
Environmental Management Division

Attachment H

# Appendix B

Gas Monitoring and Injection Form
Fire Incident Report Form

GAS MONITORING AND INJECTION FORM

**Measurements, Date:**
**CO2 injection, Date:**

| Probe ID | Temp (F°) | CO (ppm) | $O_2$ (%) | $CH_4$ (% Vol) | $H_2S$ (ppm) | $CO_2$ (% Vol) | $CO_2$ Injected (lbs) |
|---|---|---|---|---|---|---|---|
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**Total $CO_2$ Injected=**
**Lbs measured=**
**NM=no measurement taken**
**NI=no injection**
**Notes:**

**Attachment H**

# FIRE INCIDENT REPORT FORM

Date:____________ Day:__________ Time:__________

Attendant (responsible for recording fire incident):________________

## Weather Information

General: (circle applicable weather conditions)

Sunny / Cloudy / Partly Cloudy / Windy / Rainy Wind direction/speed:________

## Fire Information

Type: Major Fire:_______ Minor Fire:_______

Surface:_______ Sub-surface:______

Other:_______

How fire has been controlled:______________________________

____________________________________________

____________________________________________

Long term response to confirm that fire has been extinguished:__________

____________________________________________

____________________________________________

____________________________________________

## Environmental Impact of the Fire Incident

Release of Toxic Fumes: Yes:__ No:______________

If yes, Action taken:______________________________

____________________________________________

____________________________________________

Damage to Liner: Yes:____ No:____

If yes, Action taken:______________________________

____________________________________________

____________________________________________

Other:________________________________________

____________________________________________

____________________________________________

**Attachment H**

# HYDROLOGY STUDY
# PVT INTEGRATED WASTE MANAGEMENT FACILITY
May 2013

## INTRODUCTION

This report evaluates the proposed surface water management system for the PVT Integrated Waste Management Facility at proposed final grades of the landfill component. It provides a conceptual design for future improvements to manage surface water as the facility proceeds toward final buildout. Proposed new and improved drainage structures are designed based on hydrologic analysis using the analytical model TR-55 developed by the Natural Resources Conservation Service (NRCS), a branch of the U.S. Department of Agriculture. TR-55 is recognized as a suitable computer model for hydrologic analysis of small watersheds.

## MODEL DESCRIPTION

TR-55 is a single-event rainfall-runoff small watershed hydrologic model. The model generates hydrographs from multiple user-defined watershed subareas and at selected points along the user-defined stream system. Hydrographs are routed downstream through channels and/or reservoirs. Each watershed subarea has a hydrograph generated from the land area based on land and climate characteristics supplied by the user. Reaches (stream segments) can be designated as either channel reaches where hydrographs are routed based on physical characteristics, or as storage reaches where hydrographs are routed through a reservoir based on temporary storage and outlet characteristics. Hydrographs are combined as needed to accumulate flow as water moves from upland areas to the watershed outlet.

## SITE DRAINAGE SYSTEM

Figure 1 shows the proposed drainage facilities for the site at full development to final grades of the landfill. Drainage is collected from the landfill top deck and slopes in shallow channels constructed on benches and roads, and conveyed to perimeter channels that drain to six sedimentation basins along the west perimeter of the site. The basins retain flow and discharge it to the Ulehawa Stream. Each basin is equipped with an overflow weir for peak flows and a floating skimmer that collects water from the top surface of the basin and discharges it through a dewatering pipe.

At the present time, all six basins (Basins A, B, C, D, E and F) have been constructed and are in use. The west side perimeter channel system is substantially complete, and the east side perimeter system is functional with improvements scheduled to improve its capacity. Drainage conveyances on the landfill interior slopes and top deck will be developed as temporary structures during the active life of the site, and improved as permanent channels and roads at the time of site closure.

## MODEL INPUTS

The primary data required for the TR-55 hydrologic model include the following:

- Watershed subarea descriptions including area, land use, slope, runoff curve number (CN) and identification of the reach (channel) into which it drains;
- Reach descriptions including length, cross-section, Manning "n" friction coefficient, slope and reach or structure into which the reach drains;
- For reservoirs, stage-storage data and description of the outfall structure; and
- Storm data including rainfall distribution type and 24-hour rainfall amounts for return periods ranging from 2 to 100 years.

Figure 1 shows the subareas and reaches defined to model site hydrology using TR-55. The drawing lists acreage of each subarea and length and slope of each reach. Details of each subarea and reach are contained in Attachment 1, the TR-55 output files.

All subareas for the site were evaluated using runoff curve number 84, corresponding to open space with at least 50% grass coverage in clay soils (Hydrologic Soil Group "D"), corresponding to expected conditions of the site during the landfill post-closure period.

Storm data is taken from the publication "Rainfall-Frequency Atlas of the Hawaiian Islands" (Technical Paper No. 43, U.S. Department of Commerce Weather Bureau, 1962). Twenty-four hour rainfall amounts for the site are as follows for the selected return periods:

| | |
|---|---|
| 2 Years | 4 inches |
| 5 years | 6 inches |
| 10 years | 8 inches |
| 25 years | 9 inches |
| 50 years | 10 inches |
| 100 years | 12 inches |

The design storm according to HAR 11-58.1-15(g) is the twenty-four hour storm with a 25-year return frequency, with a total rainfall of 9 inches.

Rainfall distribution is assumed to be the Type I storm as designated by NRCS for the West Pacific area including Hawaii (TR-55 Users Guide, Appendix B).

## TR-55 RESULTS

The peak flows and depths in each channel segment during the 25-year return storm are presented in Table 1 below. It indicates that all channels and basins have capacity to manage the design storm prescribed by Hawaii solid waste regulations.

## TABLE 1
## PEAK FLOWS AND DEPTHS
## 25-YEAR STORM

| REACH | FLOW (CFS) | DEPTH (FT)[1] |
|---|---|---|
| R1 | 90 | 0.7 |
| R2 | 210 | 1.1 |
| R3 | 78 | 0.4 |
| R4 | 171 | 0.5 |
| R5 | 47 | 0.3 |
| R6 | 90 | 0.6 |
| R7 | 50 | 0.5 |
| R8 | 50 | 0.5 |
| Basin A | 201 | 1.9 |
| Basin B | 158 | 1.5 |
| Basin C | 96 | 2.1 |
| Basin D | 98 | 1.2 |
| Basin E | 116 | 1.2 |
| Basin F | 78 | 1.2 |

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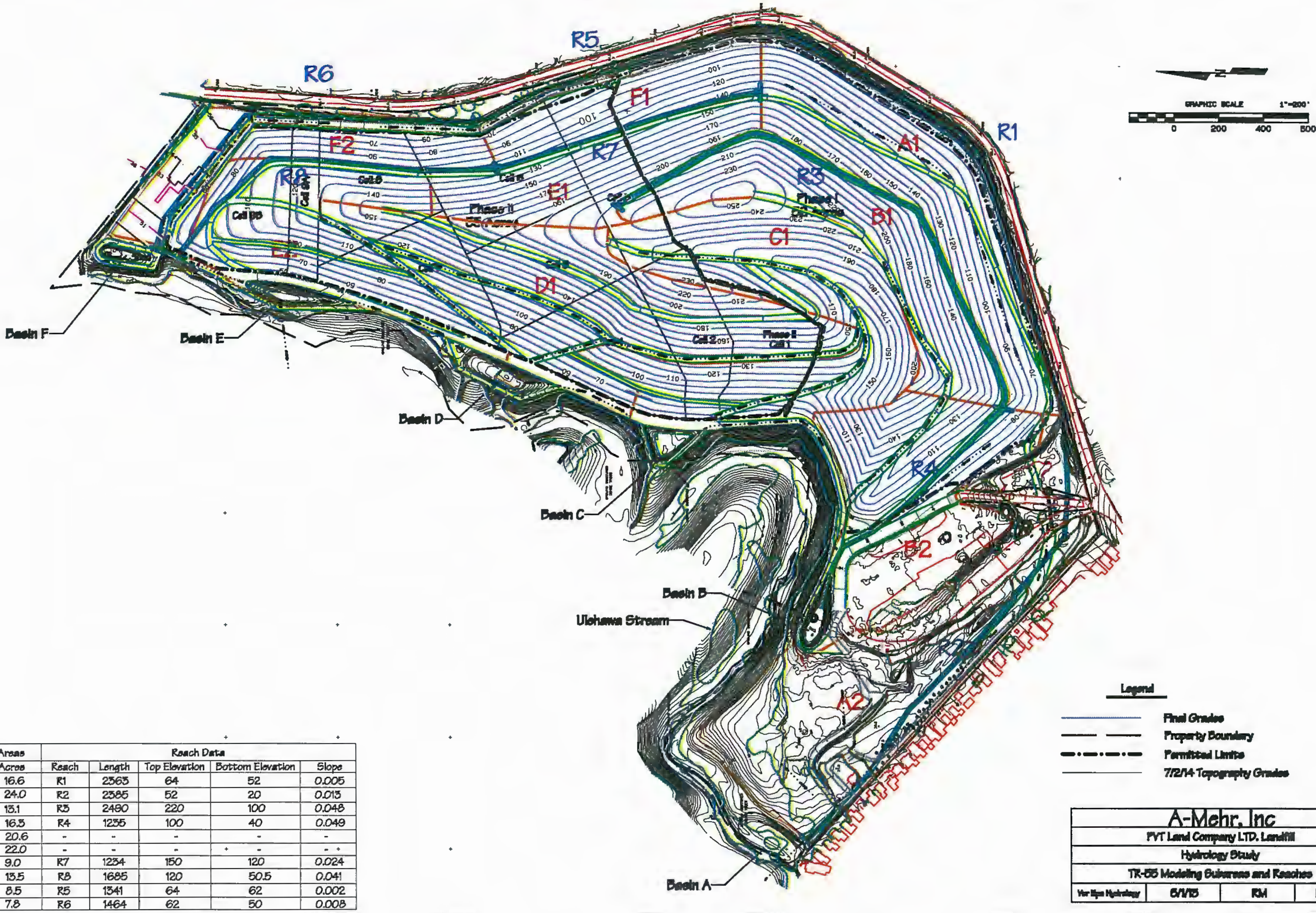
[1] Depth listed for basins is depth of water above base of overflow spillway weir.



| Drainage Areas | | Reach Data | | | | |
|---|---|---|---|---|---|---|
| Area | Acres | Reach | Length | Top Elevation | Bottom Elevation | Slope |
| A1 | 16.6 | R1 | 2363 | 64 | 52 | 0.005 |
| A2 | 24.0 | R2 | 2385 | 52 | 20 | 0.013 |
| B1 | 13.1 | R3 | 2480 | 220 | 100 | 0.048 |
| B2 | 16.3 | R4 | 1235 | 100 | 40 | 0.049 |
| C1 | 20.6 | - | - | - | - | - |
| D1 | 22.0 | - | - | - | - | - |
| E1 | 9.0 | R7 | 1234 | 150 | 120 | 0.024 |
| E2 | 13.5 | R8 | 1685 | 120 | 50.5 | 0.041 |
| F1 | 8.5 | R5 | 1341 | 64 | 62 | 0.002 |
| F2 | 7.8 | R6 | 1464 | 62 | 50 | 0.008 |

A-Mehr, Inc
PVT Land Company LTD. Landfill
Hydrology Study
TR-55 Modeling Subareas and Reaches

| | | | |
|---|---|---|---|
| [illegible] Hydrology | 6/1/15 | RM | Figure 1 |

# TR-55 REPORTS

```
                   WinTR-55 Current Data Description
                    --- Identification Data ---

User:      A-Mehr Inc                        Date:         4/30/2013
Project:   PVT Landfill                      Units:        English
SubTitle:  Basins A, B & C                   Areal Units:  Acres
State:     Hawaii
County:    Honolulu
Filename:  C:\Users\Glen\AppData\Roaming\WinTR-55\PVT Basins A, B & C.w55

                         --- Sub-Area Data ---
Name          Description            Reach       Area(ac)    RCN    Tc
------------------------------------------------------------------------------
A1                                   R1            16.6       89   .148
A2                                   R2            24         89   .207
B1                                   R3            13.1       89   0.1
B2                                   R4            16.3       89   0.1
C1                                   Basin C       20.6       89   .148

Total area: 90.60 (ac)

                         --- Storm Data  --
                  Rainfall Depth by Rainfall Return Period

   2-Yr      5-Yr      10-Yr     25-Yr     50-Yr     100-Yr     -Yr
   (in)      (in)      (in)      (in)      (in)      (in)       (in)
----------------------------------------------------------------------------
   4.0       6.0       8.0       9.0       10.0      12.0       .0


Storm Data Source:             User-provided custom storm data
Rainfall Distribution Type:    Type I
Dimensionless Unit Hydrograph: <standard>
```

```
A-Mehr Inc                       PVT Landfill
                               Basins A, B & C
                            Honolulu County, Hawaii

                                 Storm Data

                  Rainfall Depth by Rainfall Return Period

   2-Yr      5-Yr      10-Yr     25-Yr     50-Yr     100-Yr     -Yr
   (in)      (in)      (in)      (in)      (in)      (in)       (in)
----------------------------------------------------------------------------
   4.0       6.0       8.0       9.0       10.0      12.0       .0


Storm Data Source:             User-provided custom storm data
Rainfall Distribution Type:    Type I
Dimensionless Unit Hydrograph: <standard>
```

```
A-Mehr Inc                           PVT Landfill
                                   Basins A, B & C
                               Honolulu County, Hawaii

                                 Watershed Peak Table


 Sub-Area              Peak Flow by Rainfall Return Period
 or Reach         25-Yr
Identifier        (cfs)
----------------------------------------------------------------------------------
--
SUBAREAS
A1                91.25

A2               121.65

B1                77.77

B2                96.76

C1               113.23


REACHES
R1                91.25
    Down          90.52

R2               210.60
    Down         209.84

R3                77.77
    Down          77.71

R4               171.32
    Down         171.21

Basin C          113.23
    Down          95.76

Basin A          209.84
    Down         201.16

Basin B          171.21
    Down         157.62


OUTLET           422.69
```

```
A-Mehr Inc                          PVT Landfill
                                  Basins A, B & C
                              Honolulu County, Hawaii
                          Hydrograph Peak/Peak Time Table

 Sub-Area       Peak Flow and Peak Time (hr) by Rainfall Return Period
 or Reach        25-Yr
Identifier       (cfs)
             (hr)
--------------------------------------------------------------------------------
SUBAREAS
A1                91.25
             9.96
A2               121.65
            10.00
B1                77.77
             9.93
B2                96.76
             9.93
C1               113.23
             9.96

REACHES
R1                91.25
             9.96
    Down          90.52
            10.03
R2               210.60
            10.02
    Down         209.84
            10.08
R3                77.77
             9.93
    Down          77.71
             9.96
R4               171.32
             9.94
    Down         171.21
             9.95

Basin C          113.23
             9.96
    Down          95.76
            10.04
Basin A          209.84
            10.08
    Down         201.16
            10.12
Basin B          171.21
             9.95
    Down         157.62
            10.00
```

```
OUTLET        422.69

A-Mehr Inc                          PVT Landfill
                                  Basins A, B & C
                               Honolulu County, Hawaii

                               Structure Output Table

Reach              Peak Flow (PF), Storage Volume (SV), Stage (STG)
 Identifier                by Rainfall Return Period
Structure
 Identifier       25-Yr
--------------------------------------------------------------------------------
--
Reach: Basin C
Weir : Basin C
 11(ft)
  PF   (cfs)       95.76
  SV (ac ft)        1.05
  STG   (ft)        2.10

Reach: Basin A
Weir : Basin A
 27(ft)
  PF   (cfs)      201.16
  SV (ac ft)         .88
  STG   (ft)        1.91

Reach: Basin B
Weir : Basin B
 30(ft)
  PF   (cfs)      157.62
  SV (ac ft)         .85
  STG   (ft)        1.48


A-Mehr Inc                          PVT Landfill
                                  Basins A, B & C
                               Honolulu County, Hawaii

                               Sub-Area Summary Table

 Sub-Area   Drainage     Time of      Curve   Receiving      Sub-Area
Identifier    Area    Concentration  Number     Reach       Description
              (ac)         (hr)
================================================================================
A1            16.60       0.148        89     R1
A2            24.00       0.207        89     R2
B1            13.10       0.100        89     R3
B2            16.30       0.100        89     R4
C1            20.60       0.148        89     Basin C
```

```
Total Area:   90.60 (ac)


A-Mehr Inc                         PVT Landfill
                                 Basins A, B & C
                              Honolulu County, Hawaii

                                Reach Summary Table


            Receiving     Reach        Routing
 Reach        Reach       Length       Method
Identifier  Identifier     (ft)
-------------------------------------------------------------------------

 R1           R2           2363        CHANNEL
 R2           Basin A      2385        CHANNEL
 R3           R4           2490        CHANNEL
 R4           Basin B      1235        CHANNEL
 Basin C      Outlet                   STRUCTURE(Basin C)
 Basin A      Outlet                   STRUCTURE(Basin A)
 Basin B      Outlet                   STRUCTURE(Basin B)


A-Mehr Inc                         PVT Landfill
                                 Basins A, B & C
                              Honolulu County, Hawaii

                         Sub-Area Time of Concentration Details


 Sub-Area      Flow               Mannings's    End     Wetted                 Travel
Identifier/   Length    Slope         n         Area   Perimeter   Velocity    Time
               (ft)    (ft/ft)                (sq ft)    (ft)      (ft/sec)     (hr)
-------------------------------------------------------------------------------------
A1
  SHEET         100    0.0330      0.150                                        0.120
  SHALLOW       100    0.0330      0.050                                        0.009
  SHALLOW       200    0.0330      0.050                                        0.019

                                               Time of Concentration            .148
                                                                            ========

A2
  SHEET         100    0.0200      0.150                                        0.146
  SHALLOW       200    0.0200      0.050                                        0.024
  SHALLOW       300    0.0200      0.050                                        0.037

                                               Time of Concentration            .207
                                                                            ========

B1
```

```
  SHEET          100   0.3300      0.150                                      0.048
  SHALLOW        100   0.3300      0.050                                      0.003

                                             Time of Concentration          0.1
                                                                        ========

B2
  SHEET          100   0.3300      0.150                                      0.048
  SHALLOW        200   0.3300      0.050                                      0.006
  SHALLOW        200   0.1500      0.050                                      0.009

                                             Time of Concentration          0.1
                                                                        ========

C1
  SHEET          100   0.0330      0.150                                      0.120
  SHALLOW        100   0.0330      0.050                                      0.009
  SHALLOW        200   0.0330      0.050                                      0.019

                                             Time of Concentration         .148
                                                                      ========
```

```
A-Mehr Inc                       PVT Landfill
                               Basins A, B & C
                           Honolulu County, Hawaii

                    Sub-Area Land Use and Curve Number Details

 Sub-Area                                                   Hydrologic   Sub-Area
Curve
Identifier            Land Use                                 Soil          Area
Number
                                                       Group       (ac)
-------------------------------------------------------------------------------------
A1       CN directly entered by user                     -          16.6         89

         Total Area / Weighted Curve Number                          16.6         89
                                                                    ====         ==

A2       CN directly entered by user                     -            24         89

         Total Area / Weighted Curve Number                            24         89
                                                                      ==         ==

B1       CN directly entered by user                     -          13.1         89

         Total Area / Weighted Curve Number                          13.1         89
                                                                    ====         ==

B2       CN directly entered by user                     -          16.3         89

         Total Area / Weighted Curve Number                          16.3         89
```

```
                                                                   ====       ==
C1        CN directly entered by user                           -          20.6        89

          Total Area / Weighted Curve Number                       20.6        89
                                                                   ====       ==
A-Mehr Inc                       PVT Landfill
                               Basins A, B & C
                           Honolulu County, Hawaii
                         Reach Channel Rating Details
   Reach       Reach        Reach         Friction      Bottom       Side
 Identifier    Length     Manning's        Slope         Width       Slope
                (ft)          n           (ft/ft)         (ft)
--------------------------------------------------------------------------------
  R1             2363     0.015           0.005           20           2 :1
  R2             2385     0.03            0.013           20           2 :1
  R3             2490     0.015           0.048           20           2 :1
  R4             1235     0.015           0.049           20           2 :1
  Basin C      (This reach is a structure: Basin C)
  Basin A      (This reach is a structure: Basin A)
  Basin B      (This reach is a structure: Basin B)

   Reach                                  End          Top      Friction
 Identifier    Stage         Flow         Area        Width       Slope
                (ft)        (cfs)       (sq ft)       (ft)       (ft/ft)
--------------------------------------------------------------------------------
  R1            0.0         0.000           0          20       0.005
                0.5        44.602        10.5          22
                1.0       143.550          22          24
                2.0       471.093          48          28
                5.0      2441.121         150          40
               10.0      9436.569         400          60
               20.0     41488.084        1200         100

  R2            0.0         0.000           0          20       0.013
                0.5        35.959        10.5          22
                1.0       115.734          22          24
                2.0       379.807          48          28
                5.0      1968.095         150          40
               10.0      7608.005         400          60
               20.0     33448.763        1200         100

  R3            0.0         0.000           0          20       0.048
                0.5       138.195        10.5          22
                1.0       444.773          22          24
                2.0      1459.627          48          28
                5.0      7563.538         150          40
               10.0     29238.139         400          60
               20.0    128546.127        1200         100

  R4            0.0         0.000           0          20       0.049
                0.5       139.627        10.5          22
                1.0       449.382          22          24
                2.0      1474.753          48          28
```

```
                   5.0      7641.919         150           40
                  10.0     29541.133         400           60
                  20.0    129878.247        1200          100

  Basin C         (This reach is a structure: Basin C)
  Basin A         (This reach is a structure: Basin A)
  Basin B         (This reach is a structure: Basin B)
A-Mehr Inc                          PVT Landfill
                                  Basins A, B & C
                              Honolulu County, Hawaii
                         Structure Description - User Entered

                 Surface     Height     Surface
   Reach         Area @      Above      Area @        Pipe       Head on    Weir
 Identifier      Crest       Crest      Ht Above    Diameter      Pipe     Length
                 (ac)         (ft)       (ac)         (in)        (ft)       (ft)
--------------------------------------------------------------------------------

  Basin C
                  0.50          0         0.54                                11

  Basin A
                  0.44          1         0.46                                27

  Basin B
                  0.55          1         0.58                                30



A-Mehr Inc                          PVT Landfill
                                  Basins A, B & C
                              Honolulu County, Hawaii

                         Structure Rating Details - Computed

   Reach                     Pool                   Flows (cfs) @ Weir Length
 Identifier      Stage      Storage      Length #1      Length #2      Length #3
                 (ft)       (ac ft)        11ft            ft             ft
--------------------------------------------------------------------------------
Basin C            0          0.00         0.000
                 0.5          0.25        10.889
                   1          0.50        30.800
                   2          1.00        87.116
                   5          2.50       344.354
                  10          5.00       973.982
                  20         10.00      2754.836

   Reach                     Pool                   Flows (cfs) @ Weir Length
 Identifier      Stage      Storage      Length #1      Length #2      Length #3
                 (ft)       (ac ft)        27ft            ft             ft
--------------------------------------------------------------------------------
```

| | | | | | |
|---|---|---|---|---|---|
| Basin A | 0 | 0.00 | 0.000 | | |
| | 0.5 | 0.22 | 26.729 | | |
| | 1 | 0.45 | 75.600 | | |
| | 2 | 0.92 | 213.829 | | |
| | 5 | 2.45 | 845.234 | | |
| | 10 | 5.40 | 2390.682 | | |
| | 20 | 12.80 | 6761.870 | | |

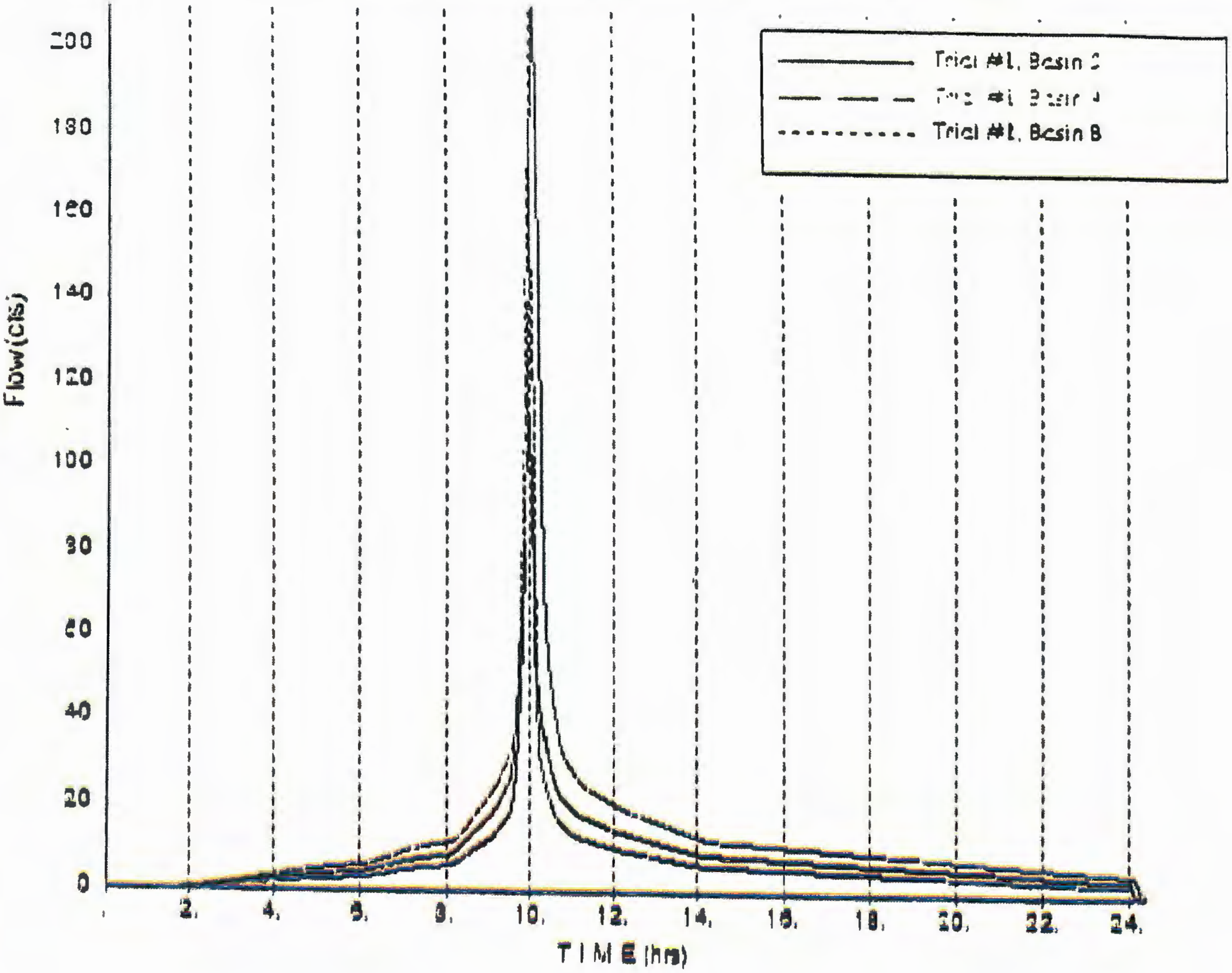
| Reach Identifier | Stage (ft) | Pool Storage (ac ft) | Flows (cfs) @ Weir Length Length #1 30ft | Length #2 ft | Length #3 ft |
|---|---|---|---|---|---|
| Basin B | 0 | 0.00 | 0.000 | | |
| | 0.5 | 0.28 | 29.698 | | |
| | 1 | 0.56 | 84.000 | | |
| | 2 | 1.16 | 237.588 | | |
| | 5 | 3.12 | 939.149 | | |
| | 10 | 7.00 | 2656.313 | | |
| | 20 | 17.00 | 7513.188 | | |

WinTR-55 Output Hydrograph
Upstream

# Project: PVT Landfill

4/30/2013

Reaches: (Basin C, Basin A, Basin B) Storm: 25-Yr
C:\Users\Glen\AppData\Roaming\WinTR-55\PVT Basins A, B & C.w55



```
                       WinTR-55 Current Data Description
                        --- Identification Data ---


User:      A-Mehr Inc                                Date:         4/30/2013
Project:   PVT Landfill                              Units:        English
SubTitle:  PVT Basins D, E & F                       Areal Units:  Acres
State:     Hawaii
County:    Honolulu
Filename:  C:\Users\Glen\AppData\Roaming\WinTR-55\PVT Basins D, E & F Rev 2.w55


                           --- Sub-Area Data ---

Name           Description             Reach        Area(ac)     RCN     Tc
-------------------------------------------------------------------------------
D1                                    Basin D        22           84     0.1
E1                                    R7             9            84     0.1
E2                                    Basin E        13.5         84     0.1
F1                                    R5             8.5          84     0.1
F2                                    R6             7.8          84     0.1

Total area: 60.80 (ac)

                           --- Storm Data  --

                    Rainfall Depth by Rainfall Return Period

   2-Yr        5-Yr        10-Yr       25-Yr       50-Yr       100-Yr       -Yr
   (in)        (in)        (in)        (in)        (in)        (in)        (in)
--------------------------------------------------------------------------------
    4.0         6.0         8.0         9.0        10.0        12.0          .0


Storm Data Source:               User-provided custom storm data
Rainfall Distribution Type:      Type I
Dimensionless Unit Hydrograph:   <standard>

A-Mehr Inc                           PVT Landfill
                                 PVT Basins D, E & F
                               Honolulu County, Hawaii
                                      Storm Data
                        Rainfall Depth by Rainfall Return Period

   2-Yr        5-Yr        10-Yr       25-Yr       50-Yr       100-Yr       -Yr
   (in)        (in)        (in)        (in)        (in)        (in)        (in)
--------------------------------------------------------------------------------
    4.0         6.0         8.0         9.0        10.0        12.0          .0


Storm Data Source:               User-provided custom storm data
Rainfall Distribution Type:      Type I
```

```
Dimensionless Unit Hydrograph:  <standard>
A-Mehr Inc                        PVT Landfill
                              PVT Basins D, E & F
                            Honolulu County, Hawaii

                              Watershed Peak Table


 Sub-Area           Peak Flow by Rainfall Return Period
 or Reach      25-Yr
Identifier     (cfs)
--------------------------------------------------------------------------------
--
SUBAREAS
D1             122.15

E1              49.96

E2              74.93

F1              47.18

F2              43.31


REACHES
Basin D        122.15
    Down        97.86

R7              49.96
    Down        49.92

R8              49.92
    Down        49.83

R5              47.18
    Down        47.15

Basin E        118.50
    Down       115.66

Basin F         89.58
    Down        78.04

R6              89.90
    Down        89.58


OUTLET         287.11
```

```
A-Mehr Inc                       PVT Landfill
                             PVT Basins D, E & F
                           Honolulu County, Hawaii
                       Hydrograph Peak/Peak Time Table

 Sub-Area       Peak Flow and Peak Time (hr) by Rainfall Return Period
 or Reach      25-Yr
Identifier     (cfs)
            (hr)
--------------------------------------------------------------------------------
SUBAREAS
D1              122.15
            9.93
E1               49.96
            9.93
E2               74.93
            9.93
F1               47.18
            9.93
F2               43.31
            9.93


REACHES
Basin D         122.15
            9.93
    Down         97.86
           10.01
R7               49.96
            9.93
    Down         49.92
            9.95
R8               49.92
            9.95
    Down         49.83
            9.98
R5               47.18
            9.93
    Down         47.15
            9.94
Basin E         118.50
            9.95
    Down        115.66
            9.98
Basin F          89.58
            9.98
    Down         78.04
           10.03
R6               89.90
            9.94
    Down         89.58
            9.98

OUTLET          287.11
```

```
A-Mehr Inc                          PVT Landfill
                                PVT Basins D, E & F
                              Honolulu County, Hawaii

                               Structure Output Table

Reach              Peak Flow (PF), Storage Volume (SV), Stage (STG)
 Identifier                  by Rainfall Return Period
Structure
 Identifier       25-Yr
--------------------------------------------------------------------------------
--
Reach: Basin D
Weir : Basin D
 25(ft)
  PF   (cfs)       97.86
  SV (ac ft)        1.11
  STG   (ft)        1.22

Reach: Basin E
Weir : Basin E
 31(ft)
  PF   (cfs)      115.66
  SV (ac ft)         .37
  STG   (ft)        1.18

Reach: Basin F
Weir : Basin F
 20(ft)
  PF   (cfs)       78.04
  SV (ac ft)         .62
  STG   (ft)        1.22
```

```
A-Mehr Inc                          PVT Landfill
                                PVT Basins D, E & F
                              Honolulu County, Hawaii

                                Sub-Area Summary Table

 Sub-Area   Drainage     Time of      Curve   Receiving      Sub-Area
Identifier    Area    Concentration  Number    Reach       Description
              (ac)        (hr)
--------------------------------------------------------------------------------
D1           22.00       0.100        84     Basin D
E1            9.00       0.100        84     R7
E2           13.50       0.100        84     Basin E
F1            8.50       0.100        84     R5
F2            7.80       0.100        84     R6

Total Area:   60.80 (ac)
```

```
A-Mehr Inc                          PVT Landfill
                                PVT Basins D, E & F
                              Honolulu County, Hawaii

                                Reach Summary Table


               Receiving     Reach        Routing
  Reach          Reach       Length       Method
Identifier     Identifier     (ft)
----------------------------------------------------------------------


  Basin D        Outlet                   STRUCTURE(Basin D)
  R7             R8            1234       CHANNEL
  R8             Basin E       1685       CHANNEL
  R5             R6            1341       CHANNEL
  Basin E        Outlet                   STRUCTURE(Basin E)
  Basin F        Outlet                   STRUCTURE(Basin F)
  R6             Basin F       1464       CHANNEL
```

```
A-Mehr Inc                          PVT Landfill
                                PVT Basins D, E & F
                              Honolulu County, Hawaii

                      Sub-Area Time of Concentration Details


 Sub-Area     Flow              Mannings's    End     Wetted                Travel
Identifier/   Length    Slope       n         Area    Perimeter   Velocity   Time
               (ft)    (ft/ft)              (sq ft)     (ft)      (ft/sec)   (hr)
----------------------------------------------------------------------------------
D1
  SHEET         100    0.3300     0.150                                      0.048
  SHALLOW       200    0.3300     0.050                                      0.006
  SHALLOW       300    0.3300     0.050                                      0.009

                                              Time of Concentration           0.1
                                                                          ========

E1
  SHEET         100    0.3300     0.150                                      0.048
  SHALLOW       150    0.3300     0.050                                      0.004

                                              Time of Concentration           0.1
                                                                          ========

E2
  SHEET         100    0.2500     0.150                                      0.053
  SHALLOW       200    0.2500     0.050                                      0.007
```

```
                                                 Time of Concentration       0.1
                                                                        ========

F1
  SHEET          100    0.3300     0.150                                   0.048
  SHALLOW        100    0.3300     0.050                                   0.003

                                                 Time of Concentration       0.1
                                                                        ========

F2
  SHEET          100    0.3300     0.150                                   0.048
  SHALLOW        100    0.3300     0.050                                   0.003

                                                 Time of Concentration       0.1
                                                                        ========


A-Mehr Inc                          PVT Landfill
                                PVT Basins D, E & F
                              Honolulu County, Hawaii

                      Sub-Area Land Use and Curve Number Details

 Sub-Area                                                 Hydrologic   Sub-Area
Curve
Identifier                 Land Use                           Soil         Area
Number
                                                      Group        (ac)
--------------------------------------------------------------------------------
D1        CN directly entered by user                   -          22       84

          Total Area / Weighted Curve Number                        22       84
                                                                    ==       ==

E1        Open space; grass cover 50% to 75%  (fair)     D           9       84

          Total Area / Weighted Curve Number                         9       84
                                                                     =       ==

E2        Open space; grass cover 50% to 75%  (fair)     D        13.5       84

          Total Area / Weighted Curve Number                      13.5       84
                                                                  ====       ==

F1        Open space; grass cover 50% to 75%  (fair)     D         8.5       84

          Total Area / Weighted Curve Number                       8.5       84
                                                                   ===       ==

F2        Open space; grass cover 50% to 75%  (fair)     D         7.8       84
```

| | | |
|---|---|---|
| Total Area / Weighted Curve Number | 7.8<br>=== | 84<br>== |

A-Mehr Inc

PVT Landfill
PVT Basins D, E & F
Honolulu County, Hawaii

## Reach Channel Rating Details

| Reach Identifier | Reach Length (ft) | Reach Manning's n | Friction Slope (ft/ft) | Bottom Width (ft) | Side Slope |
|---|---|---|---|---|---|
| Basin D | (This reach is a structure: Basin D) | | | | |
| R7 | 1234 | 0.015 | 0.024 | 10 | 1 :1 |
| R8 | 1685 | 0.015 | 0.02 | 10 | 1 :1 |
| R5 | 1341 | 0.015 | 0.041 | 20 | 2 :1 |
| Basin E | (This reach is a structure: Basin E) | | | | |
| Basin F | (This reach is a structure: Basin F) | | | | |
| R6 | 1464 | 0.015 | 0.008 | 20 | 2 :1 |

| Reach Identifier | Stage (ft) | Flow (cfs) | End Area (sq ft) | Top Width (ft) | Friction Slope (ft/ft) |
|---|---|---|---|---|---|
| Basin D | (This reach is a structure: Basin D) | | | | |
| R7 | 0.0 | 0.000 | 0 | 10 | 0.024 |
| | 0.5 | 48.010 | 5.3 | 11 | |
| | 1.0 | 152.372 | 11 | 12 | |
| | 2.0 | 489.684 | 24 | 14 | |
| | 5.0 | 2450.670 | 75 | 20 | |
| | 10.0 | 9241.367 | 200 | 30 | |
| | 20.0 | 39881.598 | 600 | 50 | |
| R8 | 0.0 | 0.000 | 0 | 10 | 0.02 |
| | 0.5 | 43.827 | 5.3 | 11 | |
| | 1.0 | 139.096 | 11 | 12 | |
| | 2.0 | 447.018 | 24 | 14 | |
| | 5.0 | 2237.145 | 75 | 20 | |
| | 10.0 | 8436.176 | 200 | 30 | |
| | 20.0 | 36406.752 | 600 | 50 | |
| R5 | 0.0 | 0.000 | 0 | 20 | 0.041 |
| | 0.5 | 127.721 | 10.5 | 22 | |
| | 1.0 | 411.064 | 22 | 24 | |
| | 2.0 | 1349.004 | 48 | 28 | |
| | 5.0 | 6990.308 | 150 | 40 | |

```
                 10.0    27022.221        400          60
                 20.0   118803.793       1200         100

 Basin E         (This reach is a structure: Basin E)

 Basin F         (This reach is a structure: Basin F)

 R6               0.0        0.000          0          20        0.008
                  0.5       56.418       10.5          22
                  1.0      181.578         22          24
                  2.0      595.890         48          28
                  5.0     3087.801        150          40
                 10.0    11936.420        400          60
                 20.0    52478.737       1200         100
```

```
A-Mehr Inc                          PVT Landfill
                                PVT Basins D, E & F
                              Honolulu County, Hawaii

                         Structure Description - User Entered

             Surface    Height    Surface
  Reach      Area @     Above     Area @       Pipe       Head on   Weir
 Identifier   Crest     Crest     Ht Above    Diameter    Pipe      Length
              (ac)       (ft)      (ac)        (in)       (ft)       (ft)
--------------------------------------------------------------------------------

  Basin D
               0.90          2    0.94                                  25


  Basin E
                .30          2     .32                                  31


  Basin F
                 .5          2     .52                                  20
```

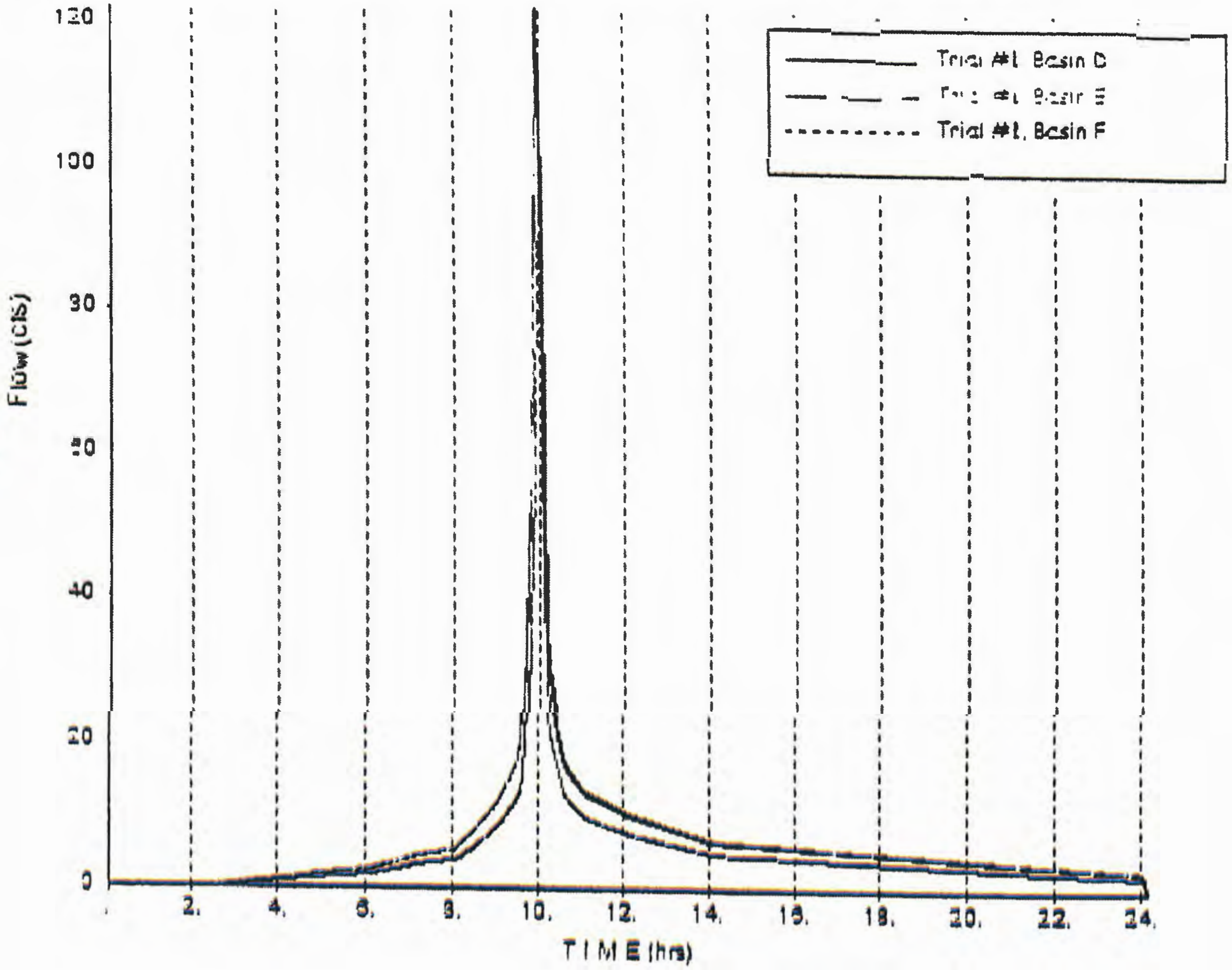
```
A-Mehr Inc                         PVT Landfill
                               PVT Basins D, E & F
                             Honolulu County, Hawaii

                      Structure Rating Details - Computed

   Reach                      Pool            Flows (cfs) @ Weir Length
 Idendifier    Stage        Storage      Length #1     Length #2     Length #3
               (ft)         (ac ft)        25ft           ft            ft
--------------------------------------------------------------------------------
Basin D           0           0.00         0.000
                0.5           0.45        24.749
                  1           0.91        70.000
                  2           1.84       197.990
                  5           4.75       782.624
                 10          10.00      2213.594
                 20          22.00      6260.990

   Reach                      Pool            Flows (cfs) @ Weir Length
 Idendifier    Stage        Storage      Length #1     Length #2     Length #3
               (ft)         (ac ft)        31ft           ft            ft
--------------------------------------------------------------------------------
Basin E           0           0.00         0.000
                0.5           0.15        30.688
                  1           0.31        86.800
                  2           0.62       245.507
                  5           1.63       970.454
                 10           3.50      2744.857
                 20           8.00      7763.628

   Reach                      Pool            Flows (cfs) @ Weir Length
 Idendifier    Stage        Storage      Length #1     Length #2     Length #3
               (ft)         (ac ft)        20ft           ft            ft
--------------------------------------------------------------------------------
Basin F           0           0.00         0.000
                0.5           0.25        19.799
                  1           0.51        56.000
                  2           1.02       158.392
                  5           2.63       626.099
                 10           5.50      1770.875
                 20          12.00      5008.792
```

WinTR-55 Output Hydrograph
Upstream

# Project: PVT Landfill

4/30/2013

Reaches: (Basin D, Basin E, Basin F) Storm: 25-Yr
C:\Users\Glen\AppData\Roaming\WinTR-55\PVT Basins D, E & F Rev 2.w55



# Static and Seismic Stability Analysis
# PVT Integrated Solid Waste Management Facility
April 2015

## Introduction

The PVT Landfill site is located within a "seismic impact zone", defined by Hawaii Administrative Rules (HAR) Section 11-58.1-13(e), as an area with a ten percent or greater probability of experiencing a horizontal acceleration, due to seismic shaking, of more than 0.10 g in a 250 year period. The United States Geological Survey (USGS) has classified the island of Oahu in UBC Seismic Zone 2A, defined as having a ten percent probability of exceeding a peak ground acceleration of 0.15 g in 50 years. (USGS, 2004a) USGS earthquake hazard maps estimate the peak horizontal ground acceleration in western Oahu to be 0.25 g with a 2% probability of occurrence in 50 years (See Figure 1). A probability of exceedance of 2% in 50 years is approximately equivalent to a probability of 10% in 250 years (USGS, 2004b), and represents an event expected to occur one time in approximately 2,400 years. (USGS, 1996)

HAR 1.58.1-13(e) prohibits municipal solid waste landfills to be constructed or expanded in a seismic impact zone unless the landfill operator or owner demonstrates that the containment structures of the landfill are designed to withstand the maximum horizontal acceleration due to an earthquake. A-Mehr, Inc. has prepared the following analysis to make the required demonstration.

## Methodology

The analysis is based on a slope stability analysis of the landfill at the time when the landfill has reached its maximum refuse elevation of 250 feet above mean sea level (Figure 4). A-Mehr, Inc. used the slope stability analysis computer program PCSTABL5 to compute the static and pseudo-static factors of safety for five (5) critical cross-sections, as shown on Figures 2-6. The program uses the Modified Bishop Method and Modified Janbu Method to determine the location of the lowest factor of safety for failure planes through the liner system for static and pseudostatic conditions.

The analysis was conducted according to procedures specified in the document "RCRA Subtitle D (248) Seismic Design Guidance for Municipal Solid Waste Facilities (U.S. Environmental Protection Agency, April 1995). The document provides a straightforward procedure for evaluating the seismic stability of refuse slopes, as follows:

- Establish cross-sections and assign appropriate shear strength parameters
- Conduct static stability analyses, using appropriate programs to search for the most critical locations in the cross-section to determine the lowest static factor of safety.
- Determine the seismic coefficient, $k_s$. The recommended value for $k_s$ is 50% of the peak horizontal acceleration during the design earthquake.
- Conduct pseudo-static stability analyses of the most critical locations for each cross-section, determining lowest pseudostatic factor of safety at a horizontal load equivalent to the seismic coefficient.
- If the resulting pseudo-static factor of safety is greater than 1.0, the seismic stability analysis is complete.

## Input Data

The analysis requires shear strength properties to be assigned to each material in the system. Table 1 lists the components that form the liner – waste system. Table 2 lists the properties for each component and interface.

The seismic coefficient used in the pseudo-static stability analysis is 50% of the peak horizontal acceleration due to the design earthquake or 0.5 x 0.25 = 0.125g.

**Table 1**
**System Components – From Bottom to Top**

| |
|---|
| Prepared subgrade |
| Geosynthetic Clay Liner (GCL) |
| 80-mil HDPE geomembrane, textured both sides |
| 16 ounce/square yard nonwoven geotextile |
| 12 inches leachate collection sand or gravel (floor only) |
| 16 ounce/square yard nonwoven geotextile |
| 2 ft. protective soil (operations layer) |
| Solid waste |

**Table 2**
**Shear Strength Properties for Stability Analysis**

| Material | Friction Angle | Cohesion | Unit Weight | Reference |
|---|---|---|---|---|
| Bedrock | 45° | 1,000 psf | 140 pcf | MFA, 2008 |
| Compacted Fill | 35° | 400 psf | 125 pcf | A-Mehr, Inc., 2000 |
| Waste | 36° | 0 | 85 pcf | USEPA, 1995 |
| (80-mil textured HDPE / Geosynthetic Clay Liner (GCL) interface | 17° | 0 | 63 pcf | A-Mehr, Inc., 2008 |
| Phase 1 Landfill Clay Liner | 25.0 | 200 | 110 pcf | MFA, 2008 |

## Results

**Based on the design earthquake (2% probability of occurrence in 50 years) of 0.25 g, the seismic coefficient $k_s$ is 0.125g.**

The computer output sheets for the PCSTABL5 stability analyses are summarized in Table 3. Appendix A contains the computer input data information and output sheets.

**Table 3**
**Stability Analysis Results**

| Cross-Section | Lowest Static Factor of Safety | Lowest Pseudo-Static Factor of Safety |
|---|---|---|
| 1-1' | 1.71 | 1.21 |
| 2-2' | 1.94 | 1.25 |
| 3-3 | 1.91 | 1.25 |
| 4-4' | 2.98 | 2.58 |
| 5-5 | 1.93 | 1.33 |

As shown in Table 3, the static factor of safety for all cross-sections exceeds 1.5, the generally accepted critical value for static slope stability. All cross-sections have a pseudo-static factor of safety greater than 1.0, thereby meeting the USEPA guideline for acceptable seismic performance.

With a seismic factor of safety greater than 1.0, it can be concluded there will be no permanent deflection of the liner system during the design seismic event.

Based on this analysis, we conclude that the containment system for the landfill is stable and it is designed to resist the maximum horizontal acceleration from the design earthquake, and therefore meets the Federal and State requirements of HAR 11-58.1-13(e).

Respectfully Submitted,

A-MEHR, INC.
M. Ali Mehrazarin, P.E.
Principal Engineer

## References

A-Mehr, Inc., 2008. Interface Shear Strength Test Results for Geosynthetic Clay Liner in Contact with 80-mil and 60-mil Textured HDPE Geomembranes. Tests performed by Precision Geosynthetic Laboratories. February 13, 2008.

Masa Fujioka and Associates, 2008. Personal Communication, Masa Fujioka, P.E.

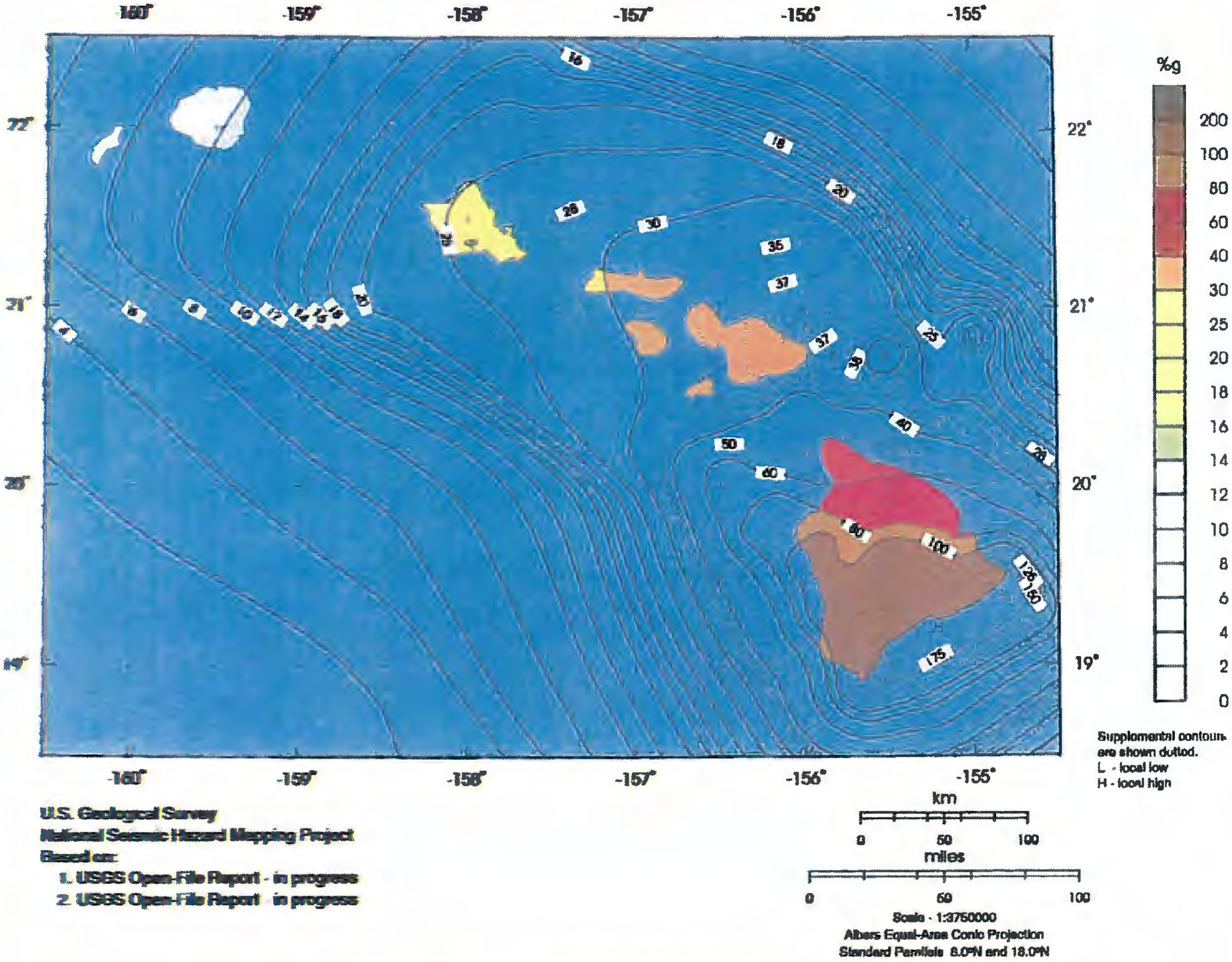
USEPA, 1995. RCRA Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities. EPA/600/R/95/051. U.S. Environmental Protection Agency, April 1995.

USGS, 2004a. Earthquake Hazards and Zoning in Hawaii. http://hvo.wr.usgs.gov/earthquakes/hazards/. June 2004.

USGS, 2004b. Frequently Asked Questions (FAQ) About Return Periods. http://equhazmaps.usgs.gov/faq/. United States Geological Survey website accessed September 2004.

USGS, 1996. Hawaii Hazard Maps 1996. http://eqhazmaps.usgs.gov/html/his.html. United States Geological Survey website accessed June 2004

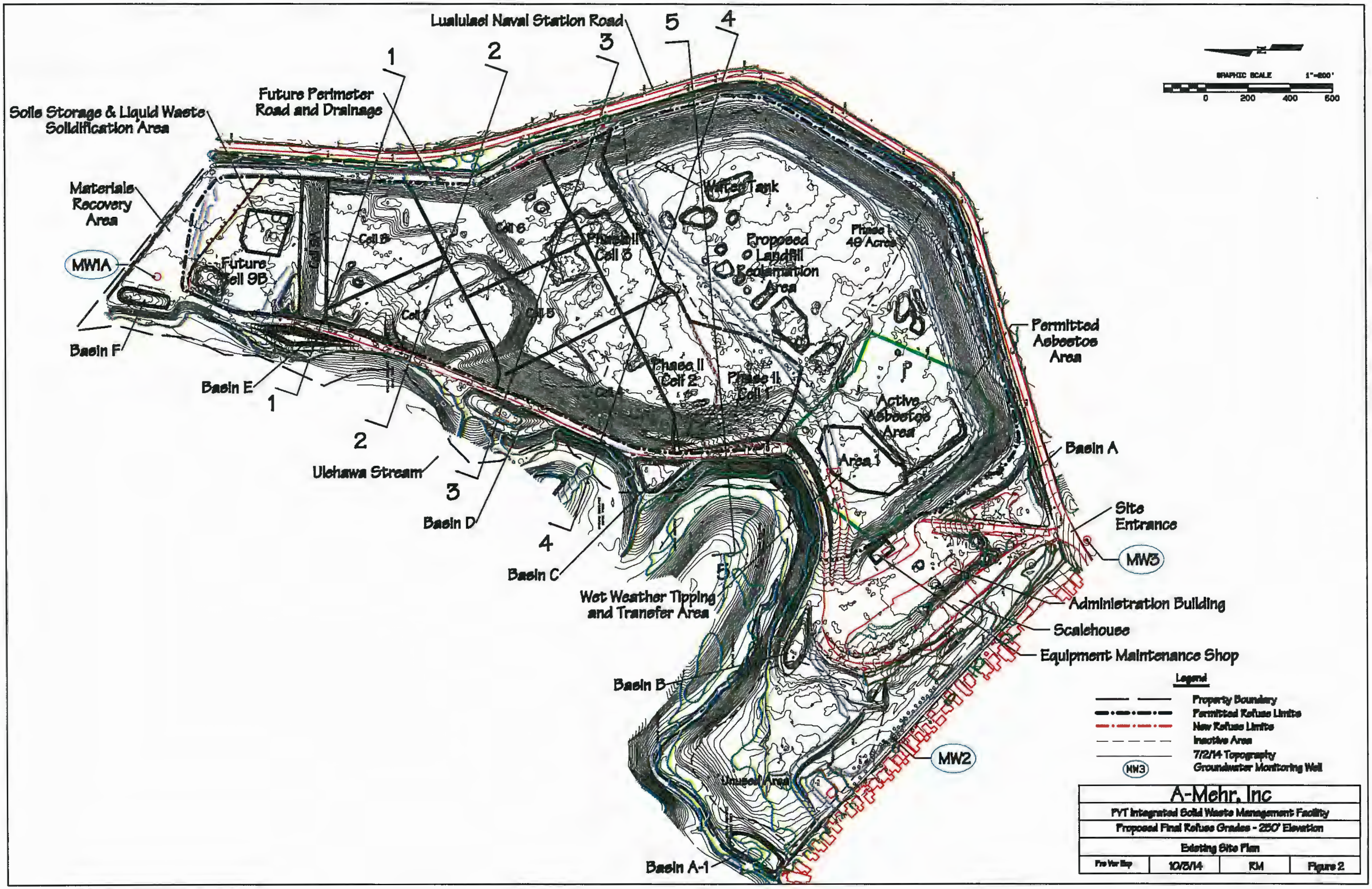
# FIGURES



U.S. Geological Survey
National Seismic Hazard Mapping Project
Based on:
1. USGS Open-File Report - in progress
2. USGS Open-File Report - in progress

Horizontal Ground Acceleration (%g)
With 2% Probability of Exceedance in 50 Years
Firm Rock - 760 m/sec shear wave velocity

FIGURE 1



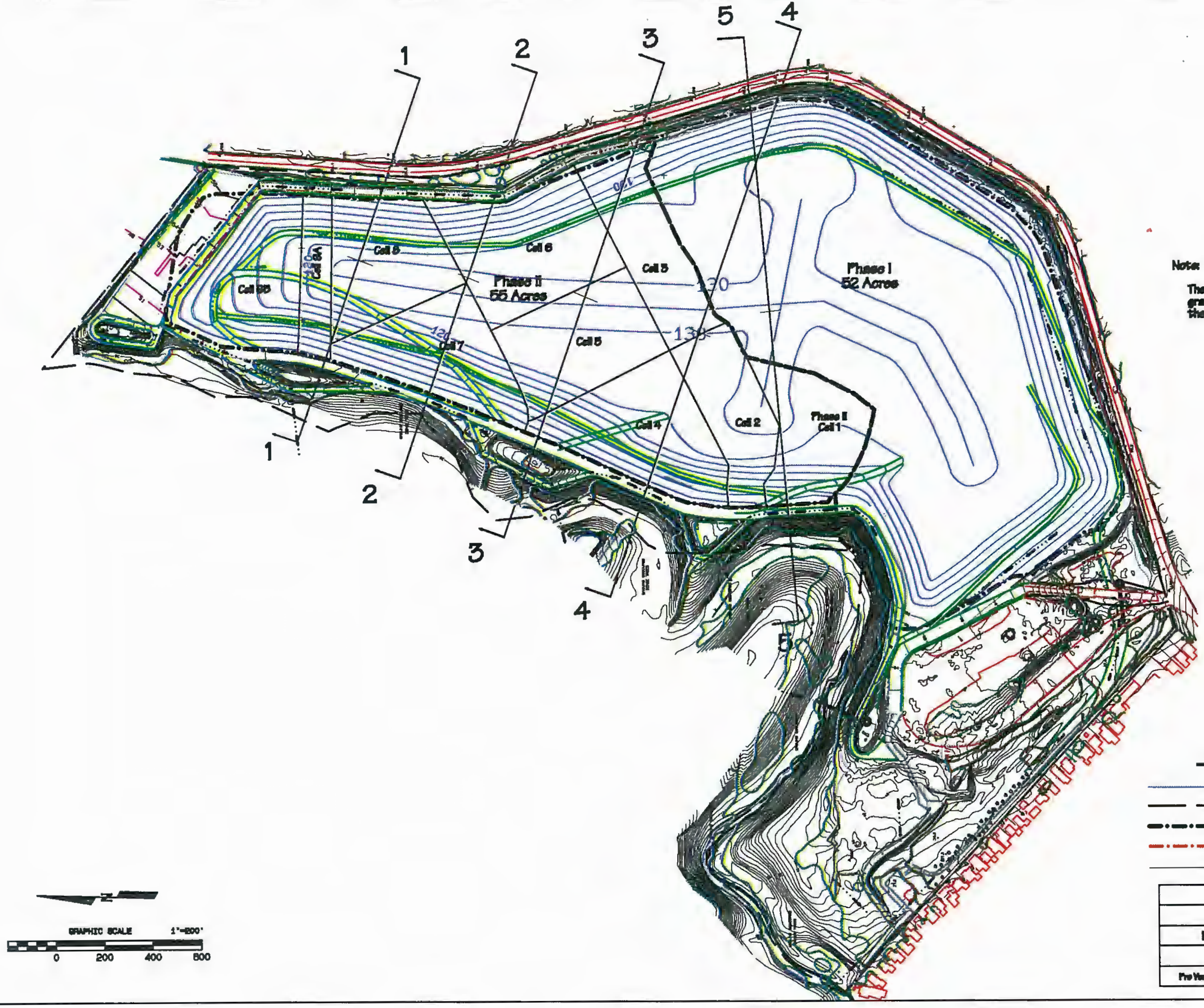
A-Mehr, Inc

PVT Integrated Solid Waste Management Facility

Proposed Final Refuse Grades - 250' Elevation

Existing Site Plan

| | | | |
|---|---|---|---|
| Pre Ver Exp | 10/3/14 | KM | Figure 2 |



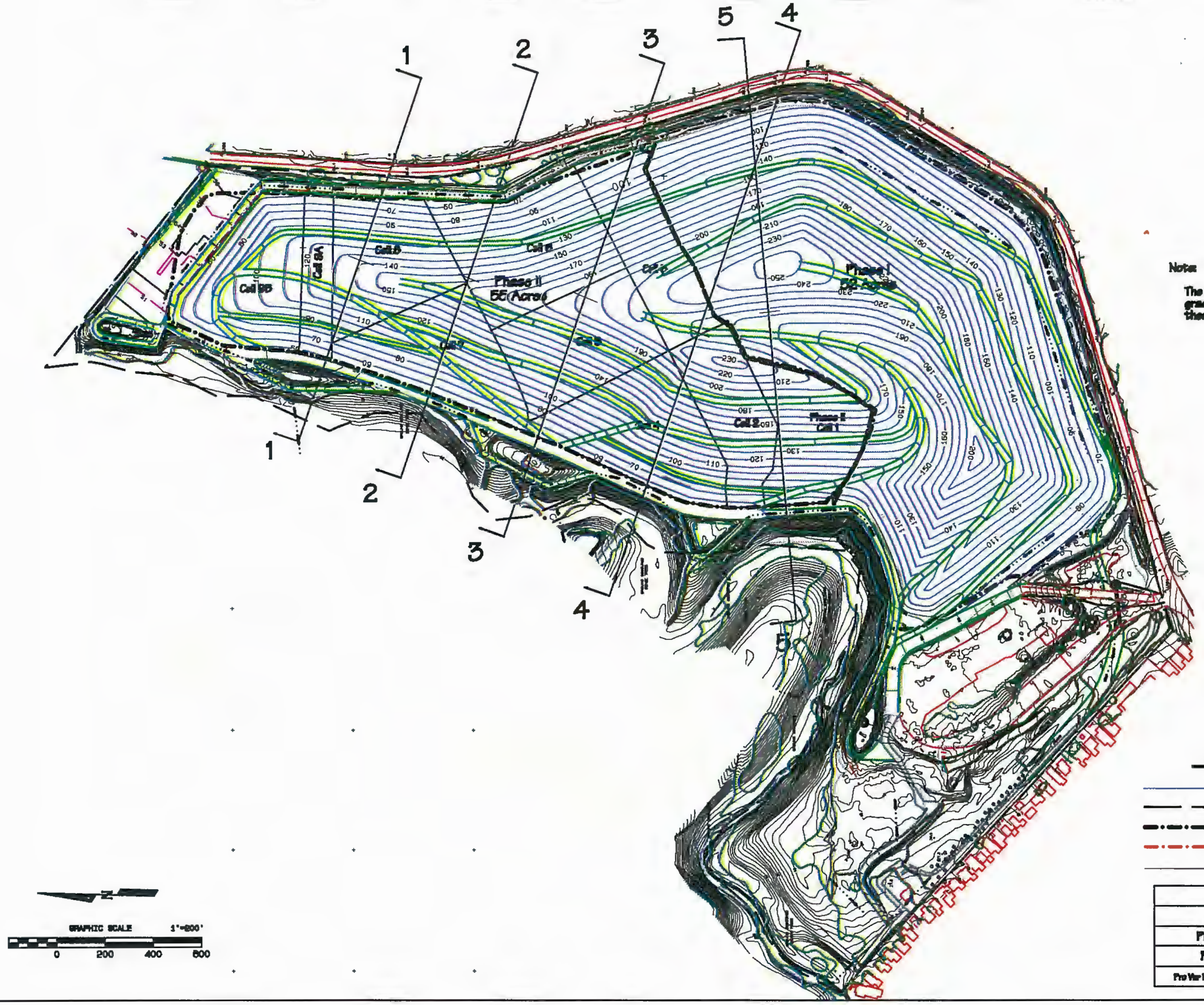
Note:

The grades shown are the permitted refuse grades. Final cover will be constructed above these grades and may be 2 to 4 feet thick.

**Legend**

Final Grades
Property Boundary
Permitted Refuse Limits
New Refuse Limits
7/2/14 Topography Grades

| | | | |
|---|---|---|---|
| A-Mehr, Inc | | | |
| PVT Land Company LTD. Landfill | | | |
| Proposed Final Refuse Grades - 250' Elevation | | | |
| Existing Permitted Refuse Grades | | | |
| Pre Ver Rep | 10/3/14 | KM | Figure 3 |



Note:

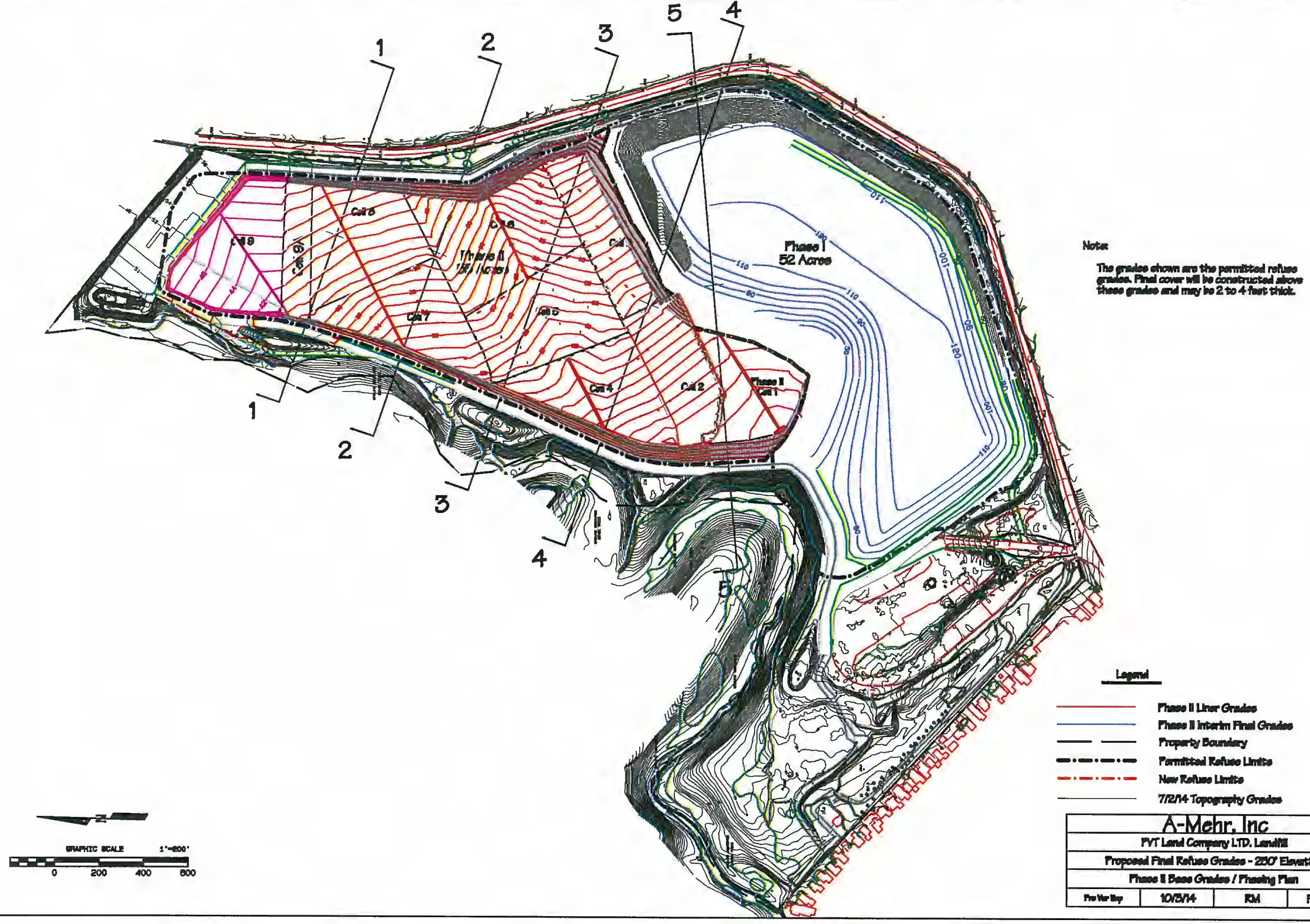
The grades shown are the permitted refuse grades. Final cover will be constructed above these grades and may be 2 to 4 feet thick.

**Legend**

Final Grades
Property Boundary
Permitted Refuse Limits
New Refuse Limits
7/2/14 Topography Grades

A-Mehr, Inc
PVT Land Company LTD. Landfill
Proposed Final Refuse Grades - 250' Elevation
Proposed Final Refuse Grades to 250' AMSL

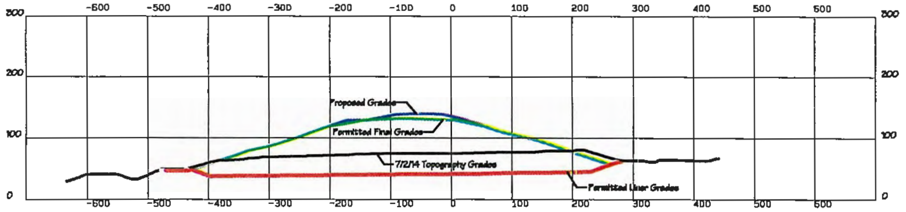
| | | | |
|---|---|---|---|
| Pro Ver Rep | 10/3/14 | KM | Figure 4 |



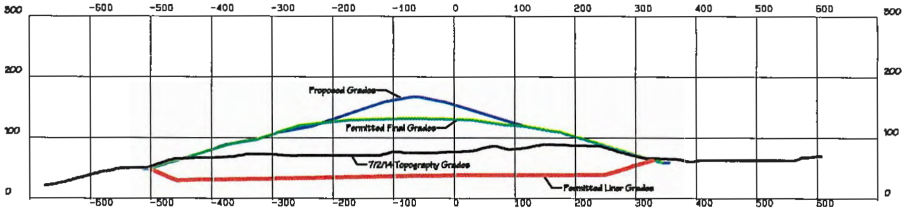
Note:

The grades shown are the permitted refuse grades. Final cover will be constructed above these grades and may be 2 to 4 feet thick.

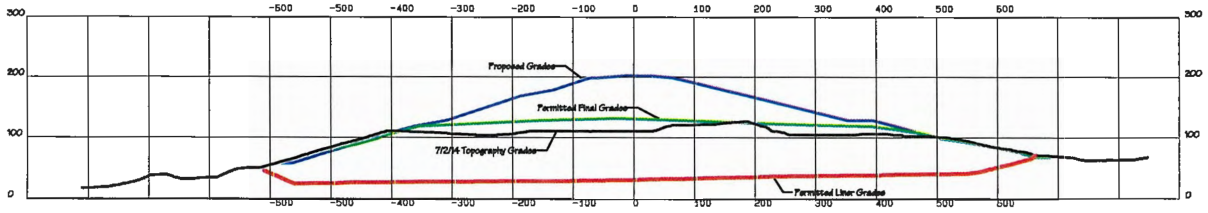
| | | | |
|---|---|---|---|
| A-Mehr, Inc | | | |
| PVT Land Company LTD. Landfill | | | |
| Proposed Final Refuse Grades - 250' Elevation | | | |
| Phase II Base Grades / Phasing Plan | | | |
| Pro Ver Rep | 10/3/14 | RM | Figure 5 |



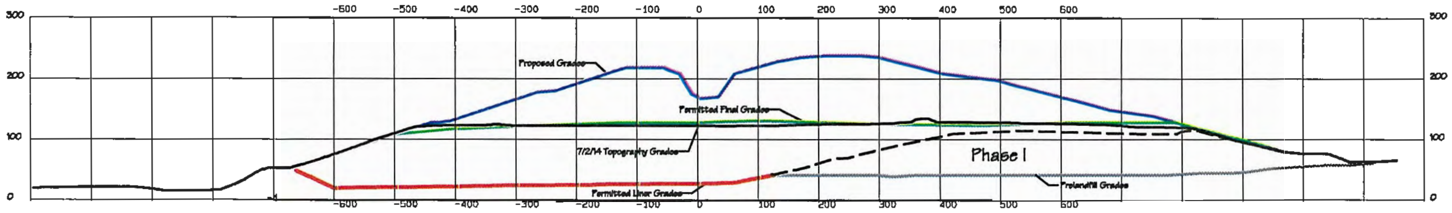
Cross-Section 1-1



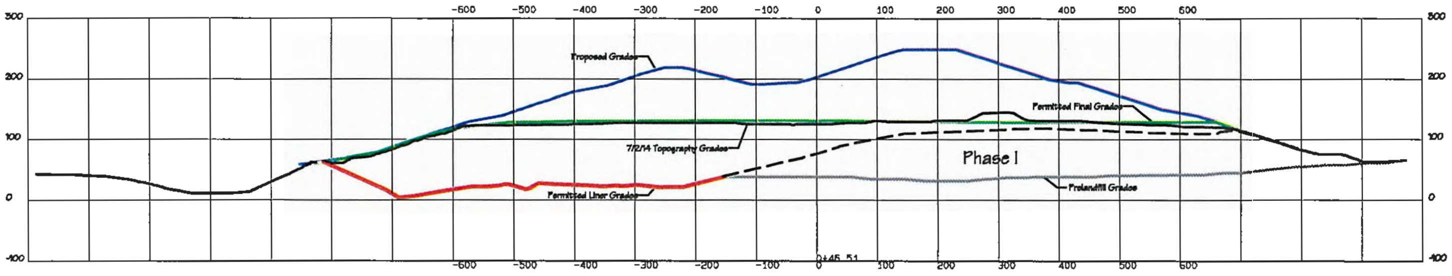
Cross-Section 2-2



Cross-Section 3-3



Cross-Section 4-4



Cross-Section 5-5

A-Mehr, Inc
FVT Land Company LTD. Landfill
Proposed Final Refuse Grades - 250' Elevation
Cross-Section 1-1 through 5-5

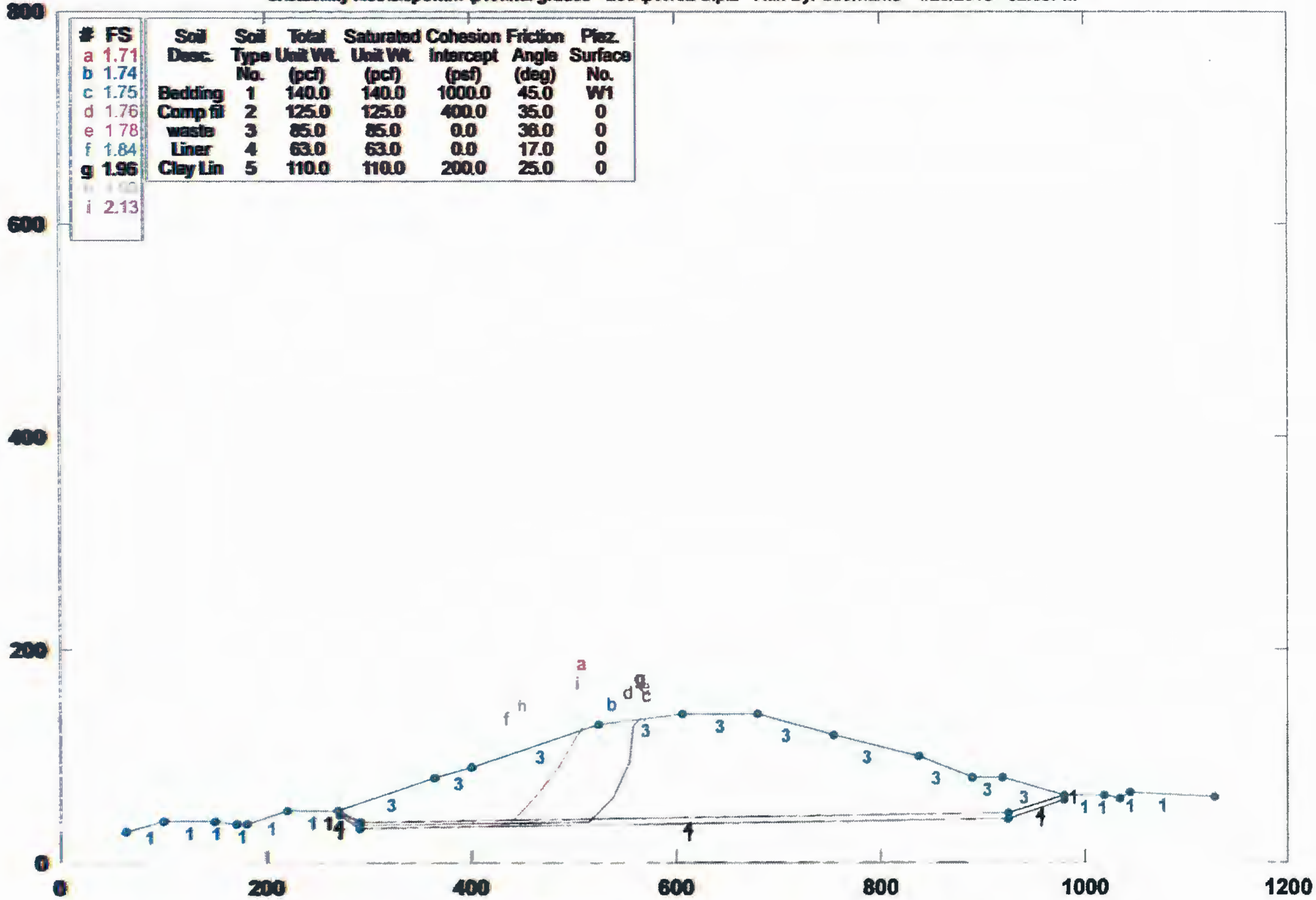
| | | | |
|---|---|---|---|
| Pre Ver Map | 4/20/15 | KM | Figure 6 |

# APPENDIX A

# DETAILED STABILITY ANALYSIS OUTPUT SHEETS

## PVT Final Refuse Grades - 250' Elev. Cross-Section 1-1' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve2-b.pl2 Run By: Username 4/23/2015 02:05PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

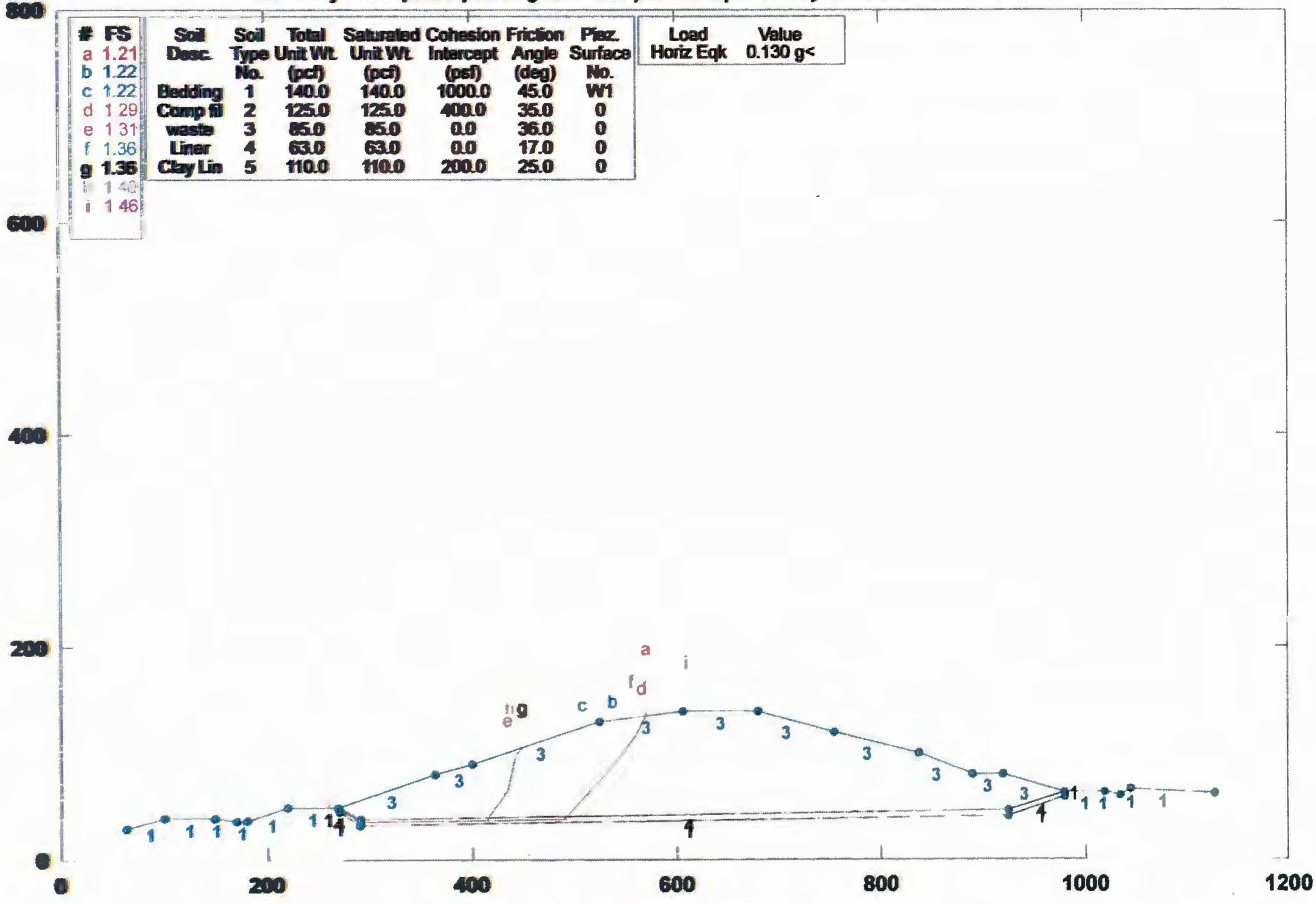
PCSTABL5M/si FSmin=1.71

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 1-1' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve2-bes.pl2 Run By: Username 4/23/2015 02:06PM



| # | FS |
|---|---|
| a | 1.21 |
| b | 1.22 |
| c | 1.22 |
| d | 1.29 |
| e | 1.31 |
| f | 1.36 |
| g | 1.36 |
| h | 1.40 |
| i | 1.46 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

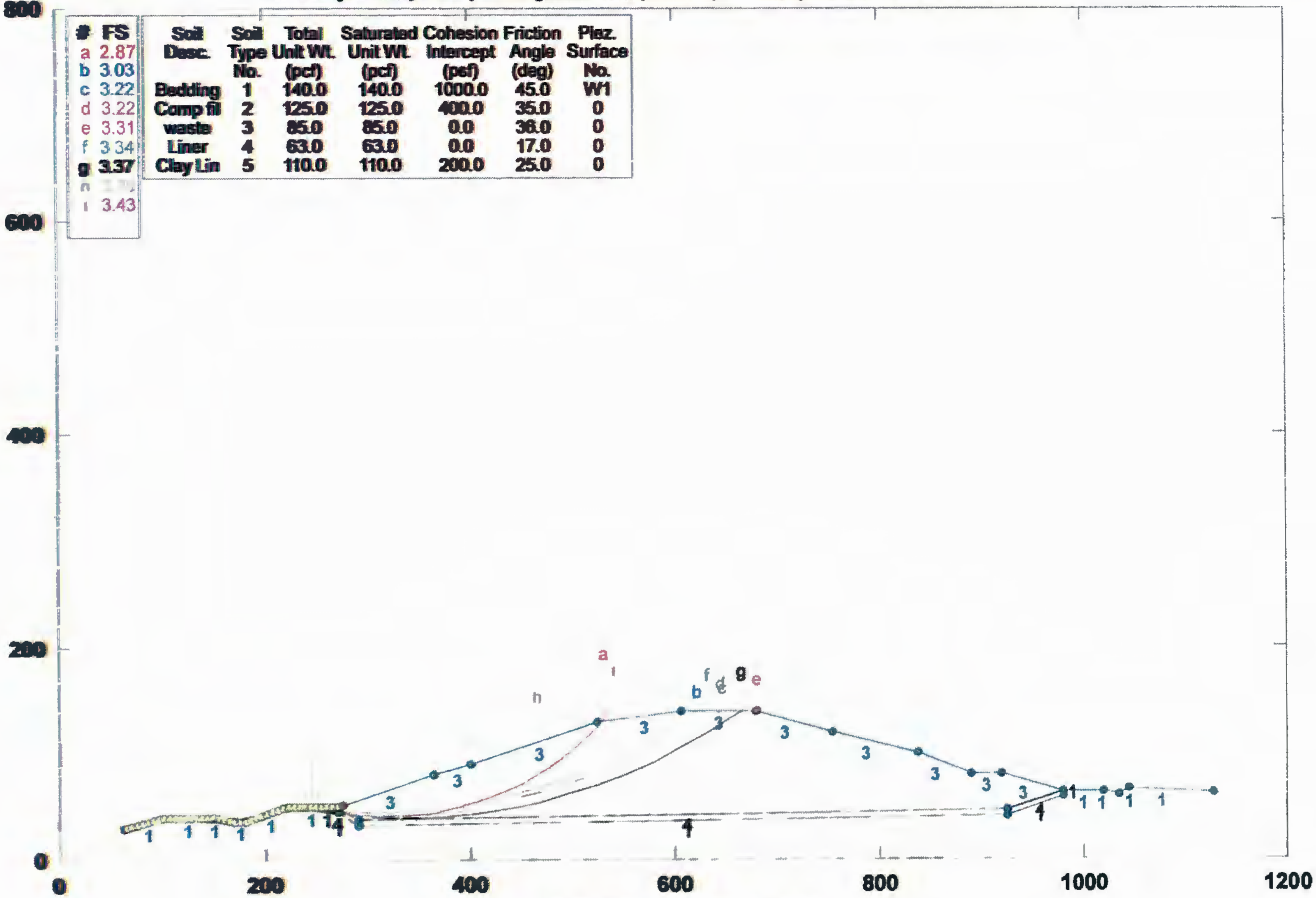
PCSTABL5M/si FSmin=1.21

Safety Factors Are Calculated By Spencer`s Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 1-1' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve1-c.pl2 Run By: Username 4/23/2015 02:01PM



| # | FS |
|---|---|
| a | 2.87 |
| b | 3.03 |
| c | 3.22 |
| d | 3.22 |
| e | 3.31 |
| f | 3.34 |
| g | 3.37 |
| h | [illegible] |
| i | 3.43 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

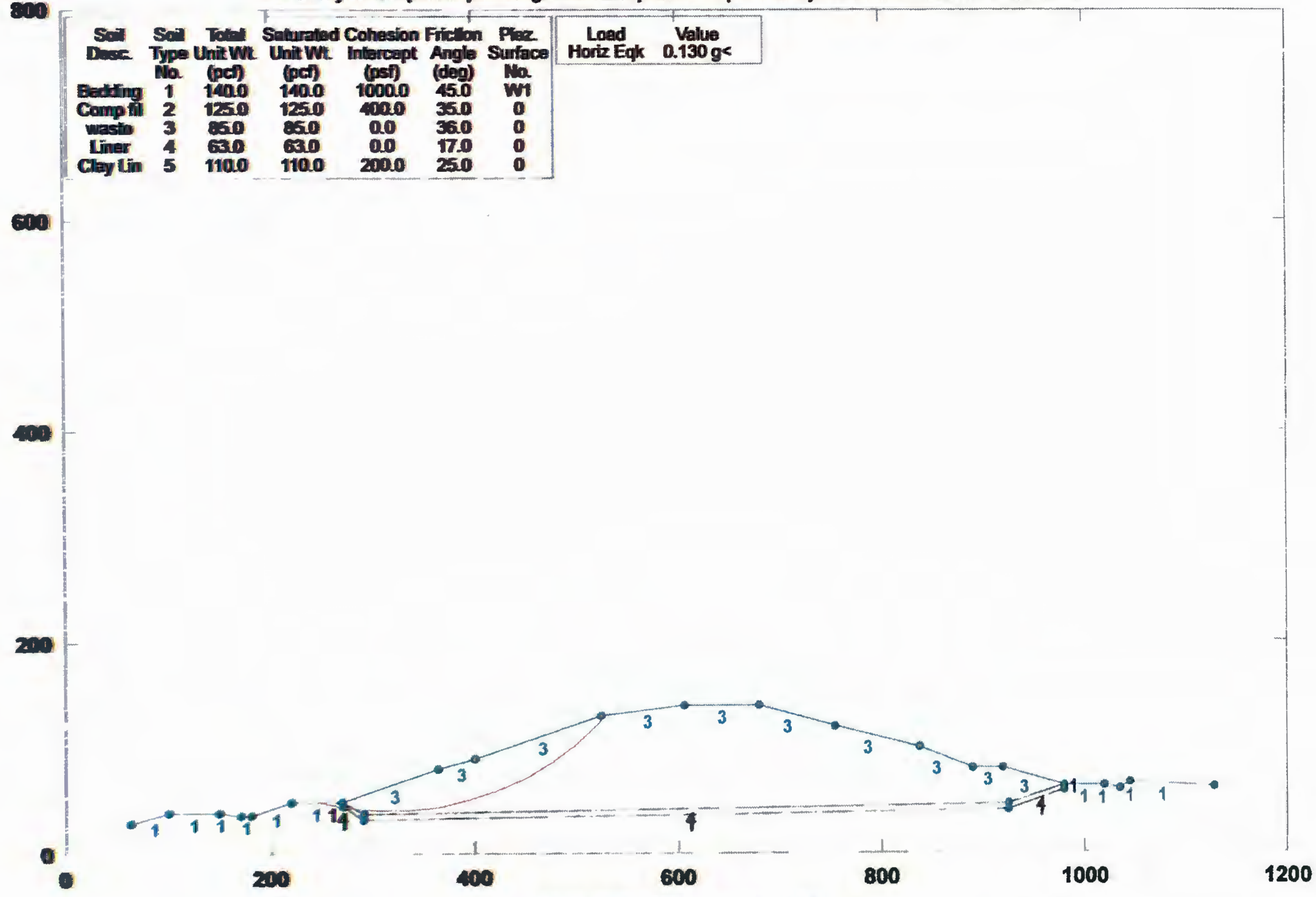
PCSTABL5M/sl FSmin=2.87

Safety Factors Are Calculated By The Modified Bishop Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 1-1' (Pesudo-Static)

e:\stability files\slopawin7\pvt final grades - 250'\pvtve1-ces.plt Run By: Username 4/23/2015 02:02PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

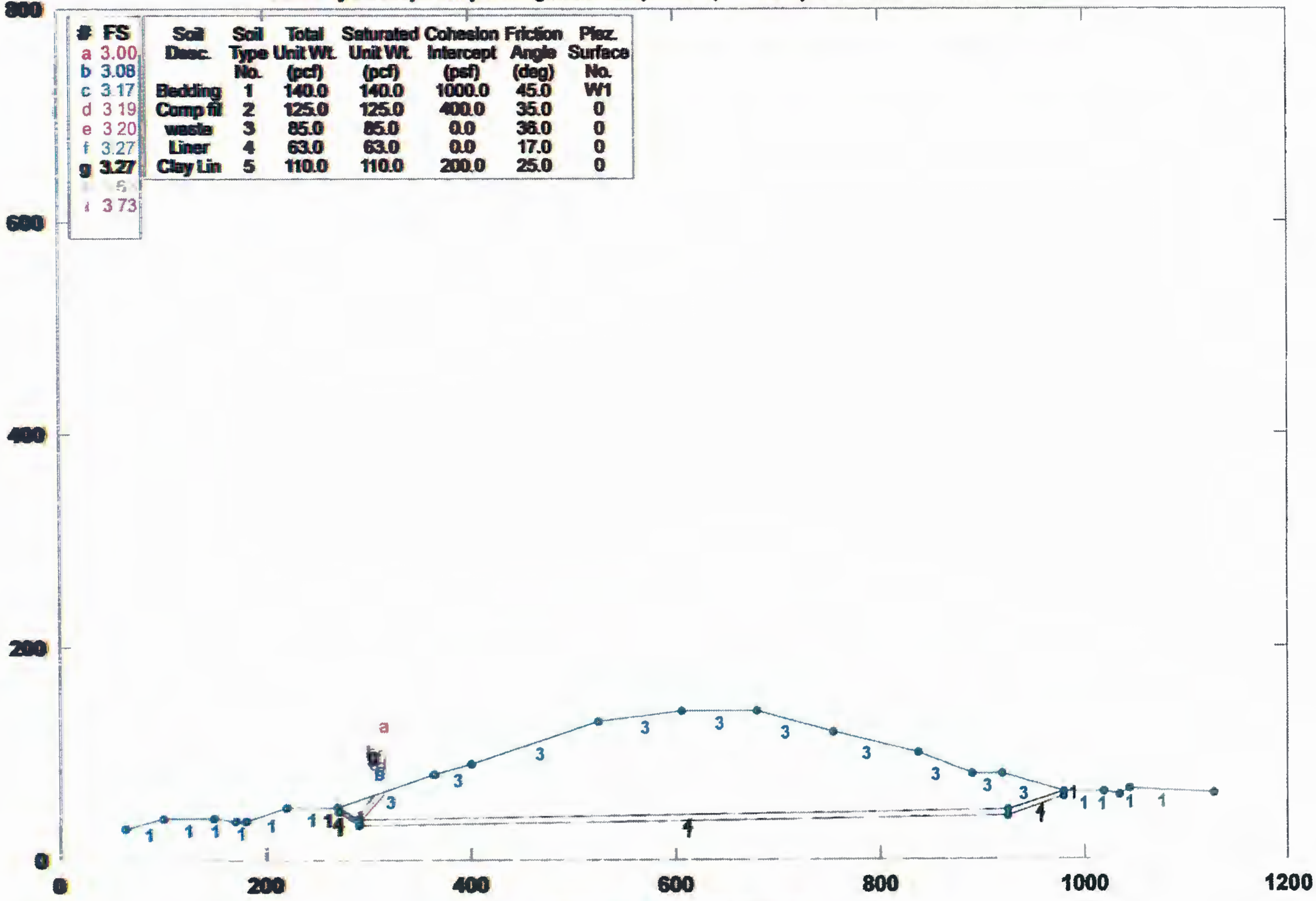
**PCSTABL5M/si FSmin=1.94**

**Factor Of Safety Is Calculated By Spencer`s Method of Slices**

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 1-1' (Static)

e:\stabillity files\slopewin7\pvt final grades - 250'\pvtve3-b.pl2 Run By: Username 4/23/2015 02:07PM



| # | FS |
|---|---|
| a | 3.00 |
| b | 3.08 |
| c | 3.17 |
| d | 3.19 |
| e | 3.20 |
| f | 3.27 |
| g | 3.27 |
| i | 3.73 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

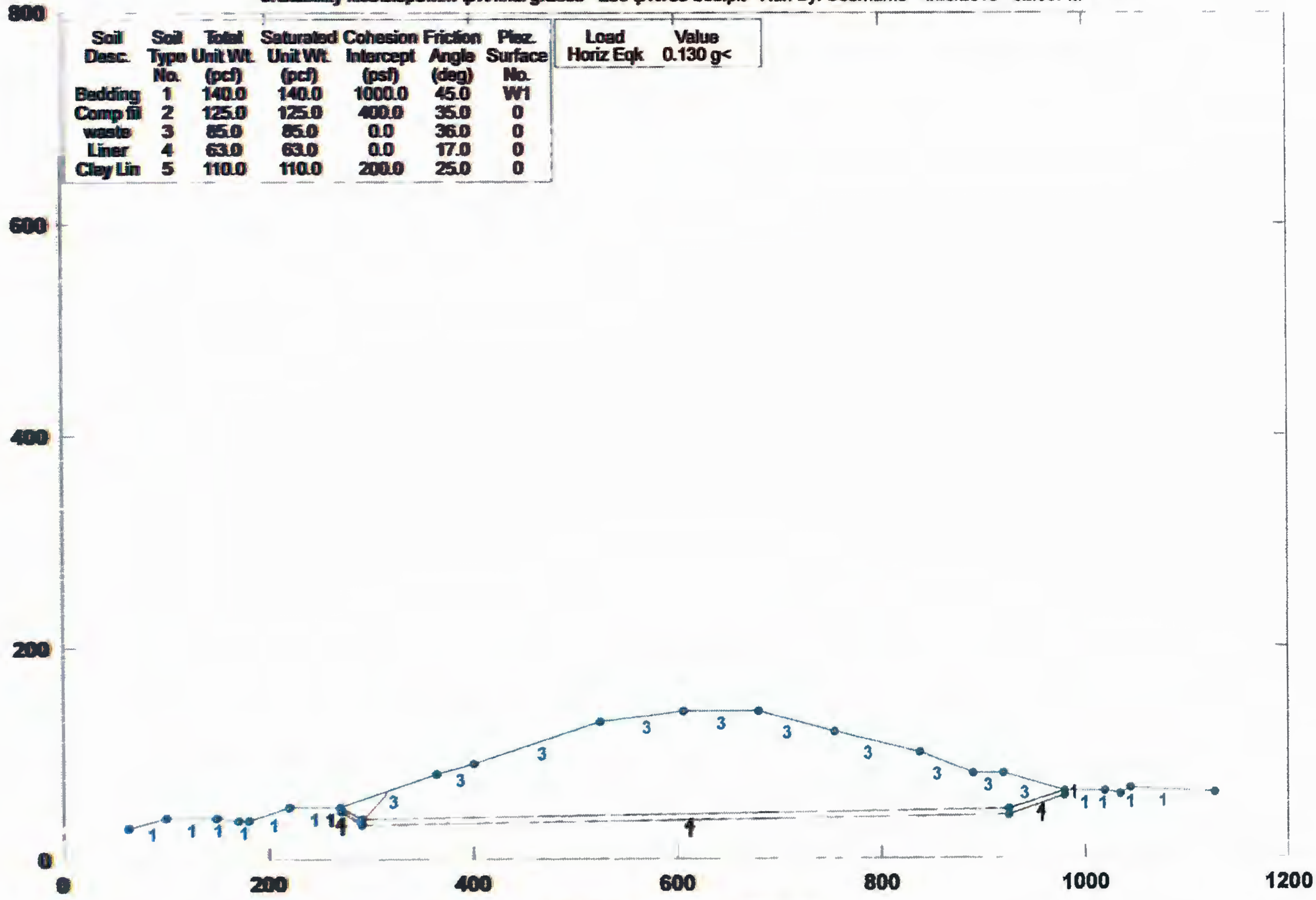
PCSTABL5M/sl FSmin=3.00

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 1-1' (Pesudo-Static)

e:\stabillity files\slopewin7\pvt final grades - 250'\pvlve3-bes.plt   Run By: Username   4/23/2015   02:08PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

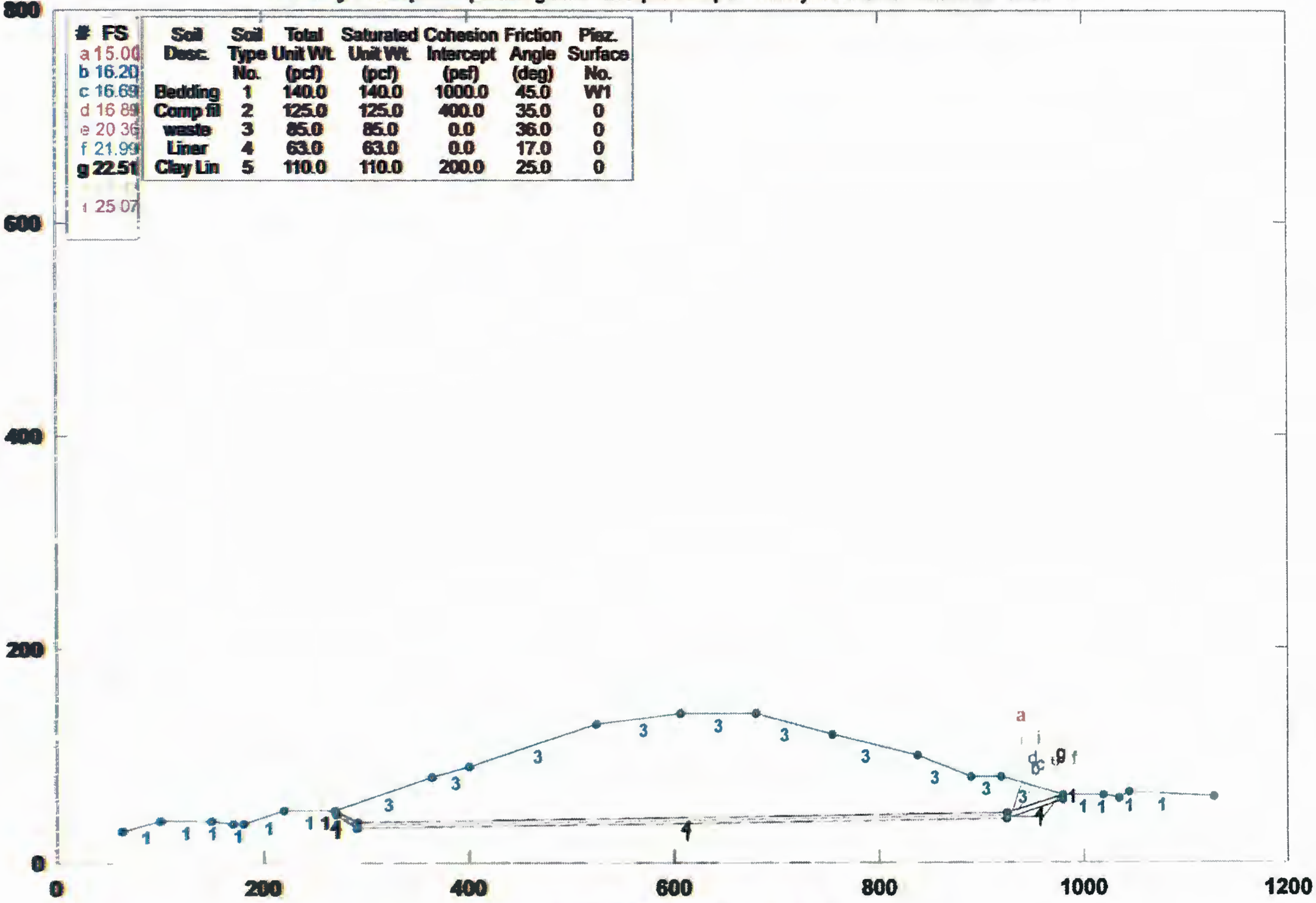
PCSTABL5M/si FSmin=2.97

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 1-1' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve1-b.pl2 Run By: Username 4/23/2015 02:51PM



| # | FS |
|---|---|
| a | 15.00 |
| b | 16.20 |
| c | 16.69 |
| d | 16.89 |
| e | 20.36 |
| f | 21.99 |
| g | 22.51 |
| i | 25.07 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

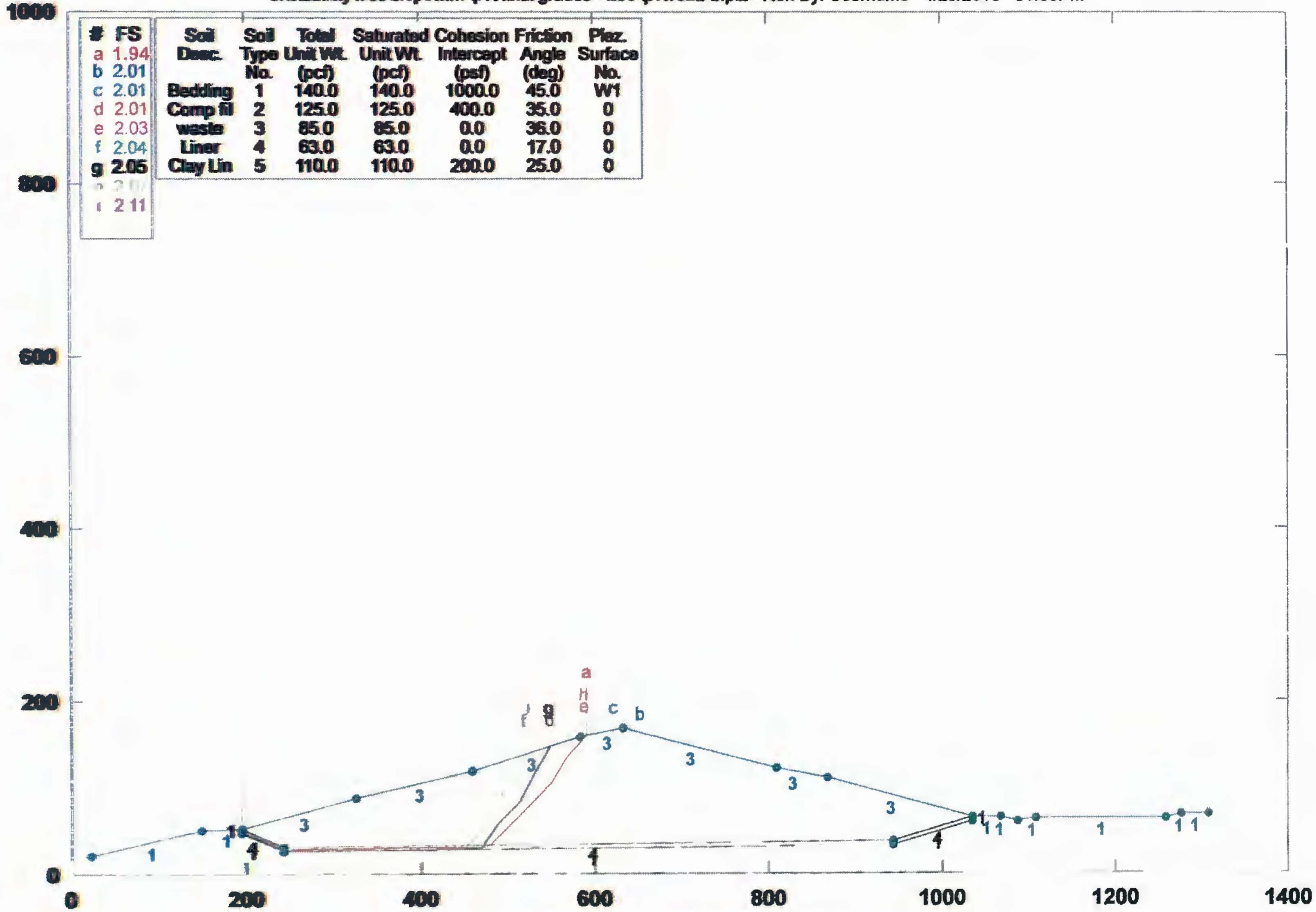
PCSTABL5M/sl FSmin=15.00

Safety Factors Are Calculated By The Modified Janbu Method

STED

## PVT Final Refuse Grades - 250' Elev. Cross-Section 2-2' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve22-b.pl2 Run By: Username 4/23/2015 01:55PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

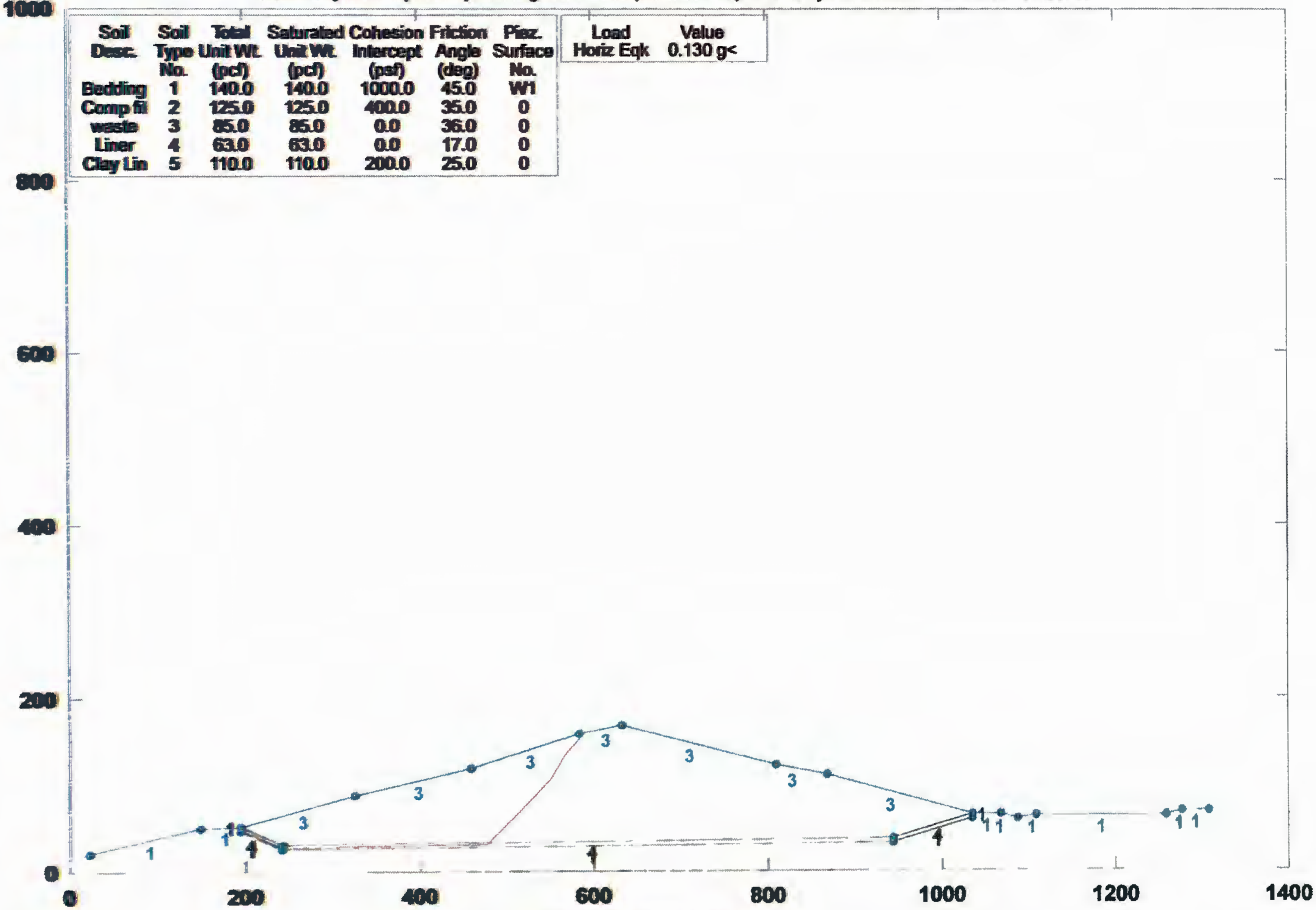
**PCSTABL5M/si FSmin=1.94**

**Safety Factors Are Calculated By The Modified Janbu Method**

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 2-2' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve22-bes.plt  Run By: Username  4/23/2015  01:56PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

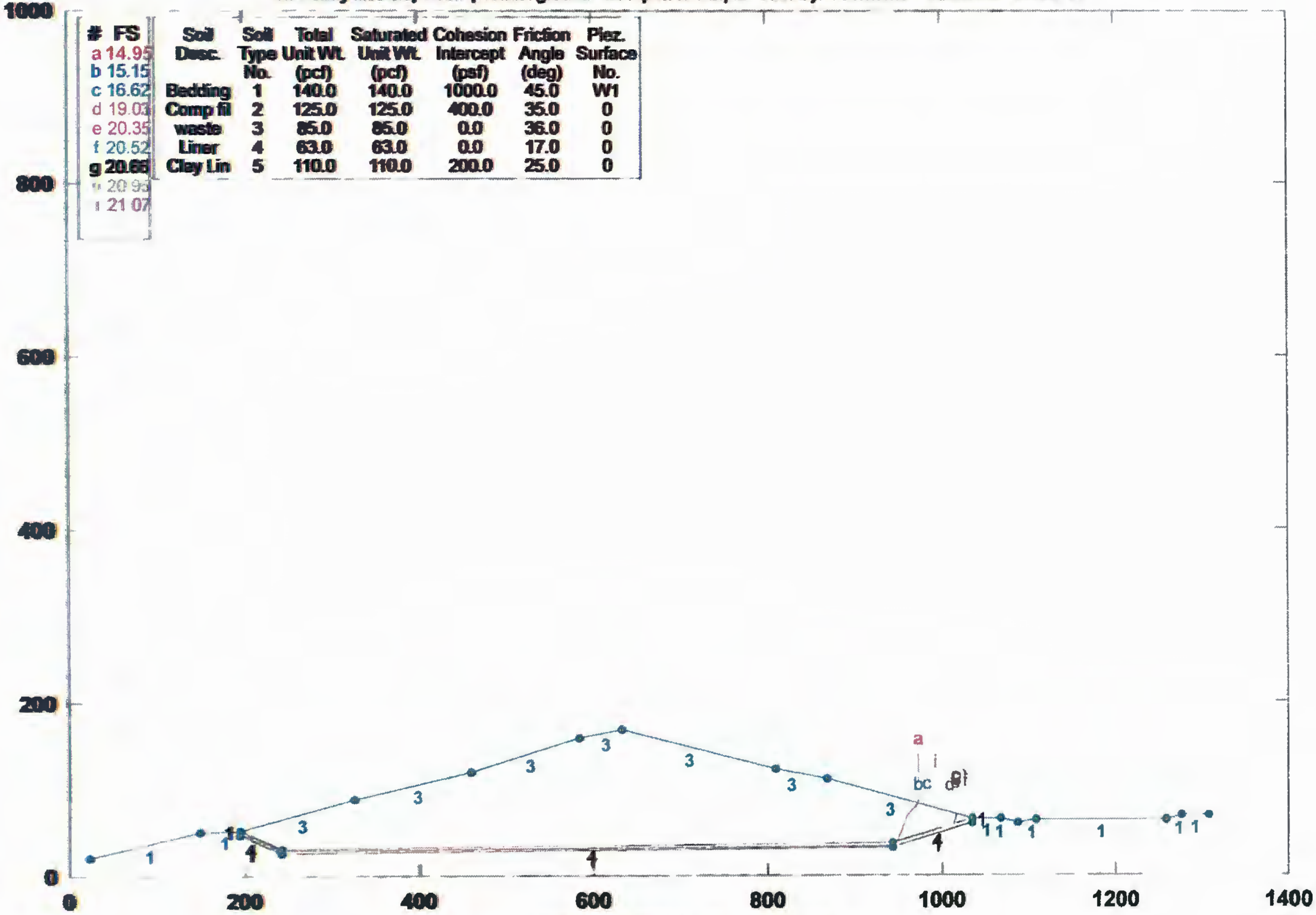
PCSTABL5M/si FSmin=1.25

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 2-2' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve21-b.pl2 Run By: Username 4/23/2015 01:59PM



| # | FS |
|---|---|
| a | 14.95 |
| b | 15.15 |
| c | 16.62 |
| d | 19.03 |
| e | 20.35 |
| f | 20.52 |
| g | 20.66 |
| h | 20.93 |
| i | 21.07 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

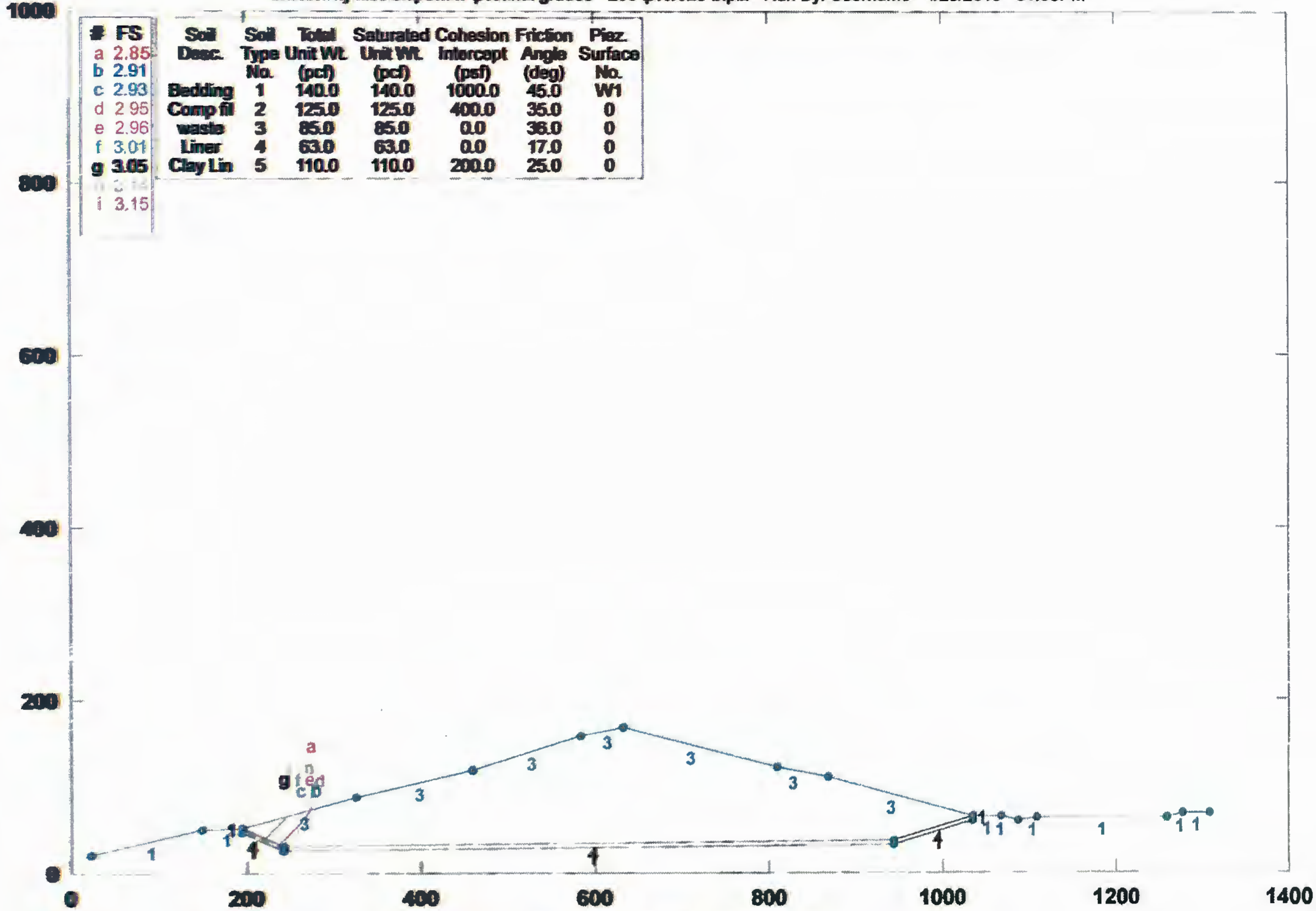
PCSTABL5M/sl FSmin=14.95

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 2-2' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve23-b.pl2 Run By: Username 4/23/2015 01:58PM



| # | FS |
|---|---|
| a | 2.85 |
| b | 2.91 |
| c | 2.93 |
| d | 2.95 |
| e | 2.96 |
| f | 3.01 |
| g | 3.05 |
| h | 3.14 |
| i | 3.15 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

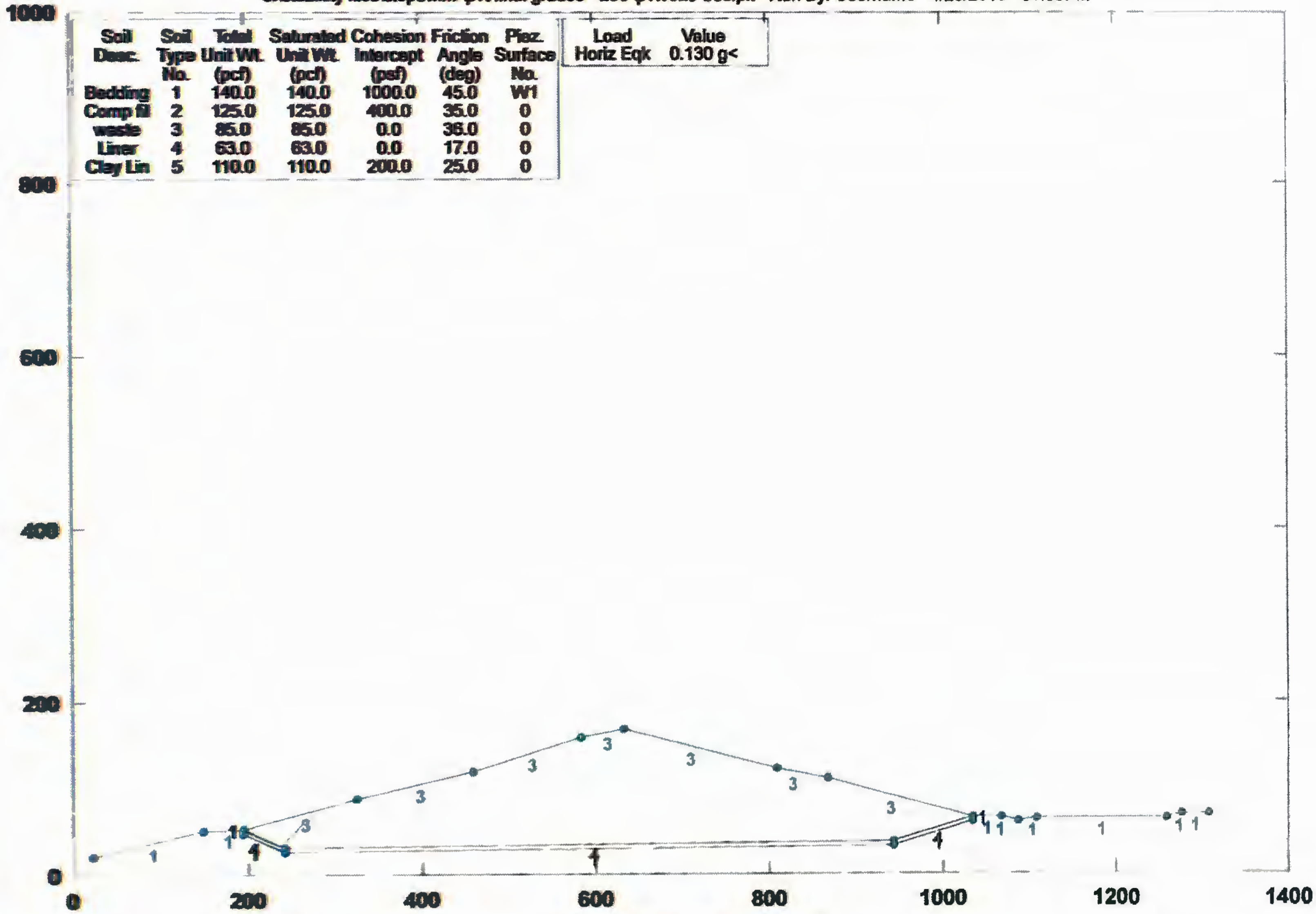
PCSTABL5M/si FSmin=2.85

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 2-2' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve23-bes.plt Run By: Username 4/23/2015 01:59PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

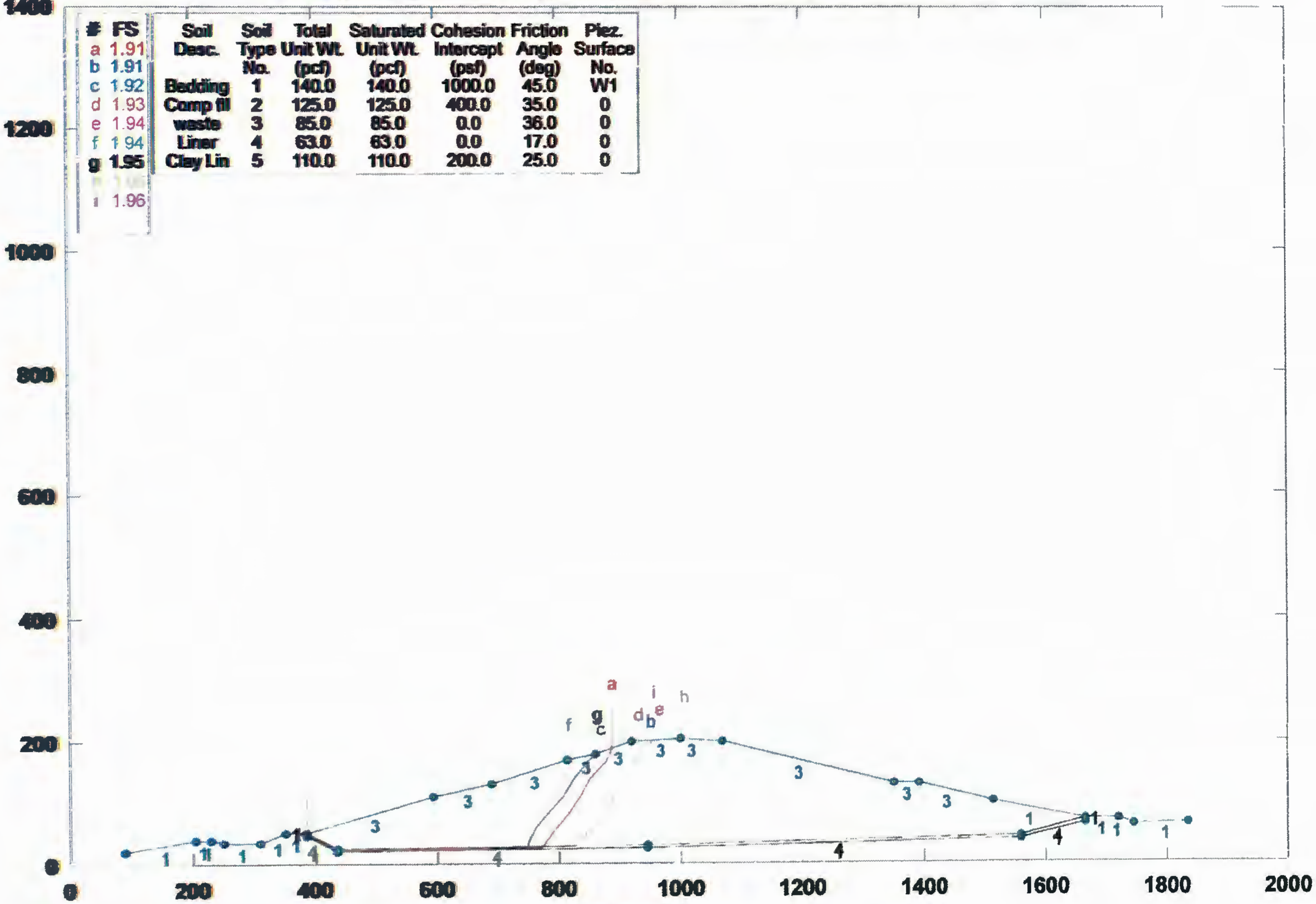
PCSTABL5M/si FSmin=2.20

Factor Of Safety Is Calculated By Spencer`s Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 3-3' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve33-b.pl2 Run By: Username 4/23/2015 01:45PM



| # | FS |
|---|---|
| a | 1.91 |
| b | 1.91 |
| c | 1.92 |
| d | 1.93 |
| e | 1.94 |
| f | 1.94 |
| g | 1.95 |
| h | 1.96 |
| i | 1.96 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fill | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

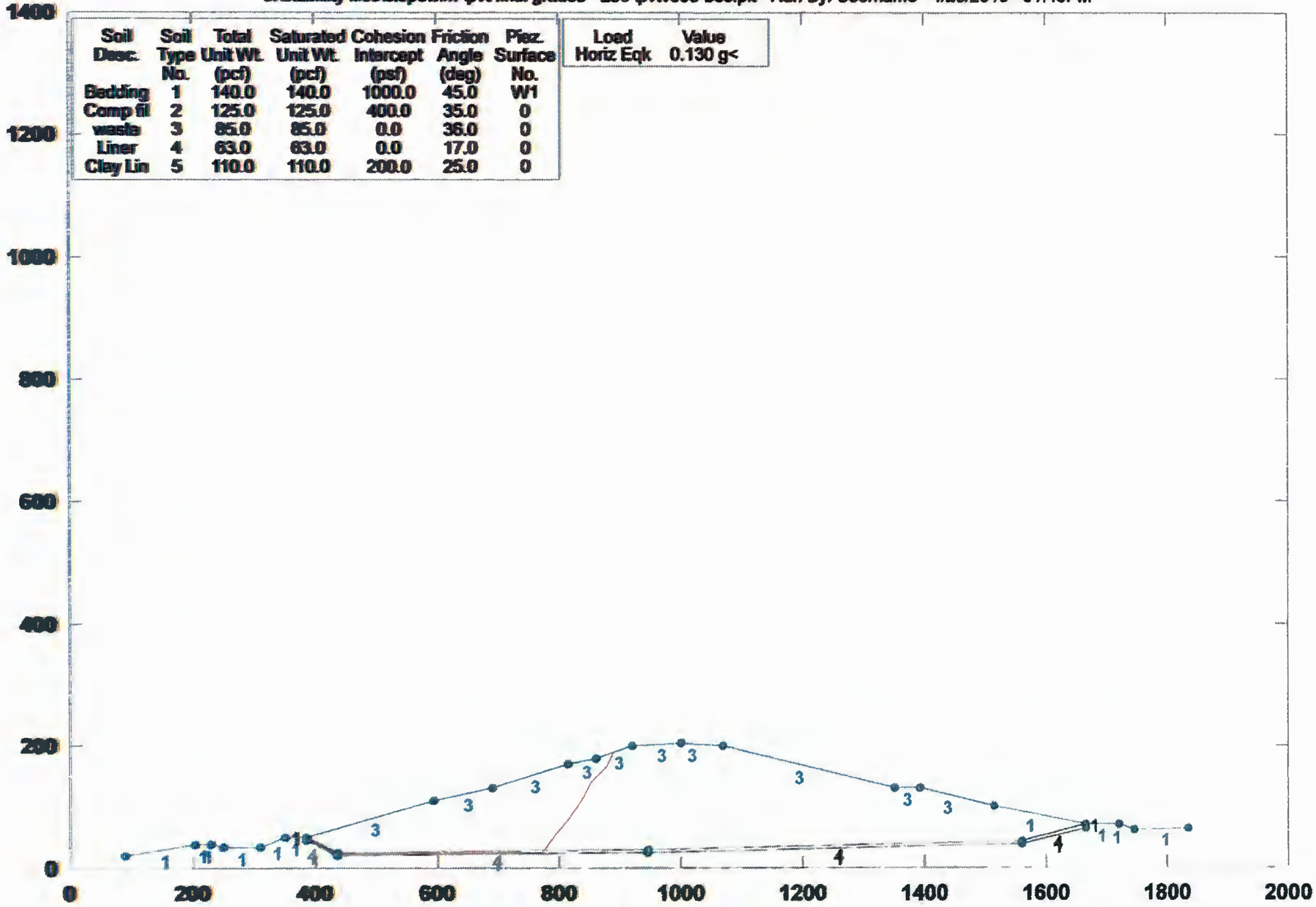
PCSTABL5M/si FSmin=1.91

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 3-3' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve33-bes.plt   Run By: Username   4/23/2015   01:46PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

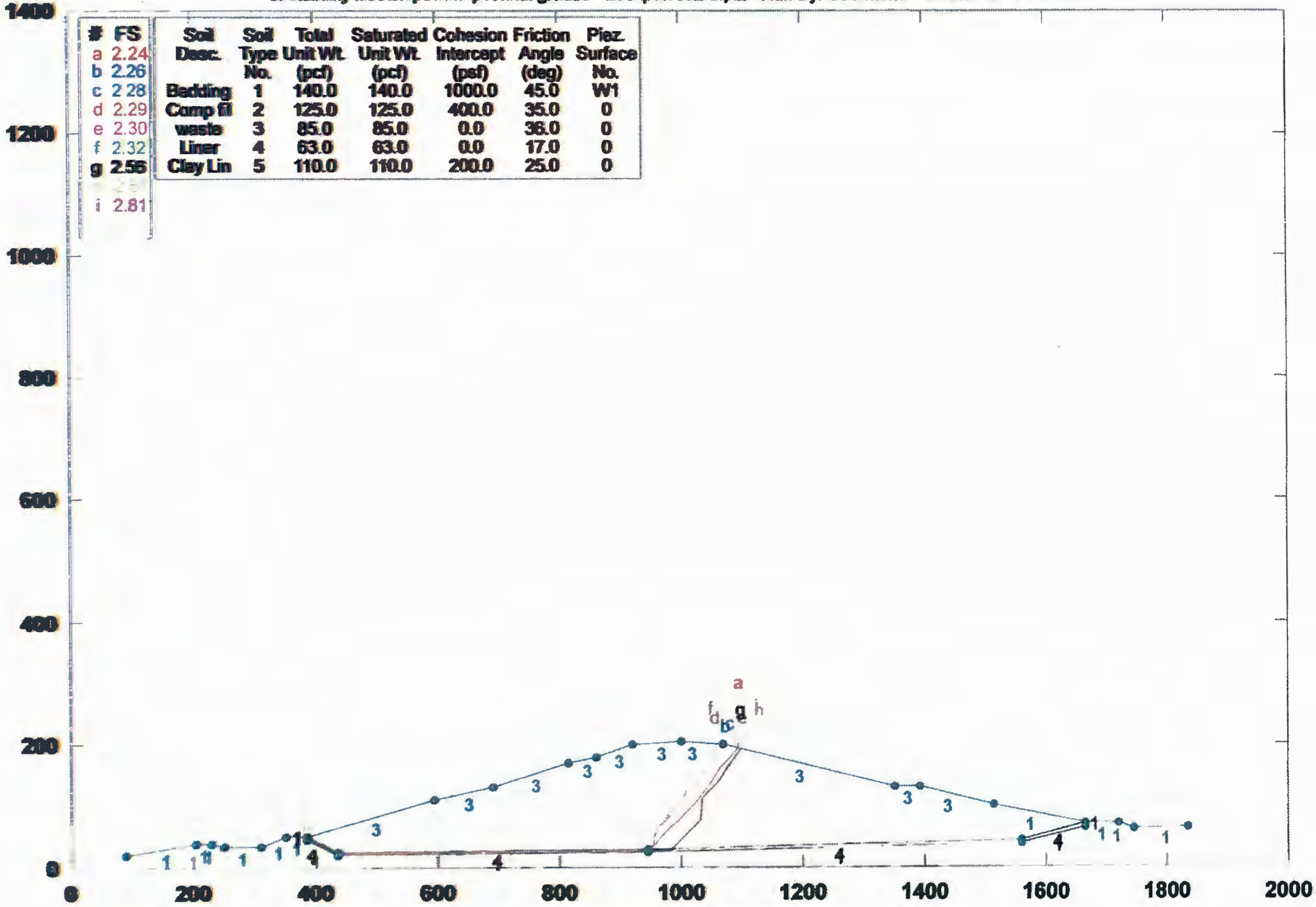
PCSTABL5M/si FSmin=1.25

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 3-3' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve32-b.pl2 Run By: Username 4/23/2015 01:47PM



| # | FS |
|---|---|
| a | 2.24 |
| b | 2.26 |
| c | 2 28 |
| d | 2.29 |
| e | 2.30 |
| f | 2.32 |
| g | 2.56 |
| h | [illegible] |
| i | 2.81 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

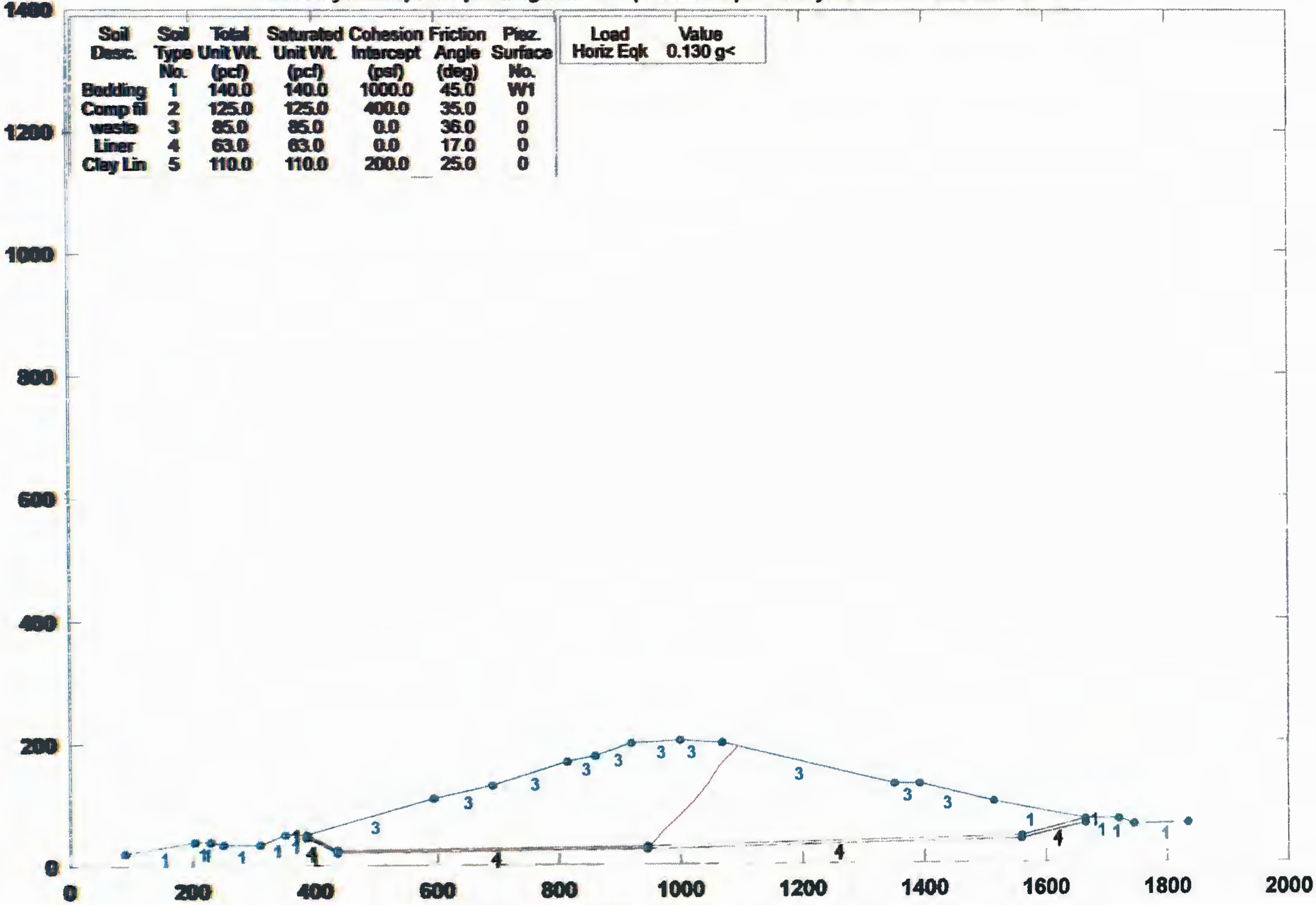
PCSTABL5M/sl FSmin=2.24

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 3-3' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve32-bes.plt Run By: Username 4/23/2015 01:49PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

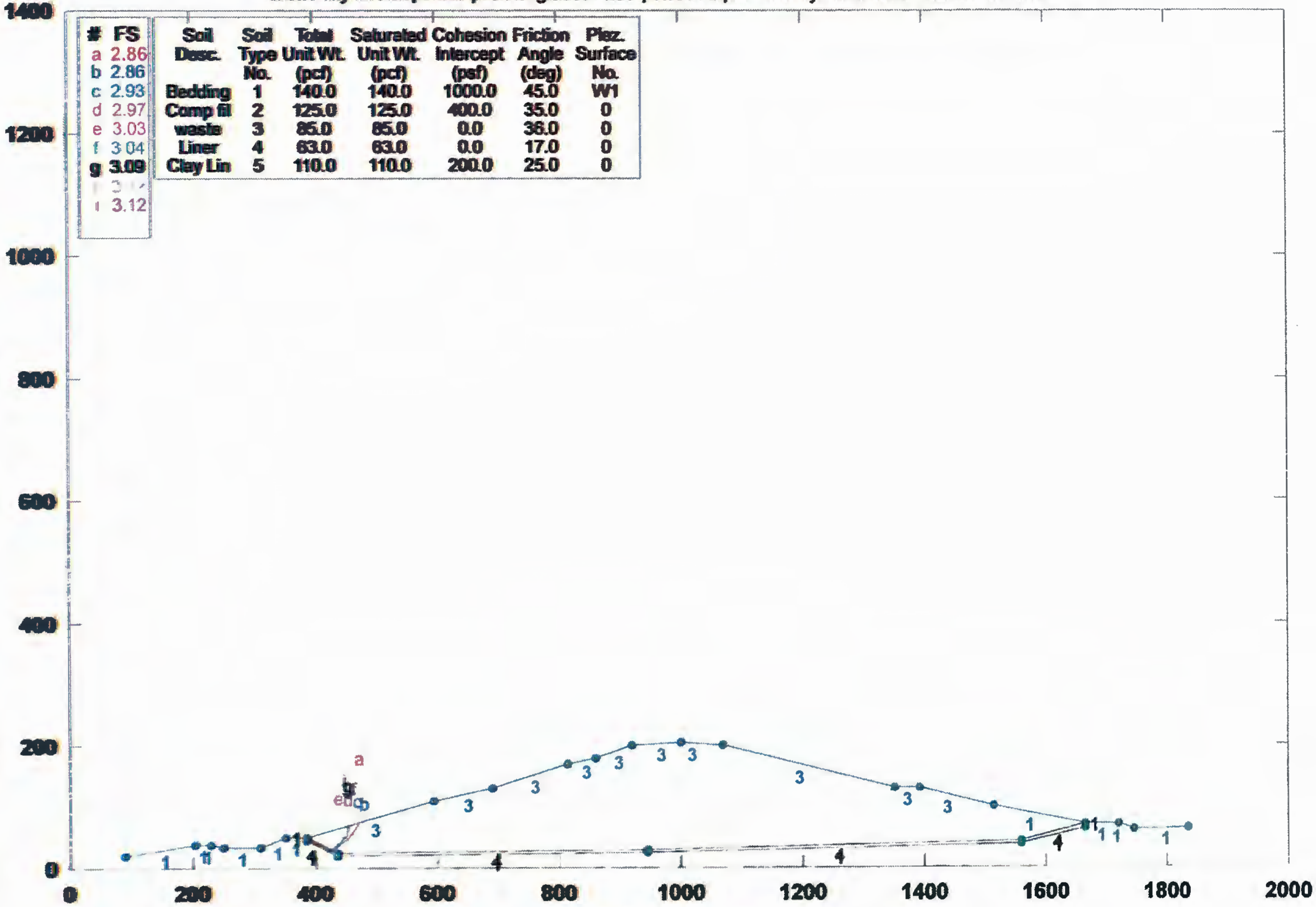
PCSTABL5M/si FSmin=1.33

Factor Of Safety Is Calculated By Spencer`s Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 3-3' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve34-b.pl2 Run By: Username 4/23/2015 01:49PM



| # | FS |
|---|---|
| a | 2.86 |
| b | 2.86 |
| c | 2.93 |
| d | 2.97 |
| e | 3.03 |
| f | 3.04 |
| g | 3.09 |
| [illegible] | [illegible] |
| i | 3.12 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

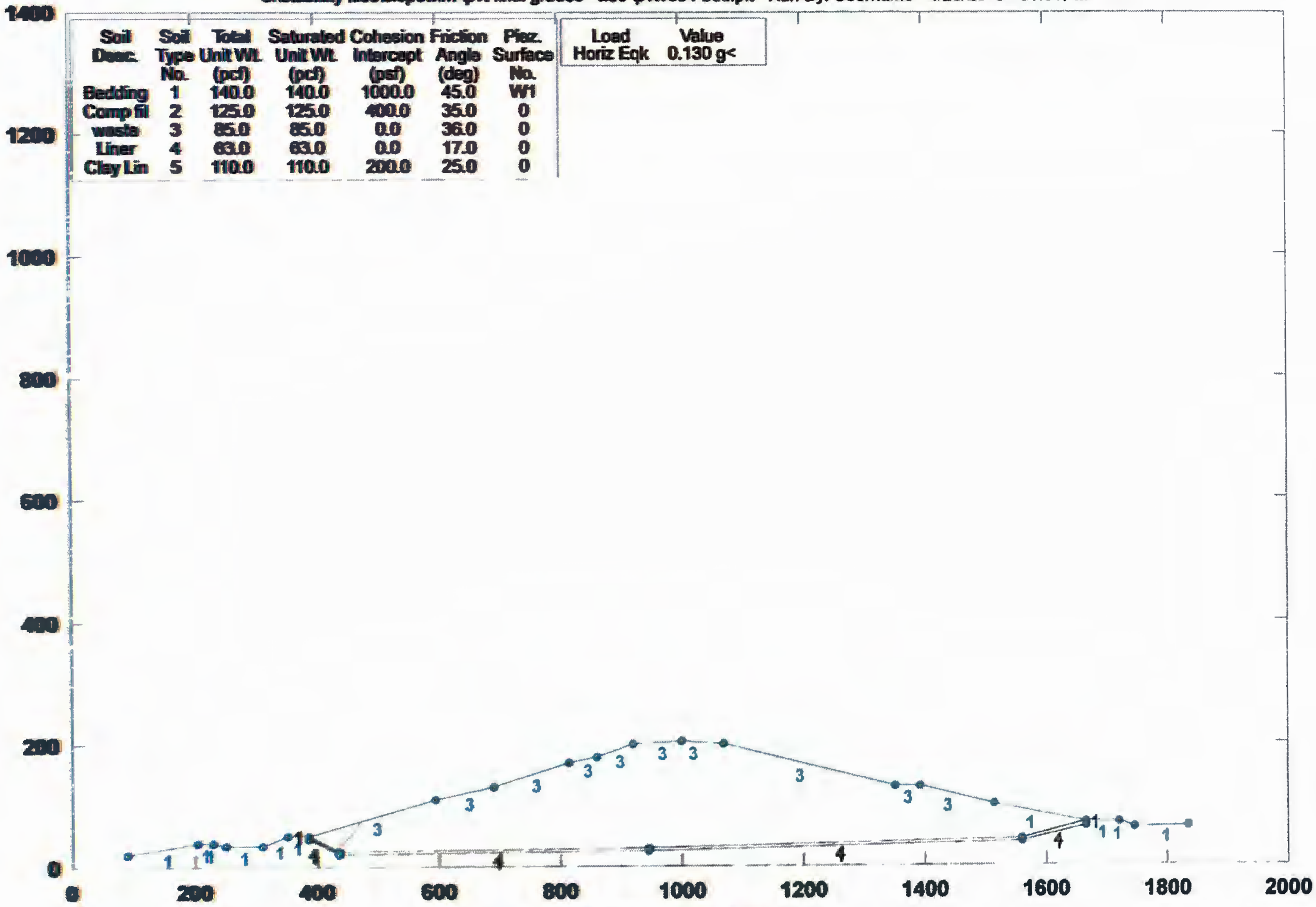
PCSTABL5M/si FSmin=2.86

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 3-3' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve34-bes.plt Run By: Username 4/23/2015 01:51PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

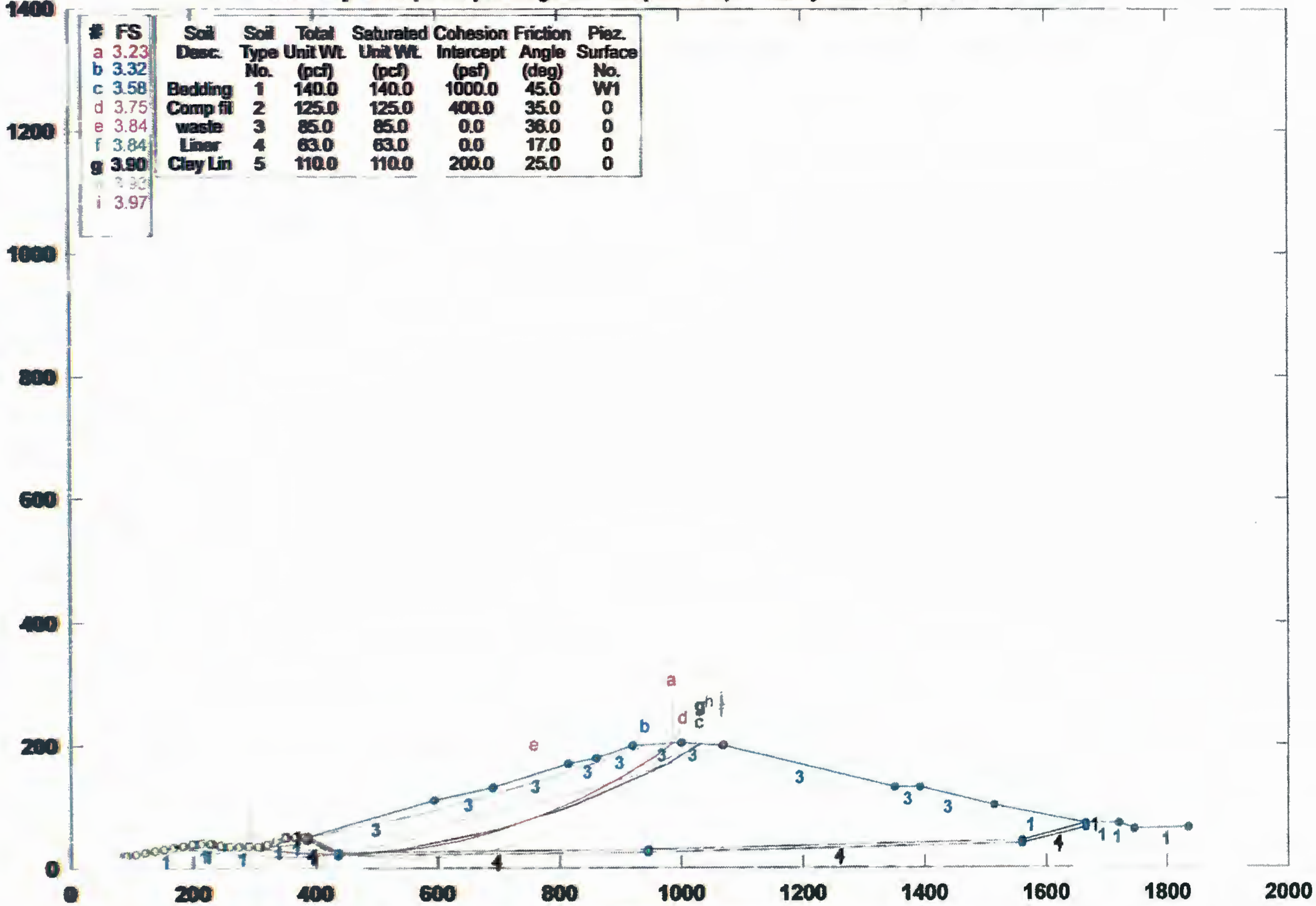
| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

PCSTABL5M/si FSmin=2.27

Factor Of Safety Is Calculated By Spencer`s Method of Slices

# PVT Final Refuse Grades - 250' Elev. Cross-Section 3-3' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve31-c.pl2 Run By: Username 4/23/2015 01:51PM



| # | FS |
|---|---|
| a | 3.23 |
| b | 3.32 |
| c | 3.58 |
| d | 3.75 |
| e | 3.84 |
| f | 3.84 |
| g | 3.90 |
| h | 3.93 |
| i | 3.97 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

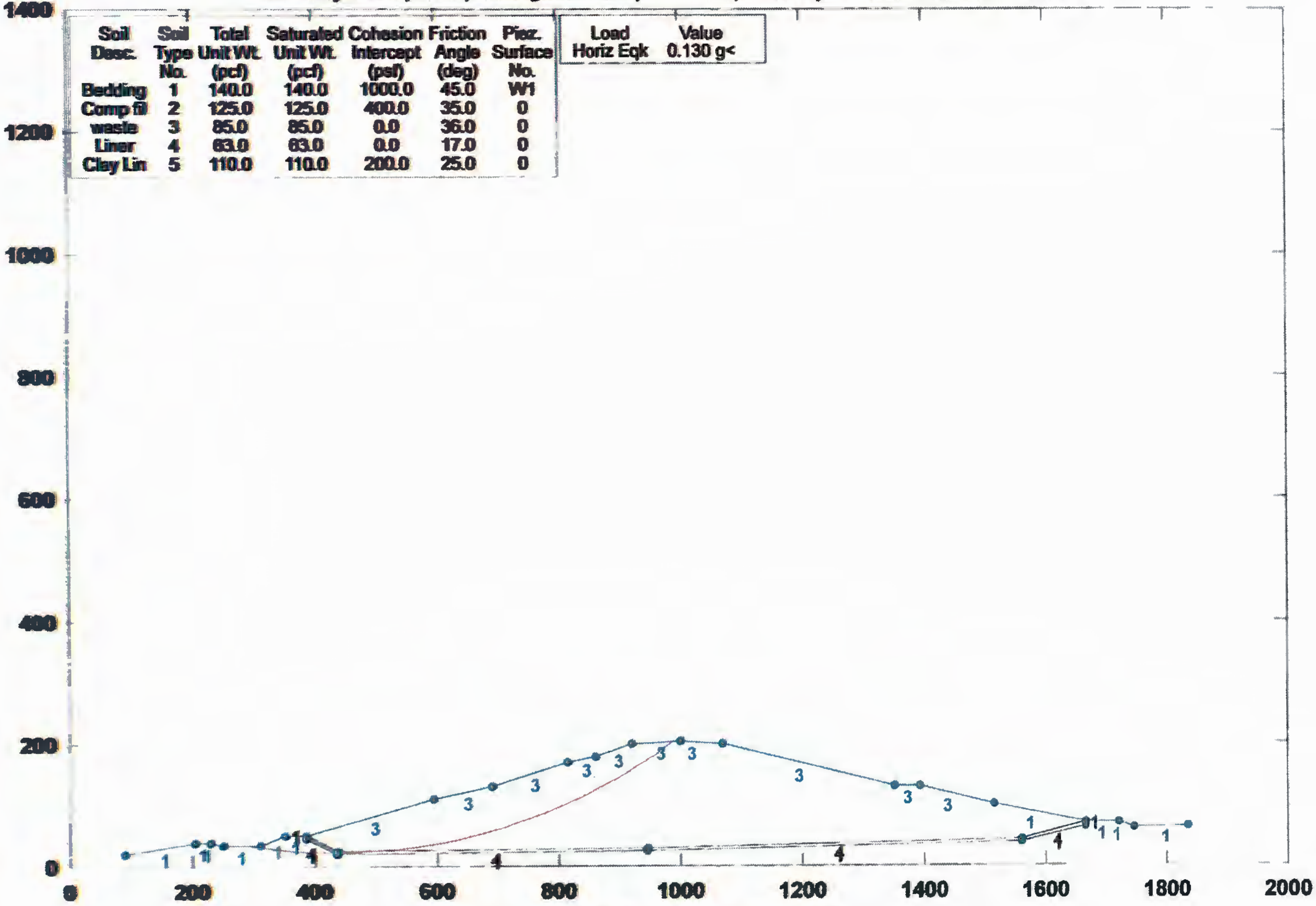
PCSTABL5M/si FSmin=3.23

Safety Factors Are Calculated By The Modified Bishop Method

STED

## PVT Final Refuse Grades - 250' Elev. Cross-Section 3-3' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve31-ces.plt Run By: Username 4/23/2015 01:52PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

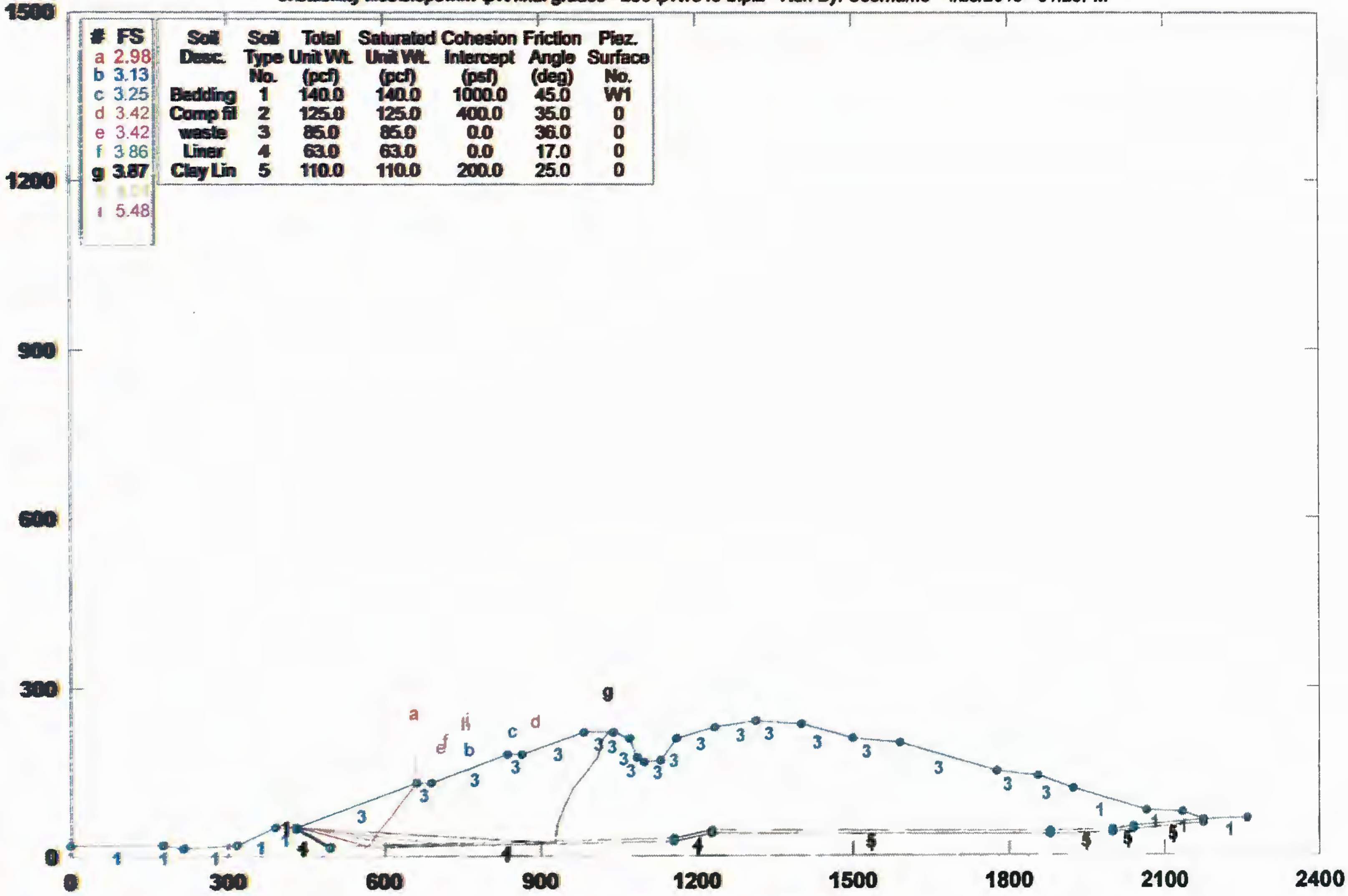
PCSTABL5M/si FSmin=2.07

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve46-b.pl2 Run By: Username 4/23/2015 01:26PM



| # | FS |
|---|---|
| a | 2.98 |
| b | 3.13 |
| c | 3.25 |
| d | 3.42 |
| e | 3.42 |
| f | 3.86 |
| g | 3.87 |
| h | [illegible] |
| i | 5.48 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

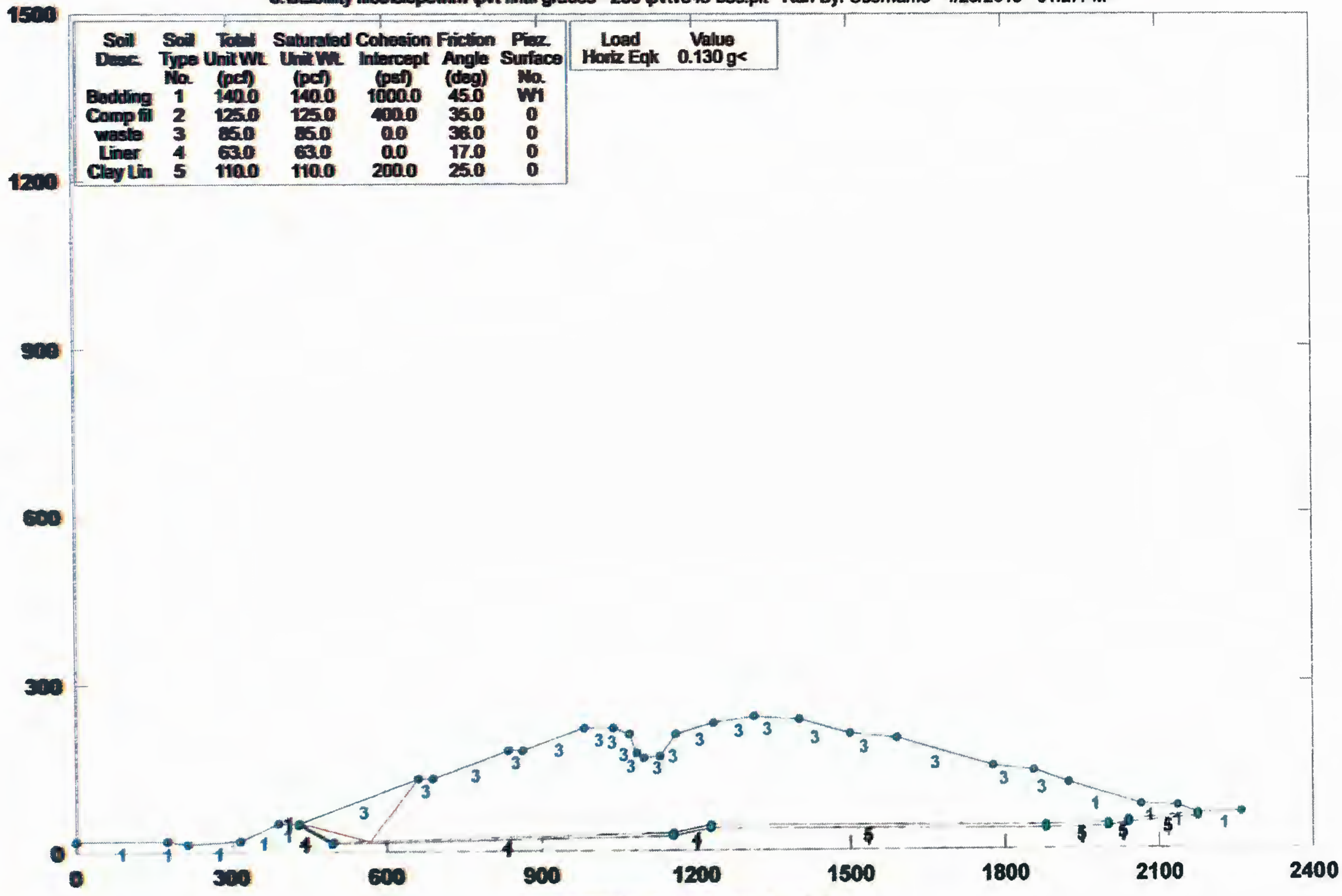
PCSTABL5M/si FSmin=2.98

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Pesudo-Static)

e:\stabillity files\slopewin7\pvt final grades - 250'\pvtve46-bes.plt Run By: Username 4/23/2015 01:27PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

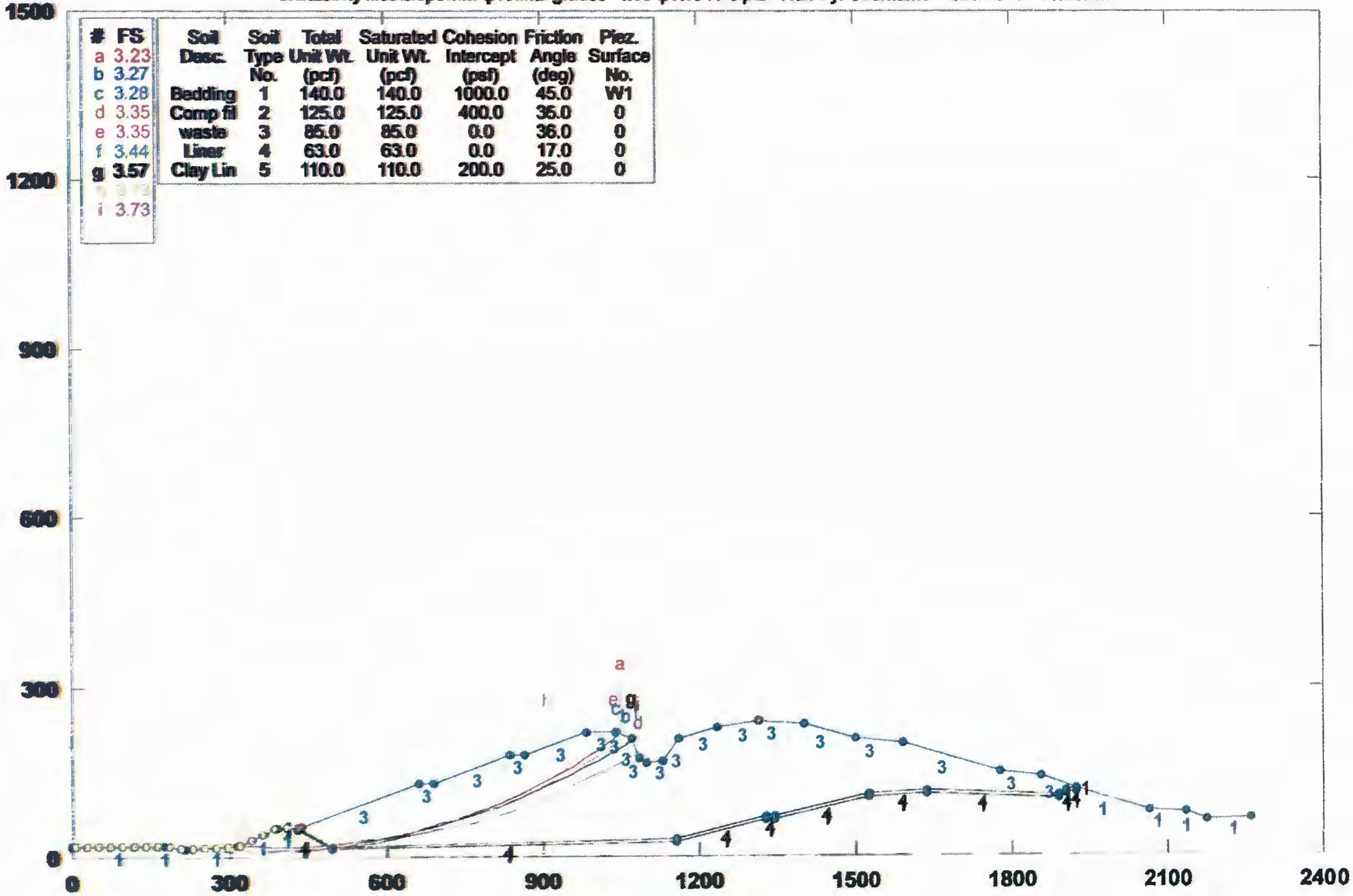
PCSTABL5M/si FSmin=2.58

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve41-c.pl2 Run By: Username 4/23/2015 01:28PM



| # | FS |
|---|---|
| a | 3.23 |
| b | 3.27 |
| c | 3.28 |
| d | 3.35 |
| e | 3.35 |
| f | 3.44 |
| g | 3.57 |
| h | 3.73 |
| i | 3.73 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

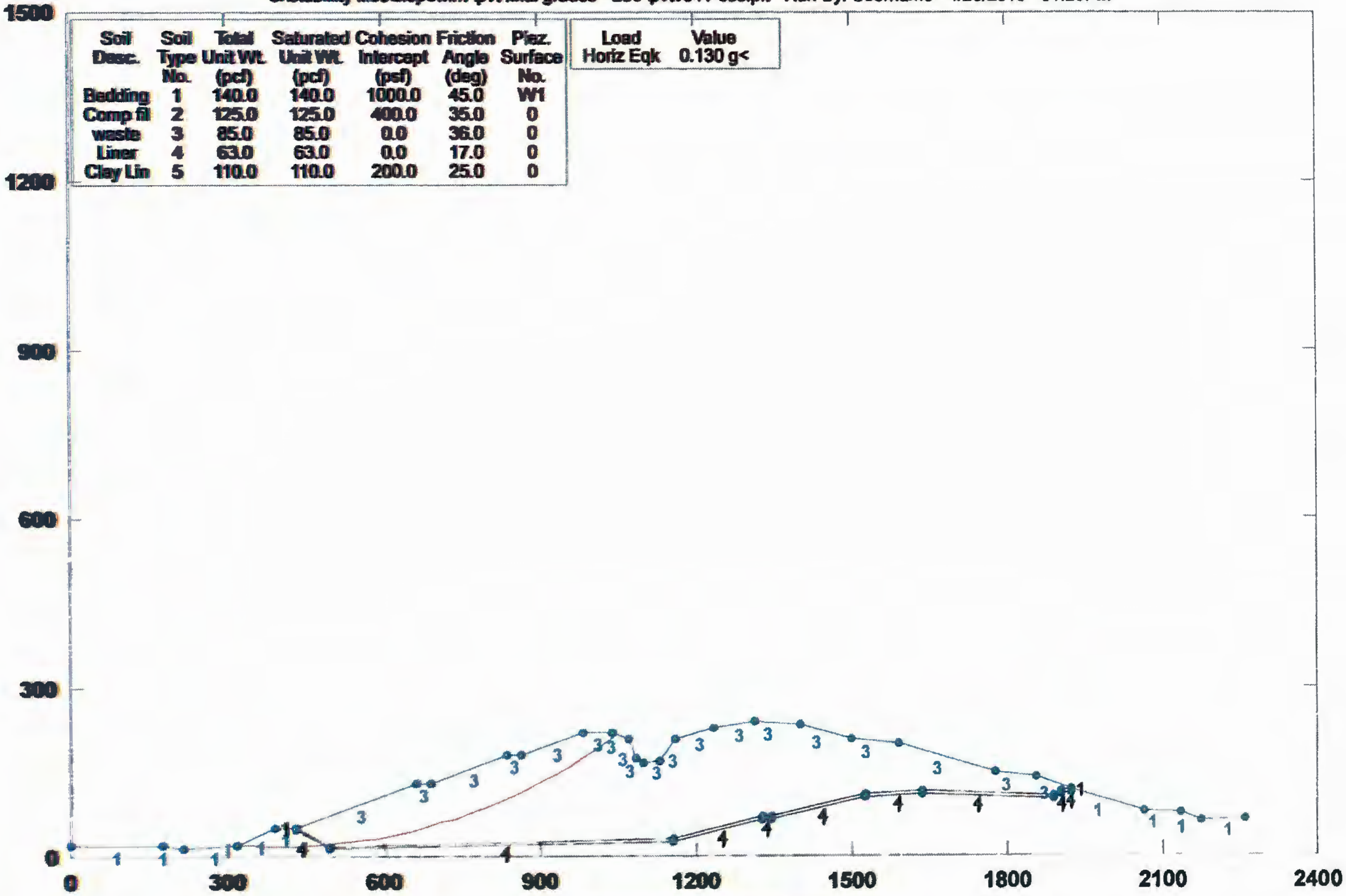
PCSTABL5M/si FSmin=3.23

Safety Factors Are Calculated By The Modified Bishop Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve41-ces.plt Run By: Username 4/23/2015 01:29PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

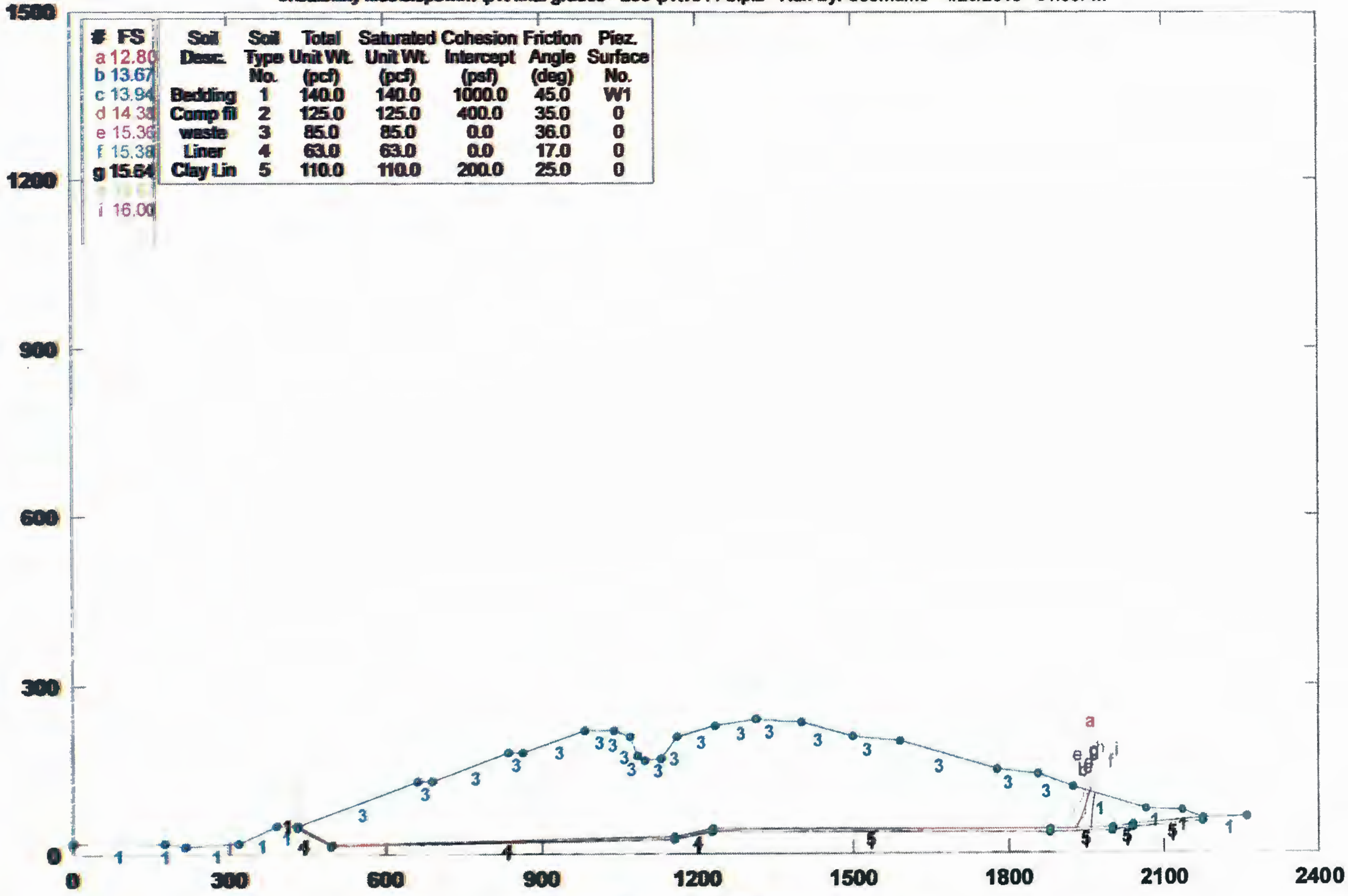
PCSTABL5M/si FSmin=2.12

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve44-b.pl2 Run By: Username 4/23/2015 01:33PM



| # | FS |
|---|---|
| a | 12.80 |
| b | 13.67 |
| c | 13.94 |
| d | 14.33 |
| e | 15.36 |
| f | 15.38 |
| g | 15.64 |
| h | [illegible] |
| i | 16.00 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

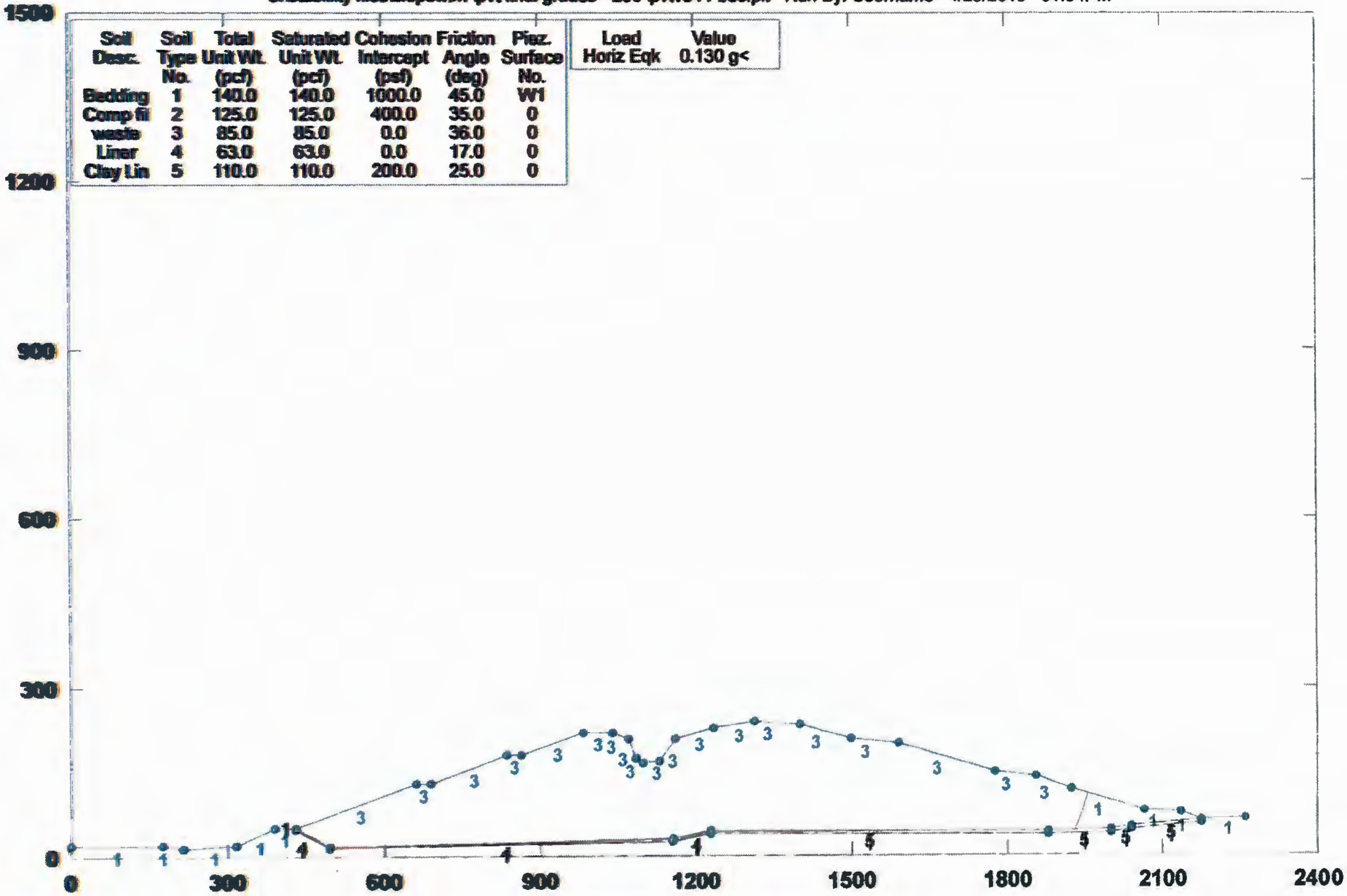
PCSTABL5M/si FSmin=12.80

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve44-bes.plt Run By: Username 4/23/2015 01:34PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

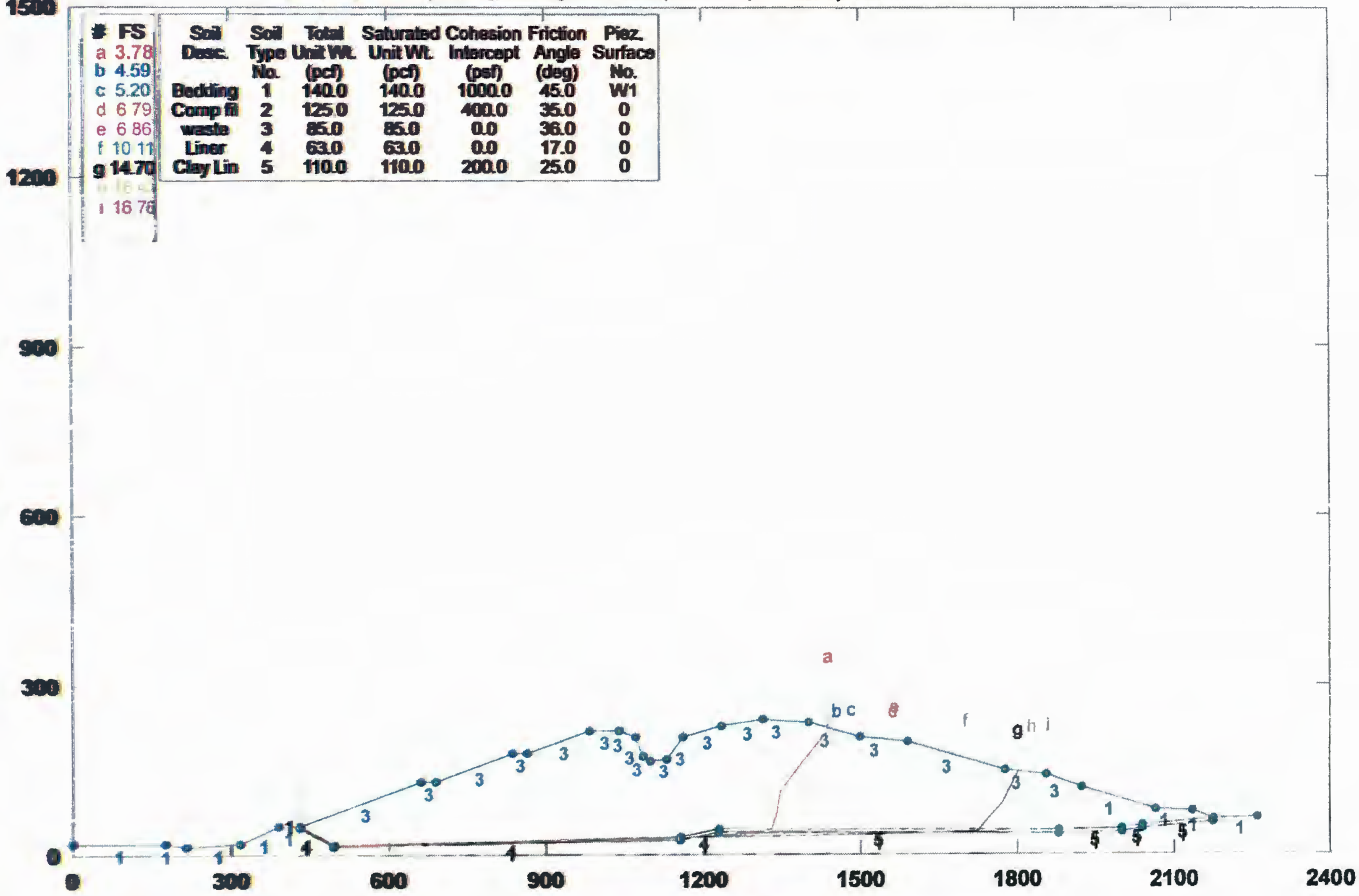
PCSTABL5M/si FSmin=2.59

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve45-b.pl2 Run By: Username 4/23/2015 01:31PM



| # | FS |
|---|---|
| a | 3.78 |
| b | 4.59 |
| c | 5.20 |
| d | 6 79 |
| e | 6 86 |
| f | 10 11 |
| g | 14.70 |
| h | 16 [illegible] |
| i | 16 76 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

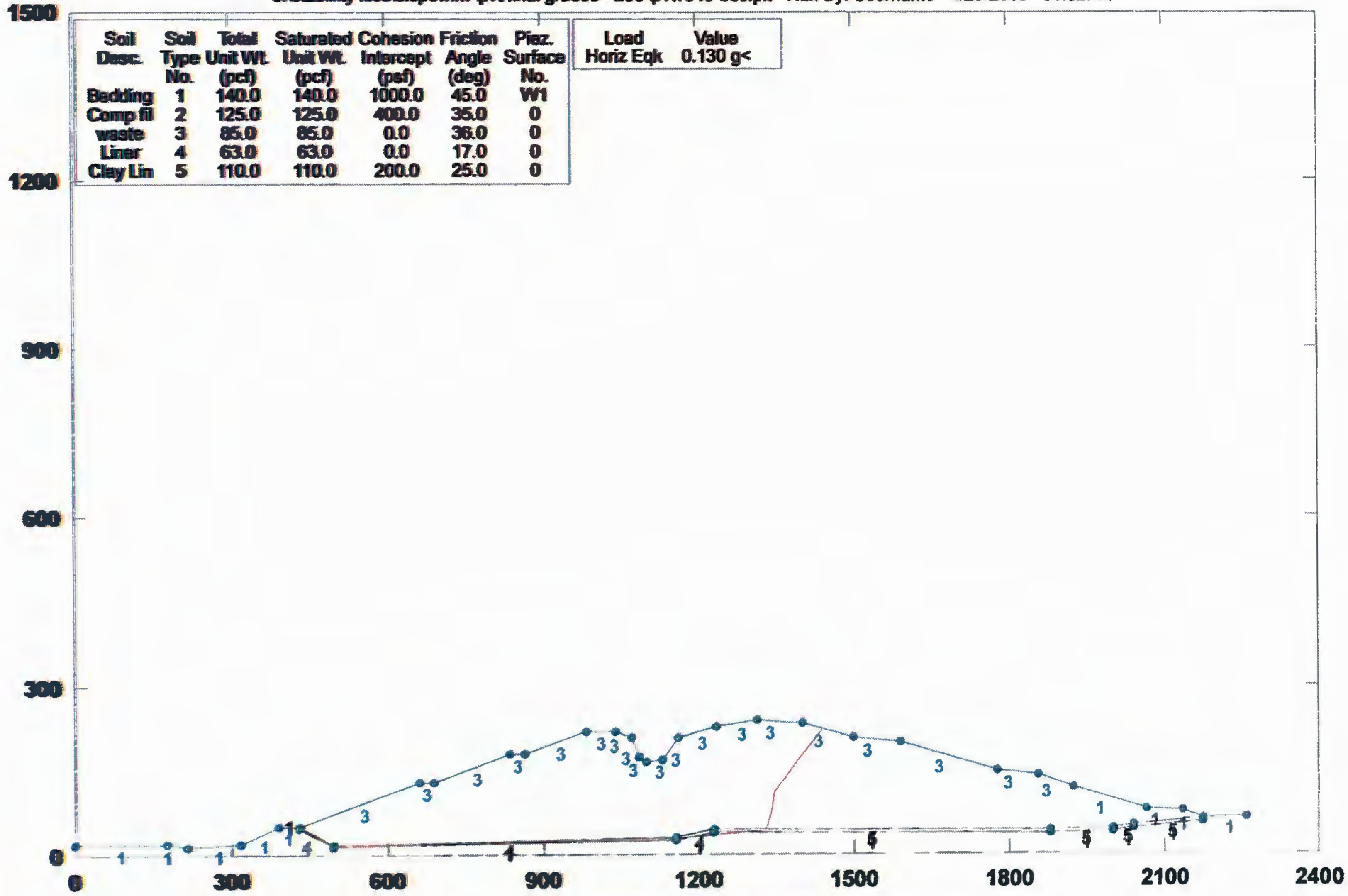
PCSTABL5M/si FSmin=3.78

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve45-bes.plt Run By: Username 4/23/2015 01:32PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

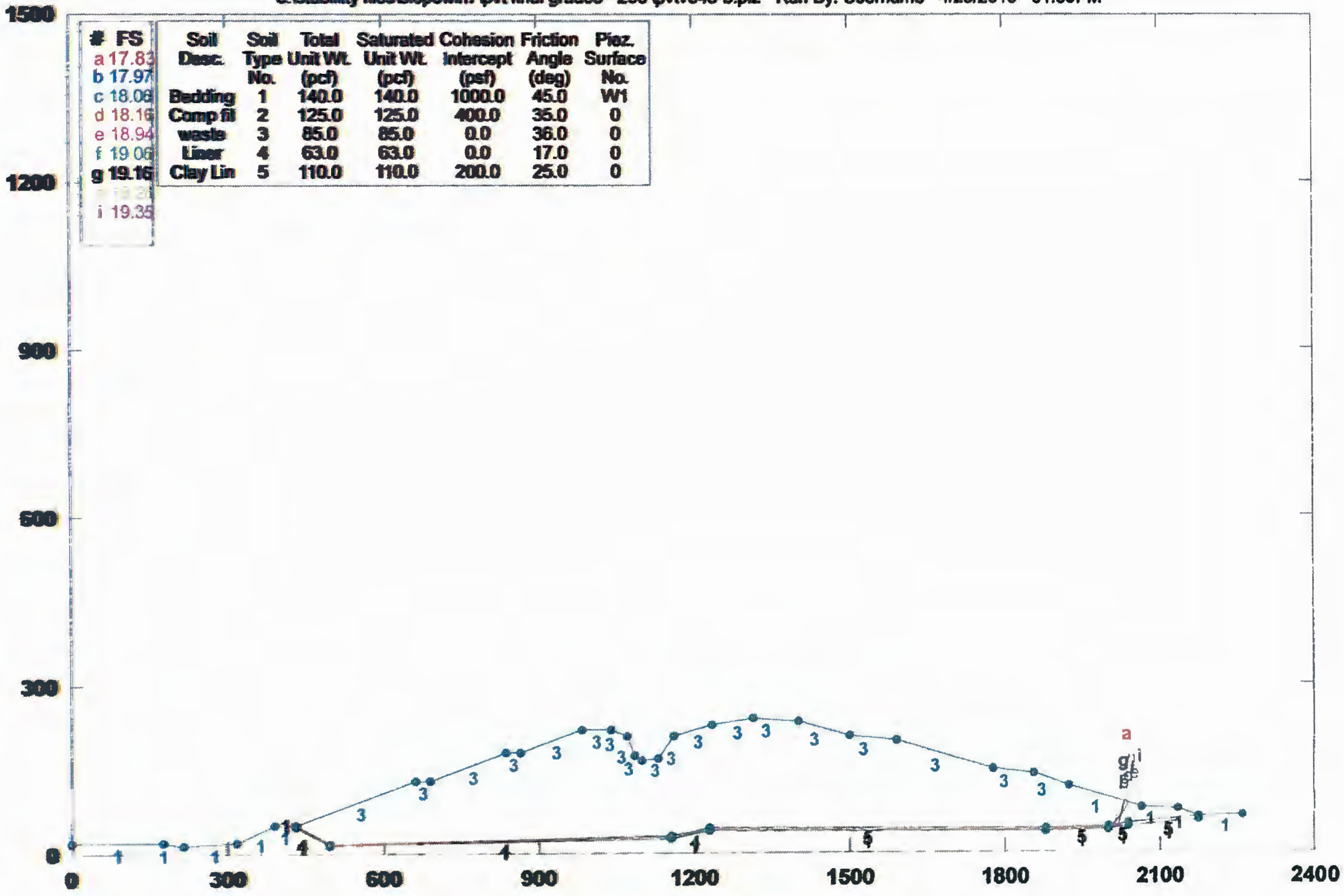
PCSTABL5M/si FSmin=2.12

Factor Of Safety Is Calculated By Spencer`s Method of Slices

STED

## PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Static)

e:\stabillity files\slopewin7\pvt final grades - 250'\pvtve43-b.pl2 Run By: Username 4/23/2015 01:35PM



| # | FS |
|---|---|
| a | 17.83 |
| b | 17.97 |
| c | 18.06 |
| d | 18.16 |
| e | 18.94 |
| f | 19.06 |
| g | 19.16 |
| h | 19.26 |
| i | 19.35 |

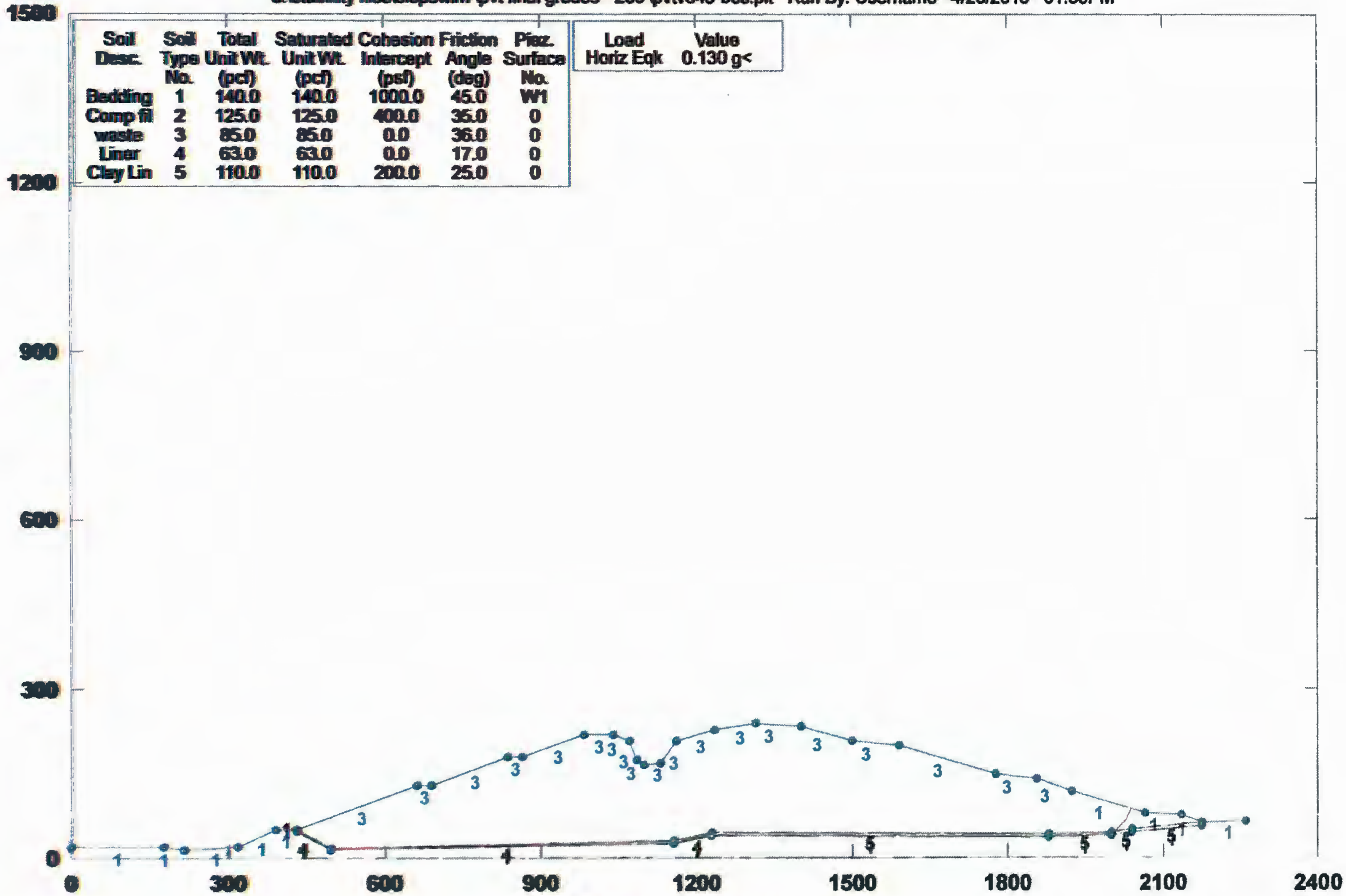
| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

PCSTABL5M/si FSmin=17.83

Safety Factors Are Calculated By The Modified Janbu Method

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve43-bes.plt Run By: Username 4/23/2015 01:36PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

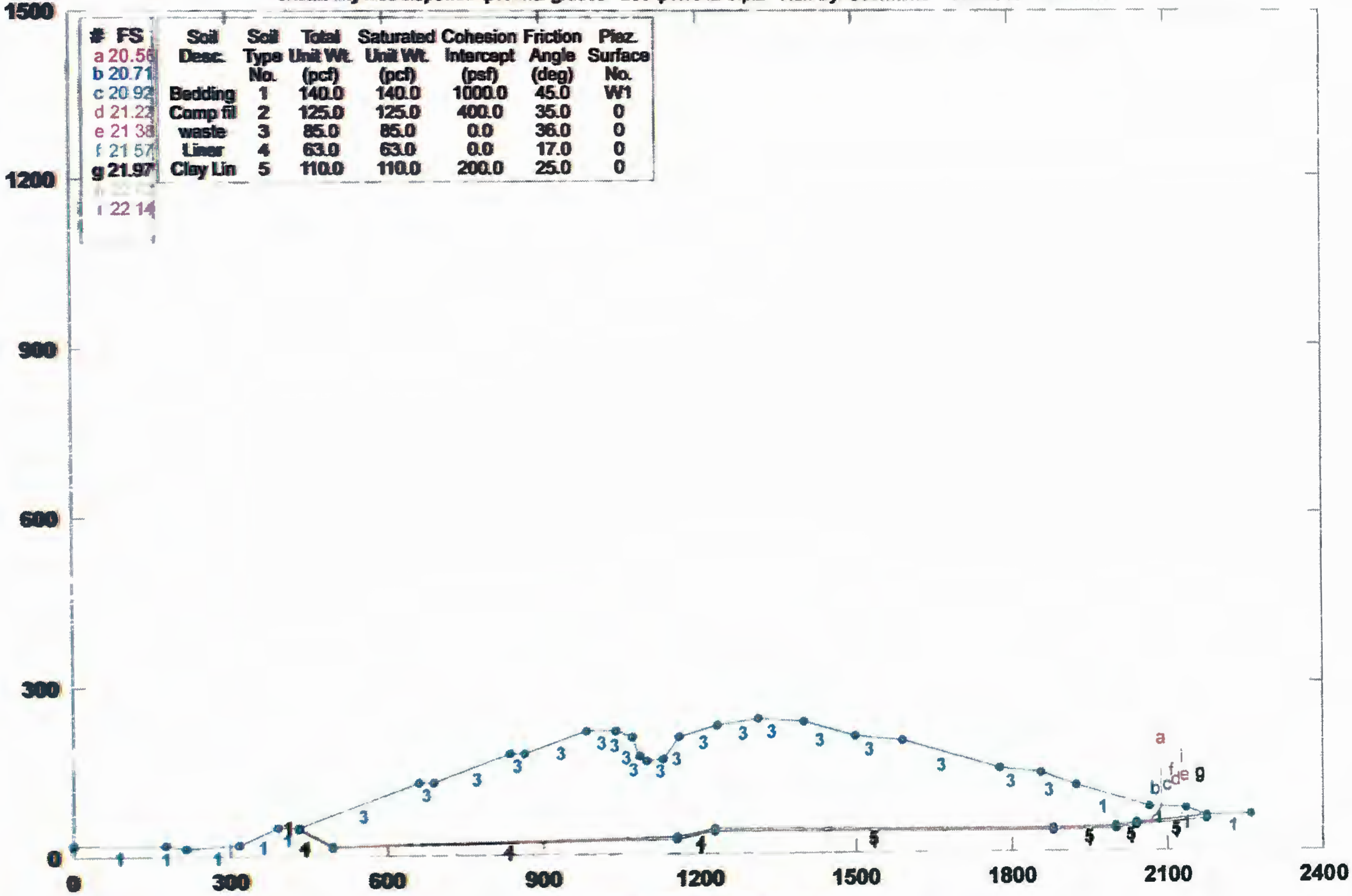
PCSTABL5M/sl FSmin=2.68

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve42-b.pl2 Run By: Username 4/23/2015 01:38PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

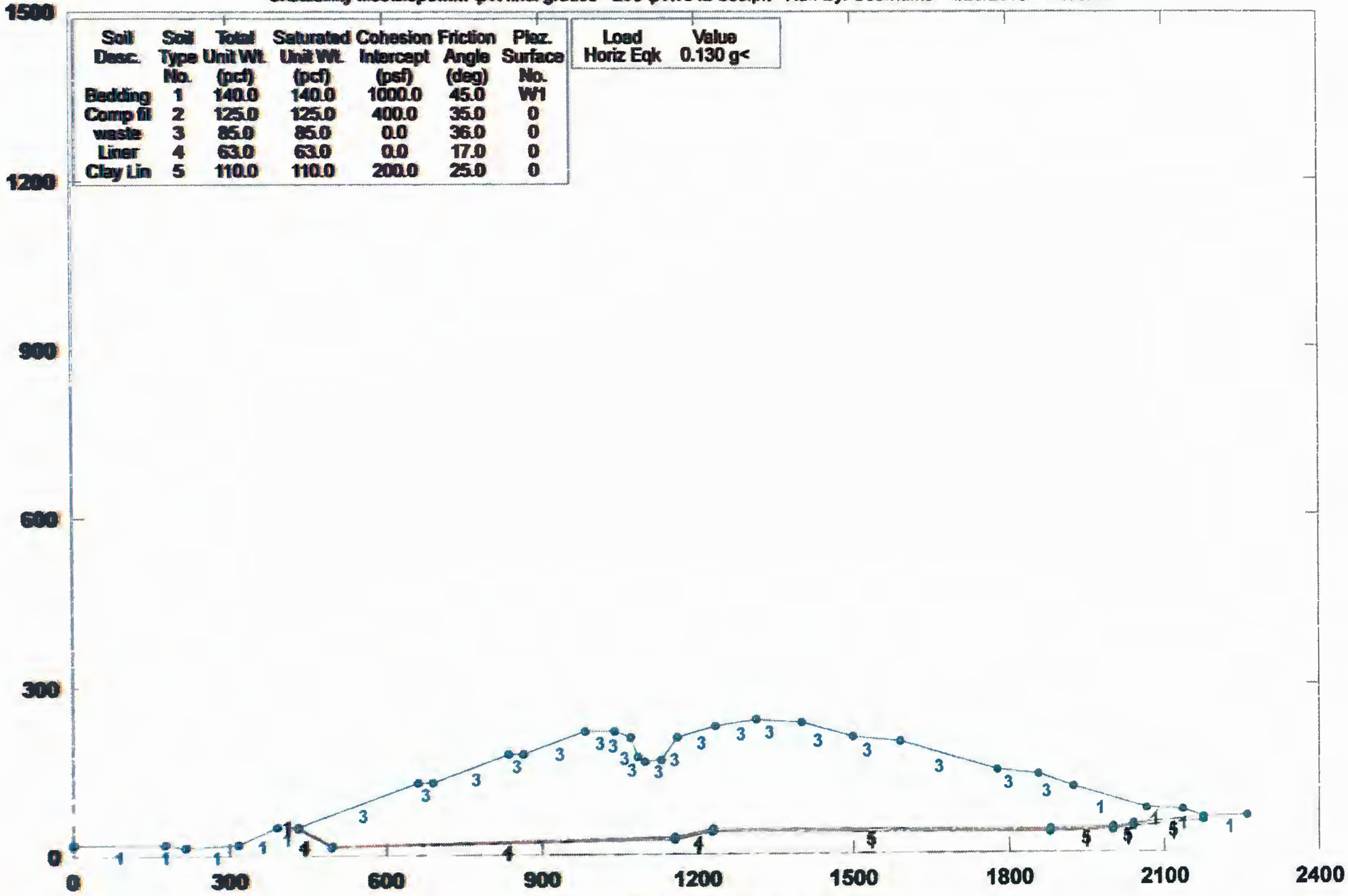
PCSTABL5M/si FSmin=20.56

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Pesudo-Static)

e:\stabillity files\slopewin7\pvt final grades - 250'\pvtve42-bes.plt Run By: Username 4/23/2015 01:38PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

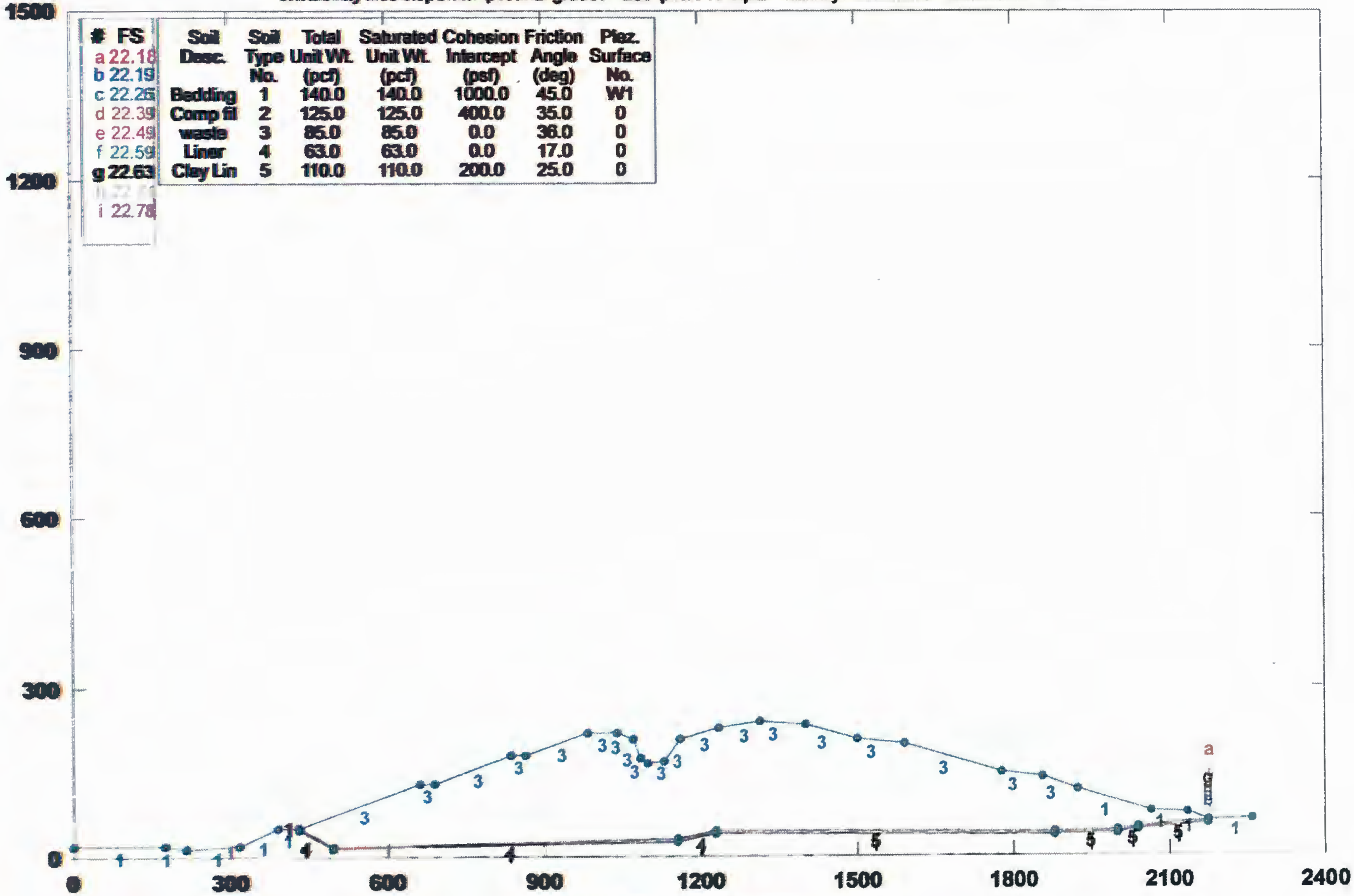
PCSTABL5M/si FSmin=1.70

Factor Of Safety Is Calculated By Spencer`s Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Static)

e:\stabillity files\slopewin7\pvt final grades - 250'\pvtve41-b.pl2 Run By: Username 4/23/2015 01:39PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

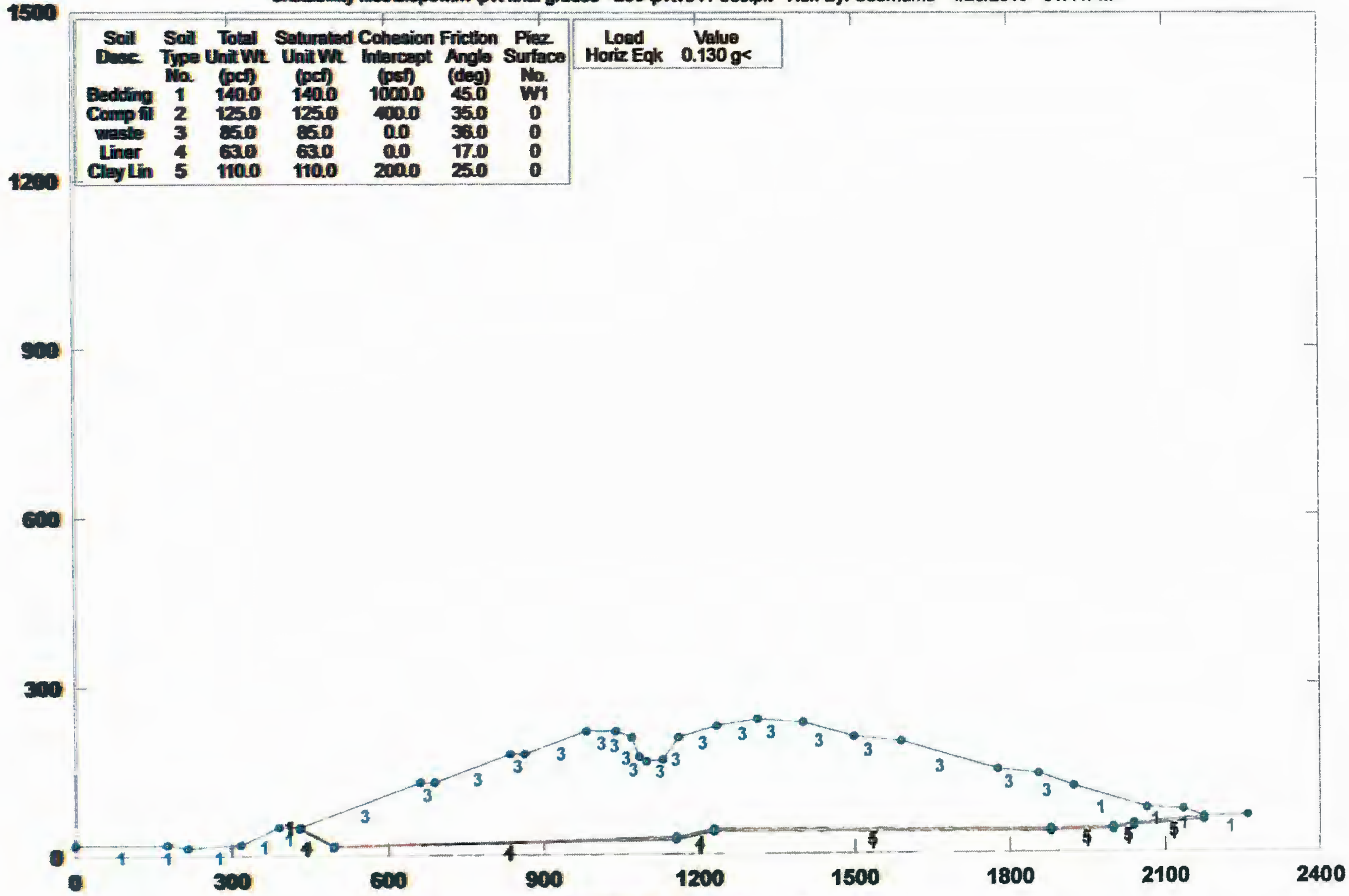
**PCSTABL5M/si FSmin=22.18**

**Safety Factors Are Calculated By The Modified Janbu Method**

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 4-4' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve41-bes.plt  Run By: Username  4/23/2015  01:41PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

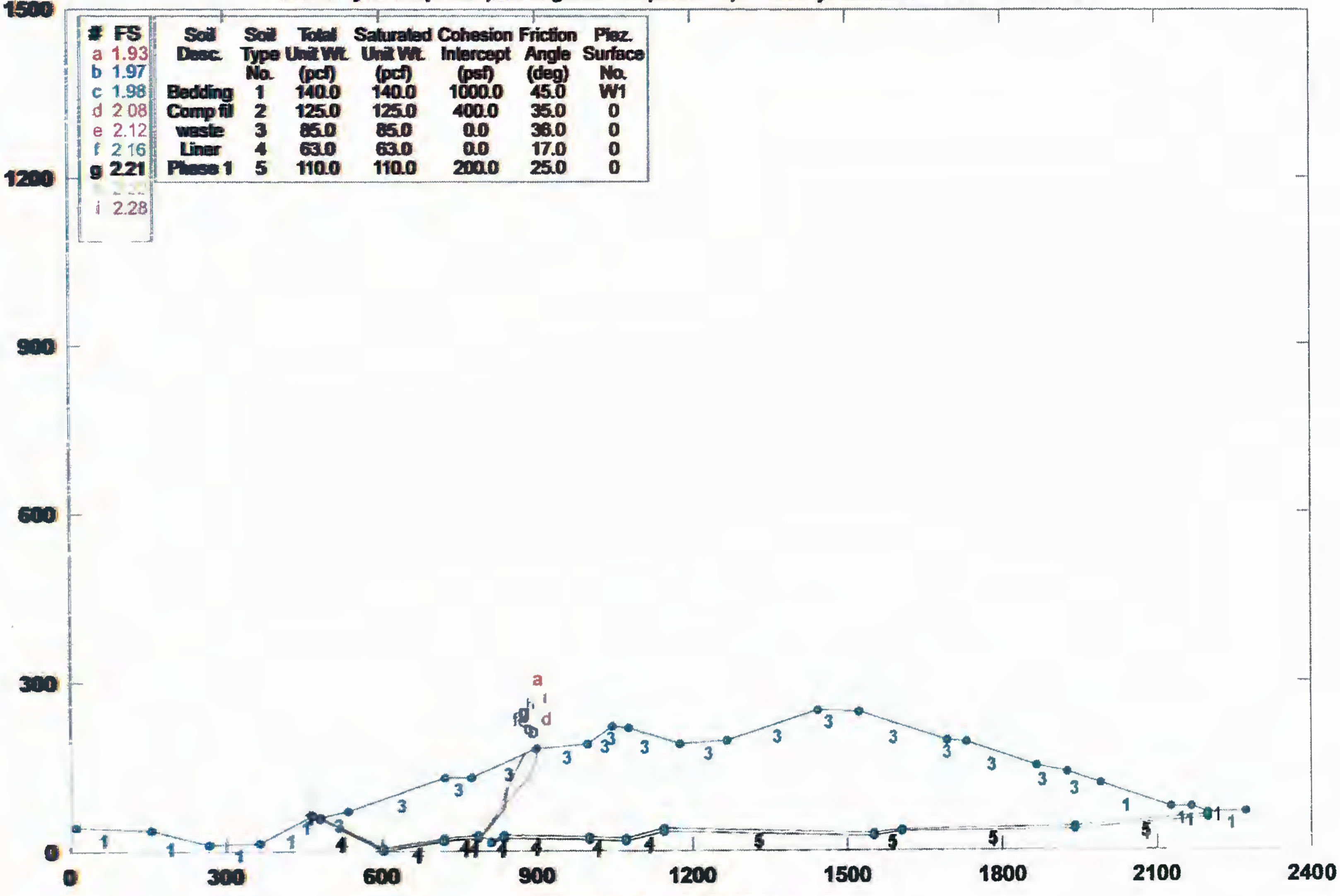
PCSTABL5M/si  FSmin=2.41

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stabillity files\slopewin7\pvt final grades 250'\pvtve57-b.pl2   Run By: Username   4/23/2015   12:30PM



| # | FS |
|---|---|
| a | 1.93 |
| b | 1.97 |
| c | 1.98 |
| d | 2.08 |
| e | 2.12 |
| f | 2.16 |
| g | 2.21 |
| [illegible] | [illegible] |
| i | 2.28 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Phase 1 | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

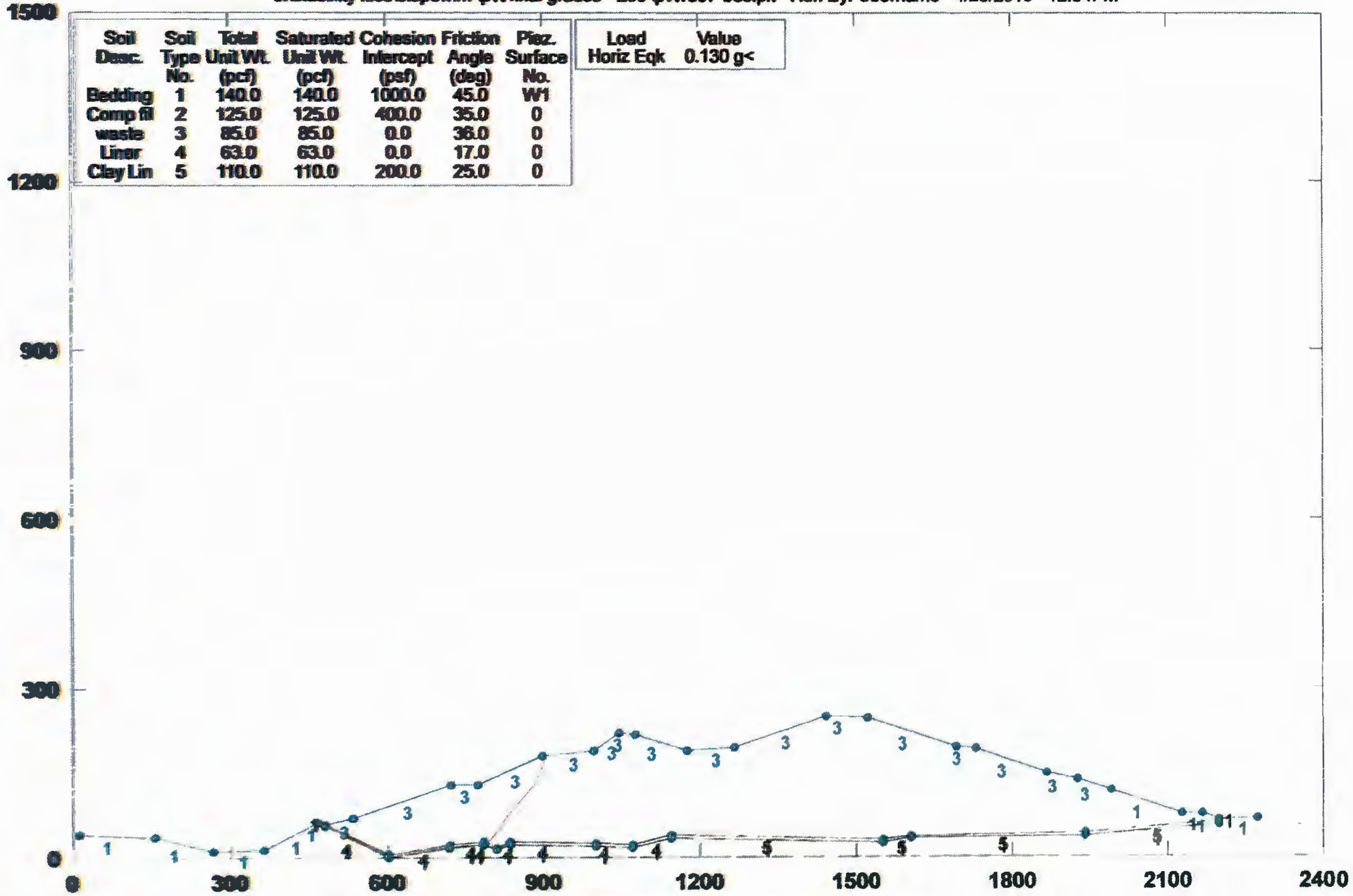
PCSTABL5M/si FSmin=1.93

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve57-bes.plt Run By: Username 4/23/2015 12:34PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

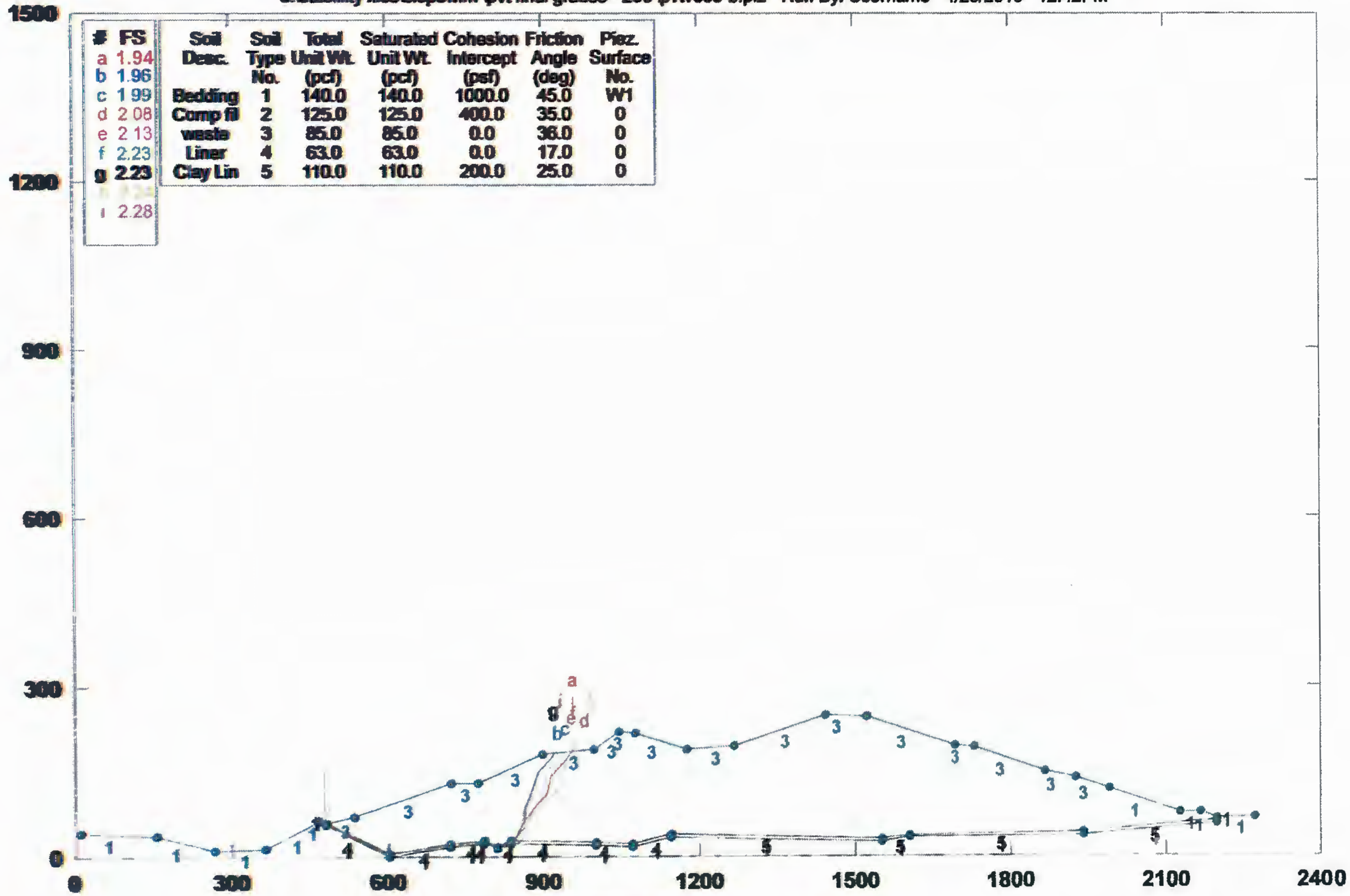
| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

PCSTABL5M/si FSmin=1.33

Factor Of Safety Is Calculated By Spencer's Method of Slices

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve55-b.pl2 Run By: Username 4/23/2015 12:42PM



| # | FS |
|---|---|
| a | 1.94 |
| b | 1.96 |
| c | 1.99 |
| d | 2.08 |
| e | 2.13 |
| f | 2.23 |
| **g** | **2.23** |
| h | [illegible] |
| i | 2.28 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

PCSTABL5M/si FSmin=1.94

Safety Factors Are Calculated By The Modified Janbu Method

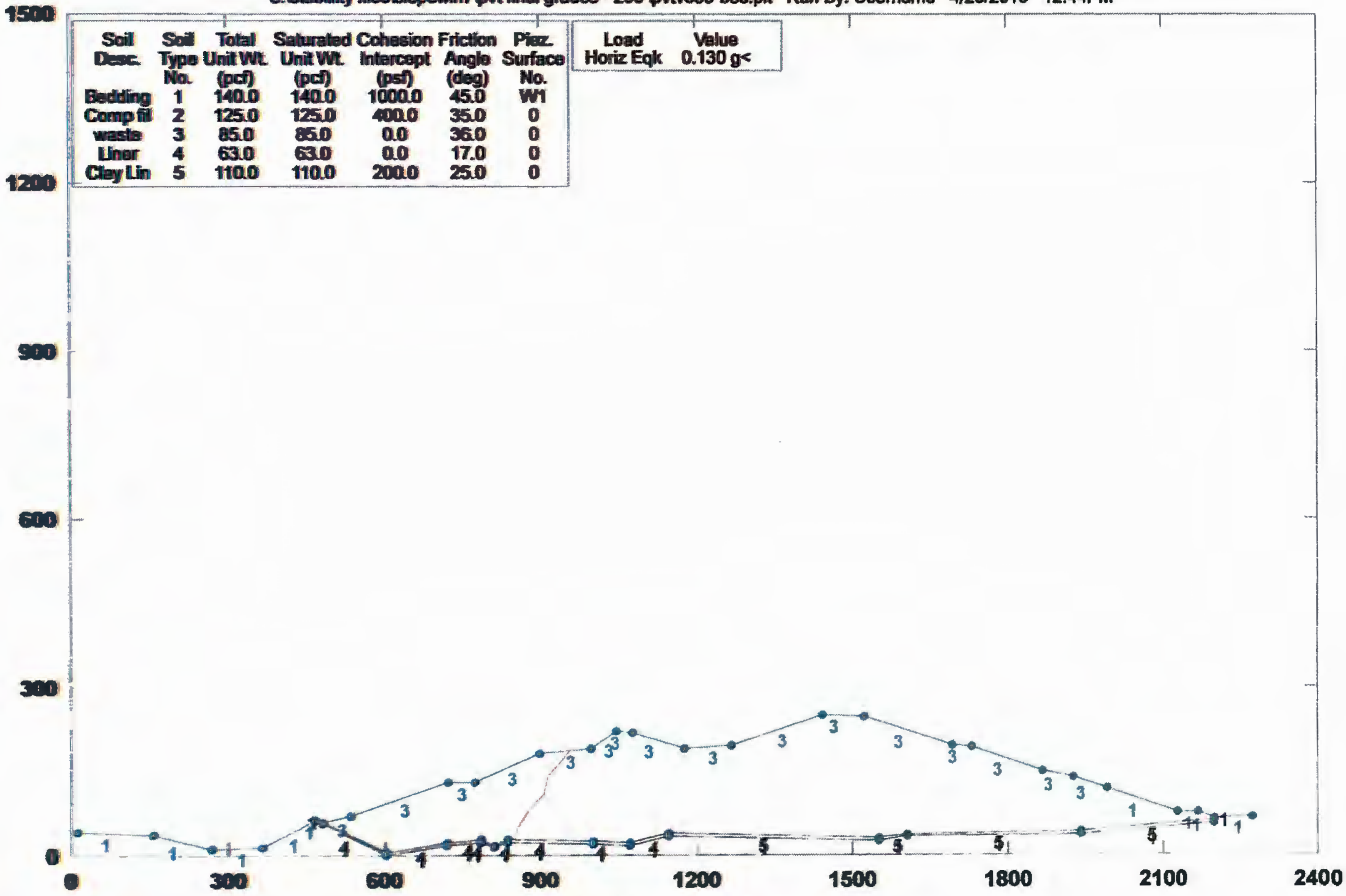
STED

## PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve55-bes.plt Run By: Username 4/23/2015 12:44PM

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |



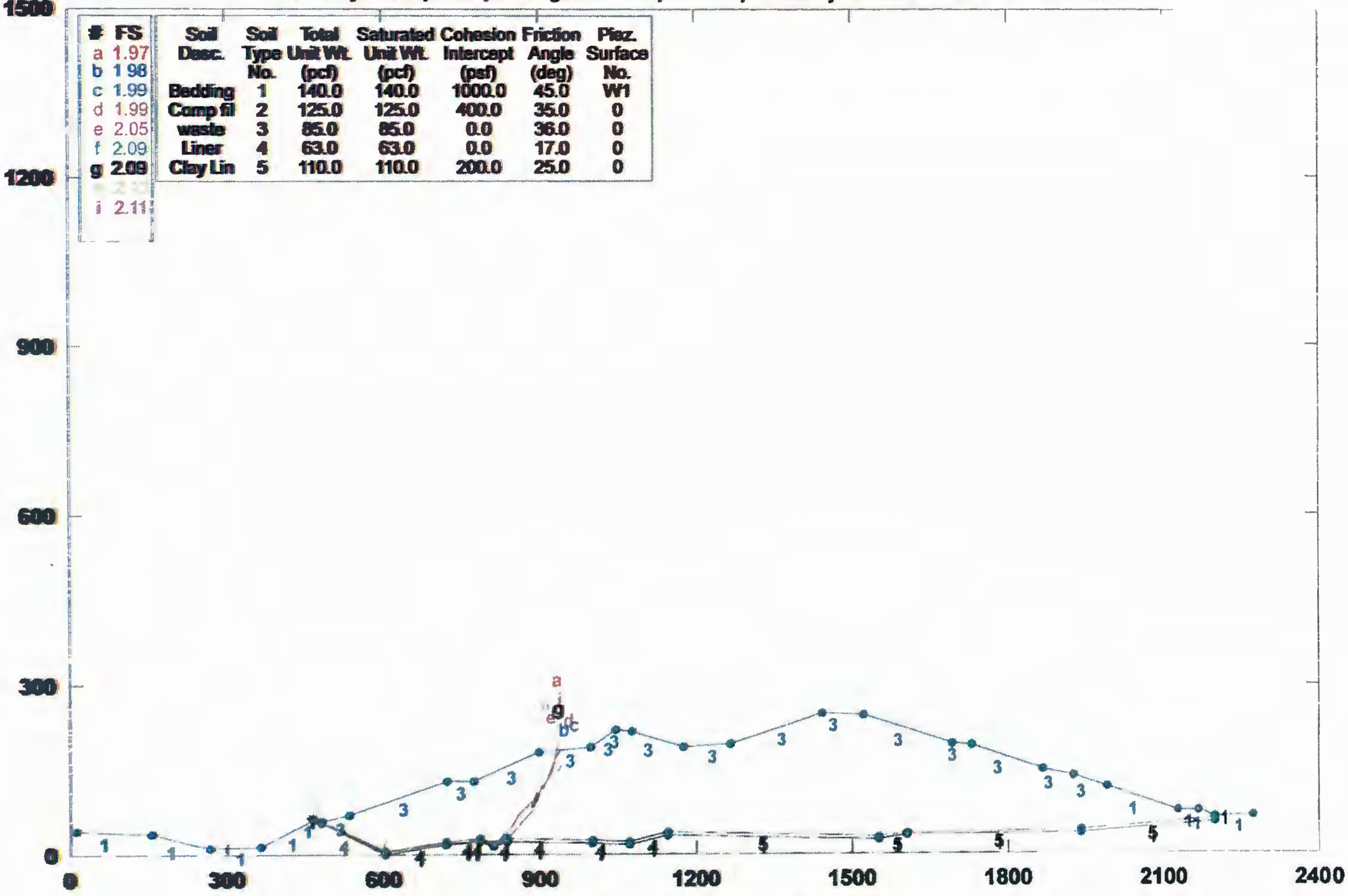
PCSTABL5M/si FSmin=1.39

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve56-b.pl2 Run By: Username 4/23/2015 12:48PM



| # | FS |
|---|---|
| a | 1.97 |
| b | 1.98 |
| c | 1.99 |
| d | 1.99 |
| e | 2.05 |
| f | 2.09 |
| g | 2.09 |
| [illegible] | [illegible] |
| i | 2.11 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

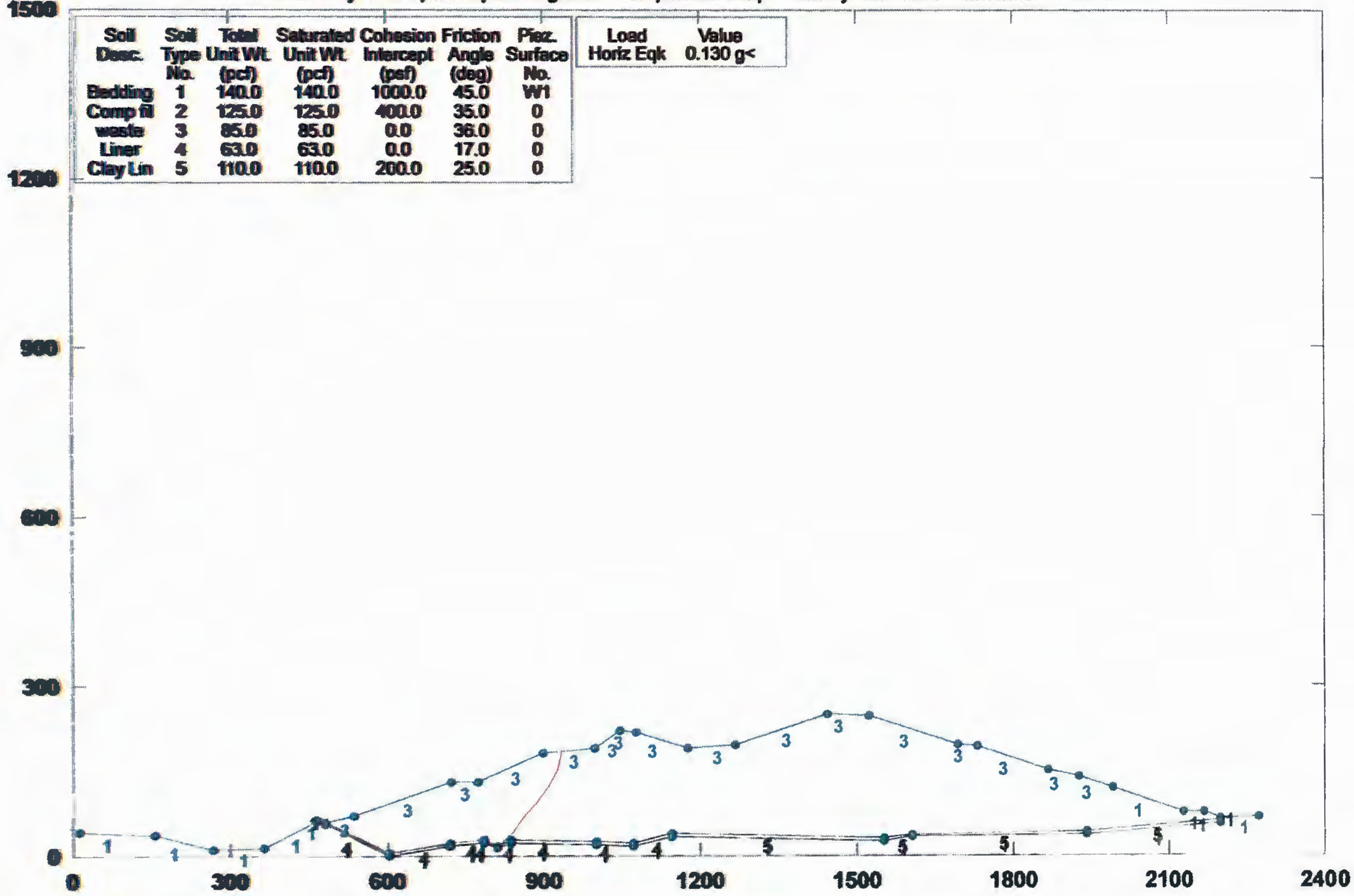
PCSTABL5M/si FSmin=1.97

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve56-bes.plt Run By: Username 4/23/2015 12:49PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

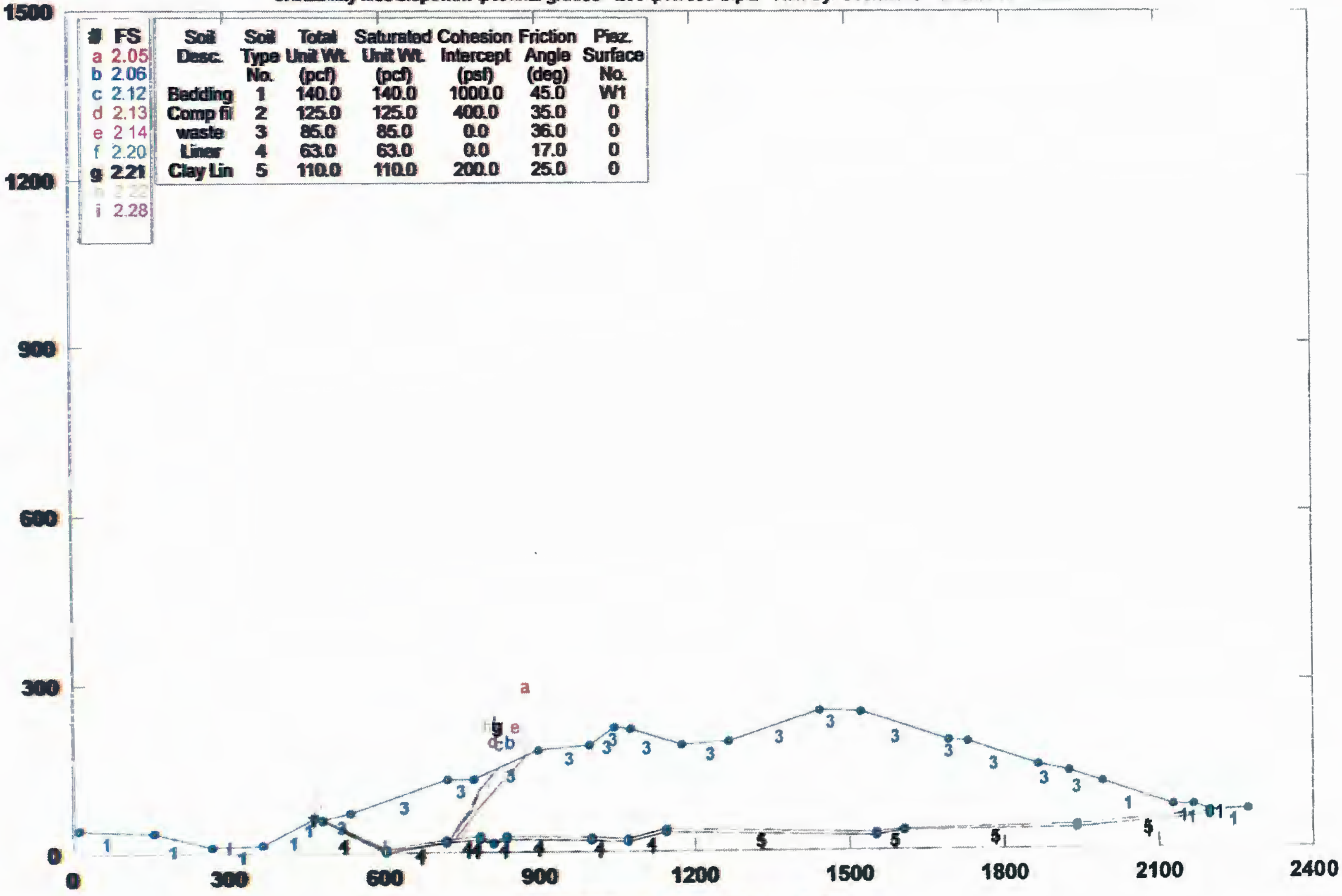
PCSTABL5M/si FSmin=1.38

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve58-b.pl2 Run By: Username 4/23/2015 12:54PM



| # | FS |
|---|---|
| a | 2.05 |
| b | 2.06 |
| c | 2.12 |
| d | 2.13 |
| e | 2.14 |
| f | 2.20 |
| g | 2.21 |
| h | 2.22 |
| i | 2.28 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

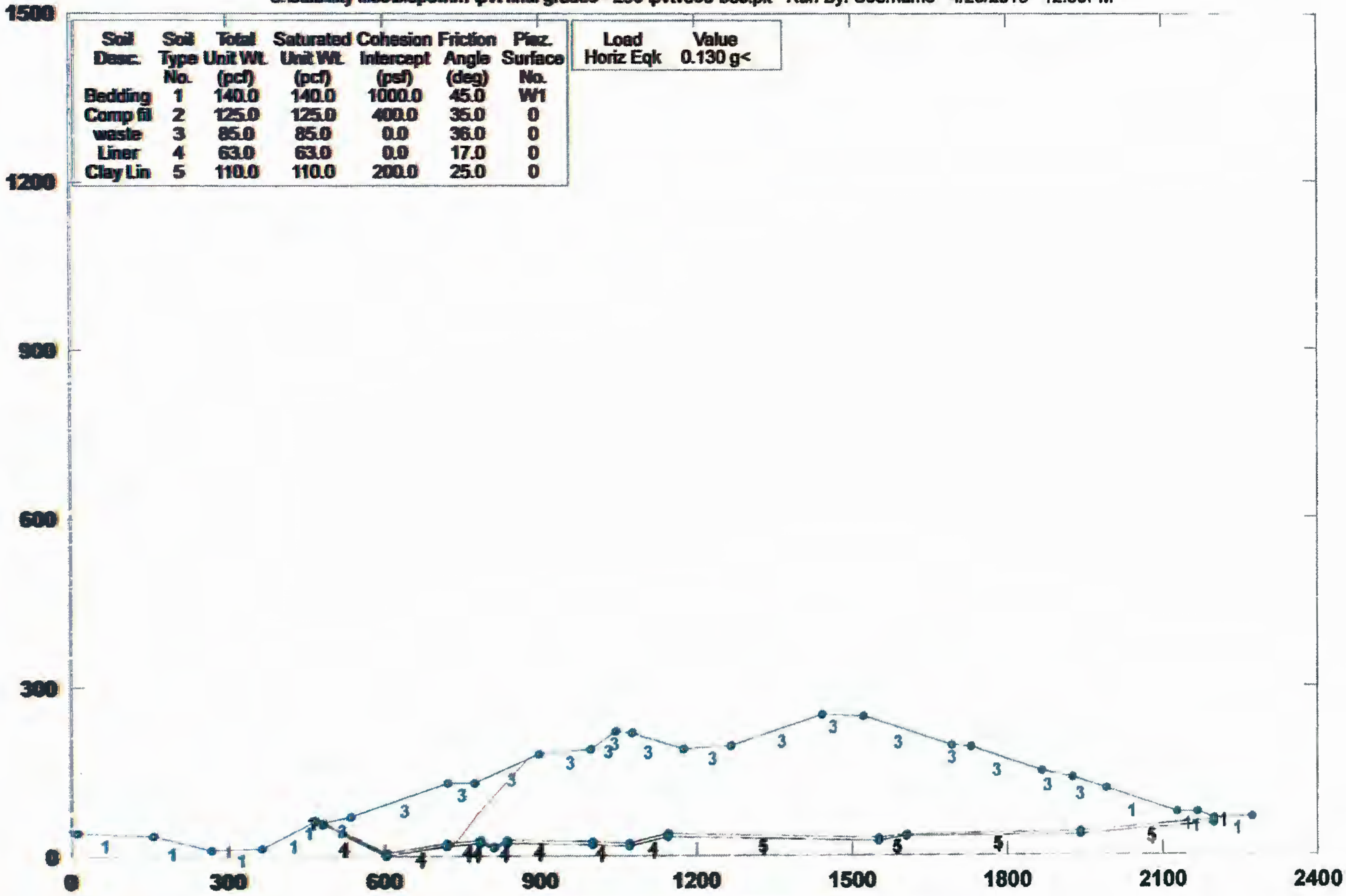
PCSTABL5M/si FSmin=2.05

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve58-bes.plt Run By: Username 4/23/2015 12:55PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

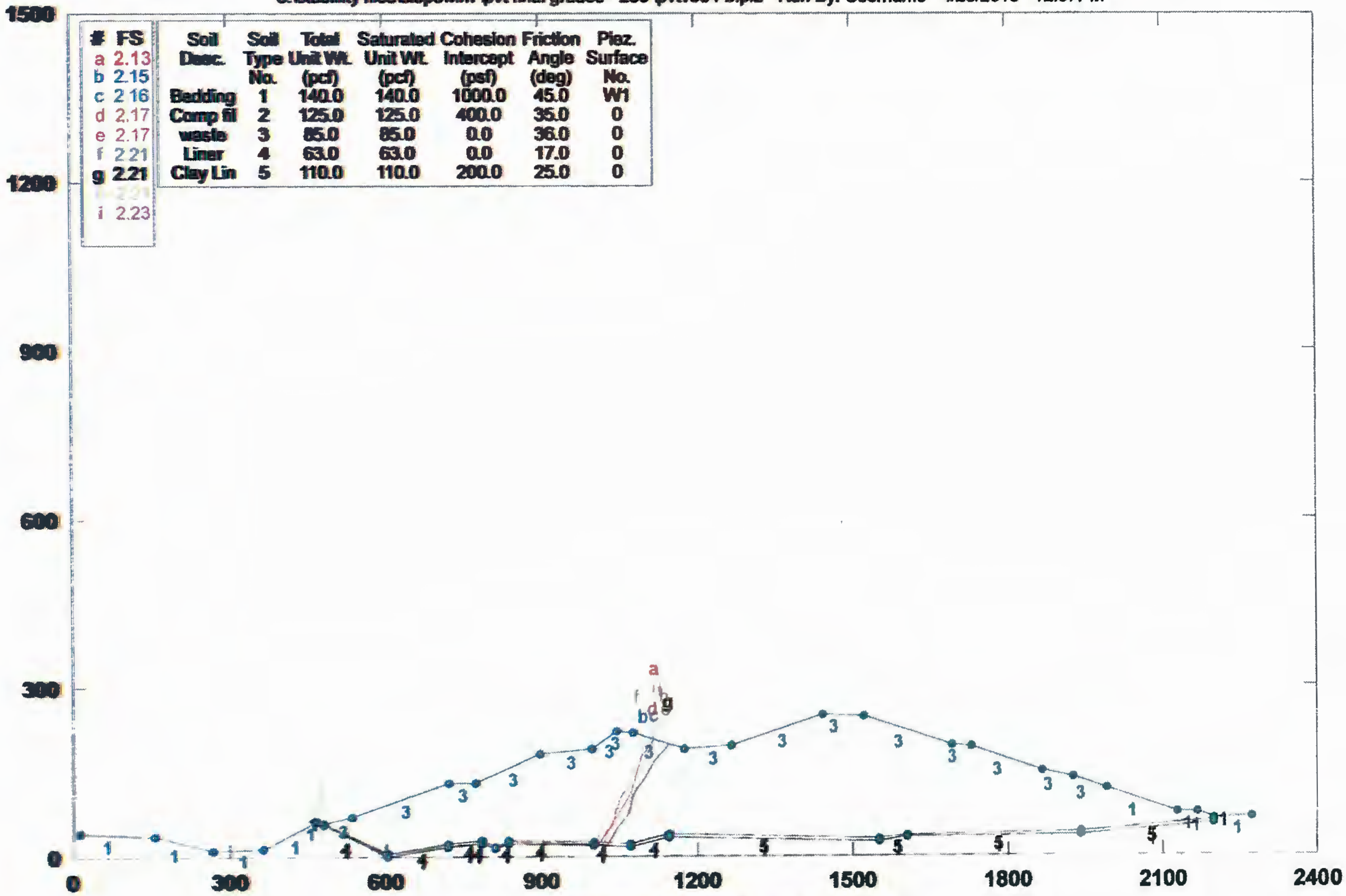
PCSTABL5M/si FSmin=1.40

Factor Of Safety Is Calculated By Spencer`s Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve54-b.pl2 Run By: Username 4/23/2015 12:57PM



| # | FS |
|---|---|
| a | 2.13 |
| b | 2.15 |
| c | 2.16 |
| d | 2.17 |
| e | 2.17 |
| f | 2.21 |
| g | 2.21 |
| h | 2.21 |
| i | 2.23 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

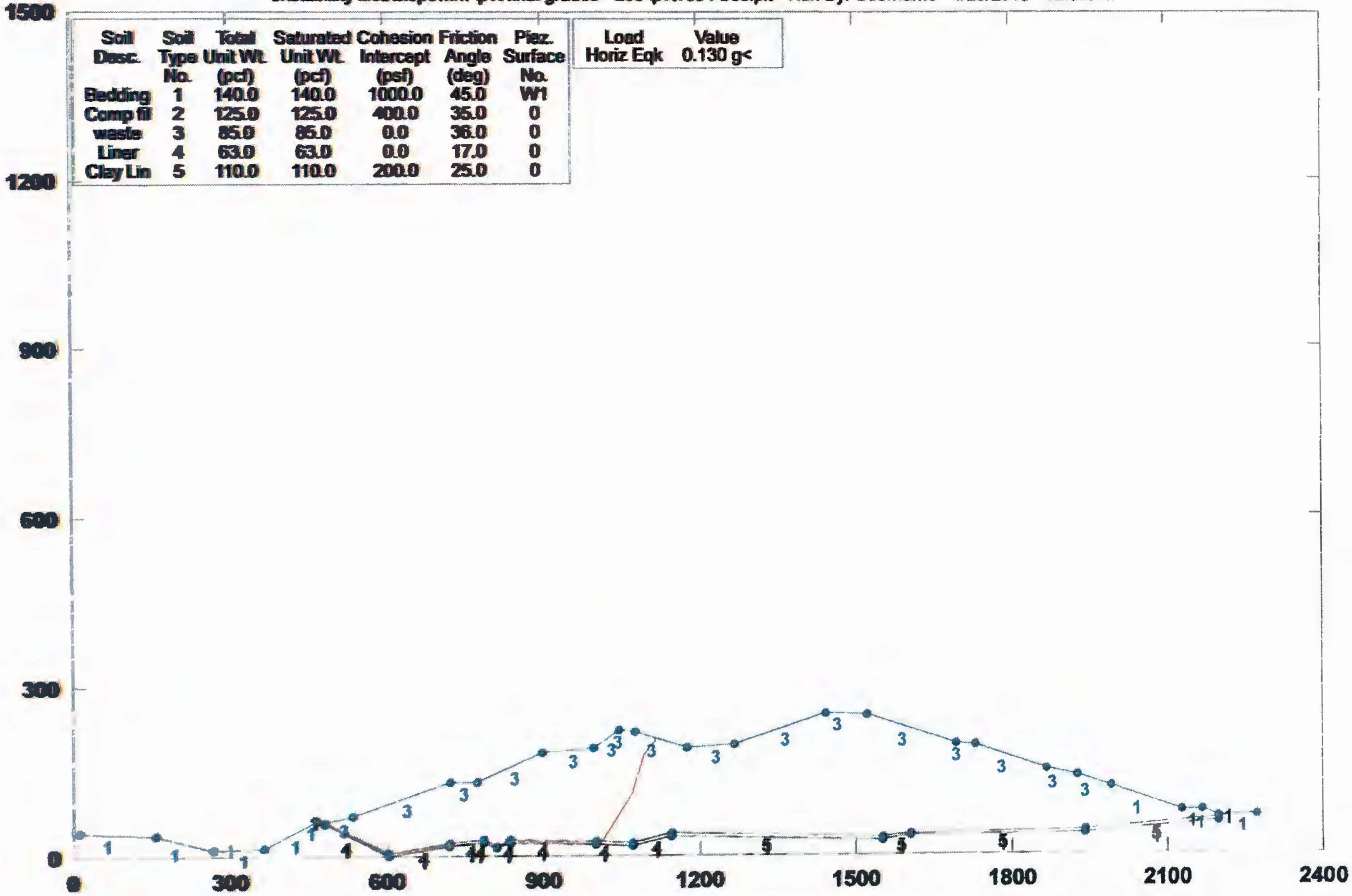
PCSTABL5M/si FSmin=2.13

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve54-bes.plt Run By: Username 4/23/2015 12:59PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

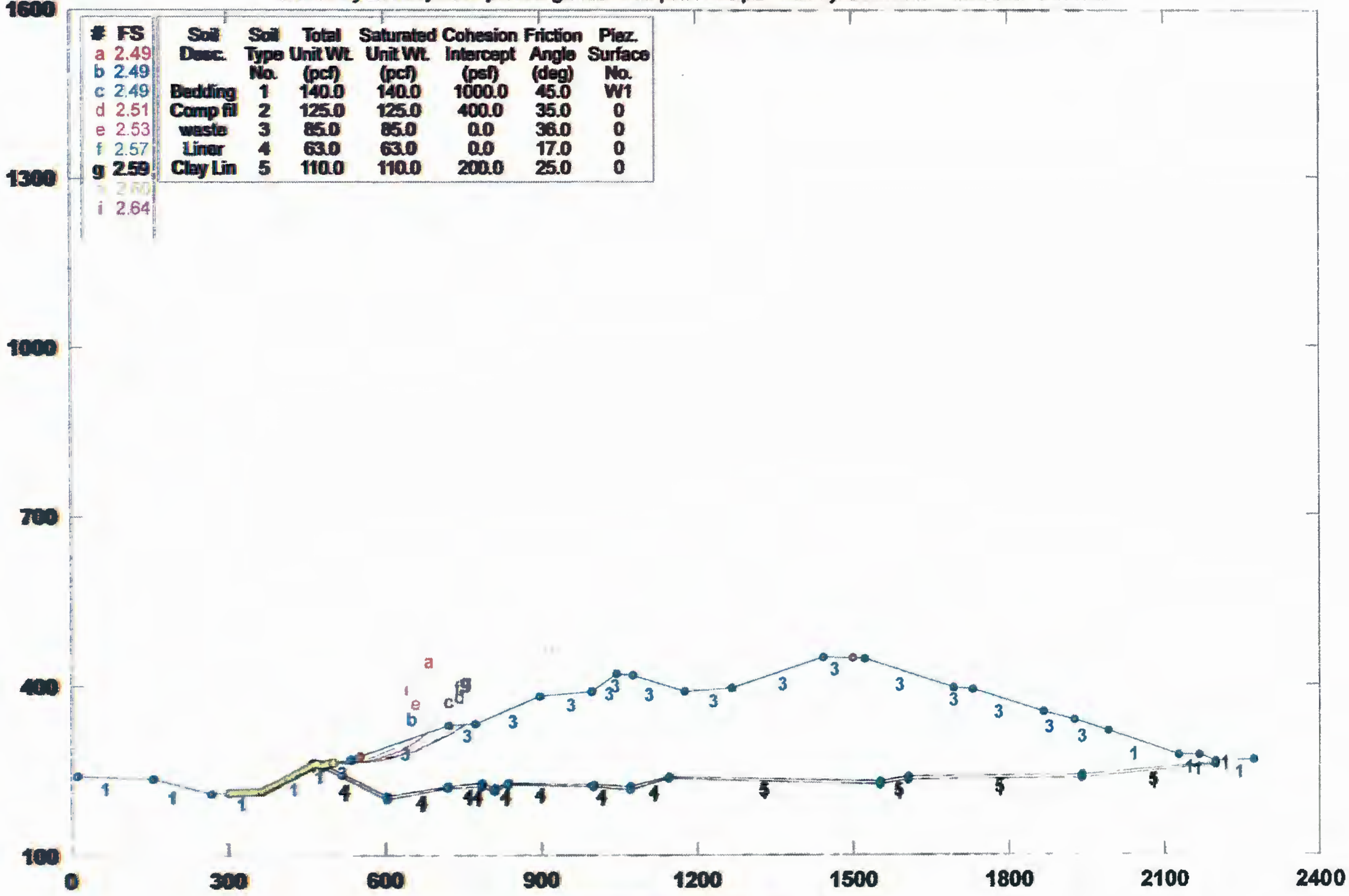
**PCSTABL5M/si FSmin=1.40**

**Factor Of Safety Is Calculated By Spencer's Method of Slices**

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve59-c.pl2 Run By: Username 4/23/2015 01:01PM



| # | FS |
|---|---|
| a | 2.49 |
| b | 2.49 |
| c | 2.49 |
| d | 2.51 |
| e | 2.53 |
| f | 2.57 |
| g | 2.59 |
| h | 2.60 |
| i | 2.64 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

PCSTABL5M/si FSmin=2.49

Safety Factors Are Calculated By The Modified Bishop Method

**STED**

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

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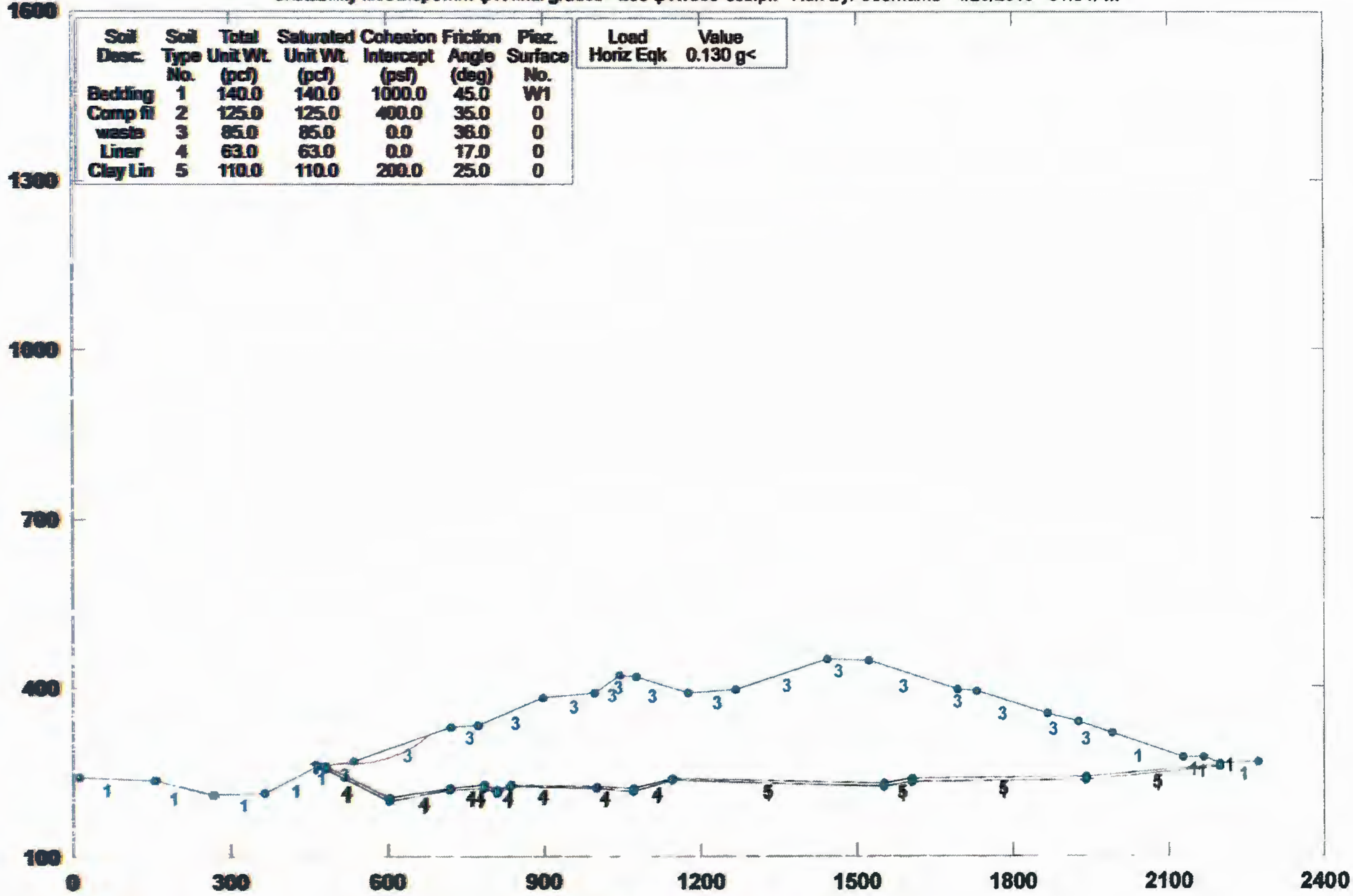


| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 38.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

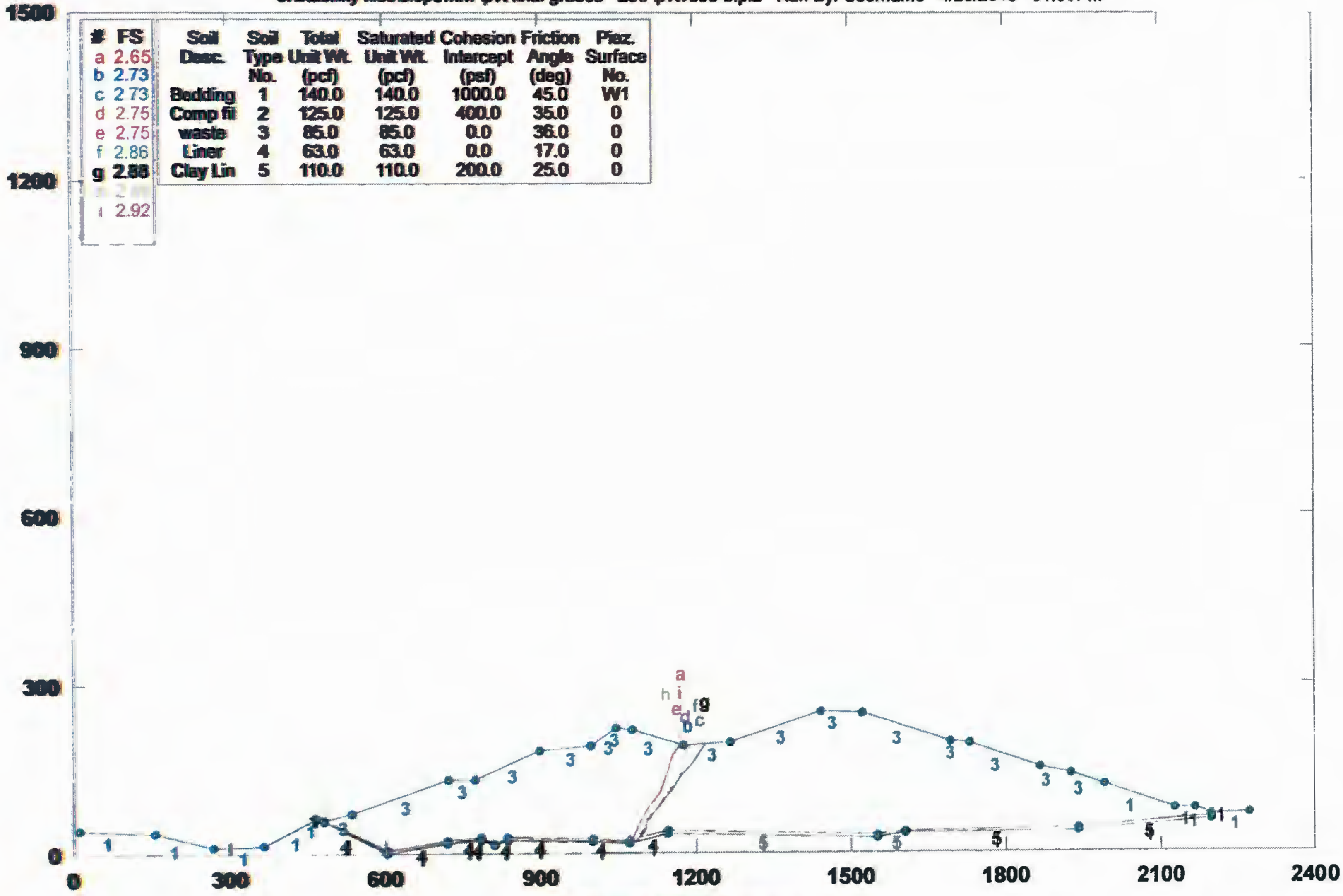
PCSTABL5M/si FSmin=1.50

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve53-b.pl2 Run By: Username 4/23/2015 01:06PM



| # | FS |
|---|---|
| a | 2.65 |
| b | 2.73 |
| c | 2.73 |
| d | 2.75 |
| e | 2.75 |
| f | 2.86 |
| g | 2.88 |
| [illegible] | [illegible] |
| i | 2.92 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

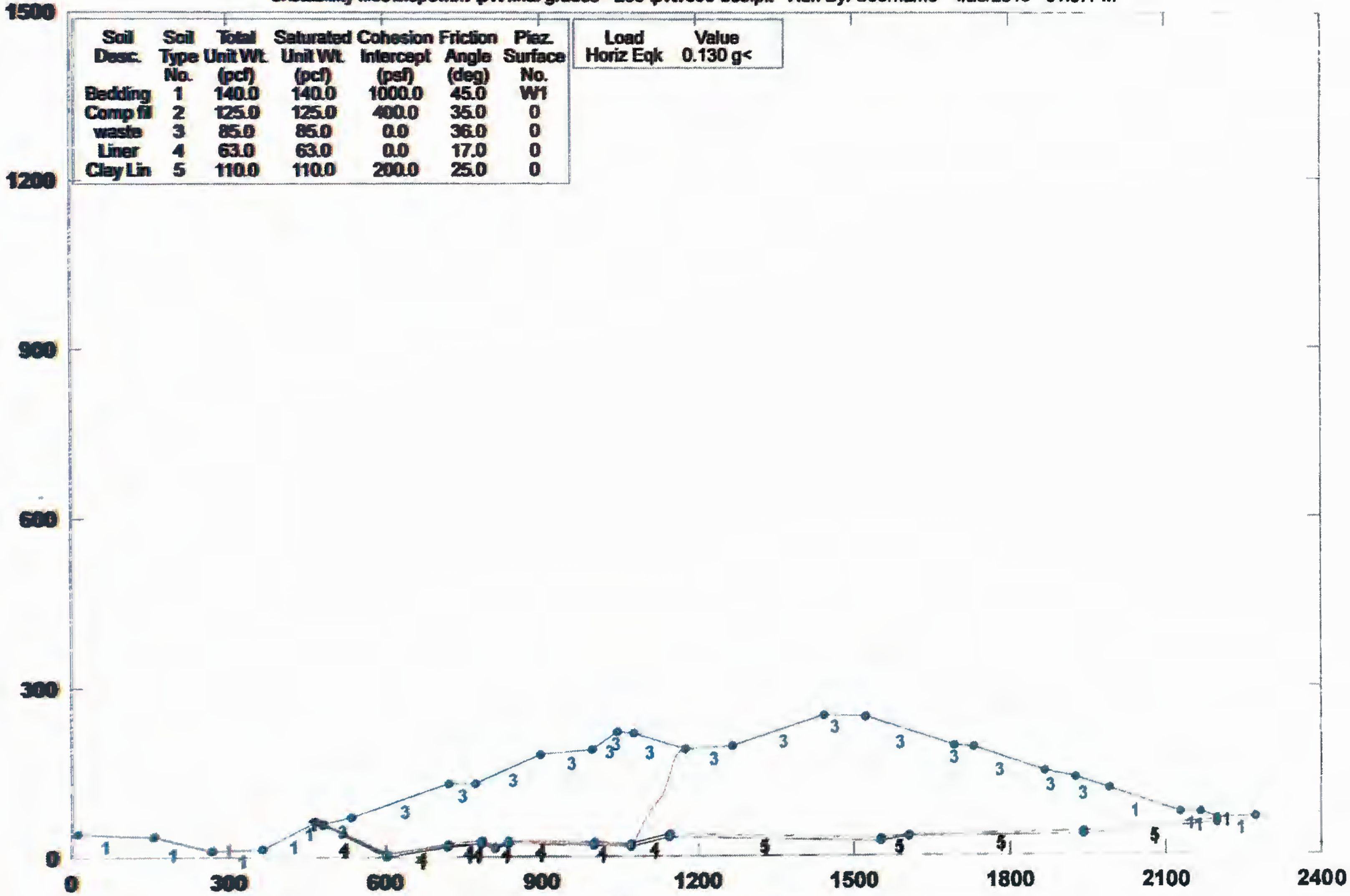
**PCSTABL5M/si FSmin=2.65**

**Safety Factors Are Calculated By The Modified Janbu Method**

**STED**

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve53-bes.plt Run By: Username 4/23/2015 01:07PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

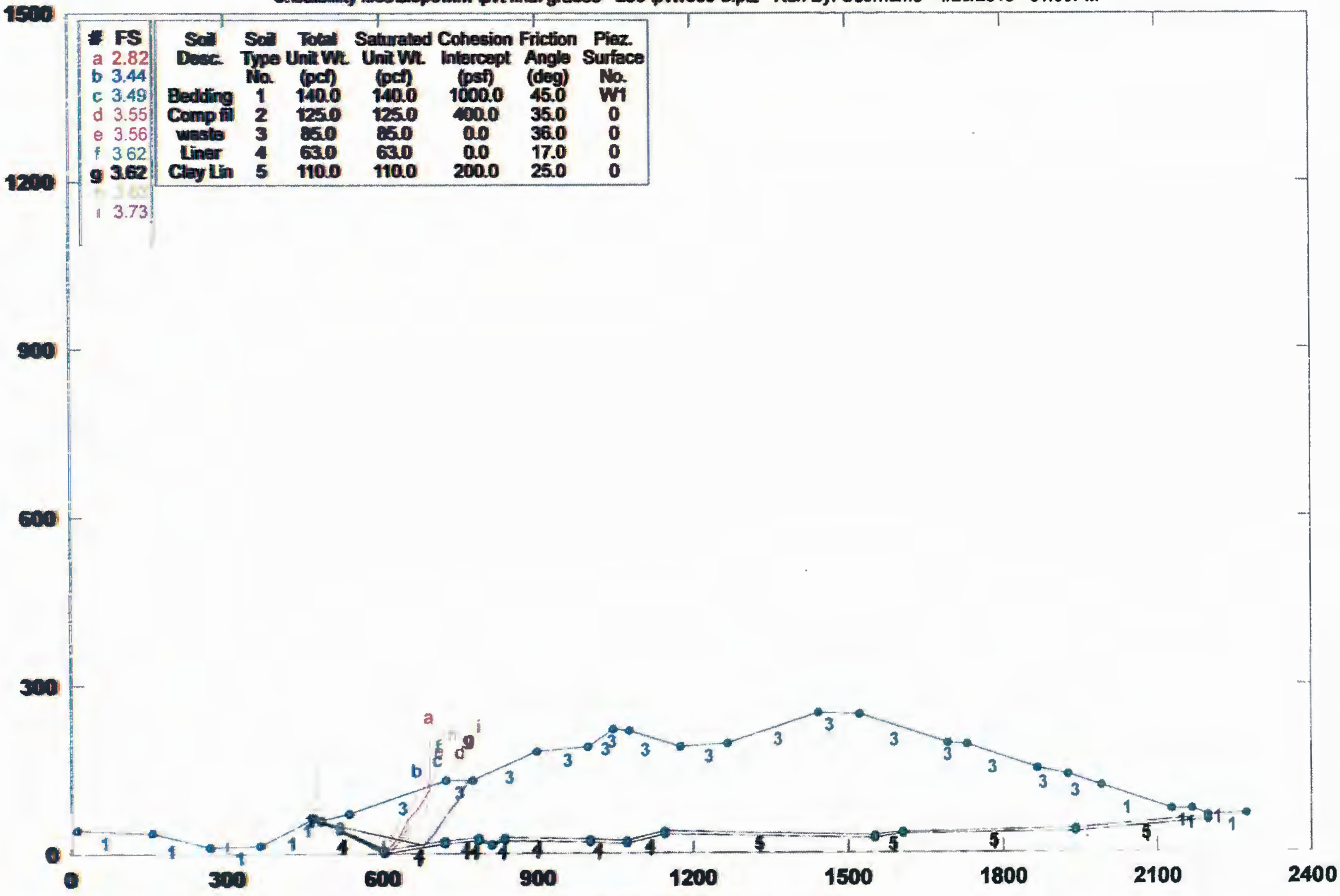
PCSTABL5M/si FSmin=1.59

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve59-b.pl2 Run By: Username 4/23/2015 01:09PM



| # | FS |
|---|---|
| a | 2.82 |
| b | 3.44 |
| c | 3.49 |
| d | 3.55 |
| e | 3.56 |
| f | 3.62 |
| g | 3.62 |
| h | 3.63 |
| i | 3.73 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

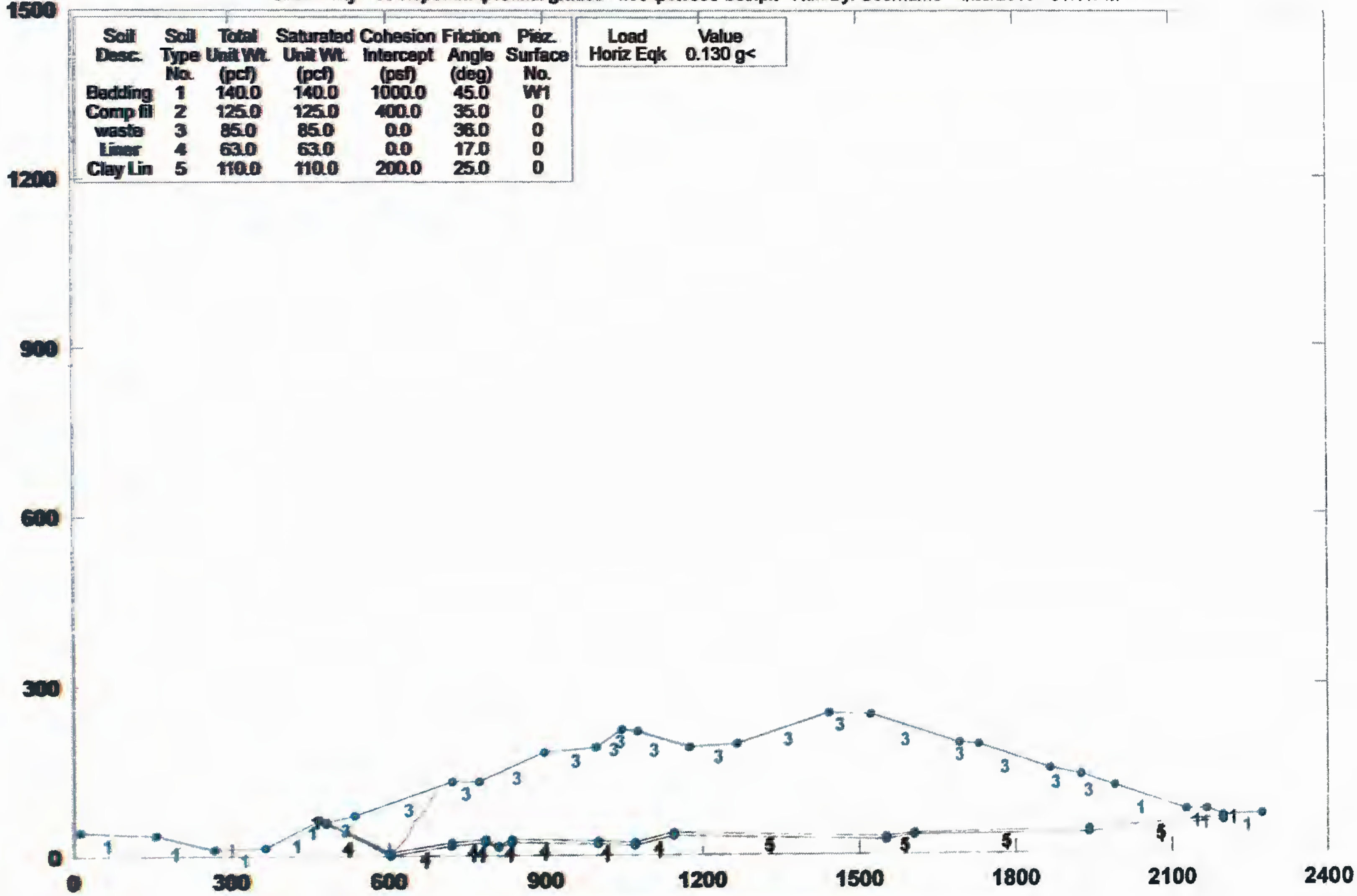
PCSTABL5M/si FSmin=2.82

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve59-bes.plt Run By: Username 4/23/2015 01:11PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

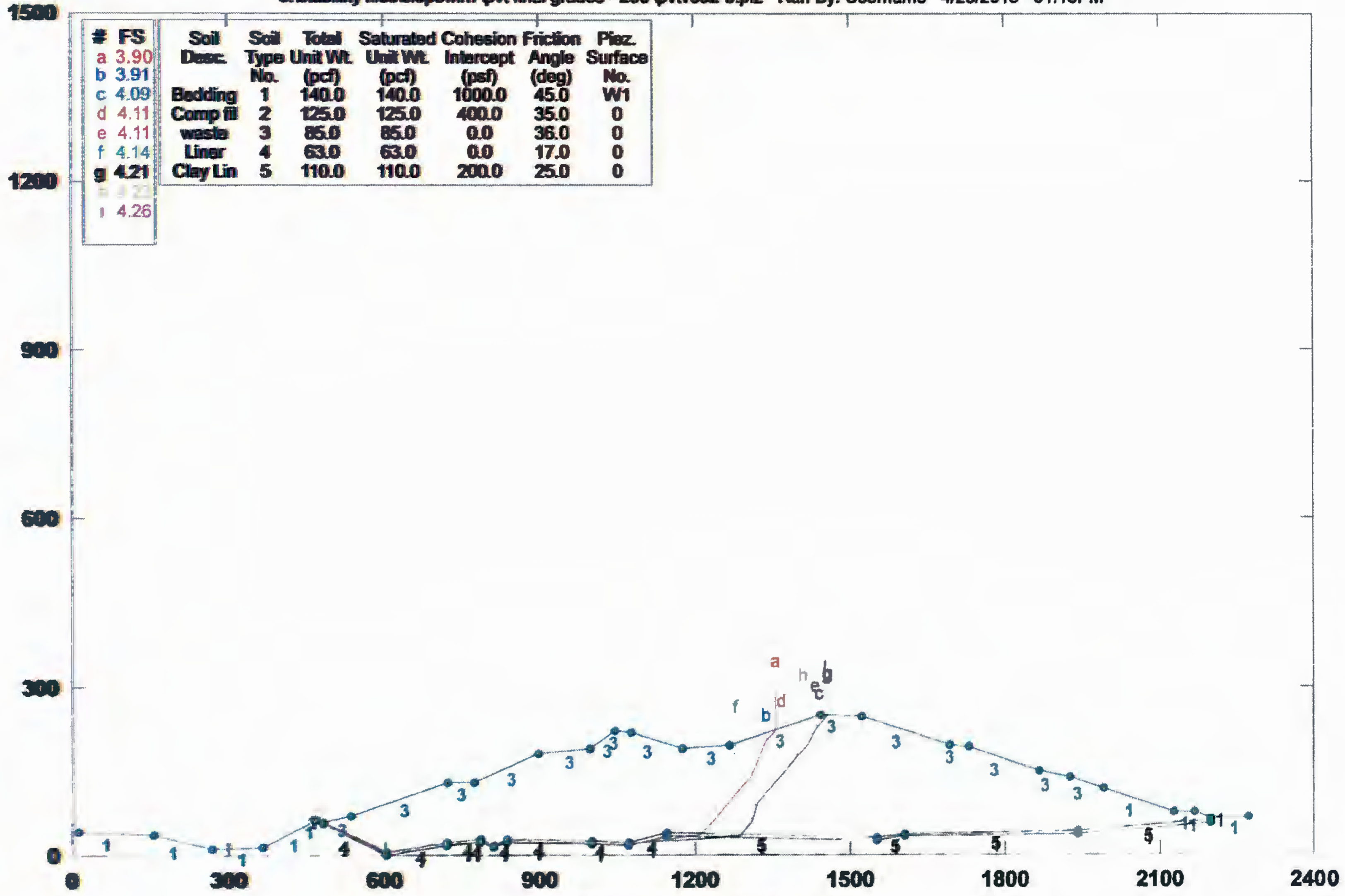
PCSTABL5M/si FSmin=2.45

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve52-b.pl2 Run By: Username 4/23/2015 01:13PM



| # | FS |
|---|---|
| a | 3.90 |
| b | 3.91 |
| c | 4.09 |
| d | 4.11 |
| e | 4.11 |
| f | 4.14 |
| g | 4.21 |
| h | [illegible] |
| i | 4.26 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

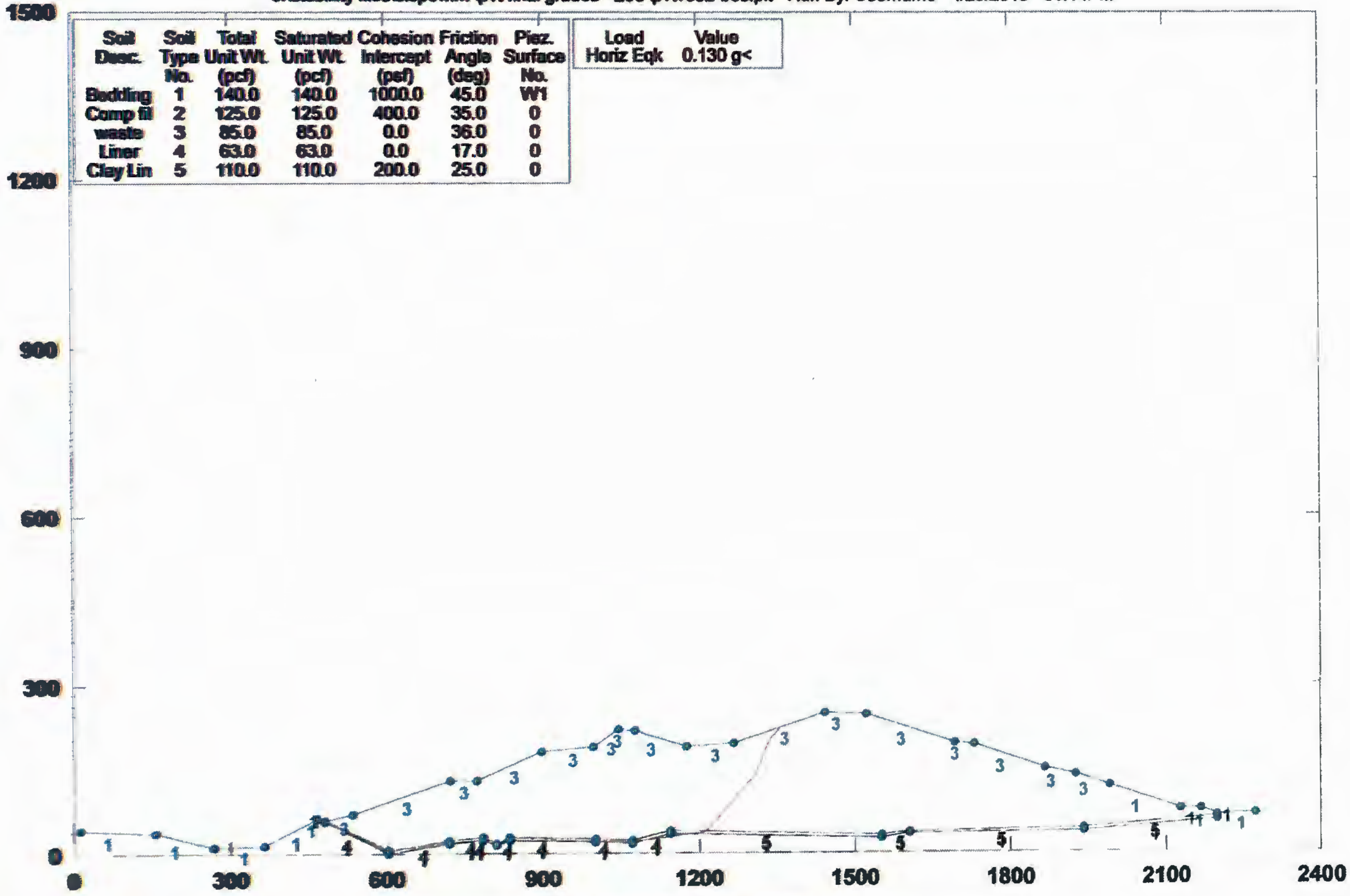
PCSTABL5M/si FSmin=3.90

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve52-bes.plt Run By: Username 4/23/2015 01:14PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

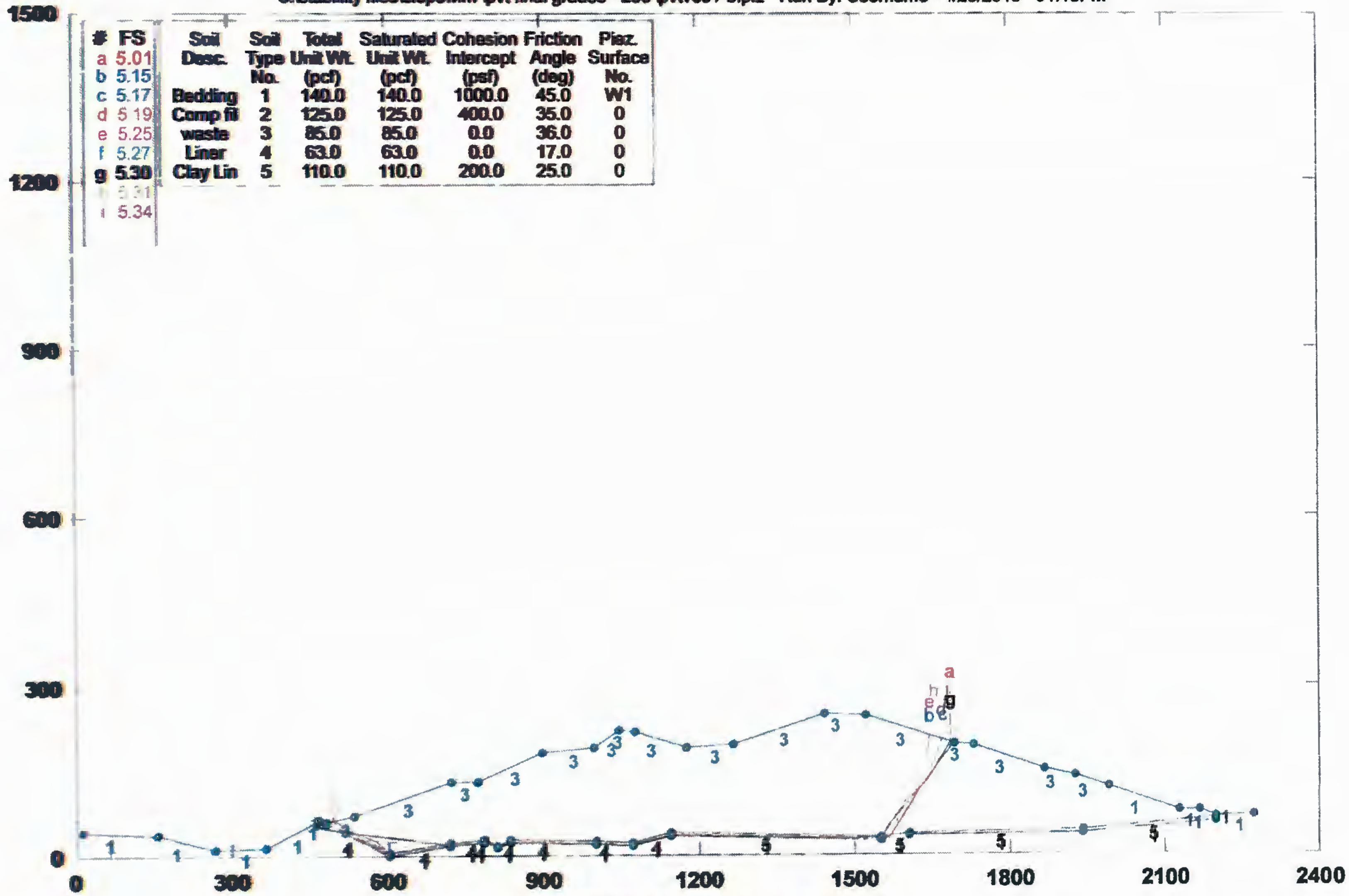
PCSTABL5M/si FSmin=2.16

Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stabillity files\slopewin7\pvt final grades - 250'\pvtve51-b.pl2 Run By: Username 4/23/2015 01:15PM



| # | FS |
|---|---|
| a | 5.01 |
| b | 5.15 |
| c | 5.17 |
| d | 5.19 |
| e | 5.25 |
| f | 5.27 |
| g | 5.30 |
| h | 5.31 |
| i | 5.34 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

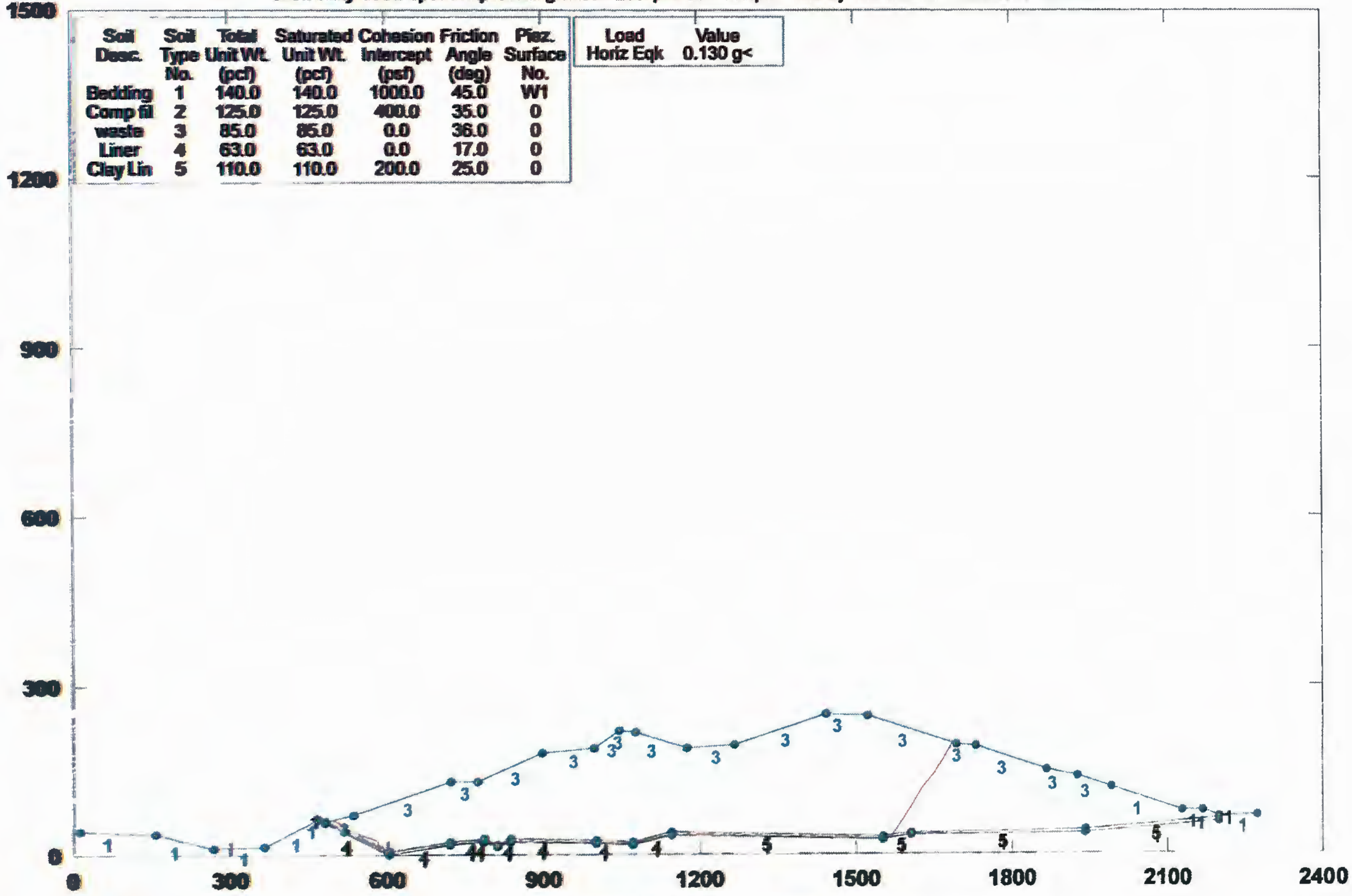
PCSTABL5M/si FSmin=5.01

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve51-bes.plt Run By: Username 4/23/2015 01:17PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

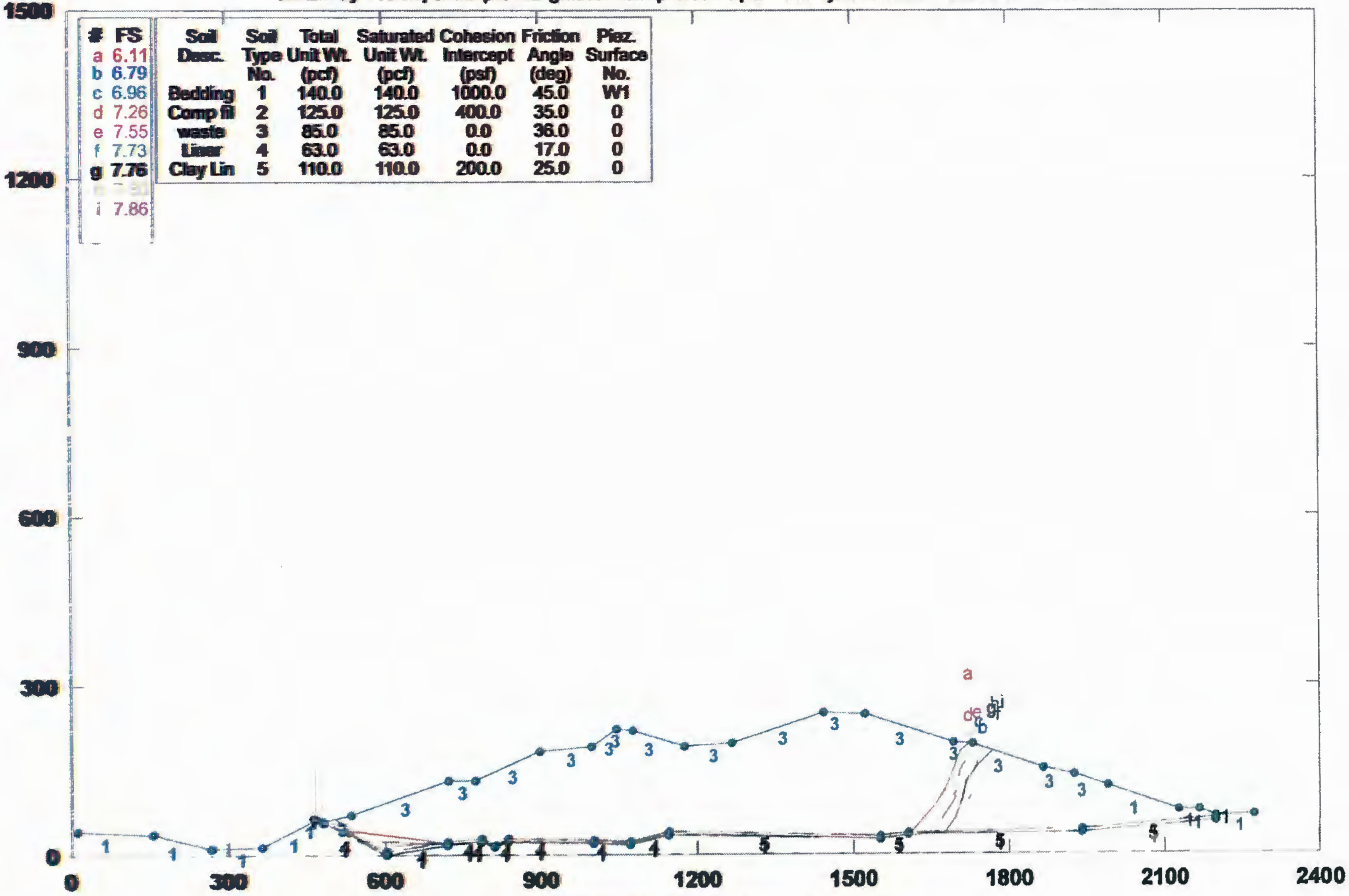
PCSTABL5M/si FSmin=2.24

Factor Of Safety Is Calculated By Spencer`s Method of Slices

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve50-b.pl2 Run By: Username 4/23/2015 01:19PM



| # | FS |
|---|---|
| a | 6.11 |
| b | 6.79 |
| c | 6.96 |
| d | 7.26 |
| e | 7.55 |
| f | 7.73 |
| g | 7.76 |
| h | [illegible] |
| i | 7.86 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

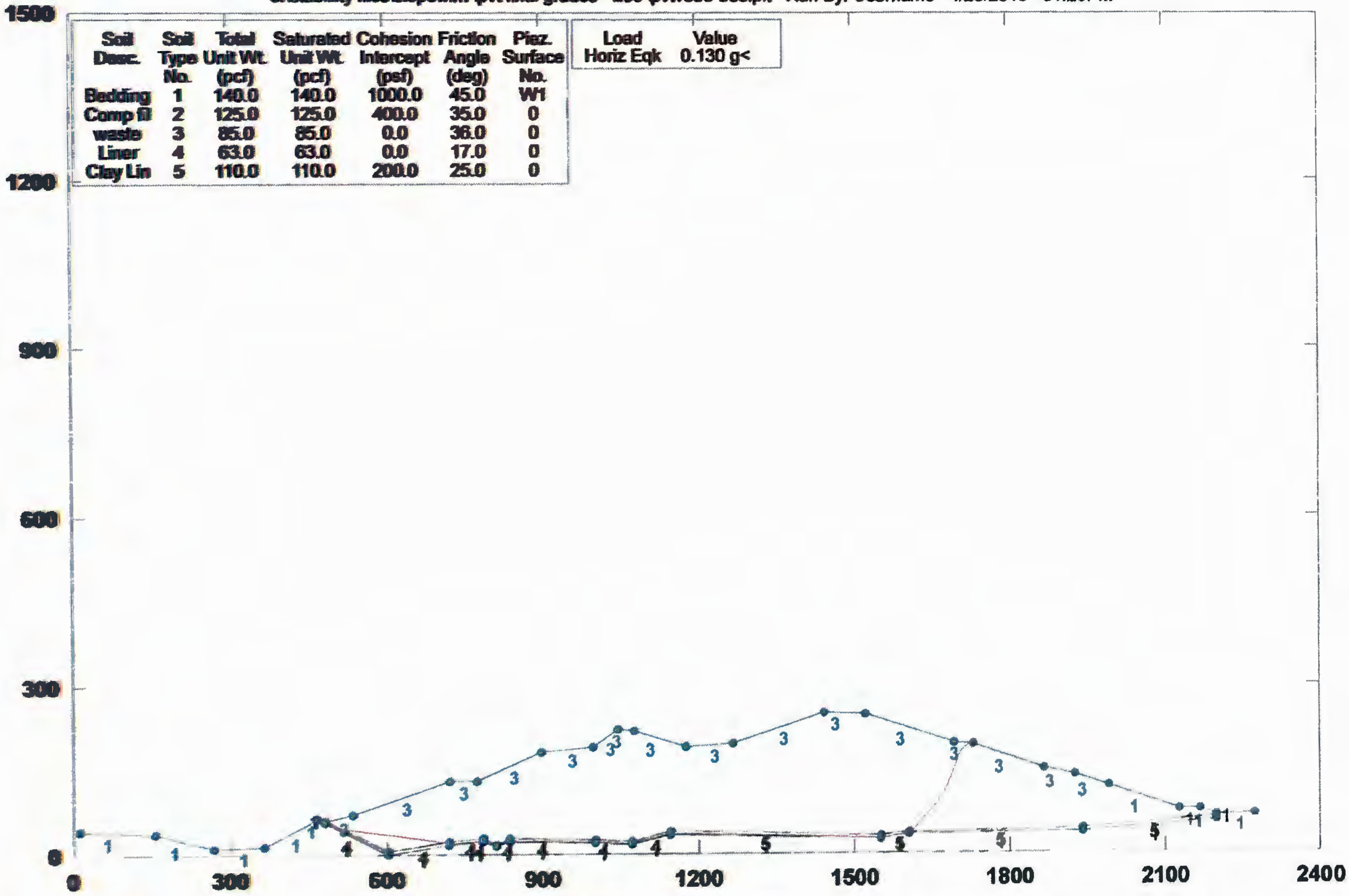
PCSTABL5M/si FSmin=6.11

Safety Factors Are Calculated By The Modified Janbu Method

STED

# PVT Final Refuse Grades - 250' Elev. Cross-Section 5-5' (Pesudo-Static)

e:\stability files\slopewin7\pvt final grades - 250'\pvtve50-bes.plt Run By: Username 4/23/2015 01:20PM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No. |
|---|---|---|---|---|---|---|
| Bedding | 1 | 140.0 | 140.0 | 1000.0 | 45.0 | W1 |
| Comp fil | 2 | 125.0 | 125.0 | 400.0 | 35.0 | 0 |
| waste | 3 | 85.0 | 85.0 | 0.0 | 36.0 | 0 |
| Liner | 4 | 63.0 | 63.0 | 0.0 | 17.0 | 0 |
| Clay Lin | 5 | 110.0 | 110.0 | 200.0 | 25.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.130 g< |

PCSTABL5M/si FSmin=2.37

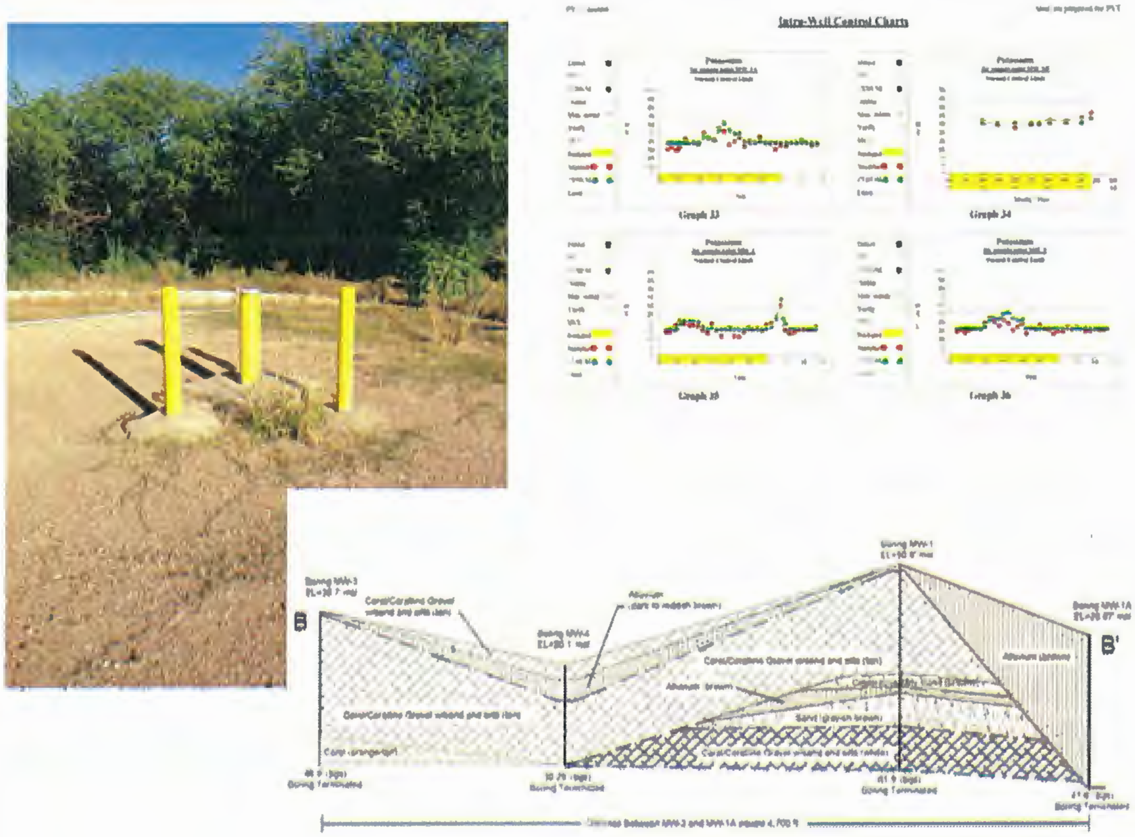
Factor Of Safety Is Calculated By Spencer's Method of Slices

STED

# Groundwater and Leachate Monitoring Plan

## PVT Integrated Solid Waste Management Facility
## Nānākuli, O'ahu, Hawai'i

October 2015



Prepared for:

PVT LAND COMPANY LIMITED

87-2020 Farrington Highway
Waianae, Hawaii 96792

Prepared by:

HYDROGEOLOGICAL CONSULTING
JUTURNA LLC

62-180 Emerson Road • Haleiwa, Hawaii 96712
Phone: (808) 220-8620 • email: jennifer.hernando@gmail.com

# Table of Contents

## List of Tables

## List of Figures

## List of Attachments

# List of Acronyms

| | |
|---|---|
| ° | Degrees |
| % | Percent |
| ALS | ALS Group USA Corp. dba ALS Environmental |
| ASTM | American Society for Testing and Materials |
| C | Celsius |
| C&D | Construction and Demolition |
| $CaCO_3$ | Calcium Carbonate |
| CFR | Code of Federal Regulations |
| cis-1,2-DCE | Cis-1,2-Dichloroethene |
| cm/sec | Dentimeters per Second |
| CUSUM | Cumulative Sum |
| DCA | 1,2-Dichloroethane |
| DLNR | State of Hawaii, Department of Land and Natural Resources |
| DOH | State of Hawaii, Department of Health |
| DRO | Diesel Range Organics |
| EAL | Environmental Action Level |
| EPA | United States Environmental Protection Agency |
| GWPS | Groundwater Protection Standard |
| HAR | Hawaii Administrative Rules |
| LCS | Laboratory Control Sample |
| MDL | Method Detection Limit |
| mg/l | Milligrams per Liter |
| MRL | method reporting limit |
| MS | Matrix Spike |
| mS/cm | Millisiemens per Centimeter |
| MSD | Matrix Spike Duplicate |
| MSL | Mean Seal Level |
| MTBE | Methyl Tert-Butyl Ether |
| NA | Not Analyzed |
| ND | Not Detected, Non-Detect |
| NL | Not Listed |
| NM | Not Measured |
| PCE | Tetrachloroethene |
| ppm | Parts per Million (same as mg/l) |
| PQL | Practical Quantitation Limit |
| PVC | Polyvinyl Chloride |
| PVT ISWMF | PVT Integrated Solid Waste Management Facility |
| QA/QC | Quality Assurance/Quality Control |
| ROI | Radius of Influence |
| SOEST | University of Hawai'i School of Ocean and Earth Science and Technology |

| | |
|---|---|
| SSI | Statistically Significant Increase |
| TCE | Trichloroethene |
| TDS | Total Dissolved Solids |
| TOC | Total Organic Carbon |
| TPH | Total Petroleum Hydrocarbons |
| USEPA | United States Environmental Protection Agency |
| USGS | United States Geological Survey |
| VOC | Volatile Organic Compound |

# Section 1 Introduction

## 1.1 Purpose

This document presents the Groundwater and Leachate Monitoring Plan for the PVT Integrated Solid Waste Management Facility (PVT ISWMF) located in Nānākuli, Hawai'i. This Groundwater and Leachate Monitoring Plan replaces the previous plan dated August 31, 2004 prepared by Mountain Edge Environmental, Inc. As stated in the 2004 Groundwater Monitoring Plan, a background water quality report containing an initial or updated list of all analytes detected, and updated concentration control limits where applicable will be submitted every five years, and will serve to adjust the Groundwater Monitoring Plan (Mountain Edge Environmental, Inc., 2004). This document constitutes an updated background water quality report and the new Groundwater and Leachate Monitoring Plan for the facility.

PVT ISWMF operates under the general and special conditions of landfill permit number LF-0152-09, issued May 5, 2011 under the provisions of Hawaii Revised Statues, Chapter 342H, "Solid Waste Pollution" and Hawaii Administrative Rules (HAR) Title 11, Chapter 58.1, "Solid Waste Management Control". The special conditions of the landfill permit require that groundwater and leachate monitoring be conducted in accordance with the State of Hawaii Landfill Groundwater Guidance Document (State of Hawaii, Department of Health [DOH], 2002), and that the 2004 Groundwater Monitoring Plan and approved subsequent submissions be implemented.

This Groundwater and Leachate Monitoring Plan complies with the requirements of landfill permit number LF-0152-09, HAR 11-58.1, and the Code of Federal Regulations (CFR), Solid Waste Disposal Facility Criteria (and its revisions) contained in 40 CFR Part 257, and follows the guidance provided in the State of Hawaii Landfill Groundwater Monitoring Guidance Document (DOH, 2002).

## 1.2 Plan Organization

This Groundwater and Leachate Monitoring Plan is organized into the following sections:

Section 1, Introduction, describes the purpose of the plan and the plan organization.

Section 2, Site Background, contains background information on the site including site location, site description, climatic conditions, and topography; a detailed characterization of the geology and hydrogeology; a summary of the groundwater quality based on sampling conducted to date; a description of surface water hydrology; and a summary of the leachate water quality based on sampling to date.

Section 3 contains a description of the groundwater monitoring well network, including well locations, well construction details, and sampling equipment.

Section 4 discusses detection monitoring parameters and schedule.

Section 5 discusses the leachate monitoring parameters and schedule.

Section 6 presents sampling procedures for groundwater and leachate, including procedures for inspecting the monitoring wells, measuring water levels, collecting groundwater and leachate samples, sample handling and documentation, decontamination of sampling equipment, handling of investigation-derived waste materials, and field quality assurance/quality control (QA/QC).

Section 7 contains the laboratory analysis plan which includes laboratory analytical methods; laboratory QA/QC; and laboratory data reduction, validation, and reporting.

Section 8 describes the statistical methods used to evaluate the data.

Section 9 describes the procedures for assessment monitoring.

Section 10 contains the procedures for data quality review, recordkeeping, and reporting.

Section 11 is a list of references.

# Section 2 Site Background

## 2.1 Site Location

The PVT ISWMF is located in the community of Nānākuli near the western coast of the Island of O'ahu, Hawai'i. The property begins approximately 1,600 feet northeast of the intersection of Farrington Highway and Lualualei Naval Road, and extends northerly approximately one mile along Lualualei Naval Road, as shown on Figure 1, Site Vicinity Map.

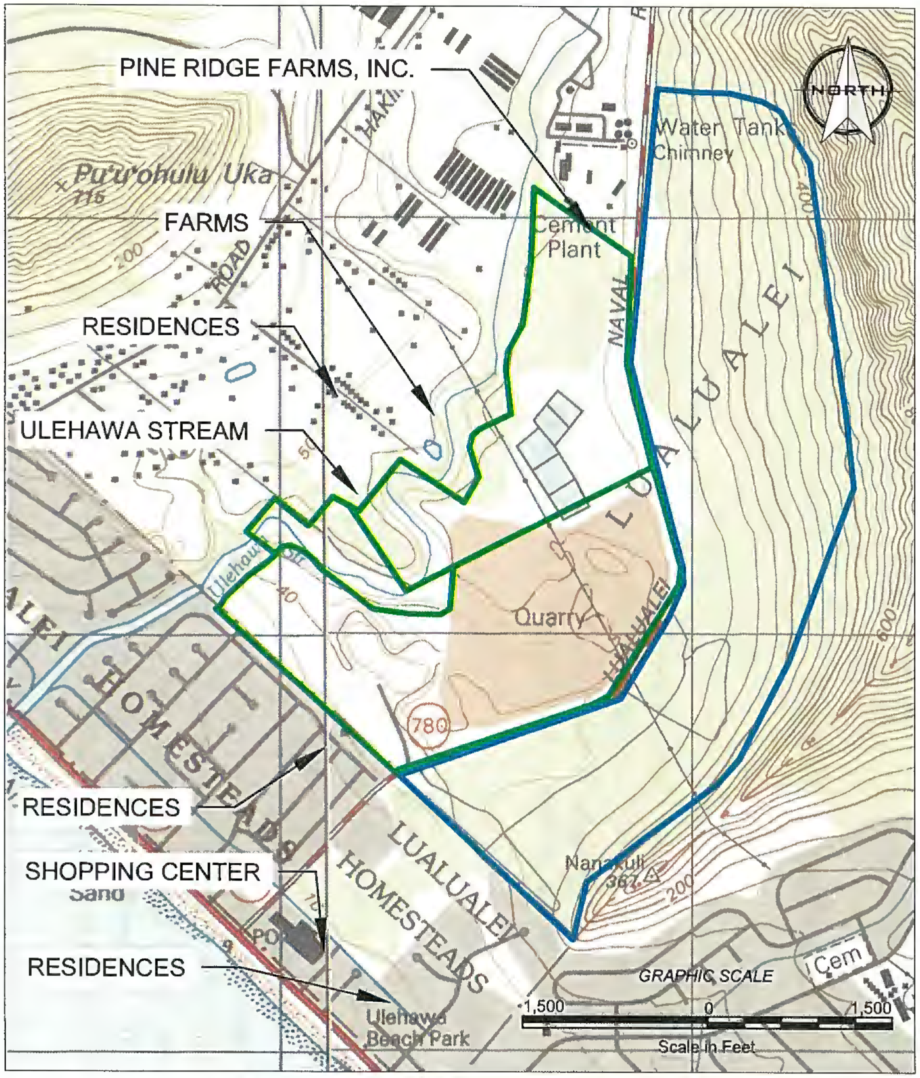
## 2.2 Site Description

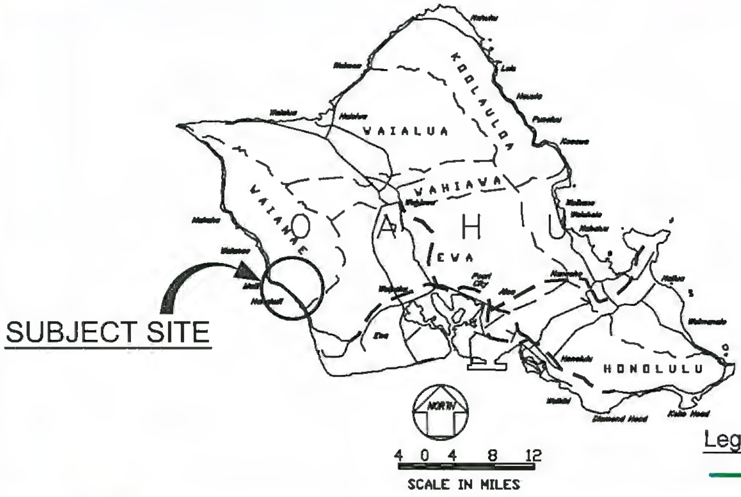
The developed portion of the PVT ISWMF covers approximately 200 acres and is bordered to the east by Lualualei Naval Road, to the west by Ulehawa Stream, to the south by a residential neighborhood, and to the north by Pine Ridge Farms, Inc., a trucking, concrete and asphalt recycling, and concrete production facility. PVT ISWMF operations include a construction and demolition (C&D) material landfill with asbestos disposal and liquids solidification areas, and a recycling and materials recovery operation. An undeveloped parcel of 179 acres to the east of Lualualei Naval Road, owned by Leeward Land, is used for soil borrow, water supply, and drainage control. The general land use of the surrounding area includes low-density residential, commercial, and agricultural properties, in addition to industrial and undeveloped properties.

The PVT ISWMF began operations in 1985 to fill depressions from past quarry activities (Clayton Environmental Consultants, 1992). The facility has historically accepted demolition and landscaping waste, roofing and other non-degradable materials, incinerator ash, shredded automobiles, encapsulated or bagged asbestos, and oily waste (Clayton Environmental Consultants, 1992). Currently, the only wastes accepted for disposal at the landfill are C&D material, asbestos-containing material, and contaminated soil. In accordance with the facility's operations plan, facility personnel follow detailed operational procedures for the acceptance of solid waste.

The C&D landfill is comprised of two areas, Phase I and Phase II. The 49-acre Phase I area of the landfill includes the original portion of the C&D landfill, which received debris prior to October 9, 1993, and the asbestos disposal area. Phase I of the landfill is earth-lined with no leachate collection system. C&D debris disposal operations in Phase I had low compaction densities, producing a fill that contains substantial amounts of void spaces. As a result, this historic area of landfill has been prone to subsurface fires due to the intrusion of oxygen into the void space. In response, PVT is authorized by its Solid Waste Management Permit to: (1) remove previously buried debris; (2) process the debris to recover recyclable materials; and (3) replace any unrecyclable materials in the landfill.

The 104-acre Phase II area of the landfill consists of a series of cells numbered Cell 1 through Cell 9 as shown on Figure 2, Site Plan. To date, Cells 1 through 9A are constructed and Cell 9B, the last remaining permitted disposal area, is partly occupied by the recycling and materials recovery operation and the liquid waste solidification area. The Phase II landfill cells





Legend

- 🟩 PVT ISWMF Property Boundary
- 🟦 Leeward Land Property Boundary

Reference: L [illegible] 998; Google Earth, 2013 (Satellite Image 1/29/2013) .

Approved by: JKH
Drawn by: LBM
Date: October 2015

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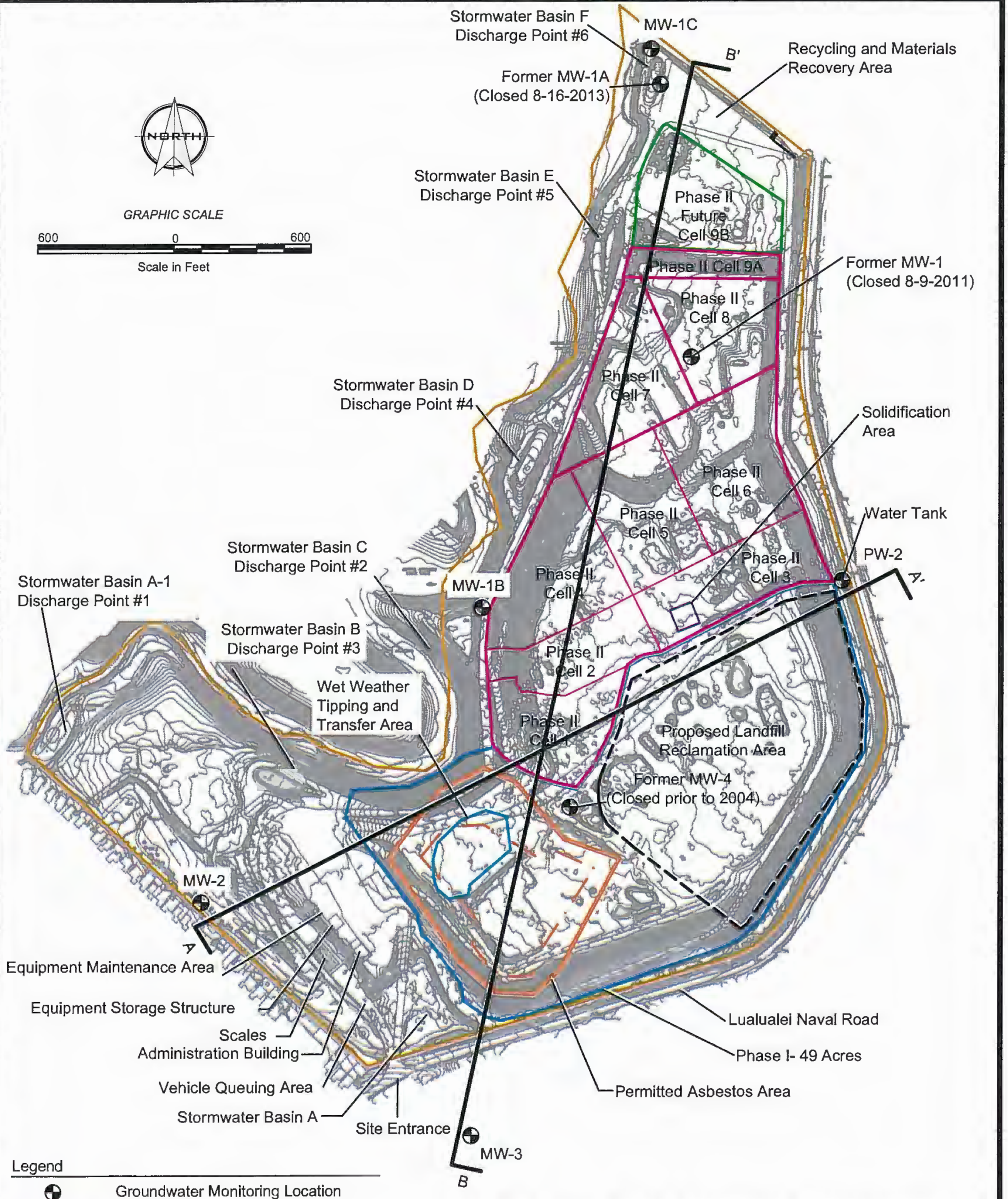
**Figure 1**
**Site Vicinity Map**

Groundwater and Leachate Monitoring Plan
PVT Integrated Solid Waste Management Facility
Nanakuli, Oahu, Hawaii



Legend

⊕ Groundwater Monitoring Location
— Primary Fill Area
— Secondary Fill Area: Phase I
— Facility Boundary
— Asbestos Disposal Area
— · — Active Asbestos Disposal Area
— Future Phase II Areas
— Solidification Area
— Wet Weather Tipping and Transfer Area
- - - - Proposed Landfill Reclamation Area
⌐¬ Geological Cross-Sections

Basemap Reference: TerraPAC LLC, 2014.

Approved by: JKH
Drawn by: LBM
Date: October 2015

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**Figure 2**
**Site Plan**

Groundwater and Leachate Monitoring Plan
PVT Integrated Solid Waste Management Facility
Nanakuli, Oahu, Hawaii

are constructed with an impermeable composite liner and leachate collection and removal system. In 2011, PVT ISWMF began operating the six-acre recycling and materials recovery facility to recover, reuse and recycle both previously landfilled debris and incoming debris.

## 2.3 Climate

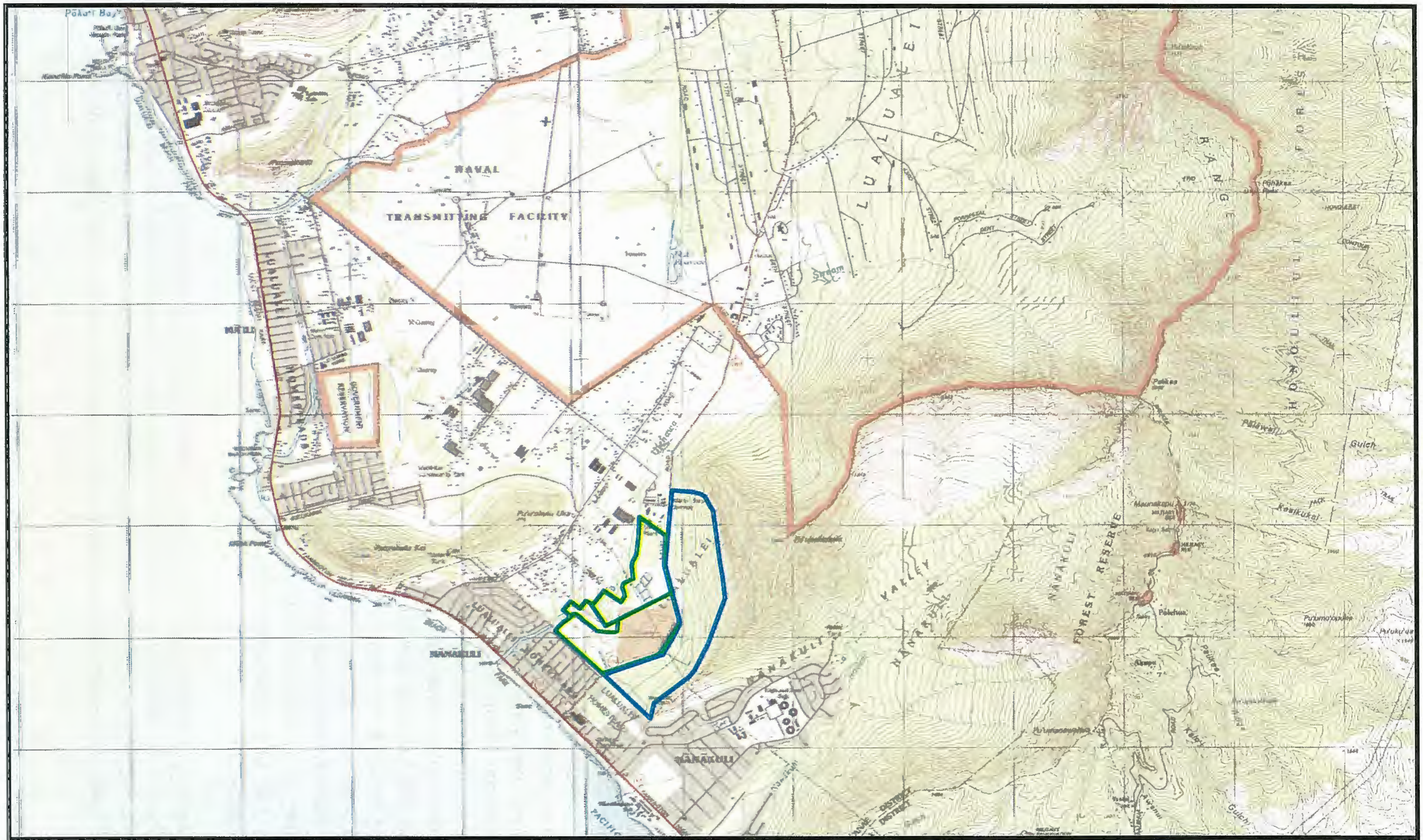
The climate of O'ahu is subtropical characterized by mild temperatures throughout the year, moderate humidity, persistence of northeasterly trade winds, significant differences in rainfall within short distances, and infrequent severe storms (National Weather Service, 2015). Another primary characteristic of O'ahu's climate is the presence of only two seasons: a dry season generally occurring between May and October, and a wet season generally occurring between October and April (National Weather Service, 2015).

The Nānākuli area receives approximately 14 inches of rainfall per year, based on data from the on-site weather station at PVT ISWMF. Most of the annual precipitation falls between October and April. During these months, rainfall averages one to two inches per month, with generally less than one inch per month falling during the rest of the year (A-Mehr, 2011). The average adjusted pan evaporation in the Nānākuli area is approximately 80 inches per year (Ekern and Chang, 1985).

Temperatures during the day range from the low 60s to the upper 70s during the winter months, and from the lower 70s to the upper 80s during the summer months (A-Mehr, 2011).

## 2.4 Topography

PVT ISWMF is located in Lualualei Valley, a broad amphitheater-headed valley located on the west side of the Wai'anae mountain range. The valley floor comprises approximately 14 square miles and is relatively flat, with the exception of several volcanic peaks located in the lower parts of the valley. These peaks include Pu'u o Hulu Kai, Pu'u o Hulu Uka, and Pu'u Heleakalā. PVT ISWMF is located between Pu'u Heleakalā (elevation 1,890 feet above mean sea level [MSL]) and Pu'u O Hulu Uka (elevation 715 feet MSL). In the valley the regional topography slopes gently down toward the ocean, as shown in Figure 3, Regional Topography. Elevations in the developed portion of the site prior to landfilling ranged from approximately 20 to 60 feet MSL (United States Geological Survey [USGS], 1983), while current site elevations in these areas range from approximately 20 to 130 feet MSL. In the undeveloped Leeward Land parcel, east of Lualualei Naval Road, the elevations range from approximately 40 to 350 feet MSL as shown on Figure 1. The southwestern side of the property is located approximately 2,000 feet from the shoreline, and the most inland portions of the property are within 7,500 feet of the shoreline.



Legend

- PVT ISWMF Property Boundary
- Leeward Land Property Boundary

NORTH

*GRAPHIC SCALE*

5,000 0 5,000

Scale in Feet

Reference: USGS, 1998.

Approved by: JKH

Drawn by: LBM

Date: October 2015

HYDROGEOLOGICAL CONSULTING

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## Figure 3
## Regional Topography

Groundwater and Leachate Monitoring Plan
PVT Integrated Solid Waste Management Facility
Nanakuli, Oahu, Hawaii

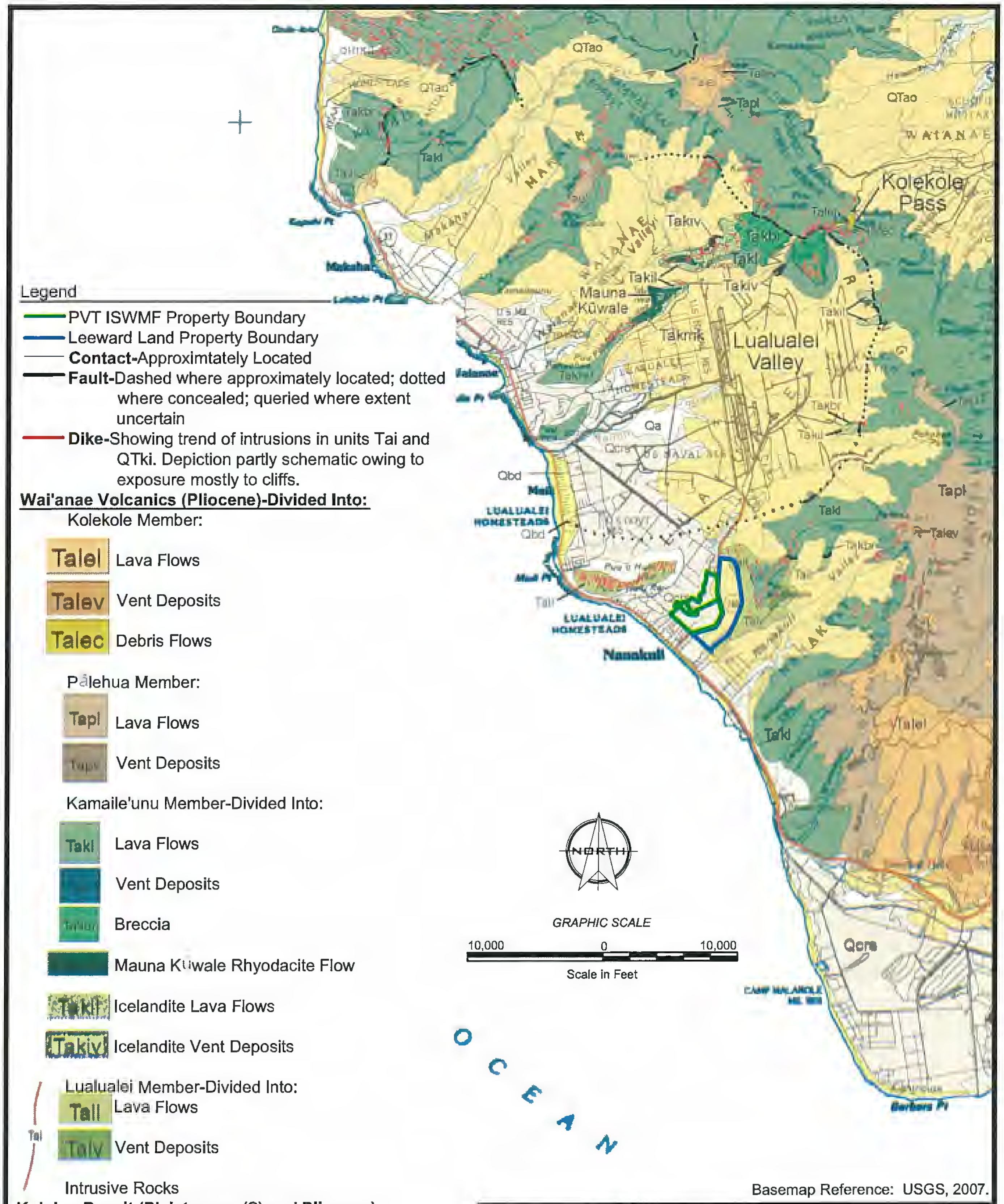
## 2.5 Geology

### 2.5.1 Regional Geology

The island of O'ahu was built by three shield volcanoes, the Ka'ena, Wai'anae, and Ko'olau volcanoes (Macdonald et al., 1983 and Sinton et al., 2014). The now submerged Ka'ena volcano is the oldest of the three volcanoes; however, the Wai'anae volcano rose above sea level first on the eastern flanks of Ka'ena approximately 3.9 million years ago (Sinton et al., 2014). Ka'ena emerged above sea level approximately 400,000 years later, followed by the Ko'olau volcano in another 500,000 years (Sinton et al., 2014). The present-day island of O'ahu consists of the Wai'anae Range (the eroded remnant of the Wai'anae volcano) forming the western portion of the island, and the Ko'olau Range (the eroded remnant of the Ko'olau volcano) forming the eastern portion of the island. The term "range" expresses the fact that the shield form of the volcano has been eroded to form long narrow ridges. The eroded remnant of the Ka'ena volcano forms a submarine ridge located northwest of the island of O'ahu (Sinton et al., 2014).

The rocks of the Wai'anae volcano are known as the Wai'anae Volcanics, and are subdivided into four members: the Lualualei (oldest), Kamaile'unu, Pālehua, and Kolekole (youngest) Members. The Lualualei Member consists of tholeiitic basaltic lava flows that built the main mass of the Wai'anae shield volcano, 3.9 to 3.55 million years ago (SOEST, 2015). During this shield-building stage, lava erupted along two, or possibly three, rift zones, and a well-developed caldera was present in Lualualei Valley (SOEST, 2015). In a later shield-building stage (approximately 3.55 to 3.06 million years ago) lavas from the Kamaile'unu Member erupted within the caldera and along rift zones outside of the caldera (SOEST, 2015). The Kamaile'unu lavas, which include plagioclase-bearing tholeiitic and alkalic basalts and basaltic hawaiites, eventually filled the caldera (SOEST, 2015). The Pālehua Member represents the post-caldera stage-eruptions, which occurred 3.06 to 2.98 million years ago, forming a relatively thin "alkalic cap" covering the top of the shield volcano (SOEST, 2015). The Pālehua Member lavas primarily contain hawaiite, with local occurrences of alkalic basalts and mugearite (Sinton, 1986). At the end of Pālehua volcanism a major erosional event occurred, possibly the great offshore, submarine Wai'anae slump (SOEST, 2015). Following this event the plumbing system of the Wai'anae Volcano was changed so that more mafic magmas from deep in the crust, the Kolekole Member, were erupted, carrying with them wall-rock fragments (xenoliths) of the deep crustal magma chamber (SOEST, 2015). The Kolekole Member includes the young cones and flows of Pu'u Kapua'i, Pu'u Ku'ua, Pu'u Makakilo, Pu'u Pālailai, and Pu'u Kapolei on the southern end of the Wai'anae Range, a post-erosional flow at Kolekole Pass, the summit region of Mt. Ka'ala (the highest point on Oahu), and Pahole and Kuaokalā regions in the northern part of the Wai'anae Range (Sinton, 1986 and SOEST, 2015). Figure 4 shows the regional geology.

The repeated eruptions that built the Wai'anae shield volcano occurred along two or possibly three rift zones, now marked by innumerable exposed dikes. Dikes form from lava congealing in the fissures that bring it to the surface. In the site vicinity dikes intrude most members of the Wai'anae Volcanics. They are sparse in the poorly permeable, massive, thick-bedded flows of



Basemap Reference: USGS, 2007.

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Date: October 2015

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## Figure 4
## Regional Geology

Groundwater and Leachate Monitoring Plan
PVT Integrated Solid Waste Management Facility
Nanakuli, Oahu, Hawaii

the Pālehua member and are numerous in the highly permeable, thin-bedded flows of the Lualualei and Kamaile'unu members (Takasaki, 1971).

The erosion of the Wai'anae shield volcano formed large valleys on the western side of the Wai'anae Range. These valleys (such as Lualualei) are some of the largest in Hawai'i, and they are believed to represent the sources for large landslides now seen on the sea floor to the west of the island (Presley et al., 1997). These valleys have extensive accumulations of alluvium and colluvium.

Also occurring along the Wai'anae coast, and along most of O'ahu's shorelines, are emerged coral reefs. These reefs formed during the interglacial stages when sea level was higher than it is now. Near Wai'anae, the reef limestone extends to about 87 feet above sea level and is overlain by almost 10 feet of fossiliferous lithified beach sand (Macdonald, et al., 1983). This calcareous sedimentary material consists of coral, coral rubble, and beach sand.

PVT ISWMF is located in Lualualei Valley, which was formed by the Lualualei and Kamaile'unu Members of the Wai'anae Volcanics. The caldera for the Wai'anae Volcano occupies most of Lualualei Valley; the caldera boundary is just north of the PVT ISWMF, as shown by the dotted fault line on Figure 4, Regional Geology. Lualualei Valley was formed by streams that eroded the Wai'anae Volcano, filling the valley with alluvial and colluvial deposits. In addition, a catastrophic erosional event (mass-wasting), evident from the submarine landslide deposits located offshore, may have contributed to the formation of the valley (Presley et al., 1997). Reef deposits were laid down in Lualualei Valley approximately 500,000 years ago when sea level was 100 feet above the current sea level. The reef filled the valley to an approximate depth of 300 feet (Macdonald, et al., 1983).

### 2.5.2 Site Geology

Geologic materials at the PVT ISWMF site, as shown on Figure 4, include calcareous reef rock and marine sediment, chiefly emerged coral reefs and lagoonal deposits, on the western portion of the site, and older alluvium on the eastern portion of the site (Stearns, 1938 and USGS, 2007). The older alluvium generally consists of mottled brown to red brown, deeply weathered, poorly sorted, and nearly impermeable, friable conglomerates (Stearns, 1938). Younger alluvium is present on the far western portion of the site along Ulehawa Stream. Underlying the calcareous reef rock, marine sediments, and alluvium are lava flows of the Lualualei Member of the Wai'anae Volcanics, which comprise the entire mountain of Pu'u Heleakalā, just east of the site.

Based on soil borings and excavation at the site, the natural surface material is a brown to dark brown clayey silt (alluvium) derived from the surrounding volcanic peaks (Mountain Edge Environmental, Inc., 2004). The underlying soil is tan silty clay with coral sand and coral fragments. This tan coralline material is approximately 6 to 18 feet thick and consists of large to small coral fragments, in which all the interstitial void space has been filled with calcic silt and clay, embedded in a calcic sand, silt and clay matrix. This material was originally deposited in a relatively quiet back-bay type of environment similar to the back bay areas of Pearl Harbor.

Undisturbed samples of matrix have yielded permeabilities of $10^{-5}$ centimeters per second (cm/s), and this same material when used for backfill and compacted to 90 percent (%) of maximum has yielded permeabilities of $10^{-7}$ cm/s (Joseph, 2004). In some areas of the site this soil includes more cemented coral and coralline gravel with sand and silts, which likely formed in a more active reef front or beach environment. These deposits range from 5 to 40 feet deep and are intermingled with alluvial deposits in some areas of the site (Mountain Edge Environmental, Inc., 2004). Figures 5 and 6 show geological cross sections detailing subsurface conditions encountered during installation of groundwater wells at the site.

### 2.5.3 Soils

According to the United States Department of Agriculture, Soil Conservation Service (Foote et al., 1972), soils occurring on the PVT ISWMF site include Pulehu Very Stony Clay Loam (PvC), 0 to 12 percent slopes; Mamala Stony Silty Clay Loam, 0 to 12% slopes (MnC); and Lualualei Extremely Stony Clay (LPE), 3 to 35% slopes. In addition, Lualualei Clay, 2 to 6% slopes (LuB) and rock land (rRK) occur on portions of the undeveloped Leeward Land parcel, east of Lualualei Naval Road. Figure 7 shows the locations of these soils at the site.

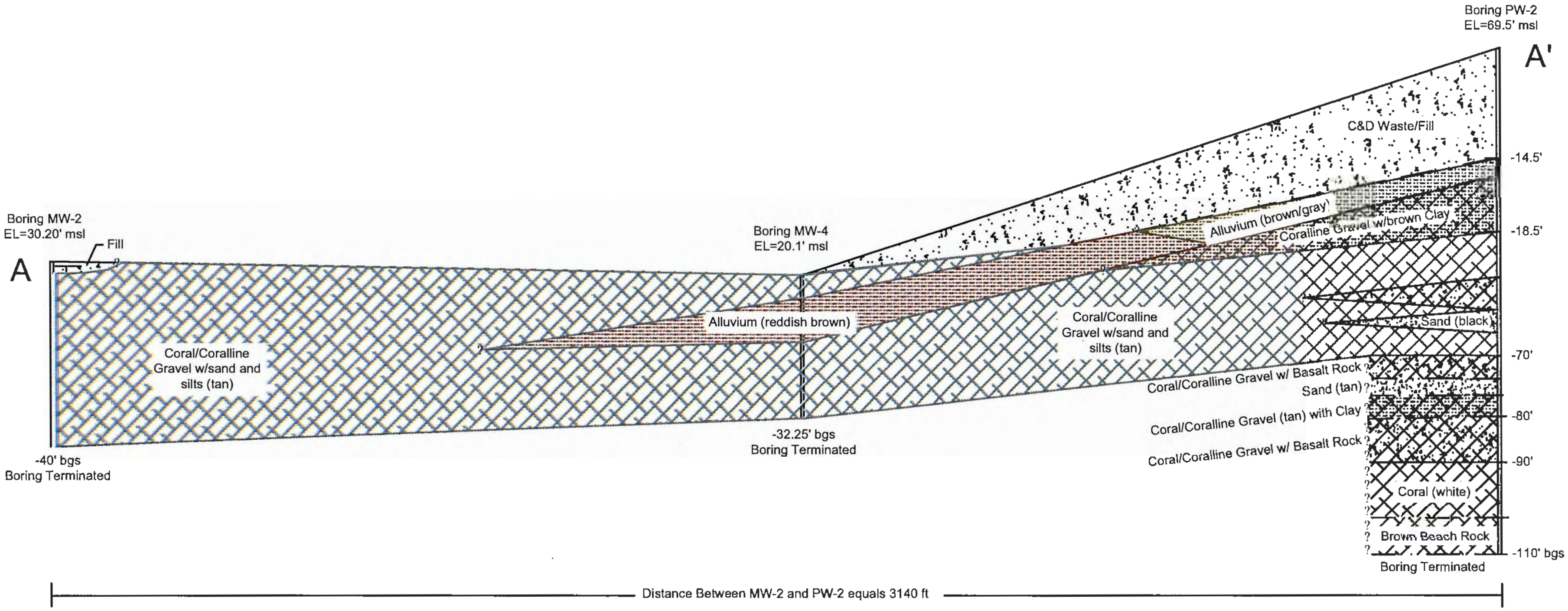
As shown on Figure 7, the Pulehu Very Stony Clay Loam is located along Ulehawa Stream. This soil developed in alluvium washed from basic igneous rocks. Pulehu Very Stony Clay Loam is a dark brown clay loam underlain by dark-brown, dark grayish-brown, and brown stratified loam, loamy sand, fine sandy loam, and silt loam. As much as 3% of the surface of Pulehu Very Stony Clay Loam is covered with stones (Foote, et al., 1972).

The Mamala Stony Silty Clay Loam originally covered most of the central and southern portions of the PVT ISWMF site, but much of this soil has been removed during previous quarry activities, covered due to landfilling, or used as cover material for landfilling operations. Mamala Stony Silty Clay Loam soils formed in alluvium deposited over coral limestone and consolidated calcareous sand (Foote et al., 1972). These soils generally consist of dark reddish-brown stony silty clay loam with coral rock fragments common in the surface layer and throughout the profile (Foote et al., 1972).

The Lualualei Extremely Stony Clay, which occurs on the eastern portion of the site along Lualualei Naval Road and at the base of Pu'u Heleakalā, developed in alluvium and colluvium. Some of these soils have also been removed due to landfilling or used as cover material for landfilling operations. Lualualei Extremely Stony Clay generally consists of very dark grayish-brown, very sticky and very plastic clay that has prismatic structure and many stones on the surface and throughout the profile. According to Foote et al. (1972), this soil cracks widely upon drying and has a high shrink-swell potential and often contains gypsum crystals.

Lualualei Clay occurs in a very small area on the Leeward Land property, east of Lualualei Naval Road, as shown on Figure 7. Lualualei Clay is similar to Lualualei Extremely Stony Clay except that it does not have stones in the surface and in the profile (Foote et al., 1972).

A small portion of the Leeward Land property on the upper slopes of Pu'u Heleakalā is considered rock land (rRK), which is made up of areas where exposed rock covers 25 to 90% of



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Drawn by: LBM
Date: October 2015

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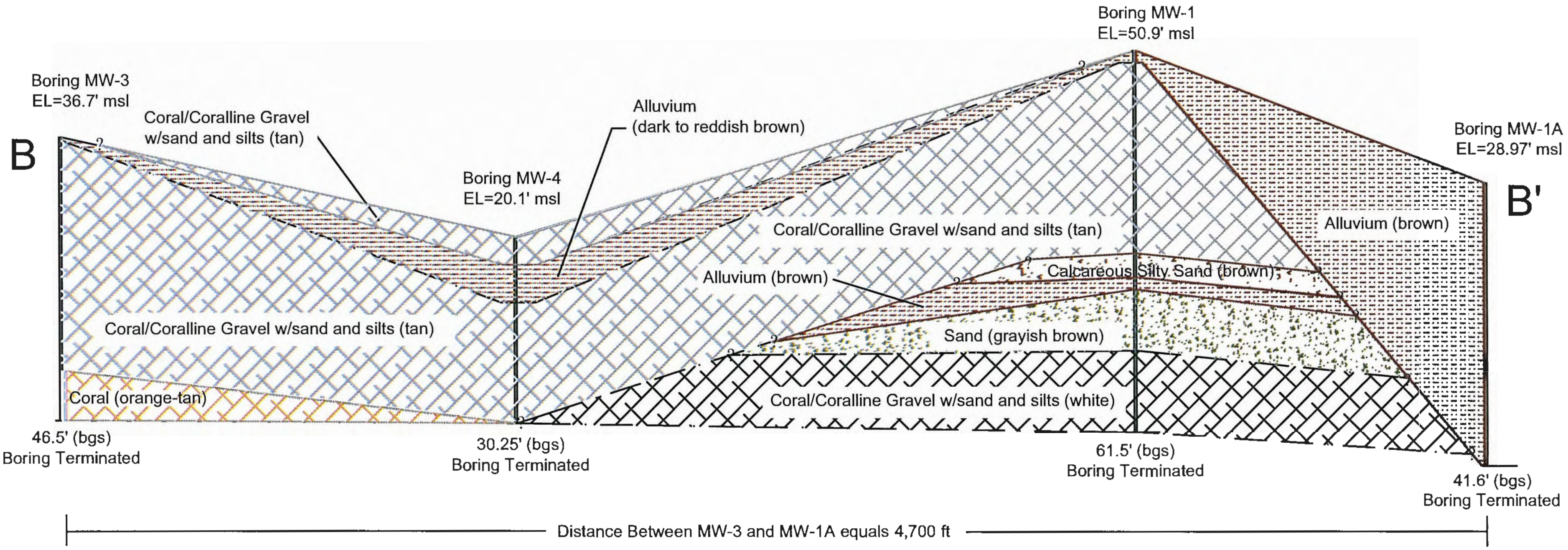
# Figure 5
# Geologic Cross Section East-West

Groundwater and Leachate Monitoring Plan
PVT Integrated Solid Waste Management Facility
Nanakuli, Oahu, Hawaii

Reference: Mountain Edge, 2004 based on boring logs by Clayton Environmental Consultants,1992
ountain Edge Environmental, Inc., 2003



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Date: October 2015

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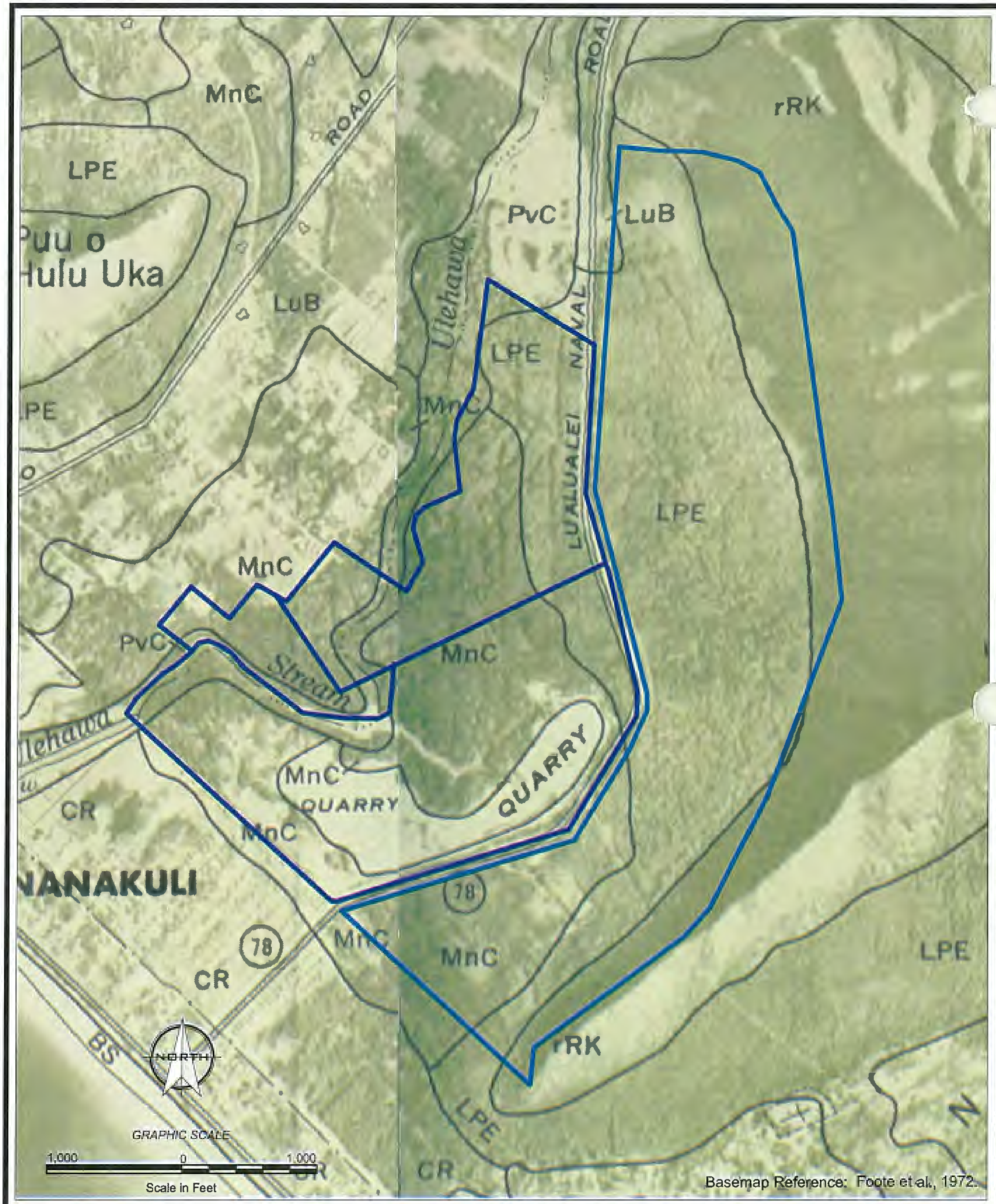
**Figure 6**
**Geologic Cross Section**
**North-South**

Groundwater and Leachate Monitoring Plan
PVT Integrated Solid Waste Management Facility
Nanakuli, Oahu, Hawaii

Reference: Mountain Edge, 2004 based on boring logs by Clayton Environmental Consultants,1992
and Mountain Edge Environmental, Inc., 2003



Basemap Reference: Foote et al., 1972.

Legend

— PVT ISWMF Property Boundary

— Leeward Land Property Boundary

LPE- Lualualei extremely stoney clay, 3 to 35 percent slopes

MnC- Mamala stony silty clay loam, 0 to 12 percent slopes

PvC- Pulehu very stony clay loam, 0 to 12 percent slopes

LuB- Lualualei clay, 2 to 6 percent slopes

rRK- Rock land

CR- Coral outcrop

BS- Beaches

Approved by: JKH
Drawn by: LBM
Date: October 2015

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## Figure 7
## Soil Map

Groundwater and Leachate Monitoring Plan
PVT Integrated Solid Waste Management Facility
Nanakuli, Oahu, Hawaii

the surface. Rock outcrops and very shallow soils are the main characteristics of rock land (Foote et al., 1972).

## 2.6 Hydrogeology

### 2.6.1 Regional Hydrogeology

Most of the fresh groundwater supply in the Wai'anae District occurs in flows of the Lualualei and Kamaile'unu Members of the Wai'anae Volcanics. Flows of the Pālehua and Kolekole Members are mostly above the water table, and contain only a small perennial supply. Some fresh groundwater occurs in the sedimentary material; however, development of this supply is generally limited by the low permeability of alluvium and seawater intrusion in the calcareous reef rock and marine sediments (Takasaki, 1971).

The groundwater reservoir in the volcanic rocks is very large, the top of which extends from an altitude of a few feet near the coast to over 1,800 feet near the crest of the Wai'anae Range. The bottom of the volcanic aquifer is undetermined but is probably limited by the inability of the rocks to transmit water at some great depth below sea level. The quality of water from wells tapping the volcanic aquifer is generally good, except in near-shore areas and areas abutting landward edges of the coralline aquifer where intrusion by seawater occurs. The quantity and orientation of dikes occurring within the volcanic aquifer greatly controls the permeability of the aquifer because the dikes are less permeable than the rocks they intrude. Where dikes are few and mostly parallel, they channel groundwater along their trend. Where dikes are numerous and intersect, they form compartments reducing the lateral movement of groundwater and impounding it at altitudes higher than in areas where dikes are less abundant (Takasaki, 1971).

The erosion of the Wai'anae shield volcano formed large valleys on the western side of the Wai'anae Range. These valleys have extensive accumulations of alluvium and colluvium. The older alluvium is moderately to well consolidated and weathered in its entirety. This material is generally poorly permeable and acts as a confining member where it overlies more permeable saturated rocks. The younger alluvium consists of reworked older alluvium occurring in and near stream channels and overlying the older alluvium. The younger alluvium is poorly to moderately permeable; its yield from wells is small, but the groundwater quality is generally fair to good, even near the coast. Talus, consisting mainly of poorly consolidated gravel and boulders, also occurs in the valleys of the Wai'anae Range. The talus is highly permeable; however, the storage is generally small (Takasaki, 1971).

Groundwater also occurs within the highly permeable calcareous reef rock and marine sediments near sea level. The coralline rocks extend inland approximately two miles in Lualualei Valley (Stearns, 1938). Many wells have been drilled into this aquifer, primarily for irrigation use; however, the wells are brackish and many have been abandoned due to an increase in chloride content of the water with continued pumping. Freshwater within the coralline aquifer occurs as a thin and unstable lens floating on seawater. This lens is subject to rapid contamination by seawater if wells tapping the aquifer are pumped heavily. The lack of freshwater needed to develop a thicker freshwater lens is partly due to the abundant growth of kiawe in the Wai'anae area. Transpiration by kiawe, from shallow groundwater in volcanic rock and alluvium, reduces the underflow that would flow from these aquifers to the coralline aquifer. Transpiration by kiawe that grows over the coralline aquifer also constitutes the main discharge of groundwater from this aquifer (Takasaki, 1971).

Groundwater occurring within the younger alluvium is generally fresh and water levels are higher than in the coralline aquifer; however, seawater intrusion occurs where the alluvium aquifer abuts the coralline aquifer and in near-shore areas (Takasaki, 1971).

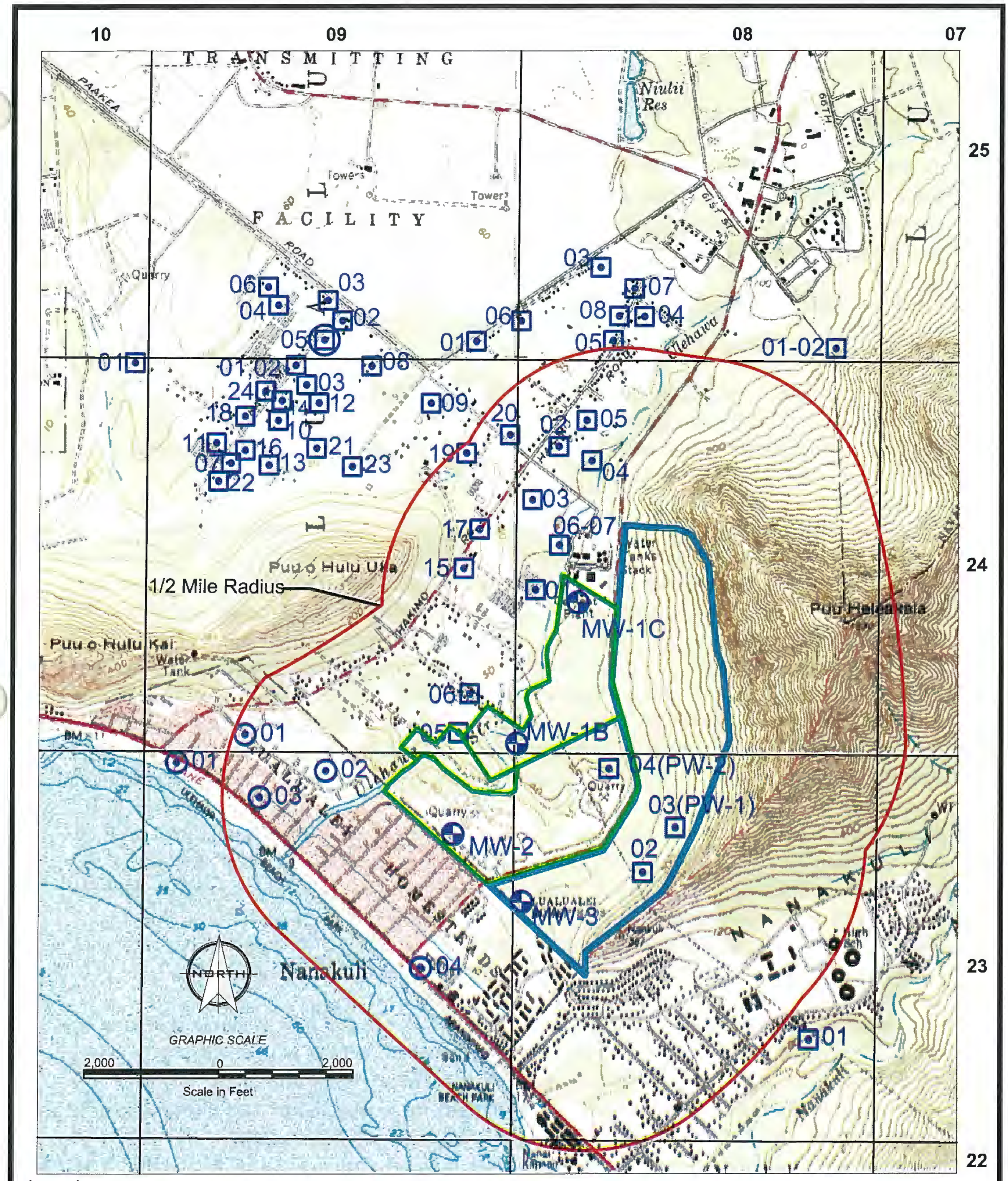
### 2.6.2 Wells in the Site Vicinity

Figure 8, Well Location Map, shows the locations of groundwater withdrawal wells in the vicinity of the PVT ISWMF property that are registered with the State of Hawaii, Department of Land and Natural Resources (DLNR), Commission on Water Resources Management (DLNR, 2008). DLNR does not regulate or record the locations of groundwater monitoring wells; however, Figure 8 does show the locations of PVT ISWMF's monitoring wells. Based on information provided by DLNR (2008), no drinking water wells are located on, downgradient of, or within one mile of the PVT ISWMF property. The closest drinking water well is located over one mile northwest and upgradient of the site. Wells in the site vicinity are used for irrigation, industrial purposes, or are currently sealed or unused (DLNR, 2008). Table 1 provides information on registered wells within one-half mile of the site.

**Table 1: Registered Wells within One-Half Mile of PVT ISWMF**

| Well Number | Well Name | Year Drilled | Owner / User | Ground Elev. (feet) | Well Depth (feet) | Initial Head (feet MSL) | Max. Chloride (ppm)* | Use |
|---|---|---|---|---|---|---|---|---|
| 2308-02 | Lualualei-PVT | 1952 | PVT Holdings | 115 | 154 | 3.7 | 292 | Unused |
| 2308-03 | Lualualei-PVT | 1990 | PVT Holdings | 136 | 200 | 7.0 | 900 | Irrigation |
| 2308-04 | Perimeter Rd (PW-2) | 2003 | PVT Land Co. | 66 | 110 | 0.47 | 3400 | Other |
| 2408-01 | Lualualei | 1949 | Kakazu S | 33 | 55 | 2.0 | 1410 | Unused |
| 2408-02 | Lualualei | 1950 | Oshiro K | 59 | 75 | 2.2 | 1850 | Irrigation |
| 2408-03 | Lualualei | 1951 | Shigeta H | 46 | 66 | 2.1 | 1422 | Irrigation |
| 2408-04 | Lualualei | 1951 | Oshiro K | 42 | 63 | 2.1 | 1700 | Unused |
| 2408-05 | Lualualei | 1957 | Nakata E & C | 62 | 86 | 2.1 | 2370 | Other |
| 2408-06 | Lualualei | 1962 | Perm Cement | 40 | 93 | NL | NL | Industrial |
| 2408-07 | Lualualei | 1962 | Perm Cement | 40 | 93 | NL | 1980 | Industrial |
| 2408-08 | Maile Irr 1 | 1989 | Kabushiki Oban | 145 | 220 | 5.0 | 1570 | Sealed |
| 2408-10 | Lualualei GC2 | 1996 | Kabushiki Oban | 75 | 100 | NL | NL | Unused |
| 2409-05 | Lualualei | 1951 | Kameya Y | 49 | 76 | 1.4 | 1520 | Irrigation |
| 2409-06 | Lualualei | 1951 | Kameya Y | 49 | 64 | 1.4 | 1150 | Unused |
| 2409-15 | Maili | 1954 | Aquillio T | 47 | 47 | 1.8 | 1580 | Unused |
| 2409-17 | Maili | 1955 | Tsuzuki I | 45 | 60 | 1.2 | 1690 | Unused |
| 2409-20 | Maili | 1955 | Tsuchitori F | 51 | 60 | 1.6 | 1950 | Other |

Reference: DLNR, 2008. NL = Not Listed in the DLNR database.
* = If maximum chloride concentration is NL, initial or test chloride concentration is shown, ppm = parts per million.



Legend

▬ 1/2 Mile Radius from PVT ISWMF

▬ PVT ISWMF Property Boundary

▬ Leeward Land Property Boundary

▣ Other Well

⊙ Injection Well

◐ PVT Monitoring Wells

▣ Potable Well

Basemap Reference: Delorme, 1985; DOH, 1984.

Approved by: JKH
Drawn by: LBM
Date: October 2015

JUTURNA LLC

## Figure 8
## Well Location Map

Groundwater and Leachate Monitoring Plan
PVT Integrated Solid Waste Management Facility
Nanakuli, Oahu, Hawaii

There are 14 other registered wells located within one-half mile of PVT ISWMF, including two industrial wells, three irrigation wells, six unused wells, one sealed well, and two other use wells (DLNR, 2008). As shown in Table 1, the maximum chloride concentration of groundwater from these 14 wells ranges from 1,150 to 2,370 parts per million (ppm), indicating that the wells are considered brackish water wells (freshwater typically has a chloride concentration less than 250 ppm (Mink and Lau, 1990)).

### 2.6.3 Site Hydrogeology

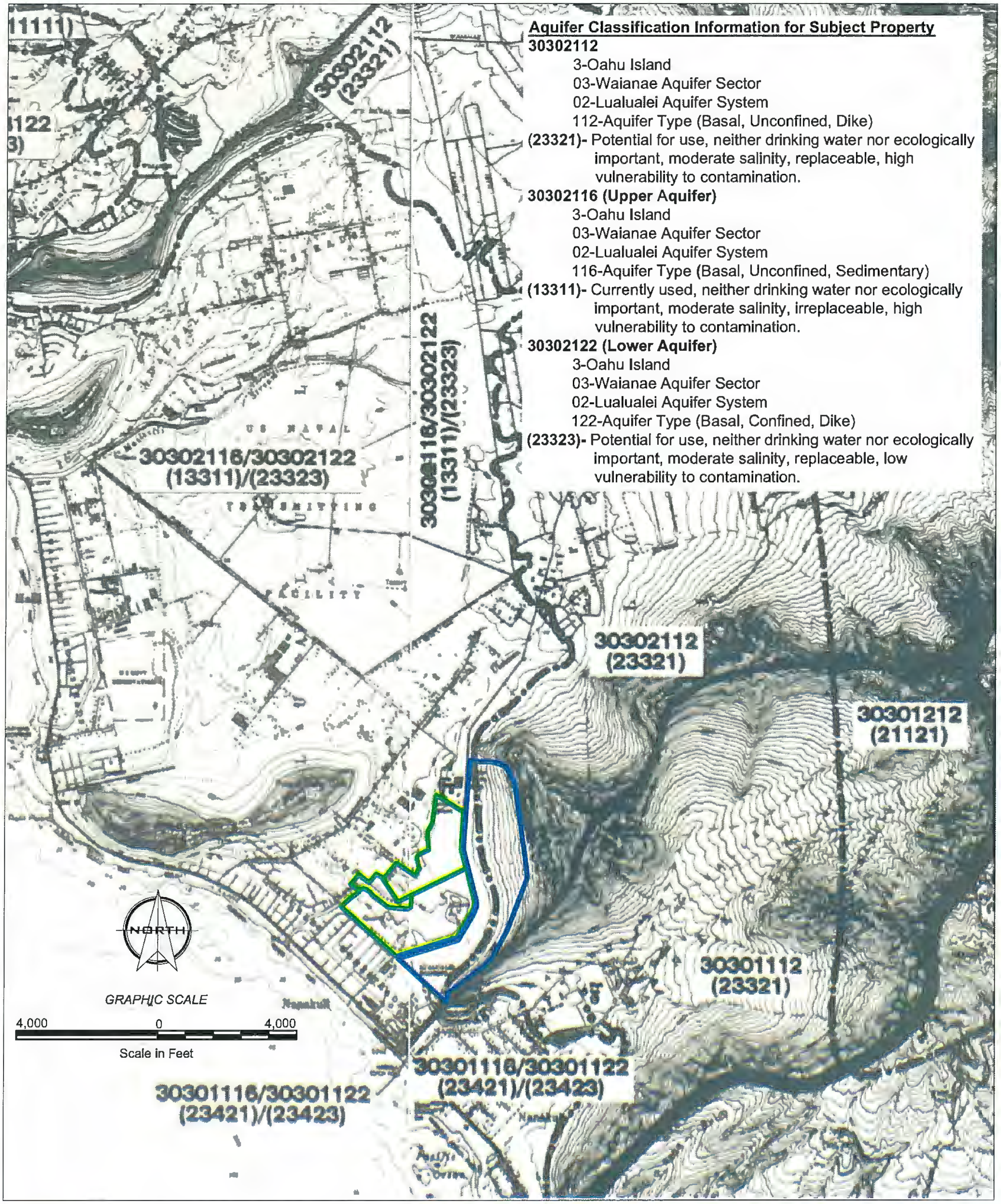
***Aquifer Classification at the Site***

Groundwater at the site occurs within coralline, alluvial, and volcanic materials. According to the aquifer identification and classification for O'ahu (Mink and Lau, 1990), two aquifers occur at the site, one overlying the other. Both aquifers are classified within the Lualualei Aquifer System of the Wai'anae Aquifer Sector.

The upper aquifer is a sedimentary caprock aquifer, which overlies a deeper volcanic aquifer. The sedimentary caprock aquifer, Aquifer Code 30302116, occurs within coralline and alluvial material at the site. This aquifer is a basal aquifer, which means that freshwater is in contact with seawater. The aquifer is unconfined, where the water table is the upper surface of the saturated aquifer, and the aquifer is currently used for purposes other than drinking water, such as for irrigation or industrial purposes. In addition, the aquifer is not classified as ecologically important. Salinity in the aquifer is moderate, having 1,000 to 5,000 milligrams per liter (mg/l) or ppm of chloride. The aquifer is also classified as irreplaceable and highly vulnerable to contamination. Based on measurements taken from the groundwater monitoring wells at PVT ISWMF, the water level or head in this aquifer is approximately 1 to 3 feet above MSL (approximately 30 to 70 feet below the ground surface). Extended groundwater level monitoring using pressure transducers indicated that the groundwater in the caprock aquifer is weakly influenced by tidal fluctuations (Joseph, 2004). Inland of the tidal reach, the bottom of the Ulehawa Stream channel has a thick layer of silt and clay. This results in minimal permeability in Ulehawa Stream and limits the amount and rate of seepage from the stream into the caprock aquifer that lies beneath the site. This also causes the water level in Ulehawa Stream to be different than the groundwater levels beneath the site (Joseph, 2004).

The lower aquifer at the site occurs within volcanic rocks directly beneath the coralline and alluvial sediments at depths on the order of 300 feet (Macdonald et al., 1983). This basal aquifer, Aquifer Code 30302122, is confined by the sedimentary materials lying above it, and occurs in volcanic rocks within compartments formed by dikes. The aquifer is not currently used; however, it does have potential for use as a source of non-drinking water. The salinity of this aquifer is moderate, 1,000 to 5,000 mg/l chloride, and the aquifer is not classified as ecologically important. This aquifer is further classified as replaceable with a low vulnerability to contamination.

These two aquifers at the site extend beneath the undeveloped property east of Lualualei Naval Road, along the lower slopes of Pu'u Heleakalā, as shown on Figure 9, Aquifer



**Aquifer Classification Information for Subject Property**

**30302112**

3-Oahu Island
03-Waianae Aquifer Sector
02-Lualualei Aquifer System
112-Aquifer Type (Basal, Unconfined, Dike)

**(23321)**- Potential for use, neither drinking water nor ecologically important, moderate salinity, replaceable, high vulnerability to contamination.

**30302116 (Upper Aquifer)**

3-Oahu Island
03-Waianae Aquifer Sector
02-Lualualei Aquifer System
116-Aquifer Type (Basal, Unconfined, Sedimentary)

**(13311)**- Currently used, neither drinking water nor ecologically important, moderate salinity, irreplaceable, high vulnerability to contamination.

**30302122 (Lower Aquifer)**

3-Oahu Island
03-Waianae Aquifer Sector
02-Lualualei Aquifer System
122-Aquifer Type (Basal, Confined, Dike)

**(23323)**- Potential for use, neither drinking water nor ecologically important, moderate salinity, replaceable, low vulnerability to contamination.

Legend

PVT ISWMF Property Boundary
Leeward Land Property Boundary
Aquifer Sector
Aquifer System

Basemap Reference: Mink and Lau, 1990.

Approved by: JKH
Drawn by: LBM
Date: October 2015

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## Figure 9
## Aquifer Classification Map

Groundwater and Leachate Monitoring Plan
PVT Integrated Solid Waste Management Facility
Nanakuli, Oahu, Hawaii

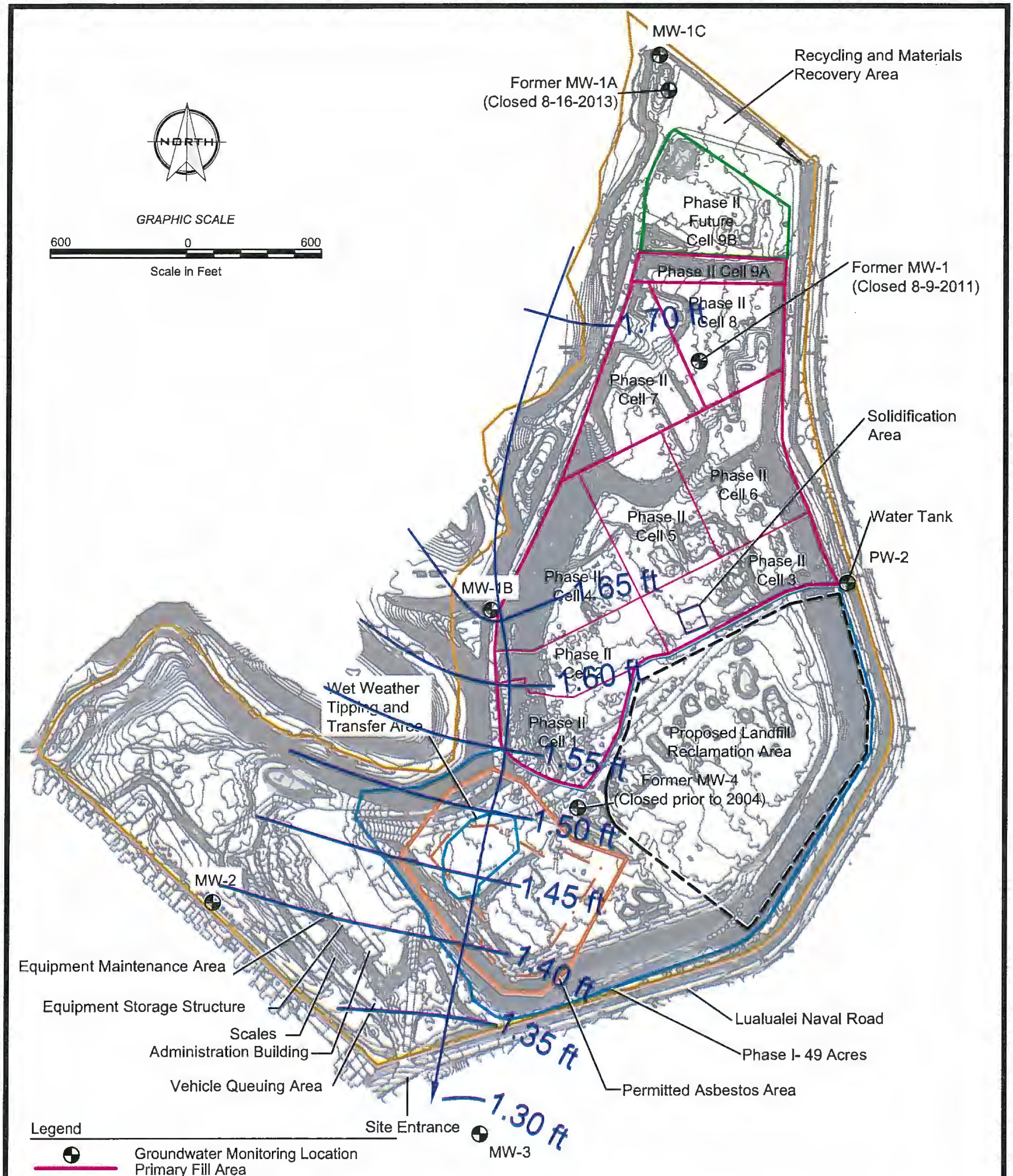
Classification Map. However, along the upper slopes of Pu'u Heleakalā, also beneath the undeveloped Leeward Land property, lies a third aquifer within the Lualualei Aquifer System of the Wai'anae Aquifer Sector. This aquifer, Aquifer 30302112, contains unconfined, dike-impounded basal water. Aquifer 30302112 is classified as having potential use but not as a source of drinking water, nor is it considered ecologically important. The aquifer is classified as having a moderate salinity with chloride concentrations between 1,000 and 5,000 mg/l. The aquifer is also classified as replaceable with a high vulnerability to contamination since there is no overlying aquifer (Mink and Lau, 1990). PVT ISWMF's well PW-1 is located in this aquifer. Based on measurements taken at well PW-1, the groundwater surface is 132 feet below the ground surface at an elevation of approximately 4 feet above MSL.

### ***Groundwater Flow Direction and Gradient***

The groundwater monitoring wells at PVT ISWMF and production well PW-2 are located in the sedimentary caprock aquifer (Aquifer Code 30302116). The groundwater flow direction and gradient in this aquifer is monitored semiannually in accordance with the 2004 Groundwater Monitoring Plan. The flow direction and gradient in this aquifer has been consistent over the years and is well documented (Mountain Edge Environmental, Inc., 2004, 2005, 2006a, 2006b; Element Environmental, LLC, 2007a, 2007b, 2008a, 2008b, 2009a, 2009b, 2010a, 2010b, 2011a, 2011b, 2012a, 2012b; and Juturna LLC, 2013a, 2013b, 2014a, 2014b, 2015). Groundwater flows in a south to southwest direction with a very flat gradient, as shown on Figure 10, Groundwater Gradient Map. The groundwater velocity is estimated to be in the range of 1.6 to 2.4 feet per day (Joseph, 2004). The flow is low, and the maximum range of groundwater elevation change measured in the wells since 1995 is less than two feet, as shown on Table 2. The groundwater gradient map shown on Figure 10 was generated using groundwater elevations measured on June 29, 2015 in the four monitoring wells. Table 2 lists the groundwater elevations measured on June 29, 2015, as well as data collected over the last ten years.

Groundwater elevations in the wells on June 29, 2015 ranged from 1.28 feet to 1.74 feet MSL, and the groundwater gradient averaged approximately 1.1 x $10^{-4}$ foot/foot across the site. The gradient map (Figure 10) shows that well MW-1C is an upgradient well and that wells MW-1B, MW-2 and MW-3 are downgradient.

Two wells (well 2308-02 [PW-1] and well 2308-03) are located in the volcanic dike aquifer (Aquifer Code 30302112), which occurs along the upper slopes of Pu'u Heleakalā on the undeveloped Leeward Land property east of the site. Head levels in this aquifer are significantly higher (50 to 63 percent) than those in the sedimentary caprock aquifer (Element Environmental, LLC, 2007c). The groundwater flow direction and gradient in the volcanic dike aquifer has not been previously measured; however, based on static water level measurements in well PW-1 and on the geologic structure and aquifer boundaries documented in the literature (Mink and Lau, 1990; Macdonald, et al., 1983; Stearns, 1938), the groundwater is anticipated to flow toward the boundary with the sedimentary caprock aquifer. It is likely that groundwater from the volcanic dike aquifer discharges into the sedimentary caprock aquifer



Basemap Reference: TerraPAC LLC, 2014.

Legend

- ⊕ Groundwater Monitoring Location
- ▬ Primary Fill Area
- ▬ Secondary Fill Area: Phase I
- ▬ Facility Boundary
- ▬ Asbestos Disposal Area
- ‒ · ‒ Active Asbestos Disposal Area
- ▬ Future Phase II Areas
- ▬ Solidification Area
- ▬ Wet Weather Tipping and Transfer Area
- ‒ ‒ ‒ Proposed Landfill Reclamation Area
- ∼ Groundwater Contour (ft msl)
- → Groundwater Flow Direction

Note: Groundwater contour based on static water level measurements collected 6/29/2015.

Approved by: JKH
Drawn by: LBM
Date: October 2015

JUTURNA LLC

**Figure 10**
**Groundwater Gradient Map**

Groundwater and Leachate Monitoring Plan
PVT Integrated Solid Waste Management Facility
Nanakuli, Oahu, Hawaii

along the aquifer boundaries. However, it is possible that individual dike compartments could have a significant role in controlling the localized groundwater flow patterns at the site.

No data is available on the groundwater flow direction and gradient in the deeper volcanic dike aquifer (Aquifer Code 30302122) located below the sedimentary caprock aquifer.

**Table 2: Groundwater Elevations in PVT ISWMF Wells**

| Date | Well Number / Groundwater Elevation (feet MSL) | | | | | | |
|---|---|---|---|---|---|---|---|
| | MW-1 | MW-1A | MW-1B | MW-1C | MW-2 | MW-3 | PW-2 |
| 5/21/2004 | 1.75 | 1.90 | ---- | ---- | 1.44 | 1.41 | 1.82 |
| 6/27/2005 | 1.55 | 1.89 | ---- | ---- | 1.40 | 1.46 | NM |
| 12/27/2005 | 1.62 | 1.81 | ---- | ---- | 1.54 | 1.49 | NM |
| 10/20/2006 | 3.34 | 3.44 | ---- | ---- | 2.72 | 2.70 | NM |
| 12/19/2006 | 3.13 | 3.21 | ---- | ---- | 2.52 | 2.52 | NM |
| 6/29/2007 | 2.85 | 2.94 | ---- | ---- | 2.17 | 2.18 | NM |
| 12/12/2007 | 3.30 | 3.39 | ---- | ---- | 2.67 | 2.69 | NM |
| 6/25/2008 | 3.00 | 3.09 | ---- | ---- | 2.30 | 2.33 | NM |
| 12/9/2008 | 3.04 | 3.11 | ---- | ---- | 2.44 | 2.42 | NM |
| 6/17/2009 | 2.71 | 2.77 | ---- | ---- | 2.02 | 2.00 | NM |
| 12/9/2009 | 2.95 | 3.03 | ---- | ---- | 2.00 | 2.28 | NM |
| 6/30/2010 | 1.51 | 1.67 | ---- | ---- | 1.33 | 1.35 | NM |
| 12/30/2010 | 1.90 | 2.03 | ---- | ---- | 1.81 | 1.79 | NM |
| 6/30/2011 | 1.50 | 1.67 | ---- | ---- | 1.37 | 1.37 | NM |
| 12/28/2011 | sealed | 1.50 | 1.38 | ---- | 1.17 | 1.20 | NM |
| 6/14/2012 | sealed | 1.59 | 1.49 | ---- | 1.25 | 1.27 | NM |
| 12/26/2012 | sealed | 1.92 | 1.78 | ---- | 1.66 | 1.72 | NM |
| 6/26/2013 | sealed | 1.69 | 1.57 | ---- | 1.43 | 1.43 | NM |
| 1/23/2014 | sealed | sealed | 1.65 | ---- | 1.42 | 1.42 | NM |
| 6/6/2014 | sealed | sealed | 1.72 | 1.78 | 1.46 | 1.34 | NM |
| 1/12/2015 | sealed | sealed | 1.54 | 1.78 | 1.31 | 1.23 | 1.44 |
| 6/29/2015 | sealed | sealed | 1.66 | 1.74 | 1.39 | 1.28 | NM |

NM = Not Measured on indicated date. ---- = Well was not yet constructed on indicated date.

Note: An electronic water level indicator was used to measure the depth to groundwater from the known elevations at the top of the well casings. On each day, static water levels were measured within a one-hour period so that changes caused by tidal influence were minimized. Obtaining water level measurements in the pump wells is difficult because it involves turning the pumps off and allowing the water levels to equilibrate which takes several hours, and the pumps need to be running during landfill operating hours; therefore, water levels are not routinely measured in the pump wells.

Reference: Mountain Edge Environmental, Inc., 2004, 2005, 2006a, 2006b; Element Environmental, LLC, 2007a, 2007b, 2008a, 2008b, 2009a, 2009b, 2010a, 2010b, 2011a, 2011b, 2012a, 2012b; Juturna LLC, 2013a, 2013b, 2014a, 2014b, 2015.

## 2.7 Groundwater Quality

### 2.7.1 Summary of Previous Sampling Events

The groundwater quality at PVT ISWMF in the sedimentary caprock aquifer has been monitored since 1992 initially following the guidelines set forth in the Groundwater Protection and Monitoring Plan prepared by Belt Collins (Belt Collins Hawaii, 1998), then following the 2004 Groundwater Monitoring Plan prepared by Mountain Edge Environmental, Inc. (2004). According to the 1998 plan, sampling and analysis of groundwater from wells MW-1A, MW-1, MW-2 and MW-3 was undertaken twice in 1992 and annually thereafter. In 1996, three rounds of groundwater sampling were completed to provide the minimum amount of samples needed for statistical data analysis. Samples were collected annually in 1997 and 1998 then in 1999 and 2000, three to four samples were collected per year to provide the minimum amount of samples needed for statistical analysis for new detection monitoring parameters. From 2001 to present, groundwater sampling and analysis has occurred semiannually, in June or July during the dry season and in December or January during the rainy season.

Well MW-1, which was located upgradient of the C&D landfill, was permanently closed in August 2011 to allow for construction of landfill Cell 8. Well MW-1B was installed in December 2011 to replace MW-1. Well MW-1A, which was the primary upgradient well, was permanently closed in August 2013 to allow for construction of the recycling and materials recovery facility and a new stormwater basin. Well MW-1C, which is now the only upgradient well, was installed in March 2014 to replace MW-1A. Additional groundwater samples from new well MW-1B were collected outside the standard semiannual sampling events to obtain the minimum number of samples needed for statistical analysis. Likewise, additional sampling outside the standard semiannual sampling events is currently ongoing for well MW-1C.

The results of the groundwater sampling events from 1992 through 2014 are presented in reports prepared by Belt Collins Hawaii (1998), Masa Fujioka & Associates (1998 to 2003), Mountain Edge Environmental, Inc. (2004 to 2006), Element Environmental, LLC (2007 to 2012), and Juturna LLC (2012 to 2015); and a summary of these groundwater quality results is provided in the following sections, along with a table of all the data presented in Attachment 1.

Production well PW-1, which is located in the volcanic dike aquifer on the undeveloped Leeward Land parcel east of the site, has been sampled twice, once on February 25, 2005 and again on April 12, 2007. A summary of the groundwater quality results from these two sampling events is also provided in the following sections.

### 2.7.2 Historical Organic Compound Detections

Three volatile organic compounds (VOCs) have been historically detected in the two former upgradient groundwater monitoring wells at the site (wells MW-1A and MW-1), and now new upgradient well MW-1C has had VOC detections in its first four rounds of sampling. In addition, trace levels of one of the VOCs have been periodically detected in downgradient well MW-3. A list of historical volatile organic compound detections in the sedimentary caprock aquifer is provided in Table 3. Organic compounds have not been detected in groundwater from well PW-1 in the volcanic dike aquifer.

As shown on Table 3, groundwater samples collected in May 1993 through December 2006 and in June 2010 from upgradient well MW-1 (upgradient of PVT's C&D landfill) have contained the VOC trichloroethene (TCE), except for the first semiannual monitoring event for 2006 where TCE was not detected above the reporting limit. The detected TCE concentrations in well MW-1 have ranged from 0.0048 to 0.0459 mg/l. Low concentrations of TCE (0.0006 to 0.00813 mg/l) were also detected in groundwater collected from downgradient well MW-3 in

1999, 2002, 2010, and 2011, but have not been detected since 2011. Some of these TCE concentrations are considered estimated concentrations since they were detected below the laboratory reporting limit. Recently, low concentrations of TCE (0.0054 to 0.007 mg/l) have been detected in new upgradient well MW-1C, which is located in the northernmost corner of the site, upgradient of all site activities. Also recently detected in MW-1C were low concentrations of tetrachloroethene (PCE) (0.0055 to 0.0076 mg/l) and cis-1,2-dichloroethene (cis-1,2-DCE) (0.005 and 0.0052 mg/l), which have not been previously detected in the wells at PVT ISWMF. TCE and PCE were used as dry-cleaning chemicals and as solvents to remove grease from metal parts (United States Environmental Protection Agency [USEPA], 2014). TCE is also a breakdown product of PCE, and cis-1,2-DCE is a breakdown product of TCE (USEPA, 2014). The source of these VOCs is suspected to be from an unlined wastewater pond at the Lualualei Naval Reservation, which is located upgradient of PVT ISWMF and was found to contain PCE (Belt Collins Hawaii, 2005).

## Table 3: Historical Volatile Organic Compound Detections

| Constituent | Units | Well | Date | Result | Laboratory Reporting Limit |
|---|---|---|---|---|---|
| Trichloroethene | mg/l | MW-1 | 5/28/1993 | 0.0048 | 0.00025 |
| Trichloroethene | mg/l | MW-1 | 6/27/1994 | 0.0066 | 0.0005 |
| Trichloroethene | mg/l | MW-1 | 6/14/1995 | 0.012 | 0.002 |
| Trichloroethene | mg/l | MW-1 | 8/7/1995 | 0.013 | 0.0005 |
| Trichloroethene | mg/l | MW-1 | 6/27/1996 | 0.015 | 0.0005 |
| Trichloroethene | mg/l | MW-1 | 8/29/1996 | 0.022 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 9/23/1996 | 0.019 | 0.0005 |
| Trichloroethene | mg/l | MW-1 | 7/2/1997 | 0.021 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 11/12/1998 | 0.018 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 4/23/1999 | 0.017 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 9/27/1999 | 0.018 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 12/2/1999 | 0.016 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 2/2/2000 | 0.0157 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 5/25/2000 | 0.0137 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 8/25/2000 | 0.0158 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 11/29/2000 | 0.0131 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 6/21/2001 | 0.0150 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 12/6/2001 | 0.0148 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 6/10/2002 | 0.0133 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 12/3/2002 | 0.0459 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 6/26/2003 | 0.0113 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 12/4/2003 | 0.0108 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 6/9/2004 | 0.00802 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 12/20/2004 | 0.00767 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 6/27/2005 | 0.00695 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 12/22/2005 | 0.0069 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 12/19/2006 | 0.00524 | 0.005 |
| Trichloroethene | mg/l | MW-1 | 6/30/2010 | 0.0042 | 0.001 |

| Constituent | Units | Well | Date | Result | Laboratory Reporting Limit |
|---|---|---|---|---|---|
| 1,2-dichloroethane | mg/l | MW-1A | 8/7/1995 | 0.016 | 0.0005 |
| 1,2-dichloroethane | mg/l | MW-1A | 6/27/1996 | 0.013 | 0.0005 |
| 1,2-dichloroethane | mg/l | MW-1A | 8/29/1996 | 0.015 | 0.0005 |
| 1,2-dichloroethane | mg/l | MW-1A | 9/23/1996 | 0.026 | 0.0005 |
| 1,2-dichloroethane | mg/l | MW-1A | 7/2/1997 | 0.017 | 0.005 |
| 1,2-dichloroethane | mg/l | MW-1A | 11/12/1998 | 0.014 | 0.005 |
| 1,2-dichloroethane | mg/l | MW-1A | 4/23/1999 | 0.014 | 0.005 |
| 1,2-dichloroethane | mg/l | MW-1A | 9/27/1999 | 0.0078 | 0.005 |
| 1,2-dichloroethane | mg/l | MW-1A | 12/2/1999 | 0.002 | 0.005 |
| 1,2-dichloroethane | mg/l | MW-1A | 8/25/2000 | 0.00565 | 0.005 |
| Methyl tert-butyl ether | mg/l | MW-1A | 4/23/1999 | 0.005 | 0.005 |
| Methyl tert-butyl ether | mg/l | MW-1A | 9/27/1999 | 0.0056 | 0.005 |
| Methyl tert-butyl ether | mg/l | MW-1A | 2/2/2000 | 0.00612 | 0.005 |
| Methyl tert-butyl ether | mg/l | MW-1A | 5/25/2000 | 0.00542 | 0.005 |
| Methyl tert-butyl ether | mg/l | MW-1A | 8/25/2000 | 0.00612 | 0.005 |
| Methyl tert-butyl ether | mg/l | MW-1A | 6/21/2001 | 0.00515 | 0.005 |
| Methyl tert-butyl ether | mg/l | MW-1A | 12/3/2002 | 0.00644 | 0.005 |
| Cis-1,2-dichloroethene | mg/l | MW-1C | 6/6/2014 | 0.0052 | 0.005 |
| Cis-1,2-dichloroethene | mg/l | MW-1C | 7/23/2014 | 0.005 | 0.005 |
| Tetrachloroethene | mg/l | MW-1C | 6/6/2014 | 0.0076 | 0.005 |
| Tetrachloroethene | mg/l | MW-1C | 7/23/2014 | 0.007 | 0.005 |
| Tetrachloroethene | mg/l | MW-1C | 1/12/2015 | 0.0065 | 0.005 |
| Tetrachloroethene | mg/l | MW-1C | 4/28/2015 | 0.0055 | 0.005 |
| Trichloroethene | mg/l | MW-1C | 6/6/2014 | 0.0064 | 0.005 |
| Trichloroethene | mg/l | MW-1C | 7/23/2014 | 0.007 | 0.005 |
| Trichloroethene | mg/l | MW-1C | 1/12/2015 | 0.006 | 0.005 |
| Trichloroethene | mg/l | MW-1C | 4/28/2015 | 0.0054 | 0.005 |
| Trichloroethene | mg/l | MW-3 | 4/23/1999 | 0.0006 | 0.005 |
| Trichloroethene | mg/l | MW-3 | 9/27/1999 | 0.0008 | 0.005 |
| Trichloroethene | mg/l | MW-3 | 12/2/1999 | 0.001 | 0.005 |
| Trichloroethene | mg/l | MW-3 | 12/3/2002 | 0.00813 | 0.005 |
| Trichloroethene | mg/l | MW-3 | 6/30/2010 | 0.0020 | 0.001 |
| Trichloroethene | mg/l | MW-3 | 12/28/2011 | 0.0016 | 0.001 |

Reference: Juturna LLC, 2015.

The VOCs 1,2-dichloroethane (DCA) and methyl tert-butyl ether (MTBE) have been detected in groundwater collected from upgradient well MW-1A. Like PCE, DCA is also a metal degreaser (USEPA, 2015a), while MTBE is used as a fuel additive to motor gasoline (USEPA, 2015b). Concentrations of DCA ranged from 0.002 to 0.026 mg/l, and concentrations of MTBE ranged from 0.005 to 0.00644 mg/l. Neither VOC has been detected in groundwater collected from well MW-1A after 2002. The source of the DCA is suspected to be from the unlined wastewater pond at the Lualualei Naval Reservation (Belt Collins Hawaii, 2005). The source of the MTBE is suspected to be from abandoned buses and 55-gallon drums that were dumped in Ulehawa Stream on an adjacent property, but were removed in 2001 (Belt Collins Hawaii, 2005).

In 1994, the semivolatile organic compound benzo(a)pyrene was detected in well MW-3. However, benzo(a)pyrene was not detected in any well samples since 1994 (Belt Collins Hawaii, 1998; Masa Fujioka & Associates, 1998 to 2003; Mountain Edge Environmental, Inc., 2004 to 2006; Element Environmental, LLC, 2007 to 2012; and Juturna LLC, 2013 to 2015).

Total petroleum hydrocarbons (TPH) as diesel was detected in all wells during the June 10, 2002 sampling event and in well MW-1A in the December 3, 2002 sampling event (Masa Fujioka & Associates, 2002). The fact that TPH-diesel had not been previously detected in these wells and that the levels encountered during the June 2002 sampling event had similar concentrations, suggests that there may have been cross-contamination during sampling. This cross-contamination perhaps resulted from inadequately decontaminated field sampling equipment. The TPH-diesel concentration encountered in well MW-1A during the December 2002 sampling event was likely remaining contamination from the previous sampling event. TPH-diesel has not been detected in groundwater above reporting limits before or after the 2002 sampling events, except for one recent detect of extractable petroleum hydrocarbons – diesel range organics (DRO), which was detected in MW-1C in April 2015 at a concentration of 0.066 mg/l; however, the chromatographic fingerprint of the sample resembled a petroleum product eluting in approximately the correct carbon range, but the elution pattern did not match the calibration standard.

Every five years total organic carbon (TOC) is monitored in the groundwater monitoring wells at the site. TOC in groundwater can originate from decaying natural organic matter and from synthetic chemicals, such as pesticides, fertilizers, and detergents, for example. In 2004 all four wells had concentrations of TOC ranging from 12.8 mg/l in MW-1A to 21.2 mg/l in MW-2. In 2009 only MW-2 had a detectable concentration of TOC, 5.9 mg/l. In April 2015, TOC was detected in all four wells again, at concentrations ranging from 0.92 mg/l in MW-3 to 3.47 mg/l in MW-2 (Juturna LLC, 2015).

### 2.7.3 Inorganic Groundwater Geochemistry

In addition to organic compounds, the following inorganic analytes are currently monitored semiannually in the groundwater at the site: total dissolved solids (TDS), chloride, sodium, potassium, magnesium, calcium, sulfate, and alkalinity. These inorganic analytes, which occur naturally in groundwater, are monitored semiannually so that small changes or trends in groundwater geochemistry can be detected. Every five years groundwater is also analyzed for the metals arsenic, cadmium, chromium, iron, and lead.

As part of PVT ISWMF's groundwater monitoring program, the groundwater monitoring data from 1992 to present is input into a statistical analysis program. The program generates Shewhart-CUSUM (cumulative sum) intra-well control charts that show the concentrations of each of the analytes detected in groundwater in each of the four monitoring wells plotted over time. The intra-well control charts include a line, called the control limit, for each of the sample points and analytes. Concentrations plotted above the control limit line are deemed "out of control" and indicate that a release may have occurred. Attachment 2 contains intra-well control charts as of April 2015 (the most recent available sampling results). Since new well

MW-1C has only been sampled four times, data from closed well MW-1A is included in the intra-well control charts until well MW-1C has the recommended minimum eight sampling events for the statistical analysis to be valid (DOH, 2002). Well MW-1A was last sampled in June 2013 prior to being closed.

As shown in the intra-well control charts, prior to 1998, the metals cadmium and chromium were periodically detected in wells MW-1A, MW-2, and MW-3 at low concentrations consistent with naturally-occurring levels of metals in groundwater; however, concentrations of these metals have been non-detectable in the groundwater samples since 1998. Cadmium and chromium have not been detected in monitoring wells MW-1, MW-1B, or MW-1C, while the metal arsenic has not been detected in any of the groundwater monitoring wells at the site. The metal lead was detected once in well MW-1B when the well was first sampled; however, lead has been non-detect in well MW-1B since 2012, and has never been detected in any of the other monitoring wells. Low levels of the metal iron, consistent with naturally-occurring concentrations, have been periodically detected in well MW-1B and once in wells MW-1A and MW-3.

The intra-well control charts in Attachment 2 contain the updated the background data, which includes all data through April 2015 as recommended in the last detection monitoring report (Juturna LLC, 2015). In accordance with the 2004 Groundwater Monitoring Plan, the background data and concentration control limits are updated every five years, and serve to adjust the Groundwater Monitoring Plan (Mountain Edge Environmental, Inc., 2004). The intra-well control charts show that since the last background update in 2009, all CUSUM statistical analyses and all individual concentrations of all analytes have been below the control limits in all wells, except for several analytes in well MW-2 in 2011.

In 2011, the CUSUM statistical analysis exceeded the control limit for chloride, magnesium, potassium, sodium, and TDS in well MW-2, and individual concentrations of magnesium and sodium exceeded the control limit. Groundwater in well MW-2 has consistently been fresher than in the other monitoring wells; however, as indicated in the intra-well control charts, from June 2007 to June 2011, the groundwater in well MW-2 became more brackish, as the concentrations of these constituents increased. Then in December 2011, the concentrations of these constituents in MW-2 decreased dramatically and have more recently begun to increase again. There is a possibility that freshwater from an old subsurface freshwater line running adjacent to MW-2 was leaking and causing groundwater in the vicinity of MW-2 to become fresher. The line was replaced in 2007 with a new 12-inch line. If the old line was leaking and influencing groundwater in MW-2 and was replaced in early 2007, it would explain why the water became more brackish beginning in June 2007. In 2011 a tree nursery with a subsurface freshwater irrigation system was installed in the vicinity of well MW-2 (Joseph, 2015), which would explain why the groundwater in MW-2 became fresher beginning in December 2011. Irrigation was more frequent after the trees were initially planted; however, now that the trees have grown, the frequency of irrigation was reduced beginning in early 2013 (Joseph, 2015), which would explain why the groundwater in MW-2 is now becoming more brackish again. It is also possible that freshwater may be influencing groundwater in the vicinity of MW-2 from the adjacent residential area and may change over time due to residential water use and/or rainfall.

As shown on the updated intra-well control charts, since 2011, all CUSUM statistical analyses and all individual concentrations have been below the control limits, which indicates that there have been no statistical exceedances, or potential releases of contaminants to groundwater from the landfill.

The statistical analysis program used at the site also generates time series plots of the data, which graphically show trends in the data over time. The time series plots are presented in Attachment 3.

Table 4 shows the concentrations of the inorganic analytes detected in the groundwater monitoring wells during the latest sampling event in April 2015. Also shown on Table 4 are the results for samples collected in 2005 and 2007 from well PW-1, which is located in the volcanic dike aquifer east of the site. Additional water quality data from well PW-1 is shown on Table 5.

**Table 4: Inorganic Groundwater Quality Results**

| **Analyte** | **Units** | **Well Number / Date Sampled** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **MW-1B Apr. 2015** | **MW-1C Apr. 2015** | **MW-2 Apr. 2015** | **MW-3 Apr. 2015** | **PW-1 Feb. 2005** | **PW-1 Apr. 2007** |
| Calcium | mg/l | 184 | 194 | 180 | 158 | 163 | 83.2 |
| Magnesium | mg/l | 199 | 213 | 87.2 | 204 | 399 | 119 |
| Potassium | mg/l | 36.1 | 25.8 | 17.3 | 32.1 | 13.5 | 14.1 |
| Sodium | mg/l | 1090 | 1090 | 415 | 1030 | 432 | 530 |
| Alkalinity, Bicarbonate (as $CaCO_3$) | mg/l | 399 | 401 | 401 | 303 | 149 | 120 |
| Chloride | mg/l | 2100 | 2080 | 800 | 2030 | 924 | 1100 |
| Sulfate | mg/l | 380 | 390 | 190 | 320 | 109 | 130 |
| Total Dissolved Solids | mg/l | 4420 | 4360 | 2100 | 4060 | 2400 | 2300 |
| Arsenic | mg/l | ND | ND | ND | ND | ND | NA |
| Cadmium | mg/l | ND | ND | ND | ND | ND | NA |
| Chromium | mg/l | ND | ND | ND | ND | ND | NA |
| Iron | mg/l | 0.031 | ND | ND | 0.027 | 0.017 | NA |
| Lead | mg/l | ND | ND | ND | ND | ND | NA |

ND = Not Detected at or above the reporting limit. NA = Not Analyzed for listed constituent. $CaCO_3$ = Calcium Carbonate.
Reference: Juturna LLC, 2015; Element Environmental, LLC, 2007d; GE Infrastructure Water & Process Technologies, 2005.

The inorganic analytes listed in Table 4 and the additional water quality parameters listed in Table 5 are constituents that occur naturally in groundwater, and the concentrations detected are typical of naturally occurring concentrations. As shown in Table 4, groundwater from well PW-1 generally has lower concentrations of almost all of the inorganic analytes than groundwater from monitoring wells MW-1B, MW-1C, and MW-3. Concentrations of these inorganic analytes would typically be lower in groundwater from a volcanic dike aquifer as compared to groundwater from a sedimentary caprock aquifer. However, the concentrations of magnesium, sodium, chloride and TDS in well MW-2 from the sedimentary caprock aquifer are significantly lower than in well PW-1 from the volcanic dike aquifer, which supports the conclusion that well MW-2 is being influenced by freshwater from the adjacent residences, the potable water line, and/or the irrigation system.

**Table 5: Additional Groundwater Monitoring Results for PW-1, February 2005**

| Analyte | PW-1 2/25/2005 | Analyte | PW-1 2/25/2005 |
|---|---|---|---|
| Ammonia, Free, as N | < 0.3 | Chromium, Hexavalent | < 0.01 |
| Ammonia, Fixed Organic, as N | < 0.4 | Fluoride | < 0.4 |
| Ammonia, Free and Fixed, as N | < 0.3 | Phosphate, Filtered Total | < 0.4 |
| pH (pH units) | 7.9 | Phosphate, Filtered Total Inorganic | < 0.2 |
| Specific Conductance at 25° C (μmhos) | 3380 | Arsenic, Total | < 0.01 |
| Hardness, Total, as $CaCO_3$ | 586 | Arsenic, Filtered | < 0.1 |
| Magnesium Hardness, Total, as $CaCO_3$ | 424 | Boron, Filtered | 0.12 |
| Barium, Total | 0.008 | Beryllium | < 0.005 |
| Strontium, Total | 0.81 | Boron | 0.12 |
| Hardness, Filtered, as $CaCO_3$ | 562 | Cadmium, Filtered | < 0.01 |
| Barium, Filtered | < 0.01 | Cadmium | < 0.005 |
| Strontium, Filtered | 0.81 | Chromium, Total | < 0.01 |
| Copper, Total | 0.003 | Chromium, Filtered | < 0.03 |
| Copper, Filtered | < 0.05 | Cobalt, Filtered | < 0.01 |
| Iron, Total | 0.017 | Cobalt, Total | < 0.005 |
| Iron, Filtered | < 0.05 | Lead, Filtered | < 0.05 |
| Lithium | 0.003 | Lead, Total | < 0.005 |
| Zinc, Total | 0.01 | Molybdenum, Filtered | < 0.06 |
| Zinc, Filtered | < 0.04 | Nickel, Filtered | < 0.01 |
| Aluminum, Total | < 0.01 | Nickel, Total | < 0.005 |
| Aluminum, Filtered | < 0.1 | Selenium, Total | 0.01 |
| Manganese, Total | < 0.005 | Selenium, Filtered | < 0.1 |
| Manganese, Filtered | < 0.01 | Tin, Total | < 0.01 |
| Nitrate | 6.5 | Titanium, Total | 0.006 |
| Molybdenum | <0.006 | Titanium, Filtered | < 0.01 |
| Phosphate, Total | < 0.4 | Vanadium, Total | 0.041 |
| Phosphate, Total Inorganic | 0.2 | Vanadium, Filtered | 0.04 |
| Phosphate, Ortho | 0.2 | Zirconium, Total | 0.012 |
| Phosphate, Filtered Ortho | < 0.2 | Thallium, Total | < 0.05 |
| Silica, Colloidal | < 17 | Tin, Filtered | < 0.05 |
| Silica, Total | 84 | Total Organic Carbon | < 1 |
| Silica, Filtered | 83 | Chemical Oxygen Demand as $O_2$ | 7980 |
| Silica, Reactive | 83 | Turbidity (NTU) | 0.8 |
| Total Suspended Solids | < 10 | | |

Results are in mg/l unless otherwise indicated.
Reference: GE Infrastructure Water & Process Technologies, 2005.

Stiff diagrams, included in Attachment 4, are used to visually represent cation and anion composition trends in the data of many samples. In this case, the Stiff diagrams are used to show differences in water quality between the wells over time. The shapes of Stiff diagrams representing cation and anion composition of groundwater from wells MW-1, MW-1A, MW-1B, MW-1C, and MW-3 have not changed over time and are all very similar to each other, with the exception of the Stiff diagrams for samples collected on June 10, 2002 when the laboratory did not analyze for sodium. These diagrams have a different shape due to the lack of a sodium concentration in the cation composition. The stiff diagrams for MW-2 vary over time and look different than the other wells. It appears that groundwater in MW-2 is being influenced by freshwater because sodium and chloride concentrations are lower in this well as compared to the other wells. Sodium and chloride concentrations in MW-2 steadily increased (i.e., the water in the well became more brackish) from June 2007 to June 2011, and the Stiff diagrams began to look similar to the other wells. However, from December 2011 to December 2012 the sodium and chloride concentrations in MW-2 began to decrease again (i.e., the water in the well became fresher), and it appears that from June 2013 to present, MW-2 is again becoming slightly more brackish. As with the intra-well control charts, the Stiff diagrams support the conclusion that well MW-2 is being influenced by freshwater from the potable water line, the irrigation system, and/or the adjacent residences.

## 2.8 Leachate Water Quality

Leachate generated within the disposal cells of Phase II of the C&D landfill at PVT ISWMF is collected in the gravel leachate collection and removal system and flows by gravity to a leachate collection sump. The sump is designed to contain leachate to a depth of four feet below the adjacent cell floor (A-Mehr, Inc., 2011). In accordance with the 2004 Groundwater Monitoring Plan (Mountain Edge Environmental, Inc., 2004), samples of leachate are collected from the leachate collection sump annually during the second semiannual sampling period for the constituents listed in Table 6. Table 6 also shows the leachate sample results for the last nine years.

As shown on Table 6, most of the analytes in the leachate have fluctuated over the last nine years without any apparent trend in the data. DRO compounds, however, steadily increased from 0.0896 mg/l in December 2009 to 0.820 mg/l in January 2014, but decreased to 0.33 mg/l in April 2015. Arsenic and cadmium have not been detected in the leachate, while lead was detected for the first time in December 2012 just at the reporting limit, and was non-detect again in January 2014 and January 2015. Chromium concentrations in the leachate have been non-detectable in some years and detectable in other years ranging from 0.009 mg/l to 0.151 mg/l. Likewise, concentrations of iron have varied from non-detect to 6.02 mg/l. The variation in analyte concentrations in the leachate is likely due to the nature of waste that has been placed in the landfill over the years and variations in the amount of rainfall. It should be noted that even though the leachate is contained within the landfill's leachate collection system and is not in contact with any groundwater, the concentrations of analytes detected in the leachate do not exceed the State of Hawaii environmental action levels for groundwater beneath the site (DOH, 2011).

Stiff diagrams of landfill leachate data were prepared to compare to the Stiff diagrams generated from the monitoring well data, as shown in Attachment 4. The Stiff diagrams for leachate samples from 2006 have a similar shape to the Stiff diagrams for wells MW-1, MW-1A, MW-1B, MW-1C, and MW-3, though the concentrations of cations and anions are greater in the leachate samples. The similar shape of the leachate and groundwater Stiff diagrams is likely due to the influence of rainwater on both the groundwater and the leachate. In 2006, the leachate consisted primarily of rainwater because the amount of waste in the lined area of the landfill was limited. The Stiff diagrams of leachate from 2007 and 2008 are much different than those from 2006, which reflects more waste being placed in the lined area of the landfill. The Stiff diagrams for leachate samples collected from 2009 to 2015 have a completely different shape than the Stiff diagrams for leachate samples collected in 2006 and are completely different from any of the wells. The change in the shape of the diagram from 2006 is due to the addition of more waste into the landfill. The cation and anion composition of the leachate will likely change over time due to the amount and nature of waste in the landfill. The fact that the Stiff diagrams of the wells are completely different than those of the leachate indicates that the leachate is not influencing groundwater.

**Table 6: Leachate Sample Results**

| **Analyte** | **Units** | **Leachate Sample Date** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **Jun. 2006** | **Dec. 2007** | **Dec. 2008** | **Dec. 2009** | **Dec. 2010** | **Dec. 2011** | **Dec. 2012** | **Jan. 2014** | **Jan. 2015** |
| TDS | mg/l | 10,900 | 3840 | 3850 | 6600 | 7200 | 6730 | 6120 | 7380 | 6650 |
| TOC | mg/l | 28.0 | 6.6 | 3.5 | 7.6 | 7.3 | 15 | 9.4 | 14.2 | 10.5 |
| Chloride | mg/l | 5400 | 1700 | 1500 | 1500 | 1800 | 2130 | 1570 | 2420 | 1920 |
| Sulfate | mg/l | 1380 | 730 | 640 | 2500 | 2000 | 2090 | 1950 | 2230 | 1860 |
| Arsenic | mg/l | NA | NA | ND | ND | ND | ND | ND | ND | ND |
| Cadmium | mg/l | NA | NA | ND | ND | ND | ND | ND | ND | ND |
| Calcium | mg/l | 428 | 84.4 | 90.7 | 390 | 550 | 495 | 451 | 538 | 472 |
| Chromium | mg/l | NA | NA | ND | ND | 0.011 | ND | 0.151 | 0.009 | 0.019 |
| Iron | mg/l | NA | NA | ND | 1.9 | ND | 5.3 | 6.02 | 1.02 | 2.37 |
| Lead | mg/l | NA | NA | ND | ND | ND | ND | 0.01 | ND | ND |
| Magnesium | mg/l | 557 | 105 | 87.4 | 250 | 370 | 243 | 187 | 272 | 222 |
| Potassium | mg/l | 88.9 | 46.1 | 37.7 | 380 | 160 | 432 | 530 | 285 | 239 |
| Sodium | mg/l | 3230 | 1040 | 972 | 950 | 1100 | 1150 | 878 | 1310 | 1250 |
| DRO | mg/l | NA | NA | NA | 0.0896 | 0.0947 | 0.210 | 0.270 | 0.820 | 0.33* |
| Bicarbonate | mg/l | 582 | 200 | 208 | 160 | 96 | 173 | 359 | 340 | 367 |
| Temperature | °C | NA | NA | 30.7 | 37.3 | 35.5 | 37.1 | 37.7 | 38.9 | 39.1 |
| Conductivity | mS/cm | NA | 61 | 5.12 | 8.4 | 10.3 | 9.41 | 7.78 | 10.15 | 9.21 |
| pH | pH unit | NA | 7.77 | 10.1 | 7.26 | 7.3 | 7.15 | 7.13 | 7.06 | 7.11 |

Temperature, conductivity, and pH are measured in the field.
* = The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
°C = degrees Celsius; mS/cm = millisiemens per centimeter.
Reference: Element Environmental, LLC, 2007a, 2008a, 2009a, 2011a; and Juturna LLC, 2015.

In addition to Stiff diagrams, trilinear plots were prepared for leachate and groundwater samples collected in December 2012, January 2014, and January 2015, as well as combined plots with multiple years of data, as shown in Attachment 4. In the plots, the groundwater samples are clustered together while the leachate sample is positioned apart from the group, indicating differences between the cation and anion composition of the groundwater and the leachate. For example, the trilinear plot for the anions carbonate plus bicarbonate ($CO_3$+$HCO_3$), sulfate ($SO_4$), and chloride (Cl) in December 2012 shows that the concentration of anions in groundwater samples collected that monitoring event were fairly similar; whereas, the anion concentrations in leachate clearly differ as depicted by the leachate data point set apart from the group of groundwater data points. This is similarly shown in the trilinear diagrams for January 2014 and January 2015, as well as in the multi-year plots. On trilinear diagrams, the mixture of two different waters will plot on a straight line connecting the points. If a straight line is drawn connecting the data points between upgradient and downgradient wells, the leachate data points do not fall on this line, indicating that the leachate is not mixing with the groundwater.

## 2.9 Regional Surface Water Hydrology

Lualualei Valley is comprised of two watersheds: Ulehawa to the east and Mā'ili'ili to the west. The Ulehawa watershed, where PVT ISWMF is located, is 5 square miles in area and has a maximum elevation of 2,844 feet (Hawaii Division of Aquatic Resources and Bishop Museum, 2015). Ulehawa Stream, which drains the watershed, is a perennial stream with a total length of 5.1 miles (Hawaii Division of Aquatic Resources and Bishop Museum, 2015). As shown on Figures 1 and 2, Ulehawa Stream borders PVT ISWMF to the west, and discharges to the ocean approximately 2,000 feet southwest of the site.

The Mā'ili'ili watershed, which encompasses 19.2 square miles and has a maximum elevation of 3,127 feet, is much larger than the Ulehawa watershed (Hawaii Division of Aquatic Resources and Bishop Museum, 2015). Mā'ili'ili Stream, which drains the Mā'ili'ili watershed, is also a perennial stream with a total length of 20.9 miles (Hawaii Division of Aquatic Resources and Bishop Museum, 2015).

## 2.10 Site Surface Water Hydrology

Rainfall runoff at PVT ISWMF eventually reaches Ulehawa Stream. HAR Chapter 11-54 classifies Ulehawa Stream as a Class 2 Inland Water (DOH, 2014). Class 2 Inland Waters are protected for recreational purposes, support and propagation of aquatic life, agricultural and industrial water supplies, shipping, and navigation. HAR Chapter 11-54 states that all uses of Class 2 Inland Waters need to be compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation in and on these waters (DOH, 2014).

The storm water management system at PVT ISWMF is designed and constructed to manage runoff from a 25-year, 24-hour storm. Runoff is collected in a system of surface ditches, channels, pipes, and ponds designed by PVT ISWMF's engineering consultants (A-Mehr, Inc., 2011). As designed, the system will carry runoff from the design storm without flooding or excessive erosion from the site, and will retain a significant volume of water to minimize off-site runoff impacts and allow sediment in the runoff to be intercepted and removed before discharge from the site. Figure 2 shows the location of the storm water basins for collection of storm water and removal of silt. There are seven storm water basins and six discharge points which discharge storm water into Ulehawa Stream. All six discharge points are permitted under PVT ISWMF's National Pollutant Discharge Elimination System permit (DOH, 2008). One of the storm water basins (Basin A) does not have a discharge point because the limited amount of storm water that collects in this basin percolates into the ground resulting in no discharge off site.

Storm water in the C&D disposal area at PVT ISWMF is managed by controlled grading on the surface of the landfill and by maintaining an engineered system of drainage ditches, channels, pipes, and basins. Drainage is managed to:

- prevent run-on of surface water to the active disposal face or uncovered refuse;
- minimize erosion in all areas of the site;
- maintain roads and other ancillary facilities in useable condition under all weather conditions; and
- prevent excessive runoff or sedimentation impacts to neighboring properties (A-Mehr, Inc., 2011).

The landfill top deck and other areas in the vicinity of active disposal areas are graded at a slope of 2% to 5% away from the active area. Earth berms are constructed upgradient of the active area if needed to prevent run-on from contacting the waste, and to divert drainage around any exposed waste (A-Mehr, Inc., 2011).

Similarly, berms are constructed downgradient of exposed waste to prevent the runoff of any precipitation that has contacted waste. Such water is retained within the waste, for collection and management as leachate. No runoff of precipitation that has contacted waste is discharged into Ulehawa Stream.

The storm water control system is inspected and maintained as needed after each significant storm event. Inspections focus on locating and repairing any areas of excessive erosion, ensuring that skimmers installed in sedimentation basins are working properly, and that no pipe inlets are plugged or blocked with sediment or debris. Sediment is removed from ditches and basins at least once each year.

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# Section 3 Groundwater Monitoring Well Network

## 3.1 Groundwater Monitoring Well Locations

The groundwater monitoring well network at PVT ISWMF consists of four monitoring wells (MW-1B, MW-1C, MW-2, and MW-3). Originally, the groundwater monitoring network, which was designed by Mr. John Mink based on hydrogeological investigations he conducted in the area, consisted of wells MW-1, MW-1A, MW-2, and MW-3 (Belt Collins Hawaii, 1998). Well MW-1, which was located upgradient of the C&D landfill, was permanently closed in August 2011 to allow for construction of landfill Cell 8. Well MW-1B was installed in December 2011 to replace MW-1. Well MW-1A, which was the primary upgradient well, was permanently closed in August 2013 to allow for construction of the recycling and materials recovery facility and a new stormwater basin. Well MW-1C, which is now the only upgradient well, was installed in March 2014 to replace MW-1A. Well MW-4 was installed in the Phase I area of the landfill in 1992 and was closed prior to 2004 to allow for expansion of the landfill. The locations of the four current wells, as well as the closed wells, are shown on Figure 2, Site Plan.

The groundwater monitoring well network is designed with one well located in the northernmost corner of the PVT ISWMF property, hydraulically upgradient of all activities on the property (MW-1C), and three wells located downgradient (see Figure 10). Well MW-1B is located on the west side of the facility between landfill Cell 4 and Ulehawa Stream. Well MW-2 is located makai of the landfill, near the southwestern property boundary, adjacent to the residential area. Well MW-3 is also located makai of the landfill, but south of the property, across Lualualei Naval Road, on the Leeward Land parcel.

## 3.2 Groundwater Monitoring Well Construction Details

Boring logs and well construction diagrams for the four groundwater monitoring wells are contained in Attachment 5, and well construction information is summarized below in Table 7. Attachment 5 also contains the boring logs for closed wells MW-1, MW-1A, and MW-4 and pump well PW-2, which is used to supply water for dust control.

Each well has a 6-inch diameter protective steel casing extending approximately four feet above the ground surface, which surrounds the 2-inch diameter polyvinyl chloride (PVC) well casing. The protective steel casings have caps with combination locks, which are kept locked at all times, except during sampling. The lower 15 to 20 feet of the well casings are machine-slotted 0.020-inch well screen fitted with flush-threaded PVC bottom caps. Blank PVC casing is present from approximately 10 feet above the groundwater surface to the ground surface. Silica sand (clean-graded, kiln dried, Monterey Sand #3) is present around the slotted portion of the well between the borehole wall and well casing. The silica sand extends within the well annulus approximately two feet above the well screen, with a bentonite seal above the silica sand, followed by cement-bentonite grout to the ground surface. The wells are screened primarily within calcareous materials including clays, silts, sands, and gravel, and cemented coral, in addition to alluvial materials, especially in well MW-1C, which is located close to

Ulehawa Stream (Clayton Environmental Consultants, 1992 Element Environmental, LLC, 2012a, and Juturna LLC, 2014b).

### Table 7: Groundwater Monitoring Well Construction Information

| | MW-1B | MW-1C | MW-2 | MW-3 |
|---|---|---|---|---|
| Date well installed | 12/20/2011 | 3/11/2014 | 2/7/1992 | 2/18/1992 |
| Elevation at top of well casing (feet MSL) | 55.99 | 50.80 | 33.58 | 39.49 |
| Ground surface elevation (feet MSL) | 53.5 | 48.19 | 30.82 | 36.12 |
| Total boring depth (feet below ground surface) | 70 | 60 | 40 | 46.5 |
| Boring diameter (inches) | 8 | 8 | 8 | 8 |
| Total well depth (feet below ground surface) | 63.99 | 55.7 | 40 | 45 |
| Total well depth (feet below top of well casing) | 66.48 | 58.31 | 42.76 | 48.37 |
| Elevation at bottom of well (feet MSL) | -10.49 | -7.51 | -9.18 | -8.88 |
| Casing material | Schedule 40 PVC | Schedule 40 PVC | PVC | PVC |
| Casing diameter (inches) | 2 | 2 | 2 | 2 |
| Screen material | Schedule 40 PVC | Schedule 40 PVC | PVC | PVC |
| Screen diameter (inches) | 2 | 2 | 2 | 2 |
| Standard screen slot openings (inches) | 0.020 | 0.020 | 0.02 | 0.02 |
| Screen open area (square inches/linear foot) | 5.20 | 5.20 | not listed | not listed |
| Screened interval depth (feet below ground surface) | 49 to 64 | 40.7 to 55.7 | 20 to 40 | 30 to 45 |
| Screened interval elevation (feet MSL) | 4.51 to -10.49 | 7.49 to -7.51 | 10.82 to -9.18 | 6.12 to -8.88 |
| Depth to water (feet below ground surface) | 51.96 | 46.41 | 29.51 | 34.89 |
| Depth to water (feet below top of well casing) | 54.45 | 49.02 | 32.27 | 38.26 |
| Groundwater head level (feet MSL) | 1.54 | 1.78 | 1.31 | 1.23 |
| Time of groundwater level measurement | 9:13 am | 8:59 am | 9:23 am | 9:32 am |

Note: Groundwater level measurements were taken January 12, 2015.
Reference: Clayton Environmental Consultants, 1992; Element Environmental, LLC, 2012a; Juturna LLC, 2014b.

## 3.3 Groundwater Sampling Equipment

Dedicated low-flow QED bladder pumps are permanently installed within the screened portion of each well. The pumps are used to purge the wells and collect groundwater samples. Wells are pumped at low rates to minimize drawdown. To assure drawdown is minimized, the pumping system is assembled with a QED electronic water level indicator, which sounds an alarm when drawdown exceeds two inches. The water level indicator is capable of measuring to the nearest hundredth (0.01) of a foot. In addition, a field parameter meter, which measures temperature, pH, and conductivity, is used to take field measurements. Disposable 0.45-micron membrane pressure filters are used for filtering groundwater samples in the field.

# Section 4 Detection Monitoring Parameters and Schedule

## 4.1 Background Sampling

Since there have been no indications of a release from the C&D landfill over the last 23 years of groundwater monitoring, all data collected to date from the groundwater monitoring wells were used to reestablish the baseline water quality data. Future groundwater monitoring events will use the last 23 years as the background data to which future results will be compared. This last 23 years of baseline water quality data were used to generate the analytical data summary presented in Attachment 1, intra-well control charts presented in Attachment 2, time series plots presented in Attachment 3, and Stiff diagrams and trilinear plots presented in Attachment 4. The background data will be reevaluated every five years.

## 4.2 Detection Monitoring Parameters

Using approved statistical or non-statistical data analysis methods, PVT ISWMF will, for each monitoring interval, compare the concentration of each monitoring parameter with its respective background concentration to determine if there has been a release from the facility.

The detection monitoring parameters are divided into two categories: (1) Semiannual Monitoring Parameters; and (2) Constituents of Concern.

(1) Semiannual Monitoring Parameters

For the Semiannual Monitoring Parameters, samples of groundwater will be collected semiannually from each of the four groundwater monitoring wells, and analyzed to assess the concentration of the constituents listed in Table 8.

Static water levels will be measured consecutively within a one-hour period prior to beginning sample collection, so that changes caused by tidal influence or slow well recharge will be minimized. All other field parameters will be collected during and after purging. No statistical analyses will be performed on the field measurements.

In addition, the gradient and direction of groundwater flow under the landfill will be assessed semiannually and included in graphical form.

(2) Constituents of Concern

Once every five years, the detection monitoring will include additional testing for constituents of concern in each of the four monitoring wells. The proposed constituents of concern are shown in Table 9.

Once every five years, corresponding with the testing for constituents of concern, Stiff diagrams will be completed and compared with Stiff diagrams from earlier groundwater sampling events. Time series plots of the data will also be prepared every five years.

### Table 8: Semiannual Groundwater Monitoring Parameters

| **Appendix I Short List – Volatile Organic Compounds** | | **Leachate Indicators, Cations and Anions** | **Field Measurements** |
|---|---|---|---|
| Dichlorodifluoromethane | 1,2-Dibromoethane (EDB) | Total Dissolved Solids | Static Water Level |
| Chloromethane | Chlorobenzene | Chloride | Static Water Depth |
| Vinyl Chloride | Ethylbenzene | Sodium | pH |
| Bromomethane | 1,1,1,2-Tetrachloroethane | Potassium | Temperature |
| Chloroethane | m,p-Xylenes | Magnesium | Conductivity |
| Trichlorofluoromethane | o-Xylene | Calcium | Total Dissolved Solids (optional) |
| 1,1-Dichloroethene | Styrene | Sulfate | |
| Methylene Chloride | Bromoform | Alkalinity, Bicarbonate (as $CaCO_3$) | |
| trans-1,2-Dichloroethene | Isopropylbenzene | | |
| 1,1-Dichloroethane | 1,1,2,2-Tetrachloroethane | | |
| 2,2-Dichloropropane | Bromobenzene | | |
| cis-1,2-Dichloroethene | n-Propylbenzene | | |
| Bromochloromethane | 1,2,3-Trichloropropane | | |
| Chloroform | 2-Chlorotoluene | | |
| 1,1,1-Trichloroethane (TCA) | 1,3,5-Trimethylbenzene | | |
| Carbon Tetrachloride | 4-Chlorotoluene | | |
| 1,1-Dichloropropene | tert-Butylbenzene | | |
| Benzene | 1,2,4-Trimethylbenzene | | |
| 1,2-Dichloroethane (DCA) | sec-Butylbenzene | | |
| Trichloroethene (TCE) | 4-Isopropyltoluene | | |
| 1,2-Dichloropropane | 1,3-Dichlorobenzene | | |
| Dibromomethane | 1,4-Dichlorobenzene | | |
| Bromodichloromethane | n-Butylbenzene | | |
| cis-1,3-Dichloropropene | 1,2-Dichlorobenzene | | |
| Toluene | 1,2-Dibromo-3-chloropropane | | |
| trans-1,3-Dichloropropene | 1,2,4-Trichlorobenzene | | |
| 1,1,2-Trichloroethane | Hexachlorobutadiene | | |
| Tetrachloroethene (PCE) | Naphthalene | | |
| 1,3-Dichloropropane | 1,2,3-Trichlorobenzene | | |
| Dibromochloromethane | | | |

### Table 9: Constituents of Concern to be Sampled Every Five Years

| **Appendix I Short List - Metals** | **Other Constituents** |
|---|---|
| Arsenic | Extractable Petroleum Hydrocarbons – Diesel Range Organics |
| Cadmium | Total Organic Carbon |
| Chromium | |
| Iron | |
| Lead | |

## 4.3 Monitoring Schedule

Groundwater will be sampled semiannually for the detection monitoring parameters. Constituents of concern will be tested every five years.

The results of the sampling will be submitted in a semiannual detection monitoring report that summarizes the monitoring activities conducted during the semiannual monitoring period. The second semiannual detection monitoring report for the year will include an annual summary. After closure of the landfill and with no identified releases from the landfill, the frequency of detection monitoring will be reduced to annually upon approval from the DOH.

Once every five years, Stiff diagrams will be completed and compared with Stiff diagrams from earlier groundwater sampling events. Also, every five years time series plots of the data will be prepared, and the background data in each well will be reevaluated. If there has been no release from the landfill, the detection monitoring data will be incorporated into the background dataset, so as sampling continues, the background data becomes more accurate. In addition, every five years, control charts and limits will be recalculated using all detection monitoring parameters for all monitoring points.

## 4.4 Adjustments to the Groundwater Monitoring Parameters

Because the characterization of groundwater becomes increasingly accurate as monitoring continues, monitoring parameter lists should be reevaluated periodically and modified appropriately, based on changes in groundwater conditions. Reevaluation of the monitoring parameter list should occur:

- If a chemical parameter is detected in the leachate, that is not sampled for in the groundwater;
- If a spill or release on site or from another property is suspected to be migrating to groundwater; or
- If a new monitoring point is added to the Groundwater and Leachate Monitoring Plan; and
- Every five years, control charts and limits will be recalculated using all detection monitoring parameters and constituents of concern for all monitoring points.

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# Section 5 Leachate Monitoring Parameters and Schedule

## 5.1 Leachate Collection and Removal System

Phase II of PVT's C&D landfill contains a leachate collection and removal system that will be sampled to provide accurate characterization of source chemistry. The leachate samples will be collected from the leachate collection sump riser.

The volume of leachate generated at the landfill is typically low due to dry climate conditions and the inert nature of the waste. Due to the small volume of organic material in the waste stream, leachate generated contains relatively low levels of contaminants, as shown on Table 6 in Section 2.8.

## 5.2 Leachate Analytes

Leachate data obtained from sampling will be compared to groundwater monitoring data on an annual basis. Leachate monitoring parameters are summarized in Table 10. If chemical parameters are detected in the leachate, that are not sampled for during groundwater detection monitoring, they will be added to the groundwater detection monitoring parameters. As the leachate database becomes more developed, adjustments to the groundwater detection monitoring parameters may be warranted (DOH, 2002).

**Table 10: Leachate Monitoring Parameters**

| **Cations and Anions** | **Major Leachate Indicators** | **Constituents of Concern** | **Field Measurements** |
|---|---|---|---|
| Magnesium | Total Dissolved Solids | Arsenic | Conductivity |
| Sodium | Total Organic Carbon | Cadmium | pH |
| Calcium | | Chromium | Temperature |
| Potassium | | Iron | Total Dissolved Solids (optional) |
| Chloride | | Lead | |
| Sulfate | | Extractable Petroleum Hydrocarbons - Diesel Range Organics | |
| Alkalinity, Bicarbonate (as $CaCO_3$) | | | |

## 5.3 Leachate Monitoring Schedule

Leachate monitoring will occur annually.

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# Section 6 Sampling Procedures

## 6.1 Groundwater Monitoring Well Inspection Program

The groundwater monitoring wells will be routinely inspected during each detection monitoring event. The groundwater sampling team will observe the conditions of the well and the surrounding area and record the information on a well inspection form. An example well inspection form is contained in Attachment 6. The information to be documented will include the following:

- The condition of the well identification markings.
- Evidence that the well was recently painted.
- Inspection of the locking mechanism to confirm that the well is locked and the combination or key works.
- The integrity of the well construction and sampling equipment, including:
  - physical surroundings (high weeds, standing water, cleanliness, activities nearby);
  - condition of dedicated pumps;
  - condition of protective casing;
  - obstructions or kinks in the well casing;
  - condition of concrete seal (i.e., cracked, raised, water in annular space);
  - grease around top of well on the threaded caps; and
  - fit of cap.
- Weather conditions during sampling, including:
  - wind direction for volatiles; and
  - note if sampling was performed downwind of possible VOC source.
- Evidence of contamination by animal or insect parts in the well, etc.
- Well bollard condition.
- Evidence of vandalism.
- Evidence of surface infiltration into the well.

## 6.2 Water Level Measurements

At each well to be monitored during the groundwater sampling event, the static groundwater level will be measured prior to purging. Water levels will be measured to the nearest 0.01 foot using an electronic water level indicator.

Water levels will be measured consecutively within a one-hour period prior to beginning sample collection, so that the measurements will be close to the same time, and water level changes caused by tidal influence or slow well recharge will be minimized. These consecutive measurements will then be used to calculate the potentiometric surface and develop a groundwater gradient map.

## 6.3 Groundwater Sample Collection Procedures

The groundwater monitoring wells will be purged and sampled using the low-flow QED bladder pumps that are permanently installed in each well. During low-flow purging, also called micro-purging, field measurements (pH, temperature, and conductivity at a minimum) will be monitored. Wells will be purged until three consecutive field measurements have stabilized to within 10% of the previous reading. Field measurements will be recorded on a well sampling information form, as described in Section 6.5.1.

Well purging and sampling procedures are as follows:

1) Measure depth to groundwater using an electronic water level indicator before purging begins.

2) Micro-purge groundwater from the monitoring well using the dedicated low-flow QED bladder pump. During micro-purging, the flow rate must be low enough to achieve no net drawdown of the water level to prevent mixing within the well. The flow rate should be less than 1.0 liter per minute. The water level must be measured continuously during purging to assure there is no net drawdown. Field measurements must stabilize before purging can cease.

3) Field measurements (a minimum of temperature, pH, and conductivity) must be measured and recorded on the well sampling information form until three consecutive measurements have stabilized to within 10% of the previous readings.

4) After the field parameters have stabilized, collect groundwater from the well and discharge it into the sample containers.

5) Fill containers for volatile samples so that no headspace exists. After capping, invert the container and tap to verify that no air bubbles are present. For parameters other than VOCs, fill the sample container to within 2 to 5 centimeters of the top, in a manner to minimize aeration.

6) For samples to be filtered in the field, a disposable 0.45-micron membrane pressure filter will be utilized from the pump tubing to the sample container. Sample containers that have been filtered will be noted as such on the chain-of-custody record. As per the Landfill Groundwater Monitoring Guidance Document (DOH, 2002), samples to be analyzed for the following constituents do **not** require field filtering: VOCs, semi-volatile organic compounds, alkalinity, turbidity, total suspended solids, total solids, total organic halides, coliform, pH, conductivity, oil and grease. Samples for all other analyses will be filtered in the field. Filtering requirements for the detection monitoring parameters are listed in Table 11.

### Table 11: Field Filtering Requirements

| Detection Monitoring Parameter | Field Filter |
|---|---|
| Volatile Organic Compounds | No |
| Extractable Petroleum Hydrocarbons – Diesel Range Organics | No |
| Total Dissolved Solids | Yes |
| Total Organic Carbon | Yes |
| Alkalinity, Bicarbonate (as $CaCO_3$) | No |
| Sodium | Yes |
| Potassium | Yes |
| Magnesium | Yes |
| Calcium | Yes |
| Sulfate | Yes |
| Chloride | Yes |
| Arsenic | Yes |
| Cadmium | Yes |
| Chromium | Yes |
| Iron | Yes |
| Lead | Yes |

7) Place filled sample containers directly in chilled coolers.

## 6.4 Leachate Sample Collection Procedures

As part of the leachate collection procedures, a field information form will be completed that records the leachate sample location, and general condition of the sample location and its surroundings. The information form will include general access point integrity, elevation at the sampling point, time, date, weather conditions, visible contamination, odors, and any unusual surface conditions. An example leachate field information form is included in Attachment 6. At a minimum, temperature, pH, and conductivity of the leachate will be measured in the field and recorded on the field information form.

Initial leachate level measurements will be obtained and recorded on the field information form before the sample is taken. Water level measuring equipment used at the leachate monitoring points should never be used at groundwater monitoring points (DOH, 2002).

Purging prior to sample collection is not required for leachate risers, manholes, and sumps. A disposable bailer or the dedicated leachate sump pump will be used to collect leachate samples. Leachate samples will **not** be filtered. Once the sample has been collected, the sump should be secured and the area cleared of disposable monitoring equipment (DOH, 2002).

Special care should be taken when preserving leachate samples with acid due to the potential of a violent reaction. To avoid a violent reaction, acid should be added to the sample slowly and carefully. The pH of the leachate sample should be checked prior to shipment. The amount of acid should be recorded on the chain-of-custody form. Acid should be added to counter the buffering capacity of leachate when appropriate (DOH, 2002). Leachate samples should not be placed in the same coolers as the groundwater samples.

## 6.5 Sample Handling and Documentation

### 6.5.1 Well Sampling Forms

Sample collection and sample handling will be documented using well sampling information forms. One well sampling information form will be completed for each well. At a minimum, the form will note the following information:

- Well ID
- Date
- Casing diameter (2 inches)
- Depth from top of casing to groundwater
- Depth from top of casing to well bottom
- Surveyed elevation at top of casing
- Equipment used for measuring water level and depth
- Names of samplers
- Time at the beginning and end of purging
- Number of minutes well was purged
- Number of gallons and well volumes removed during purging
- Water clarity
- Water odor
- Field measurement readings during purging, including:
  - pH
  - Conductivity
  - Temperature
- Field conditions including weather, wind, and tidal conditions
- Notes or other observations

An example well sampling form is included in Attachment 6.

### 6.5.2 Leachate Sampling Form

Leachate sample collection and sample handling will be documented using a leachate sampling information form. At a minimum, the form will note the following information:

- Leachate sample location
- Date

- Time
- Depth to leachate from top of casing
- Elevation at the top of casing (note: per PVT ISWMF's landfill permit LF-0152-09, this elevation control point needs to be surveyed every two years)
- Equipment used for measuring leachate level
- Names of samplers
- Leachate clarity
- Leachate odor
- Field measurement readings during sampling, including:
  - pH
  - Conductivity
  - Temperature
- Field conditions including weather and wind
- Surface conditions
- Access point integrity
- Notes or other observations

An example leachate sampling form is included in Attachment 6.

### 6.5.3 Chain-of-Custody Record

Chain-of-custody procedures will provide an accurate written record that can be used to trace the possession of each sample from the time it is collected until completion of all required analyses. The coolers in which samples are packed will be accompanied by a chain-of-custody record. When transferring samples, the individuals relinquishing and receiving them will sign, date, and note the time on the chain-of-custody record to document sample custody transfer.

The chain-of-custody record will include the following types of information:

- Sample number
- Date and time of collection
- Sample matrix
- Identification of well
- Number of containers
- Whether container was field filtered or not field filtered
- Analytical test parameters
- Signature of collector
- Signature(s) of persons involved in the chain of possession and dates of possession.

An example chain-of-custody record is included in Attachment 6.

### 6.5.4 Sample Labeling

To prevent misidentification of samples, all containers will be pre-labeled. The labels will be filled out using waterproof ink and will be firmly affixed to the sample containers. The labels will contain the following information:

- Name of landfill (PVT ISWMF)
- Date and time of collection
- Sample number
- Analysis required
- Preservatives used, if any
- Field Filtered or Not Field Filtered
- Sampler's initials.

### 6.5.5 Sample Packaging and Shipping

If shipping of samples is necessary, the samples will be transported and handled in a manner that protects the integrity of the sample. Each sample bottle set will be placed in a separate sealed plastic bag. A cooler will be used as a shipping container. The drain plug will be taped shut from the inside and outside. The cooler will be filled with packing material and ice or frozen gel packs. Samples of leachate should never be placed in the same cooler as the groundwater samples.

The paper work accompanying the samples will be placed inside a plastic bag, sealed, and taped to the inside of the cooler lid. At least two custody seals will be placed across the lid and body of the cooler.

## 6.6 Decontamination of Sampling Equipment

Dedicated or disposable sampling equipment will not be decontaminated between sampling events. Since all of the wells will be purged and sampled with dedicated pumps, it is not anticipated that decontamination will be necessary, other than decontamination of the water level indicator.

The water level indicator will be decontaminated between wells using a paper towel to clean the tape while winding it up from the well, washing with a mixture of water and a non-phosphate detergent (e.g., Alconox), then rinsing with distilled or deionized water.

Since the leachate sump will be sampled with a dedicated or disposable bailer or pump, decontamination will not be necessary. The leachate sump will have its own dedicated water level indicator. The water level indicator used in the wells should never be used in the leachate sump.

## 6.7 Handling of Investigation-Derived Waste Materials

Groundwater purged from the groundwater monitoring wells will be containerized and discharged onto the ground surface away from the well. If elevated concentrations of contaminants are suspected to be present in the groundwater, purged groundwater will be discharged on top of a waste-filled area of the landfill. Filter membranes, gloves, and paper towels will be disposed of in the general trash.

## 6.8 Field Quality Assurance / Quality Control

### 6.8.1 Trip Blank

A minimum of one trip blank will be analyzed for each sampling event for VOCs. There will be one trip blank in each cooler used to ship VOC samples to the laboratory. The trip blank will consist of organic-free water (e.g., deionized or laboratory reagent-quality) supplied by the analytical laboratory. It will be transported to and from the field, then returned to the laboratory unopened and unaltered, for analysis using the same procedures and methods that are used for the collected field samples. The trip blank will be reported in the laboratory results as a separate sample, using the designation TB-(#) as the sample point designation.

If a sampling round consists of only one well, a trip blank is not necessary as long as one field blank is collected and analyzed.

### 6.8.2 Field Blank

Field blanks will be collected and analyzed to detect contamination which might be introduced into the groundwater samples through the air. The field blank will consist of deionized, distilled, or laboratory reagent-quality water transferred in the field into the appropriate sampling containers. The well at which the field blank is prepared will be identified on the field sampling form, along with any observations that may help explain anomalous results (i.e., prevailing wind direction, upwind potential sources of contamination, etc.). The field blank will be handled in the same manner as the rest of the samples.

For each sampling event for VOCs, a minimum of one field blank will be analyzed per 20 samples or one per sampling day. If a sampling event does not involve VOCs, a duplicate well sample will take the place of the field blank.

### 6.8.3 Field Measurement Controls

Field measurements (i.e., pH, temperature, and conductivity) will be verified and checked through review of instrument calibration, measurement, and recording procedures.

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# Section 7 Laboratory Analysis Plan

## 7.1 Laboratory Analytical Methods

Sample collection, storage, and analysis should be performed according to the most recent version of Standard EPA Methods. Analysis should be performed by a laboratory experienced in performing these analyses. Specific methods of analysis should be identified on each laboratory report. Analytical work should be supervised by the director of the laboratory and each laboratory report should be signed by the director of the laboratory.

If methods other than EPA approved methods or Standard Methods are to be used, the exact methodology should be submitted to the DOH for review and approval prior to use. Preferred analytical methods for the monitoring parameters are presented in Table 12.

Table 12: Preferred Analytical Methods

| **Monitoring Parameter** | **Analytical Method** |
|---|---|
| Volatile Organic Compounds | EPA 8260C |
| Extractable Petroleum Hydrocarbons - Diesel Range Organics | EPA 8015C |
| Total Dissolved Solids | SM 2540 C or EPA 160.1 |
| Total Organic Carbon | SM 5310 C or EPA 415.1 |
| Alkalinity, Bicarbonate (as $CaCO_3$) | SM 2320 B |
| Sodium | EPA 200.7 or EPA 6010C |
| Potassium | EPA 200.7 or EPA 6010C |
| Magnesium | EPA 200.7 or EPA 6010C |
| Calcium | EPA 200.7 or EPA 6010C |
| Arsenic | EPA 200.8 or EPA 6010C |
| Cadmium | EPA 200.8 or EPA 6010C |
| Chromium | EPA 200.8 or EPA 6010C |
| Iron | EPA 200.7 or EPA 6010C |
| Lead | EPA 200.8 or EPA 6010C |
| Sulfate | EPA 300.0 |
| Chloride | EPA 300.0 |

## 7.2 Laboratory Quality Assurance / Quality Control

### 7.2.1 General Procedures

The QA/QC procedures for the Groundwater and Leachate Monitoring Plan are based on the Quality Assurance Manual of ALS Group USA Corp. dba ALS Environmental (ALS), formerly Columbia Analytical Services, Inc., the laboratory currently used for sample analysis (Columbia Analytical Services, Inc., 2011). ALS employs several specific quality control procedures to ensure the accuracy, precision, and comparability of all analytical results. The quality control procedures include calibration standards, blanks, laboratory control samples (LCS), matrix spikes (MS), duplicates, surrogates, and internal standards. These quality control checks are performed as required by the method or regulations to assess precision and accuracy.

The method detection limit (MDL) and the practical quantitation limit (PQL) or method reporting limit (MRL) will be established and verified by the laboratory for each analytical procedure. These MDLs and PQLs/MRLs will reflect the detection and quantitation capabilities of the specific analytical procedure and equipment used.

The QA/QC data will be reported, along with the sample results to which it applies. The QA/QC data will include the method of analysis; PQL or MRL; MDL; recovery rates; results of equipment and method blanks; the results of spiked and surrogate samples; the frequency of quality control analysis; and the name of the person performing the analyses. Sample results will be reported unadjusted for blank results or spike recovery. In cases where contaminants are detected in QA/QC samples, the accompanying sample results will be appropriately flagged.

Specific procedures and frequencies for laboratory quality control will follow guidelines established in SW-846 (USEPA, 1986) as detailed by the analytical method. A general description of the types of required laboratory QC samples is provided in the following sections.

### 7.2.2 Method Blank

The method blank is an analyte-free matrix (e.g., reagent water) subjected to the entire analytical process. The method blank goes through all the procedural steps used for analysis and is analyzed identically to samples taken from the wells/sump. The method blank is analyzed to demonstrate that the analytical system itself does not introduce contamination. The method blank results should be below the MRL for the analytes being tested. Otherwise, corrective action must be taken.

A method blank should be included with the analysis of every sample preparation batch, every 20 samples, or as stated in the method, whichever is more frequent.

### 7.2.3 Laboratory Control Sample

The LCS is an aliquot of analyte-free water to which known amounts of the method analytes are added. A reference material of known matrix type, containing certified amounts of target analytes, may also be used as an LCS. An LCS should be prepared and analyzed at a minimum frequency of one LCS per 20 samples, with every analytical batch or as stated in the method, whichever is more frequent. The LCS sample is prepared and analyzed in exactly the same manner as the field samples.

The percent recovery of the target analytes in the LCS is compared to established control limits and assists in determining whether the methodology is in control and whether the laboratory is capable of making accurate and precise measurements at the required reporting limit. Comparison of batch-to-batch LCS analyses enables the laboratory to evaluate batch-to-batch precision and accuracy.

### 7.2.4 Matrix Spike

Matrix spiked samples are aliquots of samples to which a known amount of the target analytes are added. The samples are then prepared and analyzed in the same analytical batch, and in exactly the same manner as are routine samples. For the appropriate methods, matrix spiked samples are prepared and analyzed and at a minimum frequency of one spiked sample (and one duplicate spiked sample, if appropriate) per 20 samples. The spike recovery measures the effects of interferences caused by the sample matrix and reflects the accuracy of the method for the particular matrix in question.

### 7.2.5 Matrix Spike Duplicate

A matrix spike duplicate (MSD) will be carried through the complete analytical procedure to provide information on the precision of the chemical analysis. The MSD is analyzed on a separate aliquot of sample collected from the same sample from which the matrix spike sample is collected. MSDs (rather than laboratory duplicates) apply to organic analyses because of the large number of undetected compounds. Comparing the MS and MSD provides information on the precision of the analysis. The precision measurement is reported as "Relative Percent Difference". Poor precision between duplicates may indicate non-homogeneous matrix or sampling. If the MS/MSDs do not meet acceptance limits, the MS/MSD and the associated spiked sample will be reported with a qualifier for those analytes that do not meet limits. If obvious preparation errors are suspected, unacceptable MS/MSDs should be reprocessed and reanalyzed to prove matrix interference.

Depending on the method of analysis, MSD analyses are performed at a minimum frequency of one set per 20 samples. If an insufficient quantity of sample is available to perform a MSD, duplicate LCSs will be prepared and analyzed.

### 7.2.6 Laboratory Duplicate

A laboratory duplicate (rather than a MS/MSD) is used to provide information on the precision of the chemical analysis for inorganic analytes. A minimum of one laboratory duplicate should be analyzed per each batch of samples, not to exceed 20 samples, when samples are analyzed for metals. If an insufficient quantity of sample is available to perform the laboratory duplicate, duplicate LCSs will be prepared and analyzed.

### 7.2.7 Surrogates

Surrogates are organic compounds which are similar in chemical composition and chromatographic behavior to the analytes of interest, but which are not normally found in environmental samples. Depending on the analytical method, one or more of these compounds is added to method blanks, calibration and check standards, and sample (including duplicates, matrix spike samples, matrix spike duplicate samples and laboratory control samples) prior to extraction and analysis in order to monitor the method performance on each sample. The percent recovery is calculated for each surrogate, and the recovery is a measurement of the overall method performance. The percent recovery of the surrogates is compared to the acceptance limits for the specific method to determine if acceptable recovery has been obtained. Poor surrogate recovery may indicate a problem with sample composition and shall be reported, with data qualifiers.

If a surrogate standard falls outside the acceptance limits, if there is not obvious chromatographic matrix interference, the sample should be reanalyzed to confirm a possible matrix effect. If the recoveries confirm or there was obvious chromatographic interference, results should be reported from the original analysis and a qualifier should be added. If the reanalysis meets surrogate recovery criteria, the second run should be reported.

## 7.3 Laboratory Data Reduction, Validation, and Reporting

### 7.3.1 Laboratory Data Reduction

Raw data (including instrument calibrations, chromatograms, and mass spectra), procedural logs for each instrument, sample extraction and preparation logs, and standard preparation logs should be kept on file at the laboratory for a minimum of five years. Sample and QA/QC results should be stored for a minimum of five years in a database maintained by the analytical laboratory.

### 7.3.2 Laboratory Data Validation

All data packages provided by the laboratory must provide a summary of quality control results adequate to enable reviewers to validate, or determine the quality of, the data. The project quality assurance officer is responsible for conducting checks for internal consistency, transmittal errors, and adherence to the specified quality control elements.

For each data package, the project quality assurance officer should conduct a review of the quality control results. Data should be evaluated and qualified using EPA guidance (USEPA, 1999 and 2004). The project quality assurance officer should review the following quality control data results for all samples:

- Chain-of-custody documentation
- Holding times
- Trip blanks
- Method blanks.

A limited review (minimum 10%) of the following quality control data results should be conducted:

- Laboratory matrix spike/matrix spike duplicate and/or matrix duplicate results
- Laboratory surrogate recoveries
- Laboratory check samples.

The project quality assurance officer should prepare a quality assurance memorandum for each data package describing the results of the data validation and describing any qualifiers that are added to the data.

### 7.3.3 Laboratory Reports

All laboratory data packages should contain the following information:

- Cover letter or narrative
- Chain-of-custody forms
- Summary of sample results
- Summary of QA/QC results.

The information provided in the cover letter or narrative should include:

- Laboratory name, address, and telephone number
- Date(s) of sample receipt and number of samples received
- Detailed description of any problems encountered with QA/QC, analysis, shipment, or handling procedures
- Identification of possible reasons for any QA/QC criteria outside acceptance limits
- Signature of laboratory representative and date certifying data results.

The minimum information to be presented for each sample for each parameter or parameter group should include:

- Client sample number and laboratory sample number
- Sample matrix
- Date of extraction/preparation and date/time of analysis
- Dilution factors
- Analytical method
- PQLs or MRLs
- Definitions of any data qualifiers and reporting acronyms used
- Sample results.

The minimum QA/QC summary information to be presented for each sample for each parameter or parameter group should include:

- Surrogate standard recovery results
- Matrix QA/QC results (matrix spike/matrix spike duplicate, laboratory duplicate)
- Method blank results
- Laboratory control sample results.

In addition to a hard copy or pdf version of the complete laboratory report, the laboratory should provide the data in an electronic format data file, preferably an MS Excel file.

# Section 8 Statistical Evaluation Methods

## 8.1 Statistical Methods Overview

The statistical evaluation of the groundwater data at the PVT ISWMF Landfill will utilize DUMPStat statistical software, which was developed specifically to address groundwater monitoring at waste disposal sites. DUMPStat incorporates two types of statistical evaluation methods, inter-well comparisons and intra-well comparisons. Inter-well comparisons involve comparing concentrations in downgradient wells to concentrations in upgradient wells; whereas, intra-well comparisons involve comparing new measurements in individual downgradient wells to their own history.

Gibbons (1994a), who is the developer of the DUMPStat software, states that if the wells are not contaminated by on-site impacts, whenever possible intra-well comparisons should be used since they completely eliminate spatial variability, and thus are more powerful than inter-well comparisons. Gibbons (1994a) states that it is unreasonable to assume that all of the spatial variability at a site will be represented by a small number of upgradient monitoring wells and that spatial variability and contamination are invariably confounded when using the traditional upgradient versus downgradient comparisons. Gibbons (1994a) further states that when using the traditional upgradient versus downgradient comparisons, most sites in the country will eventually find themselves in assessment monitoring and corrective action whether they have impacted the environment or not.

Intra-well monitoring is always the preferred approach because it eliminates the spatial component of chemistry variability from the statistical evaluation. However, intra-well comparisons are appropriate only if it can be demonstrated that the wells have not been impacted by the site. If previous contamination exists, the intra-well method will not detect it unless it significantly increases (Gibbons, 1994a).

Gibbons (1994a) suggests an intermediate solution through the use of Shewhart-CUSUM control charts. These control charts detect releases both in terms of their absolute magnitude and cumulative increases (i.e., trends). Although background data are collected for each well and summary statistics computed, the cumulative sum includes these data; hence, even gradual trends in groundwater quality are detected (Gibbons, 1994a). Further confidence can be placed in these methods by removing outliers and existing trends from the background database for each well prior to computing the historical mean and variance from which the limits are derived. The actual data, however, are then compared to these limits, so that if trends are present even in background data, they will be detected (Gibbons, 1994a).

In applying the statistical methods to data from the monitoring points at PVT ISWMF, we followed methods developed and applied by Shewart (1931) and Gibbons (1994a) and have been using the intra-well comparisons. For monitoring points with constituents that had a low percentage of or zero non-detected results, we utilized Shewart-CUSUM control charts, which plot time versus concentration. A horizontal line was drawn to intersect the vertical axis at the point $\mu + Zs$, where $\mu$ and s are the mean and standard deviation and Z is an upper percentage point of the normal distribution. This line is called the control limit and new measurements that exceed the control limit are declared out of control. Lucas (1982) and the USEPA (2009) have suggested a control limit of $\mu + 4.5s$ for groundwater monitoring applications. We have applied this recommendation to PVT ISWMF data. Overall confidence levels for this control limit are 95% with $n = 8$ historical measurements and 35 future comparisons, and with verification resampling the false positive rates are further reduced to acceptable levels.

For data with greater than 5% non-detect values or what is commonly referred to as censored data, we have followed the suggestions of Gibbons (1994a), Davis (1994), and Cohen (1959 and 1961) and used maximum likelihood estimators to determine the mean and standard deviation. They have concluded that the PQL and not the MDL should be the censoring mechanism since values above the MDL and below the PQL are detected but not quantifiable. Using the MDL as the censoring point produces data with widely varying levels of uncertainty, violating the assumption of homoscedasticity (i.e., constant measurement variation), which is assumed by all the previous statistical theory and common methods.

In using the maximum likelihood estimators, we can account for the left singly censored normal distribution and have used the tables and values for $l(g,h)$ developed by Cohen (1961), Schneider (1986), and Schmee, et al. (1985). We have also used the first-order bias corrections developed by Saw (1961) and used by Haas and Scheff (1990) for fixed censoring point cases.

The best available approach to balancing false positive and false negative rates in groundwater monitoring is through the use of verification resampling. For sites with small background sample sizes that expect the number of future comparisons to be large, statistical exceedance would be declared only if all resampled values exceed the limit (Davis and McNichols, 1987; Gibbons, 1990). A verification resampling consisting of one retest with the verification resample passing will yield a site-wide false positive rate of $a^*= 0.05$ for $a= 0.01$. This is illustrated in Gibbons (1994a) by the equation $a^*=1-(1-a+a(1-a)^2)^k$, which becomes $a^*=1-(1-.01+.01(1-.01)^2)$ or .01 (i.e., site-wide false positive rate of approximately 5% and individual test false positive rate of approximately 1%). This type of verification resampling meets all the Subtitle D requirements.

For constituents that historically have been non-detect at the MDL, we have followed Gibbons (1994a) and used PQLs for the control limit instead of the MDLs. We have done this because MDLs vary with spiking concentration and can give widely variable results. Gibbons (1994a) has pointed out that when variability is not constant over concentration, both concentration and variability must be modeled to obtain a valid estimate of the MDL. This means that the MDL cannot be obtained from data at a single spiking concentration, regardless of the method, and that the 40 CFR Part 136, Appendix B method is statistically flawed. With the large number of constituents in EPA Method 8260 and the large number of monitoring points, it is statistically probable that samples will exceed the MDLs on every sampling that occurs at the site (i.e., false positives). We have seen this in VOCs that have exceed MDLs for other sites' trip blanks and in upgradient wells. Neither of which could possibly have been contaminated by the landfill. Gibbons (1994b *"The Folly of Subtitle D Statistics: When Green Field Sites Fail"*) reports similar conditions at a new waste facility that had not yet disposed of any waste. He found differing detectable concentrations of VOCs in almost every monitoring well above the MDLs. Statistically, this site should exceed the MDLs for almost every sampling round if the control limit is set at the MDL. For this reason the control limits for VOCs and constituents with an insufficient number of detectable results were set at the PQLs.

## 8.2 Control Limits

The Shewhart-CUSUM intra-well control charts plot the concentration of each detection monitoring parameter in each well over time. The detection monitoring parameters for each of the wells are shown on a separate graph containing the parameter concentration over time in a particular well and the control limit. It is necessary to have eight separate samplings for the control limits to be statistically valid. The control limits may change slightly as additional data is acquired and the control limits are recalculated. The control limits will be recalculated every five years. Attachment 2 contains the intra-well control charts with control limits that were recalculated as of the last sampling event in April 2015.

Using the Shewhart-CUSUM intra-well control charts, the concentration of each monitored parameter at each well will be compared to its respective background concentration or control limit to determine if there has been a release from the landfill. Overall confidence levels for this control limit are 95% with n = 8 historical measurements and 35 future comparisons, and with verification resampling the false positive rates are further reduced to acceptable levels of about 1%. This type of verification resampling meets the regulatory requirements.

The confidence levels for the Shewart-CUSUM intra-well control charts are demonstrated on the statistical power curve shown in Attachment 2. The best power curve is one that starts low and rises quickly. Ideally, the curve starts low (less than 5%) and rises quickly in 3 to 4 standard deviations to 95%. The current power curve, which includes the constituents of concern sampled in April 2015, intersects the vertical axis at approximately 2%, which represents a 2% chance of a false positive result occurring in the groundwater data. The power curve then rises sharply from 5% to 91% over a space of 4 standard deviations, which indicates fairly good statistical validity and sensitivity to changes in levels of constituents. Ninety-one percent power indicates a false negative rate of 9%, which means there is a 9% chance that the statistical analysis will show there has not been an impact to groundwater when in fact groundwater has been impacted. This false negative rate is slightly higher than the American Society for Testing and Materials (ASTM) (2012) recommendation of a false negative rate of 5% or less (i.e., 95% power) over 3 to 4 standard deviations. The false negative rate at the site is usually 2% to 5% during routine semiannual detection monitoring. The increase in the current false negative rate is due to the addition of the constituents of concern into the statistical analysis. The constituents of concern are primarily non-detect; whereas, statistical validity increases with more data that is detectable.

In preparing the data for statistical analysis using Shewhart-CUSUM control charts, some of the data need to be placed into the background database, and outliers need to be manually removed. Outliers are data that are known to be invalid because of sampling or other external conditions. In addition, groundwater protection standards (GWPSs) need to be assigned for the detection monitoring parameters. The GWPSs for PVT ISWMF will be the DOH Environmental Action Levels (EALs) for groundwater that is not a current or potential source of drinking water and is located more than 150 meters from surface water (DOH, 2011). GWPSs based on drinking water limits (Maximum Contaminant Levels) are not appropriate for the PVT ISWMF because the aquifer beneath the site is not used for drinking water. For detection monitoring parameters for which there are no EALs, the Shewhart-CUSUM control limit will be used in lieu of a GWPS.

## 8.3 Summary of Proposed Statistical Approach

This section outlines the statistical analysis procedures to evaluate groundwater monitoring data collected at PVT ISWMF. As recommended by Gibbons (1994a) and DOH (2002), PVT ISWMF will utilize intra-well statistical comparisons, whereby constituent levels measured at each well are compared to historical levels determined at the same well. Intra-well comparisons take into consideration the natural variability of each well and are statistically more powerful (less opportunity for false positives or false negatives) because they eliminate the spatial variability between wells.

During each monitoring event, constituent levels from each well will be compared to the control limits calculated from the background data for that constituent at that well. A sampled concentration that exceeds its control limit will indicate that the distribution of current concentrations is higher than that for the background data. Verification resampling and analysis prior to the next monitoring event will then be conducted for that parameter at that well. Evidence of a statistically significant increase (SSI) over background will occur when a constituent level again exceeds the control limit during two of two verification resampling events. The typical time frame for the first verification resampling event would be approximately two months after the initial sampling event. If the first verification resampling event confirms the exceedance, the second verification resampling event would occur approximately two months after the first verification resampling event. Time-series plots will be generated every five years, and will be used to visually evaluate whether constituent levels are increasing over time. The most recent time-series plots are shown in Attachment 3.

The statistical method used will depend on the percentage of non-detects and the distribution of the detected values in the data set. Statistical evaluation for those compounds where nothing is detected above the detection limit in the background data deserves special note. In this situation, the PQL as determined by the laboratory or as defined in SW-846 (USEPA, 1986) will be used in place of a calculated control limit (Gibbons et al., 1992). The PQL is the lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. This approach is particularly applicable for most of the volatile organic compounds and many of the dissolved metals constituents.

# Section 9 Assessment Monitoring

## 9.1 Overview of Assessment Monitoring

The analytical and data evaluation program described in the previous sections is for detection monitoring. If statistical significant increases over background in a detection monitoring parameter are detected and verified, assessment monitoring will be required. The first step of assessment monitoring is to evaluate if an alternate source (i.e., natural change or spatial variability, upgradient source, manmade cause, etc.) could explain the exceedance. If the source is verified to be the landfill, then assessment monitoring will be required. Assessment monitoring requires sampling downgradient groundwater monitoring wells for the constituents listed in Appendix II of Subtitle D (40 CFR Part 257), shown below in Table 11.

**Table 11: Assessment Monitoring Parameters**

| | | | |
|---|---|---|---|
| Acenaphthene | o-Cresol | Endosulfan sulfate | N-Nitrosodiphenylamine |
| Acenaphthylene | p-Cresol | Endrin | N-Nitrosodipropylamine |
| Acetone | Cyanide | Endrin aldehyde | N-Nitrosomethylethalamine |
| Acetonitrile | 2,4-D (2,4-Dichlorophenoxyacetic acid) | Ethylbenzene | N-Nitrosopiperidine |
| Acetophenone | 4,4[prime]-DDD | Ethyl methacrylate | N-Nitrosopyrrolidine |
| 2-Acetylaminofluorene | 4,4[prime]-DDE | Ethyl methanesulfonate | 5-Nitro-o-toluidine |
| Acrolein | 4,4[prime]-DDT | Famphur | Parathion |
| Acrylonitrile | Diallate | Fluoranthene | Pentachlorobenzene |
| Aldrin | Dibenz[a,h]anthracene | Fluorene | Pentachloronitrobenzene |
| Allyl chloride | Dibenzofuran | Heptachlor | Pentachlorophenol |
| 4-Aminobiphenyl | Dibromochloromethane | Heptachlor epoxide | Phenacetin |
| Anthracene | 1,2-Dibromo-3-chloropropane | Hexachlorobenzene | Phenanthrene |
| Antimony | 1,2-Dibromoethane (Ethylene Dibromide) | Hexachlorobutadiene | Phenol |
| Arsenic | Di-n-butyl phthalate | Hexachlorocyclopentadiene | p-Phenylenediamine |
| Barium | o-Dichlorobenzene | Hexachloroethane | Phorate |
| Benzene | m-Dichlorobenzene | Hexachloropropene | Polychlorinated biphenyls (PCBs) |
| Benzo[a]anthracene | p-Dichlorobenzene | 2-Hexanone | Pronamide |
| Benzo[b]fluoranthene | 3,3[prime]-Dichlorobenzidine | Indeno(1,2,3-cd)pyrene | Propionitrile |
| Benzo[k]fluoranthene | trans-1,4-Dichloro-2-butene | Isobutyl alcohol | Pyrene |
| Benzo[ghi]perylene | Dichlorodifluoromethane | Isodrin | Safrole |
| Benzo[a]pyrene | 1,1-Dichloroethane | Isophorone | Selenium |
| Benzyl alcohol | 1,2-Dichloroethane | Isosafrole | Silver |
| Beryllium | 1,1-Dichloroethylene | Kepone | Silvex (2,4,5-TP) |
| alpha-BHC | Vinylidene chloride cis-1,2-Dichloroethylene | Lead | Styrene |
| beta-BHC | trans-1,2-Dichloroethylene | Mercury | Sulfide |
| delta-BHC | 2,4-Dichlorophenol | Methacrylonitrile | 2,4,5-T (2,4,5-Trichlorophenoxyacetic acid) |
| gamma-BHC (Lindane) | 2,6-Dichlorophenol | Methapyrilene | 2,3,7,8-TCDD (2,3,7,8-Tetrachlorodibenzo-p-dioxin) |
| Bis(2-chloroethoxy)methane | 1,2-Dichloropropane | Methoxychlor | 1,2,4,5-Tetrachlorobenzene |
| Bis(2-chloroethyl)ether | 1,3-Dichloropropane | Methyl bromide (Bromomethane) | 1,1,1,2-Tetrachloroethane |

| | | | |
|---|---|---|---|
| Bis(2-chloro-1-methylethyl) ether | 2,2-Dichloropropane | Methyl chloride (Chloromethane) | 1,1,2,2-Tetrachloroethane |
| Bis(2-ethylhexyl) phthalate | 1,1-Dichloropropene | 3-Methylcholanthrene | Tetrachloroethylene |
| Bromochloromethane | cis-1,3-Dichloropropene | Methyl ethyl ketone (MEK; 2-Butanone) | 2,3,4,6-Tetrachlorophenol |
| Bromodichloromethane | trans-1,3-Dichloropropene | Methyl iodide | Thallium |
| Bromoform | Dieldrin | Methyl methacrylate | Tin |
| Butyl benzyl phthalate | Diethyl phthalate | Methyl methanesulfonate | Toluene |
| Cadmium | O,O-Diethyl O-2-pyrazinyl phosphorothioate (Thionazine) | 2-Methylnaphthalene | o-Toluidine |
| Carbon disulfide | Dimethoate | Methyl parathion | Toxaphene |
| Carbon tetrachloride | p-(Dimethylamino)azobenzene | 4-Methyl-2-pentanone | 1,2,4-Trichlorobenzene |
| Chlordane | 7,12-Dimethylbenz[a]anthracene | Methylene bromide (Dibromomethane) | 1,1,1-Trichloroethane |
| p-Chloroaniline | 3,3[prime]-Dimethylbenzidine | Methylene chloride (Dichloromethane) | 1,1,2-Trichloroethane |
| Chlorobenzene | alpha, alpha-Dimethylphenethylamine | Naphthalene | Trichloroethylene |
| Chlorobenzilate | 2,4-Dimethylphenol | 1,4-Naphthoquinone | Trichlorofluoromethane |
| p-Chloro-m-cresol | Dimethyl phthalate | 1-Naphthylamine | 2,4,5-Trichlorophenol |
| Chloroethane | m-Dinitrobenzene | 2-Naphthylamine | 2,4,6-Trichlorophenol |
| Chloroform | 4,6-Dinitro-o-cresol; 2-methyl-4,6-dintrophenol | Nickel | 1,2,3-Trichloropropane |
| 2-Chloronaphthalene | 2,4-Dinitrophenol | o-Nitroaniline | O,O,O-Triethyl phosphorothioate |
| 2-Chlorophenol | 2,4-Dinitrotoluene | m-Nitroaniline | sym-Trinitrobenzene |
| 4-Chlorophenyl phenyl ether | 2,6-Dinitrotoluene | p-Nitroaniline | Vanadium |
| Chloroprene | Dinoseb | Nitrobenzene | Vinyl acetate |
| Chromium | Di-n-octyl phthalate | o-Nitrophenol | Vinyl chloride |
| Chrysene | Diphenylamine | p-Nitrophenol | Xylene (total) |
| Cobalt | Disulfoton | N-Nitrosodi-n-butylamine | Zinc |
| Copper | Endosulfan I | N-Nitrosodiethylamine | |
| m-Cresol | Endosulfan II | N-Nitrosodimethylamine | |

For each Appendix II constituent detected, four samples must be tested within 180 days to establish baseline data. If the concentrations of all Appendix II parameters are below background values for two consecutive sampling events, the site may return to detection monitoring. If the concentrations are above background but below established GWPSs, assessment monitoring must continue. If the concentrations are above established GWPSs, additional investigations and corrective actions are required.

PVT ISWMF has been sampling since 1992 and groundwater data has never triggered assessment monitoring.

## 9.2 Assessment Monitoring Procedures

The procedures for assessment monitoring, as summarized in the Landfill Groundwater Monitoring Guidance Document (DOH, 2002), are outlined below. These assessment monitoring procedures would be triggered by a detected and verified statistically significant increase (SSI) over background in a detection monitoring parameter during detection monitoring. The first step in assessment monitoring is evaluation of an alternate source, as outlined below.

**Alternate Source Evaluation:**

1. Evaluate if SSI is a result of an alternate source

    a) Does an alternate explanation of the exceedance potentially exist at the site (e.g., natural change or spatial variability, upgradient source, manmade cause, etc.)? If no, go to Assessment Monitoring, below. If yes, proceed with the following:

    b) Sample upgradient wells.

    c) Sample leachate (if possible).

    d) Sample regional wells.

    e) Fingerprint groundwater and potential sources (isotopes, Stiff diagrams, trilinear diagrams, etc.).

    f) Have a qualified groundwater scientist develop an alternate monitoring scheme that incorporates different source(s) - e.g., incorporate new data into background if alternate source, or eliminate parameter(s) from the routine detection monitoring program.

    g) Perform other related tasks as appropriate.

2. If source is verified not to be the landfill, amend detection monitoring program to avoid repetitive SSI.

3. If source is verified to be the landfill, move to Assessment Monitoring.

**Assessment Monitoring:**

1. Follow regulation requirements for notification (see Section 10).

2. Initial Assessment Monitoring → If approval has already been obtained or can be obtained within the required time frame from the DOH:

    a) Within 90 days of triggering Assessment Monitoring sample only the well(s) that triggered Assessment for Appendix II parameters (i.e., alternate assessment wells).

    b) If approval from the DOH has not or cannot be obtained within the specified time frame (i.e., 90 days from trigger), sample all of the wells in the approved network for Appendix II parameters.

    (Note: The preferred approach is to sample only the well(s) that triggered Assessment, since by definition these are the only wells that are possibly indicative of a release at the facility, and the regulations support this preferred approach. However, approval from the DOH must be obtained to use a subset of the approved detection monitoring network prior to this approach being implemented.)

c) If approval cannot be obtained prior to the initial Appendix II sampling, submit a formal request as soon as possible to the DOH to allow the site to address only the well(s) that have triggered an SSI during future Assessment Monitoring.

3. In this manner, only those wells exhibiting impacts are in Assessment Monitoring, while the rest of the site remains in detection monitoring (40 CFR 258.55(b)&(d)(2)).

4. Verify any Appendix II parameters that were detected above the relevant laboratory reporting limit or previously established statistical limit and that were not previously verified in detection monitoring with a resample as soon as sample independence is achieved. The verification resample should be for the parameter(s) that failed only.

   Technical Note: Sample independence is controlled by site groundwater flow conditions, and is achieved when sufficient time has passed such that the radius of influence (ROI) from one sample event is substantially beyond the ROI caused by the subsequent sample event. For relatively high permeability groundwater zones (e.g., $>10^{-5}$ feet/second hydraulic conductivity) sample independence may be obtained within a matter of days. Lower permeability groundwater zones take progressively longer. However, verification resampling should always be performed within three months of determination of SSI.

5. If no Appendix II parameters are detected above the relevant laboratory reporting limit or previously established statistical limit (i.e., background), obtain another independent sample and analyze again for Appendix II. If no Appendix II parameters are detected above background for two consecutive sample events, return to detection monitoring and notify DOH per regulations (see Section 10 and 40 CFR 258.55(e)).

   Technical Note: Return to Detection Monitoring - Pursuant to 40 CFR 258.55(e), any time during assessment monitoring that Appendix II parameters statistically return to background levels (i.e., detection monitoring background levels or background as defined in Assessment Monitoring [see item 7., below]) for two consecutive sample events, the site may return to detection monitoring upon notification of the DOH.

6. If an alternate detection monitoring parameter (e.g., chloride, magnesium, bicarbonate, etc.) caused the initial SSI, and no Appendix II parameters are detected in the Assessment Monitoring, perform an alternate source evaluation as described above.

   a) If it cannot be determined that the landfill is not the source of the alternate parameter SSI(s) (i.e., the landfill could be the source of the SSI), site returns to detection monitoring (40 CFR 258.55(e)); however, Appendix II sampling occurs at the SSI well(s) once every two years instead of once every five years (as stipulated in normal detection monitoring) until the alternate parameters remain below the statistical limit(s) for two consecutive samples. These alternate SSI parameters remain in the monitoring program, but are not used as formal detection monitoring parameters until the concentrations return to below SSI levels, or until an alternate source not associated with the landfill is determined to be the cause of the SSI(s).

b) If alternate source analysis performed in item 6a. above determines that the landfill is not the source of the SSI, place results in the operating record and either incorporate the new data into background to recalculate the statistical limits, eliminate the SSI parameters from the monitoring program, or revise the statistical methodology pursuant to ASTM Standard D6312-98(2012)e1 (ASTM, 2012).

7. Develop Background → Develop background for all newly detected and verified Appendix II parameters (see item 4. above) that could be derived from a release at the landfill, pursuant to the following:

    a) Inorganic Appendix II parameter for which background has not previously been established → Background should include a minimum of eight independent samples recommended over at least a one year period. Samples should be collected at locations that are appropriate to obtain an accurate representation of background groundwater chemistry in the effected aquifer as determined by a qualified groundwater scientist (all background and downgradient wells must be sampled in the absence of DOH approval).

    b) Independent of the background development process for the detected Appendix II parameter(s), obtain a minimum of four independent samples from the SSI well(s) and analyze for the detected Appendix II parameter(s). These data will be necessary to establish a statistical base for ultimate comparison with the GWPS (see item 12. below). In addition, leachate and groundwater should be sampled for major anions and cations and general leachate indicators (if sufficient data do not already exist) to aid potential future source characterization. Should the original SSI parameter(s) return to pre-Assessment background levels at any time, analyze two independent samples for full Appendix II list. If two consecutive events verify non-exceedances of pre-Assessment background, notify the DOH and return to detection monitoring (40 CFR 258.55(e)).

    c) Organic parameters not suspected to previously be in the groundwater system, and inorganic Appendix II parameters for which background has previously been established → Collect four independent samples to comply with the regulations (40 CFR 258.55(b)) from appropriate wells and to allow more confident statistical comparison to EALs or other established and relevant GWPS. At a minimum, obtain four independent samples from the SSI well(s) and analyze for the detected Appendix II parameter(s). These data will be necessary to establish a statistical base for ultimate comparison with the GWPS (see item 12. below).

    d) Establish background → Establish background concentrations for any constituents detected pursuant to item 4. above (40 CFR 258.55(d)(3)).

8. <u>Groundwater Protection Standards (GWPS)</u> → Establish GWPS for all detected Appendix II constituents based on background concentrations if the background concentrations are greater than any published EAL or if no EAL exists for a given parameter. Use the statistical methodologies as outlined in ASTM (e.g., D6312-98(2012)e1) to determine GWPS using background (if >EAL or no EAL), or the other no-EAL health-based methodology specified in 40 CFR 258.55(i). In all other cases, the EAL should be used if possible.

9. <u>Routine Assessment Monitoring</u> → Recommended procedure: routine Assessment Monitoring should only be performed at the well(s) that exhibited the SSI. All other wells in the approved network should remain in detection monitoring. The DOH must be approached with a proposal allowing this use of a subset of wells in accordance with 40 CFR 258.55(b) & (d)(2). Routine Assessment Monitoring should consist of sampling the SSI well(s) 90 days from the verified Appendix II sample date (see item 4. above), and semiannually thereafter, for the routine detection monitoring parameters and the detected Appendix II parameter(s) from item 4. above. The full Appendix II parameter list should be monitored at the SSI well(s) every five years (with the approval of the DOH). Semi-volatiles should be monitored at the SSI wells every two years (with the approval of the DOH).

   <u>Technical Note:</u> Default requirements - in the absence of DOH approval as outlined above, the site must monitor all wells in the approved network semiannually and 90 days following the verified detection of Appendix II parameter(s) for detected Appendix II parameters (Item 4. above) and routine detection monitoring parameters. In addition, annual monitoring must be conducted at all downgradient wells for the full list of Appendix II parameters. Since the regulation allows a less stringent course of action (40 CFR 258.55(b) & (d)(2)), approval from the DOH is strongly recommended to limit the Assessment activities to only the well(s) at which there is evidence of a release from the landfill.

10. If the results of the routine Assessment Monitoring program reveal concentrations less than or equal to background (as determined either in detection monitoring or pursuant to item 7. above) for two consecutive sampling events, notify DOH and return to detection monitoring.

11. If the results of the Assessment Monitoring program show concentrations greater than background but less than the GWPS, continue Assessment Monitoring.

12. See the book by Dr. R.D. Gibbons (1994a), entitled *Statistical Methods for Groundwater Monitoring*, for guidance on determining whether an SSI over a GWPS has occurred.

    a) If an SSI over the GWPS is confirmed, notify appropriate parties in accordance with the regulations (40 CFR 258.55(g)), characterize nature and extent of release by installing additional wells as necessary using such methods as geophysics, geochemistry, hydropunch, etc., to define locations of wells and plume characteristics. At least one additional well within the flow path of contaminant migration at the property boundary is required by the regulation. Screen intervals should intercept the preferential groundwater migration pathways. In addition, appropriate landfill operational actions should be implemented to minimize or eliminate the release, if possible.

--- Or ---

b) Perform an alternate source demonstration by a qualified groundwater scientist, if appropriate, and submit the report to the DOH. Until a successful demonstration is made (i.e., approved), comply with item 12a. above, and item 14. below. If the report is approved by the DOH, place it in the Operating Record for the site. Continue Assessment Monitoring until all Appendix II parameters are below background levels established incorporating the alternate source concentrations, or eliminate the exceedance parameters from the comparison (with DOH approval), for two consecutive sample events; then return to detection monitoring.

13. Obtain approval from the DOH to delete those Appendix II parameters shown to be from an alternate source (i.e., not the landfill) from the routine detection monitoring program. The DOH should comply with this request since the parameters would by definition not be effective at detecting a future release from the landfill.

    Technical Note: SSI over GWPS – Additional details on comparing groundwater data to a regulatory limit (e.g., GWPS) is provided in Gibbons (1994a), *Statistical Methods for Groundwater Monitoring*.

14. Initiate Assessment of Corrective Measures within 90 days of the verified exceedance of the GWPS (i.e., item 12a. above) if no alternate source evaluation was conducted, if it failed, or if awaiting approval (40 CFR 258.55(g)(2)). There is no formal requirement for DOH notification in the regulation. This corrective measures assessment must be complete within a "reasonable period of time" (40 CFR 258.56(a)). Results must be presented in a public hearing prior to the selection of the remedy (40 CFR 258.56(d)).

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# Section 10 Data Quality Review, Recordkeeping, and Reporting

## 10.1 Data Quality Review

Before data are subjected to statistical analysis, a qualified groundwater scientist should evaluate the data by examining the quality control information accompanying the data report from the laboratory. Relevant quality control data include measures of accuracy (percent recovery), precision (relative percent difference), and sample contamination (blank determination). In addition, the laboratory MDLs and MRLs/PQLs should be reviewed for consistency with previous reports. Data that appears questionable should be flagged for a closer evaluation and a data quality review by the laboratory.

Following the initial data quality review, all data should undergo a second level of review by graphing historical trends and comparing new results with the historical trends to flag visual outliers or other anomalous data. If a clearly anomalous result is detected, a data quality review should be initiated by the laboratory to ascertain if laboratory error is involved. Field information, including field and trip blanks, should also be checked for anomalous occurrences or observations that might help to explain an outlier result. The groundwater level measurements should also be reviewed by a qualified groundwater scientist prior to using this data in development of the groundwater gradient map.

## 10.2 Recordkeeping

Written records should be maintained by PVT ISWMF for a minimum of five years. This includes monitoring reports as well as other submittals to the DOH.

## 10.3 Reporting Requirements

### 10.3.1 Detection Monitoring Water Quality Reports

While the landfill is still in operation, detection monitoring will be conducted semiannually and a detection monitoring report will be submitted semiannually. The report will summarize the groundwater monitoring information collected during the semiannual monitoring event. The second semiannual report prepared in the monitoring year will also contain an annual summary. Upon landfill closure and with no identified releases from the landfill, detection monitoring will be conducted annually, upon approval from DOH.

Every five years, the annual report will include a background water quality report, which will contain an updated list of all parameters detected and updated control limits where applicable. This report will serve to adjust the Groundwater and Leachate Monitoring Plan accordingly.

The Detection Monitoring Reports will contain the following items:

a. A map showing the locations of the monitoring wells.

b. A description and graphical presentation of the gradient and direction of groundwater flow under the landfill. This will be based on groundwater elevations taken during the collection of the groundwater quality data submitted in the report.

c. Well information for each monitoring well including the method and time of water level measurement, a description of the method of purging used before sampling to remove stagnant water in the well, and a description of the sampling procedures.

d. Monitoring analytical data obtained during the previous year's reporting periods, presented in tabular form.

e. The results of sampling analysis including control limits for each monitoring point.

f. The laboratory analytical data for samples taken from each monitoring point within at least the previous five years. This information will be in graphical form. Each graph will plot the concentration of one or more constituents over time for a given monitoring point, at a scale appropriate to show trends or variations in water quality. Graphs will plot each datum, rather than plotting mean values.

g. A summary of monitoring results and monitoring systems (e.g., condition of the wells) indicating changes made or observed since the previous report.

h. A complete discussion of the compliance record, and the result of any corrective actions taken or planned which may be needed to bring the site into full compliance with the waste discharge requirements.

i. An evaluation of the effectiveness of the storm water run-off and run-on control facilities.

j. In addition, to the above items, the second semiannual report during the monitoring period will contain an annual summary of the detection monitoring results.

k. Stiff diagrams and/or trilinear plots of major inorganic element composition of groundwater in each well and of leachate will be included in the annual report every five years.

l. Time series plots of the data will be generated every five years, and will be used to visually evaluate whether constituent levels are increasing over time.

m. Background water quality data containing an updated list of all parameters detected and updated control limits where applicable will be included in the annual report every five years.

Reports will be submitted to the DOH within 90 days following the end of the reporting period.

### 10.3.2 Unscheduled Reports

***Exceedance Report***

If after two of two verification resampling events, a given detection monitoring parameter or constituent of concern still has a statistically significant exceedance of its control limit, then a confirmed exceedance has been identified. The operators of PVT ISWMF will identify the monitoring point and parameter involved, and discuss the findings in the next detection monitoring report.

***Assessment Monitoring Water Quality Reports***

For the assessment monitoring reports, a short letter outlining the results and containing plots that show the assessment monitoring parameters and their associated GWPSs will be submitted. Any exceedances of the GWPSs will be highlighted and discussed.

An assessment monitoring report will be submitted semiannually, as needed while in assessment monitoring. The assessment monitoring report can be incorporated into the semiannual detection monitoring report. The assessment monitoring report will identify the wells and parameters that are in assessment monitoring. The report will also identify the GWPS applicable for each parameter.

The Assessment Monitoring Reports will contain the following items:

a. The results of sampling analysis including the GWPS for each monitoring point that is in assessment monitoring.

b. A letter transmitting the essential points in each report will accompany each report.

c. Well information for each monitoring well in assessment monitoring will be included in the report. This information will include the method and time of water level measurement, a description of the method of purging used before sampling to remove stagnant water in the well, and a description of the sampling procedures.

d. A map showing the locations of monitoring points will be included in the report.

Assessment monitoring reports will be submitted to DOH within 90 days after the end of the reporting period.

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# Attachment 1

## Analytical Data Summary

# Table 1

## Analytical Data Summary for LEACHAT

| Constituents | Units | 2/25/1992 | 6/23/1992 | 5/28/1993 | 6/27/1994 | 6/14/1995 | 8/07/1995 | 6/27/1996 | 8/29/1996 | 9/23/1996 | 7/02/1997 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | ug/L | | | | | | | | | | |
| Alkalinity, bicarbonate (as caco3) | mg/L | | | | | | | | | | |
| Arsenic | mg/L | | | | | | | | | | |
| Barium | mg/L | | | | | | | | | | |
| Cadmium | mg/L | | | | | | | | | | |
| Calcium | mg/L | | | | | | | | | | |
| Chloride | mg/L | | | | | | | | | | |
| Chromium | mg/L | | | | | | | | | | |
| Cis- 1,2 - dichloroethene | ug/L | | | | | | | | | | |
| COD | mg/L | | | | | | | | | | |
| Iron | mg/L | | | | | | | | | | |
| Lead | mg/L | | | | | | | | | | |
| Magnesium | mg/L | | | | | | | | | | |
| Mercury | mg/L | | | | | | | | | | |
| Methyl tert-butyl ether | µg/L | | | | | | | | | | |
| Potassium | mg/L | | | | | | | | | | |
| Sodium | mg/L | | | | | | | | | | |
| Sulfate | mg/L | | | | | | | | | | |
| Tetrachloroethene | ug/L | | | | | | | | | | |
| TOC | mg/L | | | | | | | | | | |
| Total dissolved solids | mg/L | | | | | | | | | | |
| Tph (diesel) | mg/L | | | | | | | | | | |
| Trichloroethene | ug/L | | | | | | | | | | |
| Xylenes (total) | ug/L | | | | | | | | | | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 1

## Analytical Data Summary for LEACHAT

| Constituents | 11/12/1998 | 4/23/1999 | 9/27/1999 | 12/02/1999 | 2/02/2000 | 5/25/2000 | 8/25/2000 | 11/29/2000 | 6/21/2001 | 12/06/2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | | | | | | | | | | |
| Alkalinity, bicarbonate (as caco3) | | | | | | | | | | |
| Arsenic | | | | | | | | | | |
| Barium | | | | | | | | | | |
| Cadmium | | | | | | | | | | |
| Calcium | | | | | | | | | | |
| Chloride | | | | | | | | | | |
| Chromium | | | | | | | | | | |
| Cis- 1,2 - dichloroethene | | | | | | | | | | |
| COD | | | | | | | | | | |
| Iron | | | | | | | | | | |
| Lead | | | | | | | | | | |
| Magnesium | | | | | | | | | | |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | | | | | | | | | | |
| Potassium | | | | | | | | | | |
| Sodium | | | | | | | | | | |
| Sulfate | | | | | | | | | | |
| Tetrachloroethene | | | | | | | | | | |
| TOC | | | | | | | | | | |
| Total dissolved solids | | | | | | | | | | |
| Tph (diesel) | | | | | | | | | | |
| Trichloroethene | | | | | | | | | | |
| Xylenes (total) | | | | | | | | | | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 1

## Analytical Data Summary for LEACHAT

| Constituents | 12/14/2001 | 12/22/2001 | 6/10/2002 | 12/03/2002 | 6/26/2003 | 12/04/2003 | 6/09/2004 | 12/20/2004 | 6/27/2005 | 6/29/2005 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | | | | | | | | | | <5.0000 |
| Alkalinity, bicarbonate (as caco3) | 200.0000 | | | | | | | | | 170.0000 |
| Arsenic | | <.0200 | | | | | | | | |
| Barium | | | | | | | | | | |
| Cadmium | | <.0050 | | | | | | | | |
| Calcium | 84.4000 | | | | | | | | | 362.0000 |
| Chloride | 1700.0000 | | | | | | | | | |
| Chromium | | <.0050 | | | | | | | | |
| Cis- 1,2 - dichloroethene | | | | | | | | | | <5.0000 |
| COD | | | | | | | | | | |
| Iron | | <.0500 | | | | | | | | |
| Lead | | <.0050 | | | | | | | | |
| Magnesium | 10.5000 | | | | | | | | | 49.6000 |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | | | | | | | | | | <5.0000 |
| Potassium | 46.1000 | | | | | | | | | 68.4000 |
| Sodium | 1040.0000 | | | | | | | | | 2950.0000 |
| Sulfate | 730.0000 | | | | | | | | | |
| Tetrachloroethene | | | | | | | | | | <5.0000 |
| TOC | 6.6000 | | | | | | | | | <100.0000 |
| Total dissolved solids | 3840.0000 | | | | | | | | | 10100.0000 |
| Tph (diesel) | | | | | | | | | | |
| Trichloroethene | | | | | | | | | | <5.0000 |
| Xylenes (total) | | | | | | | | | | <5.0000 |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 1

## Analytical Data Summary for LEACHAT

| Constituents | 12/22/2005 | 2/28/2006 | 6/15/2006 | 6/29/2006 | 10/31/2006 | 12/19/2006 | 6/29/2007 | 12/12/2007 | 12/14/2007 | 6/25/2008 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | | | | | | | | | | |
| Alkalinity, bicarbonate (as caco3) | | 862.0000 | 582.0000 | | | | | | 200.0000 | |
| Arsenic | | | | | <.0200 | | | | | |
| Barium | | | | | .0079 | | | | | |
| Cadmium | | | | | <.0050 | | | | | |
| Calcium | | 420.0000 | 428.0000 | | | | | | 84.4000 | |
| Chloride | | 4700.0000 | 5400.0000 | | | | | | 1700.0000 | |
| Chromium | | | | | .0084 | | | | | |
| Cis- 1,2 - dichloroethene | | | | | | | | | | |
| COD | | | | | | | | | | |
| Iron | | | | | | | | | | |
| Lead | | | | | <.0050 | | | | | |
| Magnesium | | 430.0000 | 557.0000 | | | | | | 105.0000 | |
| Mercury | | | | | <.0002 | | | | | |
| Methyl tert-butyl ether | | | | | | | | | | |
| Potassium | | 80.0000 | 88.9000 | | | | | | 46.1000 | |
| Sodium | | 2900.0000 | 3230.0000 | | | | | | 1040.0000 | |
| Sulfate | | 1000.0000 | 1380.0000 | | | | | | 730.0000 | |
| Tetrachloroethene | | | | | | | | | | |
| TOC | | 14.0000 | 28.0000 | | | | | | 6.6000 | |
| Total dissolved solids | | 10700.0000 | 1090.0000 | | | | | | 3840.0000 | |
| Tph (diesel) | | | | | | | | | | |
| Trichloroethene | | | | | | | | | | |
| Xylenes (total) | | | | | | | | | | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 1

## Analytical Data Summary for LEACHAT

| Constituents | 12/09/2008 | 12/22/2008 | 6/17/2009 | 12/09/2009 | 6/30/2010 | 12/09/2010 | 12/30/2010 | 1/25/2011 | 6/30/2011 | 9/30/2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | | | | | | | | | | |
| Alkalinity, bicarbonate (as caco3) | 208.0000 | | | 160.0000 | | | 96.0000* | | | |
| Arsenic | | <.0200 | | <.0100 | | | <.0100 | <.0100 | | |
| Barium | | | | | | | | | | |
| Cadmium | | <.0050 | | <.0050 | | | <.0050 | <.0050 | | |
| Calcium | 90.7000 | | | 390.0000 | | | 550.0000 | 590.0000 | | |
| Chloride | 1500.0000 | | | 1500.0000 | | | 1800.0000 | | | |
| Chromium | | <.0050 | | <.0050 | | | .0110 | <.0050 | | |
| Cis- 1,2 - dichloroethene | | | | | | | | | | |
| COD | | | | | | | | | | |
| Iron | | <.0500 | | 1.9000 | | | <.0400 | <.0400 | | |
| Lead | | <.0050 | | <.0050 | | | <.0050 | <.0050 | | |
| Magnesium | 87.4000 | | | 250.0000 | | | 370.0000 | 390.0000 | | |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | | | | | | | | | | |
| Potassium | 37.7000 | | | 380.0000 | | | 160.0000 | 150.0000 | | |
| Sodium | 972.0000 | | | 950.0000 | | | 1100.0000 | 1300.0000 | | |
| Sulfate | 640.0000 | | | 2500.0000 | | | 2000.0000 | | | |
| Tetrachloroethene | | | | | | | | | | |
| TOC | 3.5000 | | | 7.6000 | | | 7.3000 | | | |
| Total dissolved solids | 3850.0000 | | | 6600.0000 | | | 7200.0000 | | | |
| Tph (diesel) | | | | .0900 | | | .0947 | | | |
| Trichloroethene | | | | | | | | | | |
| Xylenes (total) | | | | | | | | | | |

* - The displayed value is the arithmetic mean of multiple database matches.

## Table 1

## Analytical Data Summary for LEACHAT

| Constituents | 12/28/2011 | 6/14/2012 | 12/23/2012 | 12/26/2012 | 6/26/2013 | 6/29/2013 | 9/24/2013 | 1/23/2014 | 6/06/2014 | 7/23/2014 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | | | | | | | | | | |
| Alkalinity, bicarbonate (as caco3) | 173.0000 | | | 359.0000* | | | | 340.0000* | | |
| Arsenic | <.0200 | | | <.0100 | | | | <.0100 | | |
| Barium | | | | | | | | | | |
| Cadmium | <.0020 | | | <.0005 | | | | <.0010 | | |
| Calcium | 495.0000 | | | 451.0000 | | | | 538.0000 | | |
| Chloride | 2130.0000 | | | 1570.0000 | | | | 2420.0000 | | |
| Chromium | <.0080 | | | .1510 | | | | .0090 | | |
| Cis- 1,2 - dichloroethene | | | | | | | | | | |
| COD | | | | | | | | | | |
| Iron | 5.3000 | | | 6.0200 | | | | 1.0200 | | |
| Lead | <.0050 | | | .0100 | | | | <.0100 | | |
| Magnesium | 243.0000 | | | 187.0000 | | | | 272.0000 | | |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | | | | | | | | | | |
| Potassium | 432.0000 | | | 530.0000 | | | | 285.0000 | | |
| Sodium | 1150.0000 | | | 878.0000 | | | | 1310.0000 | | |
| Sulfate | 2090.0000 | | | 1950.0000 | | | | 2230.0000 | | |
| Tetrachloroethene | | | | | | | | | | |
| TOC | 15.0000 | | | 9.4000 | | | | 14.2000 | | |
| Total dissolved solids | 6730.0000 | | | 6120.0000 | | | | 7380.0000 | | |
| Tph (diesel) | .2100 | | | .2700 | | | | .8200 | | |
| Trichloroethene | | | | | | | | | | |
| Xylenes (total) | | | | | | | | | | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 1

## Analytical Data Summary for LEACHAT

| Constituents | 1/12/2015 | 4/28/2015 |
|---|---|---|
| 1,2 - dichloroethane | | |
| Alkalinity, bicarbonate (as caco3) | 367.0000* | |
| Arsenic | <.0100 | |
| Barium | | |
| Cadmium | <.0010 | |
| Calcium | 472.0000 | |
| Chloride | 1920.0000 | |
| Chromium | .0190 | |
| Cis- 1,2 - dichloroethene | | |
| COD | | |
| Iron | 2.3700 | |
| Lead | <.0100 | |
| Magnesium | 222.0000 | |
| Mercury | | |
| Methyl tert-butyl ether | | |
| Potassium | 239.0000 | |
| Sodium | 1250.0000 | |
| Sulfate | 1860.0000 | |
| Tetrachloroethene | | |
| TOC | 10.5000 | |
| Total dissolved solids | 6650.0000 | |
| Tph (diesel) | .3300 | |
| Trichloroethene | | |
| Xylenes (total) | | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 2

## Analytical Data Summary for MW-1

| Constituents | Units | 2/25/1992 | 6/23/1992 | 5/28/1993 | 6/27/1994 | 6/14/1995 | 8/07/1995 | 6/27/1996 | 8/29/1996 | 9/23/1996 | 7/02/1997 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | ug/L | <3.0000 | <5.0000 | <.2500 | <.5000 | <2.0000 | <.5000 | <.5000 | <.5000 | <.5000 | <5.0000 |
| Alkalinity, bicarbonate (as caco3) | mg/L | | | | | | | | | | |
| Arsenic | mg/L | | | | | <.5000 | | <.5000 | <.5000 | <.5000 | <.5000 |
| Barium | mg/L | .0300 | .0300 | | | <.0500 | | <.0500 | <.0500 | <.0500 | <.0500 |
| Cadmium | mg/L | | | <.0100 | | <.0050 | | <.0050 | <.0050 | <.0050 | <.0050 |
| Calcium | mg/L | | | | | | | | | | |
| Chloride | mg/L | | | | | | | | | | |
| Chromium | mg/L | | .0400 | | | <.0500 | | <.0500 | <.0500 | <.0500 | <.0500 |
| Cis- 1,2 - dichloroethene | ug/L | | | | | | | | | | <5.0000 |
| COD | mg/L | | | | | | | | | | 230.0000 |
| Iron | mg/L | | | | | | | | | | |
| Lead | mg/L | | | <.1000 | | <.1000 | | <.1000 | <.1000 | <.1000 | <.0050 |
| Magnesium | mg/L | | | | | | | | | | |
| Mercury | mg/L | | | | | | | | | | <.0010 |
| Methyl tert-butyl ether | µg/L | | | | | | | | | | |
| Potassium | mg/L | | | | | | | | | | |
| Sodium | mg/L | | | | | | | | | | |
| Sulfate | mg/L | | | | | | | | | | |
| Tetrachloroethene | ug/L | | | | | | | | | | <5.0000 |
| TOC | mg/L | 2.0000 | 180.0000 | | | <5.0000 | | 20.0000 | 27.0000 | 13.0000 | <3.0000 |
| Total dissolved solids | mg/L | | | | | | | | | | |
| Tph (diesel) | mg/L | | | | | | | | | | <.0500 |
| Trichloroethene | ug/L | <4.0000 | <5.0000 | 4.8000 | 6.6000 | 12.0000 | 13.0000 | 15.0000 | 22.0000 | 19.0000 | 21.0000 |
| Xylenes (total) | ug/L | <3.0000 | <5.0000 | <.2500 | <2.0000 | <2.0000 | | <2.0000 | <2.0000 | <2.0000 | <3.5000* |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 2

## Analytical Data Summary for MW-1

| Constituents | 11/12/1998 | 4/23/1999 | 9/27/1999 | 12/02/1999 | 2/02/2000 | 5/25/2000 | 8/25/2000 | 11/29/2000 | 6/21/2001 | 12/06/2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |
| Alkalinity, bicarbonate (as caco3) | 400.0000 |  | 340.0000 | 370.0000 | 375.0000 | 371.0000 | 367.0000 | 386.0000 | 375.0000 | 381.0000 |
| Arsenic | <.5000 | <.5000 | <.5000 | <.5000 | <.5000 | <.5000 |  | <.5000 | <.5000 | <.0200 |
| Barium |  |  |  |  |  |  |  |  |  |  |
| Cadmium |  | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 |
| Calcium | 170.0000 | 170.0000 | 177.0000 | 210.0000 | 183.0000 | 194.0000 | 201.0000 | 194.0000 | 191.0000 | 183.0000 |
| Chloride | 1900.0000 | 2100.0000 | 2200.0000 | 2100.0000 | 2200.0000 | 1940.0000 | 2080.0000 | 2060.0000 | 1970.0000 | 2330.0000 |
| Chromium | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0050 |
| Cis- 1,2 - dichloroethene | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |
| COD |  |  |  |  |  |  |  |  |  |  |
| Iron | <.1000 | <.1000 | <.1000 | <.1000 | <.1000 | <.1000 | <.1000 | <.1000 | <.1000 | <.0500 |
| Lead |  | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 |
| Magnesium | 190.0000 | 190.0000 | 194.0000 | 220.0000 | 209.0000 | 197.0000 | 208.0000 | 211.0000 | 215.0000 |  |
| Mercury |  |  |  |  |  |  |  |  |  |  |
| Methyl tert-butyl ether |  | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |
| Potassium | 28.0000 | 28.0000 | 29.9940 | 32.0000 | 27.9000 | 29.3000 | 34.0000 | 31.6000 | 30.2000 | 47.8000 |
| Sodium | 1000.0000 | 930.0000 | 991.0000 | 1100.0000 | 1040.0000 | 964.0000 | 1020.0000 | 1070.0000 | 969.0000 | 991.0000 |
| Sulfate | 410.0000 | 110.0000 | 410.0000 | 380.0000 | <50.0000 | 360.0000 | 345.0000 | 266.0000 | 93.6000 | 404.0000 |
| Tetrachloroethene | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |
| TOC | 1.6000 |  |  | 35.3000 | 104.0000 | 38.3000 | 36.8000 | 6.8000 | 3.0400 | 17.6000 |
| Total dissolved solids | 4600.0000 | 4500.0000 | 7500.0000 | 4400.0000 | 4510.0000 | 4820.0000 | 4550.0000 | 4690.0000 | 5930.0000 | 17600.0000 |
| Tph (diesel) |  | <.1500 | <.5000 | .0800 | <.1500 | <.1500 | <.1500 | <.1500 | <.1500 | <.1520 |
| Trichloroethene | 18.0000 | 17.0000 | 18.0000 | 16.0000 | 15.7000 | 13.7000 | 15.8000 | 13.1000 | 15.0000 | 14.8000 |
| Xylenes (total) | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 2

## Analytical Data Summary for MW-1

| Constituents | 12/14/2001 | 12/22/2001 | 6/10/2002 | 12/03/2002 | 6/26/2003 | 12/04/2003 | 6/09/2004 | 12/20/2004 | 6/27/2005 | 6/29/2005 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |
| Alkalinity, bicarbonate (as caco3) | | | 364.0000 | 364.0000 | 378.0000 | | 444.0000 | 362.0000 | 378.0000 | |
| Arsenic | | | <.0200 | <.0200 | <.0200 | <.0200 | <.0200 | <.0200 | | |
| Barium | | | | | | | .0193 | | | |
| Cadmium | | | <.0050 | <.0050 | <.0050 | <.0050 | <.0050* | <.0050 | | |
| Calcium | | | 191.0000 | 197.0000 | 176.0000 | 204.0000 | 208.0000 | 196.0000 | 184.0000 | |
| Chloride | | | 2140.0000 | 2080.0000 | 1990.0000 | 2090.0000 | 2420.0000 | 2260.0000 | 1720.0000 | |
| Chromium | | | <.0050 | <.0050 | <.0050 | <.0050 | <.0050* | <.0050 | | |
| Cis- 1,2 - dichloroethene | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |
| COD | | | | | | | | | | |
| Iron | | | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | | |
| Lead | | | <.0050 | <.0050 | <.0050 | <.0050 | <.0050* | <.0050 | | |
| Magnesium | | | 220.0000 | 215.0000 | 190.0000 | 223.0000 | 237.0000 | 223.0000 | 210.0000 | |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |
| Potassium | | | 39.4000 | 36.0000 | 31.8000 | 40.2000 | 36.5000 | 25.8000 | 29.3000 | |
| Sodium | | | | 1220.0000 | 1010.0000 | 956.0000 | 1090.0000 | 1050.0000 | 1110.0000 | |
| Sulfate | | | 400.0000 | 400.0000 | 393.0000 | 393.0000 | 363.0000 | 415.0000 | 390.0000 | |
| Tetrachloroethene | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |
| TOC | | | 16.6000 | 13.0000 | 19.0000 | 23.3000 | 14.1000 | | | |
| Total dissolved solids | | | 4600.0000 | 4640.0000 | 4570.0000 | 4830.0000 | 4630.0000 | 4790.0000 | 4488.0000 | |
| Tph (diesel) | | | .8610 | <.1500 | <.1590 | <.2560 | <.2600 | .0560 | | |
| Trichloroethene | | | 13.3000 | 45.9000 | 11.3000 | 10.8000 | 8.0200 | 7.6700 | 6.9500 | |
| Xylenes (total) | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 2

## Analytical Data Summary for MW-1

| Constituents | 12/22/2005 | 2/28/2006 | 6/15/2006 | 6/29/2006 | 10/31/2006 | 12/19/2006 | 6/29/2007 | 12/12/2007 | 12/14/2007 | 6/25/2008 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |
| Alkalinity, bicarbonate (as caco3) | 364.0000 | | 374.0000* | | | 374.0000 | 386.0000 | 378.0000 | | 356.0000 |
| Arsenic | | | | | | | | | | |
| Barium | | | | | | | | | | |
| Cadmium | | | | | | | | | | |
| Calcium | 199.0000 | | 193.0000 | | | 190.0000 | 226.0000 | 180.0000 | | 188.0000 |
| Chloride | 2000.0000 | | 2340.0000 | | | 2100.0000 | 2100.0000 | 2000.0000 | | 1900.0000 |
| Chromium | | | | | | | | | | |
| Cis- 1,2 - dichloroethene | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |
| COD | | | | | | | | | | |
| Iron | | | | | | | | | | |
| Lead | | | | | | | | | | |
| Magnesium | 210.0000 | | 199.0000 | | | 198.0000 | 239.0000 | 199.0000 | | 215.0000 |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |
| Potassium | 32.7000 | | 25.2000 | | | 32.0000 | 30.0000 | 35.9000 | | 28.0000 |
| Sodium | 1060.0000 | | 1060.0000 | | | 1040.0000 | 1160.0000 | 958.0000 | | 903.0000 |
| Sulfate | 410.0000 | | 462.0000 | | | 390.0000 | 440.0000 | 410.0000 | | 380.0000 |
| Tetrachloroethene | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |
| TOC | | | | | | | | | | |
| Total dissolved solids | 4440.0000 | | 4526.0000 | | | 4470.0000 | 5200.0000 | 4670.0000 | | 4550.0000 |
| Tph (diesel) | | | | | | | | | | |
| Trichloroethene | 6.9000 | | <5.0000 | | | 5.2400 | <5.0000 | <5.0000 | | <5.0000 |
| Xylenes (total) | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 2

## Analytical Data Summary for MW-1

| Constituents | 12/09/2008 | 12/22/2008 | 6/17/2009 | 12/09/2009 | 6/30/2010 | 12/09/2010 | 12/30/2010 | 1/25/2011 | 6/30/2011 | 9/30/2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | <5.0000 | | <5.0000 | <5.0000 | <.5000 | | <5.0000 | | <.5000 | |
| Alkalinity, bicarbonate (as caco3) | 363.0000 | | 374.0000 | 346.0000 | 360.0000 | | 360.0000* | | 360.0000* | |
| Arsenic | | | | <.0200 | | | | | | |
| Barium | | | | | | | | | | |
| Cadmium | | | | <.0050 | | | | | | |
| Calcium | 200.0000 | | 185.0000 | 177.0000 | 193.0000 | | 190.0000 | | 150.0000 | |
| Chloride | 2000.0000 | | 2100.0000 | 2100.0000 | 1900.0000 | | 2000.0000 | | 1900.0000 | |
| Chromium | | | | <.0050 | | | | | | |
| Cis- 1,2 - dichloroethene | <5.0000 | | <5.0000 | <5.0000 | <1.0000 | | <5.0000 | | <1.0000 | |
| COD | | | | | | | | | | |
| Iron | | | | <.0500 | | | | | | |
| Lead | | | | <.0050 | | | | | | |
| Magnesium | 200.0000 | | 187.0000 | 198.0000 | 212.0000 | | 210.0000 | | 80.0000 | |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | <5.0000 | | <5.0000 | <5.0000 | <1.0000 | | <5.0000 | | <1.0000 | |
| Potassium | 29.4000 | | 25.2000 | 27.0000 | 26.0000 | | 31.0000 | | 18.0000 | |
| Sodium | 1000.0000 | | 895.0000 | 975.0000 | 1030.0000 | | 1100.0000 | | 440.0000 | |
| Sulfate | 400.0000 | | 430.0000 | 390.0000 | 390.0000 | | 350.0000 | | 400.0000 | |
| Tetrachloroethene | <5.0000 | | <5.0000 | <5.0000 | <1.0000 | | <5.0000 | | <1.0000 | |
| TOC | | | | <1.0000 | | | | | | |
| Total dissolved solids | 4720.0000 | | 5040.0000 | 4820.0000 | 4410.0000 | | 4600.0000 | | 4900.0000 | |
| Tph (diesel) | | | | <.0780 | | | | | | |
| Trichloroethene | <5.0000 | | <5.0000 | <5.0000 | 4.2000 | | <5.0000 | | <5.0000 | |
| Xylenes (total) | <5.0000 | | <5.0000 | <5.0000 | <1.0000 | | <5.0000 | | <1.0000 | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 2

## Analytical Data Summary for MW-1

| Constituents | 12/28/2011 | 6/14/2012 | 12/23/2012 | 12/26/2012 | 6/26/2013 | 6/29/2013 | 9/24/2013 | 1/23/2014 | 6/06/2014 | 7/23/2014 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | | | | | | | | | | |
| Alkalinity, bicarbonate (as caco3) | | | | | | | | | | |
| Arsenic | | | | | | | | | | |
| Barium | | | | | | | | | | |
| Cadmium | | | | | | | | | | |
| Calcium | | | | | | | | | | |
| Chloride | | | | | | | | | | |
| Chromium | | | | | | | | | | |
| Cis- 1,2 - dichloroethene | | | | | | | | | | |
| COD | | | | | | | | | | |
| Iron | | | | | | | | | | |
| Lead | | | | | | | | | | |
| Magnesium | | | | | | | | | | |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | | | | | | | | | | |
| Potassium | | | | | | | | | | |
| Sodium | | | | | | | | | | |
| Sulfate | | | | | | | | | | |
| Tetrachloroethene | | | | | | | | | | |
| TOC | | | | | | | | | | |
| Total dissolved solids | | | | | | | | | | |
| Tph (diesel) | | | | | | | | | | |
| Trichloroethene | | | | | | | | | | |
| Xylenes (total) | | | | | | | | | | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 2

## Analytical Data Summary for MW-1

| Constituents | 1/12/2015 | 4/28/2015 |
|---|---|---|
| 1,2 - dichloroethane | | |
| Alkalinity, bicarbonate (as caco3) | | |
| Arsenic | | |
| Barium | | |
| Cadmium | | |
| Calcium | | |
| Chloride | | |
| Chromium | | |
| Cis- 1,2 - dichloroethene | | |
| COD | | |
| Iron | | |
| Lead | | |
| Magnesium | | |
| Mercury | | |
| Methyl tert-butyl ether | | |
| Potassium | | |
| Sodium | | |
| Sulfate | | |
| Tetrachloroethene | | |
| TOC | | |
| Total dissolved solids | | |
| Tph (diesel) | | |
| Trichloroethene | | |
| Xylenes (total) | | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 3

## Analytical Data Summary for MW-1A

| Constituents | Units | 2/25/1992 | 6/23/1992 | 5/28/1993 | 6/27/1994 | 6/14/1995 | 8/07/1995 | 6/27/1996 | 8/29/1996 | 9/23/1996 | 7/02/1997 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | ug/L | | | | | <2.0000 | 16.0000 | 13.0000 | 15.0000 | 26.0000 | 8.5000* |
| Alkalinity, bicarbonate (as caco3) | mg/L | | | | | | | | | | |
| Arsenic | mg/L | | | | | <.5000 | | <.5000 | <.5000 | <.5000 | <.5000 |
| Barium | mg/L | | | | | | | .5500 | .2400 | .2100 | .3500 |
| Cadmium | mg/L | | | | | | | .0080 | <.0050 | <.0050 | .0120 |
| Calcium | mg/L | | | | | | | | | | |
| Chloride | mg/L | | | | | | | | | | |
| Chromium | mg/L | | | | | | | .7200 | .4600 | .3600 | .5600 |
| Cis- 1,2 - dichloroethene | ug/L | | | | | | | | | | <5.0000 |
| COD | mg/L | | | | | | | | | | 96.0000 |
| Iron | mg/L | | | | | | | | | | |
| Lead | mg/L | | | | | | | <.1000 | <.1000 | <.1000 | <.1000 |
| Magnesium | mg/L | | | | | | | | | | |
| Mercury | mg/L | | | | | | | | | | .0040 |
| Methyl tert-butyl ether | µg/L | | | | | | | | | | |
| Potassium | mg/L | | | | | | | | | | |
| Sodium | mg/L | | | | | | | | | | |
| Sulfate | mg/L | | | | | | | | | | |
| Tetrachloroethene | ug/L | | | | | | | | | | <5.0000 |
| TOC | mg/L | | | | | | | 130.0000 | 160.0000 | 6.4000 | <15.0000 |
| Total dissolved solids | mg/L | | | | | | | | | | |
| Tph (diesel) | mg/L | | | | | | | | | | .1500 |
| Trichloroethene | ug/L | | | | | | <.5000 | <.5000 | <5.0000 | <.5000 | <5.0000* |
| Xylenes (total) | ug/L | | | | | | | <2.0000 | <2.0000 | 3.9000 | <3.5000* |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 3

## Analytical Data Summary for MW-1A

| Constituents | 11/12/1998 | 4/23/1999 | 9/27/1999 | 12/02/1999 | 2/02/2000 | 5/25/2000 | 8/25/2000 | 11/29/2000 | 6/21/2001 | 12/06/2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | 14.0000 | 14.0000 | 7.8000 | 2.0000 | <5.0000 | <5.0000 | 5.6500 | <5.0000 | <5.0000 | <5.0000 |
| Alkalinity, bicarbonate (as caco3) | 720.0000 |  | 340.0000 | 320.0000 | 403.0000 | 463.0000 | 513.0000 | 533.0000 | 476.0000 | 603.0000 |
| Arsenic | <.5000 | <.5000 | <.5000 | <.5000 | <.5000 | <.5000 |  | <.5000 | <.5000 | <.0200 |
| Barium |  |  |  |  |  |  |  |  |  |  |
| Cadmium |  | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 |
| Calcium | 160.0000 | 170.0000 | 152.0000 | 190.0000 | 197.0000 | 196.0000 | 203.0000 | 178.0000 | 184.0000 | 178.0000 |
| Chloride | 1300.0000 | 1600.0000 | 1600.0000 | 1200.0000 | 1420.0000 | 1290.0000 | 1890.0000 | 735.0000 | 1800.0000 | 2000.0000 |
| Chromium | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0050 |
| Cis- 1,2 - dichloroethene | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |
| COD |  |  |  |  |  |  |  |  |  |  |
| Iron | <.1000 | <.1000 | <.1000 | <.1000 | <.1000 | <.1000 | .3960 | <.1000 | <.1000 | <.0500 |
| Lead |  | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 |
| Magnesium | 140.0000 | 160.0000 | 147.0000 | 120.0000 | 164.0000 | 167.0000 | 193.0000 | 177.0000 | 187.0000 |  |
| Mercury |  |  |  |  |  |  |  |  |  |  |
| Methyl tert-butyl ether |  | 5.0000 | 5.6000 | <5.0000 | 6.1200 | 5.4200 | 6.1200 | <5.0000 | 5.1500 | <5.0000 |
| Potassium | 30.0000 | 32.0000 | 29.0000 | 30.0000 | 32.3000 | 37.8000 | 42.7000 | 37.1000 | 38.6000 | 35.8000 |
| Sodium | 740.0000 | 830.0000 | 829.0000 | 600.0000 | 757.0000 | 829.0000 | 994.0000 | 973.0000 | 898.0000 | 958.0000 |
| Sulfate | 300.0000 | 100.0000 | 320.0000 | 250.0000 | 330.0000 | 327.0000 | 353.0000 | 195.0000 | 108.0000 | 411.0000 |
| Tetrachloroethene | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |
| TOC | 2.3000 |  |  | 32.6000 | 114.0000 | 60.7000 | 54.6000 | 7.3200 | 6.5000 | 20.7000 |
| Total dissolved solids | 3500.0000 | 3800.0000 | 3600.0000 | 2700.0000 | 3670.0000 | 4100.0000 | 4240.0000 | 4160.0000 | 4680.0000 | 4370.0000 |
| Tph (diesel) |  | <.1500 | <.5000 | .0700 | <.1500 | <.1500 | <.1500 | <.1500 | <.1500 | <.1550 |
| Trichloroethene | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |
| Xylenes (total) | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |

* - The displayed value is the arithmetic mean of multiple database matches.

## Table 3

## Analytical Data Summary for MW-1A

| Constituents | 12/14/2001 | 12/22/2001 | 6/10/2002 | 12/03/2002 | 6/26/2003 | 12/04/2003 | 6/09/2004 | 12/20/2004 | 6/27/2005 | 6/29/2005 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |
| Alkalinity, bicarbonate (as caco3) | | | 432.0000 | 420.0000 | 424.0000 | | 352.0000 | 436.0000 | 404.0000 | |
| Arsenic | | | <.0200 | <.0200 | <.0200 | <.0200 | <.0200 | <.0200 | | |
| Barium | | | | | | | | | | |
| Cadmium | | | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | | |
| Calcium | | | 184.0000 | 190.0000 | 171.0000 | 213.0000 | 225.0000 | 211.0000 | 196.0000 | |
| Chloride | | | 1930.0000 | 1920.0000 | 1880.0000 | 1950.0000 | 2510.0000 | 2330.0000 | 1510.0000 | |
| Chromium | | | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | | |
| Cis- 1,2 - dichloroethene | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |
| COD | | | | | | | | | | |
| Iron | | | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | | |
| Lead | | | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | | |
| Magnesium | | | 195.0000 | 191.0000 | 172.0000 | 220.0000 | 245.0000 | 226.0000 | 210.0000 | |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | | | <5.0000 | 6.4400 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |
| Potassium | | | 50.0000 | 42.8000 | 40.8000 | 55.0000 | 51.2000 | 35.5000 | 39.4000 | |
| Sodium | | | | 1130.0000 | 951.0000 | 958.0000 | 1140.0000 | 1070.0000 | 1110.0000 | |
| Sulfate | | | 423.0000 | 458.0000 | 455.0000 | 479.0000 | 434.0000 | 472.0000 | 433.0000 | |
| Tetrachloroethene | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |
| TOC | | | 16.6000 | 18.8000 | 25.4000 | 31.8000 | 12.8000 | | | |
| Total dissolved solids | | | 4370.0000 | 4590.0000 | 4500.0000 | 4500.0000 | 4830.0000 | 4932.0000 | 4524.0000 | |
| Tph (diesel) | | | .8260 | .1940 | <.1520 | <.2530 | <.2530 | .1000 | | |
| Trichloroethene | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |
| Xylenes (total) | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 3

## Analytical Data Summary for MW-1A

| Constituents | 12/22/2005 | 2/28/2006 | 6/15/2006 | 6/29/2006 | 10/31/2006 | 12/19/2006 | 6/29/2007 | 12/12/2007 | 12/14/2007 | 6/25/2008 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |
| Alkalinity, bicarbonate (as caco3) | 406.0000 | | 398.0000* | | | 442.0000 | 438.0000 | 430.0000 | | 434.0000 |
| Arsenic | | | | | | | | | | |
| Barium | | | | | | | | | | |
| Cadmium | | | | | | | | | | |
| Calcium | 207.0000 | | 200.0000 | | | 182.0000 | 191.0000 | 168.0000 | | 180.0000 |
| Chloride | 1900.0000 | | 1910.0000 | | | 2000.0000 | 1800.0000 | 1800.0000 | | 1700.0000 |
| Chromium | | | | | | | | | | |
| Cis- 1,2 - dichloroethene | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |
| COD | | | | | | | | | | |
| Iron | | | | | | | | | | |
| Lead | | | | | | | | | | |
| Magnesium | 204.0000 | | 196.0000 | | | 182.0000 | 206.0000 | 178.0000 | | 197.0000 |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |
| Potassium | 43.4000 | | 33.1000 | | | 40.0000 | 37.7000 | 44.7000 | | 36.8000 |
| Sodium | 1080.0000 | | 1100.0000 | | | 1000.0000 | 1090.0000 | 959.0000 | | 912.0000 |
| Sulfate | 500.0000 | | 1520.0000 | | | 450.0000 | 490.0000 | 460.0000 | | 440.0000 |
| Tetrachloroethene | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |
| TOC | | | | | | | | | | |
| Total dissolved solids | 4330.0000 | | 4298.0000 | | | 4330.0000 | 4620.0000 | 4200.0000 | | 4200.0000 |
| Tph (diesel) | | | | | | | | | | |
| Trichloroethene | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |
| Xylenes (total) | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 3

## Analytical Data Summary for MW-1A

| Constituents | 12/09/2008 | 12/22/2008 | 6/17/2009 | 12/09/2009 | 6/30/2010 | 12/09/2010 | 12/30/2010 | 1/25/2011 | 6/30/2011 | 9/30/2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | <5.0000 | | <5.0000 | <5.0000 | <.5000 | | <5.0000 | | <.5000 | |
| Alkalinity, bicarbonate (as caco3) | 446.0000 | | 434.0000 | 420.0000 | 434.0000 | | 430.0000* | | 400.0000* | |
| Arsenic | | | | <.0200 | | | | | | |
| Barium | | | | | | | | | | |
| Cadmium | | | | <.0050 | | | | | | |
| Calcium | 200.0000 | | 167.0000 | 162.0000 | 185.0000 | | 170.0000 | | 190.0000 | |
| Chloride | 1700.0000 | | 1900.0000 | 1700.0000 | 1900.0000 | | 1700.0000 | | 1700.0000 | |
| Chromium | | | | <.0050 | | | | | | |
| Cis- 1,2 - dichloroethene | <5.0000 | | <5.0000 | <5.0000 | <1.0000 | | <5.0000 | | <1.0000 | |
| COD | | | | | | | | | | |
| Iron | | | | <.0500 | | | | | | |
| Lead | | | | <.0050 | | | | | | |
| Magnesium | 200.0000 | | 160.0000 | 175.0000 | 197.0000 | | 190.0000 | | 190.0000 | |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | <5.0000 | | <5.0000 | <5.0000 | <1.0000 | | <5.0000 | | <1.0000 | |
| Potassium | 36.4000 | | 29.6000 | 34.2000 | 33.5000 | | 38.0000 | | 37.0000 | |
| Sodium | 900.0000 | | 839.0000 | 1000.0000 | 1010.0000 | | 1000.0000 | | 1100.0000 | |
| Sulfate | 440.0000 | | 490.0000 | 450.0000 | 430.0000 | | 480.0000 | | 440.0000 | |
| Tetrachloroethene | <5.0000 | | <5.0000 | <5.0000 | <1.0000 | | <5.0000 | | <1.0000 | |
| TOC | | | | <1.0000 | | | | | | |
| Total dissolved solids | 4250.0000 | | 4540.0000 | 4520.0000 | 4220.0000 | | 4500.0000 | | 4500.0000 | |
| Tph (diesel) | | | | <.0820 | | | | | | |
| Trichloroethene | <5.0000 | | <5.0000 | <5.0000 | <1.0000 | | <5.0000 | | <5.0000 | |
| Xylenes (total) | <5.0000 | | <5.0000 | <5.0000 | <1.0000 | | <5.0000 | | <1.0000 | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 3

## Analytical Data Summary for MW-1A

| Constituents | 12/28/2011 | 6/14/2012 | 12/23/2012 | 12/26/2012 | 6/26/2013 | 6/29/2013 | 9/24/2013 | 1/23/2014 | 6/06/2014 | 7/23/2014 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | <1.0000 | <5.0000 |  | <5.0000 | <5.0000 |  |  |  |  |  |
| Alkalinity, bicarbonate (as caco3) | 424.0000 | 460.0000 |  | 410.0000* | 408.0000* |  |  |  |  |  |
| Arsenic |  |  |  |  |  |  |  |  |  |  |
| Barium |  |  |  |  |  |  |  |  |  |  |
| Cadmium |  |  |  |  |  |  |  |  |  |  |
| Calcium | 201.0000 | 180.0000 |  | 188.0000 | 194.0000 |  |  |  |  |  |
| Chloride | 1920.0000 | 1900.0000 |  | 1940.0000 | 1980.0000 |  |  |  |  |  |
| Chromium |  |  |  |  |  |  |  |  |  |  |
| Cis- 1,2 - dichloroethene | <1.0000 | <5.0000 |  | <5.0000 | <5.0000 |  |  |  |  |  |
| COD |  |  |  |  |  |  |  |  |  |  |
| Iron |  |  |  |  |  |  |  |  |  |  |
| Lead |  |  |  |  |  |  |  |  |  |  |
| Magnesium | 206.0000 | 190.0000 |  | 202.0000 | 209.0000 |  |  |  |  |  |
| Mercury |  |  |  |  |  |  |  |  |  |  |
| Methyl tert-butyl ether |  |  |  |  |  |  |  |  |  |  |
| Potassium | 41.1000 | 38.0000 |  | 33.6000 | 35.4000 |  |  |  |  |  |
| Sodium | 1060.0000 | 1000.0000 |  | 1020.0000 | 1060.0000 |  |  |  |  |  |
| Sulfate | 433.0000 | 440.0000 |  | 384.0000 | 390.0000 |  |  |  |  |  |
| Tetrachloroethene | <1.0000 | <5.0000 |  | <5.0000 | <5.0000 |  |  |  |  |  |
| TOC |  |  |  |  |  |  |  |  |  |  |
| Total dissolved solids | 4430.0000 | 4400.0000 |  | 4440.0000 | 4220.0000 |  |  |  |  |  |
| Tph (diesel) |  |  |  |  |  |  |  |  |  |  |
| Trichloroethene | <1.0000 | <5.0000 |  | <5.0000 | <5.0000 |  |  |  |  |  |
| Xylenes (total) | <1.0000 | <5.0000 |  | <5.0000 | <5.0000 |  |  |  |  |  |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 3

## Analytical Data Summary for MW-1A

| Constituents | 1/12/2015 | 4/28/2015 |
|---|---|---|
| 1,2 - dichloroethane | | |
| Alkalinity, bicarbonate (as caco3) | | |
| Arsenic | | |
| Barium | | |
| Cadmium | | |
| Calcium | | |
| Chloride | | |
| Chromium | | |
| Cis- 1,2 - dichloroethene | | |
| COD | | |
| Iron | | |
| Lead | | |
| Magnesium | | |
| Mercury | | |
| Methyl tert-butyl ether | | |
| Potassium | | |
| Sodium | | |
| Sulfate | | |
| Tetrachloroethene | | |
| TOC | | |
| Total dissolved solids | | |
| Tph (diesel) | | |
| Trichloroethene | | |
| Xylenes (total) | | |

* - The displayed value is the arithmetic mean of multiple database matches.

## Table 4

## Analytical Data Summary for MW-1B

| Constituents | Units | 2/25/1992 | 6/23/1992 | 5/28/1993 | 6/27/1994 | 6/14/1995 | 8/07/1995 | 6/27/1996 | 8/29/1996 | 9/23/1996 | 7/02/1997 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | ug/L | | | | | | | | | | |
| Alkalinity, bicarbonate (as caco3) | mg/L | | | | | | | | | | |
| Arsenic | mg/L | | | | | | | | | | |
| Barium | mg/L | | | | | | | | | | |
| Cadmium | mg/L | | | | | | | | | | |
| Calcium | mg/L | | | | | | | | | | |
| Chloride | mg/L | | | | | | | | | | |
| Chromium | mg/L | | | | | | | | | | |
| Cis- 1,2 - dichloroethene | ug/L | | | | | | | | | | |
| COD | mg/L | | | | | | | | | | |
| Iron | mg/L | | | | | | | | | | |
| Lead | mg/L | | | | | | | | | | |
| Magnesium | mg/L | | | | | | | | | | |
| Mercury | mg/L | | | | | | | | | | |
| Methyl tert-butyl ether | µg/L | | | | | | | | | | |
| Potassium | mg/L | | | | | | | | | | |
| Sodium | mg/L | | | | | | | | | | |
| Sulfate | mg/L | | | | | | | | | | |
| Tetrachloroethene | ug/L | | | | | | | | | | |
| TOC | mg/L | | | | | | | | | | |
| Total dissolved solids | mg/L | | | | | | | | | | |
| Tph (diesel) | mg/L | | | | | | | | | | |
| Trichloroethene | ug/L | | | | | | | | | | |
| Xylenes (total) | ug/L | | | | | | | | | | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 4

## Analytical Data Summary for MW-1B

| Constituents | 11/12/1998 | 4/23/1999 | 9/27/1999 | 12/02/1999 | 2/02/2000 | 5/25/2000 | 8/25/2000 | 11/29/2000 | 6/21/2001 | 12/06/2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | | | | | | | | | | |
| Alkalinity, bicarbonate (as caco3) | | | | | | | | | | |
| Arsenic | | | | | | | | | | |
| Barium | | | | | | | | | | |
| Cadmium | | | | | | | | | | |
| Calcium | | | | | | | | | | |
| Chloride | | | | | | | | | | |
| Chromium | | | | | | | | | | |
| Cis- 1,2 - dichloroethene | | | | | | | | | | |
| COD | | | | | | | | | | |
| Iron | | | | | | | | | | |
| Lead | | | | | | | | | | |
| Magnesium | | | | | | | | | | |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | | | | | | | | | | |
| Potassium | | | | | | | | | | |
| Sodium | | | | | | | | | | |
| Sulfate | | | | | | | | | | |
| Tetrachloroethene | | | | | | | | | | |
| TOC | | | | | | | | | | |
| Total dissolved solids | | | | | | | | | | |
| Tph (diesel) | | | | | | | | | | |
| Trichloroethene | | | | | | | | | | |
| Xylenes (total) | | | | | | | | | | |

* - The displayed value is the arithmetic mean of multiple database matches.

## Table 4

## Analytical Data Summary for MW-1B

| Constituents | 12/14/2001 | 12/22/2001 | 6/10/2002 | 12/03/2002 | 6/26/2003 | 12/04/2003 | 6/09/2004 | 12/20/2004 | 6/27/2005 | 6/29/2005 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | | | | | | | | | | |
| Alkalinity, bicarbonate (as caco3) | | | | | | | | | | |
| Arsenic | | | | | | | | | | |
| Barium | | | | | | | | | | |
| Cadmium | | | | | | | | | | |
| Calcium | | | | | | | | | | |
| Chloride | | | | | | | | | | |
| Chromium | | | | | | | | | | |
| Cis- 1,2 - dichloroethene | | | | | | | | | | |
| COD | | | | | | | | | | |
| Iron | | | | | | | | | | |
| Lead | | | | | | | | | | |
| Magnesium | | | | | | | | | | |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | | | | | | | | | | |
| Potassium | | | | | | | | | | |
| Sodium | | | | | | | | | | |
| Sulfate | | | | | | | | | | |
| Tetrachloroethene | | | | | | | | | | |
| TOC | | | | | | | | | | |
| Total dissolved solids | | | | | | | | | | |
| Tph (diesel) | | | | | | | | | | |
| Trichloroethene | | | | | | | | | | |
| Xylenes (total) | | | | | | | | | | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 4

## Analytical Data Summary for MW-1B

| Constituents | 12/22/2005 | 2/28/2006 | 6/15/2006 | 6/29/2006 | 10/31/2006 | 12/19/2006 | 6/29/2007 | 12/12/2007 | 12/14/2007 | 6/25/2008 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | | | | | | | | | | |
| Alkalinity, bicarbonate (as caco3) | | | | | | | | | | |
| Arsenic | | | | | | | | | | |
| Barium | | | | | | | | | | |
| Cadmium | | | | | | | | | | |
| Calcium | | | | | | | | | | |
| Chloride | | | | | | | | | | |
| Chromium | | | | | | | | | | |
| Cis- 1,2 - dichloroethene | | | | | | | | | | |
| COD | | | | | | | | | | |
| Iron | | | | | | | | | | |
| Lead | | | | | | | | | | |
| Magnesium | | | | | | | | | | |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | | | | | | | | | | |
| Potassium | | | | | | | | | | |
| Sodium | | | | | | | | | | |
| Sulfate | | | | | | | | | | |
| Tetrachloroethene | | | | | | | | | | |
| TOC | | | | | | | | | | |
| Total dissolved solids | | | | | | | | | | |
| Tph (diesel) | | | | | | | | | | |
| Trichloroethene | | | | | | | | | | |
| Xylenes (total) | | | | | | | | | | |

* - The displayed value is the arithmetic mean of multiple database matches.

## Table 4

## Analytical Data Summary for MW-1B

| Constituents | 12/09/2008 | 12/22/2008 | 6/17/2009 | 12/09/2009 | 6/30/2010 | 12/09/2010 | 12/30/2010 | 1/25/2011 | 6/30/2011 | 9/30/2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | | | | | | | | | | |
| Alkalinity, bicarbonate (as caco3) | | | | | | | | | | |
| Arsenic | | | | | | | | | | |
| Barium | | | | | | | | | | |
| Cadmium | | | | | | | | | | |
| Calcium | | | | | | | | | | |
| Chloride | | | | | | | | | | |
| Chromium | | | | | | | | | | |
| Cis- 1,2 - dichloroethene | | | | | | | | | | |
| COD | | | | | | | | | | |
| Iron | | | | | | | | | | |
| Lead | | | | | | | | | | |
| Magnesium | | | | | | | | | | |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | | | | | | | | | | |
| Potassium | | | | | | | | | | |
| Sodium | | | | | | | | | | |
| Sulfate | | | | | | | | | | |
| Tetrachloroethene | | | | | | | | | | |
| TOC | | | | | | | | | | |
| Total dissolved solids | | | | | | | | | | |
| Tph (diesel) | | | | | | | | | | |
| Trichloroethene | | | | | | | | | | |
| Xylenes (total) | | | | | | | | | | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 4

## Analytical Data Summary for MW-1B

| Constituents | 12/28/2011 | 6/14/2012 | 12/23/2012 | 12/26/2012 | 6/26/2013 | 6/29/2013 | 9/24/2013 | 1/23/2014 | 6/06/2014 | 7/23/2014 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | <1.0000 | <5.0000 |  | <5.0000* | <5.0000 | <5.0000 | <5.0000 | <5.0000 |  | <5.0000 |
| Alkalinity, bicarbonate (as caco3) | 359.0000 | 390.0000 | 370.5000* | 370.5000* | 375.0000* | 370.0000* | 373.0000* | 391.0000* |  | 404.0000* |
| Arsenic | <.0200 | <.0100 | <.0100 | <.0100 | <.0100 | <.0100 | <.0100 | <.0100 |  |  |
| Barium |  |  |  |  |  |  |  |  |  |  |
| Cadmium | <.0020 | <.0025 | <.0005 | <.0005 | <.0010 | <.0010 | <.0010 | <.0010 |  |  |
| Calcium | 130.0000 | 120.0000 | 132.0000 | 132.0000 | 144.0000 | 143.0000 | 142.0000 | 153.0000 |  | 162.0000 |
| Chloride | 1390.0000 | 1400.0000 | 1540.0000 | 1560.0000 | 1590.0000 | 1570.0000 | 1630.0000 | 1830.0000 |  | 1980.0000 |
| Chromium | <.0080 | <.0100 | <.0020 | <.0020 | <.0040 | <.0040 | <.0040 | <.0040 |  |  |
| Cis- 1,2 - dichloroethene | <1.0000 | <5.0000 |  | <5.0000* | <5.0000 | <5.0000 | <5.0000 | <5.0000 |  | <5.0000 |
| COD |  |  |  |  |  |  |  |  |  |  |
| Iron | <.1000 | <.2000 | .0400 | .0300 | <.0200 | <.0200 | <.0200 | <.0200 |  |  |
| Lead | .0062 | <.0050 | <.0100 | <.0100 | <.0100 | <.0100 | <.0100 | <.0100 |  |  |
| Magnesium | 126.0000 | 110.0000 | 134.0000 | 134.0000 | 148.0000 | 147.0000 | 147.0000 | 158.0000 |  | 160.0000 |
| Mercury |  |  |  |  |  |  |  |  |  |  |
| Methyl tert-butyl ether |  |  |  |  |  |  |  |  |  |  |
| Potassium | 31.8000 | 29.0000 | 27.3000 | 27.3000 | 29.7000 | 29.5000 | 29.4000 | 32.0000 |  | 31.5000 |
| Sodium | 841.0000 | 840.0000 | 763.0000 | 764.0000 | 828.0000 | 802.0000 | 883.0000 | 933.0000 |  | 980.0000 |
| Sulfate | 318.0000 | 360.0000 | 333.0000 | 332.0000 | 340.0000 | 340.0000 | 354.0000 | 388.0000 |  | 389.0000 |
| Tetrachloroethene | <1.0000 | <5.0000 |  | <5.0000* | <5.0000 | <5.0000 | <5.0000 | <5.0000 |  | <5.0000 |
| TOC | <1.0000 | 1.3000 | 1.1700 | 1.2800 | 1.5000 | 1.4900 | .8800 | .9100 |  |  |
| Total dissolved solids | 3220.0000 | 3400.0000 | 3360.0000 | 3460.0000 | 3510.0000 | 3530.0000 | 3570.0000 | 3720.0000 |  | 3690.0000 |
| Tph (diesel) | <.0530 | <.0530 | <.0480 | <.0490 | <.0500 | <.0480 | <.0480 | <.0510 |  |  |
| Trichloroethene | <1.0000 | <5.0000 |  | <5.0000* | <5.0000 | <5.0000 | <5.0000 | <5.0000 |  | <5.0000 |
| Xylenes (total) | <1.0000 | <5.0000 |  | <5.0000* | <5.0000 | <5.0000 | <5.0000 | <5.0000 |  | <5.0000 |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 4

## Analytical Data Summary for MW-1B

| Constituents | 1/12/2015 | 4/28/2015 |
|---|---|---|
| 1,2 - dichloroethane | <5.0000 | <5.0000 |
| Alkalinity, bicarbonate (as caco3) | 416.0000* | 399.0000* |
| Arsenic | | <.0100 |
| Barium | | |
| Cadmium | | <.0010 |
| Calcium | 175.0000 | 184.0000 |
| Chloride | 1840.0000 | 2100.0000 |
| Chromium | | <.0040 |
| Cis- 1,2 - dichloroethene | <5.0000 | <5.0000 |
| COD | | |
| Iron | | .0310 |
| Lead | | <.0100 |
| Magnesium | 177.0000 | 199.0000 |
| Mercury | | |
| Methyl tert-butyl ether | | |
| Potassium | 33.4000 | 36.1000 |
| Sodium | 1060.0000 | 1090.0000 |
| Sulfate | 354.0000 | 380.0000 |
| Tetrachloroethene | <5.0000 | <5.0000 |
| TOC | | 1.0800 |
| Total dissolved solids | 4280.0000 | 4420.0000 |
| Tph (diesel) | | <.0500 |
| Trichloroethene | <5.0000 | <5.0000 |
| Xylenes (total) | <5.0000 | <5.0000 |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 5

## Analytical Data Summary for MW-1C

| Constituents | Units | 2/25/1992 | 6/23/1992 | 5/28/1993 | 6/27/1994 | 6/14/1995 | 8/07/1995 | 6/27/1996 | 8/29/1996 | 9/23/1996 | 7/02/1997 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | ug/L | | | | | | | | | | |
| Alkalinity, bicarbonate (as caco3) | mg/L | | | | | | | | | | |
| Arsenic | mg/L | | | | | | | | | | |
| Barium | mg/L | | | | | | | | | | |
| Cadmium | mg/L | | | | | | | | | | |
| Calcium | mg/L | | | | | | | | | | |
| Chloride | mg/L | | | | | | | | | | |
| Chromium | mg/L | | | | | | | | | | |
| Cis- 1,2 - dichloroethene | ug/L | | | | | | | | | | |
| COD | mg/L | | | | | | | | | | |
| Iron | mg/L | | | | | | | | | | |
| Lead | mg/L | | | | | | | | | | |
| Magnesium | mg/L | | | | | | | | | | |
| Mercury | mg/L | | | | | | | | | | |
| Methyl tert-butyl ether | µg/L | | | | | | | | | | |
| Potassium | mg/L | | | | | | | | | | |
| Sodium | mg/L | | | | | | | | | | |
| Sulfate | mg/L | | | | | | | | | | |
| Tetrachloroethene | ug/L | | | | | | | | | | |
| TOC | mg/L | | | | | | | | | | |
| Total dissolved solids | mg/L | | | | | | | | | | |
| Tph (diesel) | mg/L | | | | | | | | | | |
| Trichloroethene | ug/L | | | | | | | | | | |
| Xylenes (total) | ug/L | | | | | | | | | | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 5

## Analytical Data Summary for MW-1C

| Constituents | 11/12/1998 | 4/23/1999 | 9/27/1999 | 12/02/1999 | 2/02/2000 | 5/25/2000 | 8/25/2000 | 11/29/2000 | 6/21/2001 | 12/06/2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | | | | | | | | | | |
| Alkalinity, bicarbonate (as caco3) | | | | | | | | | | |
| Arsenic | | | | | | | | | | |
| Barium | | | | | | | | | | |
| Cadmium | | | | | | | | | | |
| Calcium | | | | | | | | | | |
| Chloride | | | | | | | | | | |
| Chromium | | | | | | | | | | |
| Cis- 1,2 - dichloroethene | | | | | | | | | | |
| COD | | | | | | | | | | |
| Iron | | | | | | | | | | |
| Lead | | | | | | | | | | |
| Magnesium | | | | | | | | | | |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | | | | | | | | | | |
| Potassium | | | | | | | | | | |
| Sodium | | | | | | | | | | |
| Sulfate | | | | | | | | | | |
| Tetrachloroethene | | | | | | | | | | |
| TOC | | | | | | | | | | |
| Total dissolved solids | | | | | | | | | | |
| Tph (diesel) | | | | | | | | | | |
| Trichloroethene | | | | | | | | | | |
| Xylenes (total) | | | | | | | | | | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 5

## Analytical Data Summary for MW-1C

| Constituents | 12/14/2001 | 12/22/2001 | 6/10/2002 | 12/03/2002 | 6/26/2003 | 12/04/2003 | 6/09/2004 | 12/20/2004 | 6/27/2005 | 6/29/2005 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | | | | | | | | | | |
| Alkalinity, bicarbonate (as caco3) | | | | | | | | | | |
| Arsenic | | | | | | | | | | |
| Barium | | | | | | | | | | |
| Cadmium | | | | | | | | | | |
| Calcium | | | | | | | | | | |
| Chloride | | | | | | | | | | |
| Chromium | | | | | | | | | | |
| Cis- 1,2 - dichloroethene | | | | | | | | | | |
| COD | | | | | | | | | | |
| Iron | | | | | | | | | | |
| Lead | | | | | | | | | | |
| Magnesium | | | | | | | | | | |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | | | | | | | | | | |
| Potassium | | | | | | | | | | |
| Sodium | | | | | | | | | | |
| Sulfate | | | | | | | | | | |
| Tetrachloroethene | | | | | | | | | | |
| TOC | | | | | | | | | | |
| Total dissolved solids | | | | | | | | | | |
| Tph (diesel) | | | | | | | | | | |
| Trichloroethene | | | | | | | | | | |
| Xylenes (total) | | | | | | | | | | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 5

## Analytical Data Summary for MW-1C

| Constituents | 12/22/2005 | 2/28/2006 | 6/15/2006 | 6/29/2006 | 10/31/2006 | 12/19/2006 | 6/29/2007 | 12/12/2007 | 12/14/2007 | 6/25/2008 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | | | | | | | | | | |
| Alkalinity, bicarbonate (as caco3) | | | | | | | | | | |
| Arsenic | | | | | | | | | | |
| Barium | | | | | | | | | | |
| Cadmium | | | | | | | | | | |
| Calcium | | | | | | | | | | |
| Chloride | | | | | | | | | | |
| Chromium | | | | | | | | | | |
| Cis- 1,2 - dichloroethene | | | | | | | | | | |
| COD | | | | | | | | | | |
| Iron | | | | | | | | | | |
| Lead | | | | | | | | | | |
| Magnesium | | | | | | | | | | |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | | | | | | | | | | |
| Potassium | | | | | | | | | | |
| Sodium | | | | | | | | | | |
| Sulfate | | | | | | | | | | |
| Tetrachloroethene | | | | | | | | | | |
| TOC | | | | | | | | | | |
| Total dissolved solids | | | | | | | | | | |
| Tph (diesel) | | | | | | | | | | |
| Trichloroethene | | | | | | | | | | |
| Xylenes (total) | | | | | | | | | | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 5

## Analytical Data Summary for MW-1C

| Constituents | 12/09/2008 | 12/22/2008 | 6/17/2009 | 12/09/2009 | 6/30/2010 | 12/09/2010 | 12/30/2010 | 1/25/2011 | 6/30/2011 | 9/30/2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | | | | | | | | | | |
| Alkalinity, bicarbonate (as caco3) | | | | | | | | | | |
| Arsenic | | | | | | | | | | |
| Barium | | | | | | | | | | |
| Cadmium | | | | | | | | | | |
| Calcium | | | | | | | | | | |
| Chloride | | | | | | | | | | |
| Chromium | | | | | | | | | | |
| Cis- 1,2 - dichloroethene | | | | | | | | | | |
| COD | | | | | | | | | | |
| Iron | | | | | | | | | | |
| Lead | | | | | | | | | | |
| Magnesium | | | | | | | | | | |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | | | | | | | | | | |
| Potassium | | | | | | | | | | |
| Sodium | | | | | | | | | | |
| Sulfate | | | | | | | | | | |
| Tetrachloroethene | | | | | | | | | | |
| TOC | | | | | | | | | | |
| Total dissolved solids | | | | | | | | | | |
| Tph (diesel) | | | | | | | | | | |
| Trichloroethene | | | | | | | | | | |
| Xylenes (total) | | | | | | | | | | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 5

## Analytical Data Summary for MW-1C

| Constituents | 12/28/2011 | 6/14/2012 | 12/23/2012 | 12/26/2012 | 6/26/2013 | 6/29/2013 | 9/24/2013 | 1/23/2014 | 6/06/2014 | 7/23/2014 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | | | | | | | | | <5.0000 | <5.0000 |
| Alkalinity, bicarbonate (as caco3) | | | | | | | | | 415.0000* | 423.0000* |
| Arsenic | | | | | | | | | <.0100 | <.0100 |
| Barium | | | | | | | | | | |
| Cadmium | | | | | | | | | <.0010 | <.0010 |
| Calcium | | | | | | | | | 201.0000 | 194.0000 |
| Chloride | | | | | | | | | 1990.0000 | 2140.0000 |
| Chromium | | | | | | | | | <.0040 | <.0040 |
| Cis- 1,2 - dichloroethene | | | | | | | | | 5.2000 | 5.6000 |
| COD | | | | | | | | | 2.4000 | 3.0000 |
| Iron | | | | | | | | | <.0400 | <.0200 |
| Lead | | | | | | | | | <.0100 | <.0100 |
| Magnesium | | | | | | | | | 209.0000 | 191.0000 |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | | | | | | | | | | |
| Potassium | | | | | | | | | 25.2000 | 23.8000 |
| Sodium | | | | | | | | | 1040.0000 | 1000.0000 |
| Sulfate | | | | | | | | | 441.0000 | 419.0000 |
| Tetrachloroethene | | | | | | | | | 7.6000 | 7.0000 |
| TOC | | | | | | | | | 2.4000* | 3.0000 |
| Total dissolved solids | | | | | | | | | 4280.0000 | 3960.0000 |
| Tph (diesel) | | | | | | | | | <.0500 | <.0530 |
| Trichloroethene | | | | | | | | | 6.4000 | 7.0000 |
| Xylenes (total) | | | | | | | | | <5.0000 | <5.0000 |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 5

## Analytical Data Summary for MW-1C

| Constituents | 1/12/2015 | 4/28/2015 |
|---|---|---|
| 1,2 - dichloroethane | <5.0000 | <5.0000 |
| Alkalinity, bicarbonate (as caco3) | 412.0000* | 401.0000* |
| Arsenic | <.0100 | <.0100 |
| Barium | | |
| Cadmium | <.0010 | <.0010 |
| Calcium | 197.0000 | 194.0000 |
| Chloride | 1900.0000 | 2080.0000 |
| Chromium | <.0040 | <.0040 |
| Cis- 1,2 - dichloroethene | <5.0000 | <5.0000 |
| COD | | |
| Iron | <.0200 | <.0200 |
| Lead | <.0100 | <.0100 |
| Magnesium | 194.0000 | 213.0000 |
| Mercury | | |
| Methyl tert-butyl ether | | |
| Potassium | 24.5000 | 25.8000 |
| Sodium | 1050.0000 | 1090.0000 |
| Sulfate | 360.0000 | 390.0000 |
| Tetrachloroethene | 6.5000 | 5.5000 |
| TOC | 1.5000 | 2.4200 |
| Total dissolved solids | 4410.0000 | 4360.0000 |
| Tph (diesel) | <.0500 | .0660 |
| Trichloroethene | 6.0000 | 5.4000 |
| Xylenes (total) | <5.0000 | <5.0000 |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 6

## Analytical Data Summary for MW-2

| Constituents | Units | 2/25/1992 | 6/23/1992 | 5/28/1993 | 6/27/1994 | 6/14/1995 | 8/07/1995 | 6/27/1996 | 8/29/1996 | 9/23/1996 | 7/02/1997 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | ug/L | <3.0000 | <5.0000 | <.2500 | <.5000 | <2.0000 | | <.5000 | <.5000 | <.5000 | <5.0000 |
| Alkalinity, bicarbonate (as caco3) | mg/L | | | | | | | | | | |
| Arsenic | mg/L | .8000 | 2.9000 | | | <.5000 | | <.5000 | <.5000 | <.5000 | <.5000 |
| Barium | mg/L | .0200 | .0100 | | | <.0500 | | <.0500 | <.0500 | <.0500 | <.0500 |
| Cadmium | mg/L | .0010 | | <.0100 | | <.0050 | | <.0050 | <.0050 | <.0050 | <.0050 |
| Calcium | mg/L | | | | | | | | | | |
| Chloride | mg/L | | | | | | | | | | |
| Chromium | mg/L | .0250 | | | | <.0500 | | <.0500 | .0660 | .0610 | <.0500 |
| Cis- 1,2 - dichloroethene | ug/L | | | | | | | | | | <5.0000 |
| COD | mg/L | | | | | | | | | | 10.0000 |
| Iron | mg/L | | | | | | | | | | |
| Lead | mg/L | | | <.1000 | | <.1000 | | <.1000 | <.1000 | <.1000 | <.1000 |
| Magnesium | mg/L | | | | | | | | | | |
| Mercury | mg/L | | | | | | | | | | <.0010 |
| Methyl tert-butyl ether | µg/L | | | | | | | | | | |
| Potassium | mg/L | | | | | | | | | | |
| Sodium | mg/L | | | | | | | | | | |
| Sulfate | mg/L | | | | | | | | | | |
| Tetrachloroethene | ug/L | | | | | | | | | | <5.0000 |
| TOC | mg/L | 4.0000 | 550.0000 | | | <5.0000 | | 1.8000 | 5.0000 | 2.7000 | <15.0000 |
| Total dissolved solids | mg/L | | | | | | | | | | |
| Tph (diesel) | mg/L | | | | | | | | | | .0820 |
| Trichloroethene | ug/L | <4.0000 | <5.0000 | <.2500 | <.5000 | <2.0000 | | <.5000 | <5.0000 | <.5000 | <5.0000 |
| Xylenes (total) | ug/L | <3.0000 | <5.0000 | <.2500 | <2.0000 | <2.0000 | | <2.0000 | <2.0000 | <2.0000 | <3.5000* |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 6

## Analytical Data Summary for MW-2

| Constituents | 11/12/1998 | 4/23/1999 | 9/27/1999 | 12/02/1999 | 2/02/2000 | 5/25/2000 | 8/25/2000 | 11/29/2000 | 6/21/2001 | 12/06/2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |
| Alkalinity, bicarbonate (as caco3) | 700.0000 |  | 480.0000 | 380.0000 | 435.0000 | 422.0000 | 481.0000 | 1570.0000 | 470.0000 | 871.0000 |
| Arsenic | <.5000 | <.5000 | <.5000 | <.5000 | <.5000 | <.5000 |  | <.5000 | <.5000 | <.0200 |
| Barium |  |  |  |  |  |  |  |  |  |  |
| Cadmium |  | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 |
| Calcium | 130.0000 | 130.0000 | 147.0000 | 180.0000 | 160.0000 | 170.0000 | 167.0000 | 162.0000 | 148.0000 | 145.0000 |
| Chloride | 560.0000 | 760.0000 | 920.0000 | 830.0000 | 844.0000 | 1020.0000 | 771.0000 | 735.0000 | 667.0000 | 674.0000 |
| Chromium | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0050 |
| Cis- 1,2 - dichloroethene | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |
| COD |  |  |  |  |  |  |  |  |  |  |
| Iron | <.1000 | <.1000 | <.1000 | <.1000 | <.1000 | <.1000 | <.1000 | <.1000 | <.1000 | <.0500 |
| Lead |  | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 |
| Magnesium | 70.0000 | 75.0000 | 93.0000 | 99.0000 | 103.0000 | 104.0000 | 94.3000 | 101.0000 | 95.1000 |  |
| Mercury |  |  |  |  |  |  |  |  |  |  |
| Methyl tert-butyl ether |  | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |
| Potassium | 14.0000 | 14.0000 | 17.0000 | 18.0000 | 18.4000 | 20.9000 | 19.2000 | 19.0000 | 17.9000 | 18.2000 |
| Sodium | 330.0000 | 350.0000 | 444.0000 | 440.0000 | 466.0000 | 462.0000 | 430.0000 | 438.0000 | 331.0000 | 366.0000 |
| Sulfate | 120.0000 | 50.0000 | 260.0000 | 280.0000 | 264.0000 | 317.0000 | 291.0000 | 195.0000 | 96.1000 | 274.0000 |
| Tetrachloroethene | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |
| TOC | 1.9000 |  |  | 33.2000 | 41.8000 | 46.9000 | 46.1000 | 6.4400 | 5.1000 | <10.0000 |
| Total dissolved solids | 1700.0000 | 1800.0000 | 2300.0000 | 2100.0000 | 2280.0000 | 3150.0000 | 2290.0000 | 2240.0000 | 2240.0000 | 1930.0000 |
| Tph (diesel) |  | <.1500 | <.5000 | .1000 | <.1500 | <.1500 | <.1500 | <.1500 | <.1500 | <.1710 |
| Trichloroethene | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |
| Xylenes (total) | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 6

## Analytical Data Summary for MW-2

| Constituents | 12/14/2001 | 12/22/2001 | 6/10/2002 | 12/03/2002 | 6/26/2003 | 12/04/2003 | 6/09/2004 | 12/20/2004 | 6/27/2005 | 6/29/2005 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |
| Alkalinity, bicarbonate (as caco3) | | | 400.0000 | 372.0000 | 770.0000 | | 928.0000 | 340.0000 | 332.0000 | |
| Arsenic | | | <.0200 | <.0200 | <.0200 | <.0200 | <.0200 | <.0200 | | |
| Barium | | | | | | | | | | |
| Cadmium | | | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | | |
| Calcium | | | 130.0000 | 127.0000 | 87.8000 | 148.0000 | 128.0000 | 131.0000 | 143.0000 | |
| Chloride | | | 621.0000 | 432.0000 | 404.0000 | 496.0000 | 461.0000 | 544.0000 | 627.0000 | |
| Chromium | | | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | | |
| Cis- 1,2 - dichloroethene | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |
| COD | | | | | | | | | | |
| Iron | | | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | | |
| Lead | | | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | | |
| Magnesium | | | 82.4000 | 69.0000 | 38.3000 | 63.6000 | 60.8000 | 65.6000 | 78.0000 | |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |
| Potassium | | | 17.4000 | 15.2000 | 13.4000 | 19.1000 | 15.1000 | 11.5000 | 16.3000 | |
| Sodium | | | | 286.0000 | 150.0000 | 248.0000 | 264.0000 | 291.0000 | 401.0000 | |
| Sulfate | | | 243.0000 | 197.0000 | 165.0000 | 269.0000 | 198.0000 | 166.0000 | 201.0000 | |
| Tetrachloroethene | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |
| TOC | | | 16.6000 | 21.0000 | 15.2000 | 23.4000 | 21.2000 | | | |
| Total dissolved solids | | | 1730.0000 | 1400.0000 | 1290.0000 | 1510.0000 | 1410.0000 | 1628.0000 | 1832.0000 | |
| Tph (diesel) | | | .8950 | <.1500 | <.1540 | <.2530 | <.2780 | <.2630 | | |
| Trichloroethene | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |
| Xylenes (total) | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 6

## Analytical Data Summary for MW-2

| Constituents | 12/22/2005 | 2/28/2006 | 6/15/2006 | 6/29/2006 | 10/31/2006 | 12/19/2006 | 6/29/2007 | 12/12/2007 | 12/14/2007 | 6/25/2008 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |
| Alkalinity, bicarbonate (as caco3) | 326.0000 | | 290.0000* | | | 280.0000 | 286.0000 | 300.0000 | | 308.0000 |
| Arsenic | | | | | | | | | | |
| Barium | | | | | | | | | | |
| Cadmium | | | | | | | | | | |
| Calcium | 148.0000 | | 132.0000 | | | 98.1000 | 138.0000 | 129.0000 | | 141.0000 |
| Chloride | 680.0000 | | 470.0000 | | | 510.0000 | 570.0000 | 580.0000 | | 660.0000 |
| Chromium | | | | | | | | | | |
| Cis- 1,2 - dichloroethene | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |
| COD | | | | | | | | | | |
| Iron | | | | | | | | | | |
| Lead | | | | | | | | | | |
| Magnesium | 77.6000 | | 63.0000 | | | 48.0000 | 67.9000 | 63.4000 | | 73.2000 |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |
| Potassium | 16.7000 | | 11.7000 | | | 11.0000 | 14.0000 | 16.7000 | | 15.5000 |
| Sodium | 364.0000 | | 337.0000 | | | 237.0000 | 340.0000 | 292.0000 | | 328.0000 |
| Sulfate | 210.0000 | | 204.0000 | | | 390.0000 | 200.0000 | 180.0000 | | 210.0000 |
| Tetrachloroethene | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |
| TOC | | | | | | | | | | |
| Total dissolved solids | 1990.0000 | | 1514.0000 | | | 1420.0000 | 1760.0000 | 1610.0000 | | 1820.0000 |
| Tph (diesel) | | | | | | | | | | |
| Trichloroethene | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |
| Xylenes (total) | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |

* - The displayed value is the arithmetic mean of multiple database matches.

## Table 6

## Analytical Data Summary for MW-2

| Constituents | 12/09/2008 | 12/22/2008 | 6/17/2009 | 12/09/2009 | 6/30/2010 | 12/09/2010 | 12/30/2010 | 1/25/2011 | 6/30/2011 | 9/30/2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | <5.0000 | | <5.0000 | <5.0000 | <.5000 | | <5.0000 | | <.5000 | |
| Alkalinity, bicarbonate (as caco3) | 336.0000 | | 332.0000 | 340.0000 | 370.0000 | | 350.0000* | | 360.0000* | |
| Arsenic | | | | <.0200 | | | | | | |
| Barium | | | | | | | | | | |
| Cadmium | | | | <.0050 | | | | | | |
| Calcium | 100.0000 | | 151.0000 | 165.0000 | 191.0000 | | 200.0000 | | 190.0000 | 160.0000 |
| Chloride | 790.0000 | | 870.0000 | 1000.0000 | 1100.0000 | | 1100.0000 | | 950.0000 | 980.0000 |
| Chromium | | | | <.0050 | | | | | | |
| Cis- 1,2 - dichloroethene | <5.0000 | | <5.0000 | <5.0000 | <1.0000 | | <5.0000 | | <1.0000 | |
| COD | | | | | | | | | | |
| Iron | | | | <.0500 | | | | | | |
| Lead | | | | <.0050 | | | | | | |
| Magnesium | 72.0000 | | 73.2000 | 89.5000 | 103.0000 | | 110.0000 | | 210.0000 | 85.0000 |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | <5.0000 | | <5.0000 | <5.0000 | <1.0000 | | <5.0000 | | <1.0000 | |
| Potassium | 16.5000 | | 14.7000 | 18.4000 | 19.1000 | | 23.0000 | | 30.0000 | 18.0000 |
| Sodium | 400.0000 | | 377.0000 | 501.0000 | 574.0000 | | 580.0000 | | 1000.0000 | 460.0000 |
| Sulfate | 210.0000 | | 250.0000 | 250.0000 | 270.0000 | | 270.0000 | | 280.0000 | |
| Tetrachloroethene | <5.0000 | | <5.0000 | <5.0000 | <1.0000 | | <5.0000 | | <1.0000 | |
| TOC | | | | 5.9000 | | | | | | |
| Total dissolved solids | 2160.0000 | | 2460.0000 | 2680.0000 | 2720.0000 | | 3100.0000 | | 2800.0000 | 2600.0000 |
| Tph (diesel) | | | | <.0800 | | | | | | |
| Trichloroethene | <5.0000 | | <5.0000 | <5.0000 | <1.0000 | | <5.0000 | | <5.0000 | |
| Xylenes (total) | <5.0000 | | <5.0000 | <5.0000 | <1.0000 | | <5.0000 | | <1.0000 | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 6

## Analytical Data Summary for MW-2

| Constituents | 12/28/2011 | 6/14/2012 | 12/23/2012 | 12/26/2012 | 6/26/2013 | 6/29/2013 | 9/24/2013 | 1/23/2014 | 6/06/2014 | 7/23/2014 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | <1.0000 | <5.0000 |  | <5.0000 | <5.0000 |  |  | <5.0000 |  | <5.0000 |
| Alkalinity, bicarbonate (as caco3) | 287.0000 | 340.0000 |  | 317.0000* | 353.0000* |  |  | 365.0000* |  | 391.0000* |
| Arsenic |  |  |  |  |  |  |  | <.0100 |  |  |
| Barium |  |  |  |  |  |  |  |  |  |  |
| Cadmium |  |  |  |  |  |  |  | <.0010 |  |  |
| Calcium | 137.0000 | 130.0000 |  | 150.0000 | 165.0000 |  |  | 163.0000 |  | 165.0000 |
| Chloride | 515.0000 | 530.0000 |  | 615.0000 | 722.0000 |  |  | 704.0000 |  | 685.0000 |
| Chromium |  |  |  |  |  |  |  | <.0040 |  |  |
| Cis- 1,2 - dichloroethene | <1.0000 | <5.0000 |  | <5.0000 | <5.0000 |  |  | <5.0000 |  | <5.0000 |
| COD |  |  |  |  |  |  |  |  |  |  |
| Iron |  |  |  |  |  |  |  | <.0200 |  |  |
| Lead |  |  |  |  |  |  |  | <.0100 |  |  |
| Magnesium | 63.8000 | 58.0000 |  | 64.1000 | 73.5000 |  |  | 70.7000 |  | 74.5000 |
| Mercury |  |  |  |  |  |  |  |  |  |  |
| Methyl tert-butyl ether |  |  |  |  |  |  |  |  |  |  |
| Potassium | 15.1000 | 13.0000 |  | 13.5000 | 15.2000 |  |  | 15.3000 |  | 15.1000 |
| Sodium | 311.0000 | 290.0000 |  | 320.0000 | 369.0000 |  |  | 362.0000 |  | 366.0000 |
| Sulfate | 177.0000 | 180.0000 |  | 170.0000 | 199.0000 |  |  | 209.0000 |  | 204.0000 |
| Tetrachloroethene | <1.0000 | <5.0000 |  | <5.0000 | <5.0000 |  |  | <5.0000 |  | <5.0000 |
| TOC |  |  |  |  |  |  |  |  |  |  |
| Total dissolved solids | 1350.0000 | 1700.0000 |  | 1680.0000 | 1890.0000 |  |  | 1840.0000 |  | 1820.0000 |
| Tph (diesel) |  |  |  |  |  |  |  |  |  |  |
| Trichloroethene | <1.0000 | <5.0000 |  | <5.0000 | <5.0000 |  |  | <5.0000 |  | <5.0000 |
| Xylenes (total) | <1.0000 | <5.0000 |  | <5.0000 | <5.0000 |  |  | <5.0000 |  | <5.0000 |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 6

## Analytical Data Summary for MW-2

| Constituents | 1/12/2015 | 4/28/2015 |
|---|---|---|
| 1,2 - dichloroethane | <5.0000 | <5.0000 |
| Alkalinity, bicarbonate (as caco3) | 398.0000* | 401.0000* |
| Arsenic | | <.0100 |
| Barium | | |
| Cadmium | | <.0010 |
| Calcium | 174.0000 | 180.0000 |
| Chloride | 729.0000 | 800.0000 |
| Chromium | | <.0040 |
| Cis- 1,2 - dichloroethene | <5.0000 | <5.0000 |
| COD | | |
| Iron | | <.0200 |
| Lead | | <.0100 |
| Magnesium | 79.8000 | 87.2000 |
| Mercury | | |
| Methyl tert-butyl ether | | |
| Potassium | 15.4000 | 17.3000 |
| Sodium | 395.0000 | 415.0000 |
| Sulfate | 190.0000 | 190.0000 |
| Tetrachloroethene | <5.0000 | <5.0000 |
| TOC | | 3.4700 |
| Total dissolved solids | 1990.0000 | 2100.0000 |
| Tph (diesel) | | <.0500 |
| Trichloroethene | <5.0000 | <5.0000 |
| Xylenes (total) | <5.0000 | <5.0000 |

* - The displayed value is the arithmetic mean of multiple database matches.

## Table 7

## Analytical Data Summary for MW-3

| Constituents | Units | 2/25/1992 | 6/23/1992 | 5/28/1993 | 6/27/1994 | 6/14/1995 | 8/07/1995 | 6/27/1996 | 8/29/1996 | 9/23/1996 | 7/02/1997 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | ug/L | <3.0000 | <5.0000 | <.2500 | <.5000 | <2.0000 |  | <.5000 | <.5000 | <.5000 | <5.0000 |
| Alkalinity, bicarbonate (as caco3) | mg/L |  |  |  |  |  |  |  |  |  |  |
| Arsenic | mg/L |  | 1.0000 |  |  | <.5000 |  | <.5000 | <.5000 | <.5000 | <.5000 |
| Barium | mg/L | .0200 | .0300 |  |  | <.0500 |  | <.0500 | <.0500 | <.0500 | <.0500 |
| Cadmium | mg/L | .0010 |  | <.0100 |  | <.0050 |  | <.0050 | <.0050 | <.0050 | <.0050 |
| Calcium | mg/L |  |  |  |  |  |  |  |  |  |  |
| Chloride | mg/L |  |  |  |  |  |  |  |  |  |  |
| Chromium | mg/L | .0180 | .0400 |  |  | <.0500 |  | <.0500 | .0810 | <.0500 | <.0500 |
| Cis- 1,2 - dichloroethene | ug/L |  |  |  |  |  |  |  |  |  | <5.0000 |
| COD | mg/L |  |  |  |  |  |  |  |  |  | 230.0000 |
| Iron | mg/L |  |  |  |  |  |  |  |  |  |  |
| Lead | mg/L |  |  | <.1000 |  | <.1000 |  | <.1000 | <.1000 | <.1000 | <.1000 |
| Magnesium | mg/L |  |  |  |  |  |  |  |  |  |  |
| Mercury | mg/L |  |  |  |  |  |  |  |  |  | <.0010 |
| Methyl tert-butyl ether | µg/L |  |  |  |  |  |  |  |  |  |  |
| Potassium | mg/L |  |  |  |  |  |  |  |  |  |  |
| Sodium | mg/L |  |  |  |  |  |  |  |  |  |  |
| Sulfate | mg/L |  |  |  |  |  |  |  |  |  |  |
| Tetrachloroethene | ug/L |  |  |  |  |  |  |  |  |  | <5.0000 |
| TOC | mg/L | 2.0000 | 2.0000 |  |  | <5.0000 |  | 22.0000 | 26.0000 | 79.0000 | <15.0000 |
| Total dissolved solids | mg/L |  |  |  |  |  |  |  |  |  |  |
| Tph (diesel) | mg/L |  |  |  |  |  |  |  |  |  | <.0500 |
| Trichloroethene | ug/L | <4.0000 | <5.0000 | <.2500 | <.5000 | <2.0000 |  | <.5000 | <5.0000 | <.5000 | <5.0000 |
| Xylenes (total) | ug/L | <3.0000 | <5.0000 | <.2500 | <2.0000 | <2.0000 |  |  | <2.0000 | <2.0000 | <3.5000* |

* - The displayed value is the arithmetic mean of multiple database matches.

## Table 7

## Analytical Data Summary for MW-3

| Constituents | 11/12/1998 | 4/23/1999 | 9/27/1999 | 12/02/1999 | 2/02/2000 | 5/25/2000 | 8/25/2000 | 11/29/2000 | 6/21/2001 | 12/06/2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |
| Alkalinity, bicarbonate (as caco3) | 780.0000 |  | 410.0000 | 380.0000 | 419.0000 | 383.0000 | 872.0000 | 1020.0000 | 439.0000 | 541.0000 |
| Arsenic | <.5000 | <.5000 | <.5000 | <.5000 | <.5000 | <.5000 |  | <.5000 | <.5000 | <.0200 |
| Barium |  |  |  |  |  |  |  |  |  |  |
| Cadmium |  | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 |
| Calcium | 140.0000 | 140.0000 | 131.0000 | 160.0000 | 150.0000 | 154.0000 | 154.0000 | 156.0000 | 154.0000 | 150.0000 |
| Chloride | 1800.0000 | 1900.0000 | 1900.0000 | 1900.0000 | 1950.0000 | 1630.0000 | 1800.0000 | 1860.0000 | 1980.0000 | 2410.0000 |
| Chromium | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0050 |
| Cis- 1,2 - dichloroethene | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |
| COD |  |  |  |  |  |  |  |  |  |  |
| Iron | <.1000 | <.1000 | <.1000 | <.1000 | <.1000 | <.1000 | <.1000 | <.1000 | <.1000 | <.0500 |
| Lead |  | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 |
| Magnesium | 160.0000 | 160.0000 | 148.0000 | 180.0000 | 173.0000 | 162.0000 | 166.0000 | 177.0000 | 180.0000 |  |
| Mercury |  |  |  |  |  |  |  |  |  |  |
| Methyl tert-butyl ether |  | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |
| Potassium | 28.0000 | 30.0000 | 26.5000 | 31.0000 | 29.4000 | 31.8000 | 31.4000 | 32.3000 | 31.3000 | 38.4000 |
| Sodium | 910.0000 | 870.0000 | 845.0000 | 990.0000 | 923.0000 | 878.0000 | 897.0000 | 993.0000 | 888.0000 | 959.0000 |
| Sulfate | 310.0000 | 60.0000 | 300.0000 | 310.0000 | 284.0000 | 272.0000 | 276.0000 | 176.0000 | 73.0000 | 311.0000 |
| Tetrachloroethene | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |
| TOC | <1.0000 |  |  | 35.2000 | 112.0000 | 34.5000 | 43.0000 | 10.2000 | 3.9700 | <10.0000 |
| Total dissolved solids | 4600.0000 | 3800.0000 | 4000.0000 | 3800.0000 | 3850.0000 | 4250.0000 | 4080.0000 | 4350.0000 | 5060.0000 | 4180.0000 |
| Tph (diesel) |  | <.1500 | <.5000 | .0800 | <.1500 | <.1500 | <.1500 | <.1500 | <.1500 | <.1580 |
| Trichloroethene | <5.0000 | .6000 | .8000 | 1.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |
| Xylenes (total) | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 7

## Analytical Data Summary for MW-3

| Constituents | 12/14/2001 | 12/22/2001 | 6/10/2002 | 12/03/2002 | 6/26/2003 | 12/04/2003 | 6/09/2004 | 12/20/2004 | 6/27/2005 | 6/29/2005 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |
| Alkalinity, bicarbonate (as caco3) | | | 346.0000 | 376.0000 | 340.0000 | | 358.0000 | 460.0000 | 326.0000 | |
| Arsenic | | | <.0200 | <.0200 | <.0200 | <.0200 | <.0200 | <.0200 | | |
| Barium | | | | | | | | | | |
| Cadmium | | | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | | |
| Calcium | | | 157.0000 | 172.0000 | 147.0000 | 167.0000 | 173.0000 | 151.0000 | 161.0000 | |
| Chloride | | | 2140.0000 | 2040.0000 | 2020.0000 | 1960.0000 | 1990.0000 | 2320.0000 | 1800.0000 | |
| Chromium | | | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | | |
| Cis- 1,2 - dichloroethene | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |
| COD | | | | | | | | | | |
| Iron | | | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | <.0500 | | |
| Lead | | | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | <.0050 | | |
| Magnesium | | | 196.0000 | 198.0000 | 169.0000 | 196.0000 | 205.0000 | 193.0000 | 198.0000 | |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |
| Potassium | | | 44.1000 | 39.3000 | 34.9000 | 41.8000 | 37.8000 | 29.8000 | 33.7000 | |
| Sodium | | | | 1180.0000 | 945.0000 | 873.0000 | 954.0000 | 1040.0000 | 1090.0000 | |
| Sulfate | | | 321.0000 | 311.0000 | 325.0000 | 328.0000 | 386.0000 | 349.0000 | 343.0000 | |
| Tetrachloroethene | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |
| TOC | | | 15.5000 | 16.0000 | 13.0000 | 20.8000 | 13.6000 | | | |
| Total dissolved solids | | | 4160.0000 | 4430.0000 | 4320.0000 | 4610.0000 | 3970.0000 | 4776.0000 | 4086.0000 | |
| Tph (diesel) | | | .8610 | <.1500 | <.1540 | <.2560 | <.2840 | .0920 | | |
| Trichloroethene | | | <5.0000 | 8.1300 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |
| Xylenes (total) | | | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | <5.0000 | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 7

## Analytical Data Summary for MW-3

| Constituents | 12/22/2005 | 2/28/2006 | 6/15/2006 | 6/29/2006 | 10/31/2006 | 12/19/2006 | 6/29/2007 | 12/12/2007 | 12/14/2007 | 6/25/2008 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |
| Alkalinity, bicarbonate (as caco3) | 316.0000 | | 320.0000* | | | 346.0000* | 318.0000 | 308.0000 | | 312.0000 |
| Arsenic | | | | | | | | | | |
| Barium | | | | | | | | | | |
| Cadmium | | | | | | | | | | |
| Calcium | 165.0000 | | 139.0000 | | | 140.0000 | 146.0000 | 132.0000 | | 145.0000 |
| Chloride | 1900.0000 | | 1460.0000 | | | 1900.0000 | 1700.0000 | 1700.0000 | | 1700.0000 |
| Chromium | | | | | | | | | | |
| Cis- 1,2 - dichloroethene | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |
| COD | | | | | | | | | | |
| Iron | | | | | | | | | | |
| Lead | | | | | | | | | | |
| Magnesium | 187.0000 | | 149.0000 | | | 155.0000 | 168.0000 | 157.0000 | | 179.0000 |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |
| Potassium | 37.2000 | | 25.7000 | | | 32.3000 | 30.4000 | 36.2000 | | 31.3000 |
| Sodium | 1030.0000 | | 846.0000 | | | 883.0000 | 892.0000 | 802.0000 | | 833.0000 |
| Sulfate | 340.0000 | | 375.0000 | | | 370.0000 | 360.0000 | 330.0000 | | 310.0000 |
| Tetrachloroethene | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |
| TOC | | | | | | | | | | |
| Total dissolved solids | 4270.0000 | | 3302.0000 | | | 3710.0000 | 4340.0000 | 3790.0000 | | 3750.0000 |
| Tph (diesel) | | | | | | | | | | |
| Trichloroethene | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |
| Xylenes (total) | <5.0000 | | <5.0000 | | | <5.0000 | <5.0000 | <5.0000 | | <5.0000 |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 7

## Analytical Data Summary for MW-3

| Constituents | 12/09/2008 | 12/22/2008 | 6/17/2009 | 12/09/2009 | 6/30/2010 | 12/09/2010 | 12/30/2010 | 1/25/2011 | 6/30/2011 | 9/30/2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | <5.0000 | | <5.0000 | <5.0000 | <.5000 | | <5.0000 | | <.5000 | |
| Alkalinity, bicarbonate (as caco3) | 315.0000 | | 320.0000 | 288.0000 | 298.0000 | | 280.0000* | | 290.0000* | |
| Arsenic | | | | <.0200 | | | | | | |
| Barium | | | | | | | | | | |
| Cadmium | | | | <.0050 | | | | | | |
| Calcium | 100.0000 | | 137.0000 | 126.0000 | 144.0000 | | 150.0000 | | 140.0000 | |
| Chloride | 1700.0000 | | 1800.0000 | 1800.0000 | 1800.0000 | | 1700.0000 | | 1400.0000 | |
| Chromium | | | | <.0050 | | | | | | |
| Cis- 1,2 - dichloroethene | <5.0000 | | <5.0000 | <5.0000 | <1.0000 | | <5.0000 | | <1.0000 | |
| COD | | | | | | | | | | |
| Iron | | | | <.0500 | | | | | | |
| Lead | | | | <.0050 | | | | | | |
| Magnesium | 200.0000 | | 154.0000 | 156.0000 | 173.0000 | | 180.0000 | | 160.0000 | |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | <5.0000 | | <5.0000 | <5.0000 | <1.0000 | | <5.0000 | | <1.0000 | |
| Potassium | 29.6000 | | 25.1000 | 28.4000 | 27.6000 | | 34.0000 | | 30.0000 | |
| Sodium | 800.0000 | | 755.0000 | 858.0000 | 876.0000 | | 910.0000 | | 810.0000 | |
| Sulfate | 330.0000 | | 360.0000 | 340.0000 | 320.0000 | | 310.0000 | | 300.0000 | |
| Tetrachloroethene | <5.0000 | | <5.0000 | <5.0000 | <1.0000 | | <5.0000 | | <1.0000 | |
| TOC | | | | <1.0000 | | | | | | |
| Total dissolved solids | 3880.0000 | | 4460.0000 | 4180.0000 | 3760.0000 | | 4200.0000 | | 3700.0000 | |
| Tph (diesel) | | | | <.0820 | | | | | | |
| Trichloroethene | <5.0000 | | <5.0000 | <5.0000 | 2.0000 | | <5.0000 | | <5.0000 | |
| Xylenes (total) | <5.0000 | | <5.0000 | <5.0000 | <1.0000 | | <5.0000 | | <1.0000 | |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 7

## Analytical Data Summary for MW-3

| Constituents | 12/28/2011 | 6/14/2012 | 12/23/2012 | 12/26/2012 | 6/26/2013 | 6/29/2013 | 9/24/2013 | 1/23/2014 | 6/06/2014 | 7/23/2014 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1,2 - dichloroethane | <1.0000 | <5.0000 | | <5.0000 | <5.0000 | | | <5.0000 | | <5.0000 |
| Alkalinity, bicarbonate (as caco3) | 296.0000 | 310.0000 | | 282.0000* | 296.0000* | | | 305.0000* | | 306.0000* |
| Arsenic | | | | | | | | <.0100 | | |
| Barium | | | | | | | | | | |
| Cadmium | | | | | | | | <.0010 | | |
| Calcium | 151.0000 | 140.0000 | | 148.0000 | 145.0000 | | | 153.0000 | | 151.0000 |
| Chloride | 1700.0000 | 1700.0000 | | 1760.0000 | 1800.0000 | | | 1900.0000 | | 1940.0000 |
| Chromium | | | | | | | | <.0040 | | |
| Cis- 1,2 - dichloroethene | <1.0000 | <5.0000 | | <5.0000 | <5.0000 | | | <5.0000 | | <5.0000 |
| COD | | | | | | | | | | |
| Iron | | | | | | | | <.0200 | | |
| Lead | | | | | | | | <.0100 | | |
| Magnesium | 181.0000 | 160.0000 | | 185.0000 | 181.0000 | | | 192.0000 | | 183.0000 |
| Mercury | | | | | | | | | | |
| Methyl tert-butyl ether | | | | | | | | | | |
| Potassium | 33.6000 | 32.0000 | | 28.1000 | 28.6000 | | | 31.2000 | | 29.4000 |
| Sodium | 920.0000 | 870.0000 | | 848.0000 | 796.0000 | | | 918.0000 | | 941.0000 |
| Sulfate | 316.0000 | 340.0000 | | 311.0000 | 370.0000 | | | 380.0000 | | 350.0000 |
| Tetrachloroethene | <1.0000 | <5.0000 | | <5.0000 | <5.0000 | | | <5.0000 | | <5.0000 |
| TOC | | | | | | | | | | |
| Total dissolved solids | 3690.0000 | 3700.0000 | | 3730.0000 | 3590.0000 | | | 3840.0000 | | 3670.0000 |
| Tph (diesel) | | | | | | | | | | |
| Trichloroethene | 1.6000 | <5.0000 | | <5.0000 | <5.0000 | | | <5.0000 | | <5.0000 |
| Xylenes (total) | <1.0000 | <5.0000 | | <5.0000 | <5.0000 | | | <5.0000 | | <5.0000 |

* - The displayed value is the arithmetic mean of multiple database matches.

# Table 7

## Analytical Data Summary for MW-3

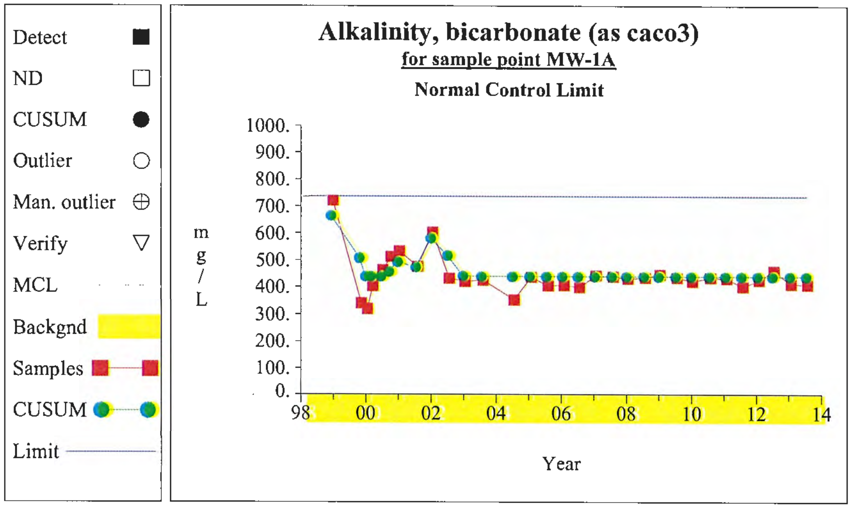
| Constituents | 1/12/2015 | 4/28/2015 |
|---|---|---|
| 1,2 - dichloroethane | <5.0000 | <5.0000 |
| Alkalinity, bicarbonate (as caco3) | 308.0000* | 303.0000* |
| Arsenic | | <.0100 |
| Barium | | |
| Cadmium | | <.0010 |
| Calcium | 154.0000 | 158.0000 |
| Chloride | 1920.0000 | 2030.0000 |
| Chromium | | <.0040 |
| Cis- 1,2 - dichloroethene | <5.0000 | <5.0000 |
| COD | | |
| Iron | | .0270 |
| Lead | | <.0100 |
| Magnesium | 184.0000 | 204.0000 |
| Mercury | | |
| Methyl tert-butyl ether | | |
| Potassium | 29.9000 | 32.1000 |
| Sodium | 970.0000 | 1030.0000 |
| Sulfate | 310.0000 | 320.0000 |
| Tetrachloroethene | <5.0000 | <5.0000 |
| TOC | | .9200 |
| Total dissolved solids | 4320.0000 | 4060.0000 |
| Tph (diesel) | | <.0540 |
| Trichloroethene | <5.0000 | <5.0000 |
| Xylenes (total) | <5.0000 | <5.0000 |

* - The displayed value is the arithmetic mean of multiple database matches.

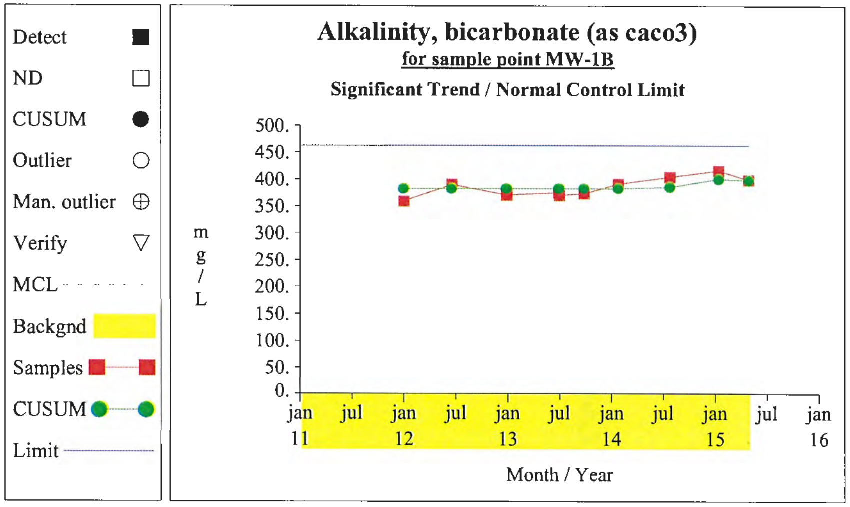
# Attachment 2

## Intra-Well Control Charts and Power Curve

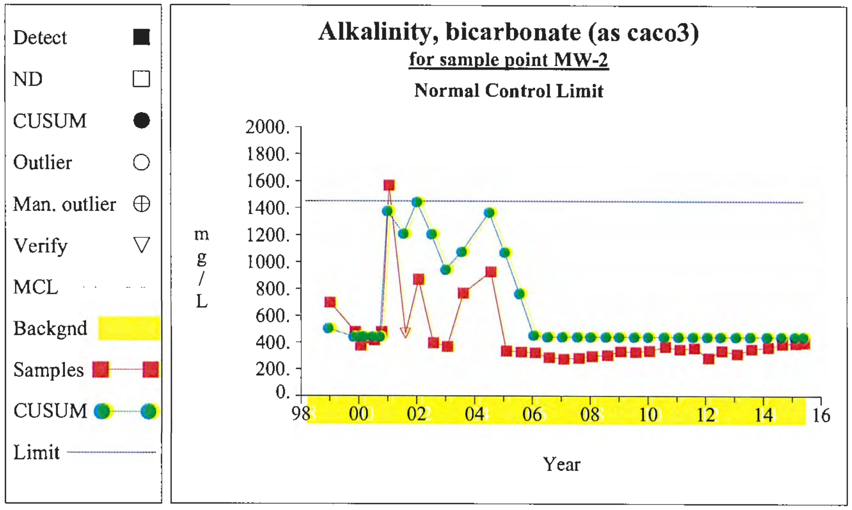
# Intra-Well Control Charts



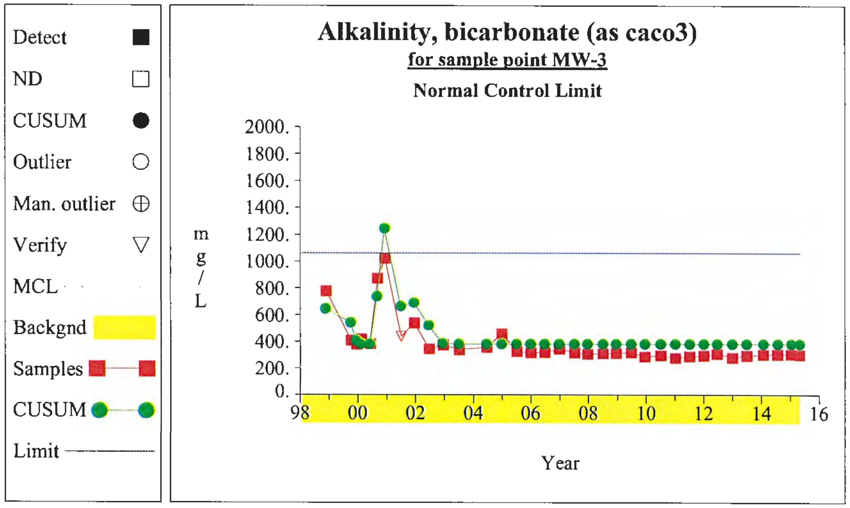
Graph 1



Graph 2

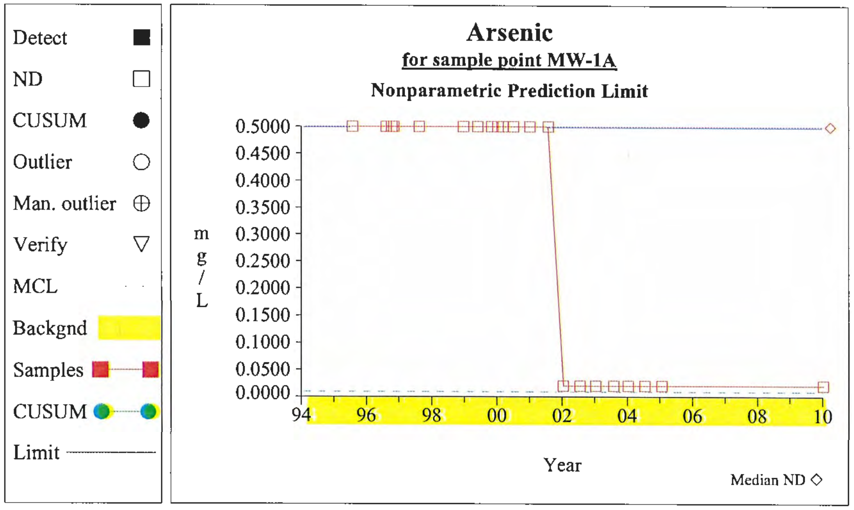


Graph 3

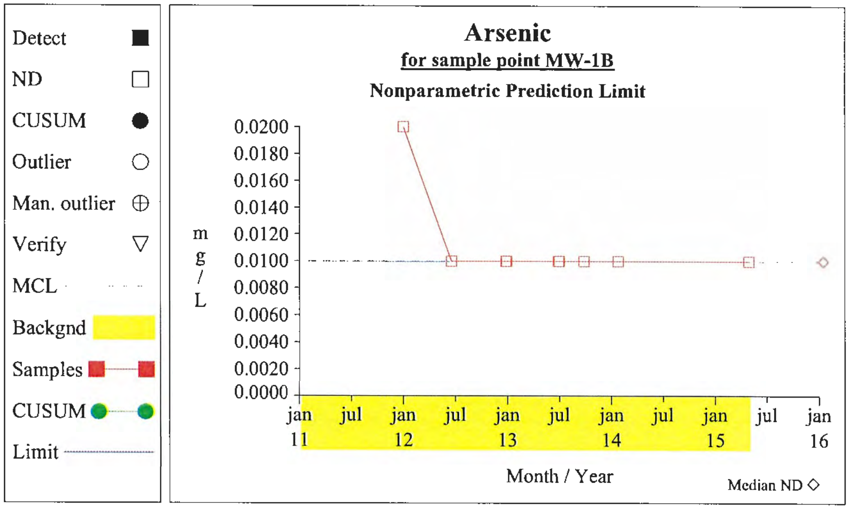


Graph 4

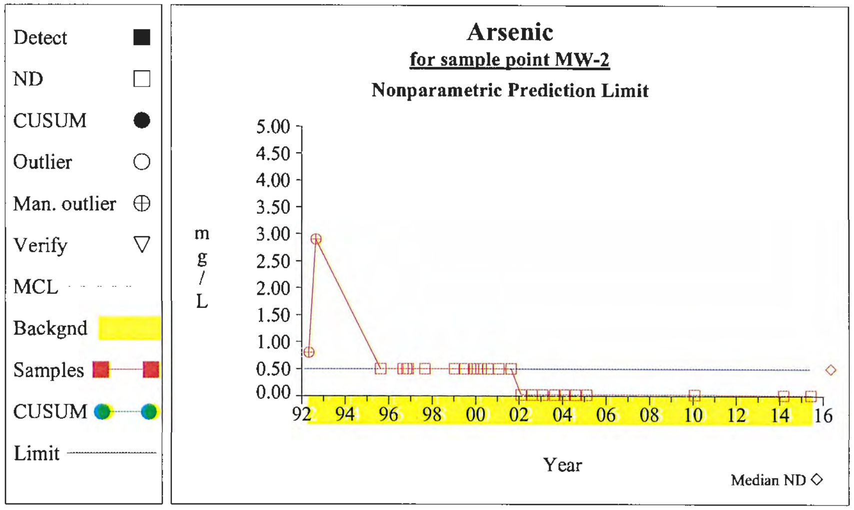
# Intra-Well Control Charts



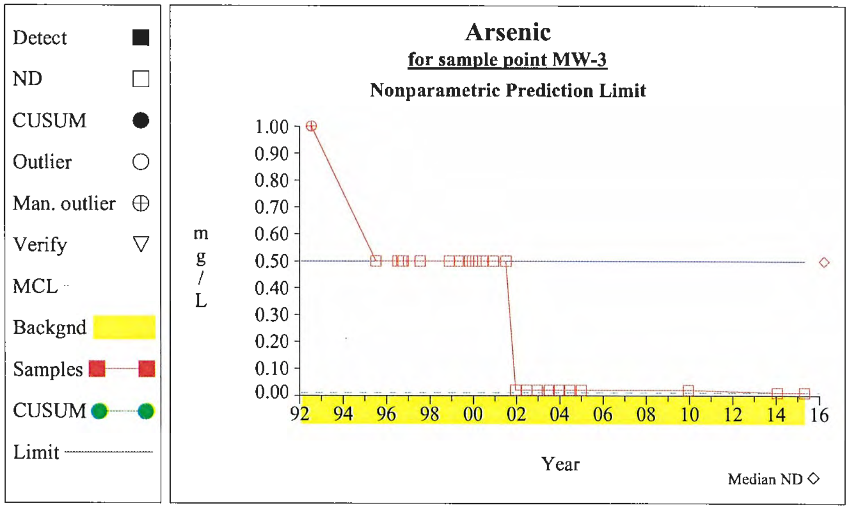
Graph 5



Graph 6

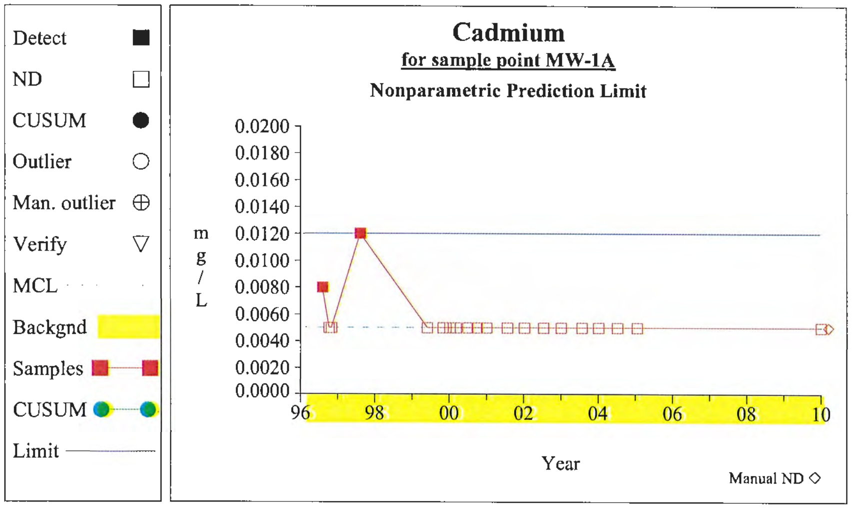


Graph 7

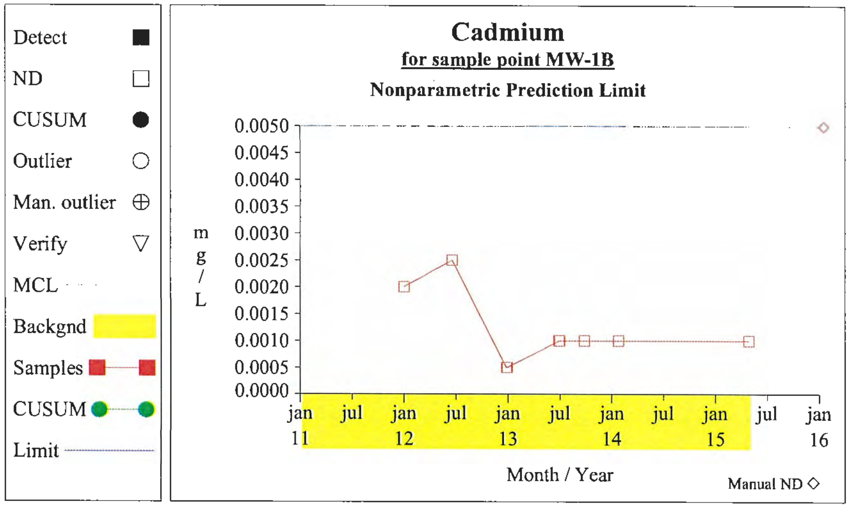


Graph 8

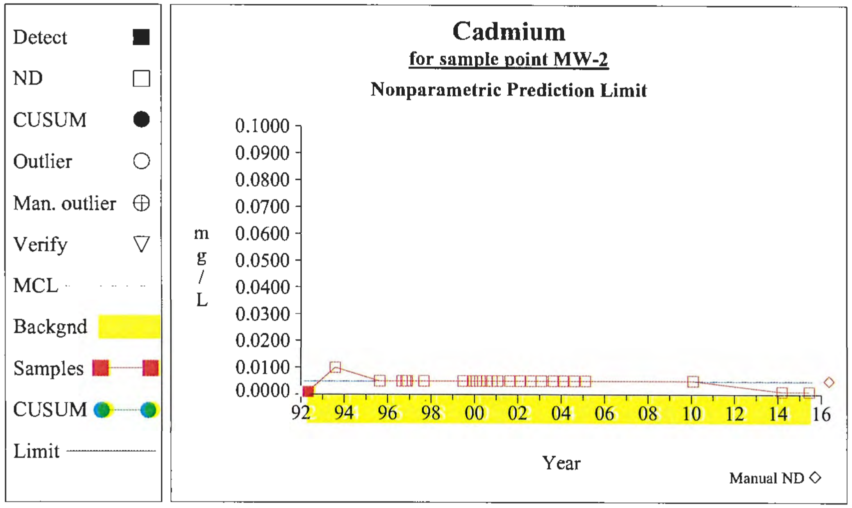
# Intra-Well Control Charts



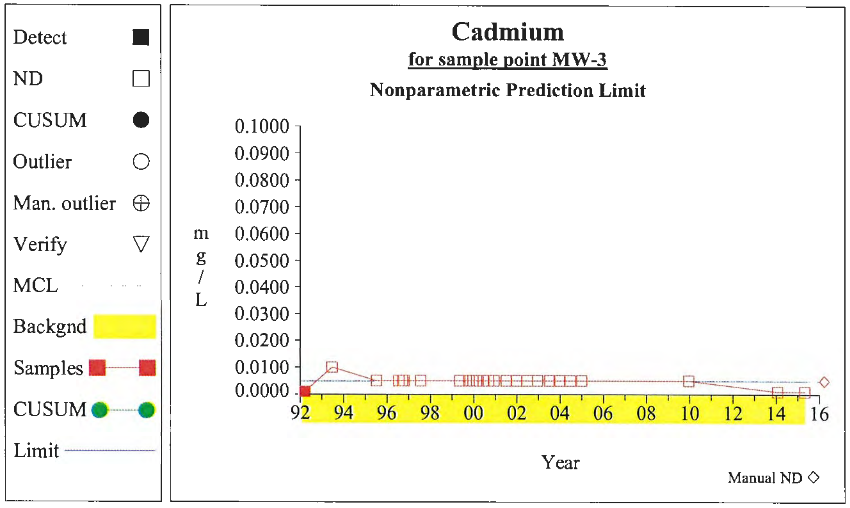
Graph 9



Graph 10

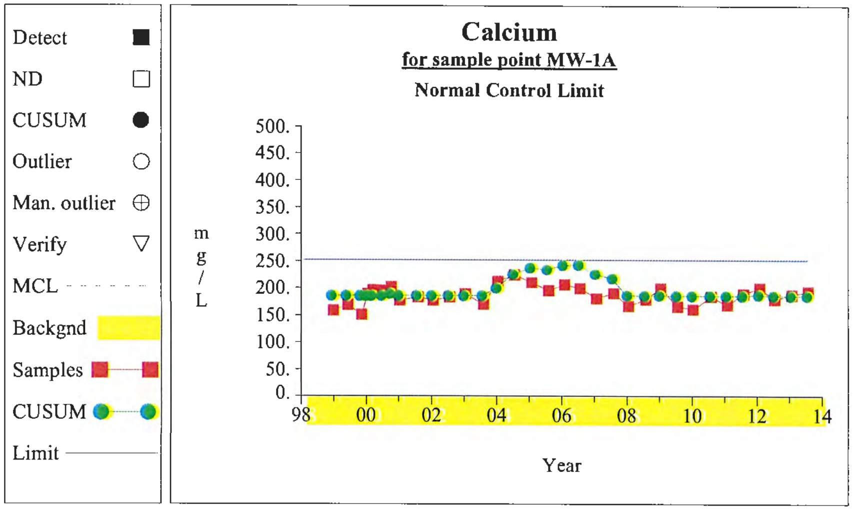


Graph 11

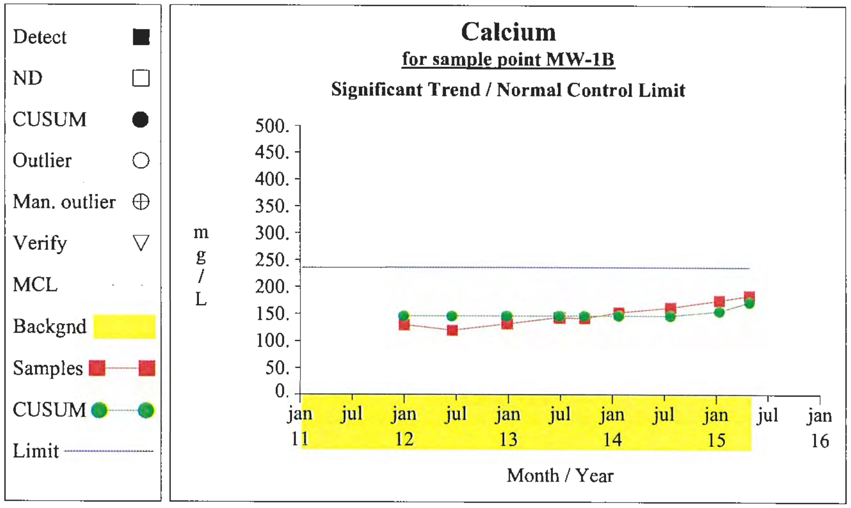


Graph 12

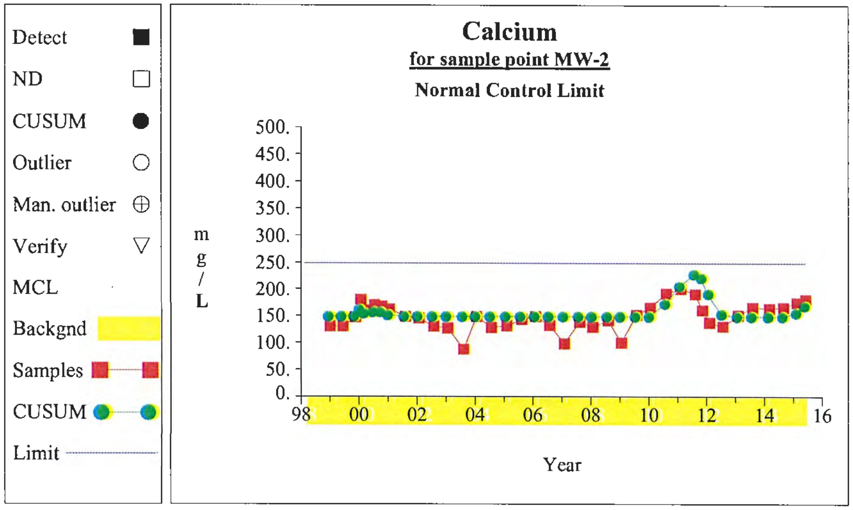
# Intra-Well Control Charts



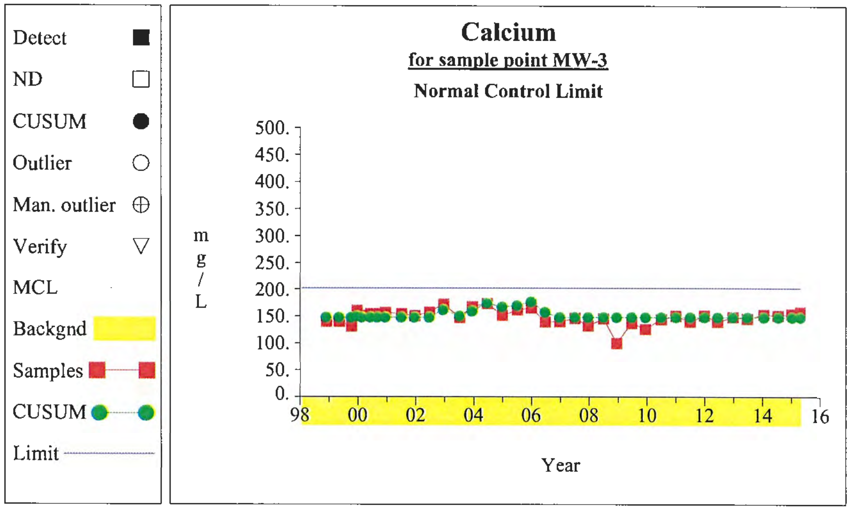
**Graph 13**



**Graph 14**

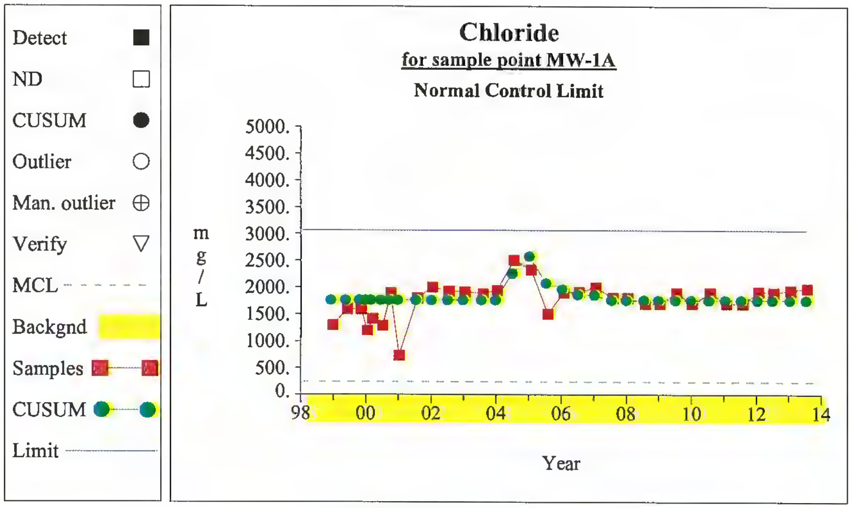


**Graph 15**

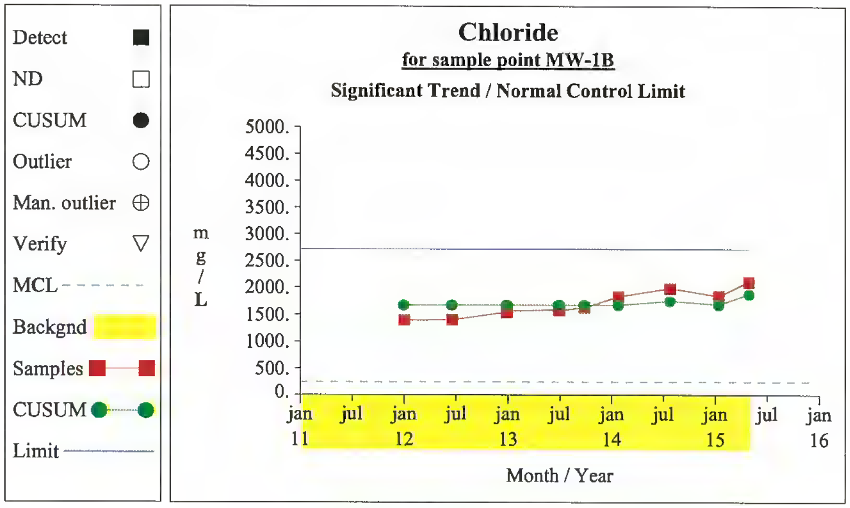


**Graph 16**

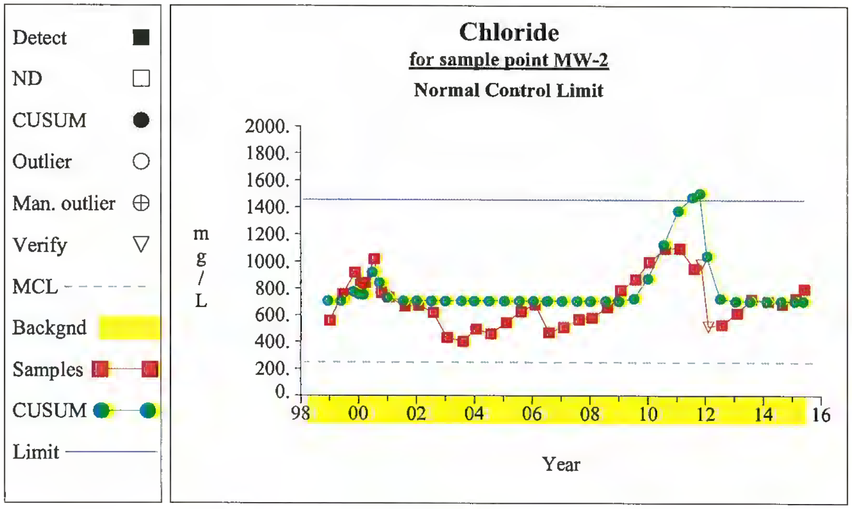
# Intra-Well Control Charts



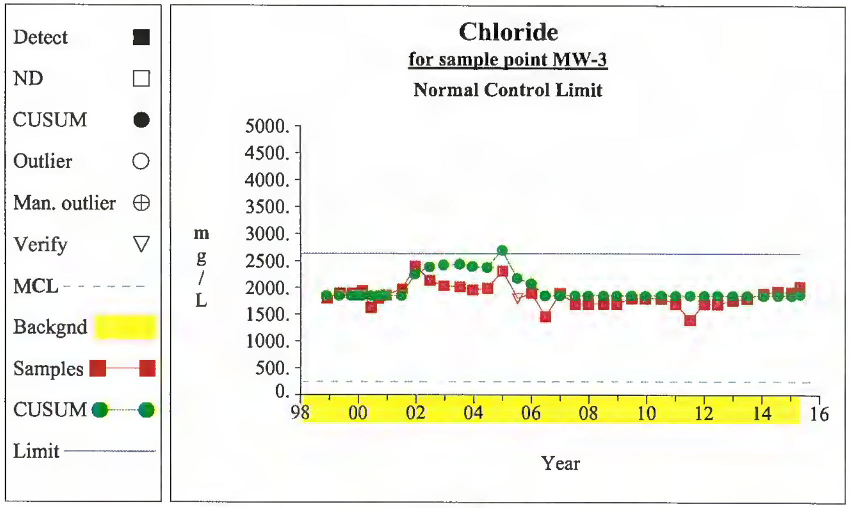
**Graph 17**



**Graph 18**

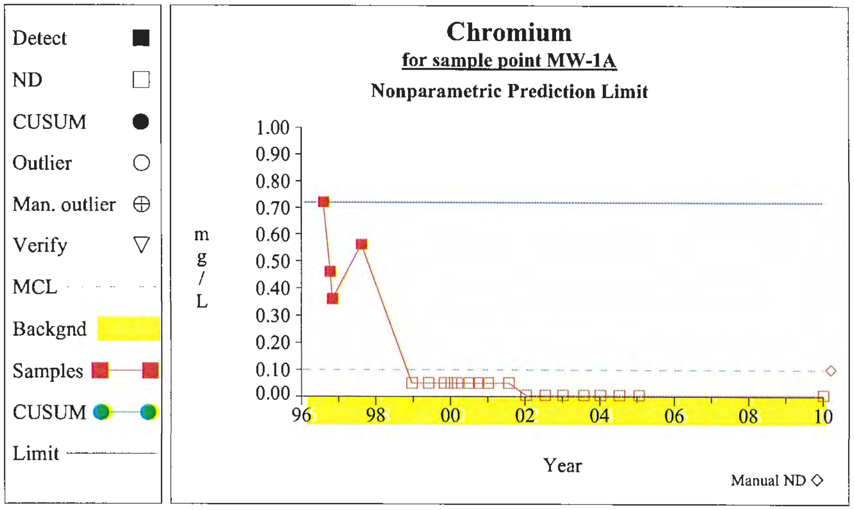


**Graph 19**

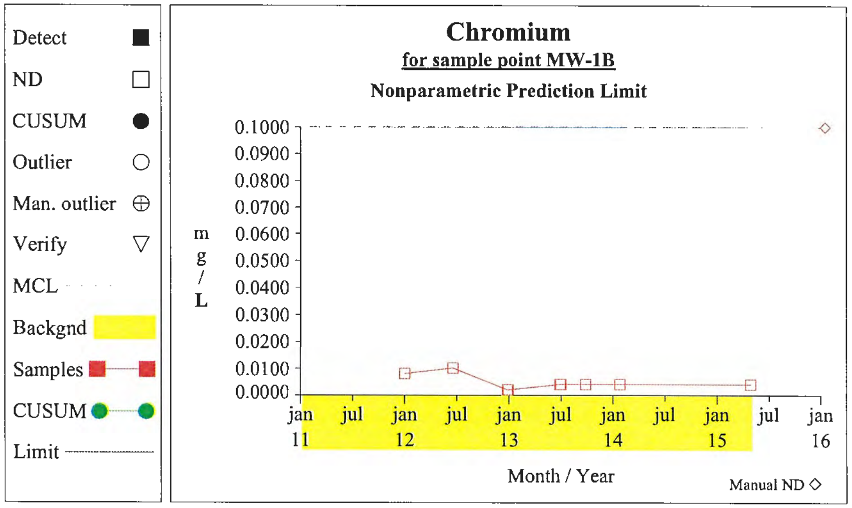


**Graph 20**

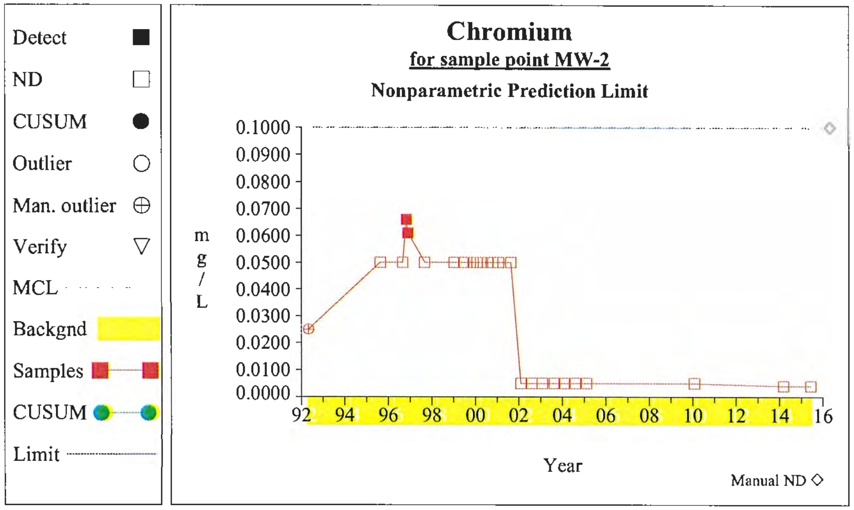
# Intra-Well Control Charts



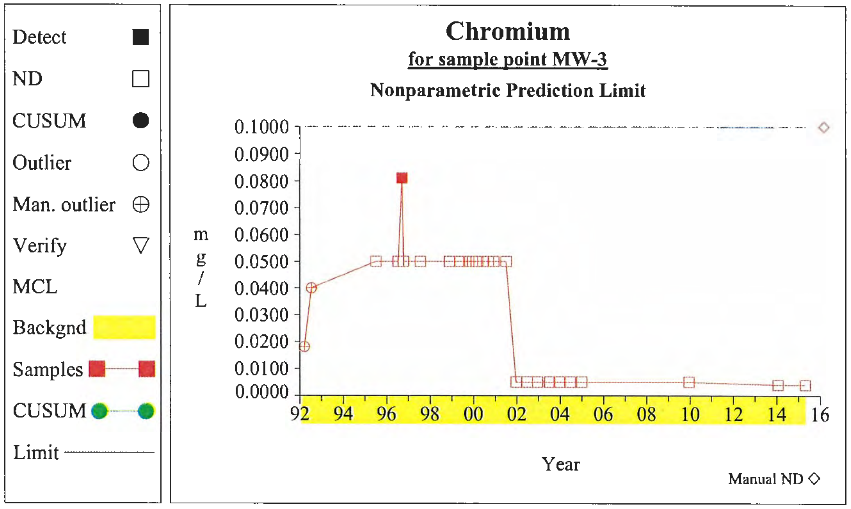
Graph 21



Graph 22

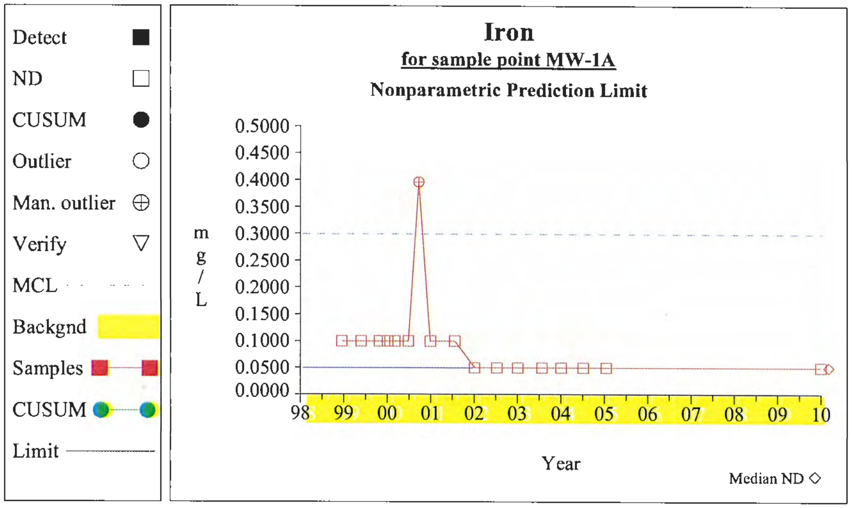


Graph 23

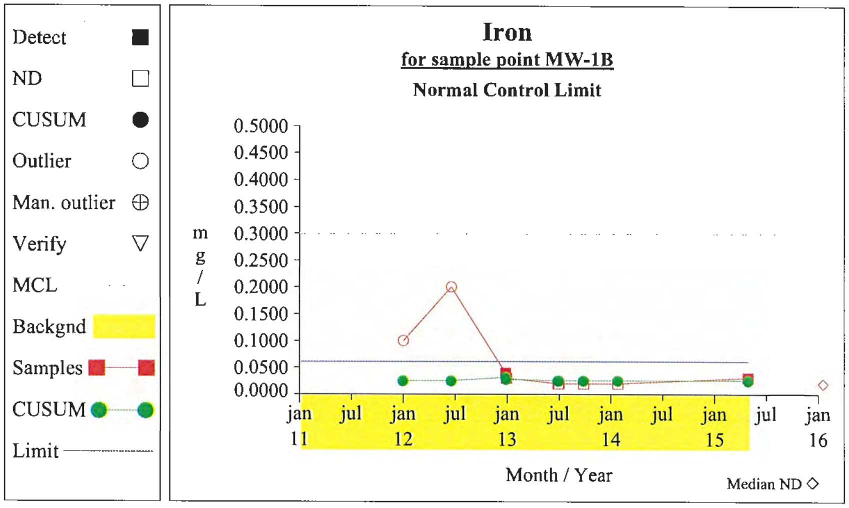


Graph 24

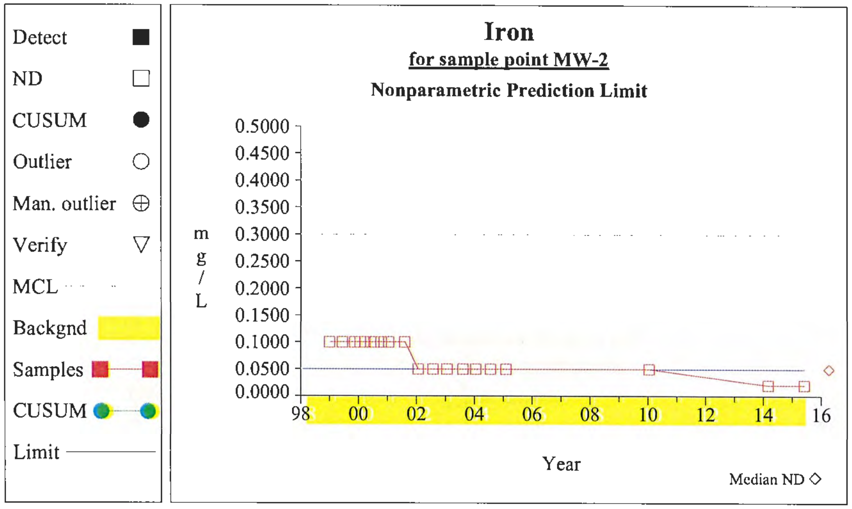
# Intra-Well Control Charts



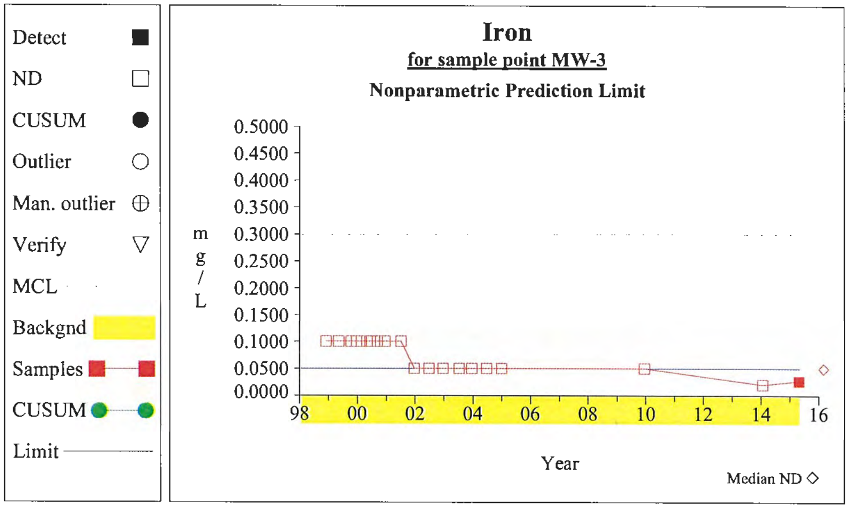
Graph 25



Graph 26

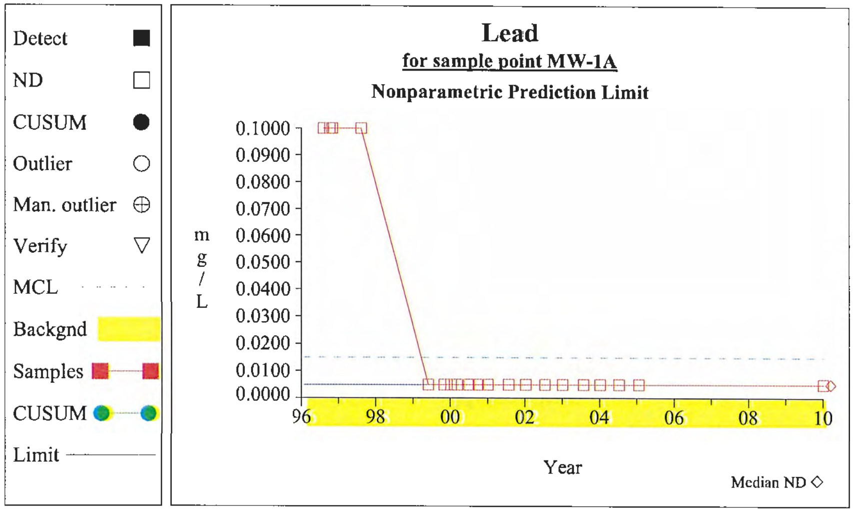


Graph 27

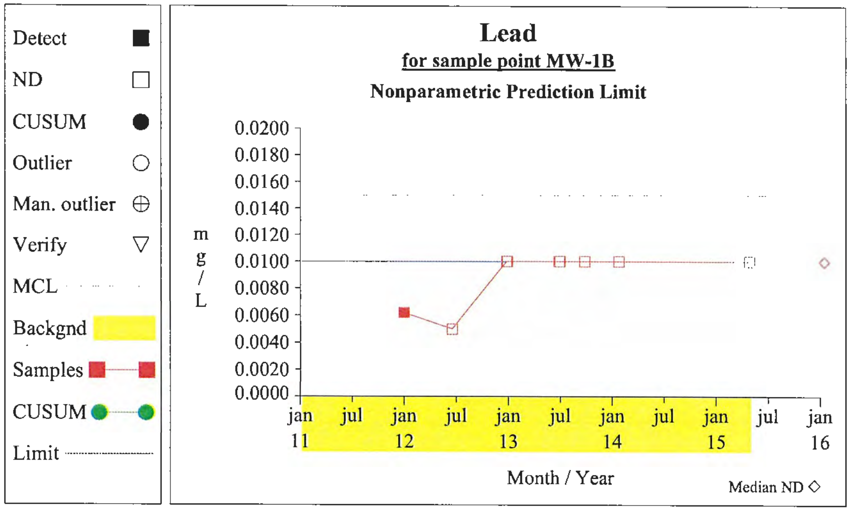


Graph 28

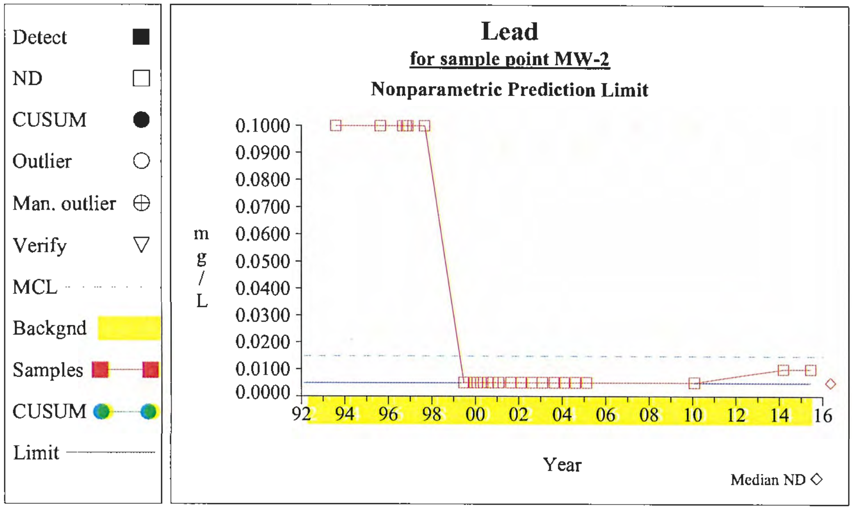
# Intra-Well Control Charts



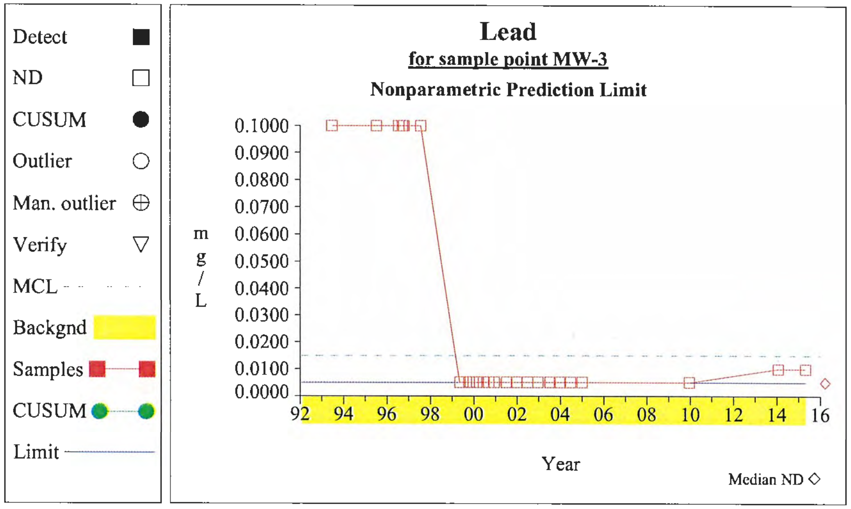
Graph 29



Graph 30

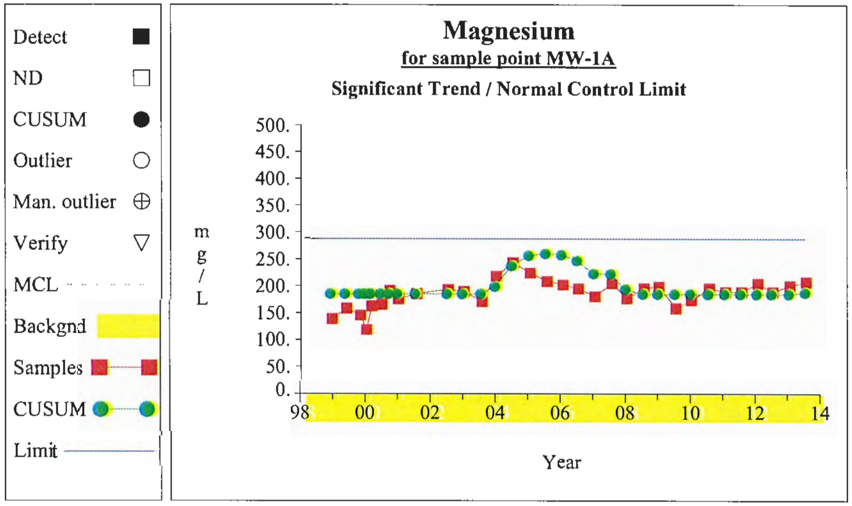


Graph 31

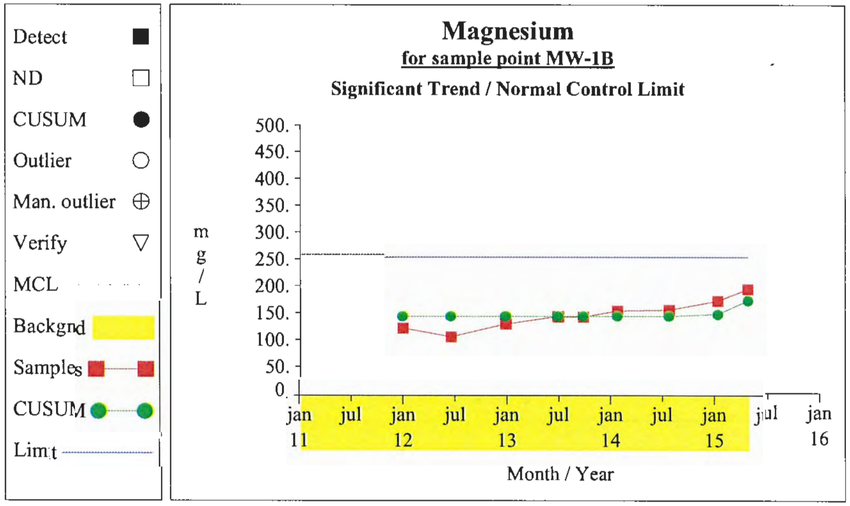


Graph 32

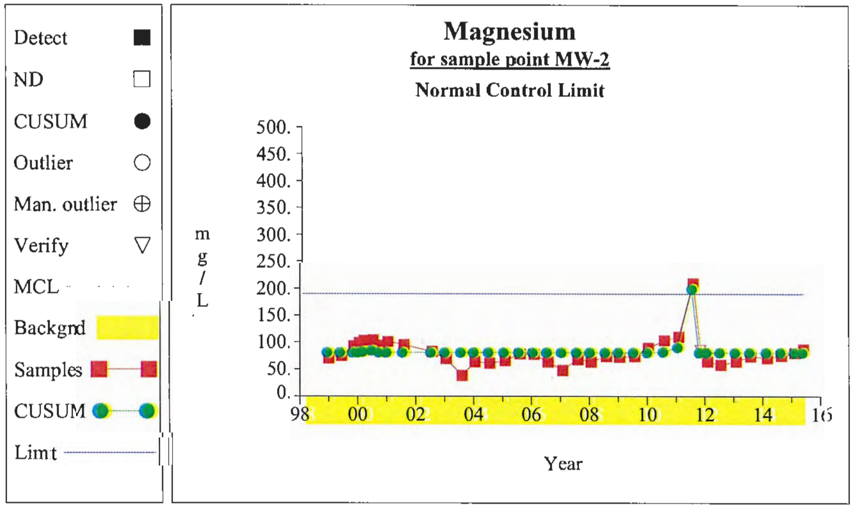
# Intra-Well Control Charts



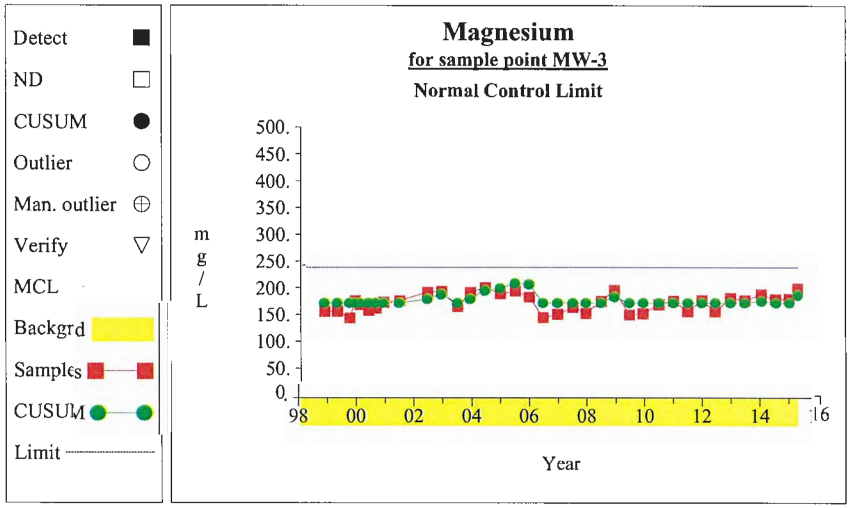
**Graph 33**



**Graph 34**

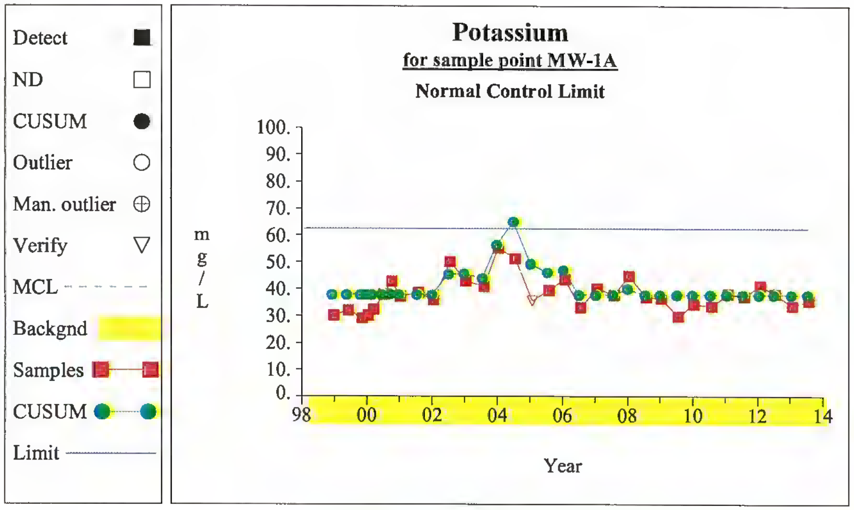


**Graph 35**

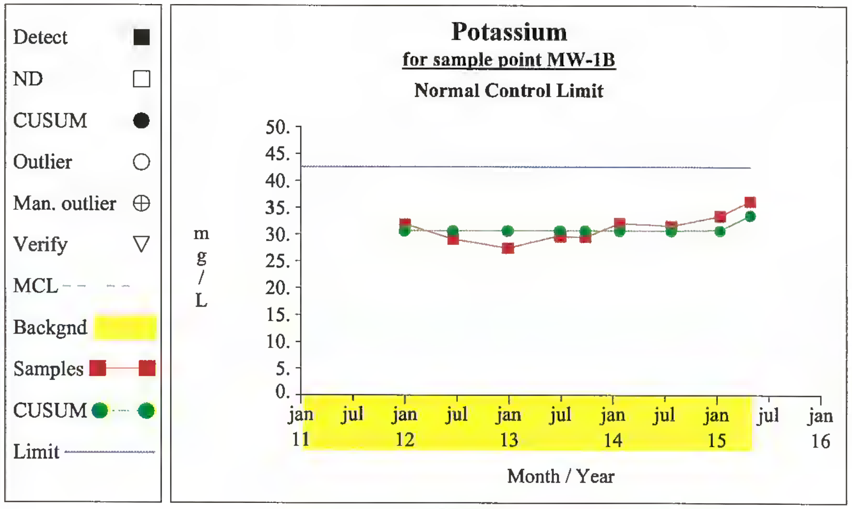


**Graph 36**

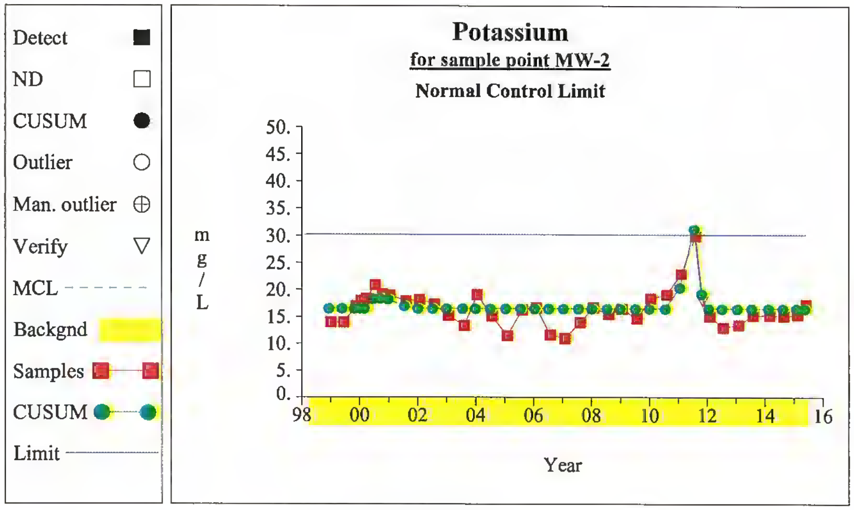
# Intra-Well Control Charts



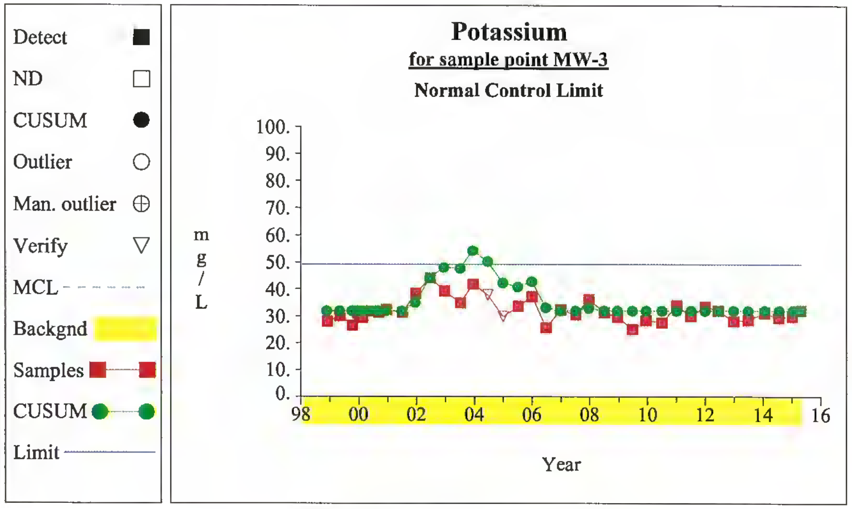
Graph 37



Graph 38

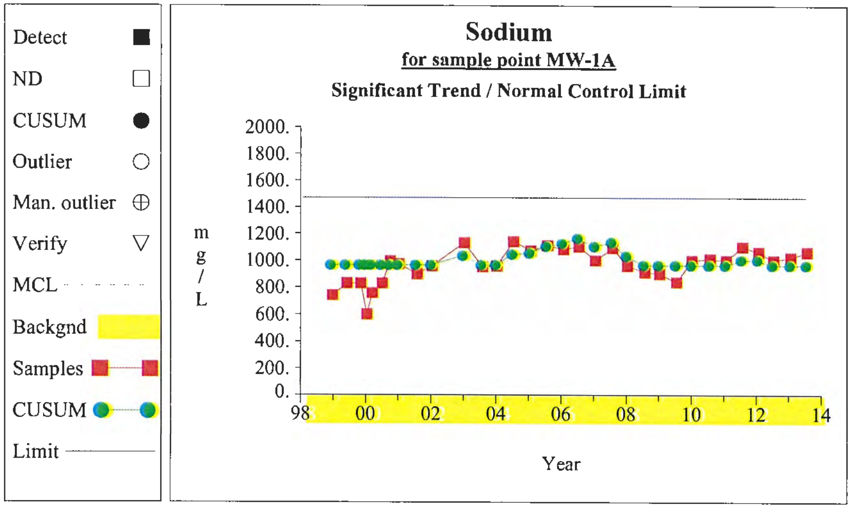


Graph 39

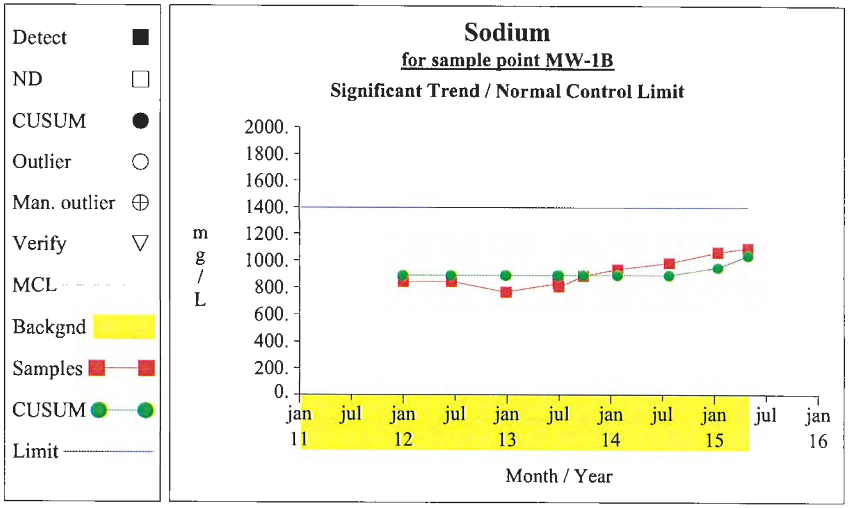


Graph 40

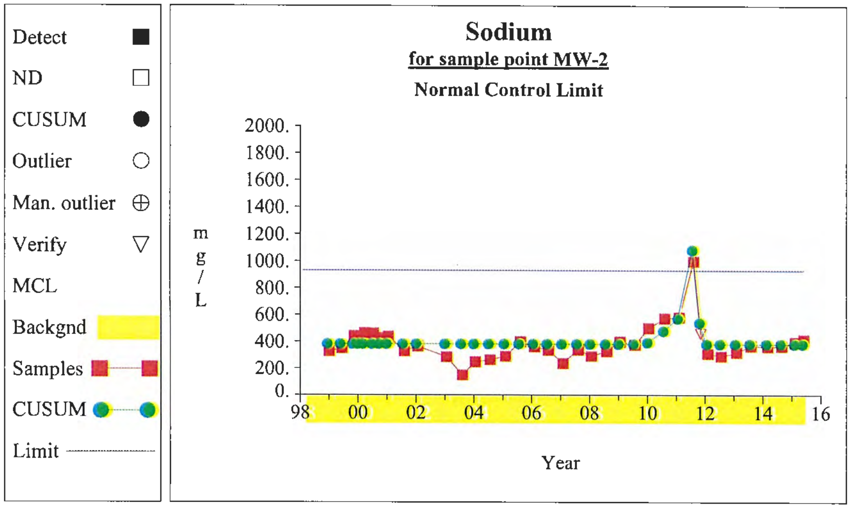
# Intra-Well Control Charts



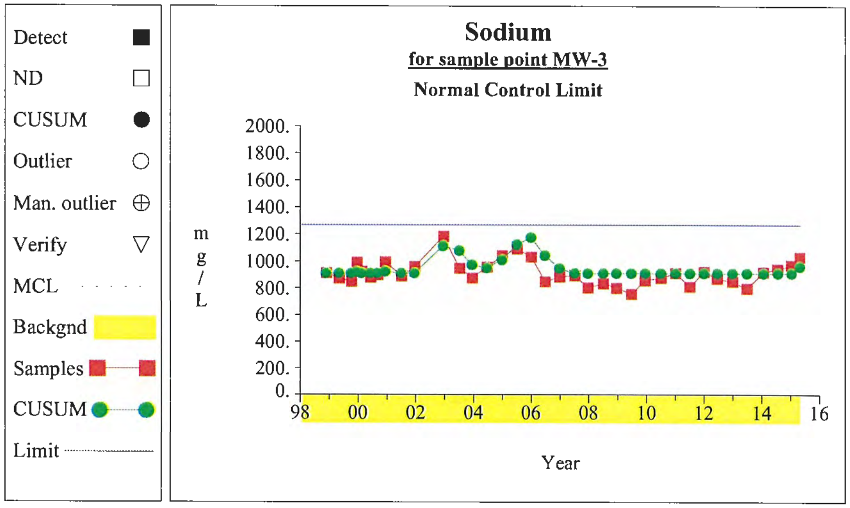
Graph 41



Graph 42

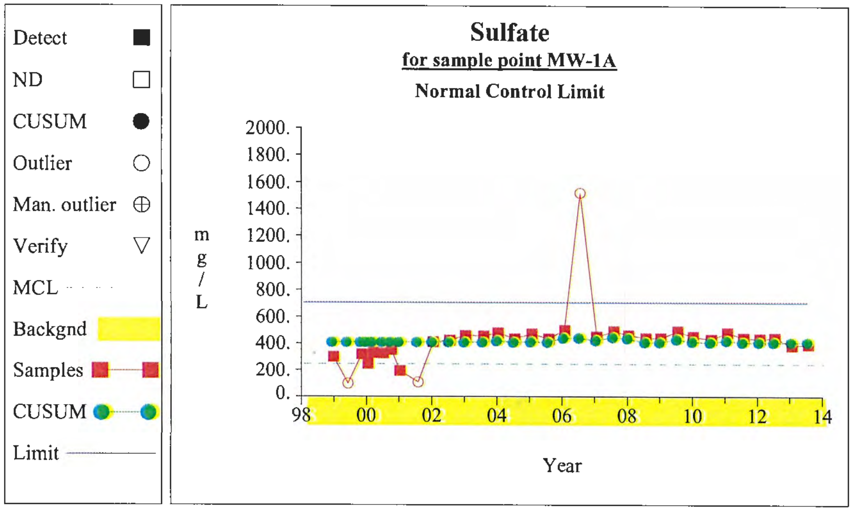


Graph 43

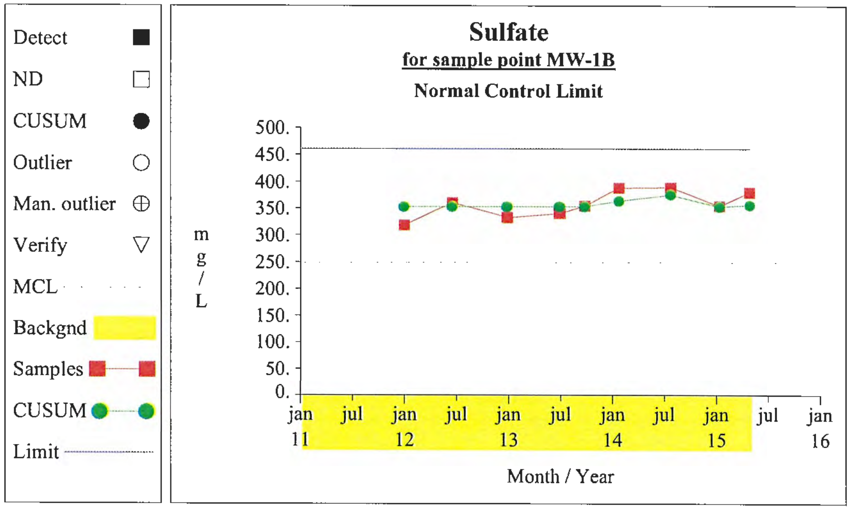


Graph 44

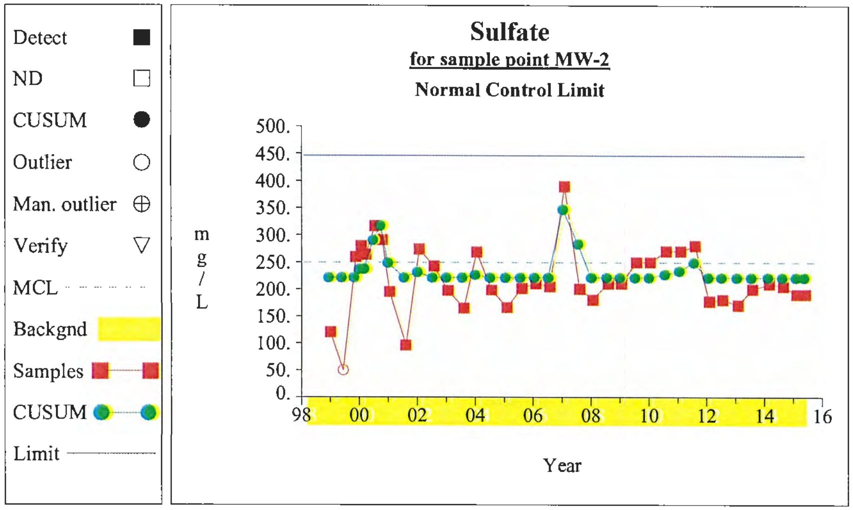
# Intra-Well Control Charts



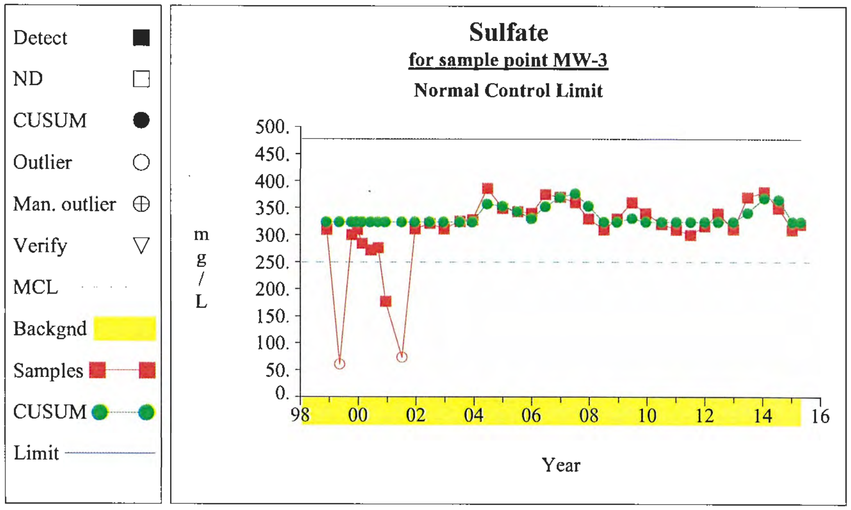
Graph 45



Graph 46

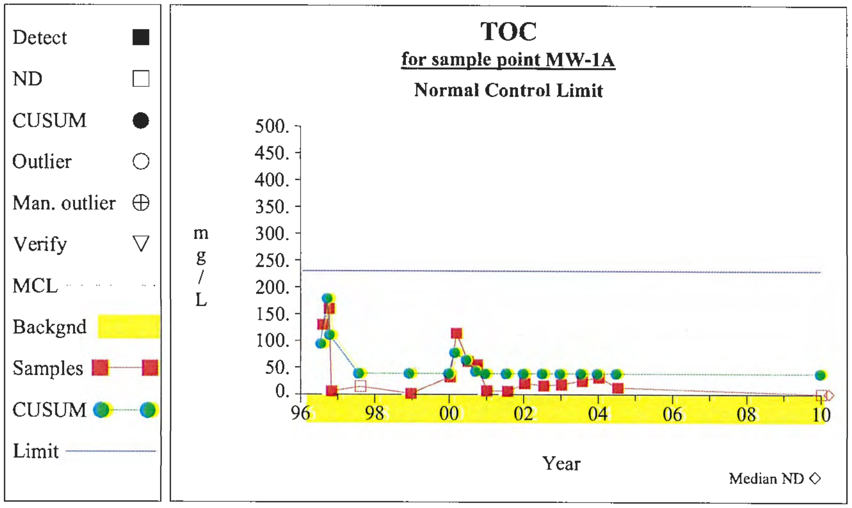


Graph 47

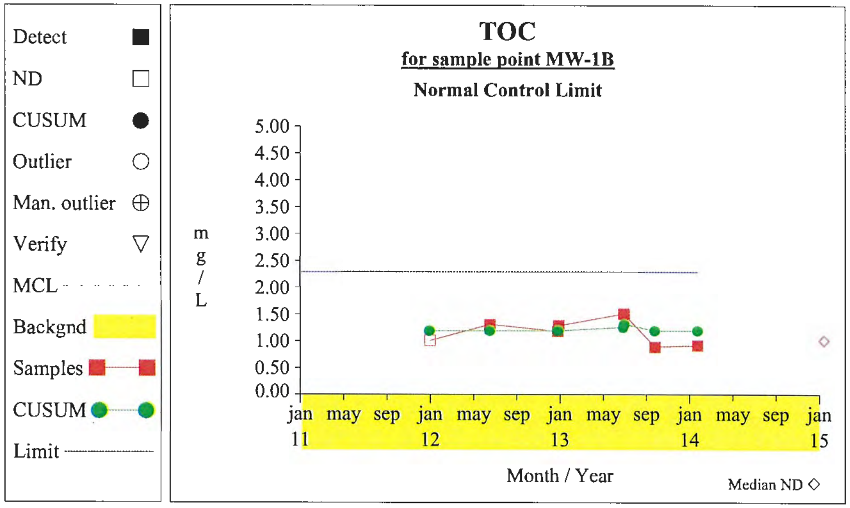


Graph 48

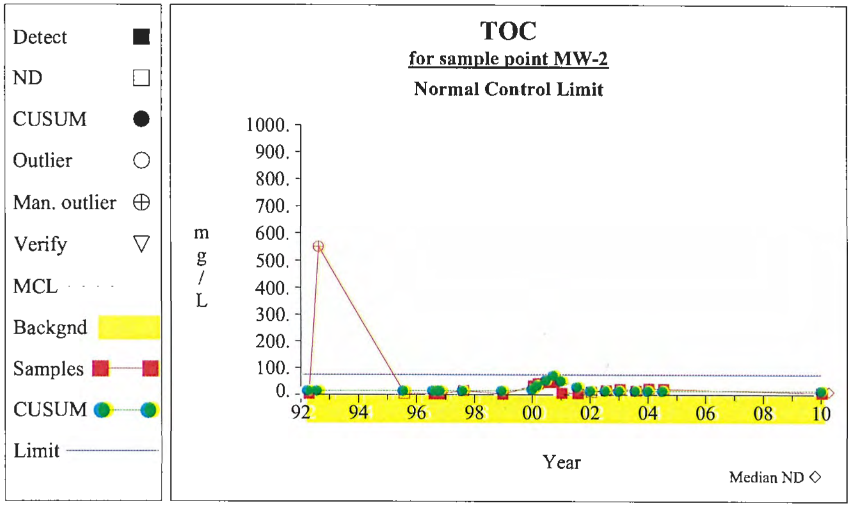
# Intra-Well Control Charts



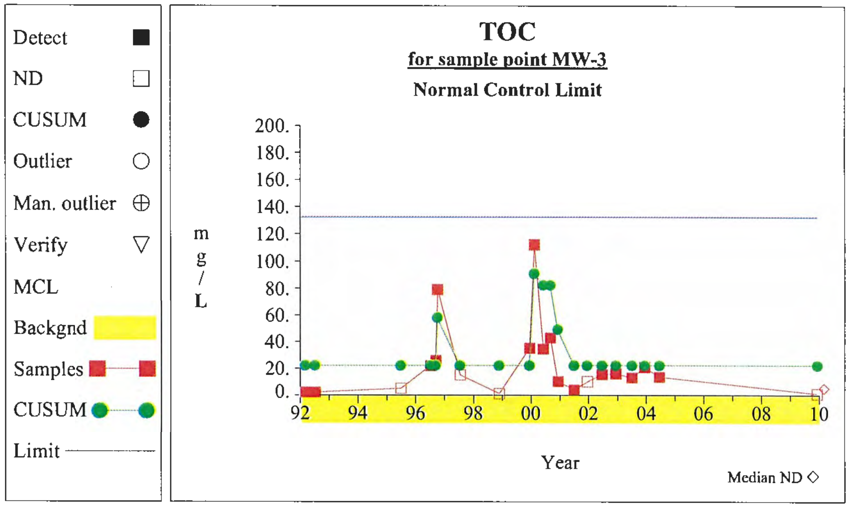
Graph 49



Graph 50

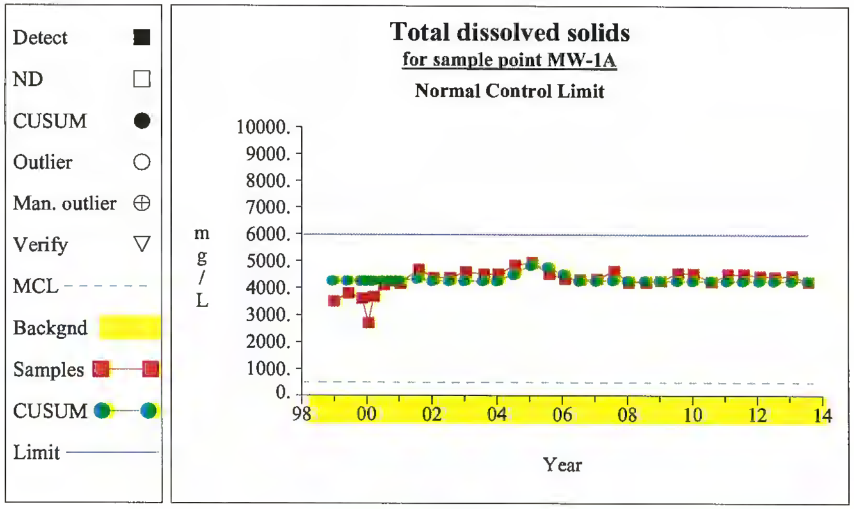


Graph 51

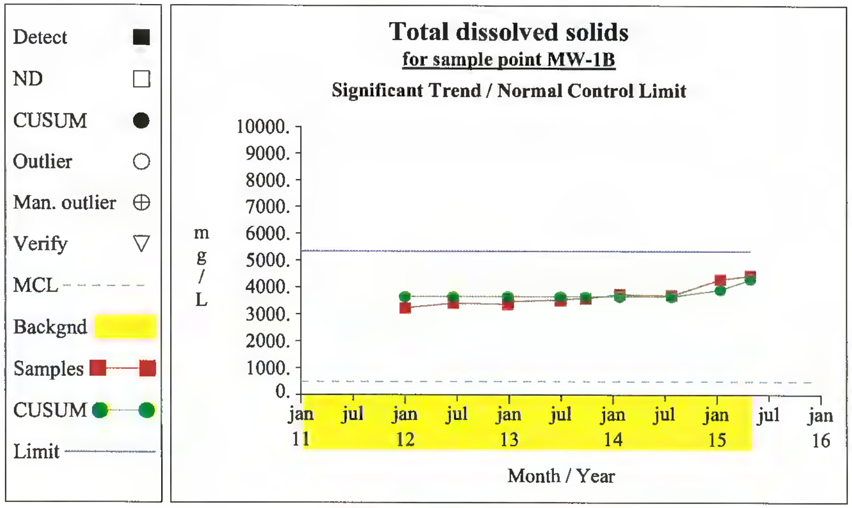


Graph 52

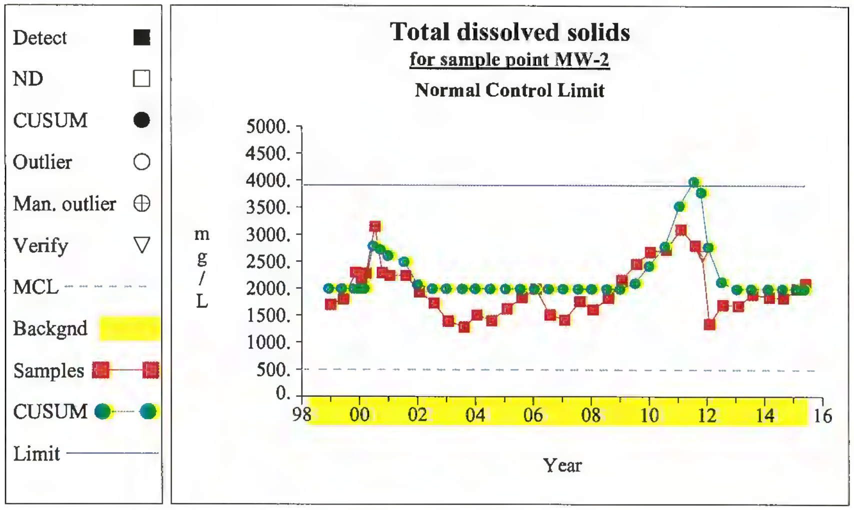
# Intra-Well Control Charts



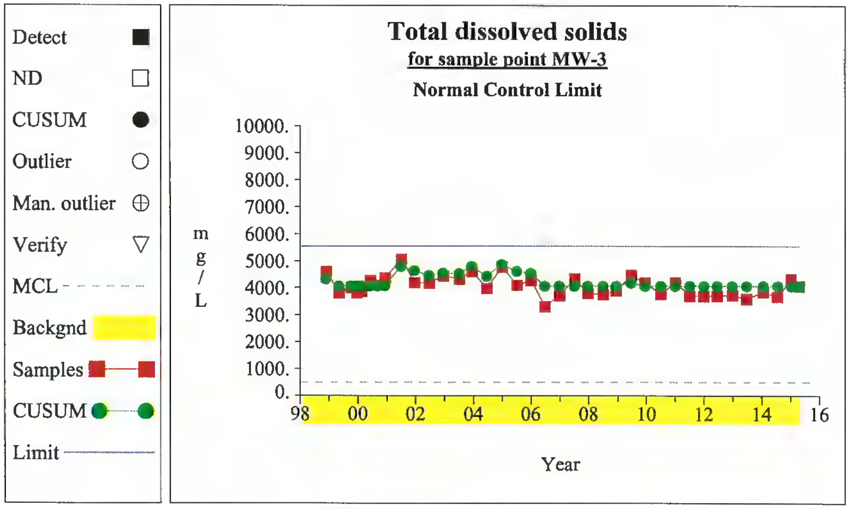
Graph 53



Graph 54

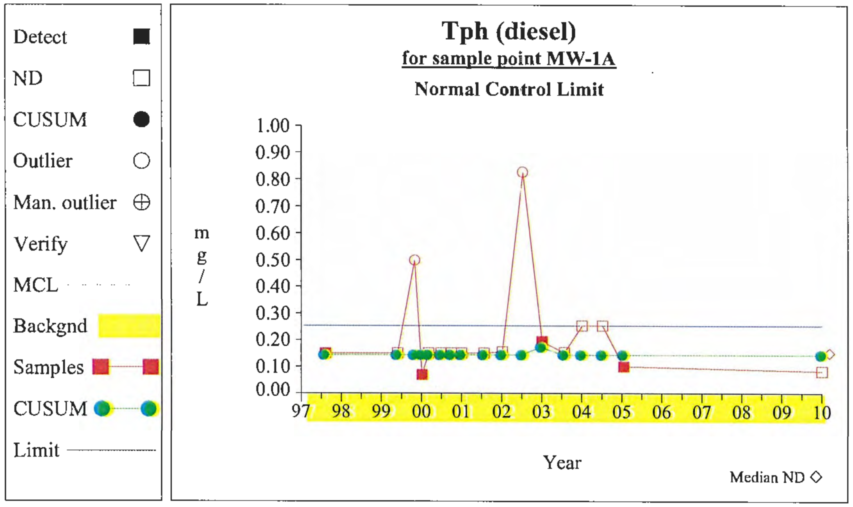


Graph 55

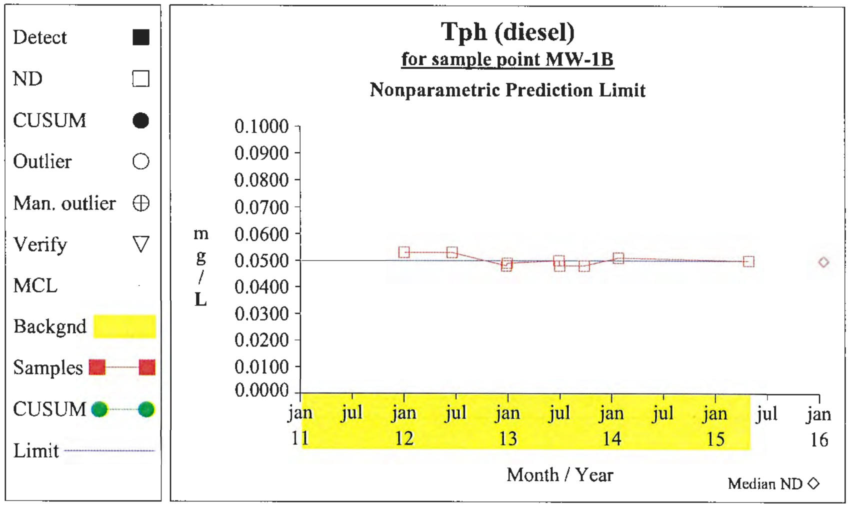


Graph 56

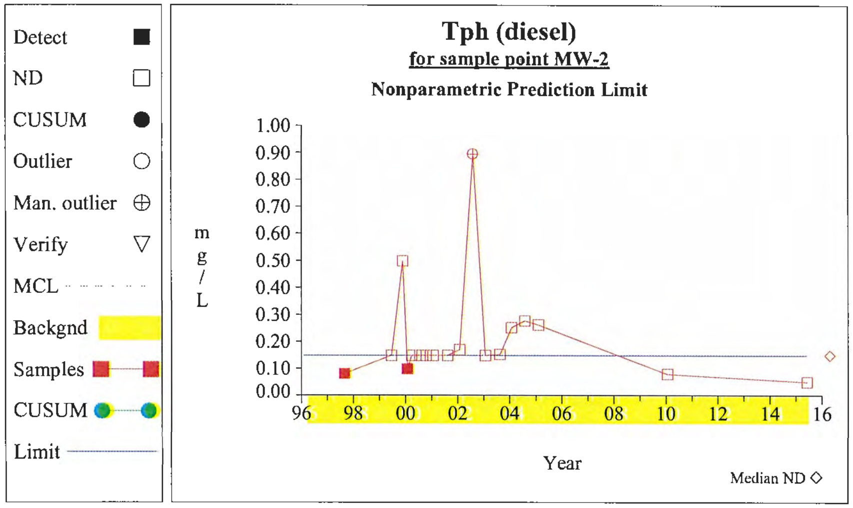
# Intra-Well Control Charts



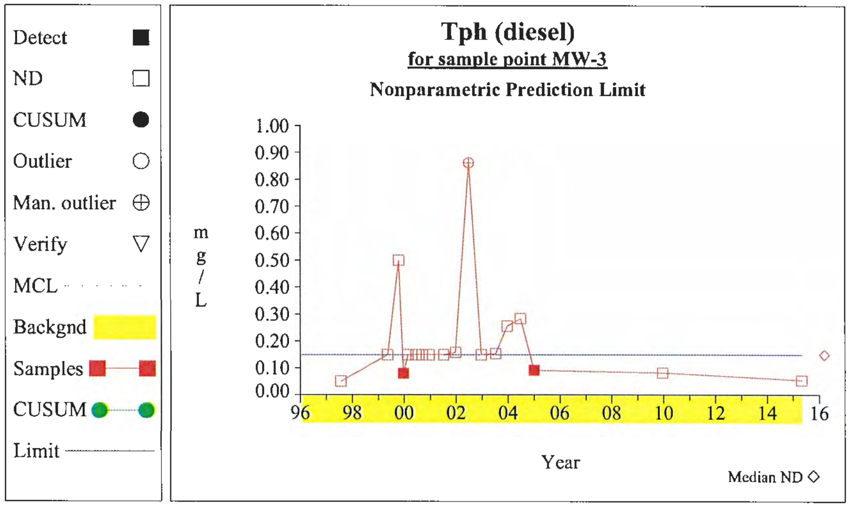
**Graph 57**



**Graph 58**

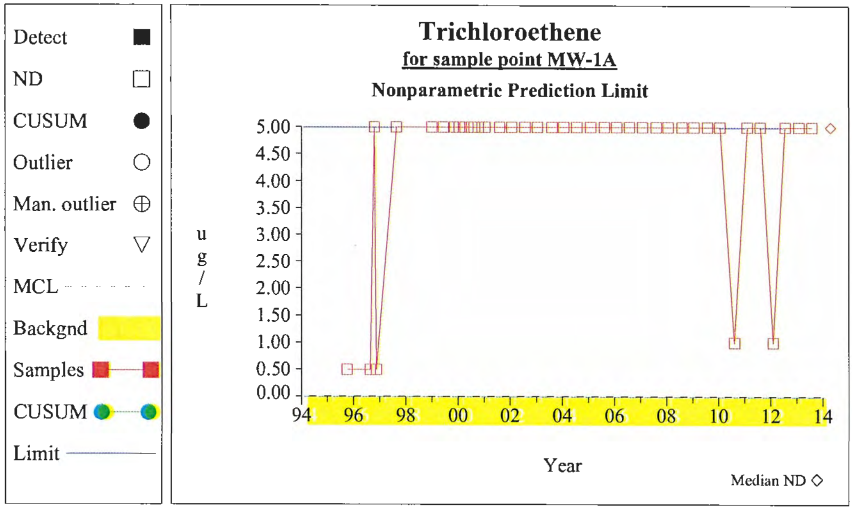


**Graph 59**

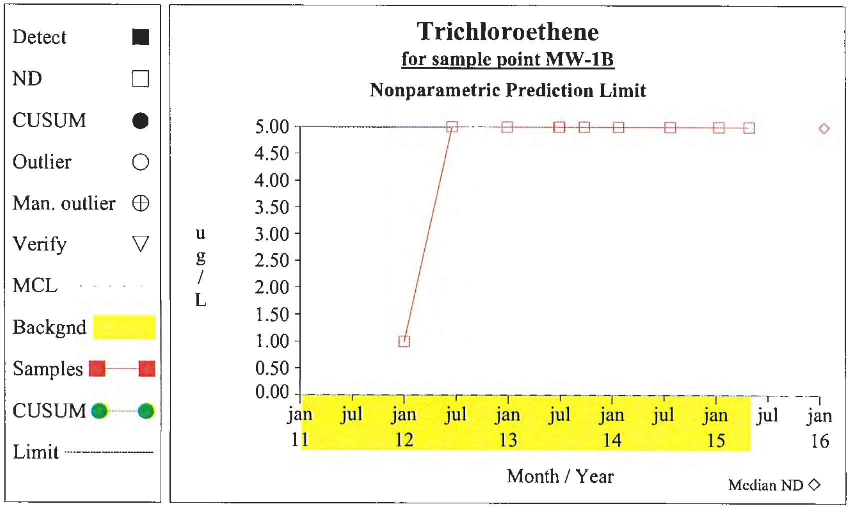


**Graph 60**

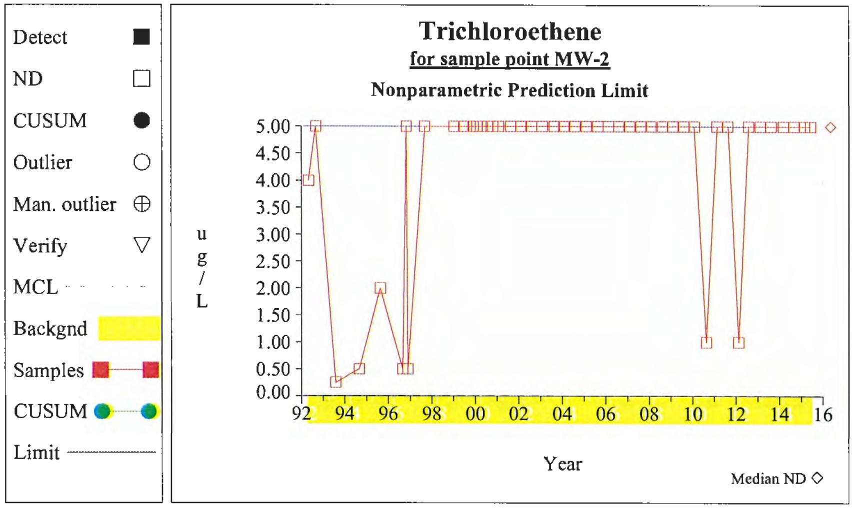
# Intra-Well Control Charts



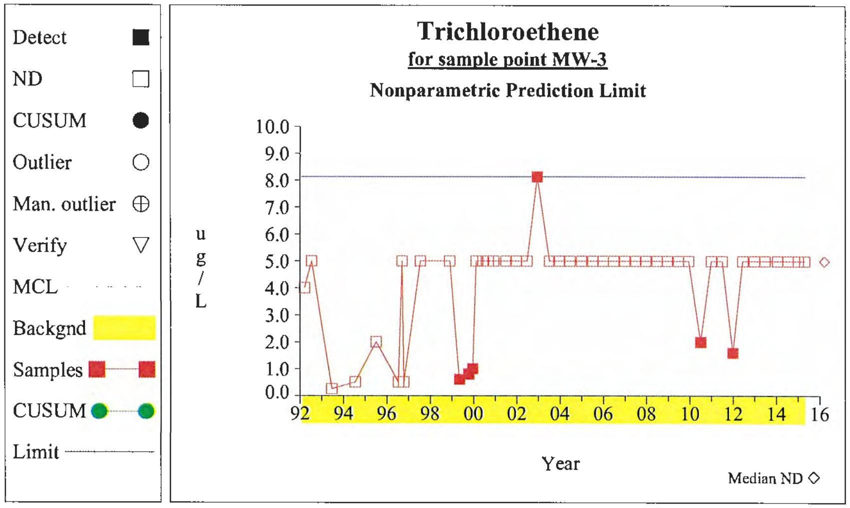
Graph 61



Graph 62

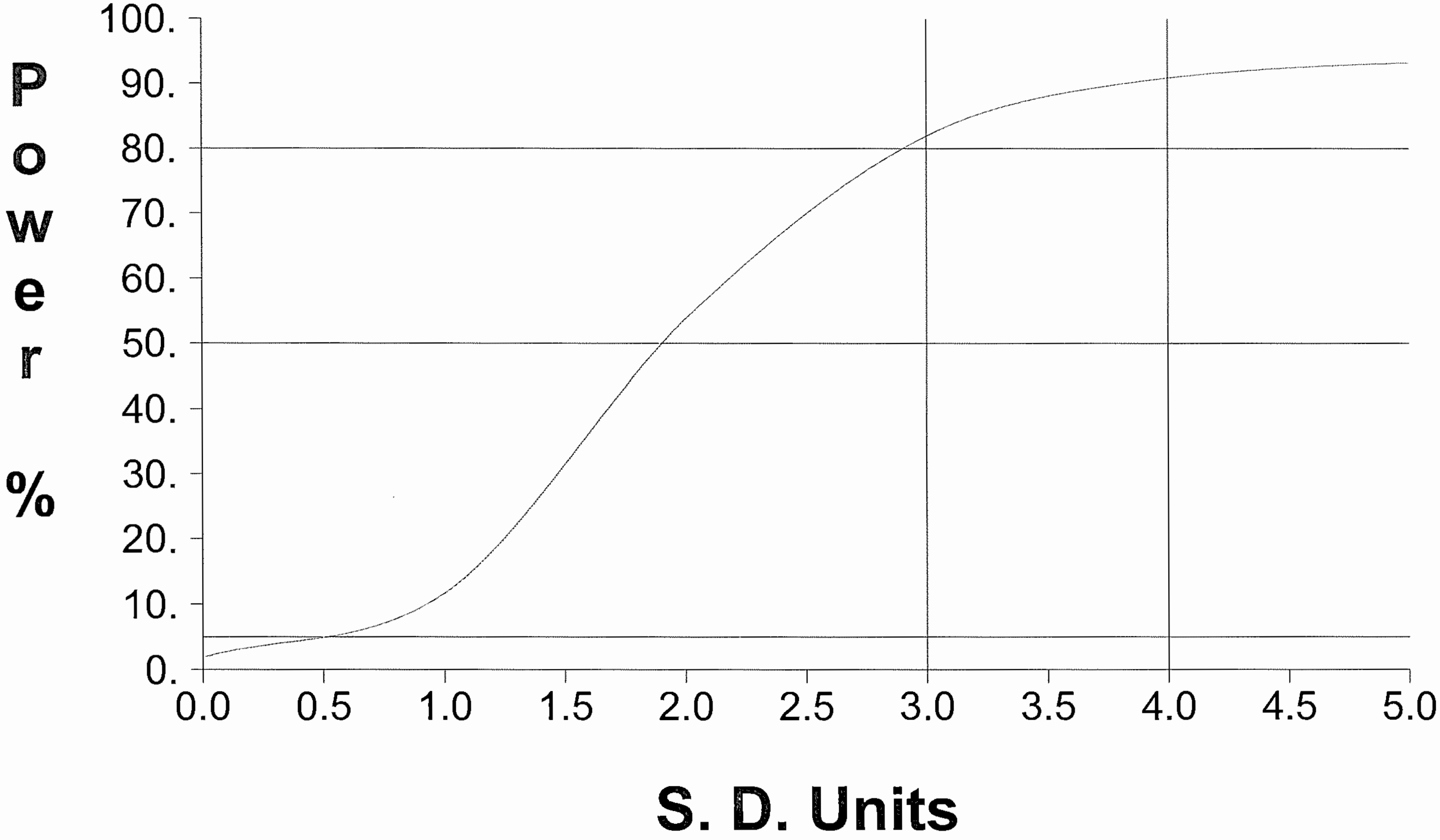


Graph 63



Graph 64

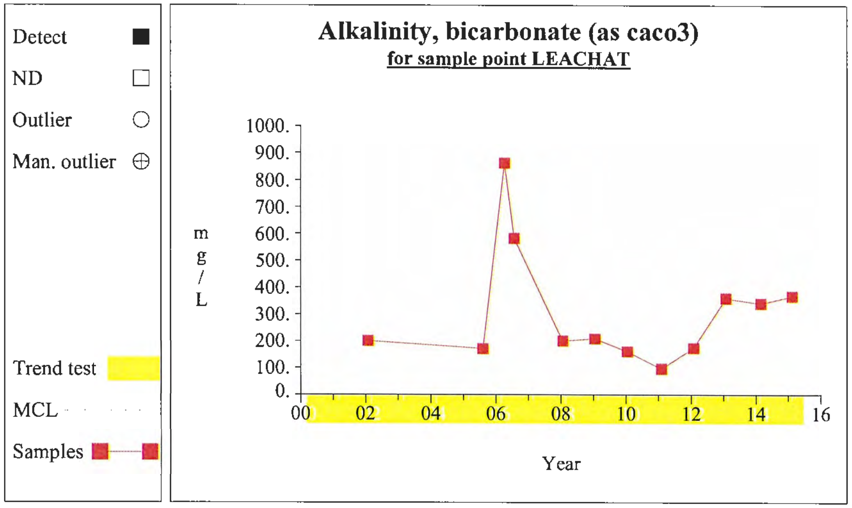
# False Positive and False Negative Rates for Current Intra-Well Control Charts Monitoring Program



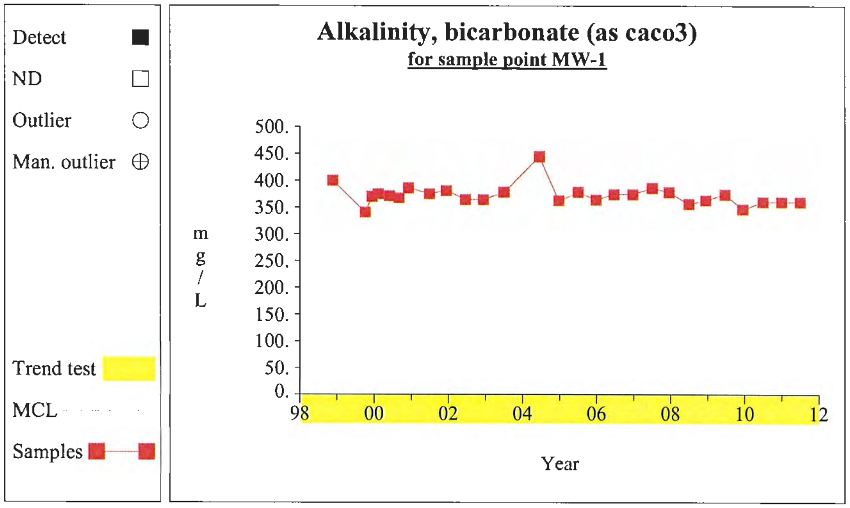
# Attachment 3

## Time Series Plots

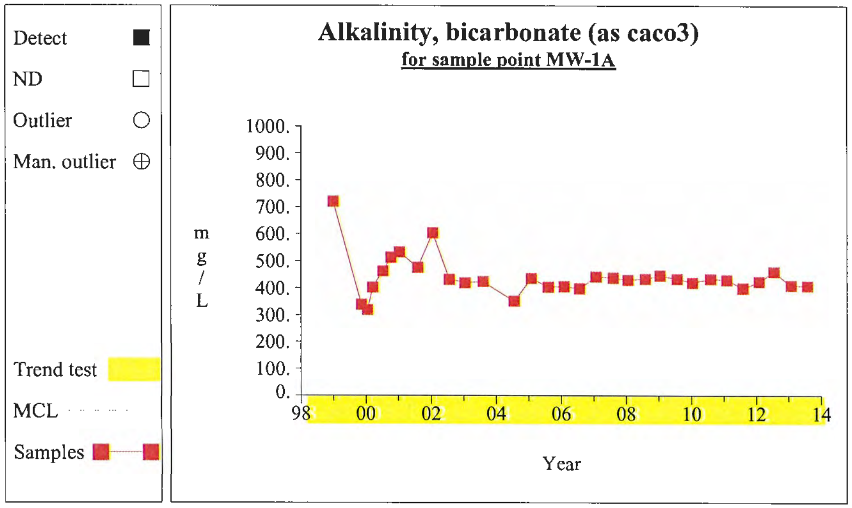
# Time Series



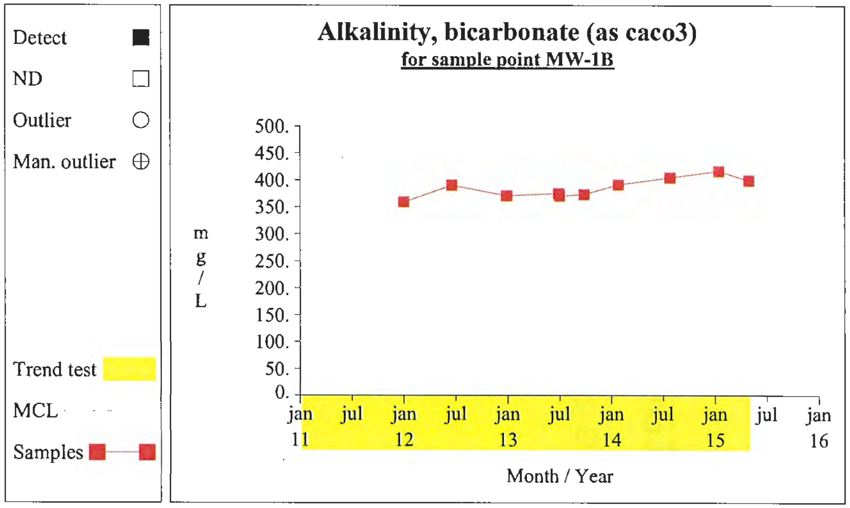
Graph 1



Graph 2

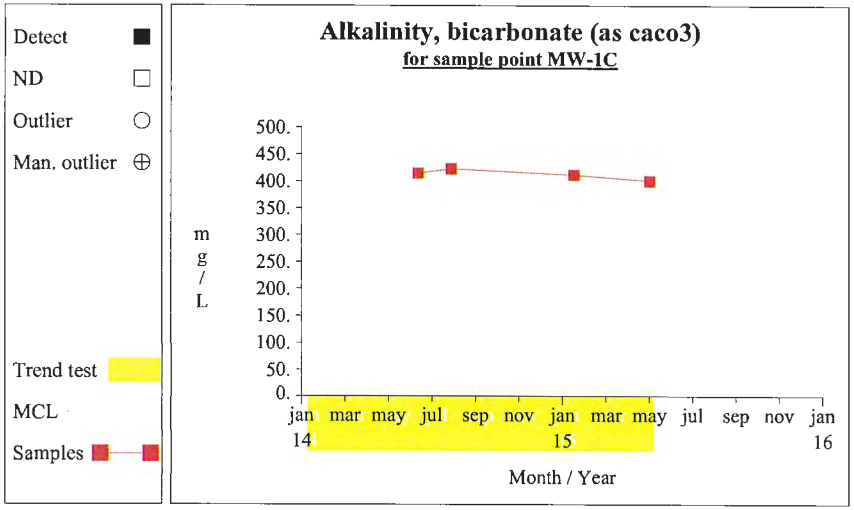


Graph 3

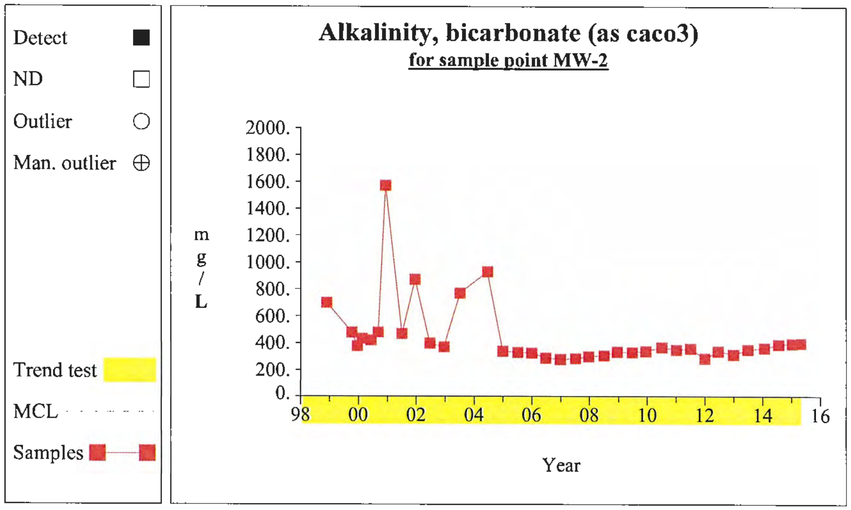


Graph 4

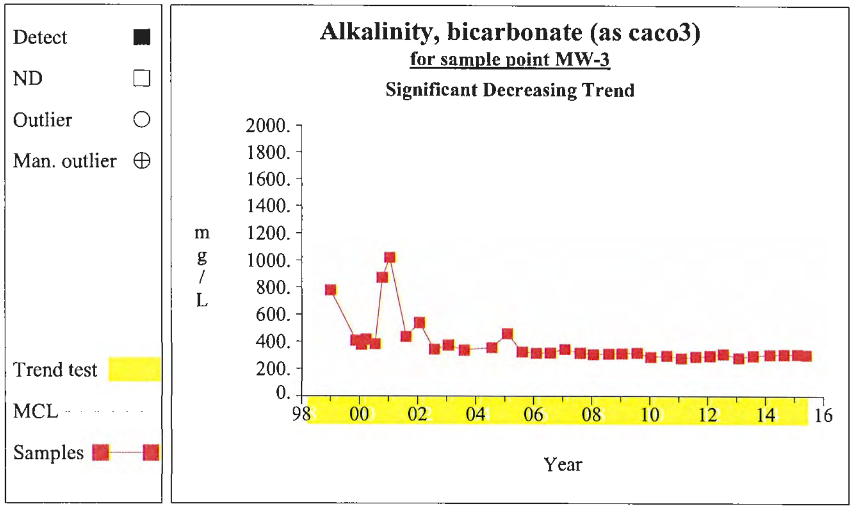
# Time Series



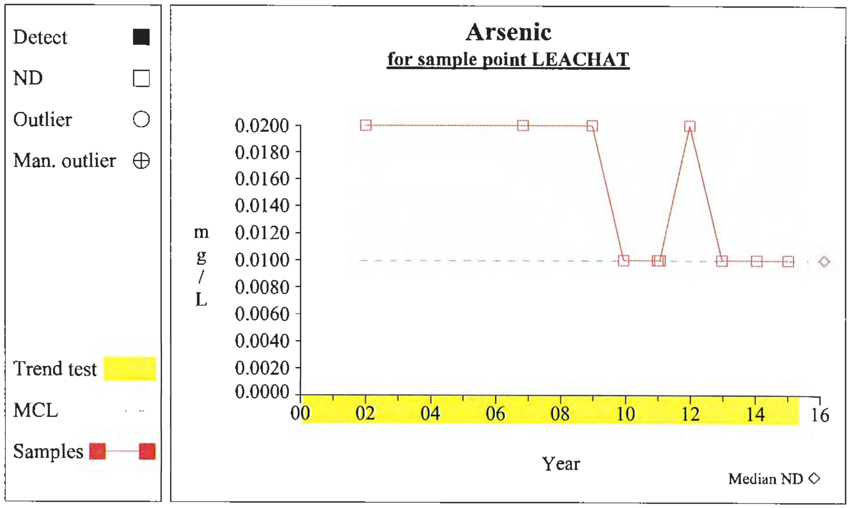
**Graph 5**



**Graph 6**

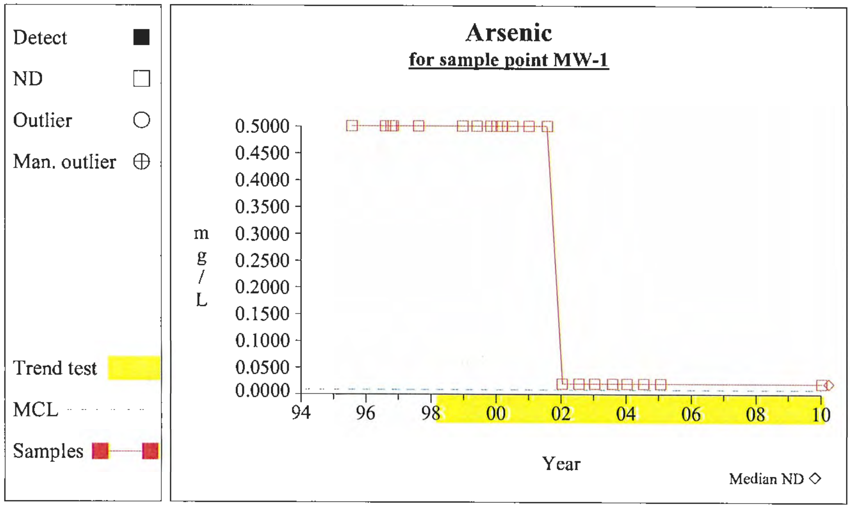


**Graph 7**

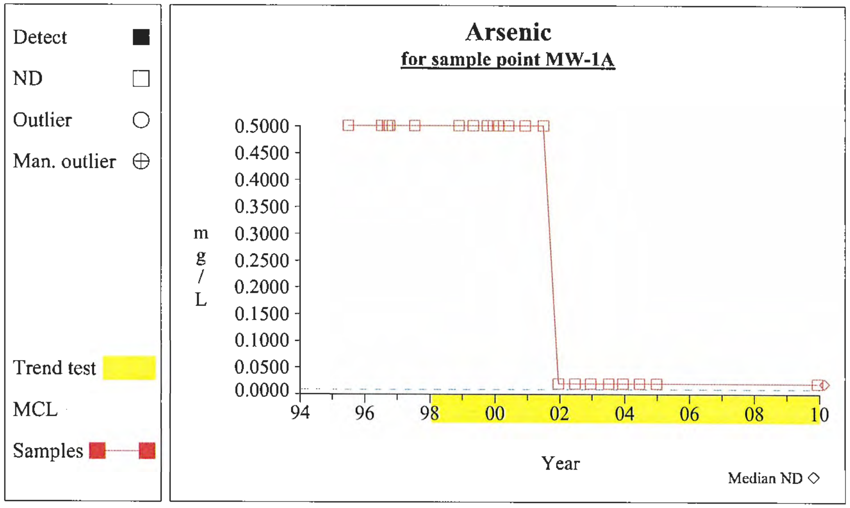


**Graph 8**

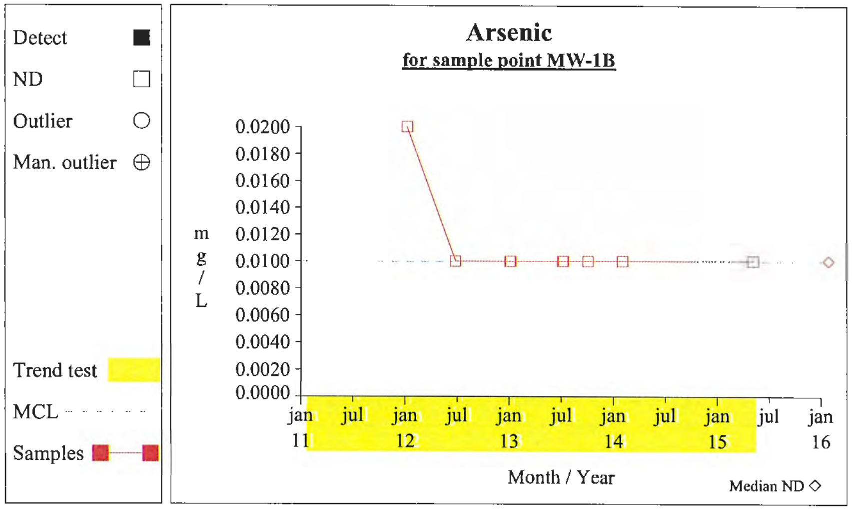
# Time Series



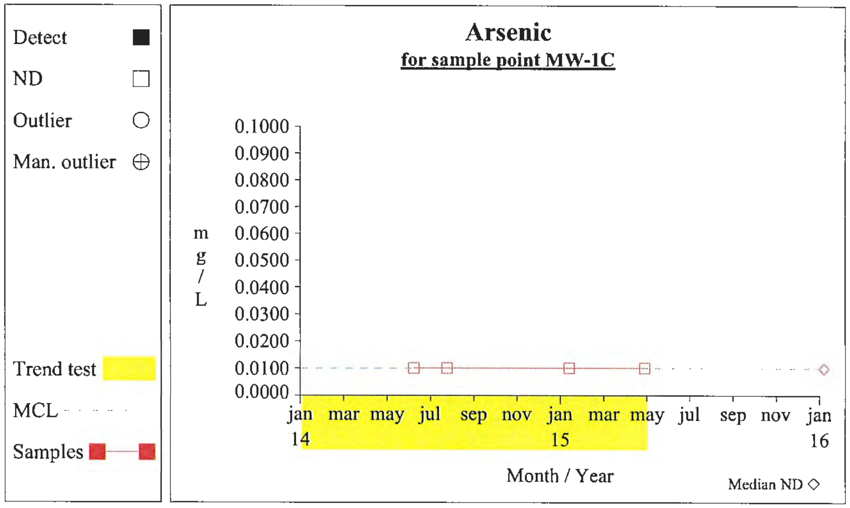
Graph 9



Graph 10

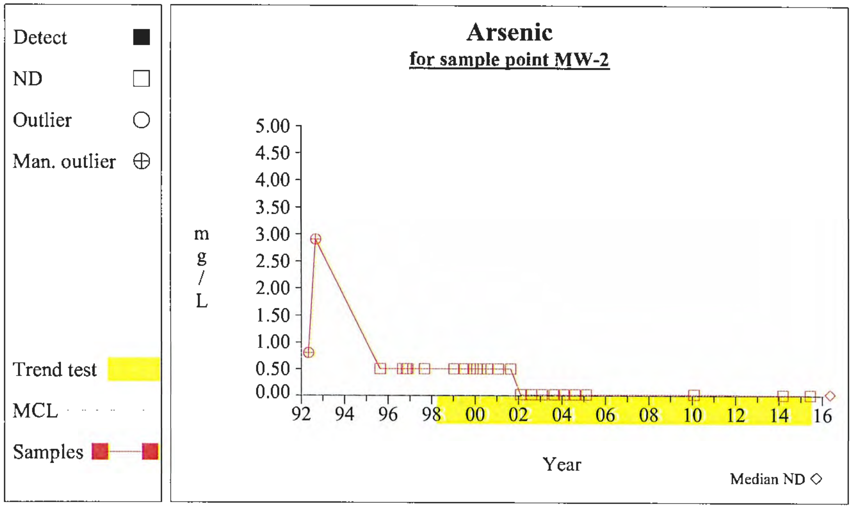


Graph 11

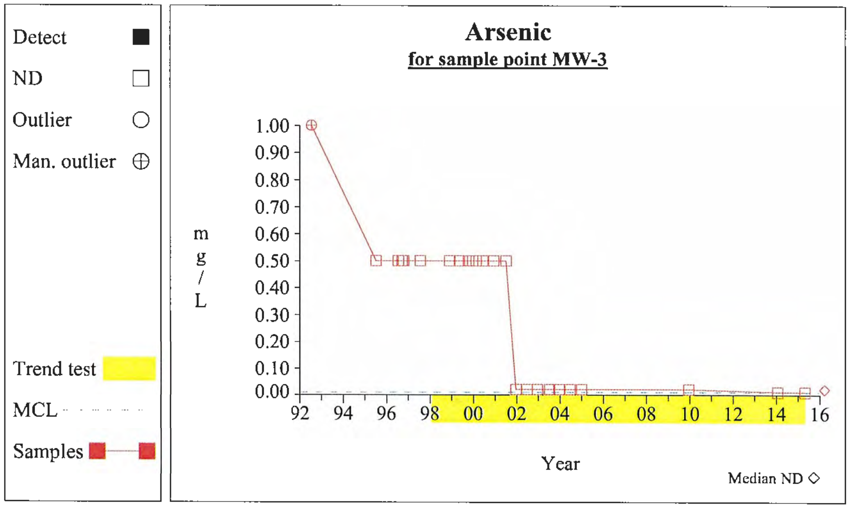


Graph 12

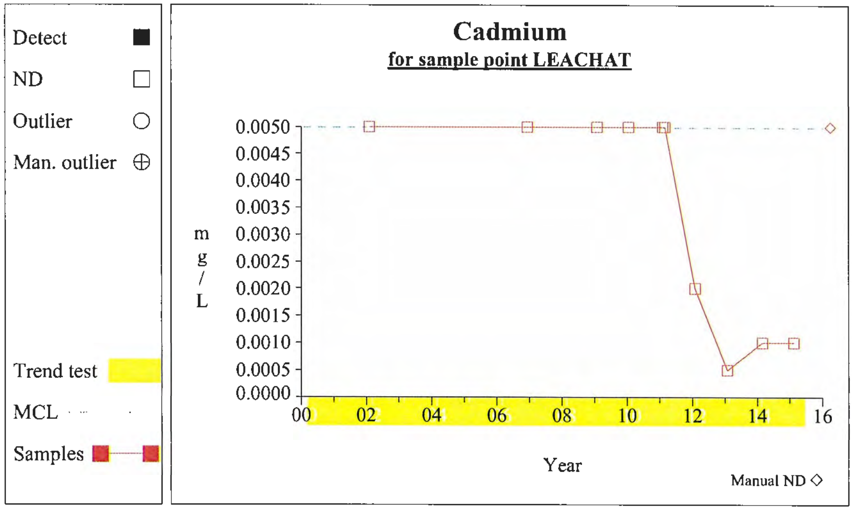
# Time Series



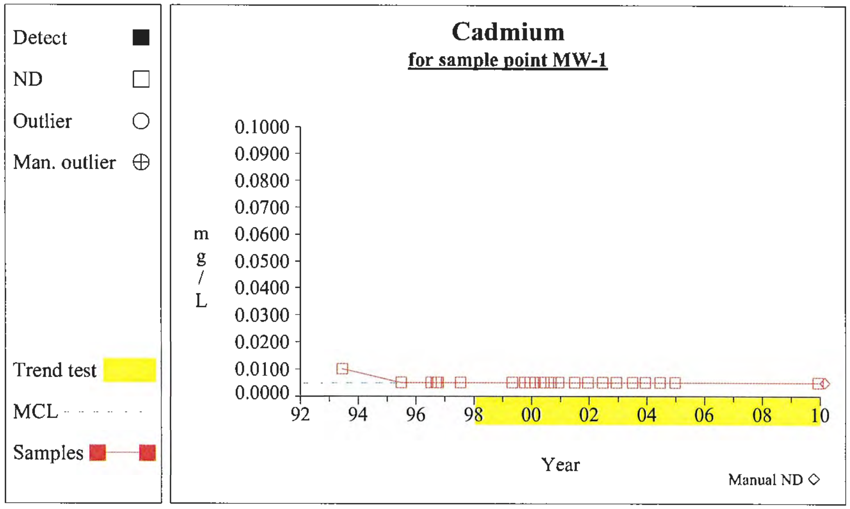
Graph 13



Graph 14

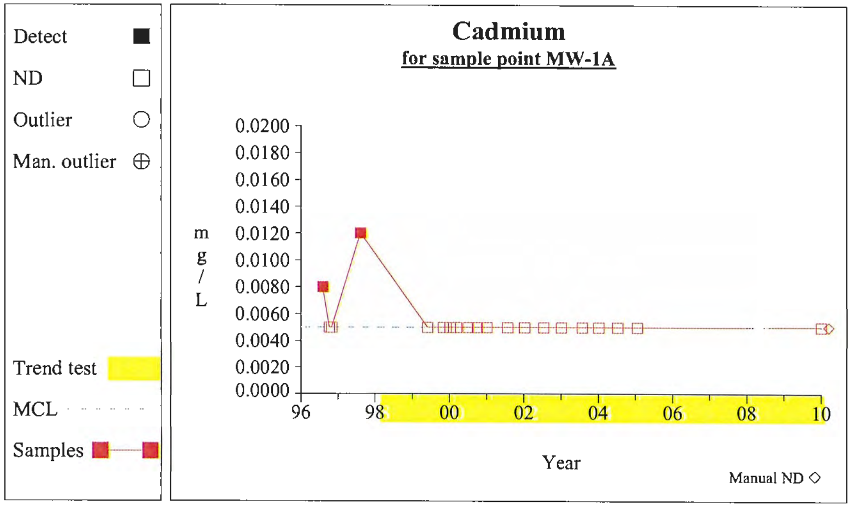


Graph 15

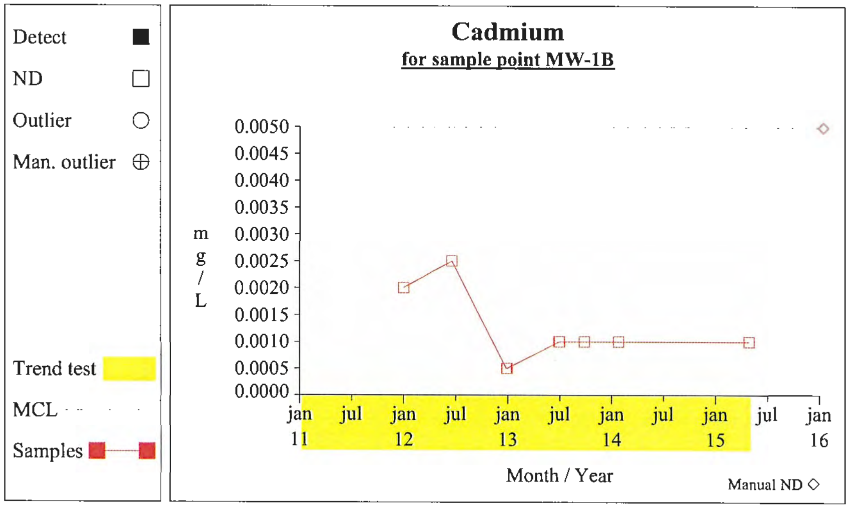


Graph 16

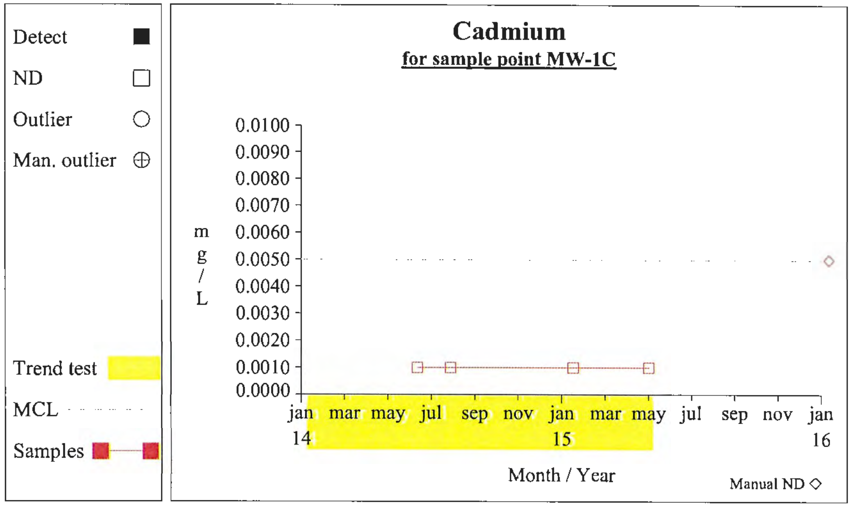
# Time Series



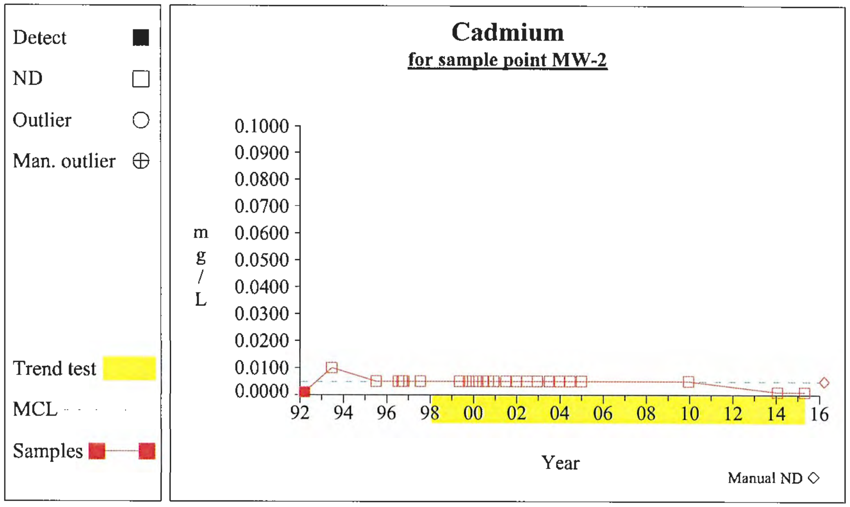
Graph 17



Graph 18

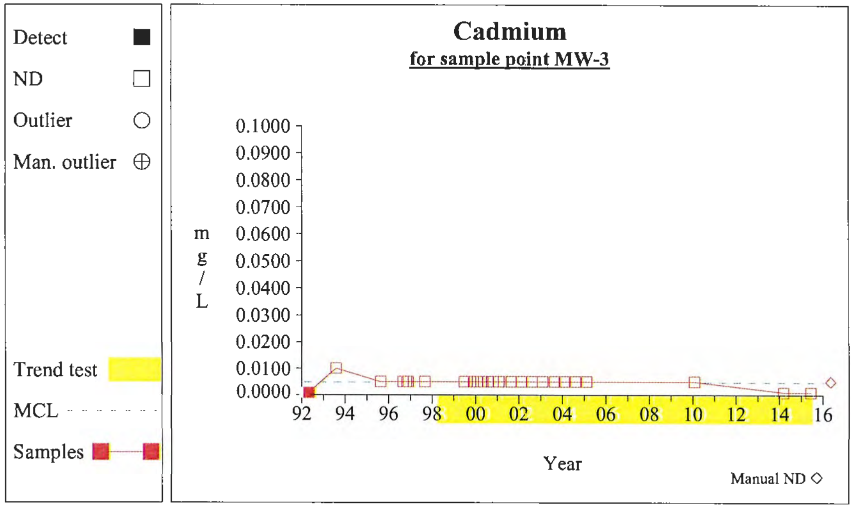


Graph 19

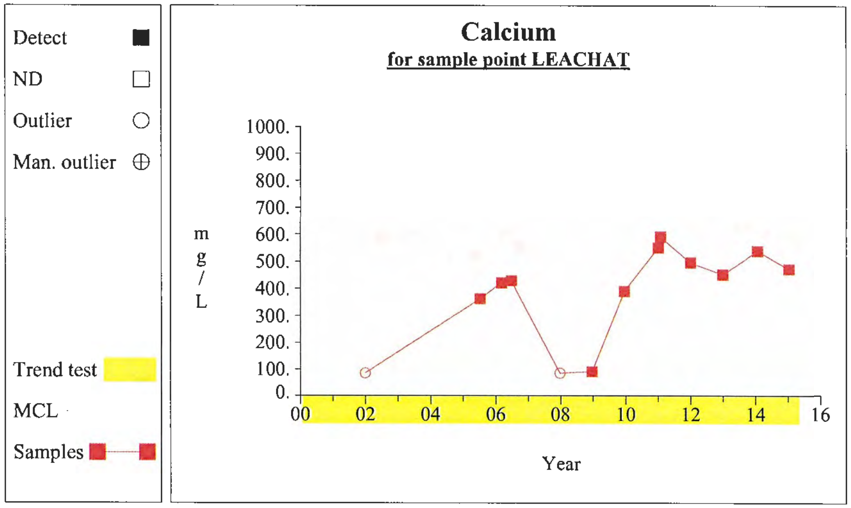


Graph 20

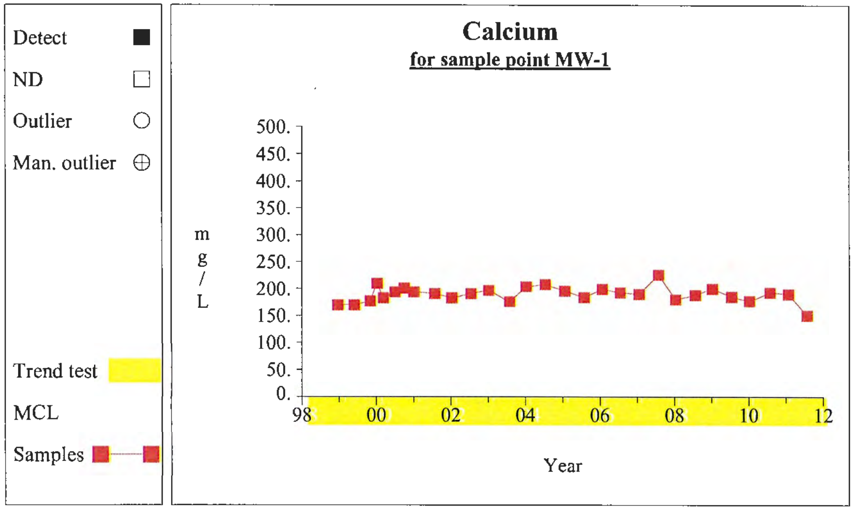
# Time Series



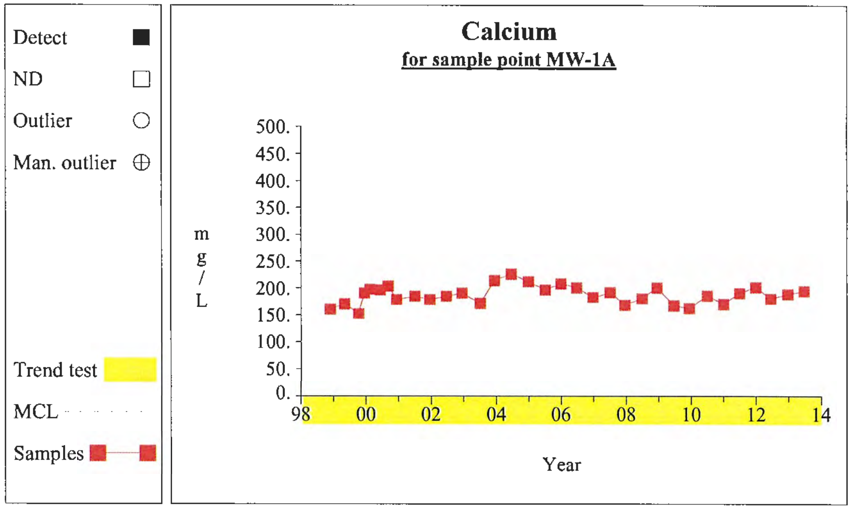
Graph 21



Graph 22

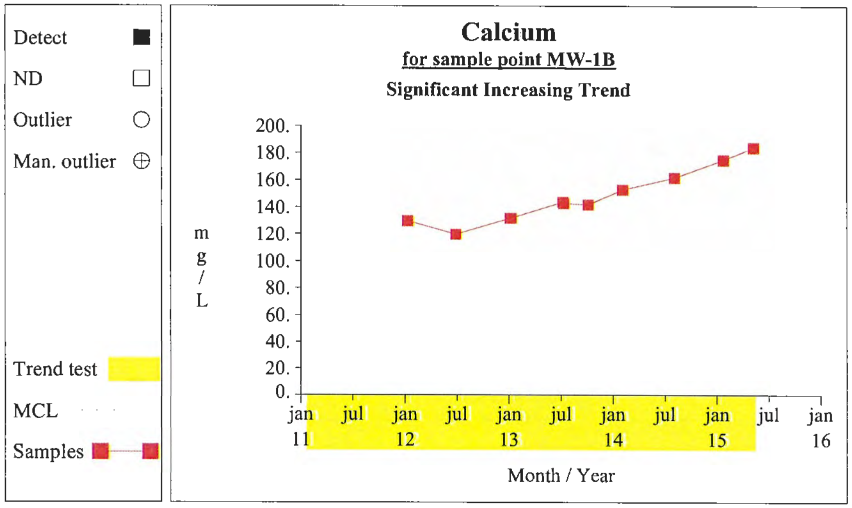


Graph 23

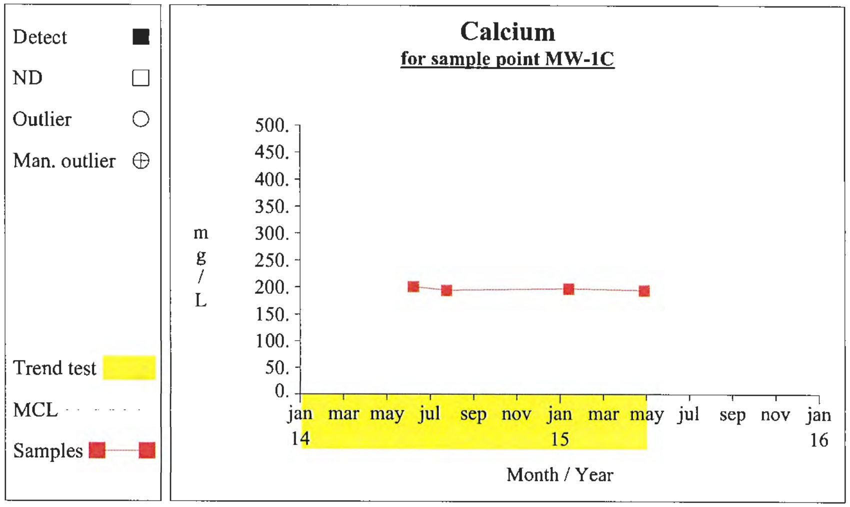


Graph 24

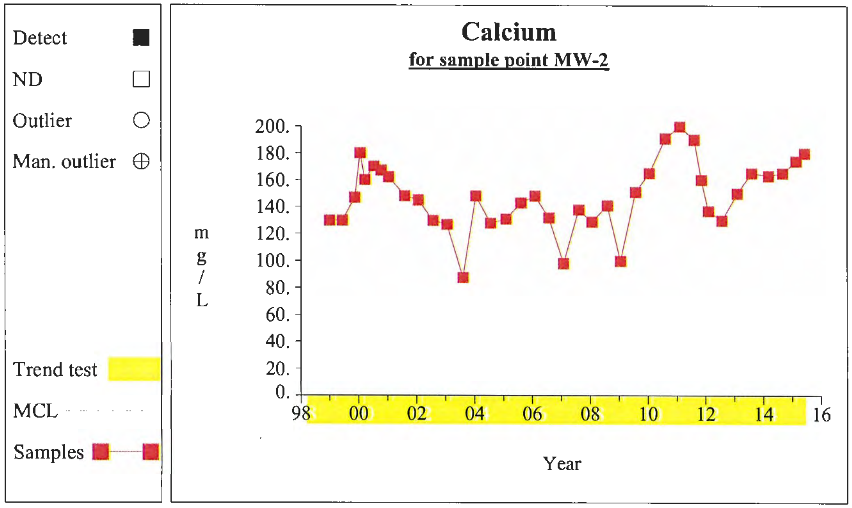
# Time Series



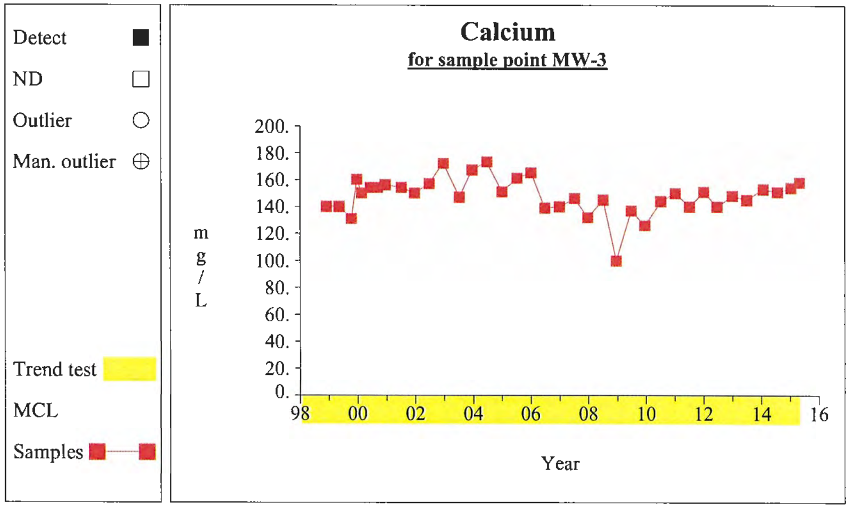
Graph 25



Graph 26

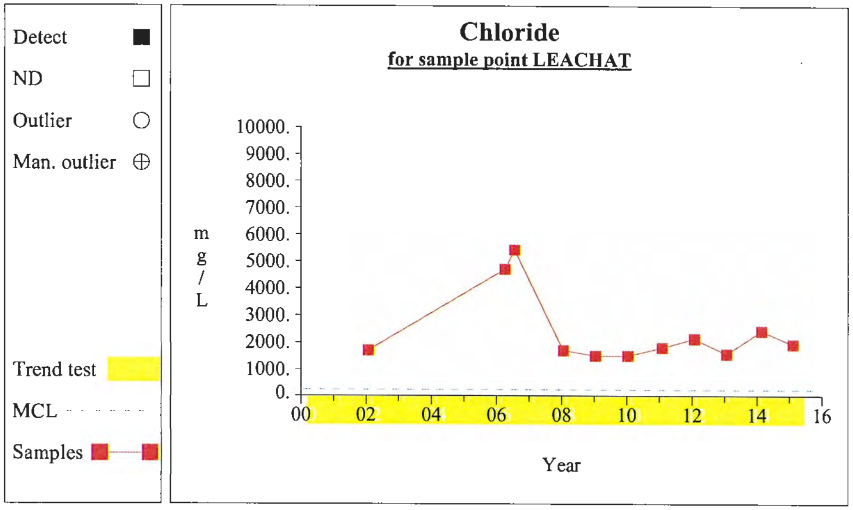


Graph 27



Graph 28

# Time Series



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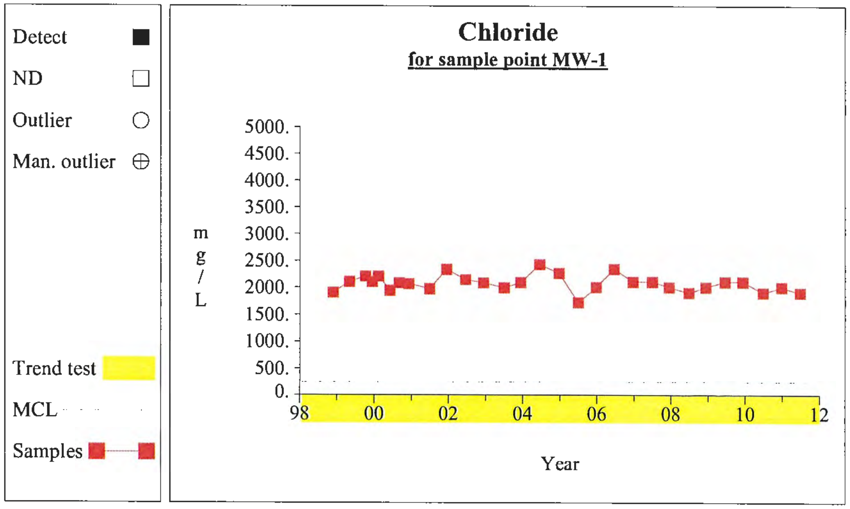
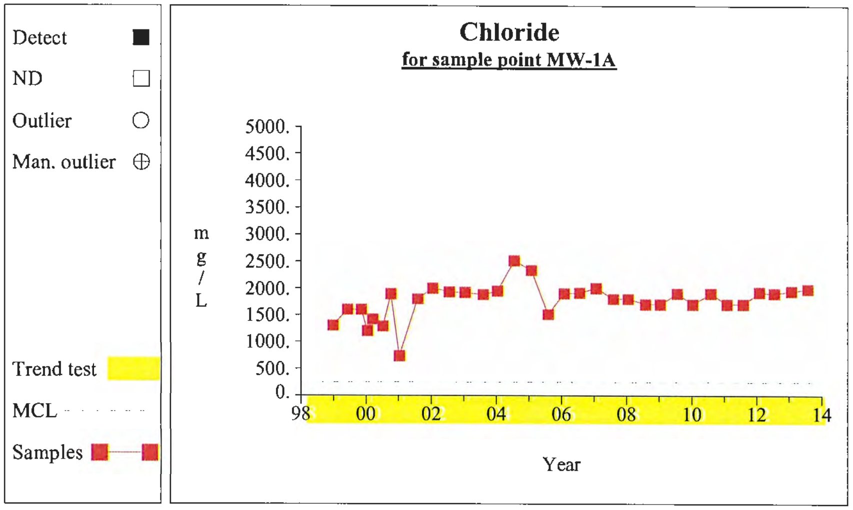
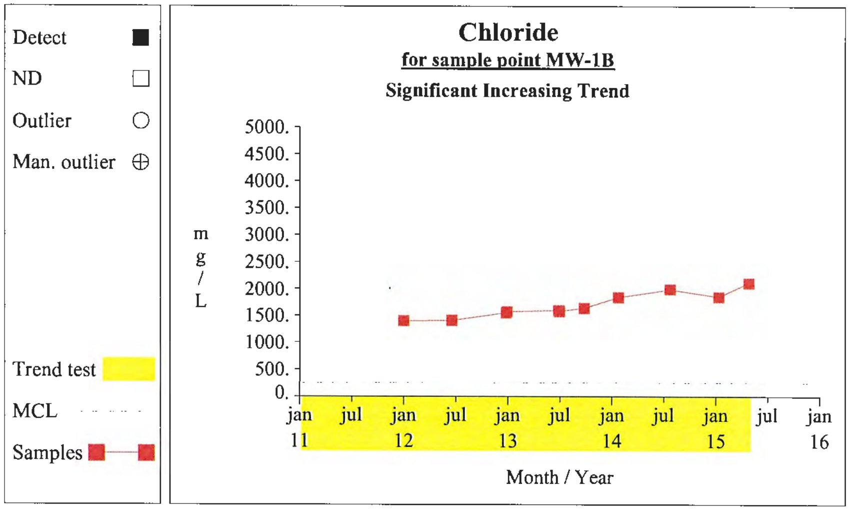


Graph 30

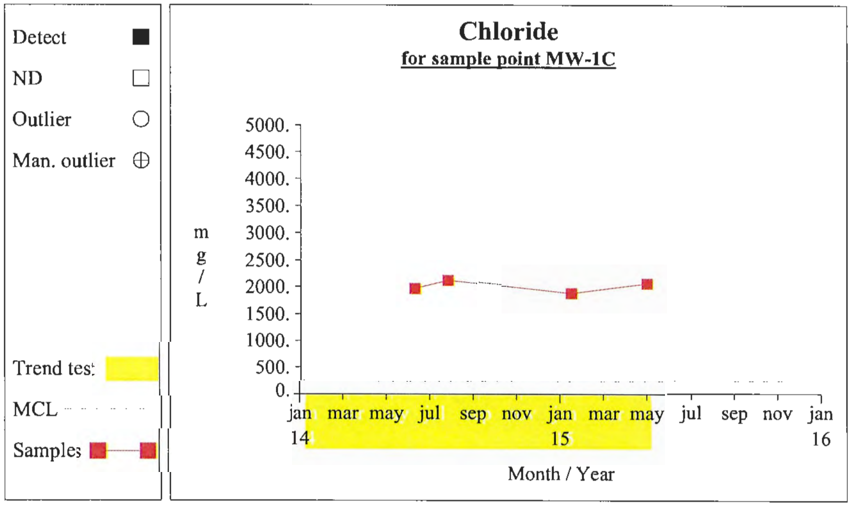


Graph 31

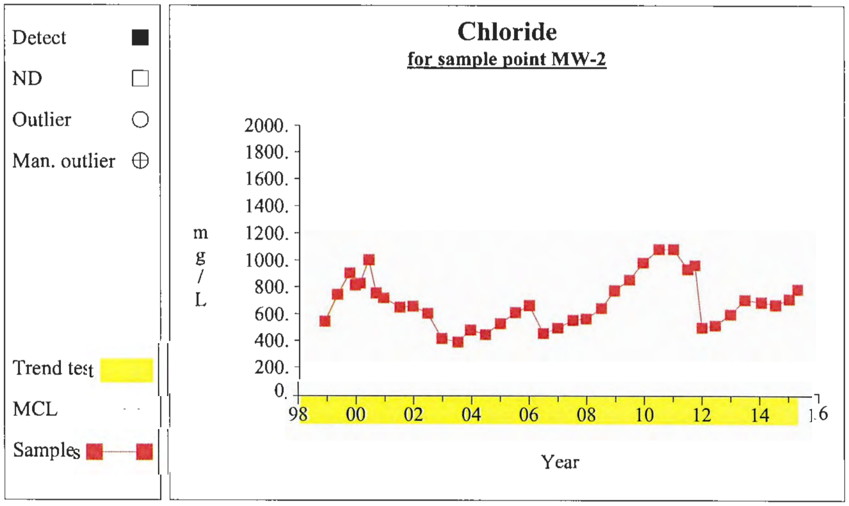


Graph 32

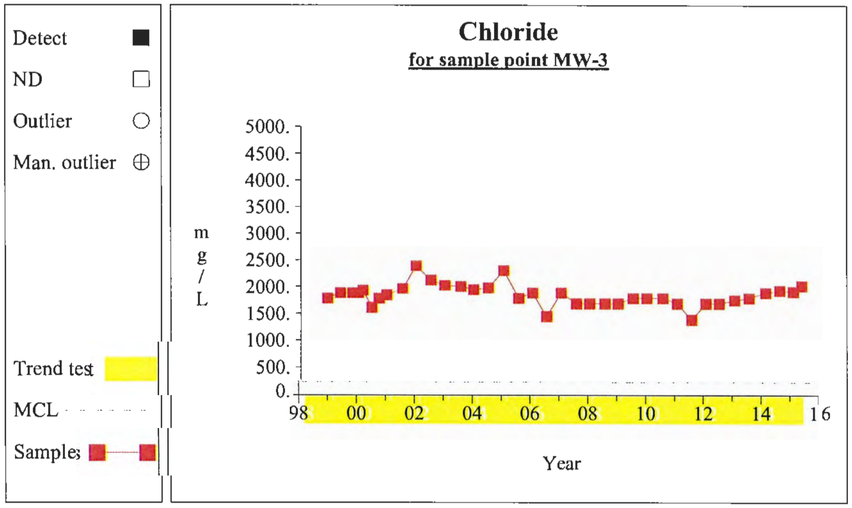
# Time Series



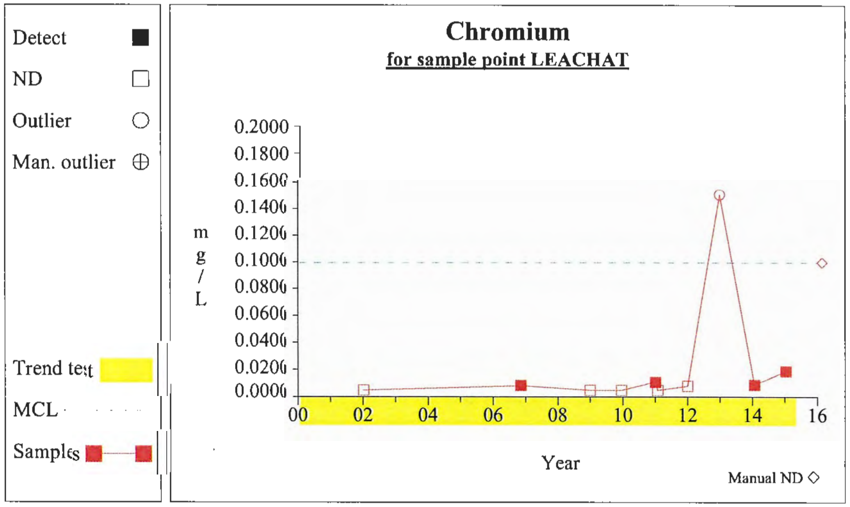
Graph 33



Graph 34

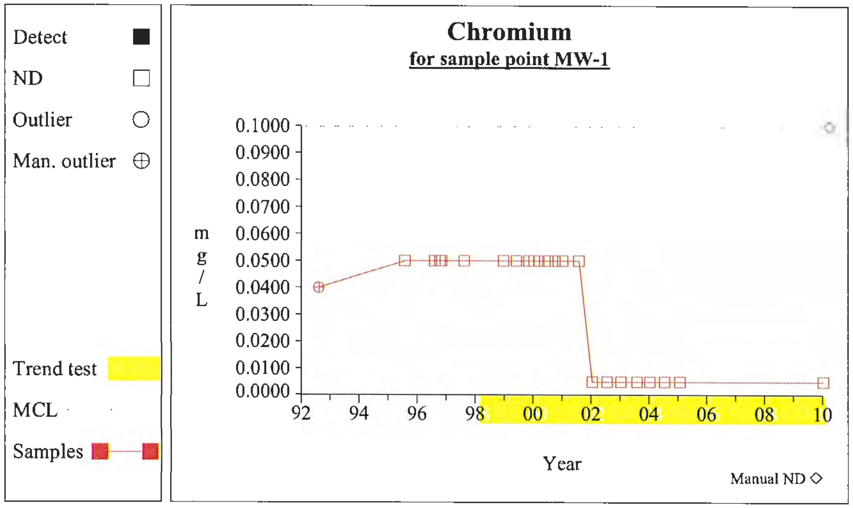


Graph 35

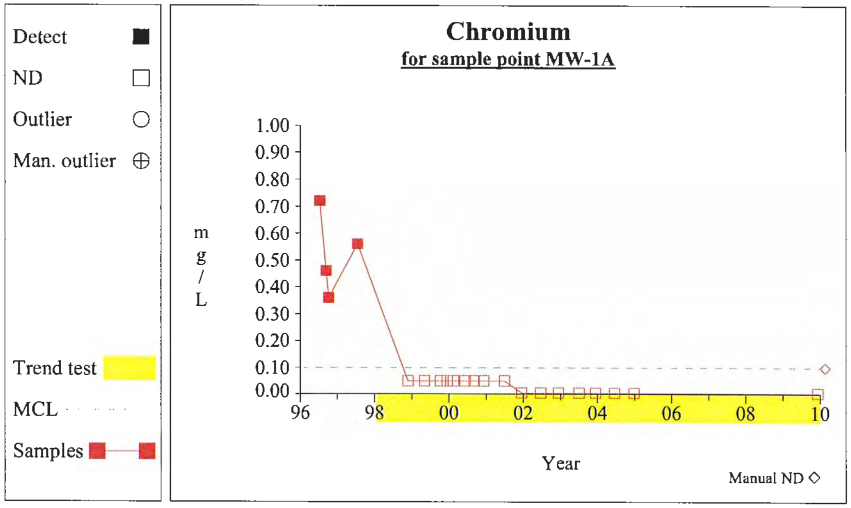


Graph 36

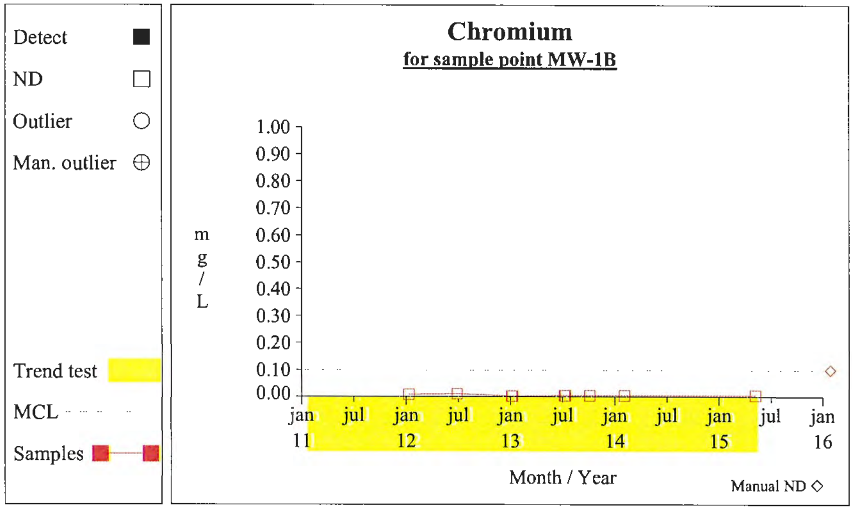
# Time Series



Graph 37



Graph 38



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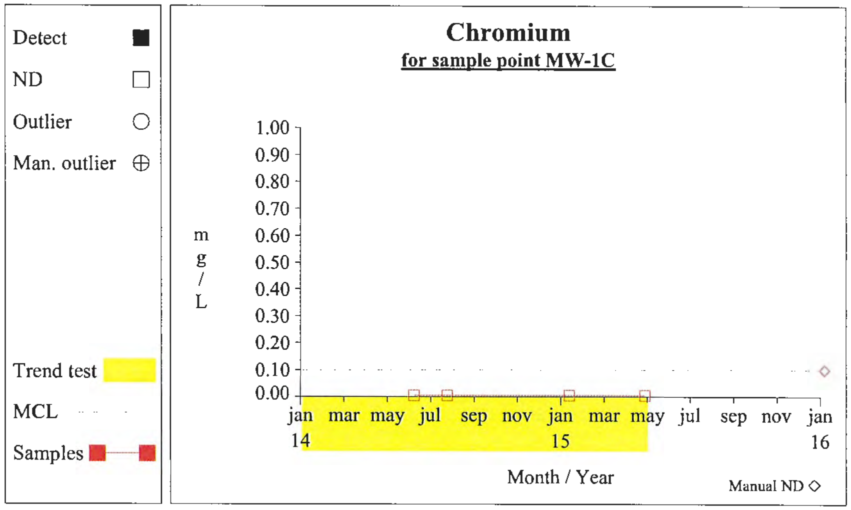
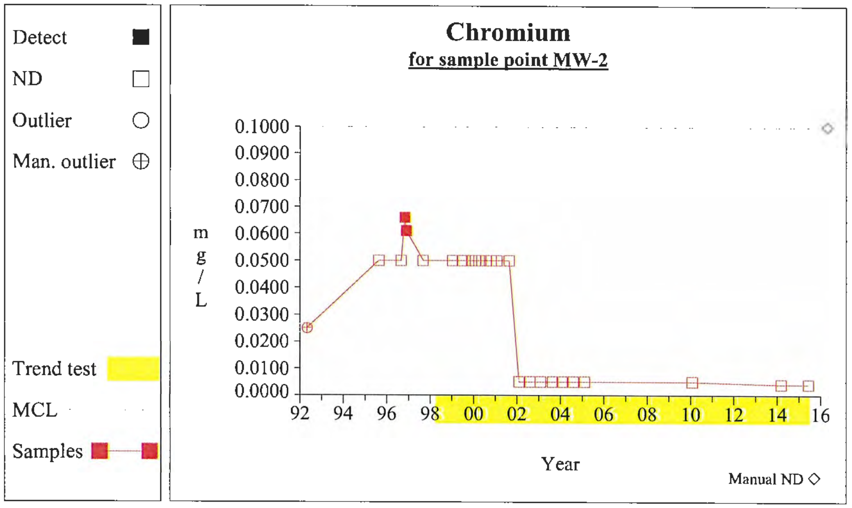
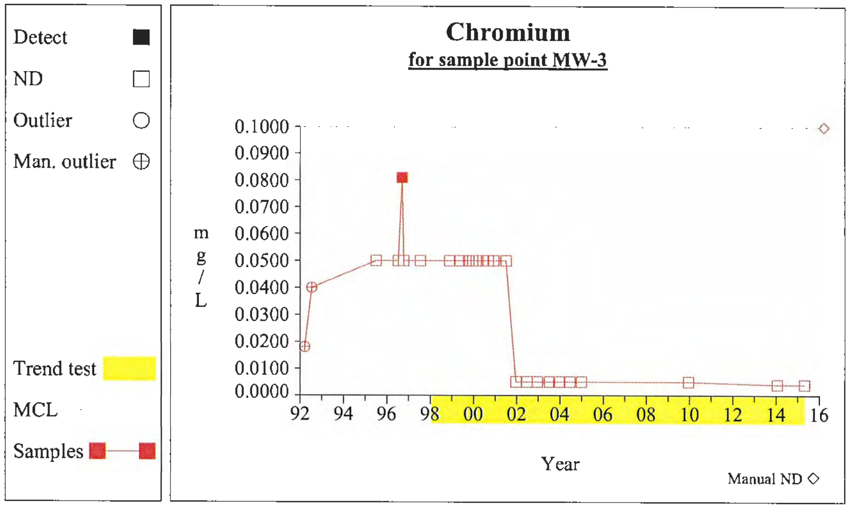


Graph 40

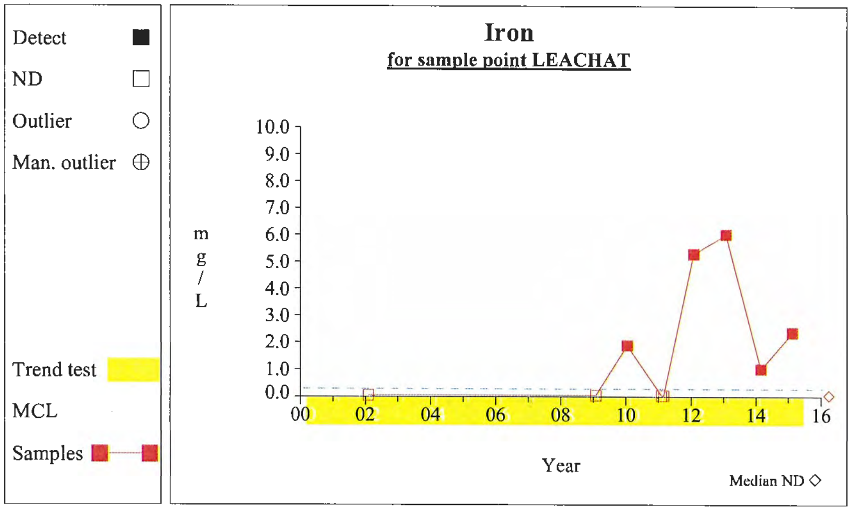
# Time Series


Chromium
for sample point MW-2

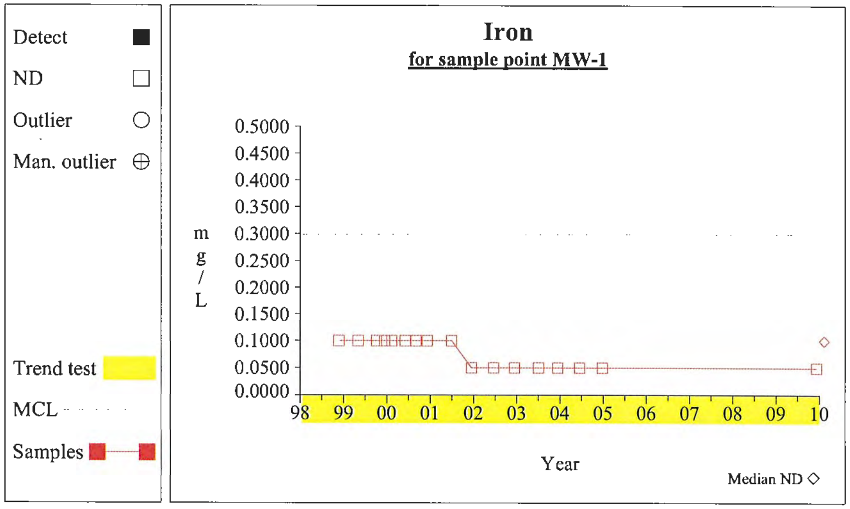
Graph 41


Chromium
for sample point MW-3

Graph 42

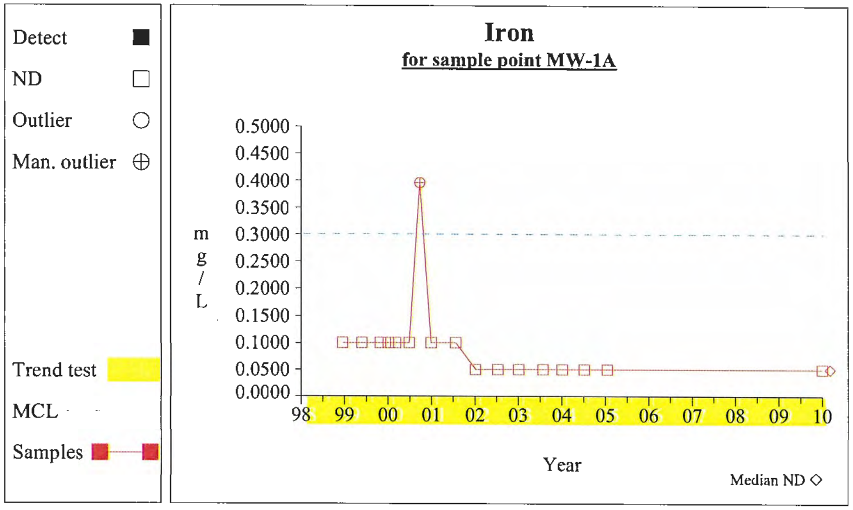

Iron
for sample point LEACHAT

Graph 43

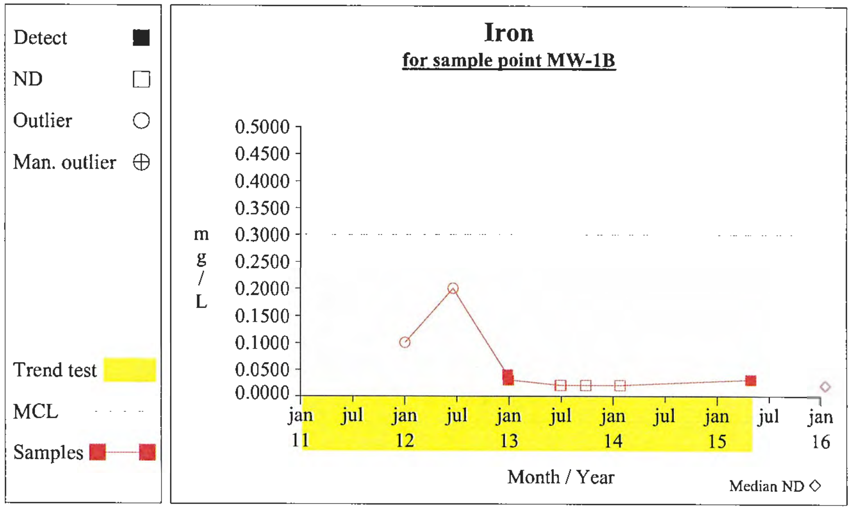

Iron
for sample point MW-1

Graph 44

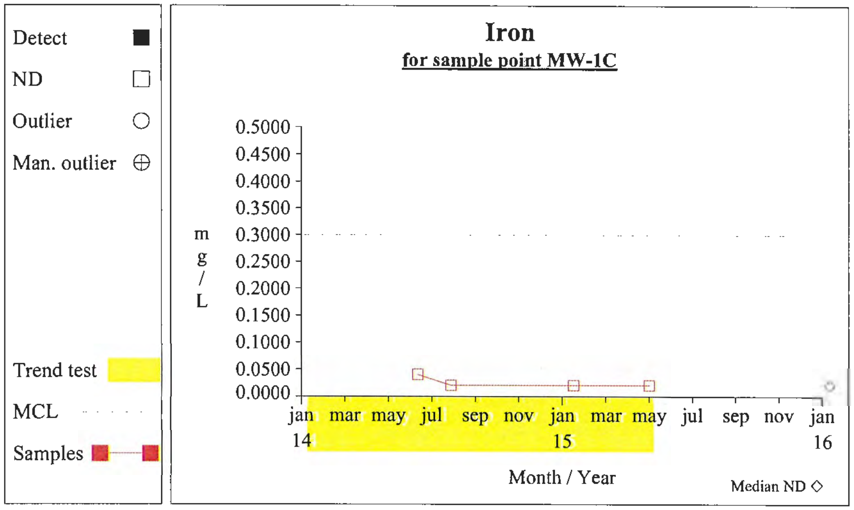
# Time Series



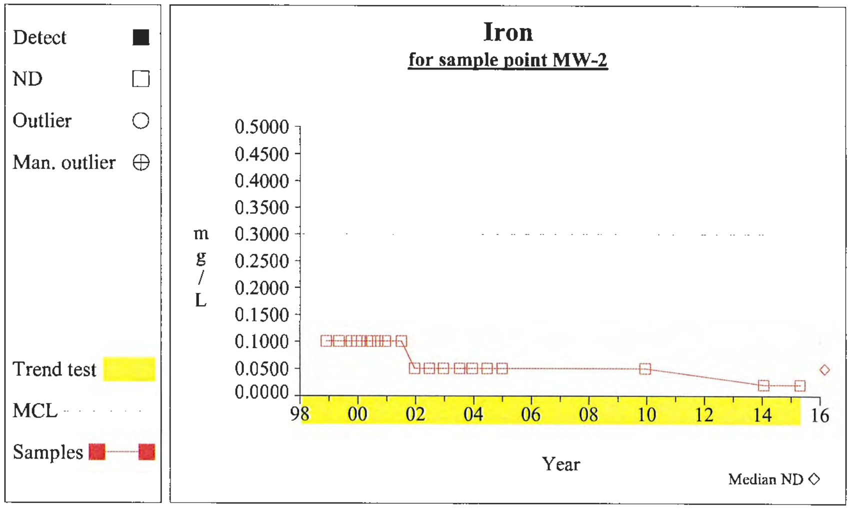
Graph 45



Graph 46

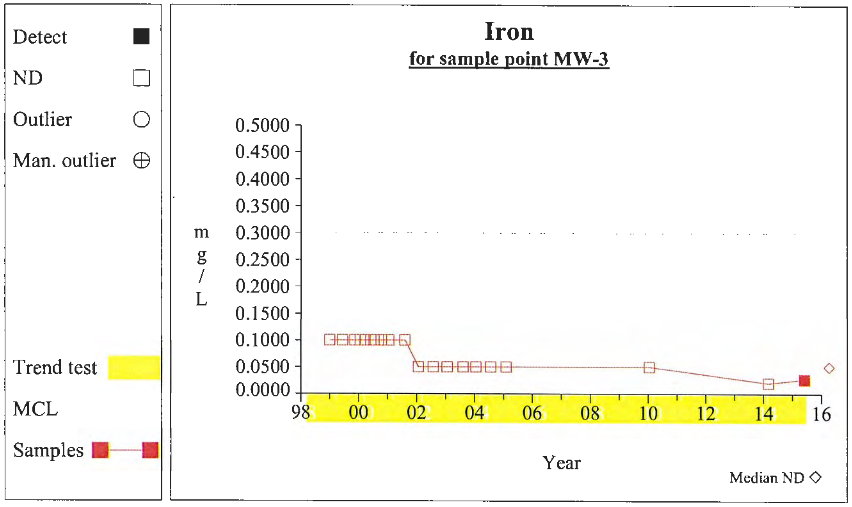


Graph 47

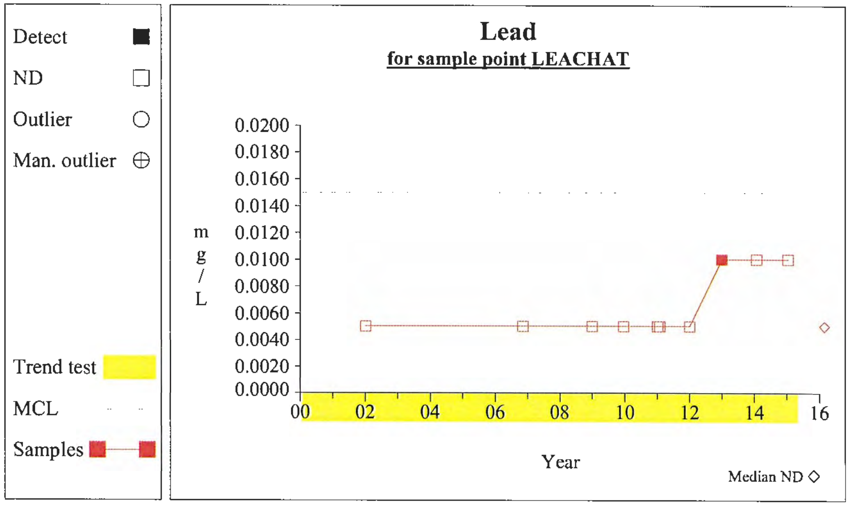


Graph 48

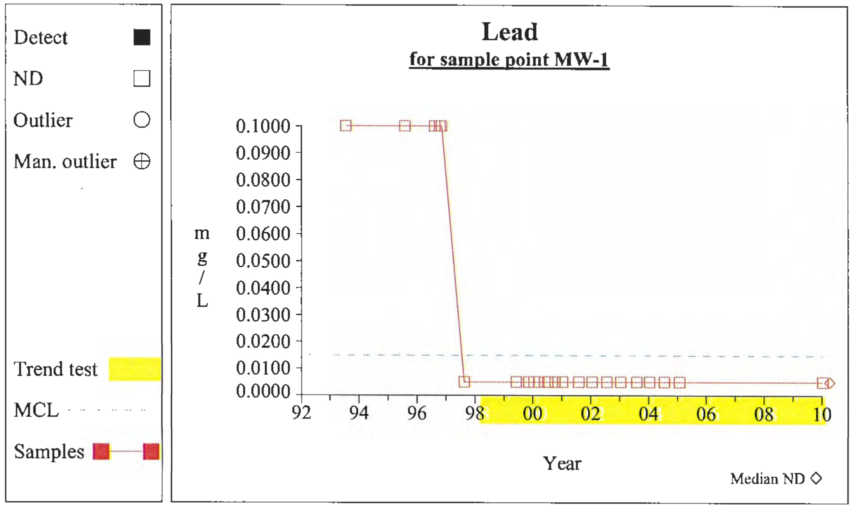
# Time Series



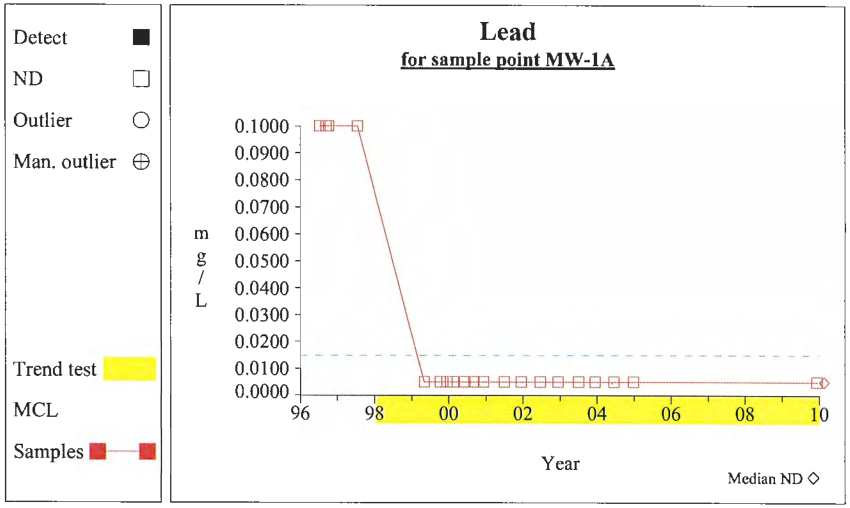
Graph 49



Graph 50

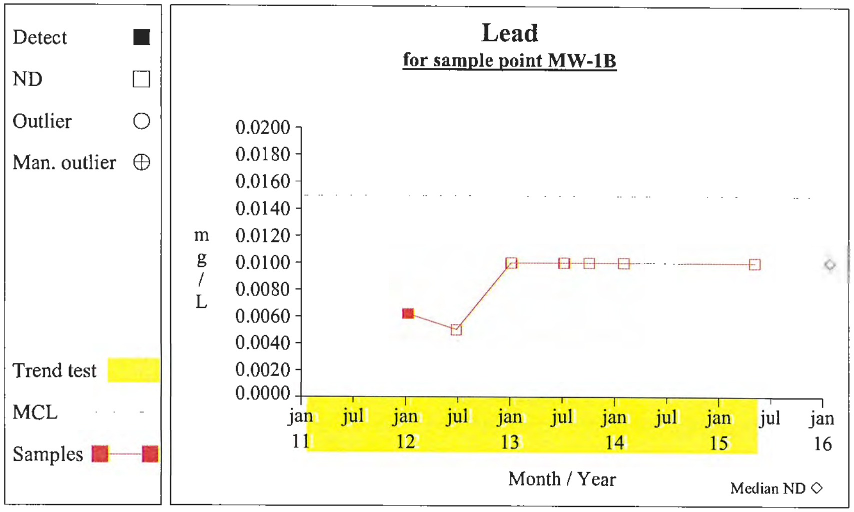


Graph 51

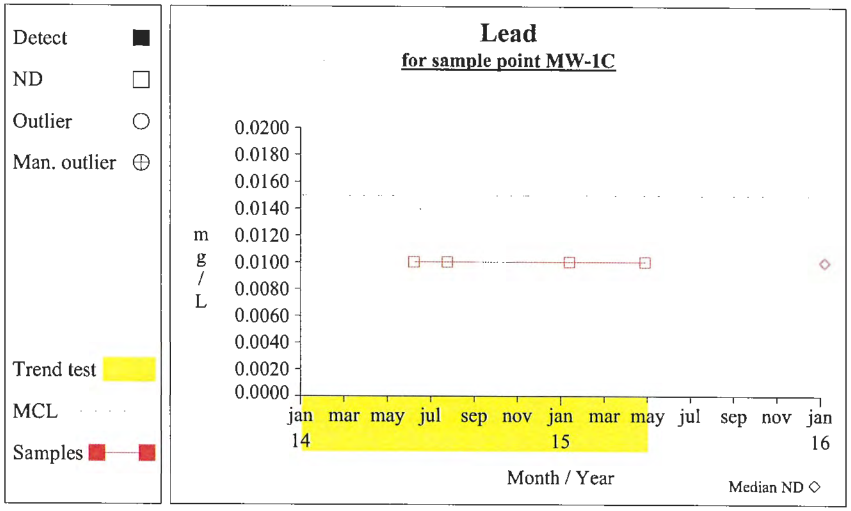


Graph 52

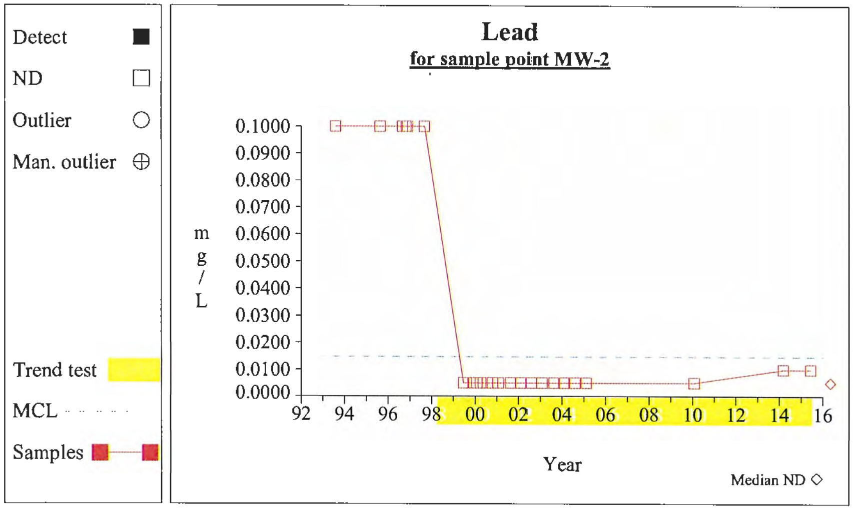
# Time Series



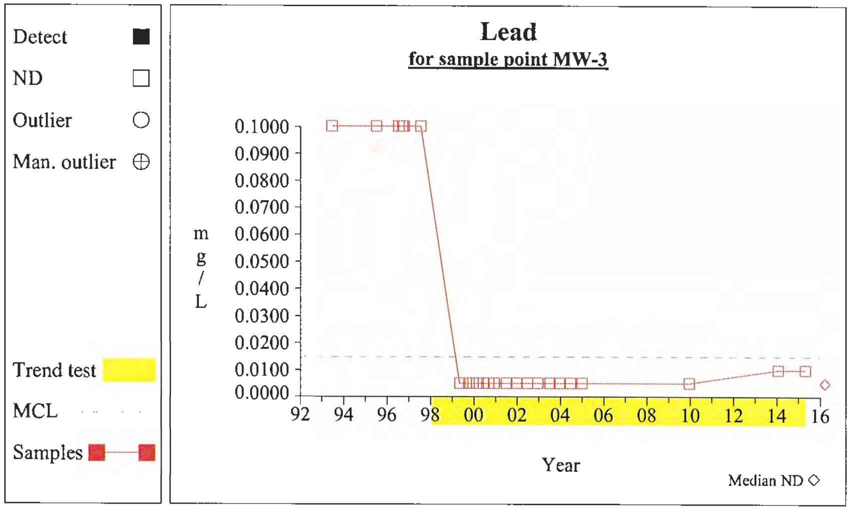
Graph 53



Graph 54

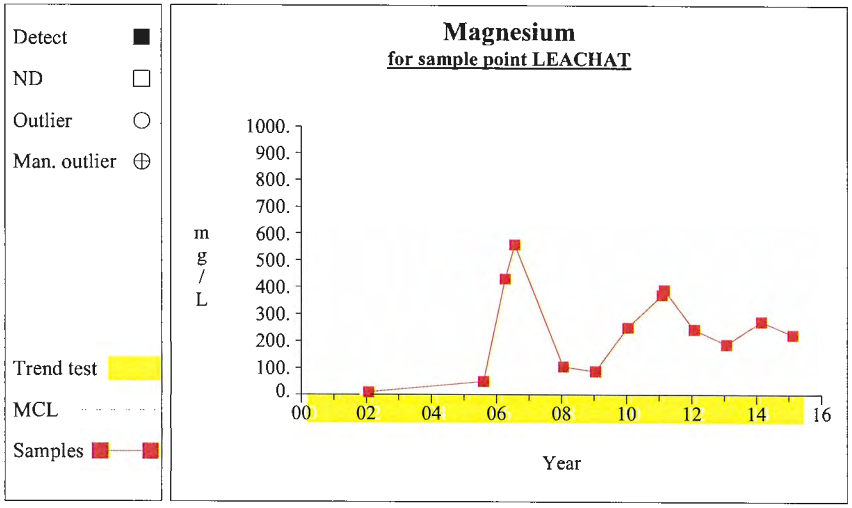


Graph 55



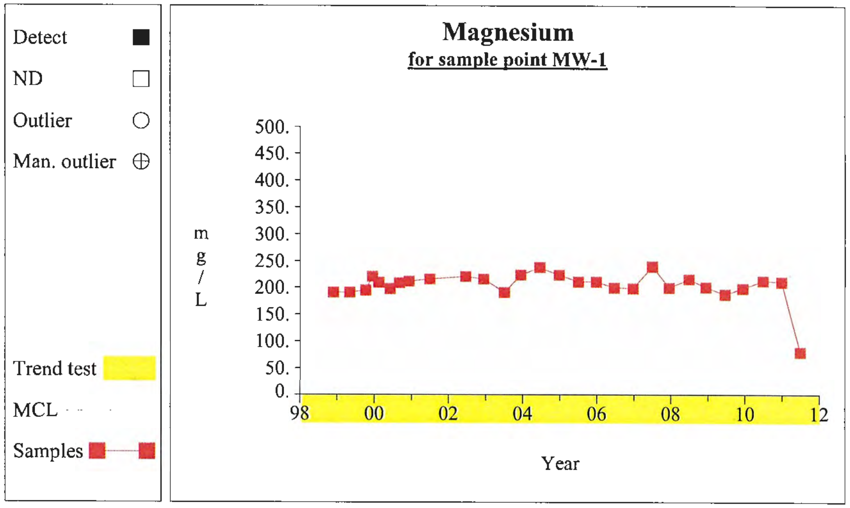
Graph 56

# Time Series



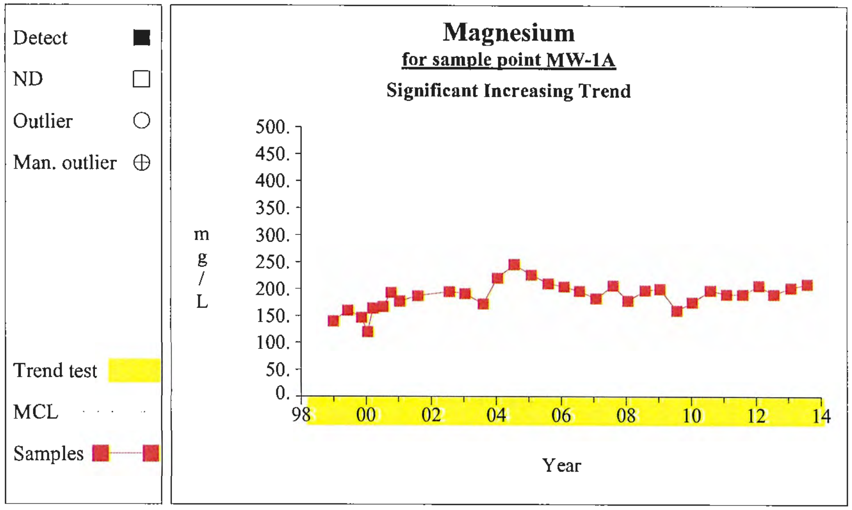
Magnesium
for sample point LEACHAT

Graph 57



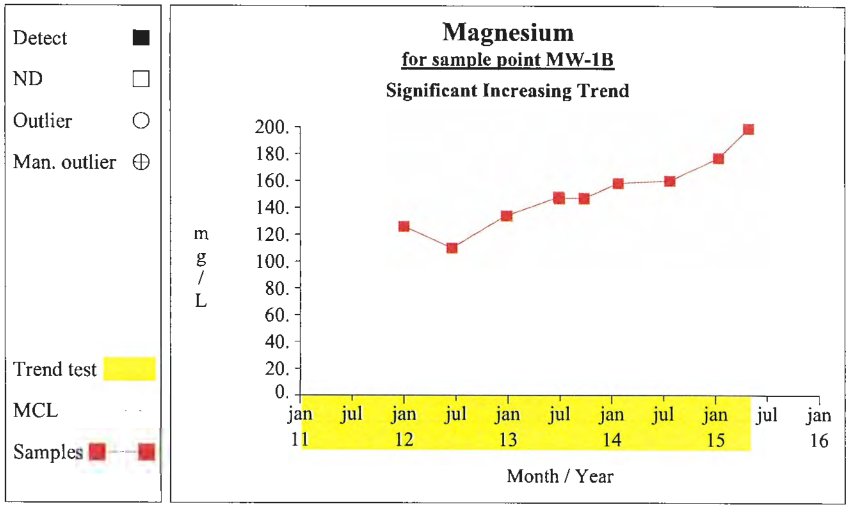
Magnesium
for sample point MW-1

Graph 58



Magnesium
for sample point MW-1A
Significant Increasing Trend

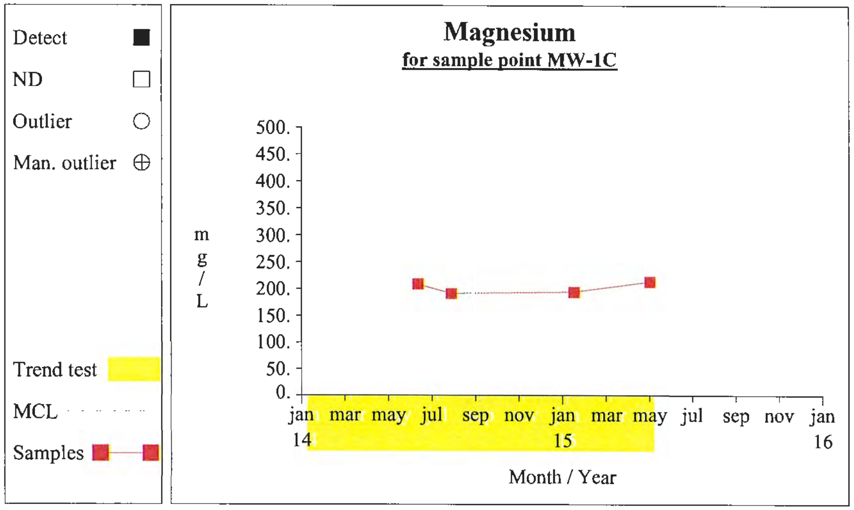
Graph 59



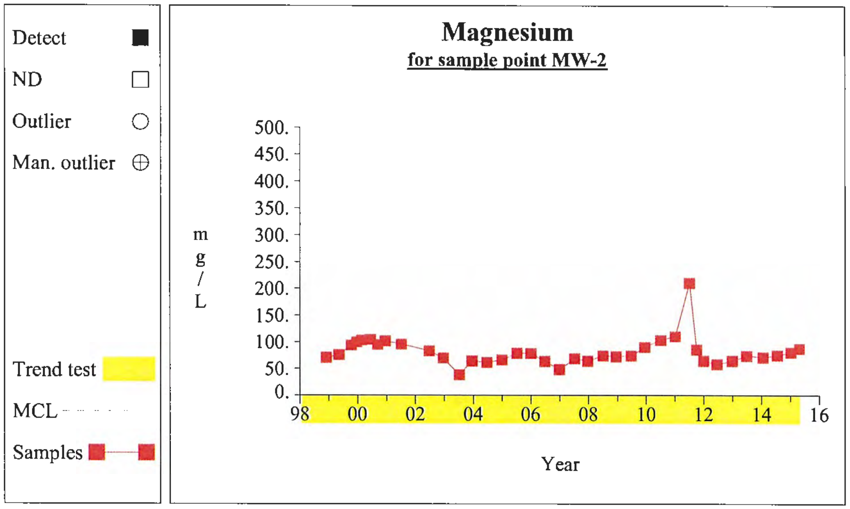
Magnesium
for sample point MW-1B
Significant Increasing Trend

Graph 60

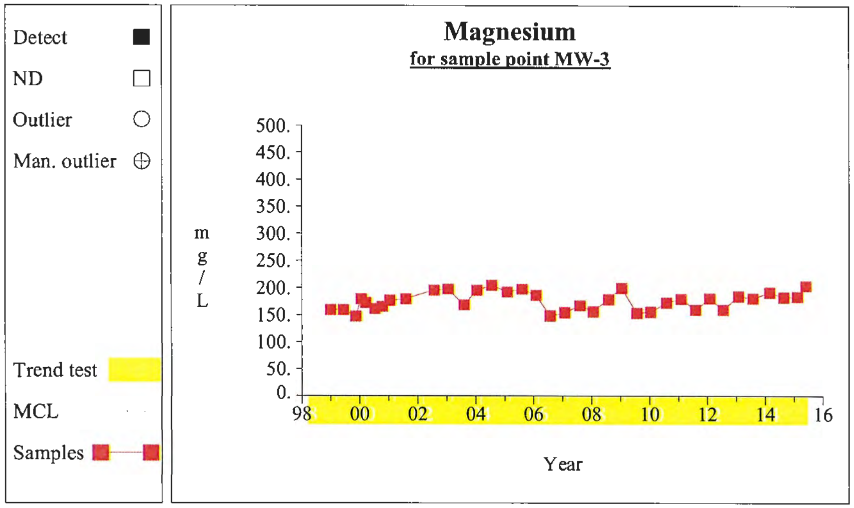
# Time Series



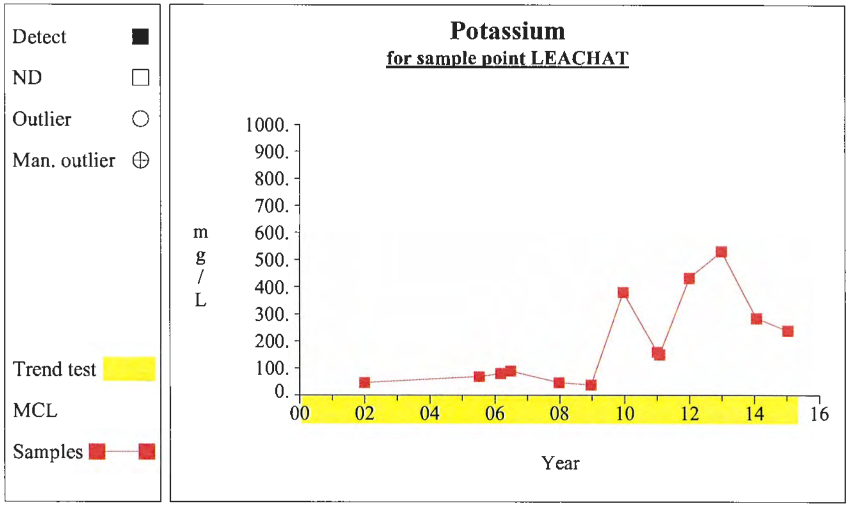
Graph 61



Graph 62

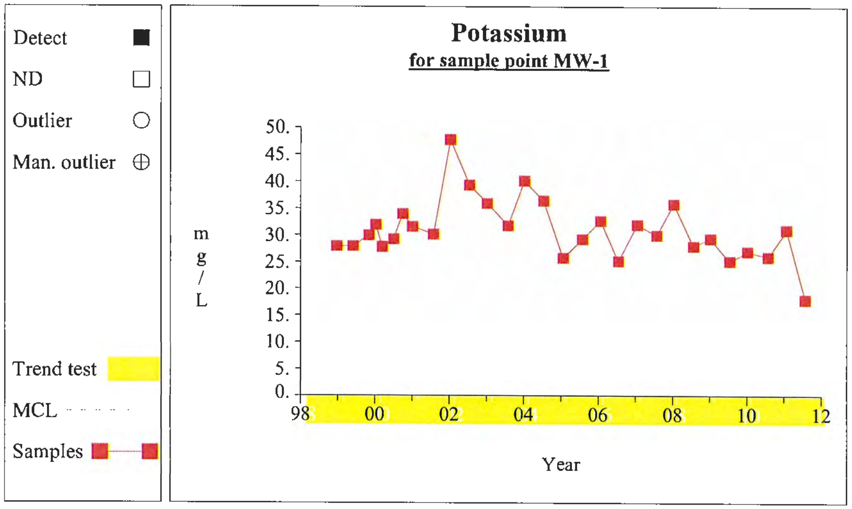


Graph 63

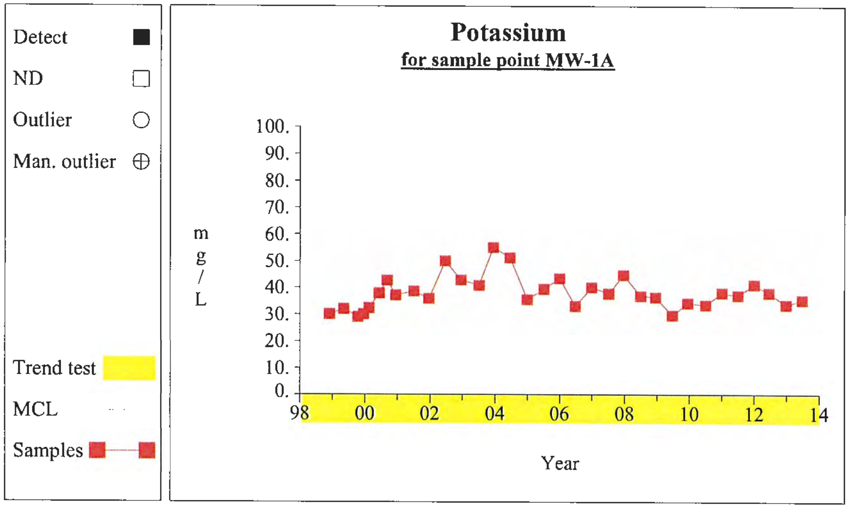


Graph 64

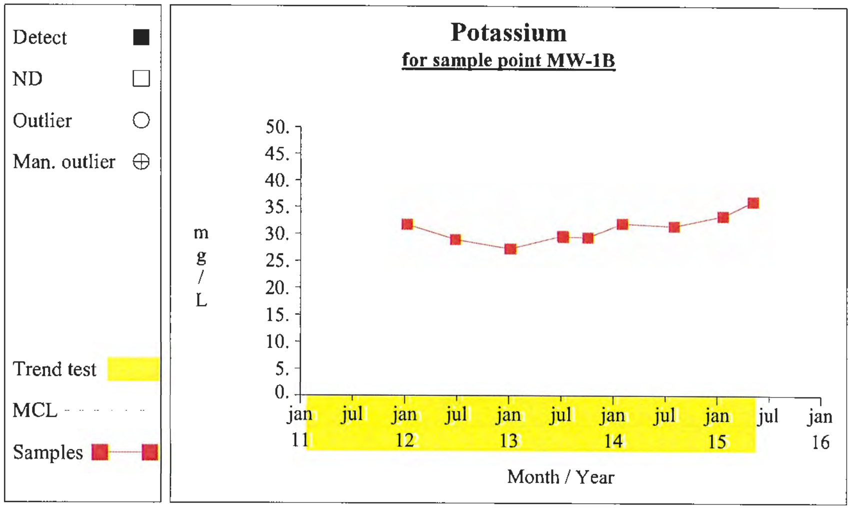
# Time Series



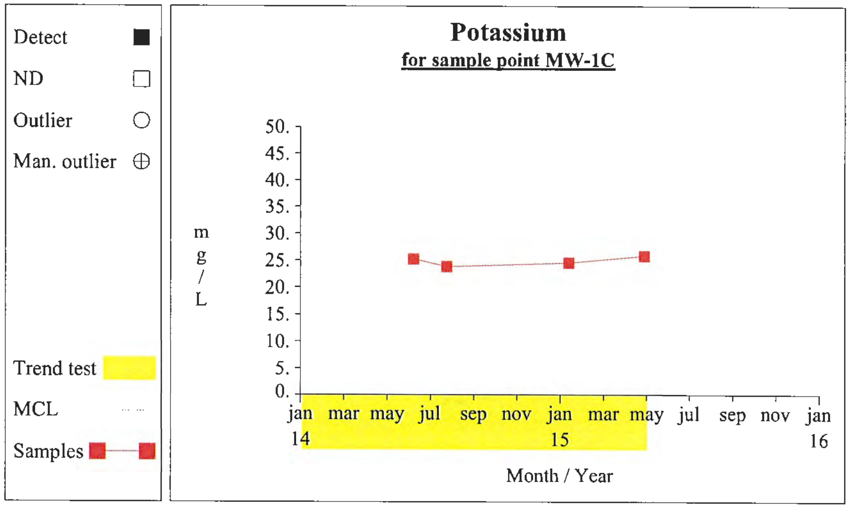
Graph 65



Graph 66

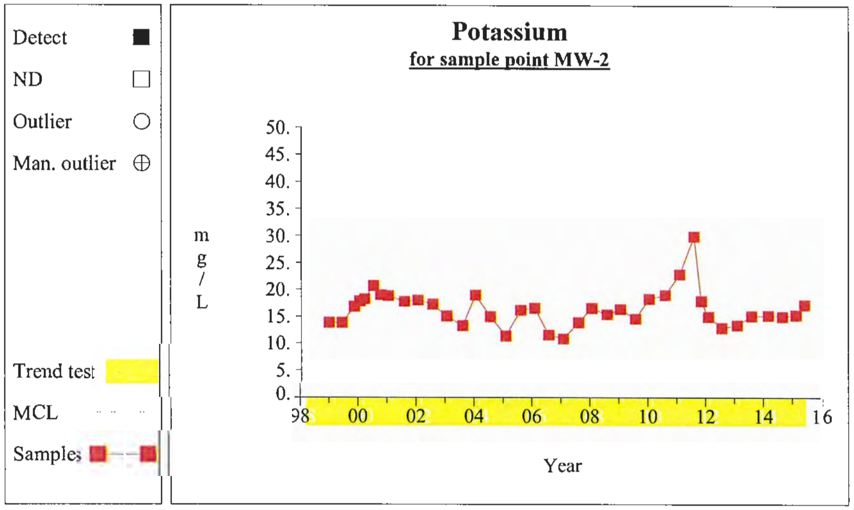


Graph 67

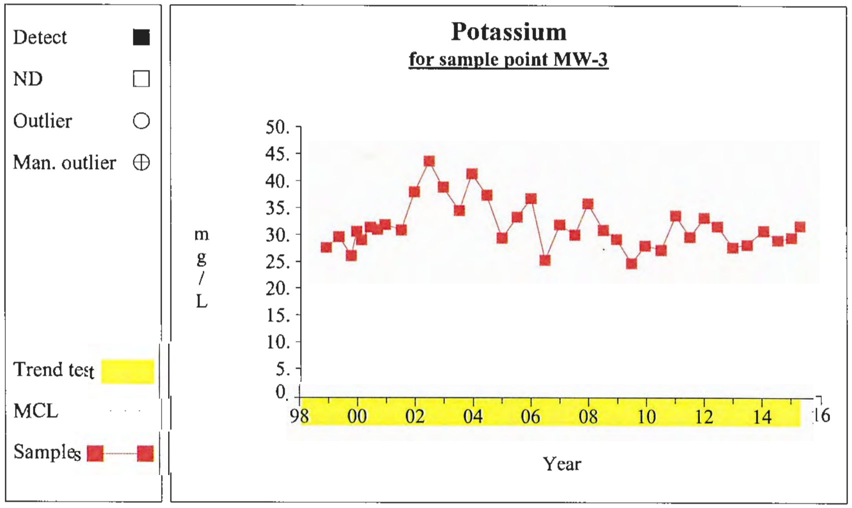


Graph 68

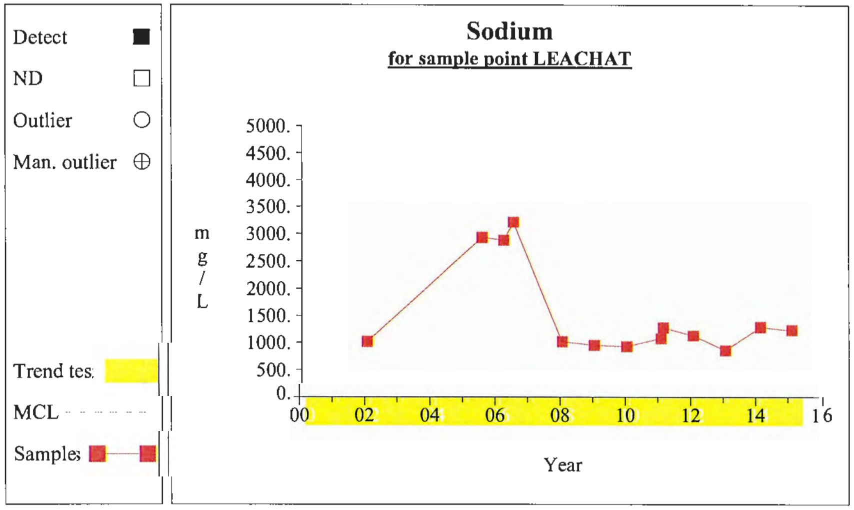
# Time Series



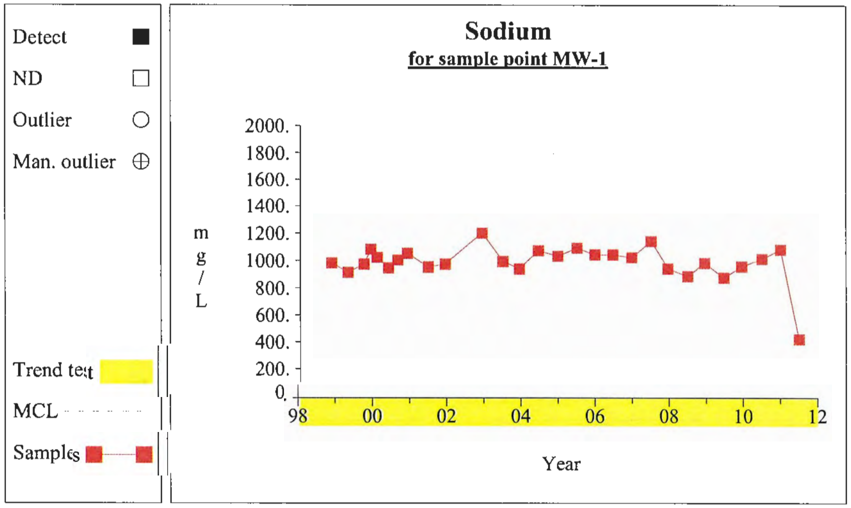
Graph 69



Graph 70

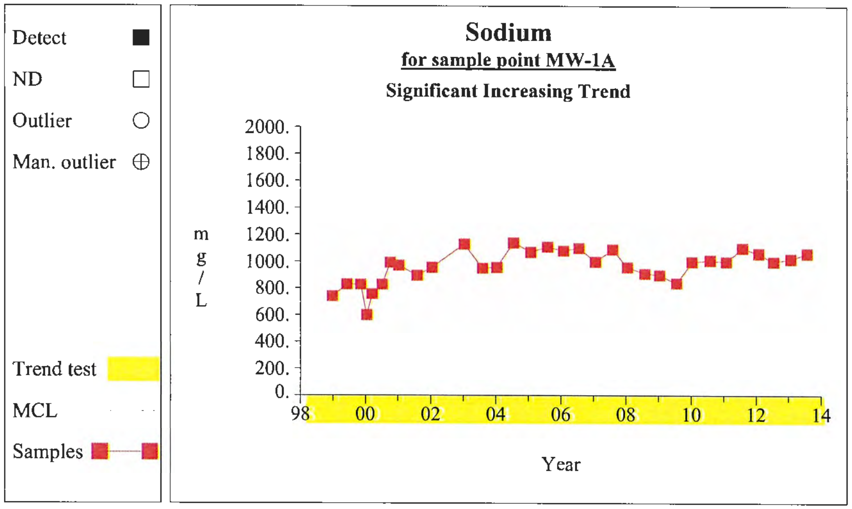


Graph 71

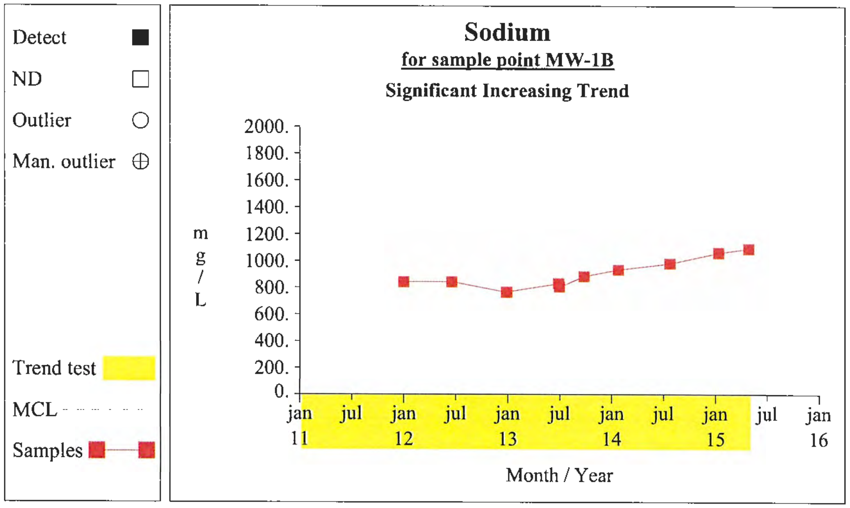


Graph 72

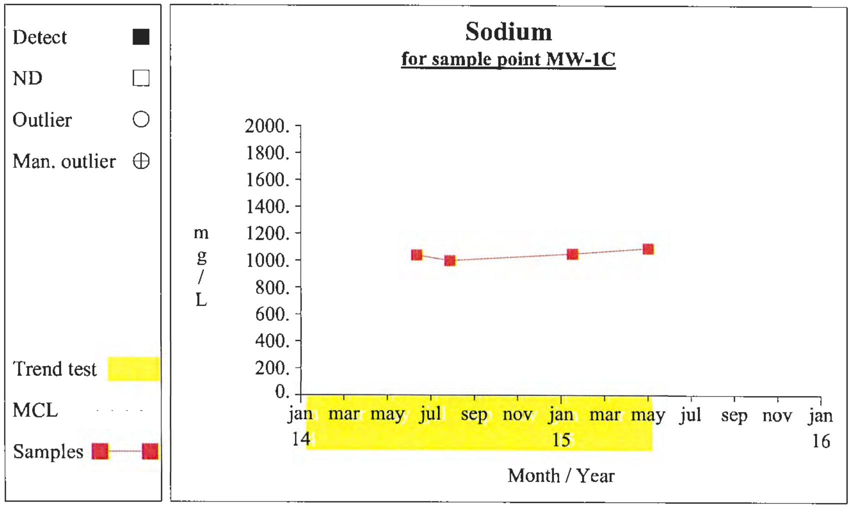
# Time Series



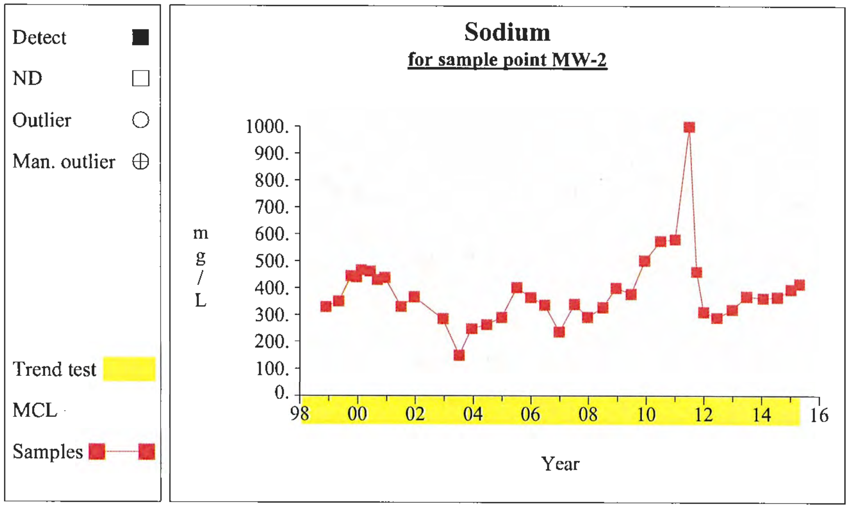
Graph 73



Graph 74

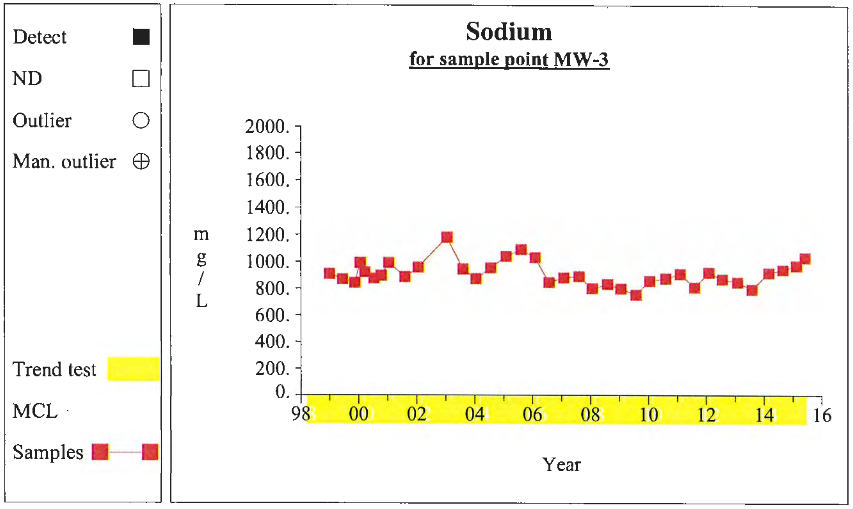


Graph 75

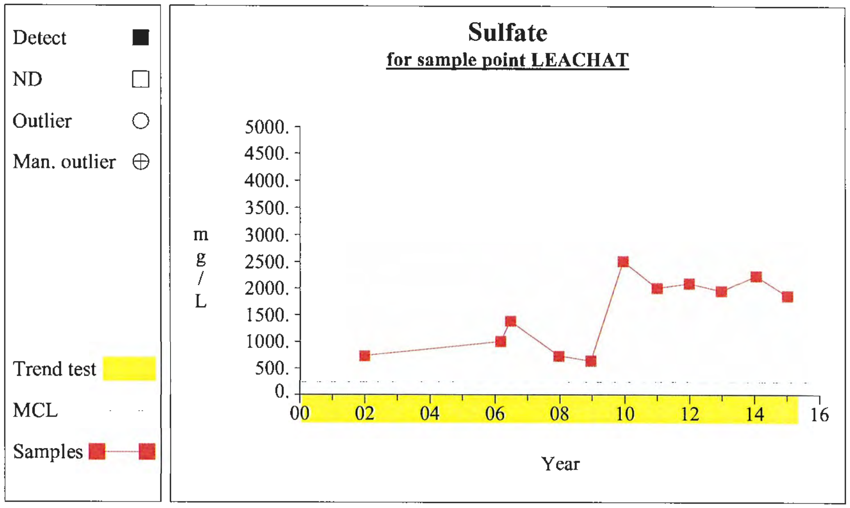


Graph 76

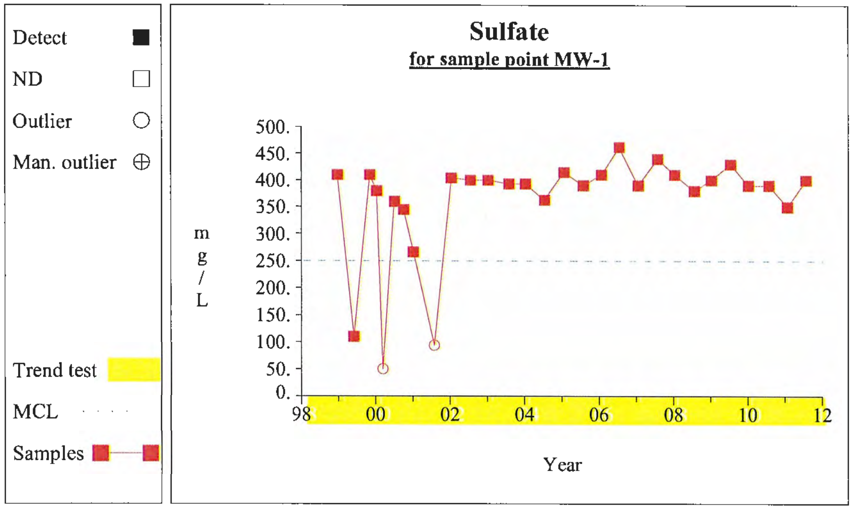
# Time Series



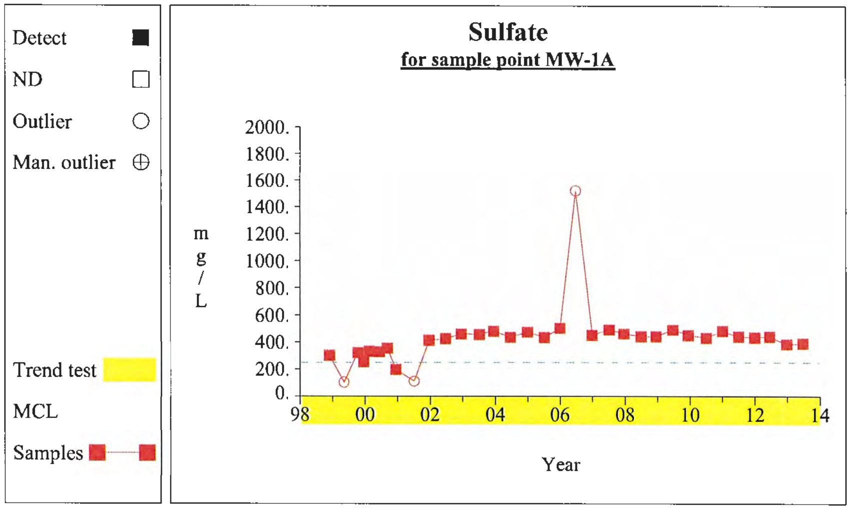
Graph 77



Graph 78

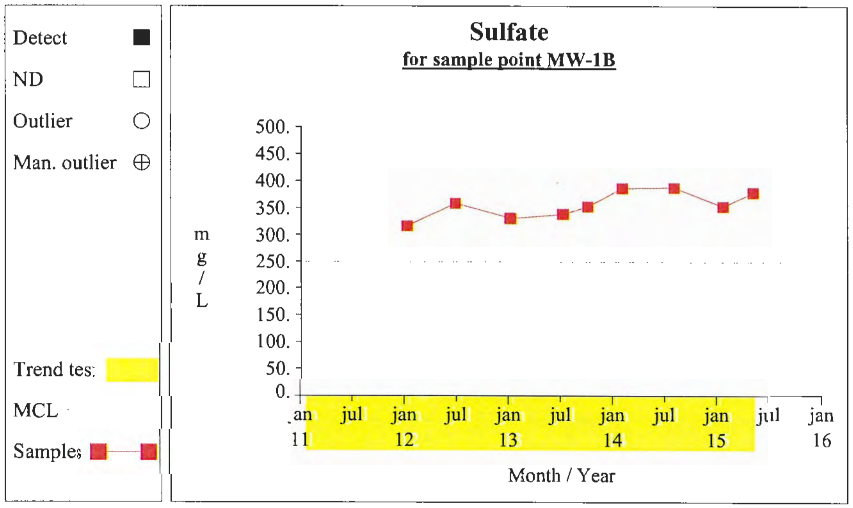


Graph 79

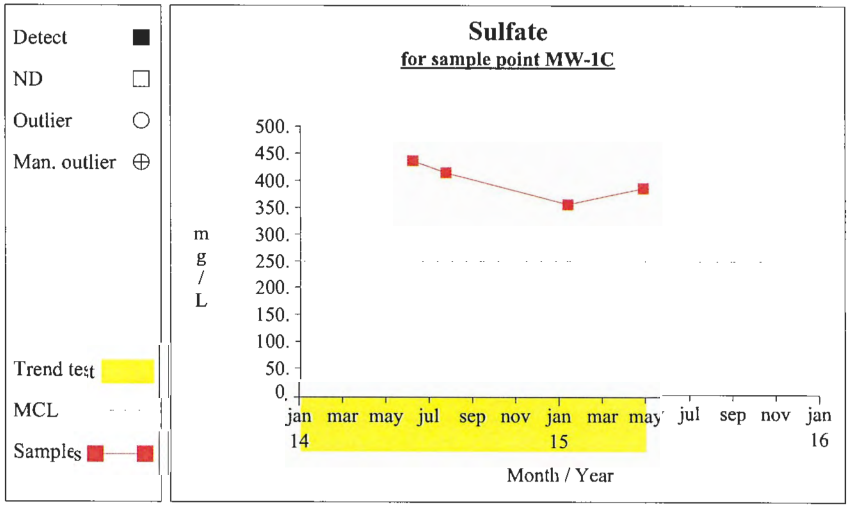


Graph 80

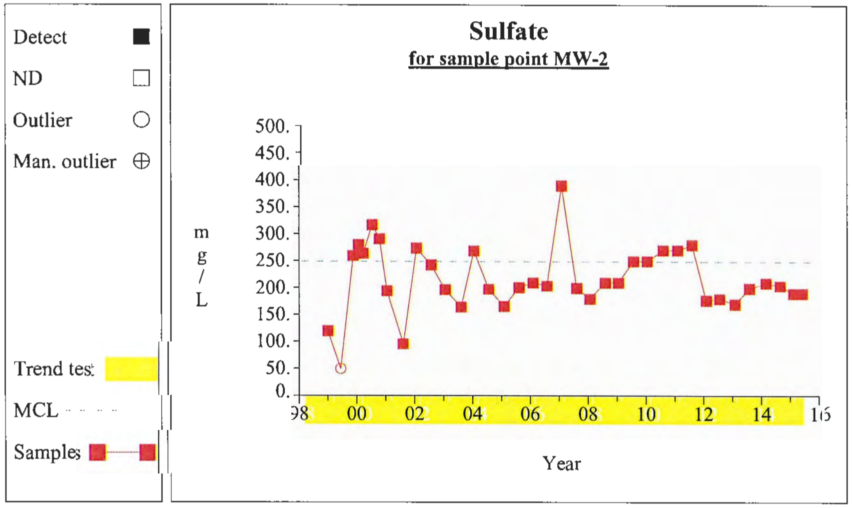
# Time Series



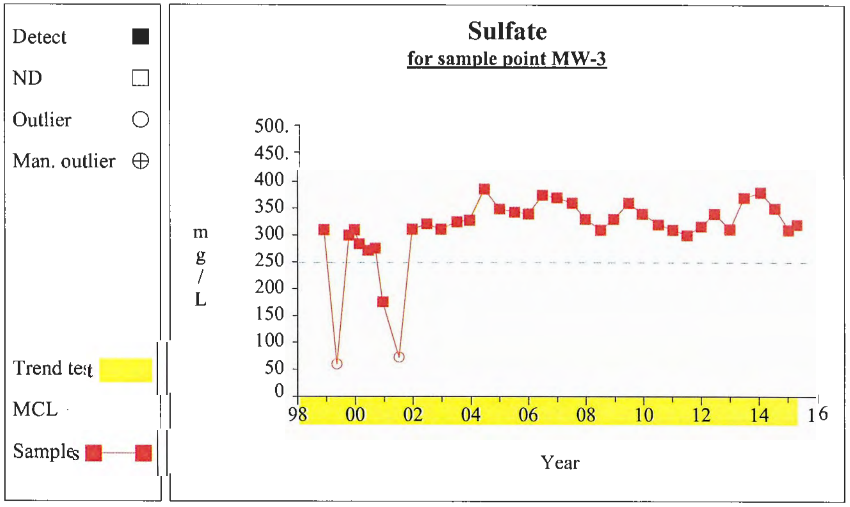
Graph 81



Graph 82

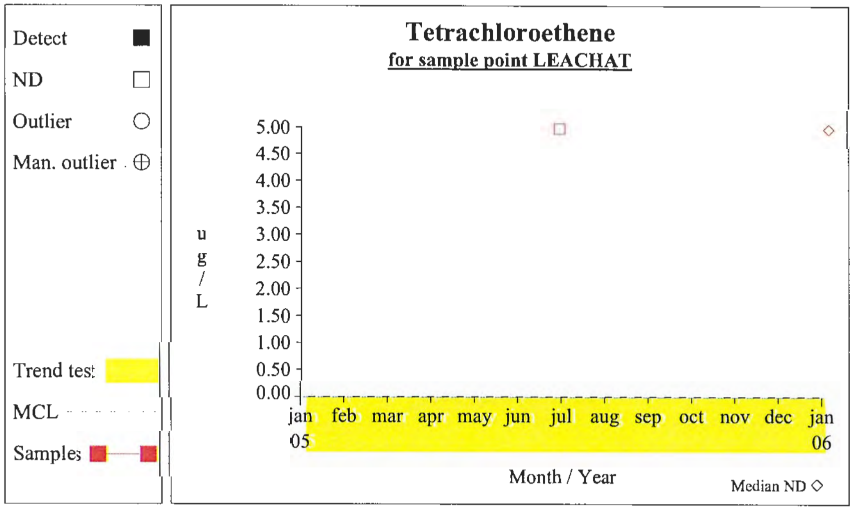


Graph 83

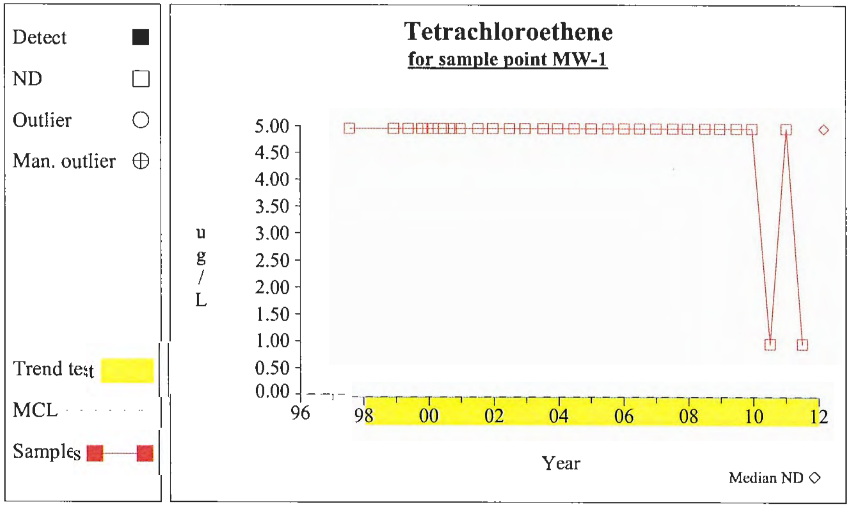


Graph 84

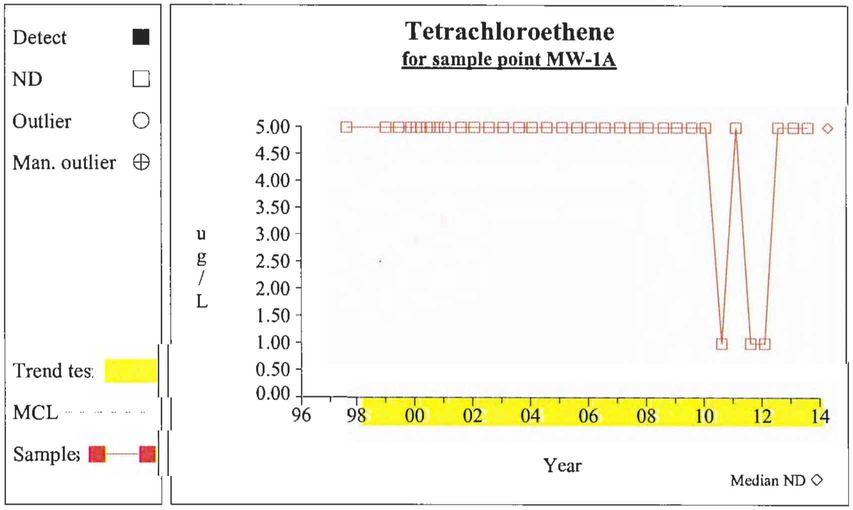
# Time Series



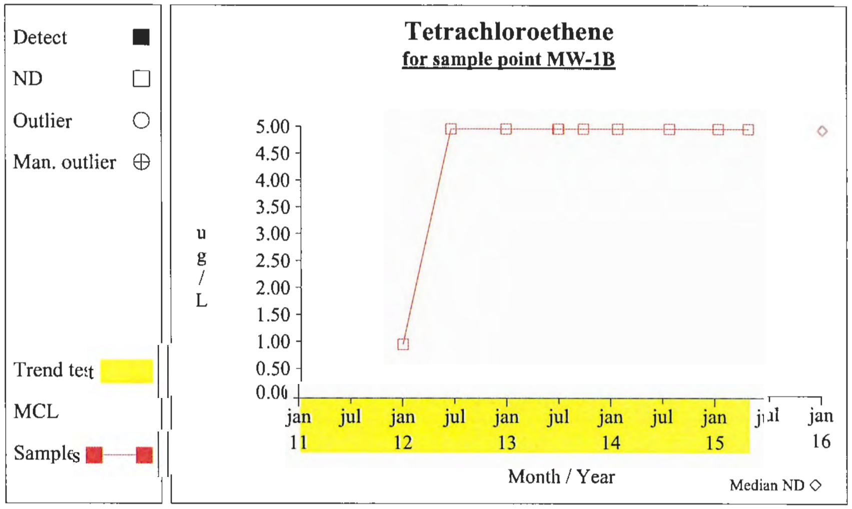
**Graph 85**



**Graph 86**

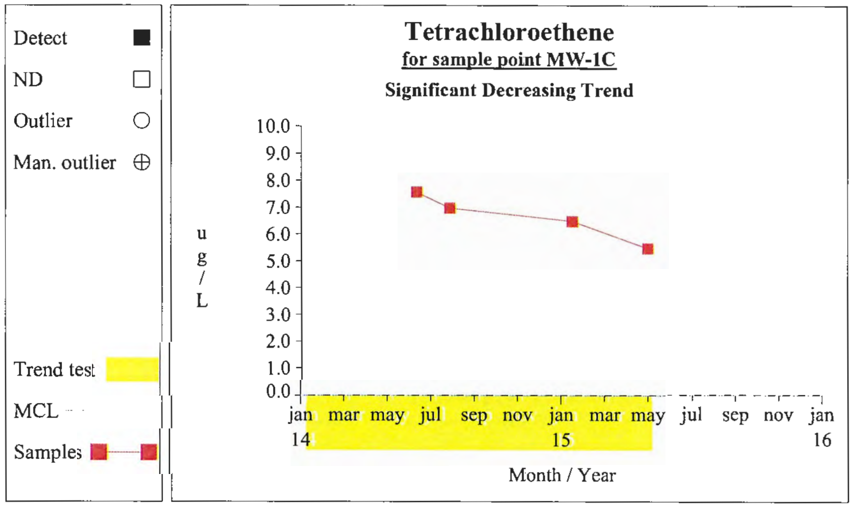


**Graph 87**

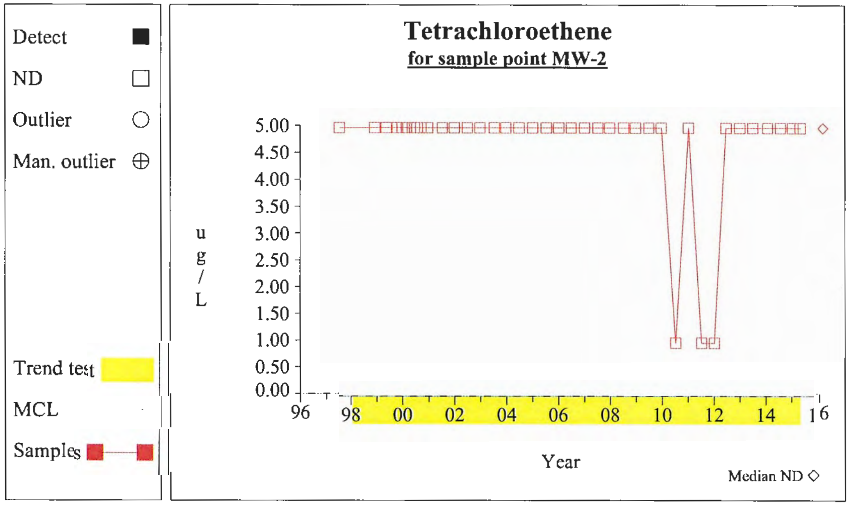


**Graph 88**

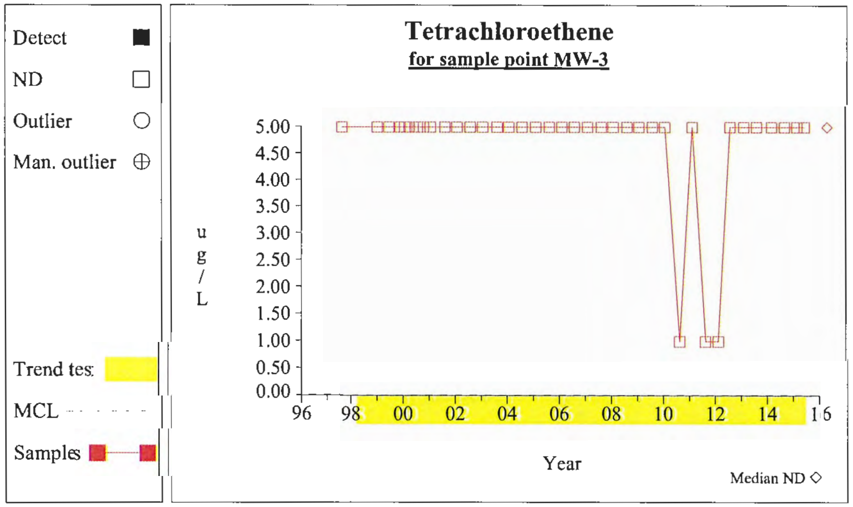
# Time Series



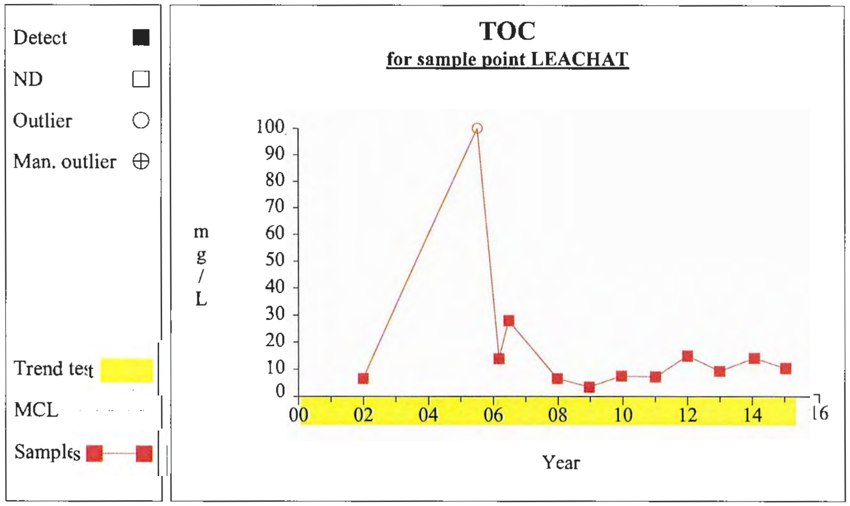
Graph 89



Graph 90

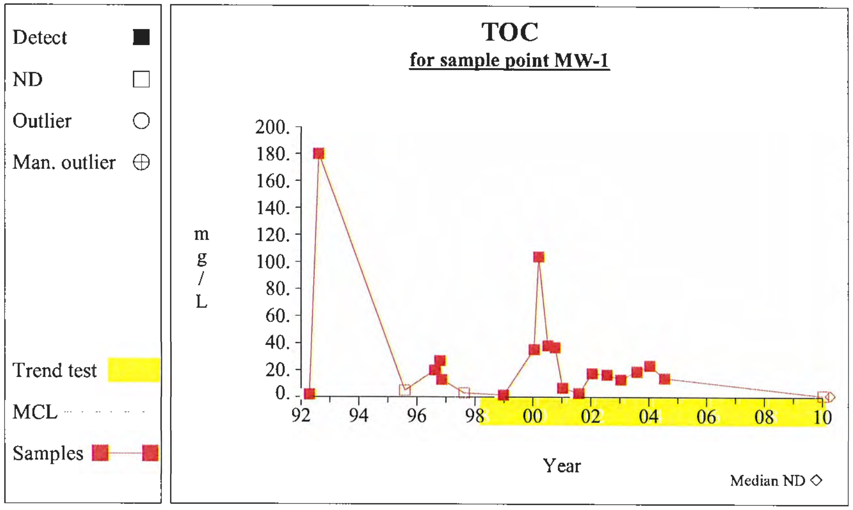


Graph 91

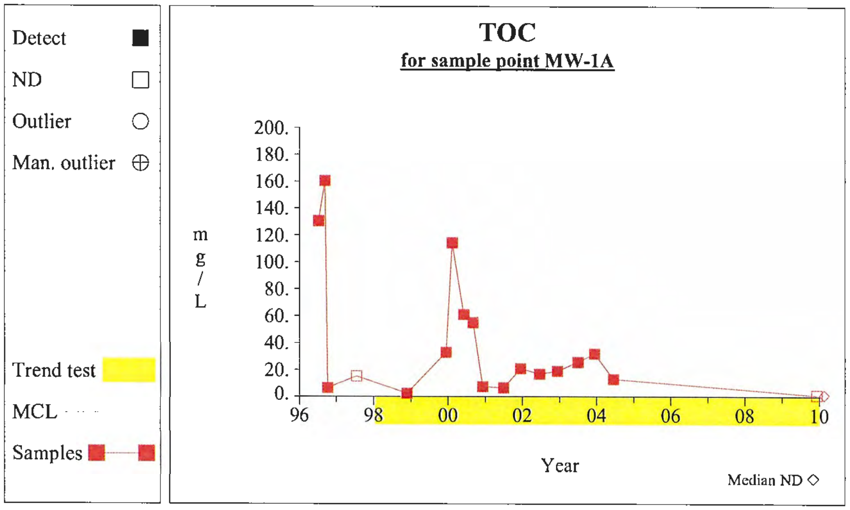


Graph 92

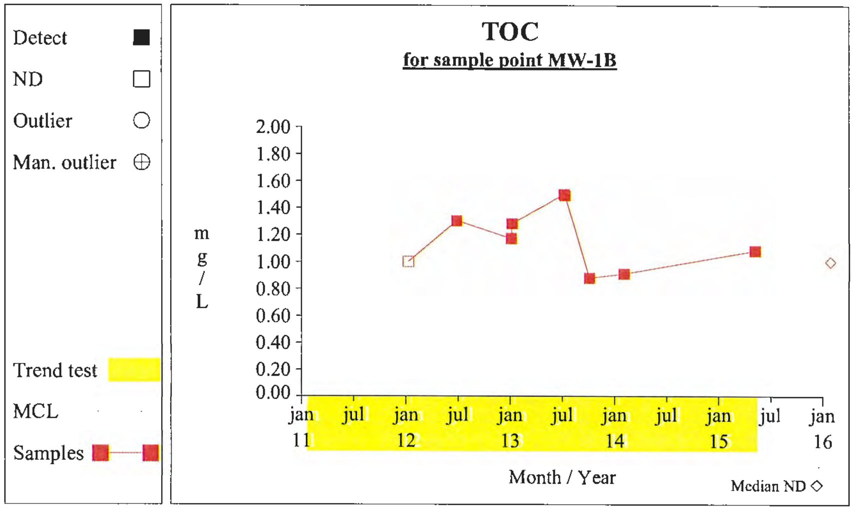
# Time Series



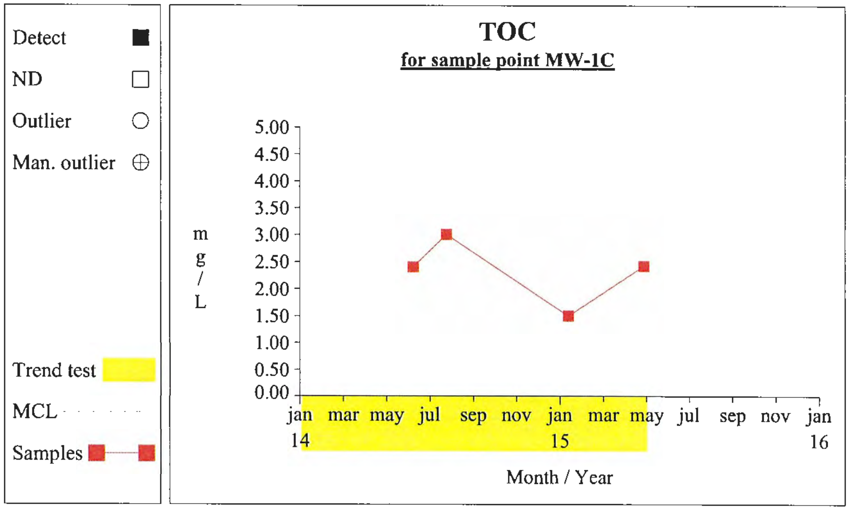
Graph 93



Graph 94



Graph 95



Graph 96

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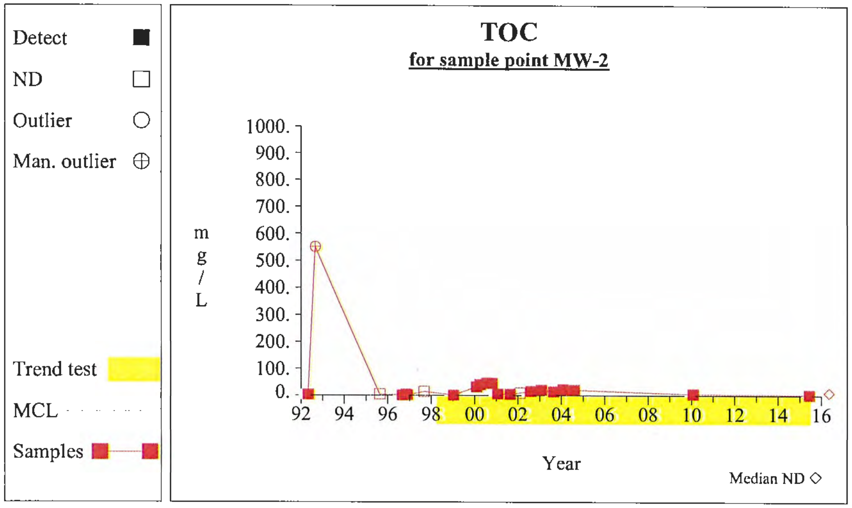
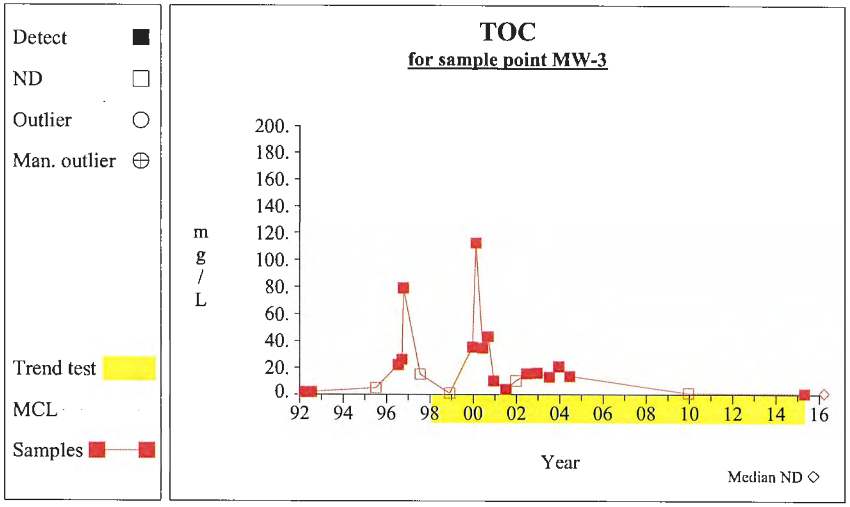
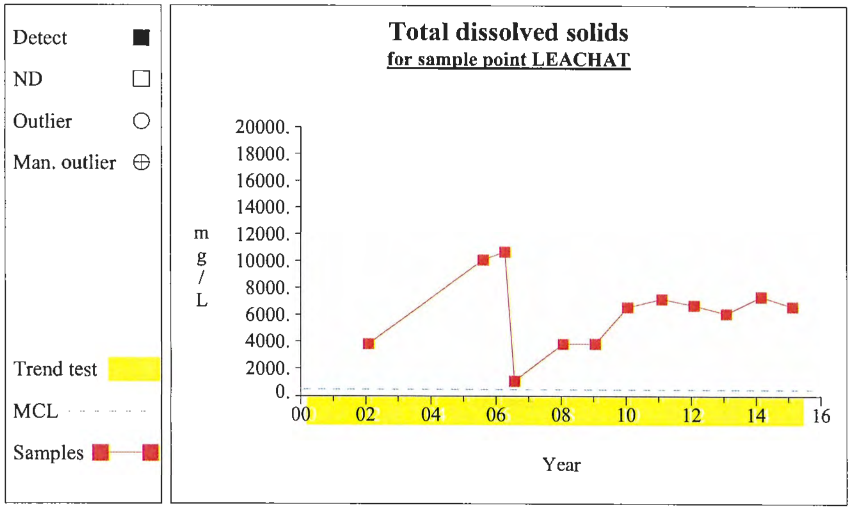


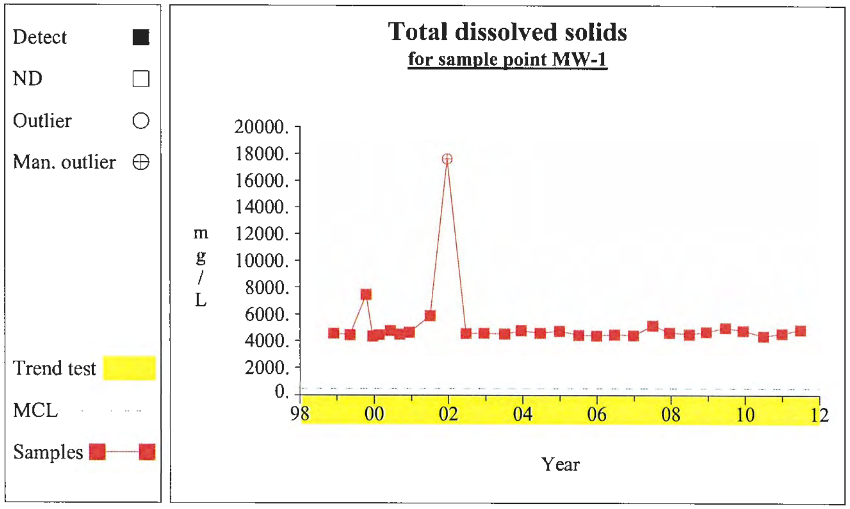
Graph 97



Graph 98



Graph 99



Graph 100

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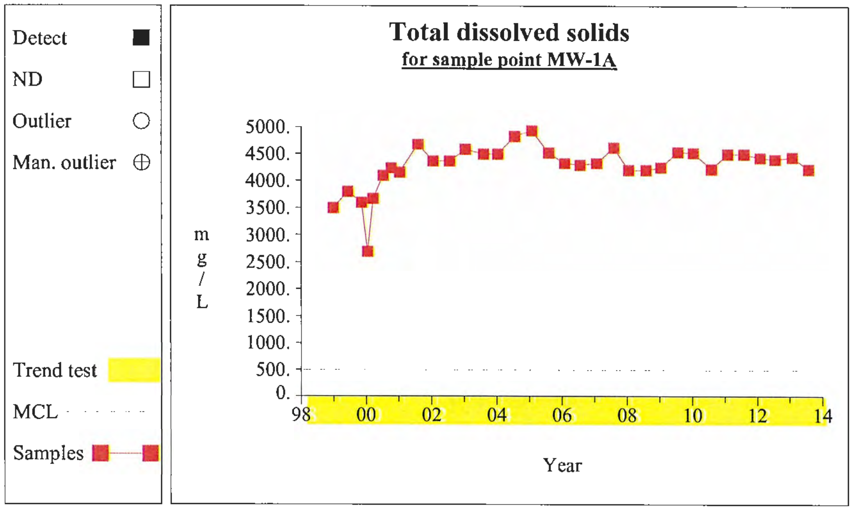
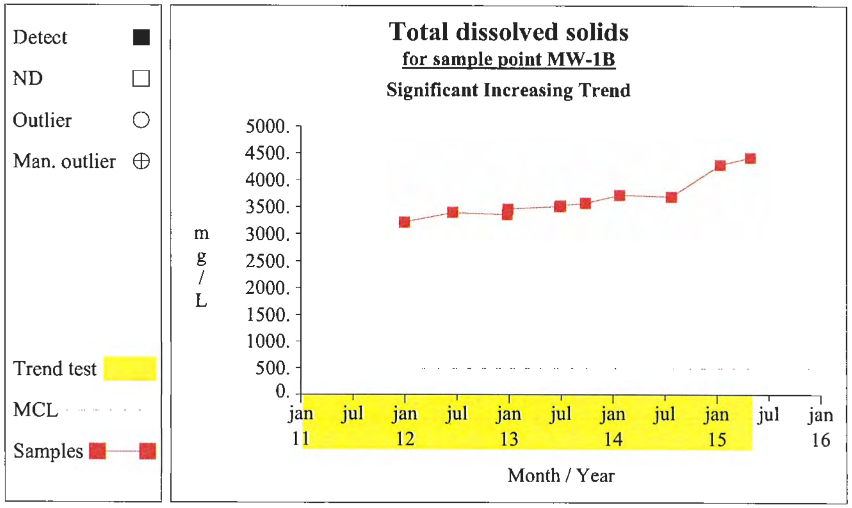
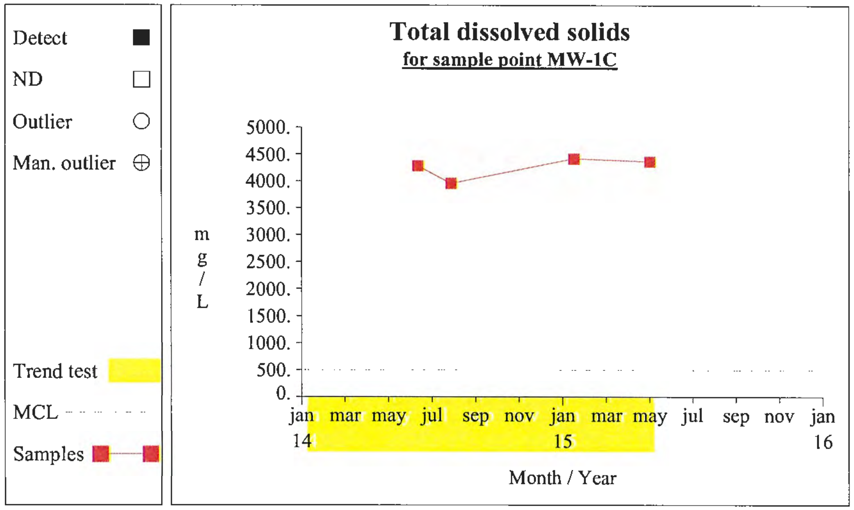


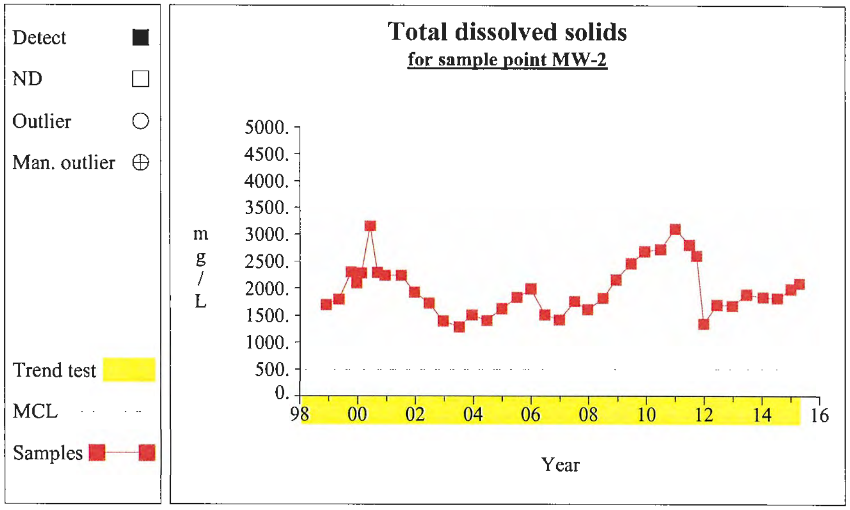
Graph 101



Graph 102



Graph 103



Graph 104

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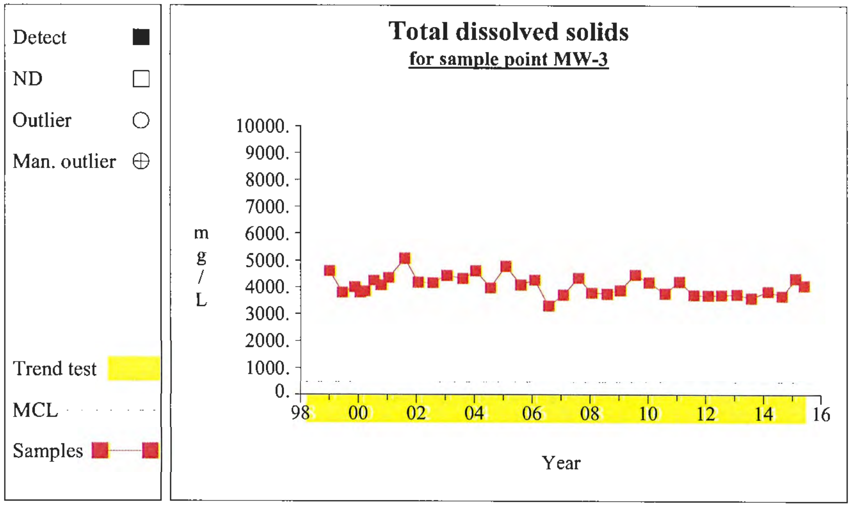

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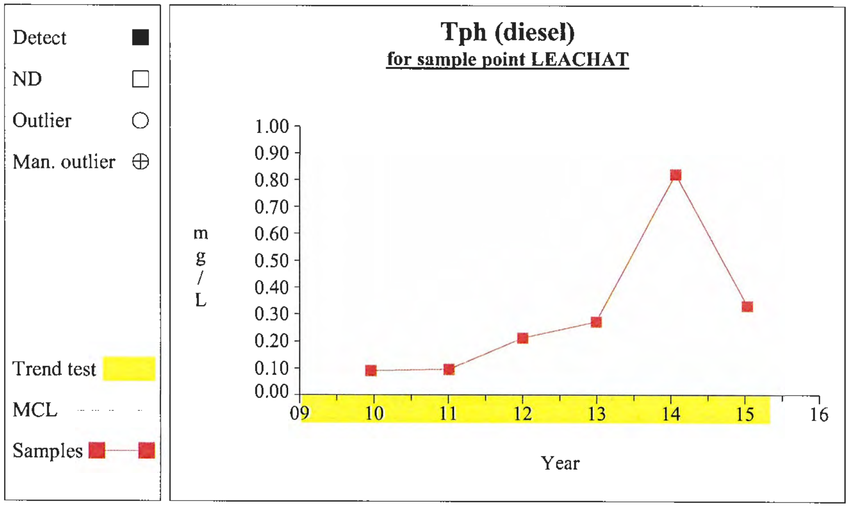
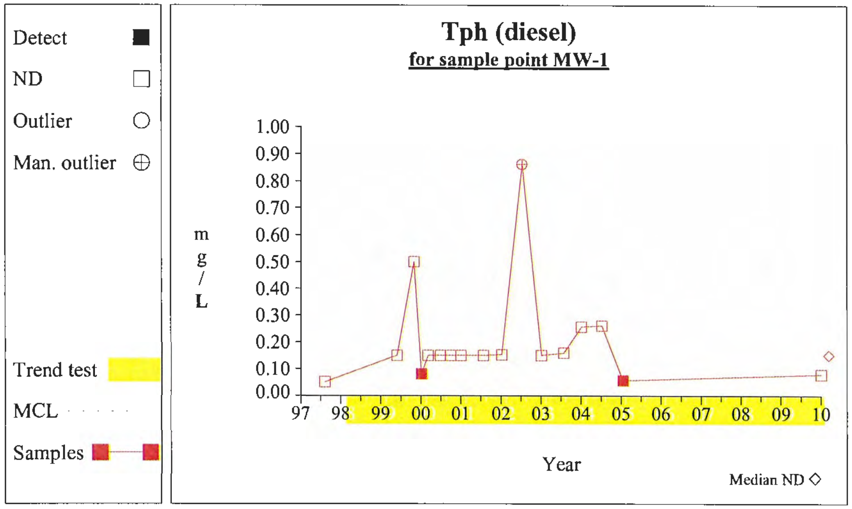
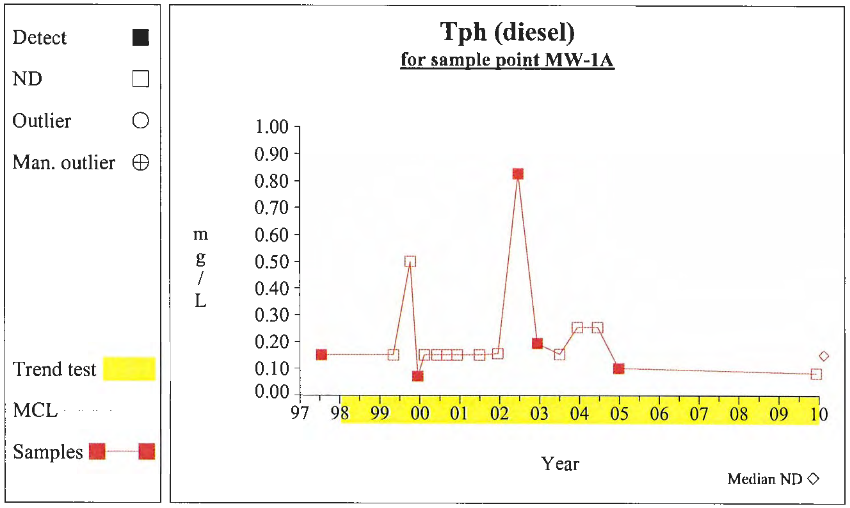


Graph 106

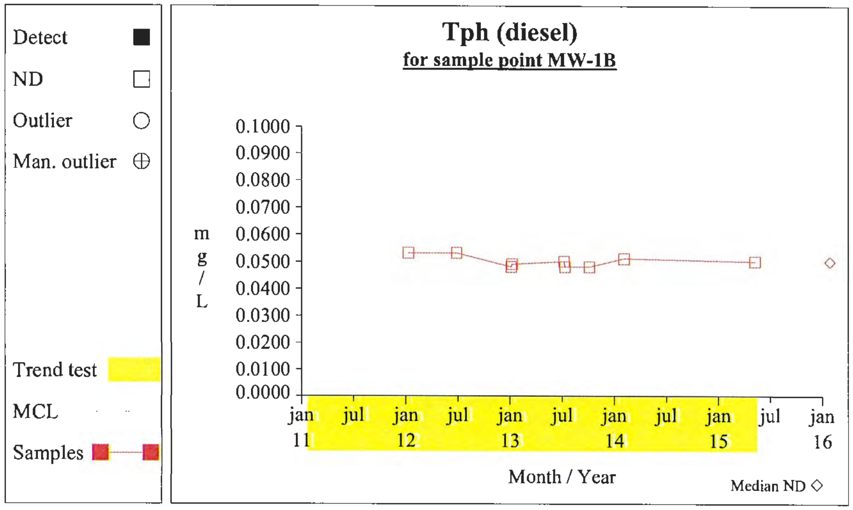


Graph 107

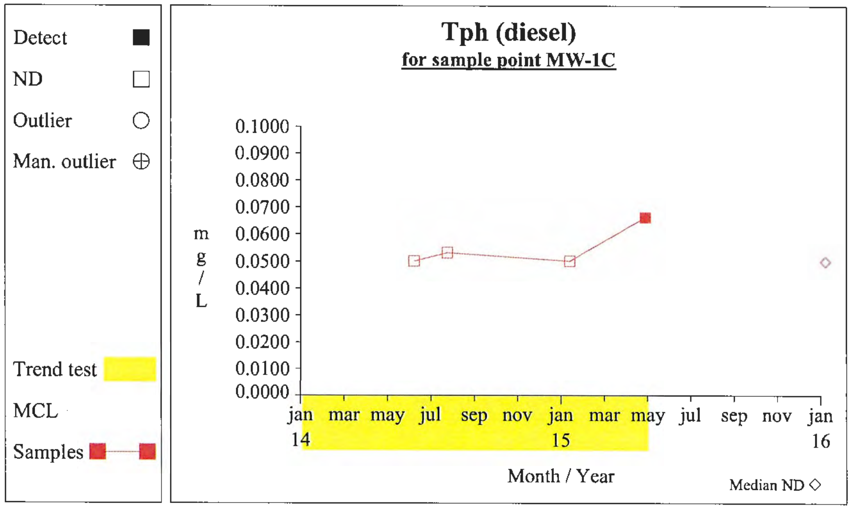


Graph 108

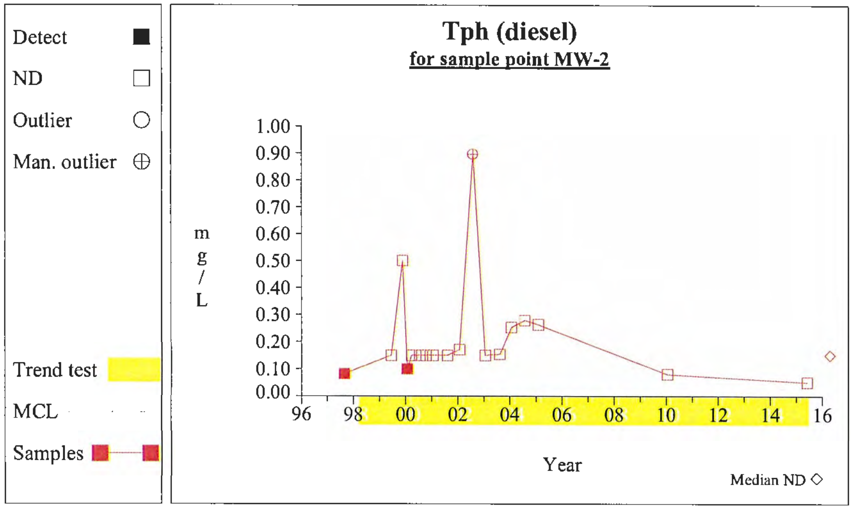
# Time Series



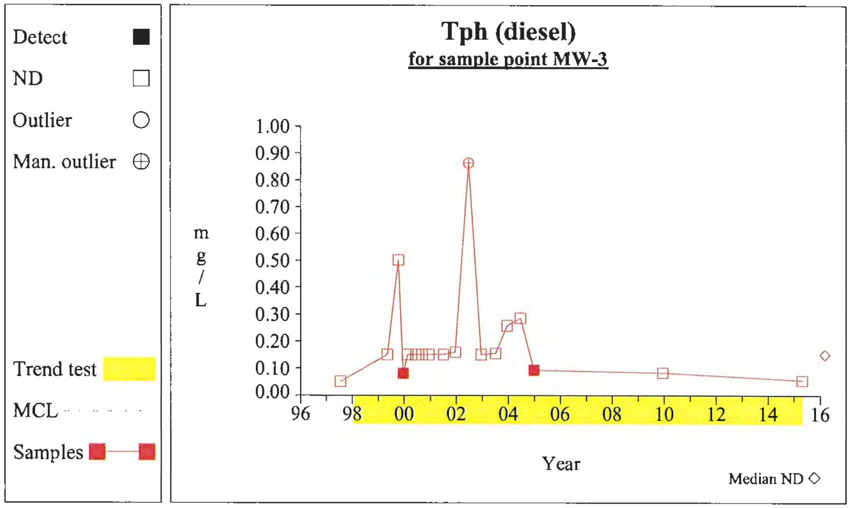
Graph 109



Graph 110

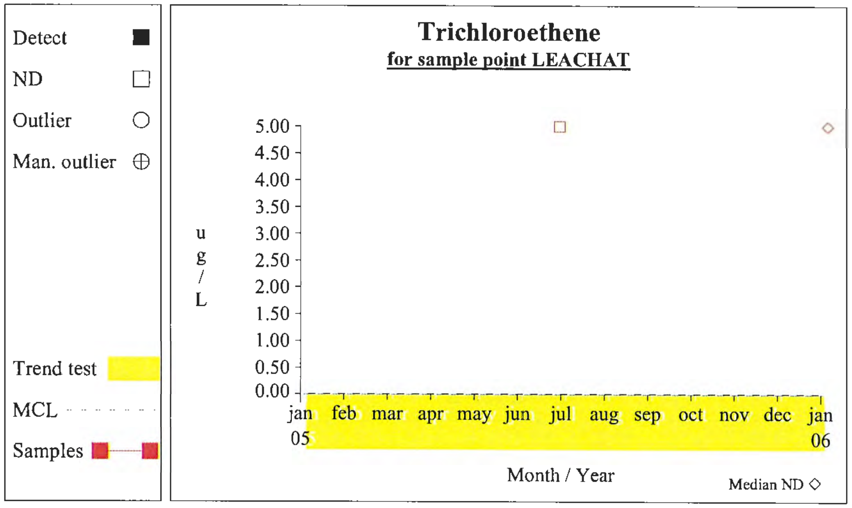


Graph 111

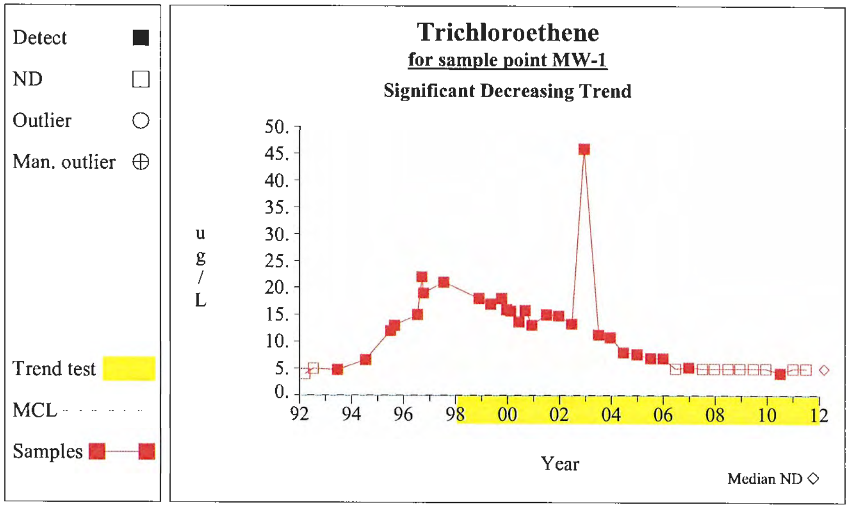


Graph 112

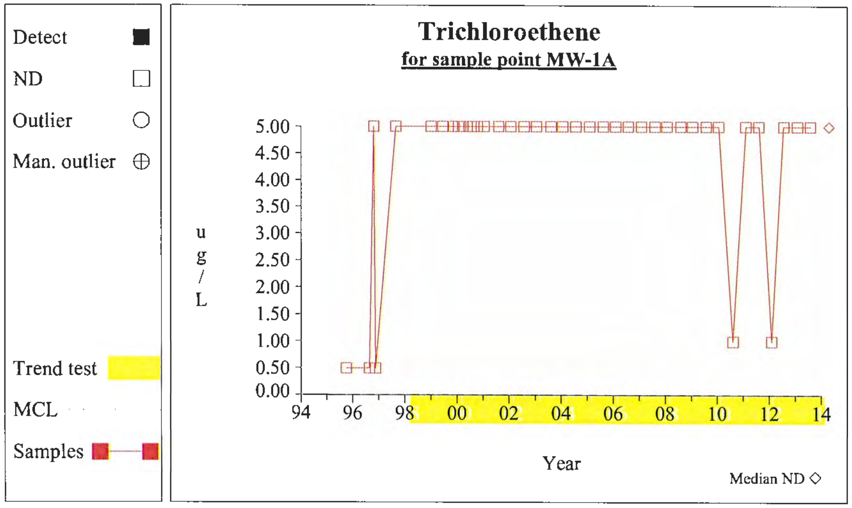
# Time Series



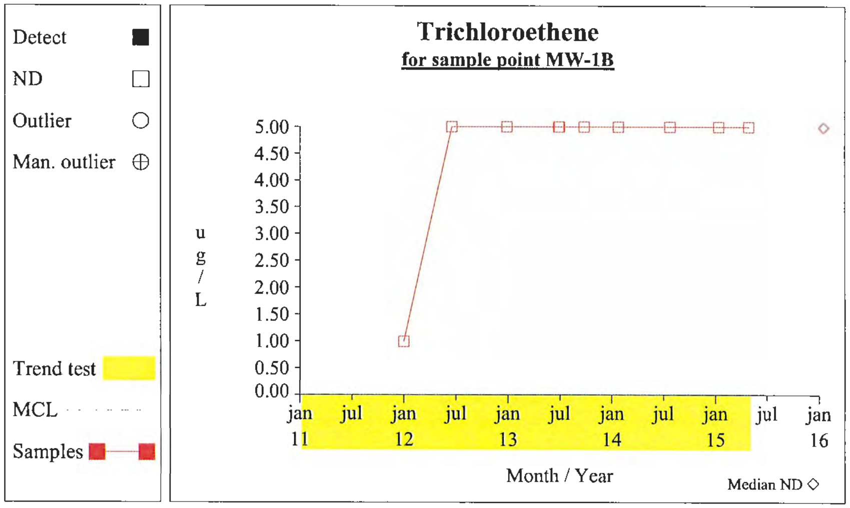
Graph 113



Graph 114

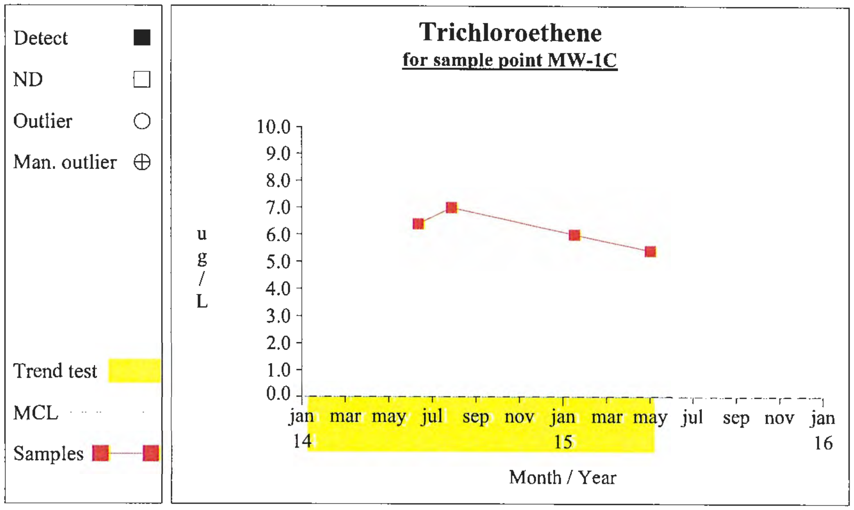


Graph 115

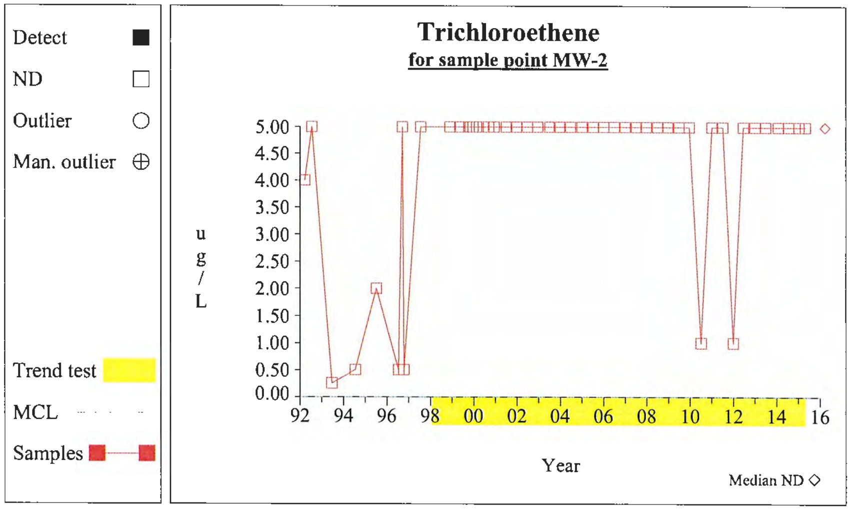


Graph 116

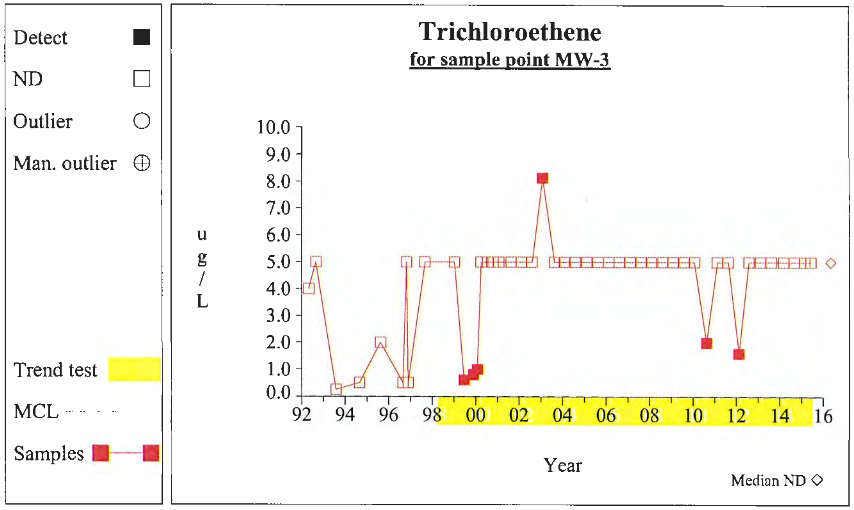
# Time Series



Graph 117



Graph 118

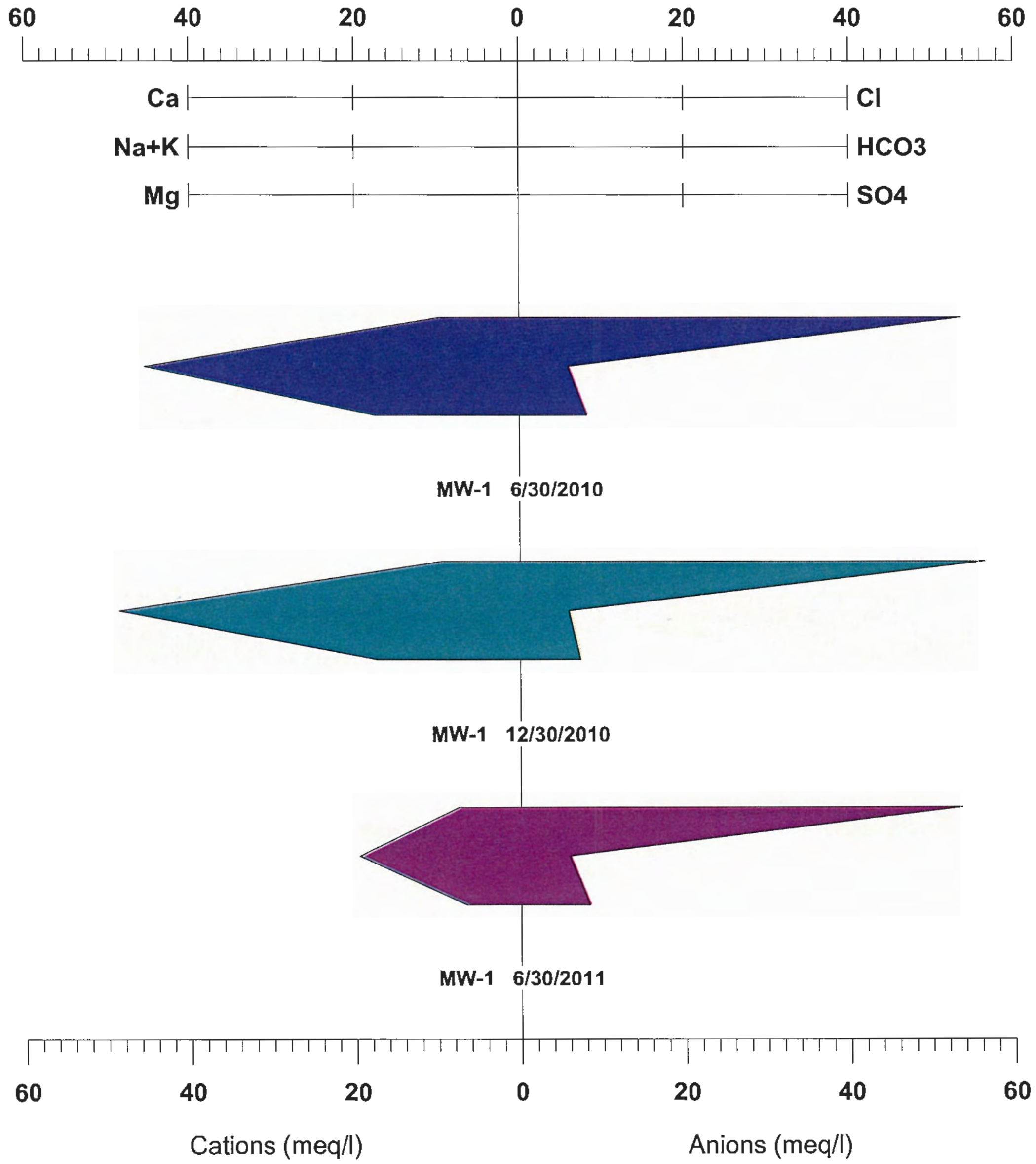


Graph 119

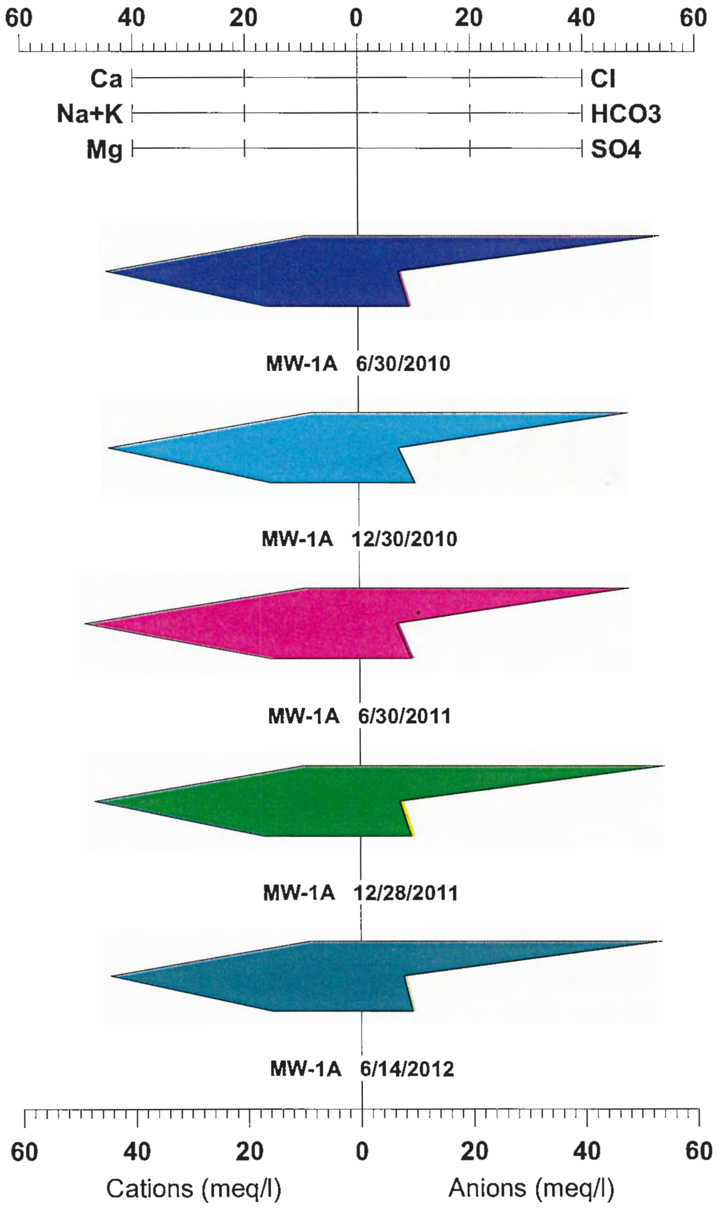
# Attachment 4

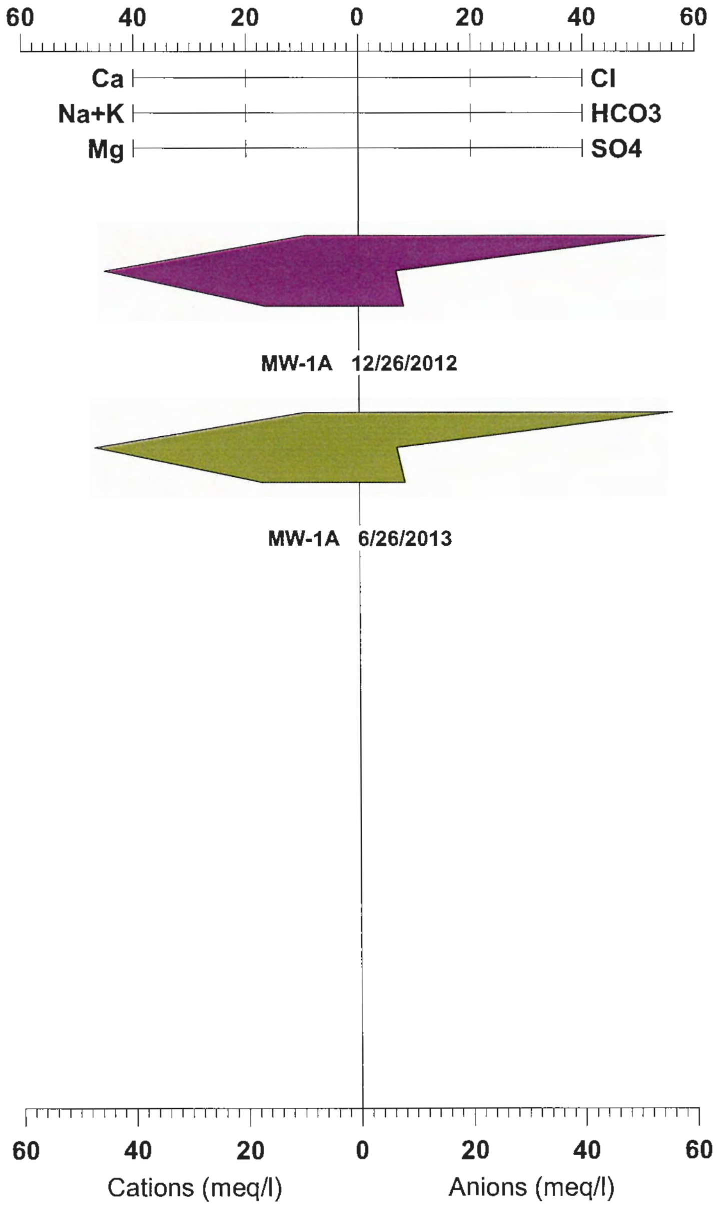
## Stiff Diagrams and Trilinear Plots

# PVT Landfill

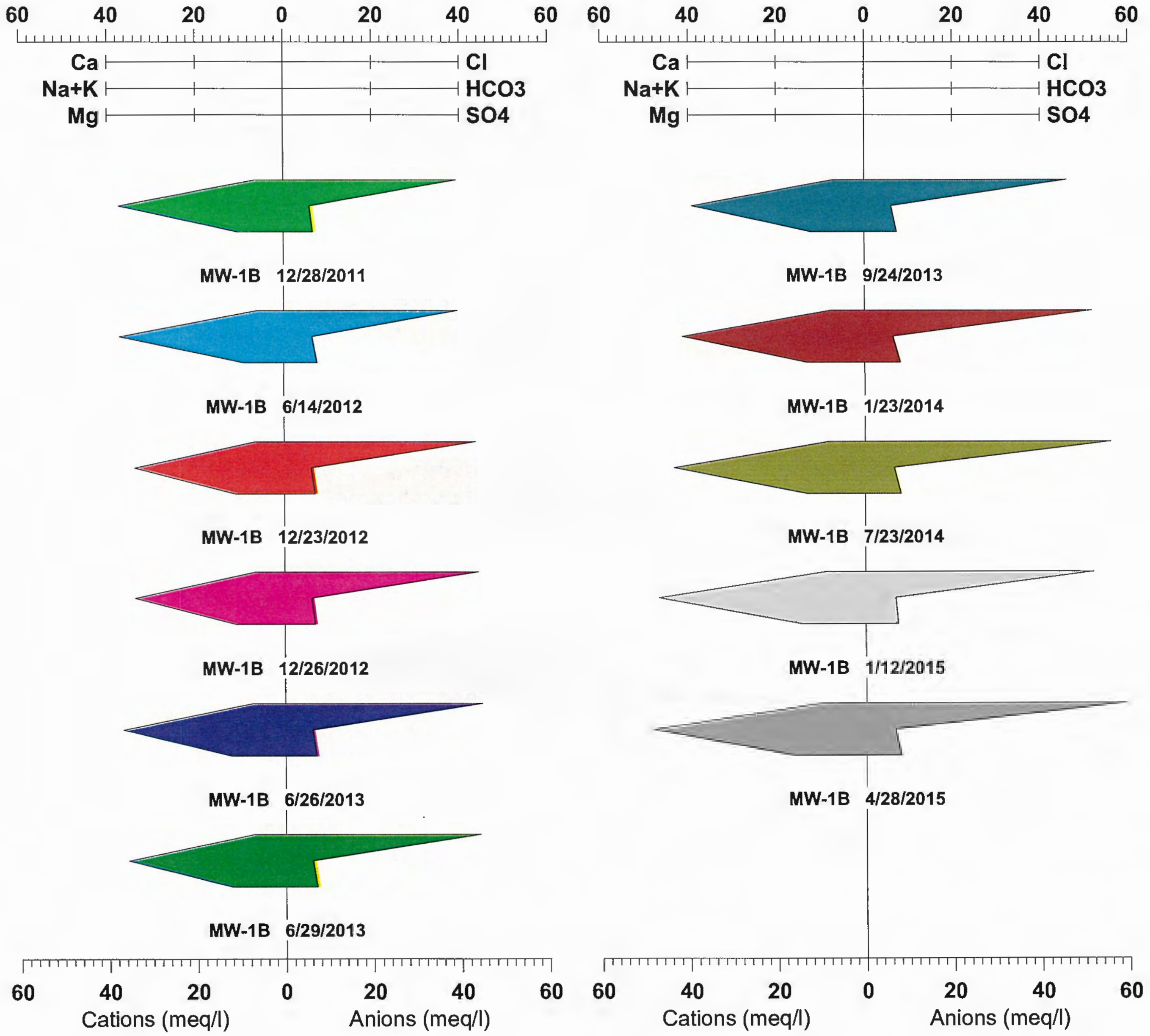


# PVT Landfill

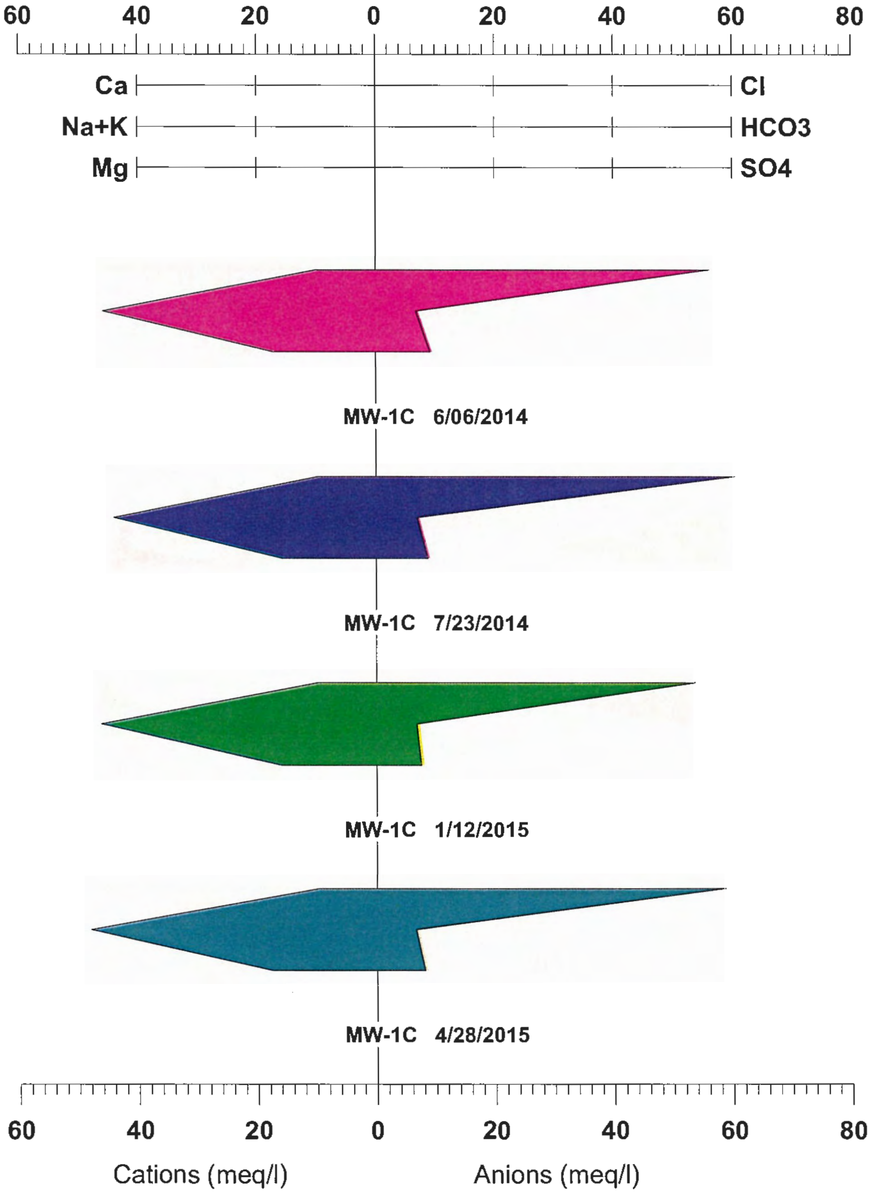




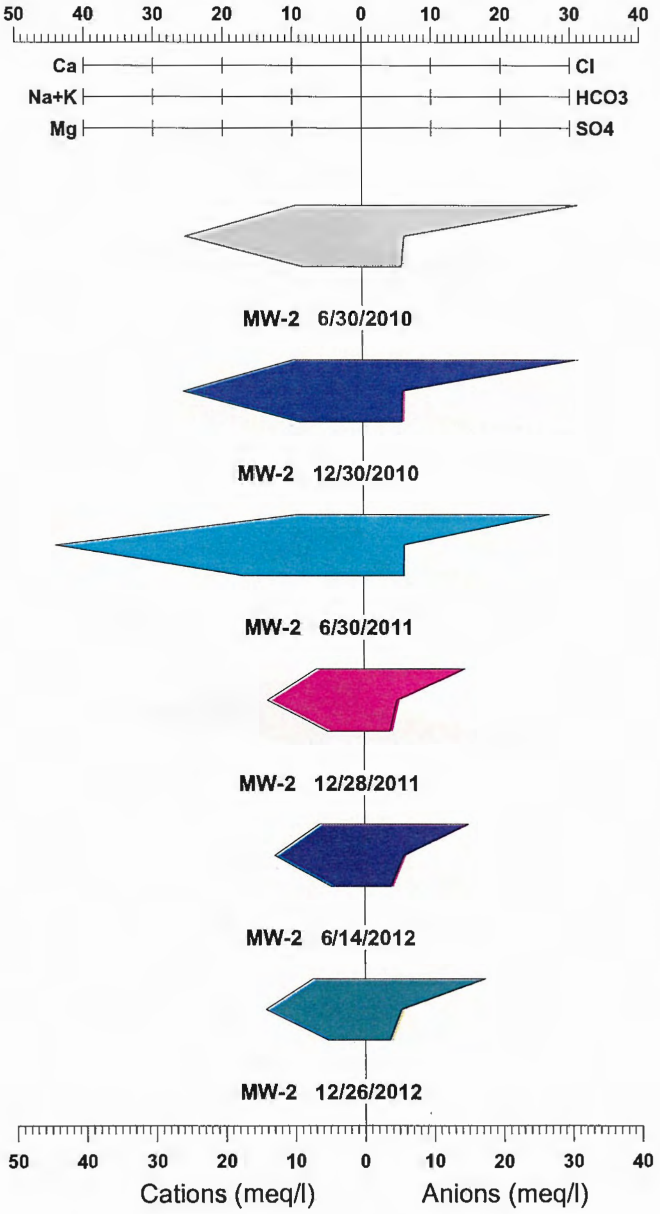
# PVT Landfill

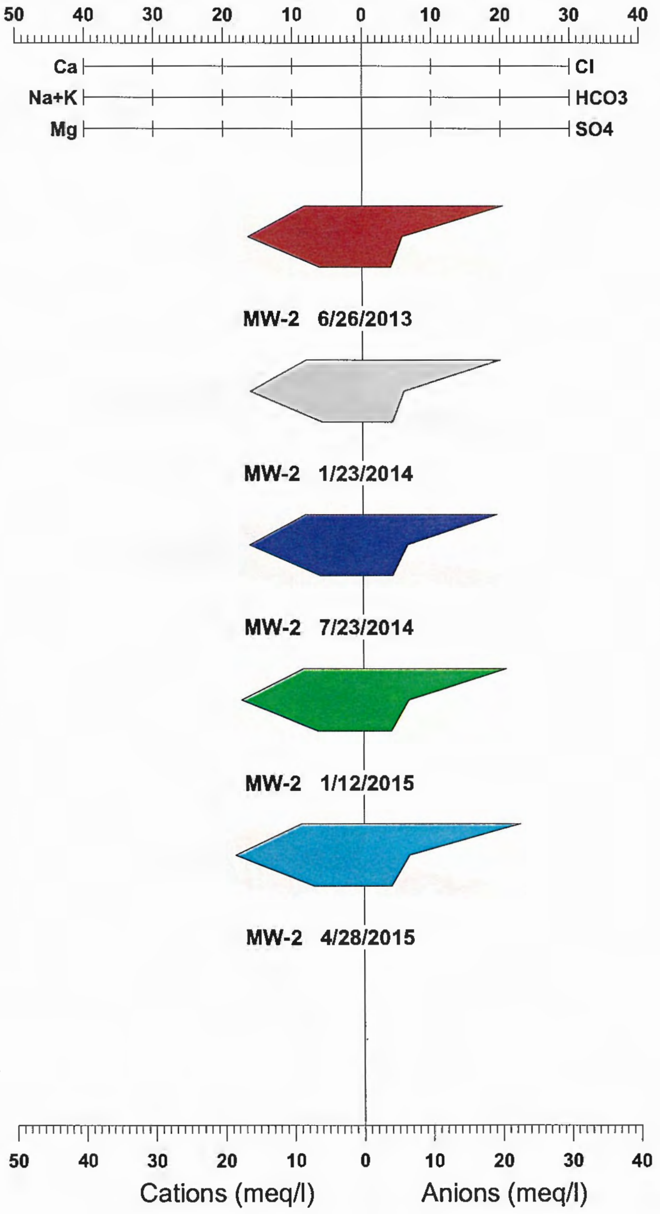


# PVT Landfill



# PVT Landfill





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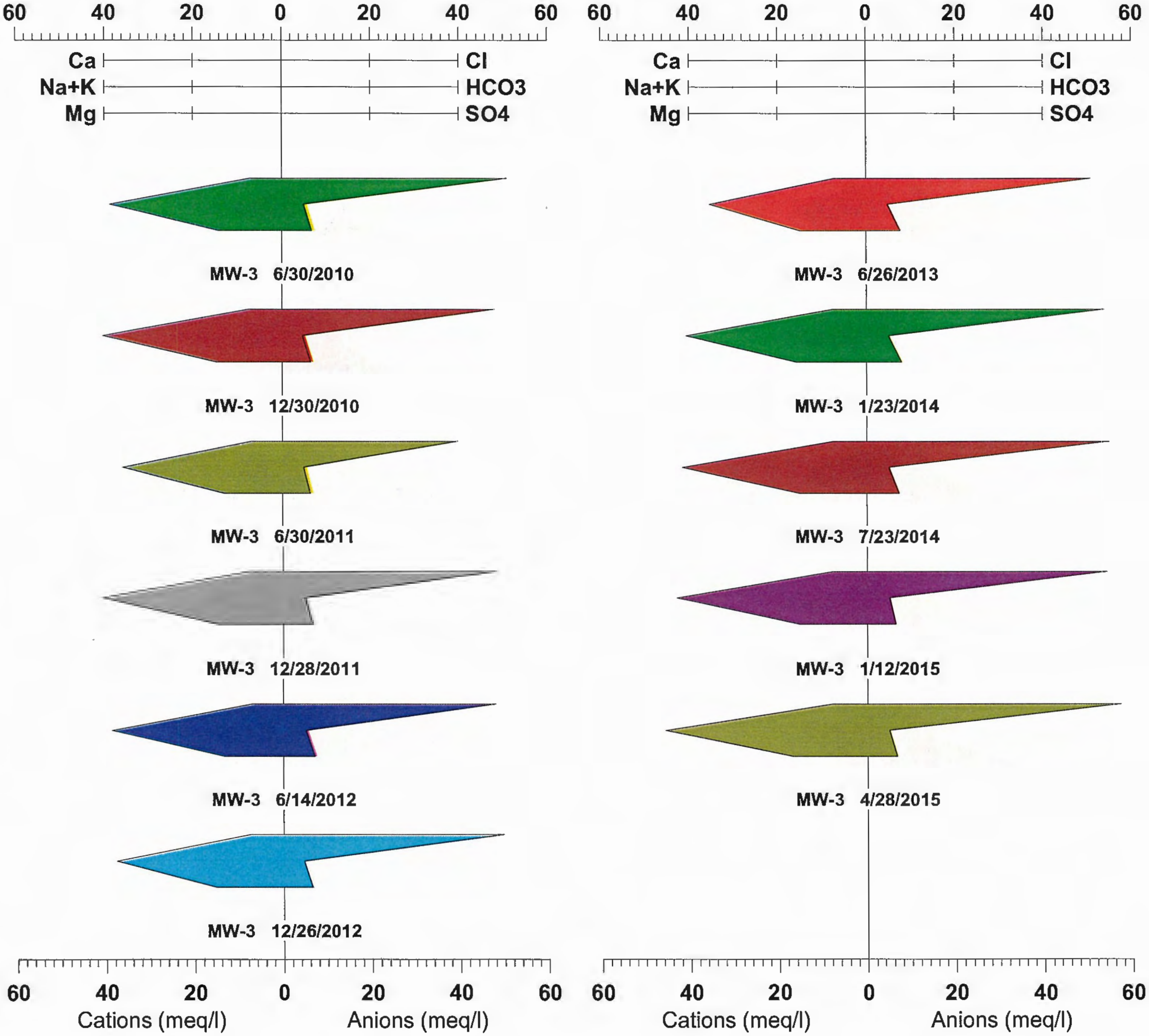

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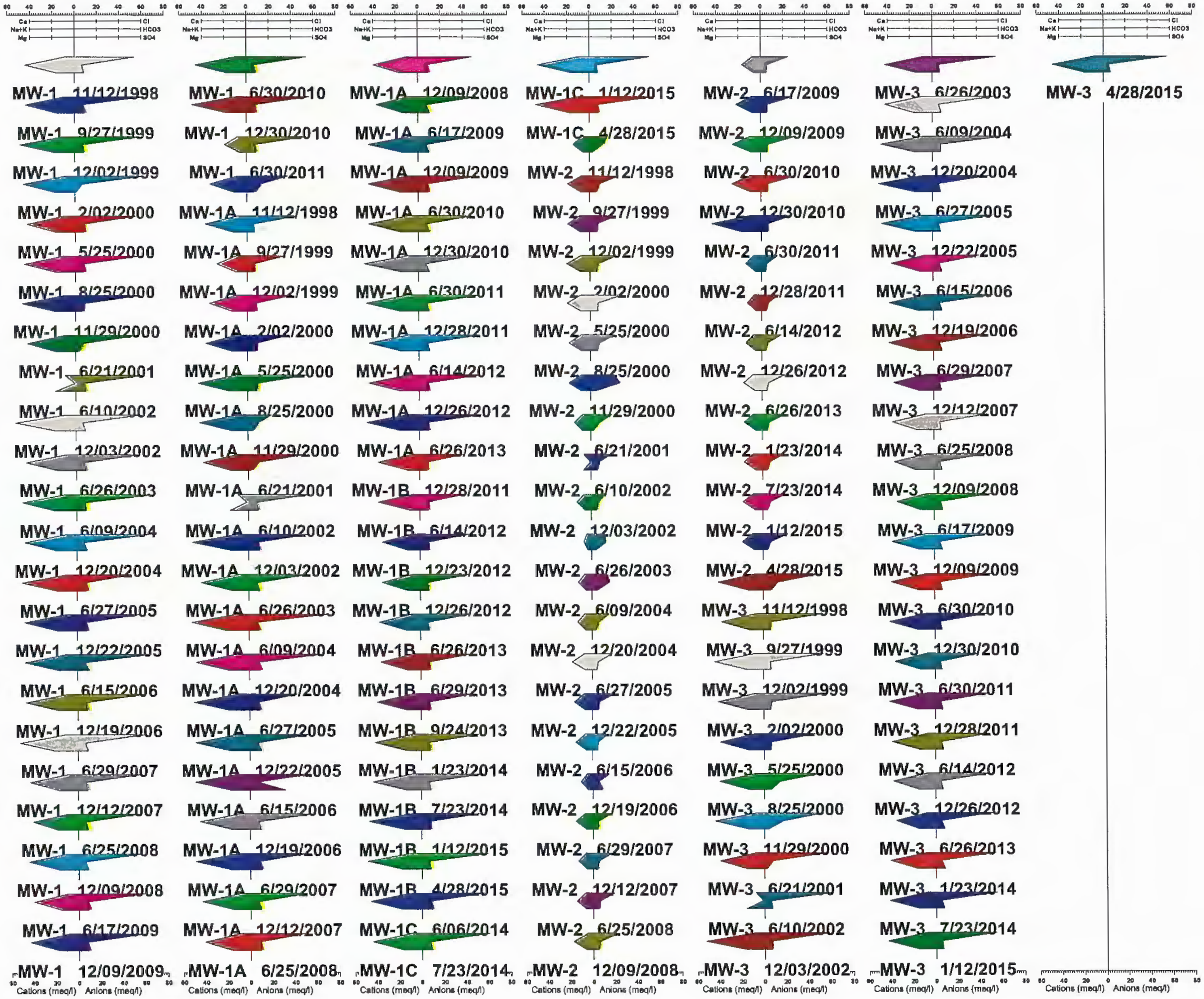
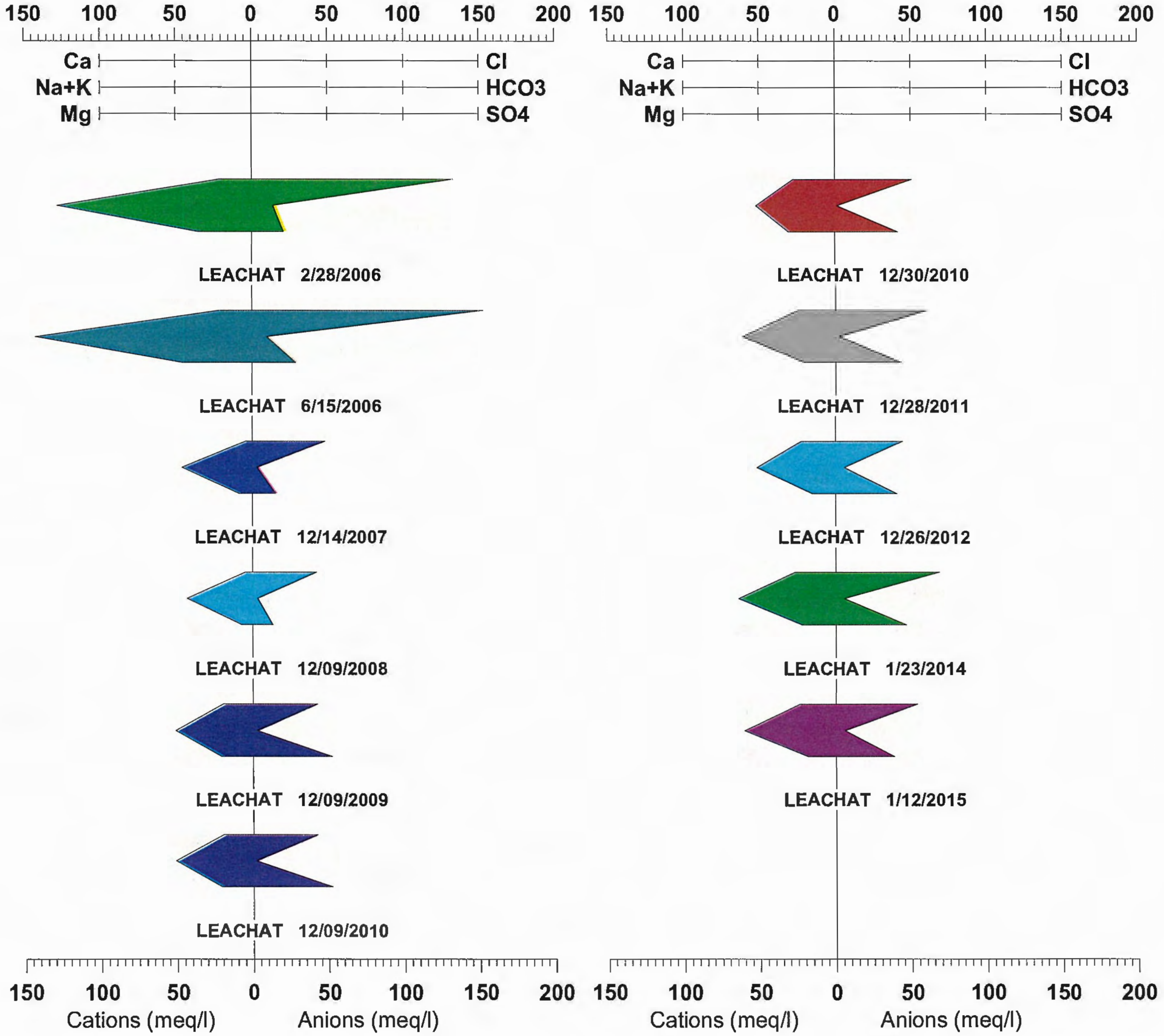


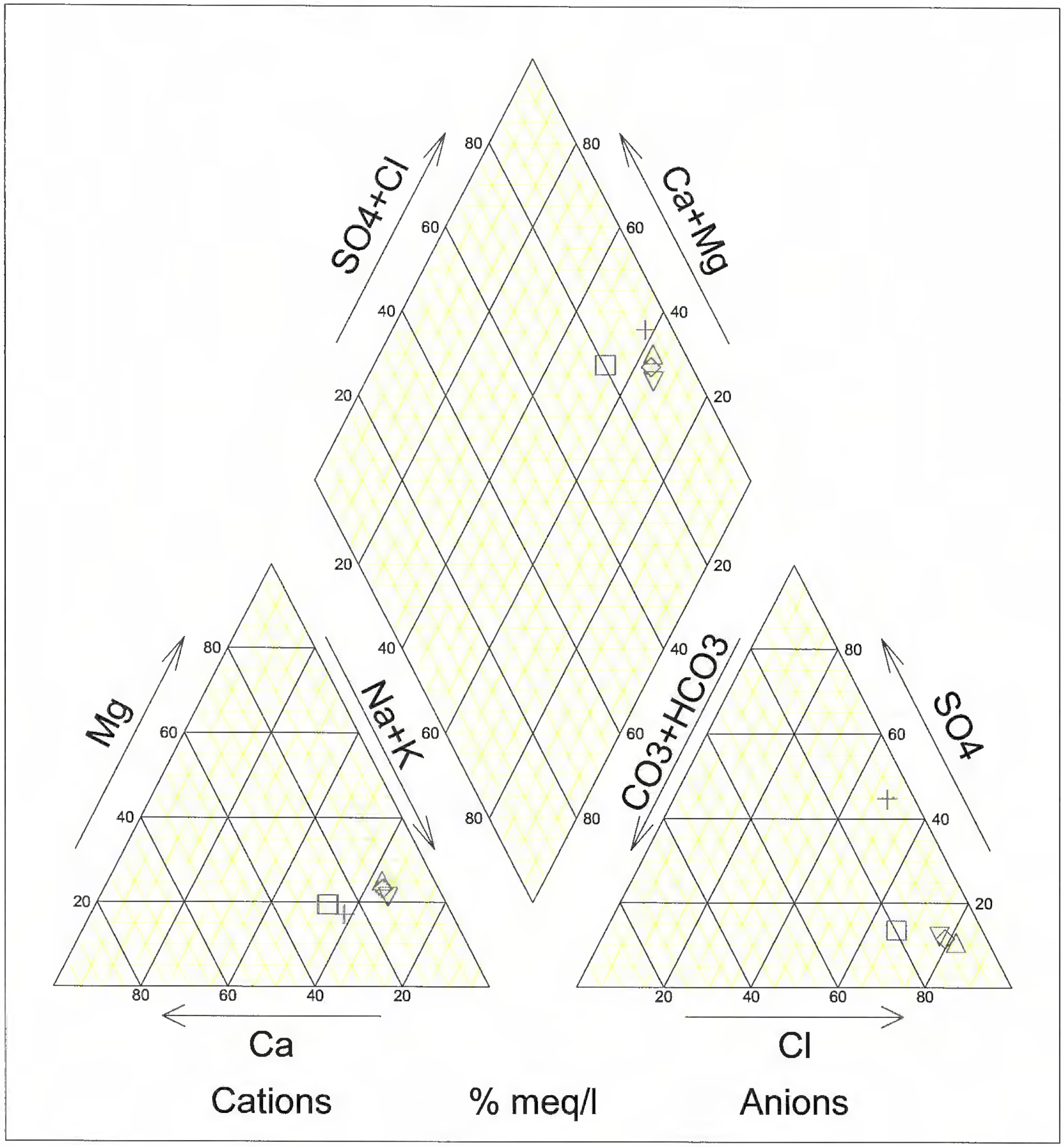
# PVT Landfill



# PVT Landfill

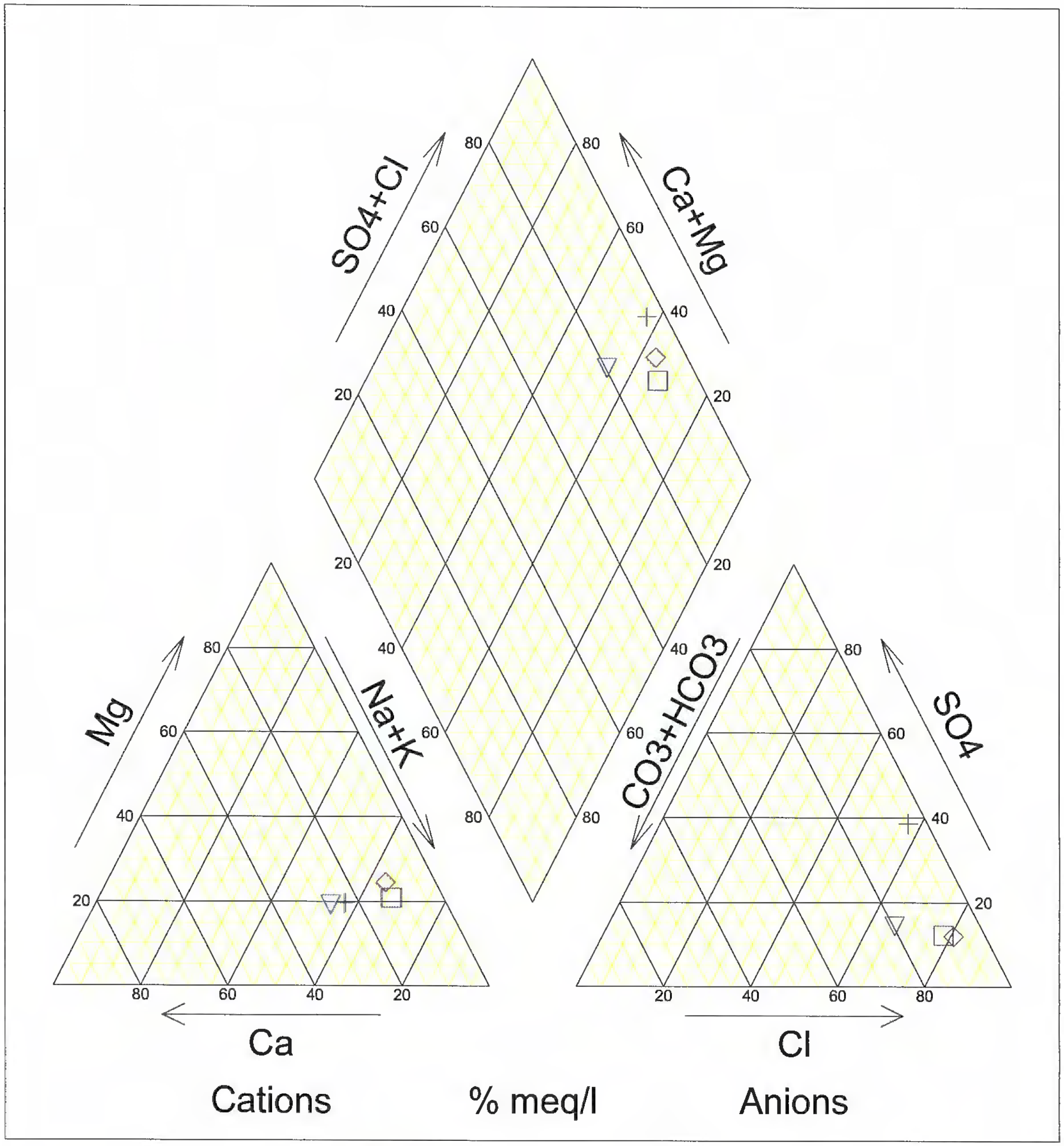
| | | |
|---|---|---|
| + | LEACHAT | 12/26/2012 |
| ◇ | MW-1A | 12/26/2012 |
| ▽ | MW-1B | 12/26/2012 |
| □ | MW-2 | 12/26/2012 |
| △ | MW-3 | 12/26/2012 |

1



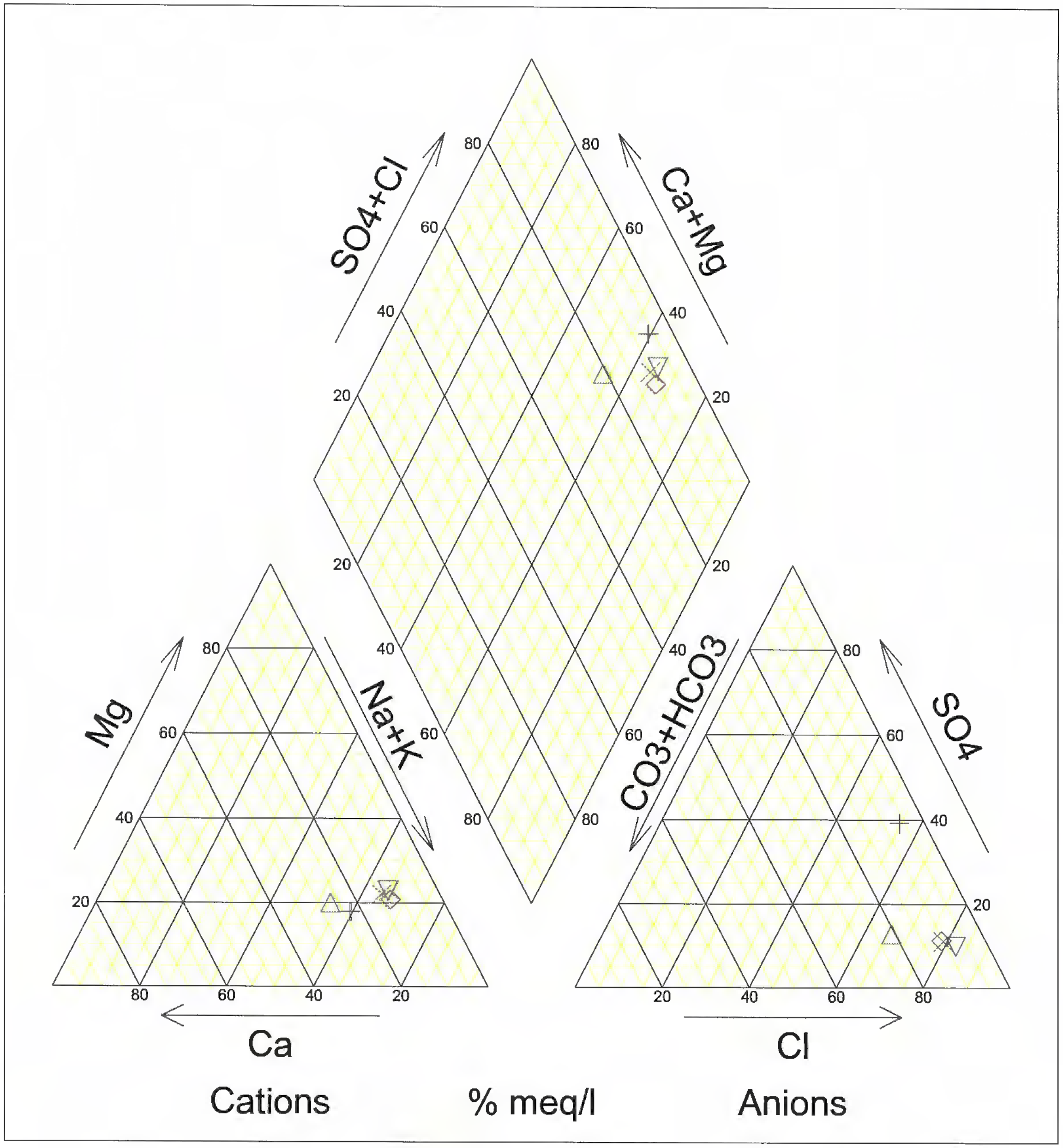
# PVT Landfill

| | | |
|---|---|---|
| + | LEACHAT | 1/23/2014 |
| □ | MW-1B | 1/23/2014 |
| ▽ | MW-2 | 1/23/2014 |
| ◇ | MW-3 | 1/23/2014 |



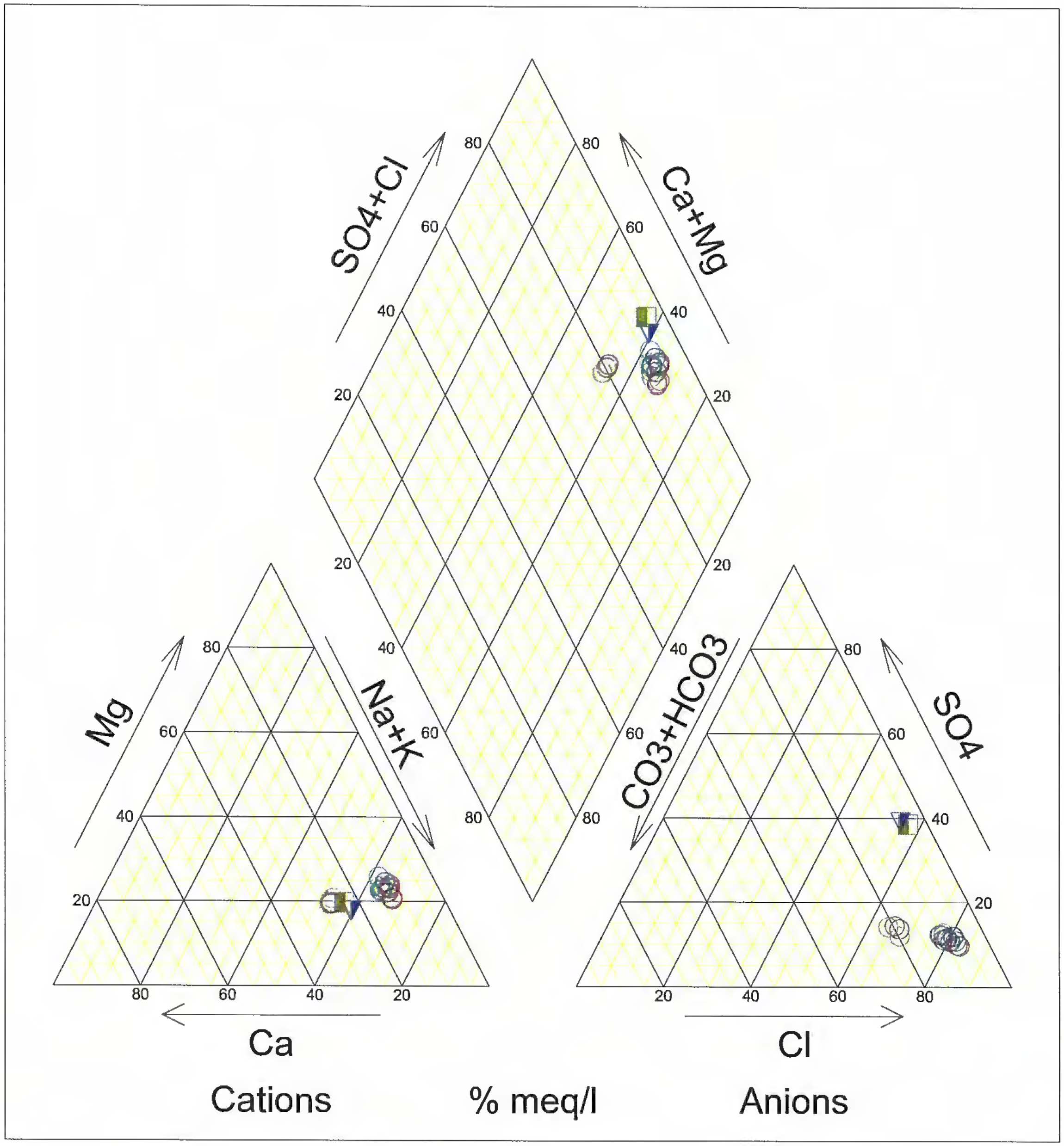
# PVT Landfill

| | | |
|---|---|---|
| △ | MW-2 | 1/12/2015 |
| ✕ | MW-1C | 1/12/2015 |
| + | LEACHAT | 1/12/2015 |
| ◇ | MW-1B | 1/12/2015 |
| ▽ | MW-3 | 1/12/2015 |

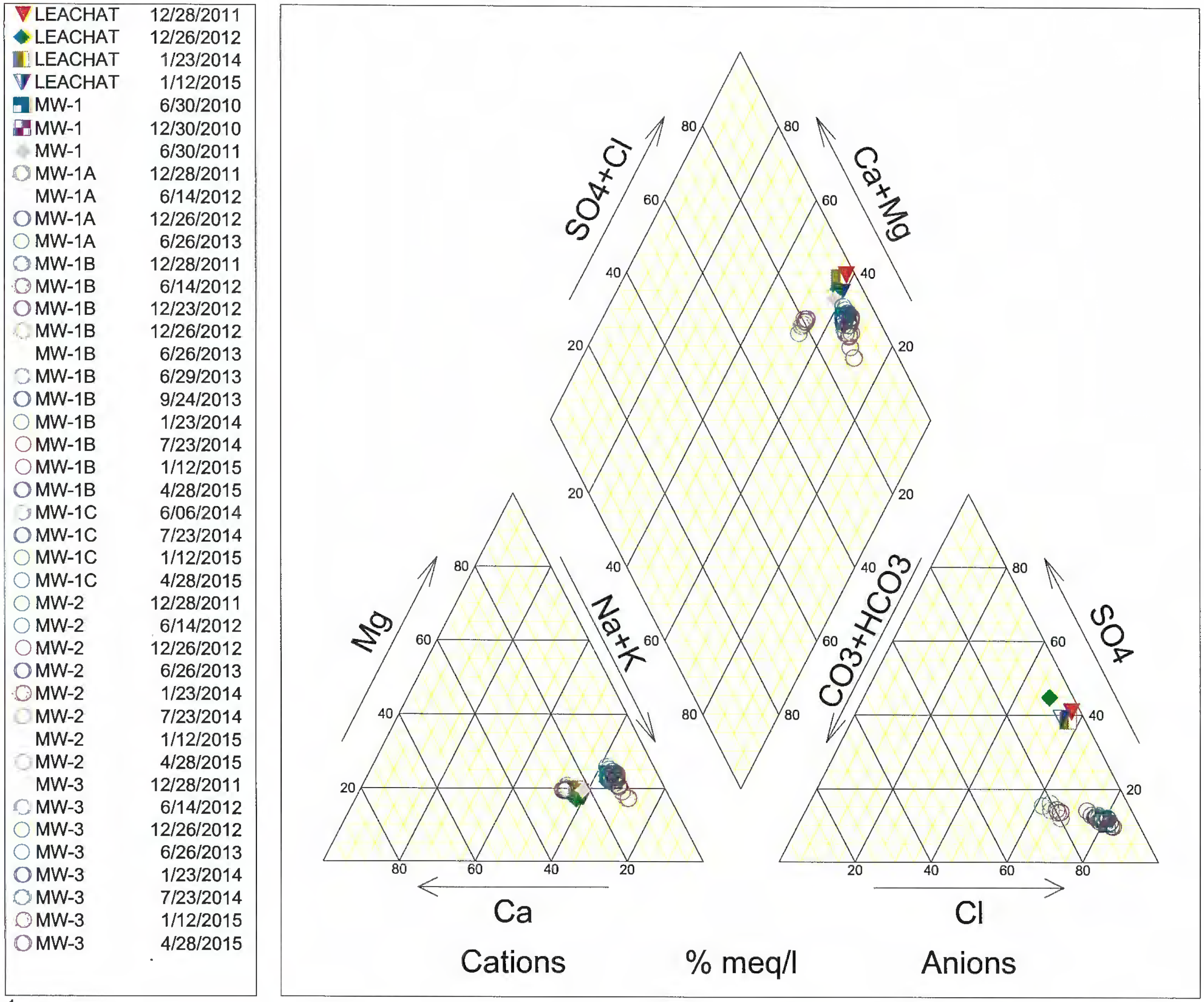


# PVT Landfill

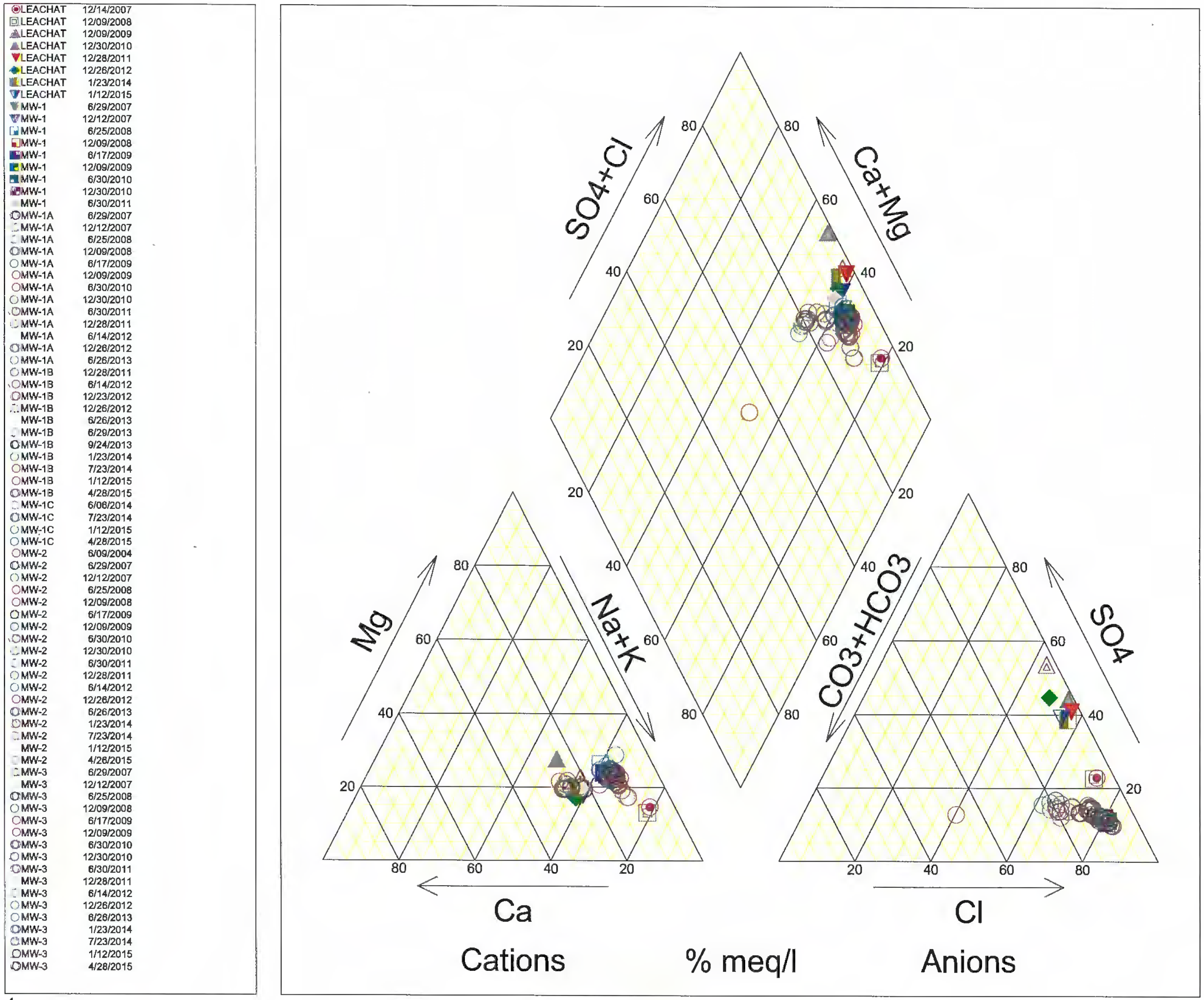
| | | |
|---|---|---|
| ▨ | LEACHAT | 1/23/2014 |
| ▼ | LEACHAT | 1/12/2015 |
| ○ | MW-1A | 6/26/2013 |
| | MW-1B | 6/26/2013 |
| ○ | MW-1B | 6/29/2013 |
| ○ | MW-1B | 9/24/2013 |
| ○ | MW-1B | 1/23/2014 |
| ○ | MW-1B | 7/23/2014 |
| ○ | MW-1B | 1/12/2015 |
| ○ | MW-1B | 4/28/2015 |
| ○ | MW-1C | 6/06/2014 |
| ○ | MW-1C | 7/23/2014 |
| ○ | MW-1C | 1/12/2015 |
| ○ | MW-1C | 4/28/2015 |
| ○ | MW-2 | 6/26/2013 |
| ○ | MW-2 | 1/23/2014 |
| ○ | MW-2 | 7/23/2014 |
| | MW-2 | 1/12/2015 |
| ○ | MW-2 | 4/28/2015 |
| ○ | MW-3 | 6/26/2013 |
| ○ | MW-3 | 1/23/2014 |
| ○ | MW-3 | 7/23/2014 |
| ○ | MW-3 | 1/12/2015 |
| ○ | MW-3 | 4/28/2015 |



# PVT Landfill



# PVT Landfill



# Attachment 5

## Boring Logs and Well Construction Diagrams

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# LOG OF EXPLORATORY BORING

**Project No.:** 37848.00 **Date:** 2/7/92
**Client:** Kyowa Nanakuli Land Company
**Location:** Nanakuli
**Logged By:** DL **Driller:** Sho

**BORING NO.** MW-1
Sheet 1 of 7

**Field Location of Boring:**
500 Feet West of Lualualei Magazine Road and
500 Feet South of Cement Plant

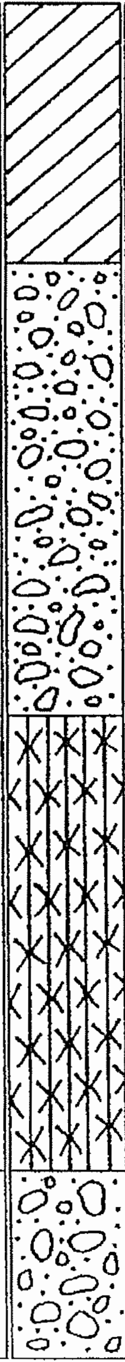
**Ground Elevation:** **Datum:** MSL

**Drilling Method:** Mobil B-80, 8" Hollow-stem Augers

**Hole Diameter:** 8"

**Casing Installation Data:** 15' Screen, 30' Solid

| | | | | |
|---|---|---|---|---|
| **Water Level** | 49.95 | 49.73 | 50.8 | |
| **Time** | 1415 | 1441 | 0833 | |
| **Date** | 2/10/92 | 2/10/92 | 2/11/92 | |



| Blow Counts (blows/ 0.5 ft) | PID / OVA (ppm) | DEPTH | SAMPLE | Soil Group Symbol (uscs) | Litho-grahic Symbol | DESCRIPTION |
|---|---|---|---|---|---|---|
| | | | | CH | | CLAY: Brown, with some silt and some sand, medium stiff, calcareous, dry (alluvium) |
| 0900 | | 1 | | | | |
| 5 | | | | | | |
| 30 | | 2 | | | | MW-1-1 |
| 50 | | | | | | CONGLOMERATE: Tannish white, very dense, moderately cemented, dry (beach |
| | | 3 | | | | deposit) |
| | | | | | | |
| | | 4 | | | | |
| | | | | | | |
| 0905 | | 5 | | | | |
| 60/5" | | | | | | MW-1-2 |
| | | 6 | | | | |
| | | | | | | CORAL: Tannish white, very dense, well cemented, dry (fossil reef) |
| | | 7 | | | | |
| | | | | | | Hard drilling |
| | | 8 | | | | |
| | | | | | | |
| | | 9 | | | | |
| | | | | | | CONGLOMERATE: Tannish white, with silt, medium dense, moderately cemented, |
| 0915 | | 10 | | | | damp (intrareef deposit) |
| 11 | | | | | | MW-1-3 |

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# LOG OF EXPLORATORY BORING

**Project No.:** 37848.00
**Date:** 2/7/92
**Client:** Kyowa Nanakuli Land Company
**Location:** Nanakuli
**Logged By:** DL
**Driller:** Sho

**BORING NO.** MW-1
Sheet 2 of 7

**Field Location of Boring:**
500 Feet West of Lualualei Magazine Road and
500 Feet South of Cement Plant

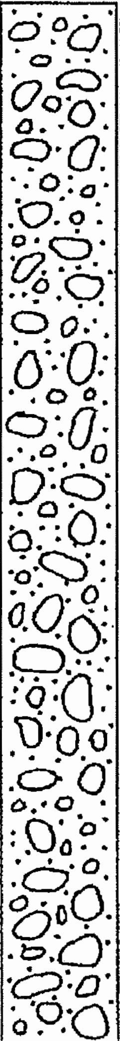
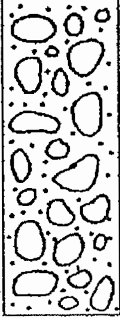
**Ground Elevation:**
**Datum:** MSL

**Drilling Method:** Mobil B-80, 8" Hollow-stem Augers

**Hole Diameter:** 8"

**Casing Installation Data:** 15' Screen, 30' Solid

| | | | | |
|---|---|---|---|---|
| **Water Level** | | | | |
| **Time** | | | | |
| **Date** | | | | |

| Blow Counts (blows/ 0.5 ft) | PID / OVA (ppm) | DEPTH | SAMPLE | Soil Group Symbol (uscs) | Litho-grahic Symbol | DESCRIPTION |
|---|---|---|---|---|---|---|
| 11 | | | | |  | CONGLOMERATE: Tannish white, with silt, medium dense, moderately cemented, |
| 13 | | 11 | | | | calcareous damp (intrareef deposit) |
| 19 | | | | | | |
| | | 12 | | | | |
| | | | | | | Easy drilling |
| | | 13 | | | | |
| | | | | | | |
| | | 14 | | | | |
| | | | | | | |
| 0925 | | 15 | | | | |
| 13 | | | | | | Same |
| 10 | | 16 | | | | MW-1-4 |
| 11 | | | | | | |
| | | 17 | | | | |
| | | | | | | |
| | | 18 | | | | |
| | | | | |  | CONGLOMERATE: Tannish white, with silt, medium dense, well cemented, |
| | | 19 | | | | damp (intrareef deposit) |
| | | | | | | |
| | | 20 | | | | |
| 0941 | | | | | | |

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# LOG OF EXPLORATORY BORING

Project No.: 37848.00
Date: 2/7/92
Client: Kyowa Nanakuli Land Company
Location: Nanakuli
Logged By: DL
Driller: Sho

**BORING NO.** MW-1
Sheet 3 of 7

**Field Location of Boring:**
500 Feet West of Lualualei Magazine Road and
500 Feet South of Cement Plant

**Ground Elevation:**
Datum: MSL

**Drilling Method:** Mobile B-80, 8" Hollow-stem Augers

**Hole Diameter:** 8"

**Casing Installation Data:** 15' Screen, 30' Solid

| | | | | |
|---|---|---|---|---|
| Water Level | | | | |
| Time | | | | |
| Date | | | | |

| Blow Counts (blows/ 0.5 ft) | PID / OVA (ppm) | DEPTH | SAMPLE | Soil Group Symbol (uscs) | Lithographic Symbol | DESCRIPTION |
|---|---|---|---|---|---|---|
| 0941 | | | | | | CONGLOMERATE: Tannish white, with silt, dense to very dense, well cemented, |
| 19 | | 21 | | | | calcareous, damp (intrareef deposit) |
| 68 | | | | | | MW-1-5 |
| 15 | | 22 | | | | |
| | | | | | | |
| | | 23 | | | | |
| | | | | | | |
| | | 24 | | | | |
| | | | | | | |
| 0951 | | 25 | | | | CONGLOMERATE: Brownish tan, with silt, medium dense, weakly cemented, |
| 10 | | | | | | calcareous, damp (intrareef deposit) |
| 10 | | 26 | | | | MW-1-6 |
| 13 | | | | | | |
| | | 27 | | | | |
| | | | | | | |
| | | 28 | | | | |
| | | | | | | |
| | | 29 | | | | SILT STONE: Tan, with some coral gravel and sand, medium dense, calcareous, |
| | | | | | | weakly cemented, damp (intrareef or lagoonal sediment) |
| | | 30 | | | | |
| 14 | | | | | | MW-1-7 |

# LOG OF EXPLORATORY BORING

Project No.: 37848.00
Date: 2/7/92
Client: Kyowa Nanakuli Land Company
Location: Nanakuli
Logged By: DL
Driller: Sho

**BORING NO.** MW-1
Sheet 4 of 7

**Field Location of Boring:**
500 Feet West of Lualualei Magazine Road and
500 Feet South of Cement Plant

**Ground Elevation:**
**Datum:** MSL

**Drilling Method:** Mobil B-80, 8" Hollow-stem Augers

**Hole Diameter:** 8"

**Casing Installation Data:** 15' Screen, 30' Solid

| | | | | |
|---|---|---|---|---|
| Water Level | | | | |
| Time | | | | |
| Date | | | | |

| Blow Counts (blows/ 0.5 ft) | PID OVA (ppm) | DEPTH | SAMPLE | Soil Group Symbol (uscs) | Litho-graphic Symbol | DESCRIPTION |
|---|---|---|---|---|---|---|
| 14 | | | | | | SILT STONE: Tan, with some coral gravel and sand, medium dense, calcareous, |
| 13 | | 31 | | | | damp (intrareef or lagoonal sediment) |
| 14 | | | | | | MW-1-7 |
| | | 32 | | | | |
| | | | | | | |
| | | 33 | | | | |
| | | | | | | |
| | | 34 | | SM | | SILTY SAND: Brown, with some coral gravel, dense to very dense, calcareous, |
| | | | | | | damp (intrareef or lagoonal sediment) |
| 1037 | | 35 | | | | |
| 21 | | | | | | |
| 36 | | 36 | | | | MW-1-8 |
| 21 | | | | | | |
| | | 37 | | | | |
| | | | | ML | | CLAYEY SILT: Brown, with some sand, stiff, damp (alluvium) |
| | | 38 | | | | |
| | | | | | | Difficult drilling |
| | | 39 | | | | |
| | | | | SP | | SAND: Grayish brown, with silt, poorly graded, very dense, terrigenous, dry |
| 1124 | | 40 | | | | (alluvium) |
| 30 | | | | | | MW-1-9 |

# LOG OF EXPLORATORY BORING

**Project No.:** 37848.00
**Date:** 2/7/92
**Client:** Kyowa Nanakuli Land Company
**Location:** Nanakuli
**Logged By:** DL
**Driller:** Sho

**BORING NO.** MW-1
Sheet 5 of 7

**Field Location of Boring:**
500 Feet West of Lualualei Magazine Road and
500 Feet South of Cement Plant

**Ground Elevation:**
**Datum:** MSL

**Drilling Method:** Mobile B-80, 8" Hollow-stem Augers

**Hole Diameter:** 8"

**Casing Installation Data:** 15' Screen, 30' Solid

| | | | | |
|---|---|---|---|---|
| Water Level | | | | |
| Time | | | | |
| Date | | | | |

| Blow Counts (blows/ 0.5 ft) | PID / OVA (ppm) | DEPTH | SAMPLE | Soil Group Symbol (uscs) | Litho-grahic Symbol | DESCRIPTION |
|---|---|---|---|---|---|---|
| 30 | | | | SM | | SAND: Grayish brown, with silt, poorly graded, very dense, terrigenous, dry |
| 60/3" | | 41 | | | | (alluvium) MW-1-9 |
| | | | | | | |
| | | 42 | | | | |
| | | | | | | |
| | | 43 | | | | Grades, well to moderately cemented |
| | | | | | | |
| | | 44 | | | | |
| | | | | | | |
| 1323 | | 45 | | | | |
| 60/1" | | | | | | Grades, with some coral gravel MW-1-10 |
| | | 46 | | | | |
| | | | | | | Void encountered 46 to 46.5 feet |
| | | 47 | | SM | | |
| | | | | | | |
| | | 48 | | | | |
| | | | | | | |
| | | 49 | | | | |
| | | | | | | SILT STONE: White, with some sand, loose, calcareous, wet (intrareef sediment) |
| 1410 | | 50 | | | | |
| 5 | | | | | | |

# LOG OF EXPLORATORY BORING

**Project No.:** 37848.00
**Date:** 2/7/92
**Client:** Kyowa Nanakuli Land Company
**Location:** Nanakuli
**Logged By:** DL
**Driller:** Sho

**BORING NO.** MW-1
Sheet 6 of 7

**Field Location of Boring:**
500 Feet West of Lualualei Magazine Road and
500 Feet South of Cement Plant

**Ground Elevation:**
**Datum:** MSL

**Drilling Method:** Mobile B-80, 8" Hollow-stem Augers

**Hole Diameter:** 8"

**Casing Installation Data:** 15' Screen, 30' Solid

| | | | | |
|---|---|---|---|---|
| Water Level | | | | |
| Time | | | | |
| Date | | | | |

| Blow Counts (blows/ 0.5 ft) | PID / OVA (ppm) | DEPTH | SAMPLE | Soil Group Symbol (uscs) | Litho-grahic Symbol | DESCRIPTION |
|---|---|---|---|---|---|---|
| 5 | | | | | | SILT STONE: White, with some sand, loose, calcareous, wet (intrareef sediment) |
| 4 | | 51 | | | | MW-1-11 |
| 2 | | | | | | Void encountered 51 to 51.5 feet |
| | | 52 | | | | |
| | | | | | | |
| | | 53 | | | | |
| | | | | | | |
| | | 54 | | | | |
| | | | | | | SAND STONE: White, with trace of silt and gravel, medium dense, calcareous |
| | | 55 | | | | (lagoonal deposit) |
| 14 | | | | | | |
| 50 | | 56 | | | | MW-1-12 |
| 50 | | | | | | |
| 1445 | | 57 | | | | |
| | | | | | | |
| | | 58 | | | | |
| | | | | | | SILT STONE: White, with trace of sand and gravel, dense, calcareous |
| | | 59 | | | | (lagoonal deposit) |
| | | | | | | |
| | | 60 | | | | |
| 40 | | | | | | |

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# LOG OF EXPLORATORY BORING

Project No.: 37848.00
Date: 2/7/92
Client: Kyowa Nanakuli Land Company
Location: Nanakuli
Logged By: DL
Driller: Sho

**BORING NO.** MW-1
Sheet 7 of 7

**Field Location of Boring:**
500 Feet West of Lualualei Magazine Road and
500 Feet South of Cement Plant

**Ground Elevation:**
**Datum:** MSL

**Drilling Method:** Mobile B-80, 8" Hollow-stem Augers

**Hole Diameter:** 8"

**Casing Installation Data:** 15' Screen, 30' Solid

| | | | | |
|---|---|---|---|---|
| Water Level | | | | |
| Time | | | | |
| Date | | | | |

| Blow Counts (blows/ 0.5 ft) | PID / OVA (ppm) | DEPTH | SAMPLE | Soil Group Symbol (uscs) | Litho-grahic Symbol | DESCRIPTION |
|---|---|---|---|---|---|---|
| 40 | | | | | ▨ | SILT STONE: White, with trace of sand and gravel, dense, calcareous |
| 21 | | 61 | | | ▨ | (lagoonal deposit) |
| 28 | | | | | ▨ | MW-1-13 |
| 0850 | | 62 | | | | TOTAL DEPTH: 61.5 feet |
| | | | | | | Groundwater encountered at approximately 50 feet |
| | | 63 | | | | |
| | | | | | | |
| | | 64 | | | | |
| | | | | | | |
| | | 65 | | | | |
| | | | | | | |
| | | 66 | | | | |
| | | | | | | |
| | | 67 | | | | |
| | | | | | | |
| | | 68 | | | | |
| | | | | | | |
| | | 69 | | | | |
| | | | | | | |
| | | 70 | | | | |
| | | | | | | |

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# WELL DETAILS

PROJECT NUMBER: 37848.00
PROJECT NAME: Kyowa Nanakuli Landfill
COUNTY: Honolulu
DATE: 2/11/92

BORING/WELL NO.: MW-1
TOP OF CASING ELEV.: 51.34'
GROUND SURFACE ELEV.: ~50.9'
DATUM: MSL

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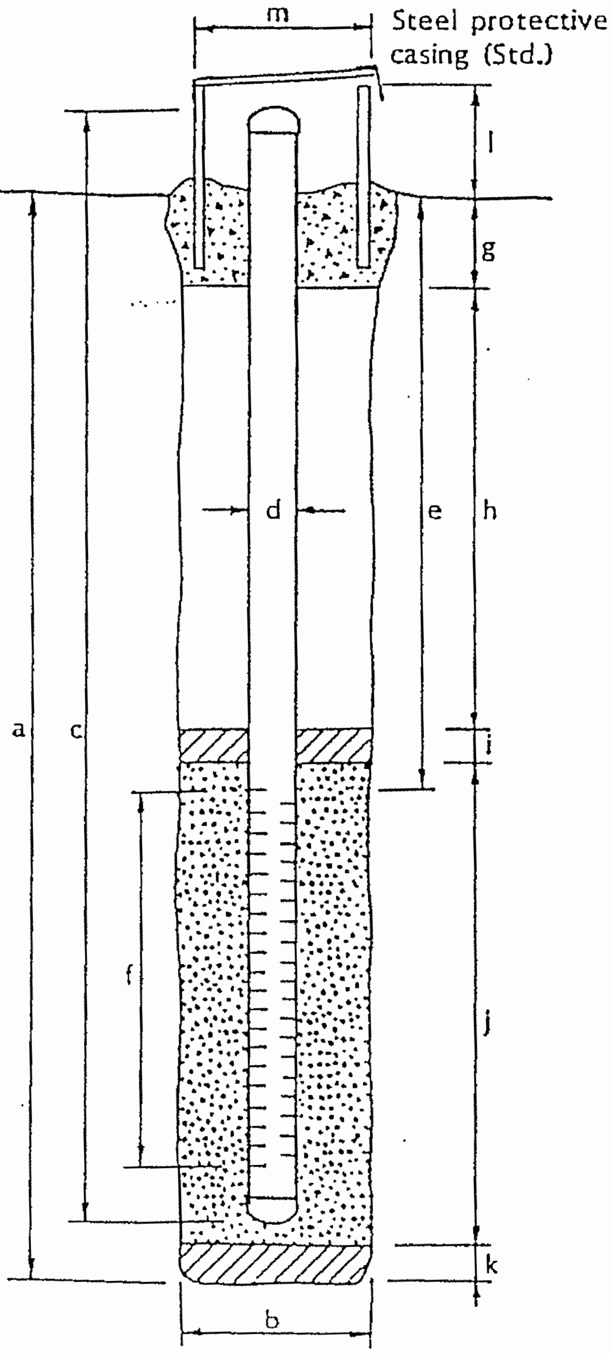

## EXPLORATORY BORING

| | |
|---|---|
| a. Total depth: | 61.5 ft. |
| b. Diameter: | 8 in. |
| Drilling Method: | Mobile B-80 with 8" Hollowstem Auger |

## WELL CONSTRUCTION

| | |
|---|---|
| c. Casing length: | 60 ft. |
| Material: | PVC |
| d. Diameter: | 2 in. |
| e. Depth to top perforations: | 45 ft. |
| f. Perforated length: | 15 ft. |
| Perforated interval from | 45 to 60 ft. |
| Perforation type: | machine |
| Perforation size: | 0.02 |
| g. Surface seal: | NA |
| Seal Material: | |
| h. Backfill: | 42 ft. |
| Backfill Material: | grout |
| i. Seal: | 2 ft. |
| Seal Material: | bentonite |
| j. Gravel pack: | 16 ft. |
| Pack Material: | Monterey #3 Silica Sand |
| k. Bottom seal: | none |
| Seal Material: | |
| l. Casing height: | 0.4 ft. |
| m. Protective casing diameter: | 8 in. |

# LOG OF EXPLORATORY BORING

Project No.: 37848.00 Date: 2/3/92
Client: Kyowa Nanakuli Land Company
Location: Nanakuli
Logged By: DL Driller: Sho

**BORING NO.** MW-2
Sheet 1 of 4

**Field Location of Boring:**
Approximately 1,000 Feet West of Landfill Entrance and Highway Intersection at End of Gravel Road Along Fence Line
**Ground Elevation:** **Datum:** MSL

**Drilling Method:** Mobile B-34L, 8" Hollow-stem Augers
**Hole Diameter:** 8"
**Casing Installation Data:**

| | | | | |
|---|---|---|---|---|
| **Water Level** | 29.7 | 30.5 | | |
| **Time** | 0925 | 0945 | | |
| **Date** | 2/6/92 | 2/6/92 | | |

| Blow Counts (blows/ 0.5 ft) | PID / OVA (ppm) | DEPTH | SAMPLE | Soil Group Symbol (uscs) | Litho-grahic Symbol | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1323 | | | | SM | | SILTY SAND: Light tan, with coral gravel, medium dense, dry (fill) |
| | | 1 | | | | SAND STONE: Yellowish tan, moderately to well cemented, very dense, calcareous, |
| | | | | | | dry (beach deposit) |
| | | 2 | | | | MW-2-1 |
| | | | | | | |
| 1333 | | 3 | | | | SILTY SAND STONE: Tannish white, with coral gravel, very dense, calcareous, 10% |
| 1336 | | | | | | porous, widely fractured, dry (beach deposit) |
| | | 4 | | | | [very hard augering] |
| | | | | | | |
| 1344 | | 5 | | | | |
| 60 | | | | | | MW-2-2 |
| 1415 | | 6 | | | | |
| | | | | | | |
| | | 7 | | | | |
| | | | | | | |
| | | 8 | | | | |
| | | | | | | |
| | | 9 | | | | |
| 1435 | | | | | | Stop for the day, resume, air coring begins |
| 1015 | | 10 | | | | MW-2-3 |
| | | | | | | |

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# LOG OF EXPLORATORY BORING

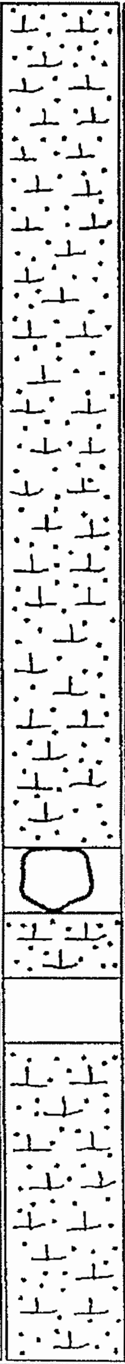
**Project No.:** 37848.00 **Date:** 2/3/92
**Client:** Kyowa Nanakuli Land Company
**Location:** Nanakuli
**Logged By:** DL **Driller:** Sho

**BORING NO.:** MW-2
Sheet 2 of 4

**Field Location of Boring:** Approximately 1,000 Feet West of Landfill Entrance and Highway Intersection at End of Gravel Road Along Fence Line
**Ground Elevation:** **Datum:** MSL

**Drilling Method:** Mobile B-34L, 8" Hollow-stem Augers
**Hole Diameter:** 8"
**Casing Installation Data:**

| | | | | |
|---|---|---|---|---|
| Water Level | | | | |
| Time | | | | |
| Date | | | | |



| Blow Counts (blows/ 0.5 ft) | PID / OVA (ppm) | DEPTH | SAMPLE | Soil Group Symbol (uscs) | Litho-grahic Symbol | DESCRIPTION |
|---|---|---|---|---|---|---|
| | | | | | | SILTY SAND STONE: Tannish white, with coral gravel, very dense, calcareous, 10% |
| | | 11 | | | | porous, widely fractured, well cemented, dry (beach deposit) |
| | | | | | | Core run 1 - 9.5 to 14.5 feet |
| | | 12 | | | | REC 62/62 = 100% |
| | | | | | | RQD 62/62 = 100% |
| | | 13 | | | | |
| | | | | | | Same material |
| 1030 | | 14 | | | | |
| | | | | | | |
| 1105 | | 15 | | | | Core run 2 - 14.5 to 19.5 feet |
| | | | | | | REC 55/60 = 92% |
| | | 16 | | | | RQD 40/60 = 67% |
| | | | | | | |
| | | 17 | | | | Coral boulder encountered at 16.5 to 17 feet |
| | | | | | | |
| | | 18 | | | | Void encountered 17.5 to 18 feet |
| | | | | | | Same material |
| | | 19 | | | | |
| | | | | | | |
| | | 20 | | | | |
| | | | | | | |

# LOG OF EXPLORATORY BORING

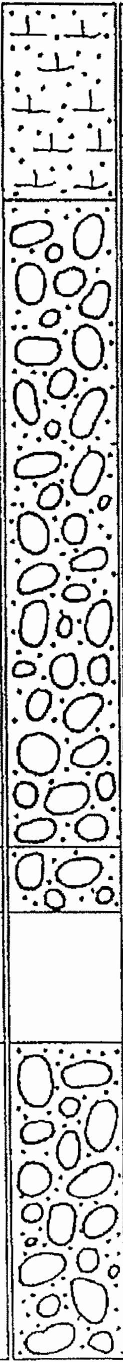
**Project No.:** 37848.00
**Date:** 2/3/92
**Client:** Kyowa Nanakuli Land Company
**Location:** Nanakuli
**Logged By:** DL
**Driller:** Sho

**BORING NO.** MW-2
Sheet 3 of 4

**Field Location of Boring:** Approximately 1,000 Feet West of Landfill Entrance and Highway Intersection at End of Gravel Road Along Fence Line
**Ground Elevation:**
**Datum:** MSL

**Drilling Method:** Mobile B-34L, 8" Hollow-stem Augers
**Hole Diameter:** 8"
**Casing Installation Data:**

| | | | | |
|---|---|---|---|---|
| Water Level | | | | |
| Time | | | | |
| Date | | | | |



| Blow Counts (blows/ 0.5 ft) | PID OVA (ppm) | DEPTH | SAMPLE | Soil Group Symbol (uscs) | Litho-graphic Symbol | DESCRIPTION |
|---|---|---|---|---|---|---|
| | | | | | | Core run 3 - 19.5 to 24.5 feet |
| | | 21 | | | | REC 59/60 = 98% |
| | | | | | | RQD 50/60 = 83% |
| | | 22 | | | | CONGLOMERATE: Tannish white, with silt, very dense, well cemented, calcareous, |
| | | | | | | grades more porous, widely fractured, dry (beach deposit) |
| | | 23 | | | | |
| | | | | | | |
| | | 24 | | | | |
| 1055 | | | | | | Core run 4 - 24.5 to 29.5 feet |
| | | 25 | | | | REC 36/60 = 60% |
| | | | | | | RQD 12/60 = 20% |
| | | 26 | | | | |
| | | | | | | |
| | | 27 | | | | CONGLOMERATE: Yellowish tan, medium dense, moderately cemented, calcareous, |
| | | | | | | dry |
| | | 28 | | | | Void encountered at 27 to 28 feet |
| | | | | | | CONGLOMERATE: Yellowish tan, medium dense, calcareous, dry |
| | | 29 | | | | |
| 1107 | | | | | | |
| | | 30 | | | | |
| | | | | | | |

# LOG OF EXPLORATORY BORING

**Project No.:** 37848.00 **Date:** 2/3/92
**Client:** Kyowa Nanakuli Land Company
**Location:** Nanakuli
**Logged By:** DL **Driller:** Sho

**BORING NO.** MW-2

Sheet 4 of 4

**Field Location of Boring:**
Approximately 1,000 Feet West of Landfill Entrance and Highway Intersection at End of Gravel Road Along Fence Line
**Ground Elevation:** **Datum:** MSL

**Drilling Method:** Mobile B-34L, 8" Hollow-stem Augers
**Hole Diameter:** 8"
**Casing Installation Data:**

| | | | | |
|---|---|---|---|---|
| Water Level | | | | |
| Time | | | | |
| Date | | | | |

| Blow Counts (blows/ 0.5 ft) | PID / OVA (ppm) | DEPTH | SAMPLE | Soil Group Symbol (uscs) | Litho-grahic Symbol | DESCRIPTION |
|---|---|---|---|---|---|---|
| | | | | | | CONGLOMERATE: Yellowish tan, medium dense, moderately cemented, calcareous, |
| | | 31 | | | | dry |
| | | | | | | |
| | | 32 | | | | |
| | | | | | | |
| | | 33 | | | | |
| | | | | | | |
| | | 34 | | | | SAND STONE: Yellowish tan, with some gravel, moderately to very porous, |
| | | | | | | moderately cemented, calcareous, moderately layered |
| | | 35 | | | | |
| | | | | | | |
| | | 36 | | | | |
| | | | | | | |
| | | 37 | | | | |
| | | | | | | CONGLOMERATE: Tannish white, with silty sand, moderately to weakly cemented, |
| | | 38 | | | | calcareous |
| | | | | | | |
| | | 39 | | | | |
| | | | | | | |
| | | 40 | | | | |
| 1008 | | | | | | TOTAL DEPTH: 40 feet, groundwater encountered at approximately 30 feet |

# WELL DETAILS

PROJECT NUMBER: 37848.00
PROJECT NAME: Kyowa Nanakuli Landfill
COUNTY: Honolulu
DATE: 2/7/92

BORING/WELL NO.: MW-2
TOP OF CASING ELEV.: 30.80'
GROUND SURFACE ELEV.: ~31.2'
DATUM: MSL

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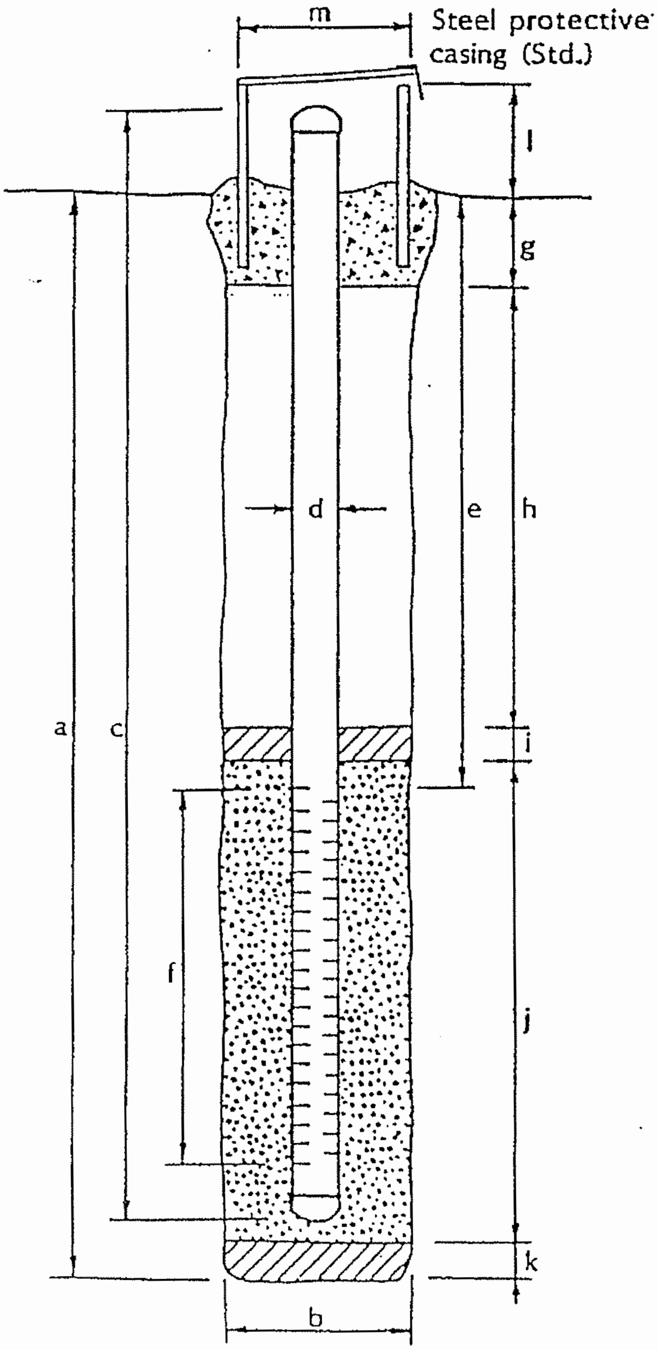

## EXPLORATORY BORING

|  |  |
|---|---|
| a. Total depth: | 40 ft. |
| b. Diameter: | 8 in. |
| Drilling Method: | Mobile B-80 with 8" Hollowstem Auger |

## WELL CONSTRUCTION

|  |  |
|---|---|
| c. Casing length: | 40 ft. |
| Material: | PVC |
| d. Diameter: | 2 in. |
| e. Depth to top perforations: | 20 ft. |
| f. Perforated length: | 20 ft. |
| Perforated interval from | 20 to 40 ft. |
| Perforation type: | machine |
| Perforation size: | 0.02 |
| g. Surface seal: | NA |
| Seal Material: |  |
| h. Backfill: | 14.5 ft. |
| Backfill Material: | grout |
| i. Seal: | 3 ft. |
| Seal Material: | bentonite |
| j. Gravel pack: | 22.5 ft. |
| Pack Material: | Monterey #3 Silica Sand |
| k. Bottom seal: | none |
| Seal Material: |  |
| l. Casing height: | 0.3 ft. |
| m. Protective casing diameter: | 12 in. |

# LOG OF EXPLORATORY BORING

**Project No.:** 37848.00
**Date:** 2/12/92
**Client:** Kyowa Nanakuli Land Company
**Location:** Nanakuli
**Logged By:** DL
**Driller:** Sho

**BORING NO.** MW-3
Sheet 1 of 5

**Field Location of Boring:**
200 Feet East of Lualualei Magazine Road Across from Landfill Entrance

**Ground Elevation:**
**Datum:** MSL

**Drilling Method:** Mobile B-80, 8" Hollow-stem Augers

**Hole Diameter:** 8"

**Casing Installation Data:**

| | | | | |
|---|---|---|---|---|
| **Water Level** | 35.0 | 35.28 | 36.30 | 35.42 |
| **Time** | 1342 | 1402 | 1432 | 0842 |
| **Date** | 2/14/92 | 2/14/92 | 2/14/92 | 2/18/92 |

| Blow Counts (blows/ 0.5 ft) | PID / OVA (ppm) | DEPTH | SAMPLE | Soil Group Symbol (uscs) | Litho-graphic Symbol | DESCRIPTION |
|---|---|---|---|---|---|---|
| 0835 | | | | CH | ▨ | CLAY: Orange-brown, with silt and some sand, soft, terrigenous, dry (alluvium) |
| 61 | | 1 | | | | SAND STONE: Light tan, with some silt, poorly graded, very dense, well cemented, |
| 60 | | | | | | calcareous, dry (lithified beach deposit) |
| 63 | | 2 | | | | MW-3-1 |
| | | | | | | |
| | | 3 | | | | Same material |
| | | | | | | |
| | | 4 | | | | |
| | | | | | | |
| 0843 | | 5 | | | | MW-3-2 |
| 60/1" | | | | | | Grades very well cemented |
| | | 6 | | | | |
| | | | | | | |
| | | 7 | | | | |
| | | | | | | Same material |
| | | 8 | | | | |
| | | | | | | |
| | | 9 | | | | |
| | | | | | | |
| | | 10 | | | | Same. Some fine layering of particle size |
| | | | | | | Core run 1 - 10 to 11 feet |

# LOG OF EXPLORATORY BORING

**Project No.:** 37848.00
**Date:** 2/12/92
**Client:** Kyowa Nanakuli Land Company
**Location:** Nanakuli
**Logged By:** DL
**Driller:** Sho

**BORING NO.** MW-3
Sheet 2 of 5

**Field Location of Boring:**
200 Feet East of Lualualei Magazine Road Across from Landfill Entrance

**Ground Elevation:**
**Datum:** MSL

**Drilling Method:** Mobile B-80, 8" Hollow-stem Augers

**Hole Diameter:** 8"

**Casing Installation Data:**

| | | | | |
|---|---|---|---|---|
| **Water Level** | | | | |
| **Time** | | | | |
| **Date** | | | | |

| Blow Counts (blows/ 0.5 ft) | PID / OVA (ppm) | DEPTH | SAMPLE | Soil Group Symbol (uscs) | Litho-grahic Symbol | DESCRIPTION |
|---|---|---|---|---|---|---|
| | | | | | | SAND STONE: Light tan, with some silt and some fine layering of particle size, |
| | | 11 | | | | well cemented, calcareous, dry (beach deposit) |
| 0924 | | | | | | Core run 1 - 10 to 11 feet |
| | | 12 | | | | |
| | | | | | | |
| | | 13 | | | | |
| | | | | | | SILT STONE: Tan, with some sand and some gravel, very dense, massive, with some |
| 0945 | | 14 | | | | porous zones, well cemented, calcareous, damp (lagoonal deposit) |
| | | | | | | Very hard augering |
| 1028 | | 15 | | | | Core run 2 - 15 to 16 feet |
| | | | | | | |
| | | 16 | | | | |
| 1054 | | | | | | |
| | | 17 | | | | Same |
| | | | | | | |
| | | 18 | | | | |
| | | | | | | |
| | | 19 | | | | |
| | | | | | | |
| 1130 | | 20 | | | | Core run 3 - 20 to 23 feet |
| | | | | | | |

# LOG OF EXPLORATORY BORING

**Project No.:** 37848.00
**Date:** 2/12/92
**Client:** Kyowa Nanakuli Land Company
**Location:** Nanakuli
**Logged By:** DL
**Driller:** Sho

**BORING NO.** MW-3
Sheet 3 of 5

**Field Location of Boring:**
200 Feet East of Lualualei Magazine Road Across from Landfill Entrance

**Ground Elevation:**
**Datum:** MSL

**Drilling Method:** B-80, 8" Hollow-stem
**Hole Diameter:** 8"
**Casing Installation Data:**

| | | | | |
|---|---|---|---|---|
| Water Level | | | | |
| Time | | | | |
| Date | | | | |

| Blow Counts (blows/ 0.5 ft) | PID / OVA (ppm) | DEPTH | SAMPLE | Soil Group Symbol (uscs) | Lithographic Symbol | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1130 | | | | | | SILT STONE: Tan, with some sand and some gravel, very dense, massive, with some |
| | | 21 | | | | porous zones, well cemented, calcareous, damp (lagoonal deposit) |
| | | | | | | Core run 3 - 20 to 23 feet |
| | | 22 | | | | |
| | | | | | | |
| | | 23 | | | | CONGLOMERATE: Tannish white, with sand and silt, very dense, well cemented, |
| | | | | | | damp |
| | | 24 | | | | |
| | | | | | | Basalt boulder encountered at 24 to 25 feet |
| | | 25 | | | | Core run 4 - 24 to 28 feet |
| | | | | | | SAND STONE: Brownish tan, very dense, porous to slight porous, well cemented, |
| | | 26 | | | | calcareous, dry (lagoonal deposit) |
| | | | | | | |
| | | 27 | | | | |
| | | | | | | |
| | | 28 | | | | |
| | | | | | | |
| | | 29 | | | | Same material |
| 1239 | | | | | | |
| 50/1" | | 30 | | | | Attempt SPT, refusal |
| 1320 | | | | | | Core run 5 - 30 to 32 feet |

# LOG OF EXPLORATORY BORING

**Project No.:** 37848.00 **Date:** 2/12/92
**Client:** Kyowa Nanakuli Land Company
**Location:** Nanakuli
**Logged By:** DL **Driller:** Sho

**BORING NO.** MW-3
Sheet 4 of 5

**Field Location of Boring:**
200 Feet East of Lualualei Magazine Road Across from Landfill Entrance

**Ground Elevation:** **Datum:** MSL

**Drilling Method:** B-80, 8" Hollow-stem
**Hole Diameter:** 8"
**Casing Installation Data:**

| | | | | |
|---|---|---|---|---|
| Water Level | | | | |
| Time | | | | |
| Date | | | | |

| Blow Counts (blows/ 0.5 ft) | PID / OVA (ppm) | DEPTH | SAMPLE | Soil Group Symbol (uscs) | Litho-grahic Symbol | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1320 | | | | | | SAND STONE: Brownish tan, very dense, porous to slightly porous, well cemented, |
| | | 31 | | | | calcareous, dry (lagoonal deposit) |
| | | | | | | |
| | | 32 | | | | |
| | | | | | | |
| | | 33 | | | | |
| | | | | | | |
| | | 34 | | | | |
| | | | | | | SILT STONE: Tan, with sand, medium dense, moderately cemented, calcareous, wet, |
| 1335 | | 35 | | | | no odor (lagoonal deposit) |
| 26 | | | | | | MW-3-3 |
| 11 | | 36 | | | | |
| 12 | | | | | | 1" dark brownish gray stained zone, no odor |
| | | 37 | | | | |
| | | | | | | |
| | | 38 | | | | |
| | | | | | | |
| | | 39 | | | | SAND STONE: Orange-tan, coarse grained, very dense, well cemented, calcareous, |
| | | | | | | no odor (lagoonal deposit) |
| 1352 | | 40 | | | | |
| 12 | | | | | | MW-3-4 |

# LOG OF EXPLORATORY BORING

**Project No.:** 37848.00
**Date:** 2/12/92
**Client:** Kyowa Nanakuli Land Company
**Location:** Nanakuli
**Logged By:** DL
**Driller:** Sho

**BORING NO.** MW-3

Sheet 5 of 5

**Field Location of Boring:**
200 Feet East of Lualualei Magazine Road Across from Landfill Entrance

**Ground Elevation:**
**Datum:** MSL

**Drilling Method:** B-80, 8" Hollow-stem

**Hole Diameter:** 8"

**Casing Installation Data:**

| | | | | |
|---|---|---|---|---|
| Water Level | | | | |
| Time | | | | |
| Date | | | | |

| Blow Counts (blows/ 0.5 ft) | PID / OVA (ppm) | DEPTH | SAMPLE | Soil Group Symbol (uscs) | Litho-grahic Symbol | DESCRIPTION |
|---|---|---|---|---|---|---|
| 60 | | | | | | SAND STONE: Orange-tan, coarse grained, very dense, calcareous, no odor (lagoonal |
| 39 | | 41 | | | | deposit) |
| | | | | | | MW-3-4 |
| | | 42 | | | | |
| | | | | | | |
| | | 43 | | | | |
| | | | | | | Same |
| | | 44 | | | | |
| | | | | | | |
| | | 45 | | | | |
| 30 | | | | | | |
| 30 | | 46 | | | | MW-3-5 |
| 30 | | | | | | |
| 1421 | | 47 | | | | TOTAL DEPTH: 46.5 feet |
| | | | | | | Groundwater encountered at approximately 35 feet |
| | | 48 | | | | |
| | | | | | | |
| | | 49 | | | | |
| | | | | | | |
| | | 50 | | | | |
| | | | | | | |

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# WELL DETAILS

PROJECT NUMBER: 37848.00
PROJECT NAME: Kyowa Nanakuli Landfill
COUNTY: Honolulu
DATE: 2/18/92

BORING/WELL NO.: MW-3
TOP OF CASING ELEV.: 36.27'
GROUND SURFACE ELEV.: ~36.7'
DATUM: MSL

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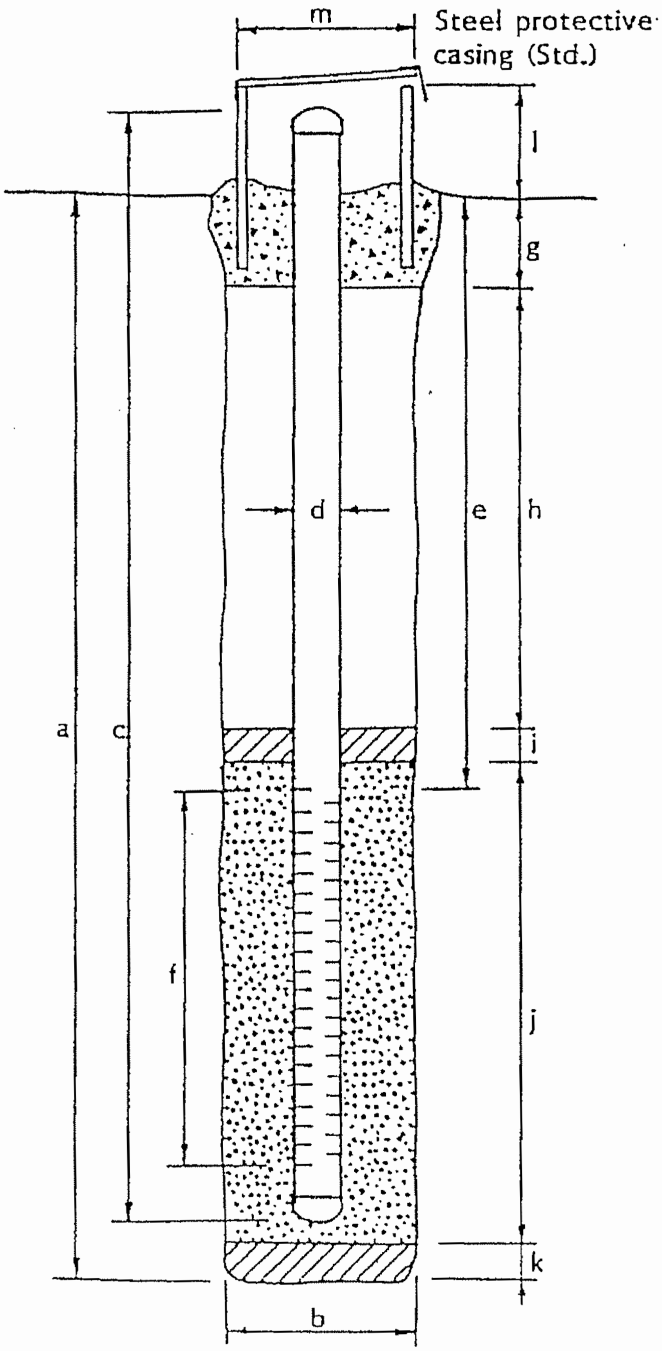

## EXPLORATORY BORING

a. Total depth: 45 ft.
b. Diameter: 8 in.
Drilling Method: Mobile B-80 with 8" Hollowstem Auger

## WELL CONSTRUCTION

c. Casing length: 45 ft.
Material: PVC
d. Diameter: 2 in.
e. Depth to top perforations: 30 ft.
f. Perforated length: 15 ft.
Perforated interval from 30 to 45 ft.
Perforation type: machine
Perforation size: 0.02
g. Surface seal: NA
Seal Material:
h. Backfill: 24 ft.
Backfill Material: grout
i. Seal: 2 ft.
Seal Material: bentonite
j. Gravel pack: 19 ft.
Pack Material: Monterey #3 Silica Sand
k. Bottom seal: none
Seal Material:
l. Casing height: 0.2 ft.
m. Protective casing diameter: 8 in.

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# LOG OF EXPLORATORY BORING

Project No.: 37848.00 Date: 2/19/92
Client: Kyowa Nanakuli Land Company
Location: Nanakuli
Logged By: DL Driller: Sho

**BORING NO.**
MW-4
Sheet 1 of 3

Field Location of Boring:

Ground Elevation: Datum:

Drilling Method: Mobile B-80, 8" Hollow-stem Augers

Hole Diameter:

Casing Installation Data:

| | | | | |
|---|---|---|---|---|
| Water Level | 18.33 | 17.76 | | |
| Time | 1324 | 1353 | | |
| Date | 2/19/92 | 2/19/92 | | |

| Blow Counts (blows/ 0.5 ft) | PID / OVA (ppm) | DEPTH | SAMPLE | Soil Group Symbol (uscs) | Litho-grahic Symbol | DESCRIPTION |
|---|---|---|---|---|---|---|
| | | | | GM | | CORAL GRAVEL: tan, sandy, with some silt, medium dense, calcareous, damp, no |
| 1045 | | 1 | | | | odor (alluvium) |
| 4 | | | | | | |
| 8 | 0.1 | 2 | | | | MW-4-1 |
| 13 | | | | | | |
| | | 3 | | | | |
| | | | | | | |
| | | 4 | | | | |
| | | | | | | |
| 1103 | | 5 | | MH | | SILTY CLAY: Dark to reddish brown, with some sand, medium stiff, terrigenous, color |
| 4 | | | | | | layering, moist, no odor (alluvium) |
| 3 | 0 | 6 | | | | MW-4-2 |
| 4 | | | | | | |
| | | 7 | | | | |
| | | | | | | |
| | | 8 | | | | |
| | | | | | | |
| | | 9 | | | | |
| | | | | | | Same |
| 1123 | | 10 | | | | |
| 8 | | | | | | MW-4-3 |

# LOG OF EXPLORATORY BORING

**Project No.:** 37848.00 **Date:** 2/19/92
**Client:** Kyowa Nanakuli Land Company
**Location:** Nanakuli
**Logged By:** DL **Driller:** Sho

**BORING NO.** MW-4
Sheet 2 of 3

**Field Location of Boring:**

**Ground Elevation:** **Datum:**

**Drilling Method:** Mobile B-80, 8" Hollow-stem Augers

**Hole Diameter:**

**Casing Installation Data:**

| | | | | | |
|---|---|---|---|---|---|
| Water Level | | | | | |
| Time | | | | | |
| Date | | | | | |

| Blow Counts (blows/ 0.5 ft) | PID / OVA (ppm) | DEPTH | SAMPLE | Soil Group Symbol (uscs) | Litho-graphic Symbol | DESCRIPTION |
|---|---|---|---|---|---|---|
| 8 | | | | MH | | SILTY CLAY: Dark to reddish brown, with some sand, medium stiff, terrigenous, |
| 17 | 0 | 11 | | | | color layering, moist, no odor (alluvium) MW-4-3-3 |
| 18 | | | | MH | | SILTY CLAY: Dark reddish brown, with some coral gravel and cobbles, very stiff, |
| | | 12 | | | | terrigenous/calcareous, moist, no odor (alluvium). |
| | | | | | | |
| | | 13 | | | | |
| | | | | | | |
| | | 14 | | | | |
| | | | | | | SAND STONE: Tan, dense to very dense, slightly to moderately cemented, dense, |
| 1305 | | 15 | | | | calcareous, damp, no odor (lagoonal deposit) |
| 50 | | | | | | MW-4-4 |
| 38 | | 16 | | | | |
| 23 | | | | | | |
| | | 17 | | | | |
| | | | | | | |
| | | 18 | | | | |
| | | | | | | |
| | | 19 | | | | Same material |
| | | | | | | |
| 1318 | | 20 | | | | |
| 19 | | | | | | |

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# LOG OF EXPLORATORY BORING

**Project No.:** 37848.00
**Date:** 2/19/92
**Client:** Kyowa Nanakuli Land Company
**Location:** Nanakuli
**Logged By:** DL
**Driller:** Sho

**BORING NO.** MW-4
Sheet 3 of 3

**Field Location of Boring:**

**Ground Elevation:**
**Datum:**

**Drilling Method:** Mobile B-80, 8" Hollow-stem Augers

**Hole Diameter:**

**Casing Installation Data:**

| | | | | | |
|---|---|---|---|---|---|
| Water Level | | | | | |
| Time | | | | | |
| Date | | | | | |

| Blow Counts (blows/ 0.5 ft) | PID OVA (ppm) | DEPTH | SAMPLE | Soil Group Symbol (uscs) | Lithographic Symbol | DESCRIPTION |
|---|---|---|---|---|---|---|
| 19 | | | | | | SAND STONE: Tan, dense to very dense, slightly to moderately cemented, dense, |
| 8 | 0.1 | 21 | | | | calcareous, damp, no odor (lagoonal deposit) |
| 16 | | | | | | MW-4-5 |
| | | 22 | | | | |
| | | | | | | |
| | | 23 | | | | |
| | | | | | | |
| | | 24 | | | | |
| | | | | | | |
| 1344 | | 25 | | | | |
| 13 | | | | | | Same. Grades dense |
| 22 | 0.1 | 26 | | | | MW-4-6 |
| 27 | | | | | | |
| | | 27 | | | | |
| | | | | | | |
| | | 28 | | | | |
| | | | | SP | | Hard augering |
| | | 29 | | | | Same. Grades very dense, well cemented |
| | | | | | | |
| 1405 | | 30 | | | | MW-4-7 |
| 60/3" | 0 | | | | | TOTAL DEPTH: 30.25 Feet. Groundwater encountered at approximately 18 feet |

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# WELL DETAILS

PROJECT NUMBER: 37848.00
PROJECT NAME: Kyowa Nanakuli Landfill
COUNTY: Honolulu
DATE: 2/19/92

BORING/WELL NO.: MW-4
TOP OF CASING ELEV.: 19.70'
GROUND SURFACE ELEV.: ~20.1'
DATUM: MSL

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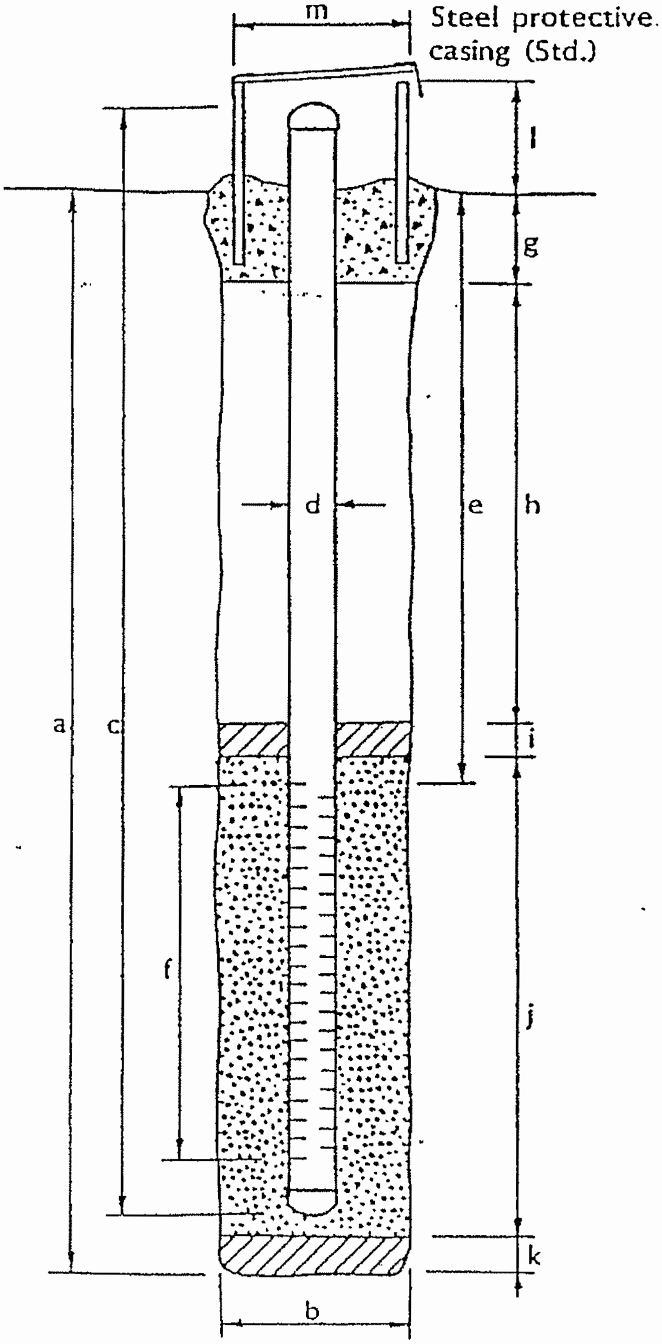


## EXPLORATORY BORING

a. Total depth: 30 ft.
b. Diameter: 8 in.
Drilling Method: Mobile B-80 with 8" Hollowstem Auger

## WELL CONSTRUCTION

c. Casing length: 30 ft.
Material: PVC
d. Diameter: 2 in.
e. Depth to top perforations: 15 ft.
f. Perforated length: 15 ft.
Perforated interval from 15 to 30 ft.
Perforation type: machine
Perforation size: 0.02
g. Surface seal: NA
Seal Material:
h. Backfill: 12 ft.
Backfill Material: grout
i. Seal: 2 ft.
Seal Material: bentonite
j. Gravel pack: 16 ft.
Pack Material: Monterey #3 Silica Sand
k. Bottom seal: none
Seal Material:
l. Casing height: 0.2 ft.
m. Protective casing diameter: 8 in.

BELT COLLINS
H A W A I I
650 Ala Moana Boulevard, First Floor
Ho..., Hawaii 96813-5406
T... 21-5361, Fax: 808 538-7819

# Nanakuli Landfill

North edge of site

Boring No: MW-A1
Page 1 of 2
File No: 033-3800
Chkd By: AWS

Boring Co: Hawaii Test Borings
Foreman: Ron Cabison
BCH Rep: Rhonda Goyke
Start: 7/24/95 End: 7/26/95
PVC Elev: 28.97' Datum: MSL

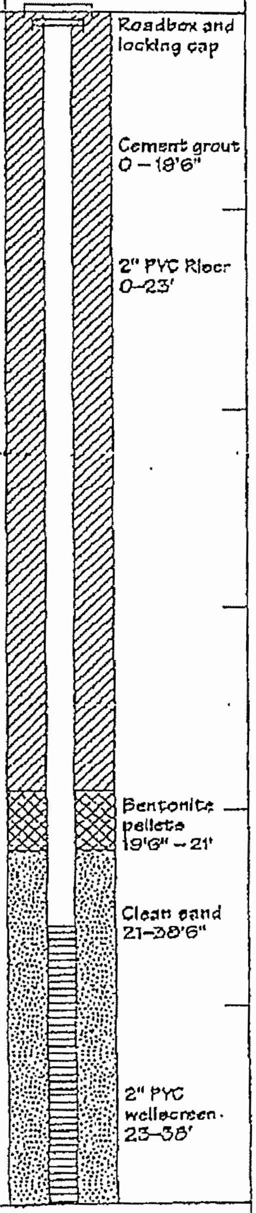
| | CASING | SAMPLER |
|---|---|---|
| Type: | HSA | 18" SS |
| ID/OD: | 4 1/2" ID | 2 1/2" ID |
| Hammer Wt: | | 140# |
| Hammer Fall: | | 30" |

Groundwater Readings

| Date | Time | Depth | Datum | Stab. Time |
|---|---|---|---|---|
| 7/24/95 | 1445 | 26.8' | grd surf | 2 hrs |
| 7/25/95 | 0830 | 26.7' | grd surf | 20 hrs |
| 8/11/95 | 1335 | 2.10' | MSL | 18 days |
| | | | | |

| DEPTH | CSNG | BLWS | Smpl No. | Pen/Rec (in) | Depth (ft) | Blows/6" | OVM (ppm) | Sample Description & Classification (Burmister) | Stratum Description | (USCS) | RMKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 1 |
| 5 | | | S-1 | 18/12 | 5–6'6" | 4–8<br>11 | bkg | S-1: Stiff, brown SILT and CLAY, trace (-) fine Sand. | Clay + Silt (CL) | | |
| 10 | | | S-2 | 18/16 | 10–11'6" | 6–14<br>22 | bkg | S-2: Very stiff, brown CLAY and SILT, trace (+) beige fine to coarse Sand, trace (-) roots. | | | |
| 15 | | | S-3 | 18/15 | 15–16'6" | 12–13<br>14 | bkg | S-3: Stiff, brown CLAY and SILT, some beige fine Sand and fine Gravel (coral fragments). | | | |
| 20 | | | S-4 | 18/18 | 20–21'6" | 8–12<br>14 | | S-4: Stiff, brown CLAY and SILT, some beige fine to coarse Sand. | | | |
| 25 | | | S-5 | 18/4 | 25–26'6" | 10–12<br>14 | | S-5: Stiff, brown CLAY and SILT, some beige fine to coarse Sand and fine to coarse Gravel (coral fragments). | | | |

Equipment Installed



Rems

1. OVM background reading = 0.1–0.5. Strong odor from pig farms evident.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time the measurements were made.

BORING NO: MW-A1

ATTACHMENT A

BELT COLLINS
HAWAII
680 Ala Moana Boulevard, First Floor
Honolulu, Hawaii 96813-5406
Tel: 808 521-5361, Fax: 808 538-7819

# Nanakuli Landfill

North edge of site

Boring No: MW-A1
Page 2 of 2
File No: 033-3900
Chkd By: AWS

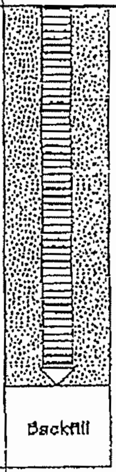
Boring Co: Hawaii Test Borings
Foreman: Ron Cabison
BCH Rep: Rhonda Goyke
Start: 7/24/95 End: 7/26/95
PVC Elev: 28.97 Datum: MSL

| | CASING | SAMPLER |
|---|---|---|
| Type: | HSA | 18" SS |
| ID/OD: | 4 1/2" ID | 2 1/2" ID |
| Hammer Wt: | | 140# |
| Hammer Fall: | | 30" |

Groundwater Readings

| Date | Time | Depth | Datum | Stab. Time |
|---|---|---|---|---|
| 7/24/95 | 1445 | 26.8' | grd surf | 2 hrs |
| 7/25/95 | 0830 | 26.7 | grd surf | 20 hrs |
| 8/11/95 | 1335 | 2.10' | MSL | 18 days |

| DEPTH | CSNG | BLWS | Smpl No. | Pen/Rec (in) | Depth (ft) | Blows/6" | OVM (ppm) | Sample Description & Classification (Burmister) | Stratum Description | (USCS) | RMKS | Equipment Installed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | S-6 | 18/3 | 30–31'6" | 20–20 | | S-6: Very stiff, brown CLAY and SILT, trace (+) beige and black fine to coarse Sand. | Clay + Silt (CL) | ▨ | 2<br>3 | |
| | | | | | | 20 | | | | | | |
| 35 | | | S-7 | 18/0 | 35–36'6" | 8-9 | | S-7: No recovery. | | - - ?- - - | | |
| | | | | | | 10 | | | | | | Silt trap |
| 40 | | | S-8 | 18/17 | 40–41'6" | 10–7 | | S-8: Medium dense, beige SILT and fine to coarse Sand, little coarse Gravel (coral fragments). | Sandy Silt (SC) | ▨ | | Backfill |
| | | | | | | 12 | | | | | | |
| | | | | | | | | BOTTOM OF BORING AT 41'6". | | | | |
| 45 | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | |
| 55 | | | | | | | | | | | | |



Remarks
2. Outside of s.s. wet, but sample not wet.
3. 1 1/2" ID standard penetration test s.s. was used to collect soil classification samples. Sample wet.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time the measurements were made.

BORING NO: MW-A1

Mountain Edge Environmental, Inc.
Hydrogeological & Environmental Consulting

# LOG OF BORING PW-2

(Page 1 of 6)

PVT Land Company
PVT Nanakuli C&D Solid Waste Landfill
Nanakuli, Oahu, Hawaii

Job No.: 03055-001

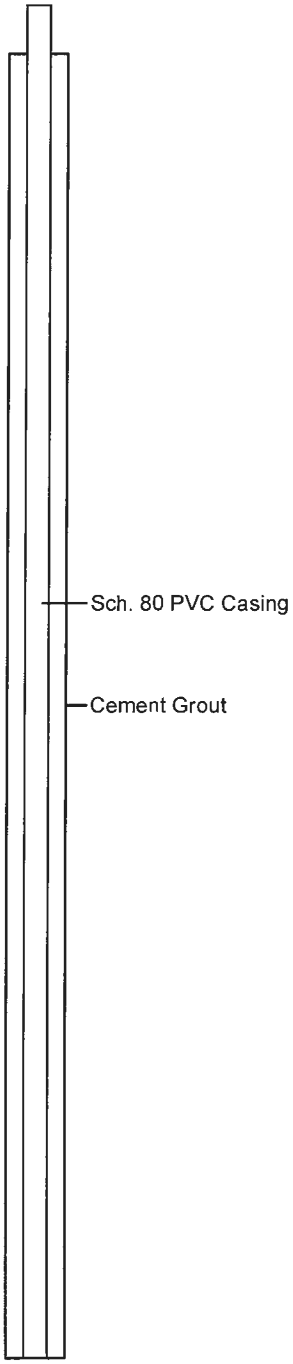
Date Drilled : September 3, 2003
Drilling Contractor : Valley Well Drilling
Drilling Method : Air Rotary
Sampling Method : Grab sample of cuttings
Hole Diameter : 14 inch
Logged By : Jennifer Hernando
Water Level : 67 feet bgs
Water Level Date : September 4, 2003
Water Level Time : 0830
Surface Conditions : Fill

Ground Elevation: 66.57 feet

Top of Casing Elevation: 70.03 feet

| Depth in Feet | USCS | GRAPHIC | DESCRIPTION |
|---|---|---|---|
| 0 | | ▩ | FILL: light brown CORALLINE GRAVEL with brown CLAY and pieces of wood |
| 1 | | ▩ | |
| 2 | | ▩ | |
| 3 | | ▩ | |
| 4 | | ▩ | |
| 5 | | ▩ | |
| 6 | | ▩ | grades more wood |
| 7 | AR | ▩ | |
| 8 | | ▩ | |
| 9 | | ▩ | pieces of rubber and metal encountered |
| 10 | | ▩ | |
| 11 | | ▩ | |
| 12 | | ▩ | |
| 13 | | ▩ | |
| 14 | | ▩ | |
| 15 | | ▨ | SILTY CLAY, grayish brown, very plastic |
| 16 | CH | ▨ | |
| 17 | | ▨ | |
| 18 | | ▨ | |
| 19 | GC | ▒ | CORALLINE GRAVEL, light brown with reddish brown CLAY |
| 20 | | | |

Well: PW-2
Diameter: 8"



# LOG OF BORING PW-2

(Page 2 of 6)

PVT Land Company
PVT Nanakuli C&D Solid Waste Landfill
Nanakuli, Oahu, Hawaii

Job No.: 03055-001

Date Drilled : September 3, 2003
Drilling Contractor : Valley Well Drilling
Drilling Method : Air Rotary
Sampling Method : Grab sample of cuttings
Hole Diameter : 14 inch

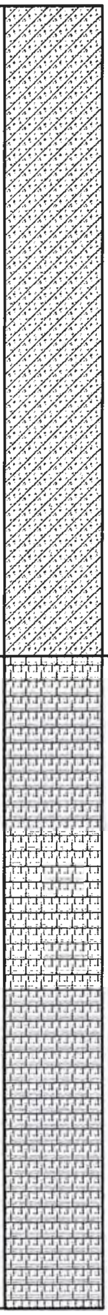
Logged By : Jennifer Hernando
Water Level : 67 feet bgs
Water Level Date : September 4, 2003
Water Level Time : 0830
Surface Conditions : Fill

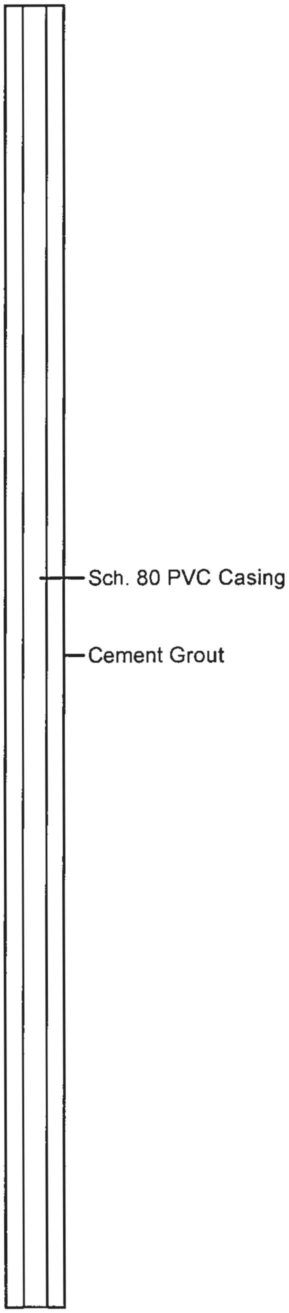
Ground Elevation: 66.57 feet

Top of Casing Elevation: 70.03 feet

Well: PW-2
Diameter: 8"

| Depth in Feet | USCS | DESCRIPTION |
|---|---|---|
| 20 | | |
| 21 | | |
| 22 | | |
| 23 | | |
| 24 | | |
| 25 | GC | |
| 26 | | |
| 27 | | |
| 28 | | |
| 29 | | |
| 30 | | CORAL / CORALLINE GRAVEL, grayish white with some fine SILT |
| 31 | | |
| 32 | | |
| 33 | | |
| 34 | | |
| 35 | LS | grades slightly more fine SILT |
| 36 | | |
| 37 | | |
| 38 | | |
| 39 | | |
| 40 | | |





# LOG OF BORING PW-2

(Page 3 of 6)

PVT Land Company
PVT Nanakuli C&D Solid Waste Landfill
Nanakuli, Oahu, Hawaii

Job No.: 03055-001

Date Drilled : September 3, 2003
Drilling Contractor : Valley Well Drilling
Drilling Method : Air Rotary
Sampling Method : Grab sample of cuttings
Hole Diameter : 14 inch
Logged By : Jennifer Hernando
Water Level : 67 feet bgs
Water Level Date : September 4, 2003
Water Level Time : 0830
Surface Conditions : Fill

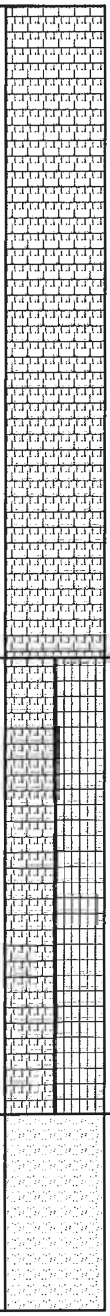
Ground Elevation: 66.57 feet

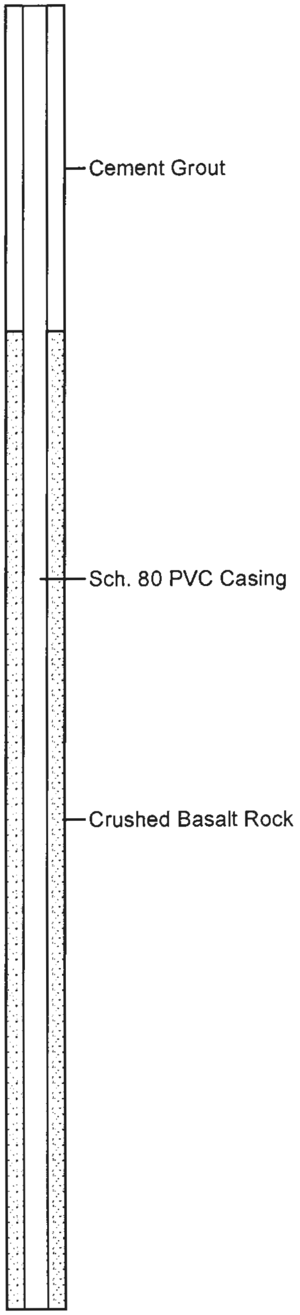
Top of Casing Elevation: 70.03 feet

Well: PW-2
Diameter: 8"

| Depth in Feet | USCS | DESCRIPTION |
|---|---|---|
| 40 | | |
| 41 | | |
| 42 | | |
| 43 | | |
| 44 | | |
| 45 | LS | |
| 46 | | |
| 47 | | |
| 48 | | |
| 49 | | |
| 50 | | CORAL / CORALLINE GRAVEL, light brown, mixed with black BASALT ROCK, hard |
| 51 | | |
| 52 | | |
| 53 | LS/VL | |
| 54 | | |
| 55 | | |
| 56 | | |
| 57 | | SAND, Poorly Graded, black, fine grained (volcanic sand) |
| 58 | SP | |
| 59 | | |
| 60 | | |

GRAPHIC





# LOG OF BORING PW-2

(Page 4 of 6)

PVT Land Company
PVT Nanakuli C&D Solid Waste Landfill
Nanakuli, Oahu, Hawaii

Job No.: 03055-001

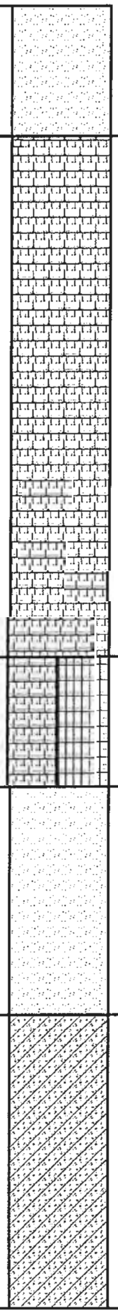
| | | | |
|---|---|---|---|
| Date Drilled | : September 3, 2003 | Logged By | : Jennifer Hernando |
| Drilling Contractor | : Valley Well Drilling | Water Level | : 67 feet bgs |
| Drilling Method | : Air Rotary | Water Level Date | : September 4, 2003 |
| Sampling Method | : Grab sample of cuttings | Water Level Time | : 0830 |
| Hole Diameter | : 14 inch | Surface Conditions | : Fill |

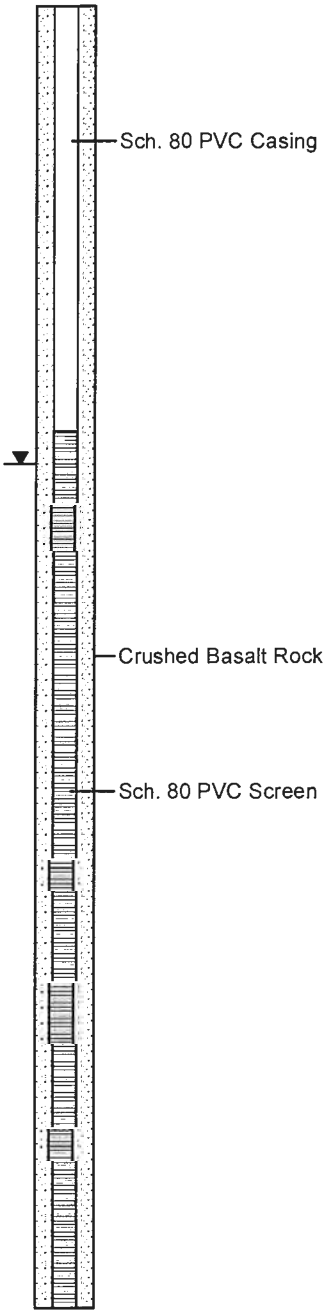
Ground Elevation: 66.57 feet

Top of Casing Elevation: 70.03 feet

Well: PW-2
Diameter: 8"

| Depth in Feet | USCS | DESCRIPTION |
|---|---|---|
| 60 | | |
| 61 | SP | |
| 62 | | CORAL / CORALLINE GRAVEL, light brown with some SAND |
| 63 | | |
| 64 | | |
| 65 | | |
| 66 | LS | |
| 67 | | grades white |
| 68 | | |
| 69 | | |
| 70 | | CORAL / CORALLINE GRAVEL, white with black BASALT ROCK |
| 71 | LS/VL | |
| 72 | | SAND, Poorly Graded, tan, fine to medium grained |
| 73 | | |
| 74 | SP | |
| 75 | | CORALLINE GRAVEL, tan with SAND with reddish-brown CLAY |
| 76 | | |
| 77 | | |
| 78 | GC | |
| 79 | | |
| 80 | | |





# LOG OF BORING PW-2

(Page 5 of 6)

PVT Land Company
PVT Nanakuli C&D Solid Waste Landfill
Nanakuli, Oahu, Hawaii

Job No.: 03055-001

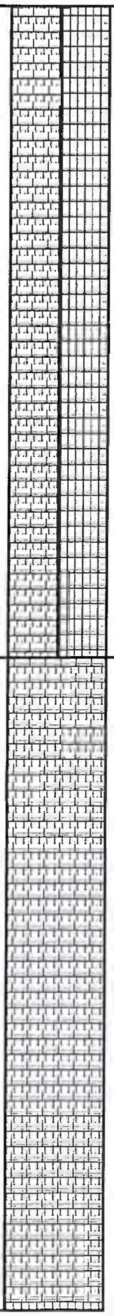
| | | | |
|---|---|---|---|
| Date Drilled | : September 3, 2003 | Logged By | : Jennifer Hernando |
| Drilling Contractor | : Valley Well Drilling | Water Level | : 67 feet bgs |
| Drilling Method | : Air Rotary | Water Level Date | : September 4, 2003 |
| Sampling Method | : Grab sample of cuttings | Water Level Time | : 0830 |
| Hole Diameter | : 14 inch | Surface Conditions | : Fill |

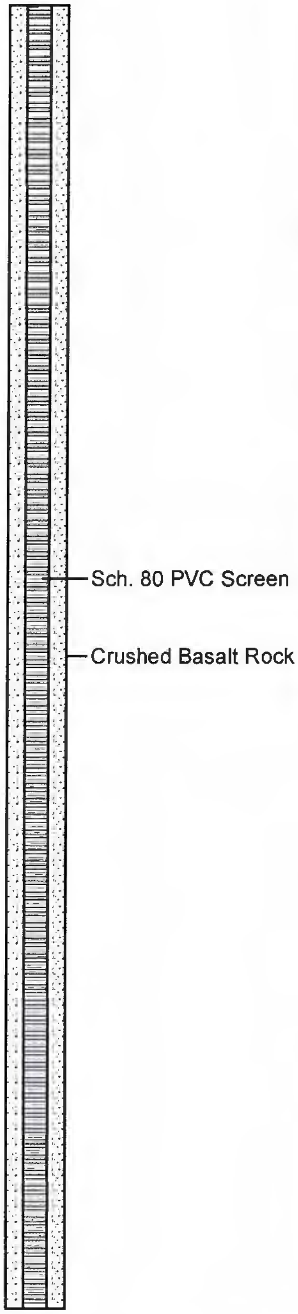
Ground Elevation: 66.57 feet

Top of Casing Elevation: 70.03 feet

Well: PW-2
Diameter: 8"

| Depth in Feet | USCS | GRAPHIC | DESCRIPTION |
|---|---|---|---|
| 80–90 | LS/VL | | CORAL / CORALLINE GRAVEL, tan to white, sandy with black BASALT ROCK |
| 90–100 | LS | | CORAL, white, little to no fines |





# LOG OF BORING PW-2

(Page 6 of 6)

PVT Land Company
PVT Nanakuli C&D Solid Waste Landfill
Nanakuli, Oahu, Hawaii

Job No.: 03055-001

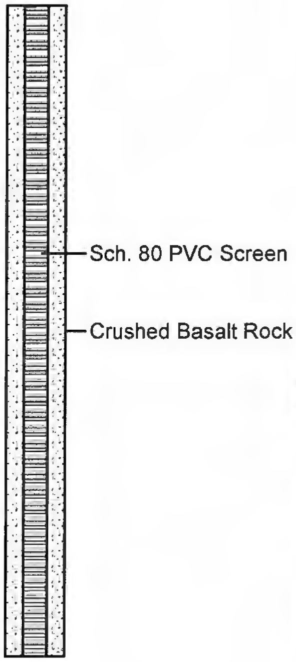
| | | | |
|---|---|---|---|
| Date Drilled | : September 3, 2003 | Logged By | : Jennifer Hernando |
| Drilling Contractor | : Valley Well Drilling | Water Level | : 67 feet bgs |
| Drilling Method | : Air Rotary | Water Level Date | : September 4, 2003 |
| Sampling Method | : Grab sample of cuttings | Water Level Time | : 0830 |
| Hole Diameter | : 14 inch | Surface Conditions | : Fill |

Ground Elevation: 66.57 feet

Top of Casing Elevation: 70.03 feet

Well: PW-2
Diameter: 8"

| Depth in Feet | USCS | GRAPHIC | DESCRIPTION |
|---|---|---|---|
| 100 | LS | | |
| 101 | | | |
| 102 | SS | | SANDSTONE, calcareous, brown with some SAND, hard (beach rock) |
| 103 | | | |
| 104 | | | |
| 105 | | | |
| 106 | | | |
| 107 | | | |
| 108 | | | |
| 109 | | | |
| 110 | | | |
| 111 | | | |
| 112 | | | |
| 113 | | | |
| 114 | | | |
| 115 | | | |
| 116 | | | |
| 117 | | | |
| 118 | | | |
| 119 | | | |
| 120 | | | |



# MW-1B Boring Log

| | | | |
|---|---|---|---|
| Boring Number **MW-1B** | | | Sheet 1 of 1 |
| Project Name<br>PVT | Project Number<br>PVT ISWM FACILITY | Elevation and Datum<br>53.5 ft Above Sea Level | Location PVT Landfill, Nanakuli, Oahu, Hawaii<br>Easting: 1590408.734 Northing: 83831.01 |
| Drilling Company<br>Valley Well Drilling | Driller<br>Dave | Date and Time Started<br>12/19/11: 8:47 am | Date and Time Completed<br>12/20/11: 10:43 am |
| Drilling Equipment<br>Mobile B-61 | Drilling Method<br>Hollow Stem Auger | Completion Depth<br>70' bgs | Total No. of Samples 0<br>(conducted video log and examined cuttings) |
| Size and Type of Bit<br>8" Carbide Tipped | Hole Diameter<br>8" | No. of Samples: Bulk NA, SS NA | Drive NA, Pitcher NA |
| Drilling Fluid<br>None | Drilling Angle<br>Vertical | Water Level: First 53.15' bgs | After _______ Hours<br>NA |
| Sample Hammer<br>Type NA | Driving Wt. NA Drop NA | Hydrogeologist/Date<br>Bill Lyon 12/19/2011 | Checked By/Date<br>Jennifer Hernando 4/10/2012 |

| Lithology | Depth (Feet) | Samples | Blow Count | Description | USCS Symbol | Estimated % Of GR | SA | FI | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 0-6' bgs: Moist, light brown, Clayey Silt FILL with Coral Sand and Gravel, No Odor | FILL | | | | |
| | 5 | | | | | | | | |
| | | | | 6-19'bgs: Moist, light brown, Clayey Silt FILL with Coral Sand and Gravel, No Odor | FILL | 8-10% | | | Structural Fill |
| | 10 | | | | | | | | |
| | 15 | | | | | | | | |
| | 20 | | | 19'-35' bgs: Moist, light brown Silt FILL with Basaltic Gravel, and intermittent 6" to 1' layers of Coral, No Odor | FILL | | | | Structural Fill |
| | | | | | | | | | @23' bgs moderately hard |
| | 25 | | | | | | | | |
| | 30 | | | | | | | | |
| | 35 | | | 35'-50' bgs: Moist, Brown, Clayey Silt with Coral Sand and Basaltic Gravel, No Odor | CL | | 10% | | |
| | 40 | | | | | | | | |
| | 45 | | | | | | | | |
| | 50 | | | 35'-50' bgs: Moist, Grades to Gray Brown, Clayey Silt with Coral Sand and Basaltic Gravel, No Odor | CL | | | | Groundwater encountered at 53.15' bgs |
| ▽ | | | | | | | | | |
| | 55 | | | | | | | | |
| | 60 | | | | | | | | |
| | 65 | | | | | | | | Boring Terminated @ 70' bgs |
| | 70 | | | | | | | | |

JOB NO.: PVT ISWMF WELL NO. MW-1B HYDROGEOLOGIST: Bill Lyon / Jennifer Hernando

CLIENT: PVT Land Company DRILLER: Valley Well Drilling

WELL LOCATION: PVT ISWM Facility DATE/TIME: 12/20/2011 10:43 am

DETAILS OF CONSTRUCTION

Date Completed 12/20/2011

Borehole Diameter (in.) 8"

Type and Size of Casing (in.) Schedule 40 PVC 2"

Type and Size of Screen (in.) Schedule 40 PVC 2"

Screen Perforation Diameter (in.) 0.020" (5.20 sq. in./L.F.)

Screen Length (ft.) 15'

Centralizer Depths (ft.) N/A

Completion Technique

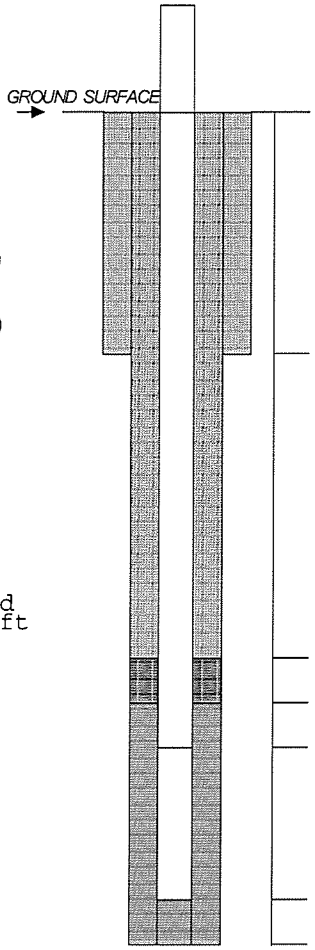
1. Type of Filter Pack and Placement Method
   Monterey Sand Sandpack
2. Type of Bentonite and Placement Method
   Bentonite pellets hydrated with clean water every 5 ft
3. Type of Grout Mixture and Placement Method
   Concrete, mix and pour

Description of Potential Problems With Well:

N/A

Development Technique

Surge block and micropurge pump



Well Head Elevation 55.992 ft msl

Ground Surface Elev. 53.5 ft msl

Well Head Completion Method

6"X4'above ground locked monument

Drilling Method/Rig Type Hollow Stem

Surface Casing: Type Steel

Diameter 6"

Length 4'

MATERIALS

Cement (sks.) 3 X 60lb

Filter Pack Material ($ft.^3$) 5.6

Casing Material (ft.) 51.48

Bentonite ($ft.^3$) 14.70

Top of Bentonite Seal 2 ft.

Top of Filter Pack 46.99 ft.

Top of Screen 48.99 ft.

(4.51 ft msl)

(-10.49 ft msl)

Bottom of Screen 63.99 ft.

Bottom of Hole 70 ft.

▦ GROUT

▥ BENTONITE

▨ FILTER PACK

*NOTE: ALL DEPTHS ARE REFERENCED TO GROUND SURFACE*

Figure 4: Well MW1-B Construction Diagram

# MW-1C Boring Log

| | | | | |
|---|---|---|---|---|
| ring Number: **MW-1C** | | | | Sheet 1 of 1 |
| oject Name:<br>PVT Integrated Solid Waste Management Facility | | Location:<br>Nanakuli, Oahu, Hawaii | | Project Number:<br>001-001-14 |
| Date and Time Started:<br>3/11/2014: 8:35 pm | Date and Time Completed:<br>3/11/2014: 2:21 pm | Ground Elevation and Datum:<br>48.19 ft msl; top of casing - 50.80 ft msl | Surface Conditions:<br>Compacted Fill | Logged By:<br>Jennifer Hernando |
| Drilling Company:<br>Valley Well Drilling | Drilling Equipment:<br>Truck-Mounted B-90 Mobile Drill | Drilling Method:<br>Hollow-Stem Auger | Sampling Method:<br>Grab samples of cuttings | Hole Diameter:<br>8" |
| Completion Depth:<br>60.0' bgs | First Water Level:<br>46.1' bgs | First Water Level Date / Time:<br>3/11/2014: 1:37 pm | Static Water Level:<br>49.30' bgs from TOC<br>1.50' msl | Static Water Level Date / Time:<br>5/30/2014: 11:43 am |

| Depth (Feet) | Lithology | USCS Symbol | Soil Description |
|---|---|---|---|
| 0<br>5<br>10<br>15 | | ML | Reddish brown sandy silt, well compacted, engineered fill (FILL) |
| 20<br>25 | | ML | Dark grayish brown silt, stiff, moist |
| 30<br>35<br>40<br>45<br>50<br>55<br>60 | | ML | Brown silt, stiff, moist<br>Grades light brown<br>Bottom of well: 55.7' bgs<br>Elevation at bottom of well: - 7.51' msl<br>Bottom of boring at 60' bgs<br>Elevation at bottom of borehole: - 11.81' msl |

Well Construction Diagram

Well monument 3.9' above ground

Cement bentonite grout 0' - 8'

2" diam. Sch. 40 PVC solid casing, 0.154" wall thickness 0' - 40.7' with 2.61' stickup above ground

Bentonite seal 8' - 38.7'

Filter pack: Clean-graded kiln dried Monterey Sand #3 38.7' - 60'

2" diam. Sch. 40 PVC well screen, 0.154" wall thickness, 5.20 sq. in./linear ft. slot openings (0.020") 40.7' - 55.7'

Sch. 40 PVC end cap

# Attachment 6

## Example Field Forms

# WELL SAMPLING INFORMATION FORM

PVT ISWMF

## WELL INFORMATION

Well ID #: ________________ Depth to GW from top of cap: (1st reading) ________ feet Time: __________

Casing Diameter: 2 inches Depth to GW from top of cap: (2nd reading) ________ feet Time: __________

Date: ____________________ Well Elevation: (at top of cap) ________ feet Groundwater Elevation: (at top of cap) ________ feet

Depth of Bottom of Well: ________ feet Equipment used for depth measurements: ________________

## PURGE INFORMATION

Purge Date: ______________ Purge Time Start: ____________ Purge Time End: ______________

Elapsed Time: ____________ Water Vol. in Casing: ________ gal Actual Vol. Purged: __________ gal

Well Vols. Purged: ________ Purge Method: ________________________________

Sample Method: ____________________________________________

## FIELD MEASUREMENTS DURING PURGING

| Time | Volume (gallon) | Water Clarity | Water Odor (yes/no) | pH | Cond. (µS / mS) | Temp. (ºC / ºF) | TDS (ppm) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

## FIELD CONDITIONS

Weather Conditions: (circle all that apply) sunny partly cloudy overcast rain

Wind Conditions: direction: ____________ speed: ____________

Tidal Conditions: ____________________________________________

## COMMENTS / NOTES

(include purge/well volume calculations)

## SAMPLING PERSONNEL

| Date | Name | Signature | Company |
|---|---|---|---|
| | | | |
| | | | |

# WELL INSPECTION FORM

PVT ISWMF

Well ID #: ______________ Evaluation Date: ______________

Evaluator: ____________________________ ______________________________

Name Company

| WELL LOCATION | YES | NO | NA |
|---|---|---|---|
| 1. Is the well location appropriately shown on a design drawing? | ☐ | ☐ | ☐ |
| 2. Is the well easily located? | ☐ | ☐ | ☐ |
| 3. Is the well elevation information correct? | ☐ | ☐ | ☐ |

| WELL CHARACTERISTICS & INTEGRITY | YES | NO | NA |
|---|---|---|---|
| 4. Is the well aboveground? ☐ or Flush with the surface? ☐ | | | |
| 5. Is there any physical damage to the well? | ☐ | ☐ | ☐ |
| 6. Has the well been recently painted? | ☐ | ☐ | ☐ |
| 7. Is the well locked to prevent unauthorized access? | ☐ | ☐ | ☐ |
| 8. Is the locking mechanism in good working order? | ☐ | ☐ | ☐ |
| 9. Does the cap fit appropriately? | ☐ | ☐ | ☐ |
| 10. Is the cap free of rust? | ☐ | ☐ | ☐ |
| 11. Is there grease around the top of the well on the threaded cap? | ☐ | ☐ | ☐ |
| 12. Is the well labeled on the inside? | ☐ | ☐ | ☐ |
| 13. Is the well labeled on the outside? | ☐ | ☐ | ☐ |
| 14. Are the well labels in good condition? | ☐ | ☐ | ☐ |
| 15. Does the well have protective posts? | ☐ | ☐ | ☐ |
| a. How many? __________ | | | |
| b. Are the posts painted or flagged? | ☐ | ☐ | ☐ |
| c. Are the posts damaged? | ☐ | ☐ | ☐ |
| 16. Is the well in or near a low point? | ☐ | ☐ | ☐ |
| 17. Is there any evidence of ponded water around the well? | ☐ | ☐ | ☐ |
| 18. Does the surface seal have cracks or other features that might affect its integrity? | ☐ | ☐ | ☐ |
| 19. Is the surface seal sloped to prevent ponding in the immediate vicinity of the well? | ☐ | ☐ | ☐ |
| 20. Is the area around the well clean (i.e. no mounds of waste, weeds, or dead animals)? | ☐ | ☐ | ☐ |
| 21. Is there evidence of contamination by animals or insect parts in the well, etc.? | ☐ | ☐ | ☐ |
| 22. Do aboveground wells have weep holes at the base of the protective casing? | ☐ | ☐ | ☐ |

# WELL INSPECTION FORM

PVT ISWMF

Well ID #: ____________

| | YES | NO | NA |
|---|---|---|---|
| 23. Is there any water in the annular space within the protective casing? | ☐ | ☐ | ☐ |
| 24. Can the well casing be moved along two perpendicular axes? | ☐ | ☐ | ☐ |
| 25. Is the dedicated pump in good condition? | ☐ | ☐ | ☐ |
| 26. Are there any obstructions or kinks in the well casing? | ☐ | ☐ | ☐ |
| 27. Is there any evidence of vandalism? | ☐ | ☐ | ☐ |

**COMMENTS / NOTES**

# LEACHATE SAMPLING INFORMATION FORM

PVT ISWMF

## GENERAL INFORMATION

Date: ______________________ Time: ______________

Leachate Sample Location: ______________________________

Depth to Leachate: __________feet Depth reference point: ____________________

Equipment used for depth measurement: ______________________________

Equipment used for sampling: ______________________________

## FIELD MEASUREMENTS

| Time | Leachate Clarity | Odor (yes/no) | pH | Cond. (µS / mS) | Temp. (ºC / ºF) | TDS ( ) | Turbidity ( ) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

## CONDITION OF SAMPLE LOCATION

Is leachate access point secured? Yes ☐ No ☐
If yes, describe how:

Are there any unusual surface conditions? Yes ☐ No ☐
If yes, describe:

Is there any visible contamination? Yes ☐ No ☐
If yes, describe:

## FIELD CONDITIONS

Weather Conditions: sunny partly cloudy overcast rain
(circle all that apply)

Wind Conditions: direction: __________ speed: __________

## COMMENTS / NOTES

## SAMPLING PERSONNEL

| Date | Name | Signature | Company |
|---|---|---|---|
| | | | |
| | | | |

# CHAIN OF CUSTODY

PAGE _____ OF _____

| | |
|---|---|
| Project Name | Project Number |
| Project Manager | |
| Company/Address | |
| | |
| | |
| Phone Number | Fax Number |
| Sampler's Signature | Sampler's Printed Name |

| | | SAMPLING | | | ANALYSIS REQUESTED | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | LAB ID | DATE | TIME | MATRIX | NUMBER OF CONTAINERS | | | | | | | | | | | | | | NOTES: |
| | | | | | | | | | | | | | | | | | | | |
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SPECIAL INSTRUCTIONS/COMMENTS

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| Firm | Firm | Firm | Firm | Firm | Firm |
| Date/Time | Date/Time | Date/Time | Date/Time | Date/Time | Date/Time |

# Storm Water Pollution Control Plan

## PVT Integrated Solid Waste Management Facility

**NGPC File No. R50B941**

October 2015

**Facility Name and Address:** PVT Integrated Solid Waste Management Facility
87-2020 Farrington Highway
Waianae, Hawaii 96792

**Facility TMK:** (1) 8-7-009:025 and (1) 8-7-021:026

**Purpose:** To minimize the discharge of pollutants in storm water from the PVT Integrated Solid Waste Management Facility (PVT ISWMF), and to maintain compliance with PVT ISWMF's Notice of General Permit Coverage (NGPC) under the National Pollutant Discharge Elimination System (NPDES) (General Permit). The General Permit authorizes PVT Land Company, Ltd. to discharge storm water associated with industrial activity from the PVT ISWMF to Ulehawa Stream. This Storm Water Pollution Control Plan (SWPCP) is a requirement of PVT ISWMF's General Permit. Use this Plan as a tool to communicate practices on preventing and responding to discharges and as a resource for site-specific information as it relates to storm water. This SWPCP updates and replaces PVT's previous SWPCP dated February 2008.

**Storm Water Resources:**

| | |
|---|---|
| HAR 11-55, Appendices A and B - NPDES General Permit Authorizing Discharges of Storm Water Associated with Industrial Activities | This SWPCP was developed in accordance with Hawaii Administrative Rules (HAR) 11-55 (effective November 15, 2014), which requires the SWPCP to:<br>• Characterize the site<br>• Outline pollution control strategies<br>• Summarize spill prevention and response plan,<br>• Identify lessons learned from past leaks or spills of pollutants that could have affected storm water<br>• Define the storm water monitoring and inspection plan<br>• Designate procedures for implementing, reviewing and updating the SWPCP. |
| HAR 11-54, Water Quality Standards | HAR 11-54, revised November 15, 2014, provides state regulations establishing water quality standards for waters in Hawaii. |

***Keep this SWPCP and associated documents on site and available for review and reference.***

# Section 1 Facility Description

PVT ISWMF is located at 87-2020 Farrington Highway in the community of Nānākuli near the western coast of the Island of O'ahu, Hawai'i. The State land use classification for the site is urban and agricultural, and the land use ordinance is AG-2 General Agricultural District. The property begins approximately 1,600 feet northeast of the intersection of Farrington Highway and Lualualei Naval Road, and extends northerly approximately one mile along Lualualei Naval Road. The developed portion of the PVT ISWMF covers approximately 200 acres and is bordered to the east by Lualualei Naval Road, to the west by Ulehawa Stream, to the south by a residential neighborhood, and to the north by Pine Ridge Farms, Inc., a trucking, concrete and asphalt recycling, and concrete production facility.

PVT ISWMF operations include a construction and demolition (C&D) material landfill with asbestos disposal and liquid waste solidification areas, and a recycling and materials recovery operation. The primary existing and future planned operations at the site include:

- Segregation of incoming loads into materials for processing, recycling, on-site usage or disposal
- Mixed waste sorting to remove and separate recyclable materials
- Processing to produce feedstock for renewable energy producers
- Production of aggregate materials including rock, gravel and crushed asphalt
- Solidification of liquid wastes
- Reclamation of previously landfilled C&D waste to minimize the potential of fire, to prevent settlement, to minimize leachate potential, and to remove voids
- Storage of recyclable materials and marketing of recyclable materials
- Landfill disposal of residual non-recoverable waste materials, including primarily composition/asphalt roofing shingles, tile, gypsum board, lead painted concrete and cementitious siding.

Hours of facility operation are 7:00 am to 3:30 pm, Monday through Friday and 7:00 am to 1:00 pm on Saturday. On-site activities including cover application, construction, and maintenance generally continue after the posted hours for waste receipts.

PVT also manages 179 acres of undeveloped land located east of Lualualei Naval Road (TMK 8-7-009: parcel 007), which is used for soil borrow, water supply and drainage control, and is not regulated under the General Permit.

The terrain at the site varies from relatively steep slopes to flat areas and is primarily unpaved. Elevations in the developed portion of the site prior to landfilling ranged from approximately 20 to 60 feet above sea level, while current site elevations in these areas range from approximately 20 to 130 feet above sea level. Approximately 104 acres are designated for waste disposal, with a maximum final elevation of up to 250 feet above sea level. Figure 1 shows the facility location.

Most of the structures at PVT ISWMF, including an administrative office building, a maintenance shop, a fuel containment area, storage containers, two office trailers, a covered employee break area, scales, a scale house, and covered employee parking, are located in the southern portion of the property. This area of the site is paved, as is the roadway leading to the scales, to the top of the landfill, and to the recycling and material recovery area. The recycling and material recovery equipment, along with a covered employee break area, is located in the northernmost portion of the property. There is also a storage building, which contains monitoring equipment and files, located in the landscaped nursery area of the site, along the southwestern property boundary.

PVT ISWMF has a storm water management system that is designed and constructed to manage runoff from a 25-year, 24-hour storm. Runoff is collected in a system of drainage ditches, channels, pipes, and basins designed by PVT ISWMF's engineering consultants. As designed, the system will carry runoff from the design storm without flooding or excessive erosion from the site, and will retain a significant volume of water to minimize off-site runoff impacts and allow sediment in the runoff to be intercepted and removed before discharge from the site.

Drainage is managed to:

- prevent run-on of surface water to the active disposal face or uncovered refuse
- minimize erosion in all areas of the site
- maintain roads and other ancillary facilities in useable condition under all weather conditions
- prevent excessive runoff or sedimentation impacts to neighboring properties.

The landfill top deck and other areas in the vicinity of active disposal areas are graded at a slope of 2% to 5% away from the active disposal area. Diversions are constructed upgradient of the active disposal area to prevent run-on from contacting the waste, and divert drainage around any exposed waste. Diversions are also constructed downgradient of exposed waste to prevent the runoff of any precipitation that has contacted waste. Water that has contacted waste is retained within the waste. No runoff of precipitation that has contacted waste is discharged off site or into any water body.

PVT ISWMF has operated under a SWPCP since 2008. There have been no discharges of a reportable quantity from the facility. Any future reportable leaks or spills of toxic or hazardous pollutions at the facility must be documented below and shown on the site map.

| Date | Location | Material Spilled & Quantity of Release | Affected Body of Water |
|---|---|---|---|
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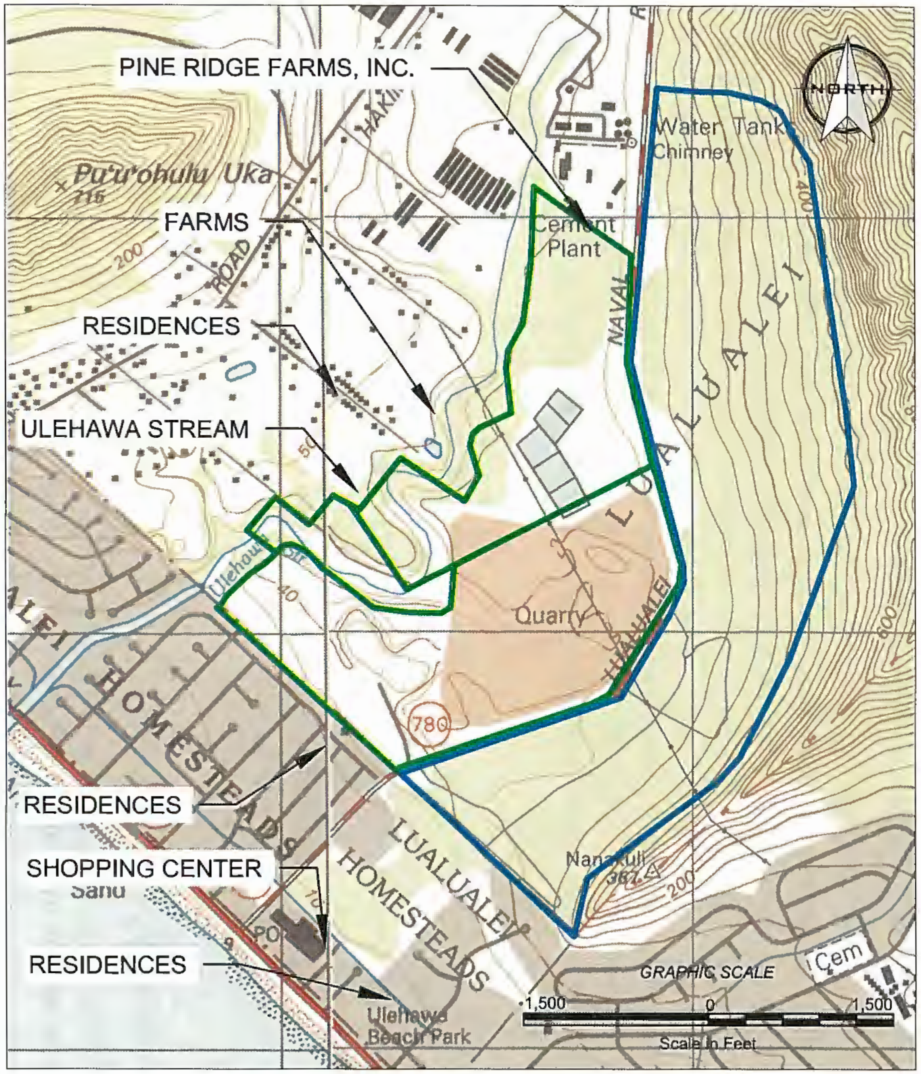
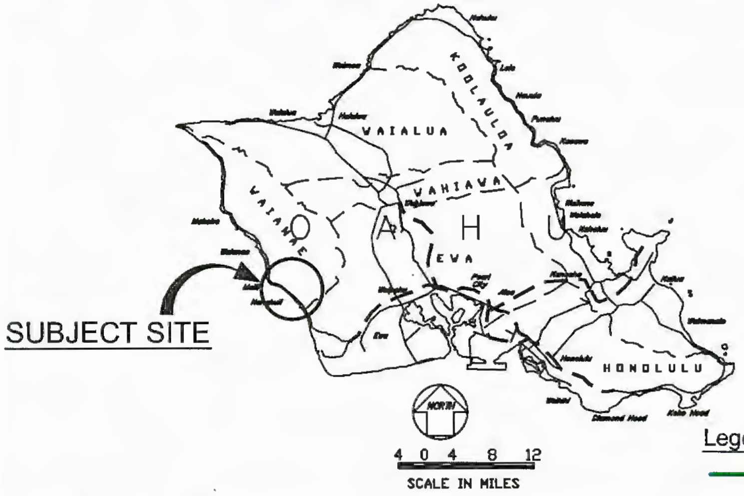




Legend
🟩 PVT ISWMF Property Boundary
🟦 Leeward Land Property Boundary

Reference: L[illegible]998; Google Earth, 2013 (Satellite Image 1/29/2013) .

Approved by: JKH
Drawn by: LBM
Date: October 2015

Hydrogeological Consulting
JUTURNA LLC

## Figure 1
## Site Vicinity Map

Storm Water Pollution Control Plan
PVT Integrated Solid Waste Management Facility
Nanakuli, Oahu, Hawaii

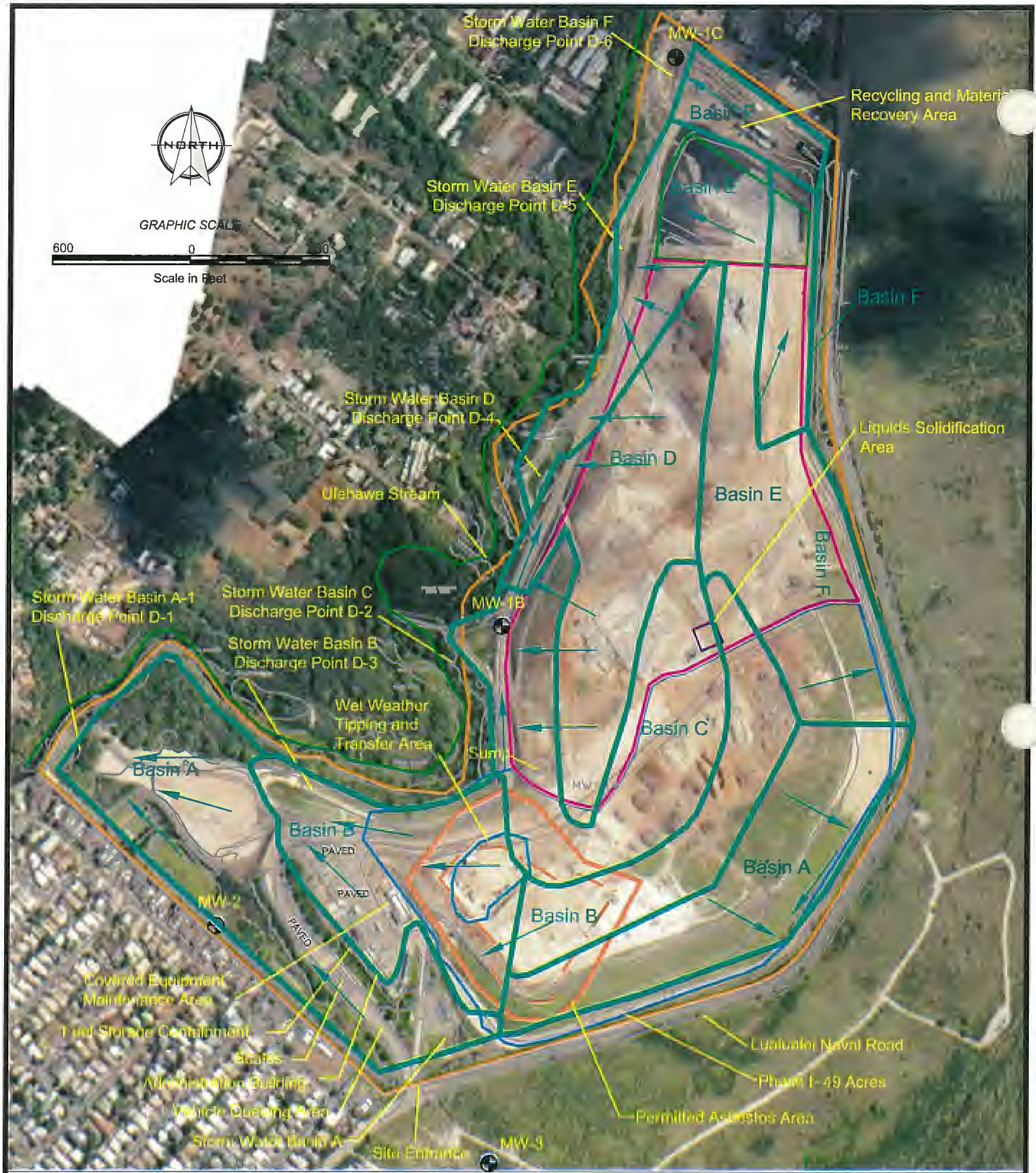
# Section 2 Site Map

Figure 2, Site Plan, on the following page identifies locations of drainage areas, potential pollutant storage areas, material disposal areas, and activities that could impact storm water. The site map also shows the location of structural best management practices (BMPs) that have been installed at the facility.

The site map identifies features that may impact storm water such as past or present areas of significant spills or areas where chemicals are currently applied.

The site map also shows the location of the storm water basins for collection of storm water and removal of silt, and the discharge sampling points, There are seven storm water basins (Basins A, A-1, B, C, D, E, and F) and six discharge points which discharge storm water into Ulehawa Stream. All six discharge points (D-1, D-2, D-3, D-4, D-5, and D-6) are permitted under PVT ISWMF's General Permit. One of the storm water basins (Basin A) does not have a discharge point because the limited amount of storm water that collects in this basin percolates into the ground resulting in no discharge off site or flows into Basin A-1, which does have a discharge point.

Anticipated storm water flow directions are indicated on the map and are based on the storm water management system and the topography at the site. These flow arrows can be used to anticipate spill direction if a spill were to occur at the site. Awareness of storm water basins that will receive discharges in the event of a spill is fundamental in protecting storm water.



Legend

- Groundwater Monitoring Location
- Primary Fill Area (Phase II)
- Secondary Fill Area: Phase I
- Facility Boundary
- Asbestos Disposal Area
- Active Asbestos Disposal Area
- Future Phase II Areas
- Solidification Area
- Wet Weather Tipping and Transfer Area
- Storm Water Flow Direction
- Storm Water Flow Areas
- Ulehawa Stream

Basemap Reference: TerraPAC LLC, 2014.

Approved by: JKH
Drawn by: LBM
Date: October 2015

JUTURNA LLC

**Figure 2**
**Site Plan**

Storm Water Pollution Control Plan
PVT Integrated Solid Waste Management Facility
Nanakuli, Oahu, Hawaii

# Section 3 Potential Pollutants, Spill Prevention and Pollutant Control Strategies

## 3.1 Potential Pollutants

The table below lists the potential pollutants present at PVT ISWMF by their sources. These potential pollutants have been identified based on the predominant activities conducted at the facility, listed in Section 1. These pollutants have the potential to be released offsite and ultimately into a surface water body.

**Table 1: List of Potential Pollutants by Source**

| Potential Pollutant | Source(s) |
|---|---|
| Loose Soil / Sediment | Erosion of landfill cover and other unpaved surfaces |
| Petroleum Fuel (Gasoline and Diesel Fuel) | Vehicle and equipment fueling, fuel storage |
| Oil and Grease | Maintenance, material storage, waste management, leaking equipment |
| Detergents | Washing of vehicles and equipment |
| Solvents | Parts cleaning and vehicle/equipment maintenance |
| Pesticides (including Herbicides, Insecticides, Fungicides, etc.) and Fertilizers | Chemical application in landscaped areas |
| Solid Waste (including Trash, Wind-Blown Litter, and Construction Debris) | Waste management and disposal, wind blowing off landfill active face and trucks |
| Metals | Material storage, waste management/recycling |
| Paint | Painting operations, material storage, waste management |
| Feedstock (wood chips) | Recycling and Material Recovery Operations |

## 3.2 Spill Prevention and Pollutant Control Strategies

Best management practices (BMPs) are activities, prohibitions or designations of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of State waters (HAR Ch.11-54). BMPs include nonstructural and structural controls. Examples of nonstructural BMPs employed at PVT ISWMF include:

- Preventative maintenance of equipment and storage containers to prevent leaks
- Waste minimization and control
- Removal of exposed pollutants, or placing such pollutants under cover
- Practicing good spill prevention practices
- Employing safe vehicle and equipment washing techniques.

Site-specific nonstructural BMPs related to the operations and potential pollutants listed above are provided in Attachment A.

Structural BMPs in place at the facility include:

- Sedimentation/detention basins
- Riser pipes and skimmers
- Earthen Berms
- Swales
- Pipes
- Channels
- Filter fabric
- Self-contained tire washer
- Street sweepers
- Litter fences

Structural BMPs at this facility are maintained by PVT employees Mr. Stephen Joseph, Vice President of Operations and Mr. William Lyon, Operations Manager.

# Section 4 Spill Response Plan

## 4.1 Spill Response

The SWPCP requires PVT ISWMF to record releases of chemicals, petroleum, or other materials that could become storm water pollutants. A release is defined as any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing of any hazardous substance, pollutant, or contaminant into the environment (Hawaii Environmental Response Law; Hawaii Revised Statutes; Chapter 128D).

Attachment B contains the procedures to follow in responding to a spill (Attachment B, item B1), including emergency notification, information on reporting a spill to the regulatory agencies, and reporting requirements and forms (Attachment B, item B2). Releases must be recorded on the spill log contained in Section 1 (page 3) of this SWPCP and shown on the site map (page 6). Training (Section 6) must include a discussion of past spills, causes and corrective action, with an emphasis on how to prevent such spills in the future.

If a release occurs on site, PVT ISWMF managers are responsible for executing the spill response plan and for completing the spill response documentation form after the spill has been addressed. Following the spill cleanup, a review should be conducted to assess whether the spill response plan is adequate for the site and to determine areas for improvement.

## 4.2 Non-Storm Water Discharges

Non-storm water discharges are flows that do not consist entirely of storm water resulting from precipitation. PVT ISWMF's General Permit does not authorize any non-storm water discharge. Only flows consisting entirely of storm water are permitted at PVT ISWMF.

Prohibited non-storm water discharges pose environmental concerns as these discharges can negatively impact water quality. Identifying and eliminating prohibited non-storm water discharges can be an easy and cost-effective method for preventing runoff contamination and pollution of receiving waters. Examples of prohibited non-storm water discharges include:

- Floor or sink drains discharging to the storm drain system instead of the sewer system
- Fertilizer runoff from improper application
- Runoff from vehicle / equipment washing
- Dumping of a chemical substance directly into the storm drain system
- Landscape irrigation water entering the storm drain system
- Dust control water entering the storm drain system
- Discharges or flows from firefighting activities
- Landfill leachate entering the storm drain system.

The best method to identify and eliminate prohibited non-storm water discharges is by routine inspection, as outlined in Section 5.2.

# Section 5 Storm Water Monitoring and Inspection

## 5.1 Storm Water Monitoring Plan

Water quality sampling results from periodic monitoring of storm water runoff at PVT ISWMF help evaluate the effectiveness of pollution prevention and control strategies and lead to informed storm water management decisions. The Site Map in Section 2 shows the locations of the six sampling locations at PVT ISWMF, identified as Discharge Points #1 through #6. The Storm Water Monitoring Plan for PVT ISWMF is contained in Attachment C.

## 5.2 Inspections

Facility managers shall conduct inspections of the facility following a significant storm event, utilizing the Storm Event Inspection Log in Attachment D. The purpose of the storm event inspections is to ensure that the storm drainage management system functioned properly and to identify any required repairs or follow-up actions. The completed Storm Event Inspection Logs shall be kept with the SWPCP in Attachment D.

In addition to inspections after significant storm events, facility managers shall conduct semiannual walkthrough inspections of the facility, utilizing the Semiannual Inspection Checklist in Attachment D. Semiannual inspections are an opportunity for personnel to check that potential pollutants at the facility are not exposed and do not have the potential to be exposed to storm water, in addition to checking the condition of the storm water management system. The semiannual inspections will also evaluate compliance with the SWPCP and the General Permit. The semiannual inspection reports shall be kept with the SWPCP in Attachment D. Facility managers will analyze the semiannual inspection results to assess the effectiveness of BMPs, and recommend additional BMPs if needed.

The semiannual inspections will include the following:

- Review of the SWPCP to identify changes in facility status and whether the SWPCP needs to be updated
- Review of storm event inspection records
- Review of personnel training records
- Review of spill records
- Evaluation of corrective actions taken based on the comments and/or recommendations of previous inspections
- Inspection of material storage areas and the maintenance shop to ensure proper housekeeping practices and other nonstructural BMPS are being used
- Inspection of spill response equipment and structural BMPs
- Inspection of storm water management system for evidence of pollutants that may enter the drainage system.

# Section 6 Training

For this SWPCP to successfully protect Hawaii's waters, PVT ISWMF employees need to know what to do and why. PVT shall train the employees who work with the materials or activities that could impact storm water, and who do inspections or maintenance of the storm water management system.

Training must be conducted at least annually. Employees new to the facility, who work in the above areas, must be trained within 30 days of the start of employment.

The topics to be covered in the training include:

- Purpose of the SWPCP
- Sources of potential pollutants at PVT ISWMF that could affect storm water
- Locations and maintenance requirements of pollution control devices/structural BMPs
- Spill response procedures
- Prohibited non-storm water discharges
- How to do semiannual and storm event inspections
- Inspection of storm drainage facilities for evidence of pollutants that may enter the drainage system
- Persons responsible for the following activities at the site:
    - Semiannual inspections
    - Storm event inspections
    - SWPCP record keeping
    - Updating the SWPCP as needed
    - Restocking spill kits as needed
    - Ensuring training occurs as required
    - Maintenance of structural BMPs at the site
    - Follow-up regarding any corrective actions recommended in semiannual or storm event inspections.

A blank Training Log is found in Attachment E. Records of training must be kept with this SWPCP and can be placed in Attachment E. Facility managers are responsible for completion of the facility's annual staff training.

# Section 7 SWPCP Review Procedures

Review this plan at least once a year to make sure its content is current. Revise the SWPCP, including the Site Map in Section 2, as needed to accurately reflect potential storm water risks.

For example, identify if a SWPCP revision is required related to any of the following changes:

- Staffing changes affect duty assignments or spill response contact information
- A storm water management or pollution control method or device was determined to be ineffective, or a new one was added
- Sampling locations have been moved
- Changes in the function or management of the facility
- New or different activities or materials used or stored at the facility have the potential to affect storm water.

The Facility's SWPCP Review and Amendment Log is contained in Attachment F. Record the date the plan was reviewed, and summarize any updates made.

# Section 8 Certification Statement

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment for knowing violations."

Name and Title

Date

# Attachment A

## Site Specific BMPs

# A1: Housekeeping

Daily activities performed at PVT ISWMF require the use of materials and products that are potential contaminants in storm water. Good housekeeping practices are intended to maintain a clean, safe, and orderly working environment when utilizing and storing these materials. Implementing the good housekeeping BMPs will reduce the possibility of accidental spills, caused by mishandling of equipment or improper storage practices, and potential safety hazards to personnel. These BMPs should be followed by all PVT ISWMF personnel.

| # | **Best Management Practices** |
|---|---|
| A1-1 | Train PVT ISWMF employees on good housekeeping practices on an annual basis. |
| A1-2 | Perform facility inspections on a regular basis to ensure good housekeeping practices are being properly implemented. |
| A1-3 | Minimize water use in washing activities and prevent runoff of water to storm drainage system or water bodies. |
| A1-4 | Sweep or vacuum facility floors and paved areas regularly to prevent tracking of materials and sediment that could become entrained in storm water. |
| A1-5 | Inspect facility storm drainage system regularly and after each significant storm event. Inspections should focus on locating and repairing any areas of excessive erosion, ensuring that skimmers installed in sedimentation basins are working properly, and that no pipe inlets are plugged or blocked with sediment or debris. |
| A1-6 | Remove and properly dispose of debris and sediment from all settling/detention basins and storm water samplers at least once per year. |
| A1-7 | Material in storm drainage system is not to be flushed downstream. |
| A1-8 | Store bulk materials that may contaminate storm water in covered areas to the extent practicable. Do not store in areas where storm water runoff flows to the drainage system. |
| A1-9 | Implement erosion and sediment control measures such as permanent stabilization using gravel, seed, sod, or mulch to minimize erosion from the bare areas. |
| A1-10 | Report any trouble, vandalism, and/or suspicious activity to management. |

| # | **Best Management Practices** |
|---|---|
| A1-11 | Inform contractors conducting work at the facility of PVT ISWMF policies and include appropriate provisions in their contracts to implement proper housekeeping, material storage and use, and waste disposal BMPs. |
| A1-12 | Check grounds for spills or leaks from vehicles, equipment, and refuse bins. Apply absorbents and sweep up immediately after identifying spills. Do not hose down oil spots. |
| A1-13 | Store oily or leaking equipment under cover with drip pans. Empty, clean, and replace drip pans as needed. |
| A1-14 | Immediately cleanup contaminated soil by removal, disposal, or treatment of the contaminated soil in the on-site liquid waste solidification treatment area. |
| A1-15 | Prevent non-storm water discharges into the storm drainage system using drainage controls such as dikes, berms, retaining walls, curbing, weirs, booms, other barriers, diversion ponds, sumps, collection systems, absorbent materials, and/or storm drain covers (as described in 40 CFR Part 112.7). |

# A2: Material Storage and Use

A variety of products and materials stored and used at PVT ISWMF may adversely affect water quality. These BMPs are intended to reduce the potential for the contamination of storm water by minimizing exposure of such products and materials to storm water runoff.

| # | **Best Management Practices** |
|---|---|
| A2-1 | Identify chemical substances used at the facility, compile Material Safety Data Sheets (MSDSs) for each product, and store MSDSs where chemicals are used. Maintain an accurate inventory of materials and/or chemicals that are stored or used. |
| A2-2 | Use hazardous materials only where and when needed to complete a task. Use less hazardous, alternative materials where possible. |
| A2-3 | Store materials in their original or appropriate containers as recommended by the manufacturer, and ensure products and materials are properly labeled. |
| A2-4 | Keep all containers closed, securely fastened, and neatly stored. |
| A2-5 | Use up existing products and materials before purchasing or opening additional containers of the same kind. |
| A2-6 | Follow manufacturer's instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals. Ensure that incompatible chemicals are not stored next to each other. |
| A2-7 | Store reactive, ignitable, or flammable materials in compliance with the Honolulu Fire Department, Fire Code of Honolulu (Article 79 for Flammable and Combustible Liquids or Article 82 for Liquefied Petroleum Gases). |
| A2-8 | Employees who handle chemicals and potentially hazardous materials must be adequately trained. |
| A2-9 | Inspect storage areas regularly. Look for leaking or corroded containers, chemical discoloration, or other changes in the containers or contents. |
| A2-10 | Properly dispose of materials that are expired, appear deteriorated, or are no longer used. If the container is deteriorating, properly transfer materials to a new container or dispose of entire container in a manner that meets disposal laws. |
| A2-11 | Potential pollutants should be stored indoors or undercover, whenever possible, to minimize their contact with storm water. Materials that must be stored outdoors without cover should be stored away from storm drain inlets and waterways. |

| # | Best Management Practices |
|---|---|
| A2-12 | Fuel drums, chemical storage containers and batteries should be placed on spill containment pallets or other type of secondary containment. |
| A2-13 | Use drainage controls in uncovered areas where stockpile erosion or contaminated runoff can occur. |
| A2-14 | Maintain spill cleanup materials near petroleum and chemical storage areas. |
| A2-15 | Clean small spills of chemicals, petroleum, or paints with absorbent material or rags, and properly dispose of contaminated spill materials. For larger spills, contact spill response personnel immediately. |
| A2-16 | Do not clean out brushes or rinse paint containers into the dirt, roadway, storm drainage system, or stream. "Paint out" brushes as much as possible. Rinse water-based paints to the sanitary sewer. Dispose of excess oil based paints or lead-containing paints and sludge as appropriate. |
| A2-17 | During periods of significant rain, suspend receipt and processing of C&D material in the recycling and materials recovery area and minimize stockpiles of unprocessed material. |
| A2-18 | Whenever possible, use tarps to cover processed feedstock, to avoid increasing its moisture content and net fuel value as well as to prevent runoff. |

# A3: Waste Management

Improper handling of wastes can allow contaminants to enter storm water runoff from the facility. The discharge of pollutants can be prevented and reduced by tracking waste generation, storage, and disposal as well as reducing the waste generation through reuse and recycling. The following BMPs identify the proper disposal methods for chemicals, petroleum products and solid wastes generated at PVT ISWMF and are intended to prevent the discharge of pollutants. Materials that cannot be reused or recycled and would be classified as hazardous waste must be disposed of by a certified/licensed hazardous waste transporter and disposal facility.

| # | **Best Management Practices** |
|---|---|
| A3-1 | Designate waste collection areas, preferably under cover. Use leak-proof rubbish cans and keep cans covered or stored undercover, to the extent practicable. |
| A3-2 | Keep waste collection areas clean. Do not overfill trash receptacles or leave trash outside of receptacles. Arrange for collection before containers overflow. |
| A3-3 | Only purchase and store needed quantities of chemicals and other materials. |
| A3-4 | Inspect containers regularly and transfer waste from damaged containers into safe containers. |
| A3-5 | Place containers that may impact storm water in secondary containment. Cover and protect containers from exposure to the elements as well as from vandalism. |
| A3-6 | Do not remove the original product label with its important safety and disposal information. |
| A3-7 | Use the entire product before disposing of the container. Ensure that disposed materials will not leak and commingle with storm water runoff. |
| A3-8 | Do not mix waste; this can cause chemical reactions, make recycling impossible, and complicate disposal. |
| A3-9 | Make sure that hazardous waste or universal waste (e.g., fluorescent light tubes) are collected, removed, and disposed of only at authorized disposal sites by a certified/licensed hazardous waste transporter. |
| A3-10 | Recycle any useful material such as metal, used oil, or batteries. |
| A3-11 | Keep spill kits or supplies of spill cleanup materials in locations near potential pollutants so they are readily accessible if needed. |

| # | Best Management Practices |
|---|---|
| A3-12 | If a container does spill or leak, attempt to stop, contain, and clean up the spill immediately. Absorb liquid spills using rags or other absorbent and properly dispose of cleaning media. |
| A3-13 | Pick up wind-blown litter and debris when observed on site. On windy days, management should appoint personnel to litter cleanup duty where they collect wind-blown litter from all affected areas of the landfill. |
| A3-14 | Non-metal litter should be placed in trash bags and disposed of on the working face of the landfill. Metal litter should be recycled. |
| A3-15 | Place appropriate engineering controls such as litter fences downwind of the active disposal face of the landfill. |

# A4: Fueling and Loading/Unloading Operations

During fueling of vehicles and equipment, leaked or spilled fuel could contaminate storm water or enter the storm drainage system and flow directly into water bodies. Loading and unloading activities may include bringing in equipment, materials, and fuel, and taking out recycling materials, feedstock, and waste materials. Materials spilled, leaked, or lost during loading or unloading may collect in the soil or on other surfaces and have the potential to be carried away by storm water runoff. The procedures outlined in these BMPs are intended to prevent fuel spills and leaks and reduce their impact on storm water.

| # | **Best Management Practices** |
|---|---|
| A4-1 | Perform fueling of vehicles and equipment in designated areas, away from drain inlets, drainage channels, or receiving waters. Heavy equipment should be fueled on the landfill. |
| A4-2 | Maintain an ample supply of spill cleanup materials and spill control equipment near fueling and loading/unloading areas. Equip fuel trucks and mobile tanks with spill cleanup materials. |
| A4-3 | Do not allow "topping off" and unattended fueling. |
| A4-4 | Post proper operational and cleanup instructions in fueling and loading/unloading areas where appropriate. |
| A4-5 | Do not allow hosing off fueling and loading/unloading areas. |
| A4-6 | Regularly clean the fueling area and storage tank loading and surrounding areas. |
| A4-7 | Regularly check vehicles and equipment for leaks or damage that could result in leaks. Inspect piping, hoses, and equipment for leaks and repair as necessary, or remove damaged and leaking equipment from the site. |
| A4-8 | Regularly check for leaks at fuel dispensers, as well as proper operation of automatic shut off controls on fuel dispensing nozzles. Repair as needed. |
| A4-9 | Limit exposure of material to rainfall whenever possible, by limiting loading or unloading to dry weather or by covering loading/unloading areas. |
| A4-10 | Park tank trucks and heavy equipment in designated areas that will contain spills or leaks. |

| # | **Best Management Practices** |
|---|---|
| A4-11 | Spills should be contained and cleaned with applicable spill absorbents immediately or as specified in the chemical's MSDS. Dispose of used absorbent material in accordance with regulatory requirements. |
| A4-12 | Keep accurate records of spills, make sure spill kits are restocked as necessary, and identify procedural improvements to prevent future spills. |

## A5: Washing and Maintenance of Vehicles and Equipment

Maintenance of vehicles and equipment is conducted at PVT ISWMF primarily inside the maintenance shop where it is not exposed to precipitation. Some maintenance of equipment is conducted on the landfill working face where any storm water runoff is retained within the waste. Washing of vehicles and equipment is only conducted on the landfill working face. The following BMPs are intended to reduce the impact of vehicle and equipment washing and maintenance on storm water runoff.

| # | **Best Management Practices** |
|---|---|
| A5-1 | Wash vehicles and equipment only in designated areas on top of the landfill where runoff would not enter the storm water management system. |
| A5-2 | Water from sinks must not drain to the storm drainage system. Connect all sinks and floor drains to septic tanks. |
| A5-3 | Prohibit washing and repair of personal vehicles at PVT ISWMF. |
| A5-4 | Maintain PVT ISWMF vehicles and equipment in good operating condition, and routinely check vehicles and equipment for fluid leaks. |
| A5-5 | Use drip pans under leaking vehicles and equipment, until they are repaired. |
| A5-6 | Conduct repair and maintenance of vehicles or equipment under cover whenever possible, to prevent contact of the storm water runoff with the maintenance operations. |
| A5-7 | Use damp cloths, brooms, and absorbent material for cleaning. Do not hose or blow the area to remove dust. |
| A5-8 | Maintain an ample supply of absorbent materials near maintenance areas. |
| A5-9 | Store materials for constructing temporary berms to direct storm water away from the storm water management system in the event of a spill. |
| A5-10 | Educate PVT ISWMF personnel that non-storm water is not to be discharged to the storm drainage system. |

## A6: Storm Water Management System Maintenance

Maintenance of the storm water management system at PVT ISWMF is one of the most important items in reducing the impact of storm water runoff on Ulehawa Stream. The following BMPs address storm water management system maintenance throughout the facility.

| # | Best Management Practices |
|---|---|
| ***C&D Landfill Working Face and Landfill Reclamation Working Face*** | |
| A6-1 | Ensure that diversions are in place upgradient of the landfill active working face to prevent run-on of surface water to the active face or uncovered refuse, and to divert drainage around any exposed waste. |
| A6-2 | Ensure that diversions are in place downgradient of exposed waste to prevent the runoff of any precipitation that has contacted waste. |
| A6-3 | Ensure that the landfill top deck and other areas in the vicinity of active disposal areas are graded at a slope of 2% to 5% away from the active disposal area. |
| A6-4 | Promptly repair gullies caused by erosion. |
| ***Liquid Waste Solidification Area*** | |
| A6-5 | Ensure that the diversions surrounding the liquid waste solidification area contain storm water runoff and prevent it from being discharged to the site drainage system. Note: the liquid waste solidification area is located above a lined area of the landfill. |
| A6-6 | Inspect the liquid waste solidification area daily during periods of rain to ensure storm water is retained, and to monitor the extent of standing water in the area. |
| A6-7 | Ensure all rainwater falling on the solidification cells is evaporated or incorporated into the solidified waste. Standing water must be incorporated into the contaminated soil within one week of a rain event if safe to do so. |
| ***Wet Weather Tipping and Transfer Area*** | |
| A6-8 | Ensure that the wet weather tipping and transfer area will retain storm water and prevent runoff that has contacted waste from leaving the wet weather tipping area. |
| A6-9 | Use the wet weather tipping and transfer area for C&D waste only. No asbestos or contaminated soil should be unloaded in the wet weather tipping area. |
| A6-10 | Remove all waste from the wet weather tipping area and transfer it to the disposal cell within one week following the end of a rain event if safe to do so. |

| # | Best Management Practices |
|---|---|
| ***Recycling and Materials Recovery Area*** | |
| A6-11 | Ensure that the recycling and materials recovery area is graded to drain toward the sedimentation basin and that a diversion is present around the lower end of the area to retain runoff from small rain events. |
| ***Storm Water Sedimentation Basins and Sloped Areas of Site*** | |
| A6-12 | Maintain diversion berms, vegetation, and sedimentation basins as needed to control and reduce the velocity of runoff. |
| A6-13 | Inspect side slopes periodically, and repair eroded areas promptly. |
| A6-14 | Install netting with embedded grass seed or hydroseed to promote establishment of grass cover on the interior slopes of sedimentation basins and in steep areas susceptible to loose soil, such as slopes along Lualualei Naval Road and Ulehawa Stream. |
| A6-15 | Areas of the site, including slope areas that are near final grades, that are not scheduled to receive additional waste fill for a year or more should be covered with mulch or hydroseeded with grass to provide erosion control. |
| A6-16 | Regularly grade the site to ensure proper sloping toward the storm water sedimentation basins. |
| A6-17 | Inspect facility storm drainage system regularly and after each significant storm event. Inspections should focus on locating and repairing any areas of excessive erosion, ensuring that skimmers installed in sedimentation basins are working properly, and that no pipe inlets are plugged or blocked with sediment or debris. |
| A6-18 | Remove and properly dispose of debris and sediment from all settling/detention basins and storm water samplers at least once per year. |
| ***Access Roads*** | |
| A6-19 | Promptly repair areas with evidence of erosion. |
| A6-20 | Ensure that diversions are present where needed to direct storm water runoff into drainage ways or to contain storm water runoff within the landfilled areas. |
| A6-21 | Ensure that roads are graded for proper drainage. |
| A6-22 | Maintain roads and other ancillary facilities in useable condition under all weather conditions. |

# A7: Grounds Maintenance

Grounds maintenance conducted at PVT ISWMF includes irrigation, pruning, trimming shrubs, grass mowing, and vegetation waste management. Most of this work is conducted by a landscaping contractor. The following BMPs are intended to reduce the impact of Grounds Maintenance on storm water. The landscaping contractor also may apply pesticides and fertilizers at the site; pesticide and fertilizer application BMPs are provided separately in A8.

| # | Best Management Practices |
|---|---|
| ***Irrigation Management*** | |
| A7-1 | Reduce impacts of water loss due to evaporation by operating the irrigation system at night, in mornings, or late afternoon. |
| A7-2 | Use automatic timers to minimize runoff of irrigation water, where practical. |
| A7-3 | Slowly or pulse irrigate to prevent runoff and then only irrigate as much as is needed. |
| A7-4 | Do not irrigate during or immediately following a rainstorm event. |
| A7-5 | Ensure that sprinkler heads are turned away from paved areas such as roadways. Sprinkler should be used for watering landscaped areas only. |
| A7-6 | Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Repair any leaks observed. |
| ***Weed Control*** | |
| A7-7 | Whenever possible, use mechanical methods of vegetation removal (e.g., weed trimmers, or hand cutting) rather than applying herbicides. |
| A7-8 | The preferred methods for removing weedy plants are as follows:<br>▪ Manual removal by cutting, digging, or pulling.<br>▪ Shading out by increasing the number of plants or planting over the weedy species.<br>▪ Timed mowing. Carefully timed mowing before seed set can effectively reduce weed seed sources.<br>▪ Mulching. Mulching around the base of plantings is widely accepted as a horticultural practice for water conservation, soil temperature moderation, soil fertility, and weed control. In most instances, composted wood chips, organic compost, or onsite recycle leaf litter are adequate materials. Mulch should be placed around the plantings at a depth of 2 to 4 inches. Replace mulch every two years or as needed. |

| # | **Best Management Practices** |
|---|---|
| A7-9 | Avoid loosening the soil when conducting vegetation removal, which could lead to erosion. Use mulch or other erosion control measures when soils are exposed. |
| ***Vegetation Waste Management*** | |
| A7-10 | Do not leave grass clippings in drainage areas or drainage ways where they could be flushed into storm drainage systems. |
| A7-11 | Do not use leaf blowers to blow leaves and grass clippings into the storm drain or drainage ways. |
| ***Overall Grounds Maintenance*** | |
| A7-12 | PVT ISWMF managers should ensure that the landscaping contractor follows these BMPs. |

## A8: Chemical (Pesticide and Fertilizer) Application

Pesticides (including herbicides, insecticides, fungicides, etc.) and fertilizers may be used in the plant nursery and landscaped area near the southern boundary of the PVT ISWMF and could have the potential to impact storm water if not handled and applied properly. Pesticides and fertilizers are provided and applied by a contracted landscaping company and are not stored on site. Pesticides and fertilizers will be applied using the following BMPs to minimize their presence in storm water runoff from the nursery/landscaped areas of the site.

| # | **Best Management Practices** |
|---|---|
| A8-1 | Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of pesticides and fertilizers. |
| A8-2 | Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface. |
| A8-3 | Apply surface dressings of fertilizer in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried off-site by runoff. Except on steep slopes, plow fertilizer into the soil rather than surface spreading or spraying it. |
| A8-4 | Sweep pavement if fertilizer is spilled on paved surfaces before applying irrigation water. |
| A8-5 | Use pesticides only when there is a visible pest problem and not as a preventative measure. |
| A8-6 | Do not mix or prepare pesticides for application near storm drainage areas. |
| A8-7 | Triple rinse containers and use rinse water as product. Dispose of unused product as appropriate. |
| A8-8 | Personnel who use pesticides are to be trained in their use. Note: The State Department of Agriculture, Pesticides Branch, licenses pesticide dealers, certifies pesticide applicators, and conducts onsite inspections. |
| A8-9 | Do not over-apply pesticides or fertilizers. Prepare only the amount needed. Follow the recommended usage instructions from the manufacturers, and use the minimum amount necessary to control the pest. Over-application is expensive and harmful to the environment. |
| A8-10 | Do not apply pesticides or fertilizers before it rains or in high wind. |
| A8-11 | PVT ISWMF managers should ensure that the landscaping contractor follows these BMPs. |

# Attachment B

## Spill Response Procedures, Notification and Reporting Requirements

# B1: Spill Response Procedures

## B1.1 Spill Cleanup Equipment

Spill containment and cleanup kit supplies shall be located in the storage containers at all times in case of a fluid spill or leak. Spill containment and cleanup kit(s) shall include salvage drums/containers such as high density polyethylene, polypropylene or polyethylene sheet-line steel; polyethylene disposal bags or equivalent; emergency response guidebook; safety gloves/clothes/equipment; shovels and/or other soil removal equipment; and absorbent pads and oil containment booms, stored in an impervious container. Spill clean up procedures shall be implemented immediately. Employees who work in areas where a spill may occur shall be trained on spill containment and cleanup measures for each contaminant used at the facility.

## B1.2 Emergency Notification

Attachment B2 summarizes the emergency spill notification information. In the event of a fire, explosion, or other release of hazardous material that could threaten human health outside the facility, or if it is possible that a spill has reached surface water, immediately report the emergency by calling 911 and the National Response Center at (800) 424-8802. In case of a spill, stop the flow, contain the spill, call 911 or the local emergency response, and report the spill to National Response Center at (800) 424-8802. The telephone number is staffed 24 hours a day, seven days a week. If the spill is large, a licensed cleanup contractor shall be contacted.

Spills of oil or hazardous substances greater than reportable quantities must be reported, including the following: Oil, gasoline, and diesel fuel that causes a violation of the State of Hawaii's water quality standards; or that causes a film or sheen upon or discoloration of the waters of the State or adjoining shorelines; or causes a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines.

## B1.3 Spill Response

According to the PVT ISWMF's Operations Plan, the person discovering a release of material from a container or operating equipment should initiate the following actions immediately:

- Extinguish any sources of ignition. Until the material is identified as nonflammable and noncombustible, all potential sources of ignition in the area should be removed. Vehicles and equipment should be turned off. If the ignition source is stationary, attempt to move spilled material away from the ignition source. Avoid sparks and movement creating static electricity.

- Attempt to stop the release at its source. Ensure that no danger to human health exists first. Simple procedures (turning valves, plugging leaks, etc.) may be attempted by the discoverer if there is no health or safety hazard and there is a reasonable certainty of the origin of the leak. No site personnel shall come into contact with unknown or hazardous substances illegally brought into the facility.

- Initiate spill notification and reporting procedures. Report the incident immediately to a supervisor. If there is an immediate threat to human life (e.g., a fire in progress or fumes overcoming workers), an immediate alarm should be sounded to evacuate the building, and the Fire Department should be called. Request the assistance of the Fire Department's hazardous materials response team if an uncontrollable spill has occurred and/or if the spill has migrated beyond the site boundaries.

The following actions should be taken for containment of a release:

- Attempt to stop the release at the source. If the source of the release has not been found; if special protective equipment is necessary to approach the release area; or if assistance is required to stop the release; the Fire Department should be called to halt the discharge at its source. Facility personnel should be available to guide the Fire Department's efforts.
- Contain the material released into the environment. Following proper safety procedures, the spill should be contained by absorbent materials and dikes using shovels and brooms. Consult applicable material safety data sheets for material compatibility, safety, and environmental precautions.
- Obtain outside contractors to clean up the spill, if necessary.

The following actions should be taken for spill cleanup:

- Recover or cleanup the material spilled. As much material as possible should be recovered and reused where appropriate. Material that cannot be reused must be declared waste. Combining non-compatible materials can cause potentially dangerous chemical and/or physical reactions or may severely limit disposal options. Compatibility information can be found on material safety data sheets.
- Cleanup of the spill area. Surfaces that are contaminated by the release shall be cleaned by the use of an appropriate substance or water. Cleanup water must be minimized, contained and properly disposed. Occasionally, porous materials (such as wood, soil, or oil-dry) may be contaminated; such materials will require special handling for disposal.
- Decontaminate tools and equipment used in cleanup. Even if dedicated to cleanup efforts, tools and equipment that have been used must be decontaminated before replacing them in the spill control kit.
- Arrange for proper disposal of any waste materials. The waste material from the cleanup must be characterized and disposed according to State and Federal Regulations.

# B2: Emergency Spill Notification and Reporting Requirements

## Summary of Notification Requirements

Discharge of any quantity of oil:

- to navigable waters or shorelines;
- that violates state water quality standards;
- that causes a film or sheen on water's surface; or
- that leaves a sludge or emulsion beneath the water's surface.

**National Response Center**
**Call: 800-424-8802**
**Provide verbal info**

SPCC-regulated discharge of:

- more than 1,000 U.S. gallons of oil in a single discharge to navigable waters or shorelines; or
- more than 42 U.S. gallons of oil in each of two discharges to navigable waters or shorelines occurring within any 12-month period.

**EPA Regional Administrator and**
**HI Dept. Health**
**Clean Water Branch**
**Written notification**

Release (to ground or water) of:

- any hazardous substance in quantities equal to or exceeding the reportable quantity criteria in any 24-hour period; or
- less than the reportable quantity in any 24-hour period that is not contained and remedied within 72 hours.

**HI Dept. Health**
**HEER Office**
**Call: 808-586-4249**
**808-247-2191**
**(after hours)**
**Written report to DOH**

# Spill Notification and Documentation Form

## Part A: Discharge Information

General information when reporting a spill to outside authorities:

Facility Name:

Facility Address:

Telephone:

Owner/Operator:

| | |
|---|---|
| Material Spilled: | Discharge Date and Time: |
| Quantity released: | Discovery Date and Time: |
| Quantity released to a water body: | Discharge Duration: |

Location/Source:

Describe how the spill occurred:

Actions taken to stop, remove, and mitigate impacts of the discharge:

Affected media:

[ ] air
[ ] water
[ ] soil
[ ] storm water drainage system
[ ] dike/berm
[ ] other: ________________________

| | |
|---|---|
| Notification person: | Telephone contact:<br>Business:<br>24-hr: |

Nature of discharges, environmental/health effects, and damages:

Injuries, fatalities or evacuation required?

| | |
|---|---|
| Mitigation Started (date/time): | Mitigation Ended (date/time): |

**Part B: Notification Checklist (Use to Log Calls if Spill Notification is Required)**

| | Date and time | Name of person receiving call |
|---|---|---|
| *Spill in any amount* | | |
| Facility Supervisor<br>808-668-4561 | | |
| *Discharge in amount exceeding "reportable quantity" and not affecting a water body or groundwater* | | |
| Honolulu Fire Department including HAZMAT (as required)<br>911 | | |
| DOH HEER (Hazard Evaluation and Emergency Response) Office<br>808-586-4249<br>808-247-2191 (after business hours) | | |
| Honolulu LEPC (Local Emergency Planning Committee)<br>808-723-8960 | | |
| *Discharge in any amount and affecting (or threatening to affect) a water body* | | |
| Honolulu Fire Department including HAZMAT (as required)<br>911 | | |
| HSERC (Hawaii State Emergency Response Commission) / DOH HEER Office<br>808-586-4249<br>808-247-2191 (after business hours) | | |
| National Response Center<br>1-800-424-8802 | | |
| Honolulu LEPC<br>808-723-8960 | | |
| *Discharge into MS4 (City Street)* | | |
| City Storm Water Quality Branch<br>808-768-3242 | | |
| *Notes:* | | |

**National Response Center Notification**
**Call: 800-424-8802**

## Provide the following information in a verbal report:

| | |
|---|---|
| Name and title of person filing report: | |
| Telephone number of person filing report: | |
| Name and address of party responsible for the incident: | |
| Date and Time of the incident: | |
| Location of the facility/incident: | |
| Owner/operator of the facility: | |
| Source and cause of the release or discharge: | |
| Types of materials and quantities released or discharged: | |
| Danger or threat posed by the release or discharge: | [ ] fire [ ] soil contamination<br>[ ] explosion [ ] groundwater contamination<br>[ ] human health risk [ ] surface water contamination<br>[ ] ecological damage [ ] other:________________ |
| Number and types of injuries: | |
| Affected Media: | [ ] air [ ] storm drainage system<br>[ ] water [ ] dike/berm/oil-water separator<br>[ ] soil [ ] other:_______________ |
| Weather conditions at the incident location: | |
| Other information to help emergency personnel respond to the incident: | |

# State of Hawaii Release Response Guidance and Notification Form from the HEER Technical Guidance Manual

Interim Final

## Appendix 2-B

### Hazardous Substance Release Notification Guideline
**Hawai`i Department of Health (HDOH)**
**Office of Hazard Evaluation and Emergency Response (HEER Office)**

This guideline is general in nature and is provided to assist in complying with HEPCRA and the SCP in Hawaii and does not have the force and effect of law. To ensure full compliance under the law, persons affected should review the appropriate Federal and State statutes and regulations. Failure to report a release under these laws and regulations may prompt EPA or State enforcement action including penalties not to exceed fines of $25,000 per day per violation or imprisonment. Copies of the laws and regulations may be obtained by contacting the HSERC/HEER at (808) 586-4249 or on the HEER website.

### Overview of Requirements

In Hawaii, owners or operators of facilities or vessels reporting releases of hazardous substances are subject to state notification requirements under Chapter 128D, Hawaii Revised Statutes, the Environmental Response Law, Chapter 128E, Hawaii Revised Statutes, the Hawaii Emergency Planning and Community Right-to-Know Act (HEPCRA) and Title 11, Chapter 451, Hawaii Administrative Rules, the State Contingency Plan (SCP).

In general, the owner or operator of a facility or vessel **must immediately notify** the Hawaii State Emergency Response Commission (HSERC/HEER) ((808) 586-4249 or (808) 247-2191 after work hours) and the Local Emergency Planning Committee (LEPC) (telephone numbers are listed on a separate sheet) of the appropriate jurisdiction after the release of:

1. A listed hazardous substance designated under section 11-451-5(b), in quantities equal to or exceeding the reportable quantity criteria in section 11-451-6(b) in any 24-hour period; or

2. An unlisted hazardous substance designated under section 11-451-5(c), in quantities equal to or exceeding the reportable quantity criteria in section 11-451-6(c) in any 24-hour period.

Note: The HSERC/HEER are listed together because the Hawaii State Department of Health Hazard Evaluation and Emergency Response Office is the administrative contact for the Hawaii State Emergency Response Commission.

An exception from immediate notification is provided for releases of oil of less than 25 gallons in any 24-hour period which is not contained and remedied within 72 hours. Such releases must be reported in written form only within 30 days of the discovery of the release.

The owner or operator of the facility or vessel must also provide a written follow-up notice within 30 days of the discovery of the release. If a release of a hazardous substance poses an imminent or immediate threat to public health or the environment, dial 911 to request fire, police, or emergency medical service personnel response.

### Immediate Notification Contents

A reportable quantity of a hazardous substance is a trigger to notify the appropriate government agencies. This is necessary so that government personnel such as the State On-Scene Coordinators can evaluate the need for a response action and ensure that any necessary response actions are undertaken in a timely manner.

Immediate verbal notification shall be provided to the HSERC/HEER and LEPC either via telephone or in person. HEER/HSERC will not accept **initial notification** via fax or e-mail. In addition, unless it is specifically stated that a verbal notification is being given to a State On-Scene Coordinator (SOSC) on scene during an incident, the presence of a SOSC does not constitute a notification.

Provide the following information to the extent known at the time of the notice so long as no delay in responding to the emergency results. It is expected that notification occur within 20 minutes of discovery of the release. (Do not delay due to incomplete notification information related to the release):

1. Name and telephone number of the caller.
2. Name and telephone number of a contact person, (if different from the caller) that can provide timely information as the incident is occurring.
3. Name (trade and chemical), of the hazardous substance which has been released.
4. Approximate quantity of the hazardous substance which has been released.
5. Location of the incident.
6. Date and time of spill, release, or threatened release.
7. Description of what happened (source and cause of the release).
8. Immediate danger or threat posed by the release.
9. Name, address, and telephone number of the responsible party or potentially responsible party.
10. Measures taken or proposed to be taken in response to the release as of the time of the notification.
11. Any known injuries or advice regarding medical attention necessary for exposed individuals.
12. The names and phone numbers of other federal, state, or local government agencies that have been notified of the release.
13. Any other information that may help emergency personnel respond to the incident.

Once the information has been provided, the caller will be provided with a HEER Incident Case Number, which shall be referenced in any future correspondence including the written notification submittal.

### Federal Requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Oil Pollution Act (OPA)

Releases of Reportable Quantities (RQ) of CERCLA hazardous substances and releases of oil which causes a sheen on water must also be reported to the National Response Center at 1(800) 424-8802.

### Written Follow-Up Notification Contents

Notice, including all information provided in the verbal notification described above and any other pertinent information not previously provided, shall also be made in writing to the HSERC/HEER. This written notification shall be sent to HSERC/HEER no later than thirty (30) days after initial discovery of a release. The written notification can be sent by certified mail, faxed, hand-delivered, or another means which provides proof of delivery. Photos should be included to document the incident. A suggested Written Follow-up Notification Form is provided.

# Hawaii Hazardous Substance Written Follow-Up Notification Form

PLEASE PROVIDE THE FOLLOWING INFORMATION

**Incident Case No.:** ____________________

**Contact Information**

Caller's Information

Name: ____________________

Address: ____________________

City: ____________________ State__________ Zip__________

Telephone number: ____________________

Owner's Information

Name: ____________________

Title: ____________________

Company: ____________________

Address: ____________________

City: ____________________ State__________ Zip__________

Telephone number: ____________________

Operator's Information

Name: ____________________

Title: ____________________

Company: ____________________

Address: ____________________

City: ____________________ State__________ Zip__________

Telephone number: ____________________

Name of a contact person at the facility or vessel where the release has occurred: ____________________

____________________

Telephone number: ____________________

**Hazardous Substance Released:**

Name (trade and chemical) of the hazardous substance which has been released: ____________________

____________________

Chemical Abstract Service (CAS) Number (if applicable): ____________________

Approximate quantity of the hazardous substance released: ____________________

**Incident Information**

Location of the release: ____________________

____________________

A brief description of the release: ____________________

____________________

Media into which the release occurred or is likely to occur (Indicate all those that apply):

☐ Air ☐ Soil ☐ Groundwater ☐ Concrete ☐ Asphalt ☐ Stream ☐ Ocean ☐ Other

Cause of the release: ____________________

____________________

Date of the release: ____________________

Time of the release: ____________________

Duration of the release: ____________________

Date: ____________________

Time that the person in charge of the facility or vessel where the release occurred obtained knowledge of the release: ____________________

Source of the release: ____________________

____________________

**Response Information**

Response measures taken thus far: ____________________

____________________

Any appropriate information relating to the ability of the owner or operator of the facility or vessel where the release has occurred to pay for or perform any proposed or required response actions: ____________________

____________________________________________

____________________________________________

The names of other federal, state, or local government agencies that have been notified of the release: __________

____________________________________________

**Health Information**

Known or anticipated acute health risks: ____________________

____________________________________________

Known or anticipated chronic health risks: ____________________

____________________________________________

Advice regarding medical attention necessary for exposed individuals: ____________________

____________________________________________

Potential impacts to public health or welfare: ____________________

____________________________________________

Potential impacts to the environment: ____________________

____________________________________________

"I certify under penalty of law that I have personally examined and am familiar with the information submitted and believe the submitted info is true, accurate, and complete."

Signature: ____________________ Date: __________

Printed Name: ____________________

Title: ____________________

Company: ____________________

# Attachment C

## Storm Water Monitoring Plan

# Storm Water Monitoring Plan

## PVT Integrated Solid Waste Management Facility

## Section 1 Sample Location Rationale

The storm water management system at PVT Integrated Solid Waste Management Facility (PVT ISWMF) is designed and constructed to manage runoff from a 25-year, 24-hour storm. Runoff is collected in a system of surface ditches, channels, pipes, and sedimentation basins designed by PVT ISWMF's engineering consultants. As designed, the system will carry runoff from the design storm without flooding or excessive erosion from the site, and will retain a significant volume of water to minimize off-site runoff impacts and allow sediment in the runoff to be intercepted and removed before discharged from the site. Figure 2 in the Storm Water Pollution Control Plan (SWPCP) for PVT ISWMF shows the locations of the storm water basins for collection of storm water and removal of silt. There are seven storm water basins (Basins A, A-1, B, C, D, E, and F) and six discharge points which discharge storm water into Ulehawa Stream. All six discharge points (D-1, D-2, D-3, D-4, D-5, and D-6) are permitted under PVT ISWMF's Notice of General Permit Coverage (NGPC) under the National Pollutant Discharge Elimination System (NPDES). One of the storm water basins (Basin A) does not have a discharge point because the limited amount of storm water that collects in this basin percolates into the ground resulting in no discharge off site or flows into Basin A-1, which does have a discharge point.

As designed, all storm water runoff from the site for the design storm will flow into the storm water basins and discharge to Ulehawa Stream at the six permitted discharge points. The locations of the storm water discharge points are listed on Table 1, below, and shown on Figure 2 in the SWPCP. The rationale for sampling is to collect a sample annually from each discharge point that discharges into Ulehawa Stream.

**Table 1: Discharge Point Locations**

| Discharge Point No. | Flow from Sedimentation Basin | Latitude (N) | Longitude (W) | Elevation (feet MSL) |
|---|---|---|---|---|
| D-1 | A-1 and A | 21°23'43.75" | 158°09'09.22" | 2.478 |
| D-2 | C | 21°23'42.84" | 158°08'57.67" | not available |
| D-3 | B | 21°23'41.94" | 158°08'58.45" | 84.438 |
| D-4 | D | 21°23'54.72" | 158°08'48.34" | 25.27 |
| D-5 | E | 21°24'04.81" | 158°08'44.15" | 78.110 |
| D-6 | F | 21°24'11.19" | 158°08'40.21" | not available |

MSL = Mean Sea Level

# Section 2 Sample Collection Methods

In accordance with the facility's NGPC, PVT ISWMF is required to take annual storm water samples and flow measurements that are representative of the volume and nature of the total discharge. The storm water samples shall be collected from a discharge resulting from a representative storm. A representative storm is a rainfall event that accumulates more than 0.1 inch of rain and occurs at least 72 hours after the previous measurable (greater than 0.1 inch) rainfall event.

PVT ISWMF shall analyze samples collected during the first fifteen minutes of the discharge as grab samples. If two or more sample aliquots are collected, PVT ISWMF shall analyze the samples as a composite sample. "Composite sample" means a combination of at least two sample aliquots, collected at periodic intervals. The composite shall be flow proportional; either the time interval between each aliquot or the volume of each aliquot shall be proportional to the total storm water discharge flow since the collection of the previous aliquot. According to PVT ISWMF's NGPC, if the duration of the discharge event is less than 30 minutes, the sample collected during the first fifteen minutes of the discharge shall be analyzed as a grab sample and reported toward the fulfillment of the composite sample specification. If the duration of the discharge event is greater than 30 minutes, PVT ISWMF shall analyze two or more sample aliquots as a composite sample.

The storm water sample will be collected using automatic Vortox samplers, which are mounted in concrete at the end of the drainage pipe at each discharge point. The Vortox sampler automatically collects the sample when there is a discharge from the sedimentation basin. After the storm water sample is collected, the Vortox sampler will be removed from the concrete mount and the storm water sample will be poured into the sample containers provided by the laboratory. The laboratory-provided sample containers will then be placed in a cooler with ice and taken to the laboratory for analysis. Chain-of-custody documentation will be utilized during transfer of the samples. An example chain-of-custody form is attached to this plan.

Sampling activities will be coordinated with the laboratory that will analyze the storm water runoff samples. Special containers and preservatives will be needed for certain parameters, and all samples must be iced or refrigerated from the time of collection until analysis. All samples submitted to the laboratory must be analyzed within 14 days of collection, except for turbidity, which needs to be analyzed within 48 hours. Temperature, conductivity, pH, and dissolved oxygen will be measured in the field.

After the sample is collected into the laboratory-provided containers, the Vortox sampler will be decontaminated and placed back in the concrete mount at the end of the drainage pipe. In accordance with the NGPC, storm water monitoring shall be conducted annually (once per calendar year).

# Section 3 Parameters to be Monitored

PVT ISWMF's NGPC specifies the facility's storm water monitoring and testing requirements, as shown below in Table 2.

**Table 2: Limitations and Minimum Monitoring Requirements for Storm Water Discharges**

| **Storm Water Discharge Parameter (units)** | **Storm Water Discharge Limitation** | **Minimum Monitoring Frequency** | **Type of Sample** |
|---|---|---|---|
| Flow (gallons) | No limitation at this time. Monitor and report values. | Annually | Calculated or Estimated |
| Biochemical Oxygen Demand (5-day) (mg/l) | No limitation at this time. Monitor and report values. | Annually | Composite |
| Chemical Oxygen Demand (mg/l) | No limitation at this time. Monitor and report values. | Annually | Composite |
| Total Suspended Solids (mg/l) | No limitation at this time. Monitor and report values. | Annually | Composite |
| Total Phosphorus (mg/l) | No limitation at this time. Monitor and report values. | Annually | Composite |
| Total Nitrogen (mg/l)<br>(to include nitrate, nitrite, ammonia, dissolved organic nitrogen, and organic matter present as particulates) | No limitation at this time. Monitor and report values. | Annually | Composite |
| Ammonia Nitrogen (mg/l) | No limitation at this time. Monitor and report values. | Annually | Composite |
| Nitrate + Nitrite Nitrogen (mg/l) | No limitation at this time. Monitor and report values. | Annually | Composite |
| Oil and Grease (mg/l) | 15 | Annually | Grab |
| pH Range (standard units) | 5.5 - 8.0 | Annually | Grab |
| Total Recoverable Iron (µg/l) | 1,000 | Annually | Composite |
| Benzene (µg/l) (D-3 only) | 1,800 | Annually | Composite |
| Toluene (µg/l) (D-3 only) | 5,800 | Annually | Composite |
| Ethylbenzene (µg/l) (D-3 only) | 11,000 | Annually | Composite |
| Xylenes (µg/l) (D-3 only) | No limitation at this time. Monitor and report values. | Annually | Composite |
| Polynuclear Aromatic Hydrocarbons (µg/l) (D-3 only) | No limitation at this time. Monitor and report values. | Annually | Composite |
| Turbidity (NTU) | No limitation at this time. Monitor and report values. | Annually | Grab |

| Storm Water Discharge Parameter (units) | Storm Water Discharge Limitation | Minimum Monitoring Frequency | Type of Sample |
|---|---|---|---|
| Dissolved Oxygen (mg/l) | No limitation at this time. Monitor and report values. | Annually | Grab |
| Oxygen Saturation (%) | No limitation at this time. Monitor and report values. | Annually | Grab |
| Temperature (°C) | No limitations at this time. Monitor and report values. | Annually | Grab |
| Conductivity (μmhos/cm) or Chloride (mg/l) or Salinity (parts per trillion) | No limitation at this time. Monitor and report values. | Annually | Grab |

mg/l = milligrams per liter = 1,000 micrograms per liter (μg/l). NTU = Nephelometric Turbidity Unit. μmhos/cm = micromhos per centimeter.

In accordance with PVT ISWMF's NGPC, the parameters benzene, toluene, ethylbenzene, xylenes, and polynuclear aromatic hydrocarbons only need to be analyzed in the sample collected from discharge point D-3 from storm water Basin B, which receives storm water runoff from the area where the maintenance shop and fuel dispensers are located. Note that previously, discharge point D-1 (Basins A and A-1) received the runoff from the maintenance area; however, to improve the quality of storm water runoff, PVT ISWMF constructed a covered facility for vehicle and equipment maintenance and for storage of oil and grease, which is now located in the area that drains into Basin B (Discharge Point D-3).

# Section 4 Test Procedures

Sample collection, storage, and analysis should be performed according to the most recent version of Standard United States Environmental Protection Agency (EPA) Methods. Analysis should be performed by a laboratory experienced in performing these analyses. Specific methods of analysis should be identified on each laboratory report. Analytical work should be supervised by the director of the laboratory and each laboratory report should be signed by the director of the laboratory.

If methods other than EPA approved methods or Standard Methods are to be used, the exact methodology should be submitted to the State of Hawaii Department of Health (DOH) Clean Water Branch (CWB) for review and approval prior to use. Preferred analytical methods and detection limits for the monitoring parameters are presented in Table 3.

**Table 3: Preferred Analytical Methods and Detection Limits**

| Storm Water Discharge Parameter (units) | Storm Water Discharge Limitation | EPA Test Method | Method Detection Limit |
|---|---|---|---|
| Biochemical Oxygen Demand (5-day) (mg/l) | No limitation at this time. Monitor and report values. | SM 5210B | 2.00 |
| Chemical Oxygen Demand (mg/l) | No limitation at this time. Monitor and report values. | 410.4 | 5.0 |

| **Storm Water Discharge Parameter (units)** | **Storm Water Discharge Limitation** | **EPA Test Method** | **Method Detection Limit** |
|---|---|---|---|
| Total Suspended Solids (mg/l) | No limitation at this time. Monitor and report values. | SM 2540D | 1.1 |
| Total Phosphorus (mg/l) | No limitation at this time. Monitor and report values. | 365.4 | 0.041 |
| Total Nitrogen (mg/l)<br>(to include nitrate, nitrite, ammonia, dissolved organic nitrogen, and organic matter present as particulates) | No limitation at this time. Monitor and report values. | SM4500-N or by Total Nitrogen calculation | 0.25 |
| Ammonia Nitrogen (mg/l) | No limitation at this time. Monitor and report values. | 350.1 | 0.026 |
| Nitrate + Nitrite Nitrogen (mg/l) | No limitation at this time. Monitor and report values. | 353.2 | 0.010 |
| Oil and Grease (mg/l) | 15 | 1664A | 5.4 |
| pH Range (standard units) | 5.5 - 8.0 | 150.1 | 0.1 |
| Total Recoverable Iron (μg/l) | 1,000 | 6010B | 40 |
| Benzene (μg/l) (D-3 only) | 1,800 | 8260B | 2.0 |
| Toluene (μg/l) (D-3 only) | 5,800 | 8260B | 2.0 |
| Ethylbenzene (μg/l) (D-3 only) | 11,000 | 8260B | 2.0 |
| Xylenes (μg/l) (D-3 only) | No limitation at this time. Monitor and report values. | 8260B | 2.0 |
| Polynuclear Aromatic Hydrocarbons (μg/l) (D-3 only) | No limitation at this time. Monitor and report values. | 8270C SIM | 0.21 |
| Turbidity (NTU) | No limitation at this time. Monitor and report values. | 180.1 | 0.0 |
| Dissolved Oxygen (mg/l) | No limitation at this time. Monitor and report values. | 360.1 | 0.05 |
| Oxygen Saturation (%) | No limitation at this time. Monitor and report values. | SM 4500-02 | 0.0100 |
| Temperature (°C) | No limitations at this time. Monitor and report values. | 170.1 | 0.1 |
| Conductivity (μmhos/cm) or Chloride (mg/l) or Salinity (parts per trillion) | No limitation at this time. Monitor and report values. | 120.1 | 0.050 |

The following storm water discharge parameters are measured in the field using hand-held field meters that are calibrated prior to use on the day of use: dissolved oxygen, temperature, pH, conductivity.

# Section 5 Laboratory Quality Assurance/Quality Control Methods

The laboratory utilized for analytical testing of storm water samples shall operate a formal quality assurance/quality control (QA/QC) program. The minimum requirements of this program shall consist of an initial demonstration of laboratory capability and an ongoing analysis of spiked samples to evaluate and document data quality. The laboratory must maintain records to document the quality of data that is generated. Ongoing data quality checks shall be compared with established performance criteria to determine if the results of analyses meet the performance characteristics of the method. When results of sample spikes indicate atypical method performance, a quality control check standard must be analyzed to confirm that the measurements were performed in an in-control mode of operation. The frequency of the check standard analyses shall be equivalent to ten percent of all samples analyzed but may be reduced if spike recoveries from samples meet all specified quality control criteria.

All monitoring and analytical equipment must be calibrated and maintained prior to use to ensure that the accuracy of the measurements is consistent with the accepted capability of the device. The device shall be capable of measuring with a maximum deviation of less than plus or minus ten percent from the true rates throughout the range of expected volumes. Calibration should take place no less than the manufacturer's recommended intervals or six-month intervals (whichever comes first). All documents pertaining to calibration and maintenance shall be kept on file for the period of time prescribed by law.

The laboratory should employ specific quality control procedures to ensure the accuracy, precision, and comparability of all analytical results. The quality control procedures should include calibration standards, blanks, laboratory control samples, matrix spikes, duplicates, surrogates, and internal standards, at a minimum. These quality control checks should be performed as required by the method or regulations to assess precision and accuracy.

The method detection limit (MDL) and the method reporting limit (MRL) should be established and verified by the laboratory for each analytical procedure. These MDLs and MRLs should reflect the detection and quantitation capabilities of the specific analytical procedure and equipment used.

The QA/QC data should be reported, along with the sample results to which it applies. The QA/QC data should include the method of analysis; MRL; MDL; recovery rates; results of equipment and method blanks; the results of spiked and surrogate samples; the frequency of quality control analysis; and the name of the person performing the analyses. Sample results should be reported unadjusted for blank results or spike recovery. In cases where contaminants are detected in QA/QC samples, the accompanying sample results should be appropriately flagged. Specific procedures and frequencies for laboratory quality control should follow guidelines established in EPA SW-846 as detailed by the analytical method.

# Section 6 Detection Limits

The MDL is typically defined as the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the value is above zero. The MDL actually achieved in a given analysis will vary depending on instrument sensitivity and matrix effects. The laboratory's procedures for developing and evaluating MDLs shall be in accordance with a formal QA/QC program, as described above in Section 5.

# Section 7 Method To Calculate Storm Water Flow

PVT ISWMF shall calculate or estimate the quantity of storm water discharged and submit the calculations to the DOH CWB. Storm water runoff quantity can be calculated while the representative sample was taken or can be estimated assuming a representative rainfall event of 0.1 inch.

Storm water runoff can be estimated using the equation $Q = CIA$, where:

$Q$ = peak discharge in cubic feet per second,
$C$ = runoff coefficient,
$I$ = rainfall intensity (inch/hour), and
$A$ = drainage area in acres.

# Section 8 Reporting Storm Event Information

## 1.1 Discharge Monitoring Reports

A Discharge Monitoring Report (DMR) form shall be submitted annually to the DOH CWB whether there is a storm event or not. If there were no discharges during the monitoring period, the DMR shall so state. A 'no discharge during the monitoring period' means that during the monitoring period, no storm water was discharged from the facility. It is not the same as an inability or failure to sample the storm event. It is not acceptable to omit information about whether storm events and sampling occurred.

The frequency of monitoring requires that sampling must be conducted one time per calendar year. Monitoring results shall be postmarked no later than sixty calendar days after the end of each calendar year.

PVT ISWMF shall report monitoring results on the DMR form (EPA No. 3320-1). A copy of this form is attached. Results of all monitoring required by the NGPC shall be submitted in a format that demonstrates compliance with the limitations in Table 3 above and requirements of the SWPCP. The following documents should be attached to the DMR form:

- monitoring results with laboratory reports, including QA/QC data
- storm water flow calculations
- date, duration, starting and ending times of the storm event
- date of the previous 0.1 inch rainfall event
- any additional pollutant control strategies to be implemented based on the monitoring results.

## 1.2 General Reporting

PVT ISWMF shall retain records and information resulting from the monitoring activities required by this storm water monitoring plan, including, but not limited to, DMR forms, records of analyses performed, laboratory reports, calculations, and visual inspections. Records shall be retained for a minimum of five years from the date of the sample, measurement, or report, unless otherwise specified. This period of retention shall be extended during the course of any unresolved litigation or administrative enforcement action regarding the discharge of pollutants by PVT ISWMF or when requested by DOH or the EPA Regional Administrator.

Records of monitoring information, if applicable, shall include:

- the date, location, and time of sampling, measurements, or inspections
- the person responsible for performing the sampling, measurements, or inspections
- the date(s) analyses were performed
- the person responsible for performing the analyses
- analytical techniques or methods used
- the results of such analyses
- major observations relating to the implementation of the SWPCP, particularly of PVT ISWMF's performance of the BMPs, and changes in the pollutant sources
- actions taken to correct inadequacies in SWPCP BMPs.

Most of the records are maintained by PVT ISWMF's administrative and management staff. Records will be kept on file in the administrative office building.

## 1.3 Reporting of Noncompliance, Unanticipated Bypass, or Upset

PVT ISWMF or its duly authorized representative shall orally report any of the following when they become aware of the circumstances:

1. Violation of a storm water discharge limitation specified in Tables 2 and 3 of this storm water monitoring plan or a basic water quality criterion specified in Hawaii Administrative Rules (HAR) § 11-54.

2. Discharge or noncompliance with storm water discharge limitations, which may endanger health or the environment.

3. Unanticipated bypass or upset.

PVT ISWMF shall make oral reports by telephone to the DOH CWB at (808) 586-4309 during regular office hours which are Monday through Friday (excluding holidays) from 7:45 a.m. until 4:15 p.m. or the Hawaii State Hospital Operator at (808) 247-2191 outside of regular office hours.

PVT ISWMF shall provide a written report within five days of the time they become aware of the circumstances. The written report shall include the following:

- description of the noncompliance, unanticipated bypass, or upset and its cause
- period of noncompliance, unanticipated bypass, or upset including exact dates and times
- estimated time the noncompliance, unanticipated bypass, or upset is expected to continue if it has not been corrected
- steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance, unanticipated bypass, or upset.

DOH may waive the written report on a case-by-case basis if the oral report has been received within twenty-four hours.

## 1.4 Reporting of Planned Changes

PVT Landfill shall report any planned physical alterations or additions to the permitted facility, not covered by 40 CFR §122.41(l)(1)(i), (ii), and (iii) to the DOH CWB on a quarterly basis.

# Section 9 Inspection Procedures

Procedures for inspecting receiving waters, storm water runoff, control measures, and best management practices to detect violations of the basic water quality criteria are contained in the SWPCP for PVT ISWMF.

# CHAIN OF CUSTODY

PAGE _____ OF _____

Project Name
Project Number
Project Manager
Company/Address
Phone Number
Fax Number
Sampler's Signature
Sampler's Printed Name

| | | SAMPLING | | | ANALYSIS REQUESTED | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE ID | LAB ID | DATE | TIME | MATRIX | NUMBER OF CONTAINERS | | | | | | | | | | | | | | NOTES: |
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SPECIAL INSTRUCTIONS/COMMENTS

| RELINQUISHED BY | RECEIVED BY | RELINQUISHED BY | RECEIVED BY | RELINQUISHED BY | RECEIVED BY |
|---|---|---|---|---|---|
| Signature | Signature | Signature | Signature | Signature | Signature |
| Printed Name | Printed Name | Printed Name | Printed Name | Printed Name | Printed Name |
| Firm | Firm | Firm | Firm | Firm | Firm |
| Date/Time | Date/Time | Date/Time | Date/Time | Date/Time | Date/Time |

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if Different)
NAME

ADDRESS

FACILITY
LOCATION

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

| (2-16) | (17-19) |
|---|---|
| | |
| PERMIT NUMBER | DISCHARGE NUMBER |

Form Approved.
OMB No. 2040-0004
Approval expires 05-31-98

| | MONITORING PERIOD | | | | | | |
|---|---|---|---|---|---|---|---|
| | YEAR | MO | DAY | | YEAR | MO | DAY |
| FROM | | | | TO | | | |
| | (20-21) | (22-23) | (24-25) | | (26-27) | (28-29) | (30-31) |

☐ Check here if No Discharge

NOTE: Read Instructions before completing this form

| PARAMETER (32-37) | | (3 Card Only) QUANTITY OR LOADING | | | (4 Card Only) QUALITY OR CONCENTRATION | | | | NO. EX (62-63) | FREQUENCY OF ANALYSIS (64-68) | SAMPLE TYPE (69-70) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | (46-53) AVERAGE | (54-61) MAXIMUM | UNITS | (38-45) MINIMUM | (46-53) AVERAGE | (54-61) MAXIMUM | UNITS | | | |
| | SAMPLE MEASUREMENT | | | | | | | | | | |
| | PERMIT REQUIREMENT | | | | | | | | | | |
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| NAME/TITLE PRINCIPAL EXECUTIVE OFFICER | I CERTIFY UNDER PENALTY OF LAW THAT THIS DOCUMENT AND ALL ATTACHMENTS WERE PREPARED UNDER MY DIRECTION OR SUPERVISION IN ACCORDANCE WITH A SYSTEM DESIGNED TO ASSURE THAT QUALIFIED PERSONNEL PROPERLY GATHER AND EVALUATE THE INFORMATION SUBMITTED. BASED ON MY INQUIRY OF THE PERSON OR PERSONS WHO MANAGE THE SYSTEM, OR THOSE PERSONS DIRECTLY RESPONSIBLE FOR GATHERING THE INFORMATION, THE INFORMATION SUBMITTED IS, TO THE BEST OF MY KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT FOR KNOWING VIOLATIONS. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.) | | TELEPHONE | | DATE | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| TYPED OR PRINTED | | SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT | AREA CODE | NUMBER | YEAR | MO | DAY |

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

EPA Form 332( -96)

(REPLACES EPA FORM T-4( CH MAY NOT BE USED.)

PAGE OF

## Paperwork Reduction Act Notice

Public Reporting Burden for this collection information is estimated to vary from a range of 10 hours as an average per response for some minor facilities, to 110 hours as an average per response for some major facilities, with a weighted average for major and minor facilities of 18 hours per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to ICR Coordinator, Office of Wastewater Management (MC4201M), US Environmental Protection Agency, 1200 Pennsylvania Avenue, NW, Washington, DC 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503.

## General Instructions

1. If form has been partially completed by preprinting, disregard instructions directed at entry of that information already preprinted.

2. Enter *"Permittee Name/Mailing Address* (and facility name/location, if different)," *"Permit Number,"* and *"Discharge Number"* where indicated. (A separate form is required for each discharge.)

3. Enter dates beginning and ending *"Monitoring Period"* covered by form where indicated.

4. Enter each *"Parameter"* as specified in monitoring requirements of permit.

5. Enter *"Sample Measurement"* data for each parameter under *"Quantity"* and *"Quality"* in units specified in permit.

6. Enter *"Permit Requirement"* for each parameter under *"Quantity"* and *"Quality"* as specified in permit.

7. Under *"No Ex"* enter number of sample measurements during monitoring period that exceed maximum (and/or minimum or 7-day average as appropriate) permit requirement for each parameter. If none, enter *"0"*.

8. Enter *"Frequency of Analysis"* both as *"Sample Measurement"* (actual sample type used during monitoring period) and as *"Permit Requirement,"* specified in permit. (e.g., Enter *"Cont."* for continuous monitoring, *"1/7"* for one day per week, *"1/30"* for one day per month, *"1/90"* for one day per quarter, etc.)

9. Enter *"Sample Type"* both as *"Sample Measurement"* (actual sample type used during monitoring period) and as *"Permit Requirement."* (e.g., Enter *"Grab"* for individual sample, *"24HC"* for 24-hour composite, *"N/A"* for continuous monitoring, etc.)

10. Where violations of permit requirements are reported, attach a brief explanation to describe cause and corrective actions taken, and reference each violation by date.

11. If "no discharge" occurs during monitoring period, enter *"No Discharge"* across form in place of data entry.

12. Enter *"Name/Title of Principal Executive Officer"* with *"Signature of Principal Executive Officer of Authorized Agent,"* *"Telephone Number,"* and *"Date"* at bottom of form.

13. Mail signed Report to Office(s) by date(s) specified in permit. Retain copy for your records.

14. More detailed Instructions for use of this *Discharge Monitoring Report (DMR)* form may be obtained from Office(s) specified in permit.

## Legal Notice

This report is required by law (33 U.S.C. 1318; 40 C.F.R. 125.27). Failure to report or failure to report truthfully can result in civil penalties not to exceed $ 10,000 per day of violation; or in criminal penalties not to exceed $25,000 per day of violation, or by imprisonment for not more than one year, or by both.

# Attachment D

## Inspection Checklists and Records

# D1: Storm Event Inspection Log

*To be completed by PVT ISWMF management after each significant rainfall event*

| | |
|---|---|
| Inspector(s) Name and Title: | |
| Date and Time of Inspection: | |
| Other Attendees, if present during inspection: | |
| Date of Last Rainfall Event: | Amount of Rain: inches |
| Raining during Inspection? | ☐ Yes ☐ No |
| Storm Water Flow Observed? | ☐ Yes ☐ No If Yes, Type of Flow: ☐ Sheet ☐ Rill ☐ Concentrated |

| | **ISSUE/OBJECTIVE** | **Yes** | **No** | **NA** | **DESCRIBE REQUIRED FOLLOW-UP ACTION** |
|---|---|---|---|---|---|
| | **C&D Landfill (Phase I, Phase II, Liquid Solidification Area, and Asbestos Disposal Area)** | | | | |
| 1 | Are there gullies caused by erosion? | ☐ | ☐ | ☐ | |
| 2 | Is there wind-blown or runoff-carried litter/debris? | ☐ | ☐ | ☐ | |
| 3 | Are there illicitly dumped materials? | ☐ | ☐ | ☐ | |
| 4 | Are there indications of leachate seepage? | ☐ | ☐ | ☐ | |
| 5 | Are diversions present to prevent storm water run-on to the working face? | ☐ | ☐ | ☐ | |
| 6 | Are diversions present where needed to control storm water runoff? | ☐ | ☐ | ☐ | |
| 7 | Do the diversions need any repair? | ☐ | ☐ | ☐ | |
| 8 | Is there liquid in the solidification treatment area that needs to be removed or incorporated into the waste? | ☐ | ☐ | ☐ | |
| 9 | Is there stressed or dead vegetation? | ☐ | ☐ | ☐ | |
| | **Heavy Equipment Staging Area, Maintenance Shop, and Fueling Area** | | | | |
| 10 | Is there evidence of storm water runoff from this area? If yes, where did the storm water runoff terminate? | ☐ | ☐ | ☐ | |
| 11 | Is there evidence of leaks or spills from vehicles, equipment, tanks, drums, or other containers on to the ground? | ☐ | ☐ | ☐ | |
| 12 | Is there wind-blown or runoff-carried litter/debris? | ☐ | ☐ | ☐ | |
| 13 | Is there storm water in the fuel storage secondary containment area?<br>If yes, is there a sheen on the water? | ☐<br>☐ | ☐<br>☐ | ☐<br>☐ | |
| 14 | Does storm water in the fuel storage secondary containment area need to be pumped out and taken to the liquid solidification area? | ☐ | ☐ | ☐ | |
| | **Plant Nursery and Landscaped Areas** | | | | |
| 15 | Is there any evidence of erosion? | ☐ | ☐ | ☐ | |
| 16 | Is there any evidence of runoff from the use of fertilizers or pesticides? | ☐ | ☐ | ☐ | |
| 17 | Are there areas of exposed soil? | ☐ | ☐ | ☐ | |

| ISSUE/OBJECTIVE | | Yes | No | NA | DESCRIBE REQUIRED FOLLOW-UP ACTION |
|---|---|---|---|---|---|
| **Access Roads** | | | | | |
| 18 | Are the access roads graded properly to allow drainage? | ☐ | ☐ | ☐ | |
| 19 | Are there gullies caused by erosion? | ☐ | ☐ | ☐ | |
| 20 | Has any gravel surfacing or other surfacing material eroded? | ☐ | ☐ | ☐ | |
| 21 | Is there wind-blown or runoff-carried litter/debris? | ☐ | ☐ | ☐ | |
| 22 | Are there diversions present where needed to control storm water runoff? | ☐ | ☐ | ☐ | |
| 23 | Are any repairs to the access roads needed? | ☐ | ☐ | ☐ | |
| **Wet Weather Tipping and Transfer Area** | | | | | |
| 24 | Are there diversions in place to contain storm water runoff? | ☐ | ☐ | ☐ | |
| 25 | Does waste need to be transferred to the landfill working face?<br>If yes, is it safe to do so? | ☐<br>☐ | ☐<br>☐ | ☐<br>☐ | |
| **Recycling and Materials Recovery Area** | | | | | |
| 26 | Are there diversions present where needed to control storm water runoff? | ☐ | ☐ | ☐ | |
| 27 | Do the diversions need any repair? | ☐ | ☐ | ☐ | |
| 28 | Is there wind-blown or runoff-carried litter/debris? | ☐ | ☐ | ☐ | |
| 29 | Is there any damage to material stockpiles? | ☐ | ☐ | ☐ | |
| **Storm Water Sedimentation Basins and Storm Water Discharges** | | | | | |
| 30 | Is there any evidence of erosion at the sedimentation basins? If yes, indicate which basins and repair needed. | ☐ | ☐ | ☐ | |
| 31 | Is there debris (paper, trash, leaves, etc.) in the basins? | ☐ | ☐ | ☐ | |
| 32 | Are the skimmers functioning properly? | ☐ | ☐ | ☐ | |
| 33 | Do the skimmers need to be reset or repaired? If yes, indicate which basins and what needs to be done. | ☐ | ☐ | ☐ | |
| 34 | Was there a discharge of storm water from the basins into the stream? If yes, indicate which basins had a discharge. | ☐ | ☐ | ☐ | |
| 35 | Was a storm water sample collected from the basins? If yes, where? | ☐ | ☐ | ☐ | |
| 36 | Do the Vortox samplers need to be cleaned and reset? | ☐ | ☐ | ☐ | |
| 37 | Does sediment or vegetation need to be removed from any of the basins? If yes, indicate which basins need to be cleaned. | ☐ | ☐ | ☐ | |
| 38 | Is there a sheen on the water in any of the basins? If yes, which basins? | ☐ | ☐ | ☐ | |
| 39 | Is there evidence of excessive sedimentation or turbidity in the basins or in the receiving water? If yes, describe and indicate where. | ☐ | ☐ | ☐ | |
| 40 | Is there any evidence of flow to the receiving water in locations other than the permitted discharge points? If yes, describe and indicate where. | ☐ | ☐ | ☐ | |

# D2: Semiannual Inspection Checklist

| *To be completed semiannually by PVT ISWMF management* | |
|---|---|
| Inspector(s) Name and Title: | |
| Date and Time of Inspection: | |
| Other Attendees, if present during inspection: | |
| SWPCP Available On Site? | ☐ Yes ☐ No |

| | **ISSUE/OBJECTIVE** | **Yes** | **No** | **NA** | **COMMENTS** |
|---|---|---|---|---|---|
| | **Good Housekeeping** | | | | |
| 1 | Is garbage regularly removed off the facility's grounds? | ☐ | ☐ | ☐ | |
| 2 | Are trash containers kept covered and inspected regularly for leaks? | ☐ | ☐ | ☐ | |
| 3 | Are all work areas and storage areas neat and clean? | ☐ | ☐ | ☐ | |
| 4 | Are all vehicle and equipment washing activities conducted on top of the landfill? | ☐ | ☐ | ☐ | |
| 5 | Are vehicles and equipment inspected daily for leaks? | ☐ | ☐ | ☐ | |
| 6 | Are BMPs (i.e. absorbents, drip pans, drip pads, etc.) used under leaking vehicles and equipment? | ☐ | ☐ | ☐ | |
| 7 | Are equipment and vehicles serviced/maintained indoors or under cover or are drip pans utilized during repairs? | ☐ | ☐ | ☐ | |
| 8 | Are drip pans clean and in good condition? | ☐ | ☐ | ☐ | |
| 9 | Are parking lots and paved areas free from dirt, grease buildup, stains? | ☐ | ☐ | ☐ | |
| 10 | Were there any other good housekeeping measures not described above that may have been an issue? If so, please describe. | ☐ | ☐ | ☐ | |
| | **Material/Chemical Inventory and Storage** | | | | |
| 11 | Are all potential pollutants, chemical containers, and drums properly labeled and identified? | ☐ | ☐ | ☐ | |
| 12 | Are all containers/drums properly stored under cover and within secondary containment structures? | ☐ | ☐ | ☐ | |
| 13 | Are storage containers and equipment competent and in good condition (no leaks)? | ☐ | ☐ | ☐ | |
| 14 | Is access to stored chemicals and fuel restricted? | ☐ | ☐ | ☐ | |
| 15 | Are MSDSs readily available for all chemicals/products/materials stored on-site? Are MSDSs located in an accessible location? | ☐<br>☐ | ☐<br>☐ | ☐<br>☐ | |
| 16 | Are all chemical substances identified on the material usage list (chemical inventory)? Is the chemical inventory current? | ☐<br>☐ | ☐<br>☐ | ☐<br>☐ | |

| | ISSUE/OBJECTIVE | Yes | No | NA | COMMENTS |
|---|---|---|---|---|---|
| **Spill Prevention and Response Plan** | | | | | |
| 17 | Are parking lots and paved areas visually inspected regularly for spills and leaks? | ☐ | ☐ | ☐ | |
| 18 | Are spills promptly cleaned up using spill kit materials?<br>Has the appropriate action taken place? | ☐<br>☐ | ☐<br>☐ | ☐<br>☐ | |
| 19 | Are fueling stations equipped with dedicated spill kits?<br>Are the spill kits well maintained and adequately stocked? | ☐<br>☐ | ☐<br>☐ | ☐<br>☐ | |
| 20 | Have spill response equipment been inspected regularly and replenished as necessary? | ☐ | ☐ | ☐ | |
| 21 | For spills that occurred, have the necessary spill documentation sheets been filled out and has the Site Plan been updated (refer to the SWPCP)? | ☐ | ☐ | ☐ | |
| 22 | If spills were recorded, has the appropriate follow-up occurred? | ☐ | ☐ | ☐ | |
| 23 | Are storage tanks and facilities clean and in good condition? | ☐ | ☐ | ☐ | |
| 24 | Are petroleum, oil, and lubricant storage facilities clean and in good condition? | ☐ | ☐ | ☐ | |
| 25 | Are proper control measures in place at the fuel storage facilities? | ☐ | ☐ | ☐ | |
| 26 | Are proper "hazard" signs in place? | ☐ | ☐ | ☐ | |
| 27 | Were other issues related to spill prevention and response procedures adequately addressed? | ☐ | ☐ | ☐ | |
| **Storm Water Management System** | | | | | |
| 28 | Is the drainage system maintained adequately on a regular basis? | ☐ | ☐ | ☐ | |
| 29 | Is any re-grading along access roads and drainage areas needed? | ☐ | ☐ | ☐ | |
| 30 | Is the drainage system (ditches, roads, inlets, etc.) clean and clear of debris or sediment? | ☐ | ☐ | ☐ | |
| 31 | Is there any evidence of erosion at the sedimentation basins? If yes, indicate which basins and repair needed. | ☐ | ☐ | ☐ | |
| 32 | Does sediment or vegetation need to be removed from any of the basins? If yes, indicate which basins need to be cleaned. | ☐ | ☐ | ☐ | |
| 33 | Do the skimmers need to be reset or repaired? If yes, indicate which basins and what needs to be done. | ☐ | ☐ | ☐ | |
| 34 | Is there evidence of excessive sedimentation or turbidity in the basins or in the receiving water? If yes, describe and indicate where. | ☐ | ☐ | ☐ | |
| 35 | Is there any evidence of flow to the receiving water in locations other than the permitted discharge points? If yes, describe and indicate where. | ☐ | ☐ | ☐ | |
| 36 | Were there any other issues or problems associated with the drainage system? If so, please describe. | ☐ | ☐ | ☐ | |

| | | | | | |
|---|---|---|---|---|---|
| **SWPCP** | | | | | |
| 37 | Does the SWPCP Site Plan need to be updated? | ☐ | ☐ | ☐ | |
| 38 | Are there other updates in the facility status that need to be included in the SWPCP? | ☐ | ☐ | ☐ | |
| 39 | Have all previous recommended corrective actions or BMPs been implemented/documented? | ☐ | ☐ | ☐ | |
| 40 | If previous recommendations or changes in the facility required modification of the SWPCP, has the document been revised? | ☐ | ☐ | ☐ | |
| **Personnel Training Records Review** | | | | | |
| 41 | Is annual training conducted for all employees? | ☐ | ☐ | ☐ | |
| 42 | Has annual training been conducted and documented? | ☐ | ☐ | ☐ | |
| 43 | Have new employees completed SWPCP training? | ☐ | ☐ | ☐ | |
| **Storm Event Inspection Logs** | | | | | |
| 44 | Are storm event inspection logs available for the last six months?<br>If yes, are they attached to the SWPCP? | ☐<br>☐ | ☐<br>☐ | ☐<br>☐ | |
| 45 | Have issues noted in the storm event inspection logs been resolved? | ☐ | ☐ | ☐ | |
| **Comments and Corrective Actions** | | | | | |

# Attachment E

## Training Logs

# PVT ISWMF Storm Water Pollution Control Plan
# Annual Training Record

Trainer/Supervisor: ______________________________

**Topics Covered:**

- ☐ SWPCP Background
- ☐ SWPCP Revision Procedures
- ☐ Potentially Effected Waterways
- ☐ PVT ISWMF Storm Drainage System
- ☐ Facility Layout Diagram, including flow direction, topography, drainage structures
- ☐ Potential Pollutants
- ☐ Site-Specific BMPs
- ☐ Spill Prevention And Response Plan
- ☐ Spill Contacts, Documentation, and Reporting
- ☐ Past Spills / Releases and their causes
- ☐ Site Inspections

By signing below, I acknowledge that I have participated in this briefing regarding the PVT ISWMF's Storm Water Pollution Control Plan, which presented information on industrial storm water discharges and what can be done to prevent or minimize contamination of storm water runoff from industrial materials. The training session is being held in accordance with the facility's NPDES requirements.

| Date | Name (print clearly) | Signature | Instructor Initials |
|---|---|---|---|
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* A copy of this sign in sheet should be kept with the SWPCP.

# Attachment F

## SWPCP Revision Log

# SWPCP Review/Amendment Log

Note any changes made to the SWPCP, including to the Site Plan in Section 2.

| Date | Reviewed by | Changes made to the SWPCP |
|---|---|---|
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# ATTACHMENT P-4

# ATTACHMENT P-4
# CLOSURE AND POST-CLOSURE PLAN
# LANDFILL FACILITIES
# SOLID WASTE PERMIT APPLICATION

All landfill facilities are required to prepare and maintain a closure and post-closure plan. Municipal solid waste (MSW) and construction/demolition (C&D) landfills and ash monofills shall meet the requirements of Hawaii Administrative Rules (HAR) Section 11-58.1-17, and are also required to have financial assurance in accordance with HAR Section 11-58.1-18. **The closure plan** shall include, but is not limited to, the following information:

1. A description of the steps necessary to close all landfill units at any point during its active life.

2. A description of the final cover design and the methods/procedures for cover installation. For MSW and C&D landfills, the design shall be in accordance with Hawaii Administrative Rules (HAR) Section 11-58.1-17(a). For special waste landfills, the final cover system shall provide protection to human health and the environment, based on the risks associated with the disposed waste.

3. An estimate of the largest area of the landfill unit ever requiring a final cover, at any time during its active life.

4. An estimate of the maximum inventory of wastes (in weight and volume) ever on-site over the active life of the landfill facility.

5. A contaminant release log during the life of the site and results of any environmental sampling at the site should be included as part of the closure planning. The Director of Health may require complete and detailed plans or reports (i.e. site assessment, remediation plans) on solid waste facilities in the event of any releases and/or incidences at the facility.

6. A schedule for completing all activities necessary to satisfy the closure plan. The facility must comply with the scheduling requirements provided in HAR 11-58.1-17(a) for MSW and C&D landfills.

**The post-closure plan** shall include, but is not limited, to the following information:

1. A description and frequency of the monitoring and maintenance activities associated with integrity and effectiveness of the final cover system, operation of the leachate collection and surface water systems, and monitoring of groundwater and landfill gas.

2. Name, address, and telephone number of the person or office to contact about the facility during the post-closure period.

3. A description of the planned uses of the property during the post-closure periods. The post-closure use shall not impact the integrity of the cover system and any of the monitoring systems.

Copies of **financial assurance documents** demonstrating compliance with HAR 11-58.1-18 shall be submitted for all MSW and C&D landfills, and ash monofills, except those owned and operated by the state or federal government. The documents shall include the cost estimates, in current dollars, of the cost of hiring a third party to close the largest area of all the landfill units at any time of its active life; the cost of hiring a third party to conduct post-closure care activities throughout the post-closure care period; and a demonstration that the funds necessary to meet the costs of closure and post-closure care will be available whenever needed. The demonstration provided is limited to the allowable mechanisms listed in HAR 11-58.1-18.

# ATTACHMENT P-4
# CLOSURE AND POST-CLOSURE PLAN
# LANDFILL FACILITIES
***PVT Integrated Solid Waste Management Facility***
***Solid Waste Permit Renewal***

## 1.0 CLOSURE AND POST-CLOSURE PLAN

A Closure and Post-Closure Plan has been submitted to the Department of Health as part of prior permit applications. The Closure and Post-Closure Plan includes plans, designs and methods for final cover, monitoring and maintenance, and financial assurance. An updated Closure and Post-Closure Plan is part of this renewal application. Highly confidential information has been redacted but will be made available for review by DOH.

# PVT LAND COMPANY
# INTEGRATED SOLID WASTE MANAGEMENT FACILITY

## CLOSURE AND
## POST-CLOSURE PLAN

**Prepared for**

**PVT Land Company, Ltd.**
87-2020 Farrington Highway
Waianae, Hawaii 96792

**By**

**A-Mehr, Inc.**
23016 Mill Creek Drive
Laguna Hills, CA 92653

**February 2005**
**Revised March 2006**
**Revised March 2010**
**Revised October 2015**

## TABLE OF CONTENTS

## FIGURES

## TABLES

## APPENDICES

# 1. INTRODUCTION

The Closure and Post-Closure Plan Sections below have been prepared for the PVT ISWMF in accordance with requirements of Hawaii Administrative Rules (HAR) Title 11, Chapter 58, Sections 1-17 and 1-18. It describes the activities that will be taken to close and maintain the site at the end of its active life, in conformance with state and federal requirements including the following:

- Estimate the largest area of the site ever requiring closure at one time during the life of the site.
- Estimate the maximum inventory of wastes ever on site.
- Identify activities necessary to close the site.
- Describe the final cover design.
- Provide a schedule for conducting closure activities.
- Describe post-closure care and maintenance activities including a scheduled frequency for them.
- Provide contact information for the person or office responsible for post-closure care.
- Provide an estimate of the costs for a third party to close and provide post-closure care for the facility.
- Describe the funding mechanism to be used to meet the financial assurance requirements for closure and post-closure costs.

Sections 2, 3 and 4 of this Plan document provide background information on the PVT Landfill site, landfill design and environmental monitoring systems. Section 5 describes the facilities, activities and schedule for closure. Section 6 provides the required information on post-closure. Section 7 contains the cost estimates and financial assurance information.

# 2. FACILITY DESCRIPTION

## 2.1 Site Description

PVT ISWMF is located near the community of Nanakuli, approximately 18 miles northwest of Honolulu International Airport. The ISWMF site begins approximately 1600 feet northeast of the intersection of Farrington Highway and Lualualei Naval Road, and extends northerly approximately one mile along Lualualei Naval Road. Figure 1 is the site location map.

The ISWMF site is bordered by industrial, agricultural, residential and undeveloped property. The Hawaiian Cement plant is adjacent to the northern boundary of the site. Ulehawa Stream separates the ISWMF from residential areas and pig farms to the west and northwest. Residences to the south along

Mohini Street are separated from landfill operations by a minimum 100-foot wide landscaped buffer zone.

The PVT ISWMF operating landfill area consists of 200 acres on the west side of Lualualei Naval Road. Figure 2 shows the existing topography of the property.

The west 200 acres lies along approximately 1 mile of Lualualei Naval Road, with a width ranging from 1,000 to 1,800 feet between the road and Ulehawa Stream. Elevations of the site prior to landfilling range from 40 to 50 feet above sea level. Approximately 104 acres are designated for waste disposal, of which approximately 49 acres are located in the area designated as Phase I, not including an inactive 21.5-acre area (Phase I-A) that was closed prior to 1995. Phase II, containing approximately 55 acres, has been developed with a composite liner that exceeds the prescriptive liner systems required for C&D landfills, and a leachate collection system. These areas are shown in Figure 2 and Figure 3.

An area of 12.8 acres within the approved disposal area is designated for asbestos disposal. The area called the Asbestos Pit is shown in Figure 2, along with the approximately 8-acre area within which asbestos has historically been disposed.

The maximum approved elevation of the landfill is 250 feet above sea level. Figure 4 presents the final grade contours of Phase I and Phase II.

## 2.2 Liners and Leachate Collection System

As a facility permitted and used only for the disposal of inert construction and demolition (C&D) waste, PVT ISWMF was not initially required to construct liner systems in disposal areas. Accordingly, Phase I of the landfill was developed with waste materials placed on native ground. Once PVT started development of Phase II of the landfill, Hawaii State regulations HAR 58.1-19, began requiring C&D landfills to be built with prescriptive liner systems consisting of 2 feet of soil with a maximum hydraulic conductivity of $5 \times 10^{-5}$ cm/sec.

PVT Land Company decided to construct disposal areas in Phase II using liner systems that exceeded the Hawaii and Federal requirements for C&D landfills, and constructed liner systems equivalent to those typically used in municipal solid waste landfills. These systems consist of:

- A lower component of geosynthetic clay liner with hydraulic conductivity of $5 \times 10^{-9}$ cm/sec;
- An upper component of 60-mil HDPE geomembrane;
- A leachate collection and removal system consisting of a granular drainage layer with perforated HDPE pipes; and

- Geotextile

The first lined disposal cell in Phase II, Cell 1, was placed in service in mid-2004 and the last lined cell, Cell 9B was constructed in 2015.

Leachate removed from leachate collection sumps in Phase II is returned to the landfill as provided in 40 CFR 258.40(a)(2) and HAR 58.1-15(i), in areas of the site equipped with a composite liner and leachate collection system. Leachate is sprayed as a dust control agent on the working face of Phase II.

## 2.3 Method of Operation

Disposal operations use the area fill method of disposal, whereby waste is discharged to a limited area each day. C&D material is compacted using bulldozers prior to covering. PVT covers the compacted waste with a minimum of six inches of cover material whenever the area of exposed waste exceeds 1,500 square feet, or once a week, whichever comes first.

## 2.4 Characteristics, Quantity and Source of Waste

### 2.4.1 Acceptable Waste Types

PVT ISWMF accepts three general waste types: construction and demolition (C&D) waste, asbestos contaminated waste, and petroleum contaminated soil. The characteristics of each waste type are described below.

### 2.4.2 Construction and Demolition Waste

C&D waste is generated primarily by contractors and government agencies involved in the construction or demolition of houses, commercial buildings, pavements and other structures. It may include any of the following types of materials:

- Concrete and asphalt rubble
- Steel and nonferrous metal
- Wood
- Glass and plastic scrap
- Dirt and rock
- Brush, wood, roots, stumps, dirt and rocks from clearing and grubbing activities

PVT sorts and processes most loads of C&D material before disposal to remove recyclable materials including:

- Wood;

- Metal;
- Concrete, rock, asphalt and other inert materials;
- Soil; and
- Plastic, papers and other organic materials suitable for use in feedstock

The sorting and recycling activities are ongoing. A significant volume of C&D waste is diverted for on-site use or recycling. In recent years PVT has used almost all the rock, dirt, and concrete, and selected portions of C&D waste, as inert fill to provide intermediate cover and grading for portions of the Phase I disposal area. In addition, PVT segregates and recycles large metal objects from the mixed C&D loads. Full implementation is expected when third-party renewable energy facilities are in place to provide markets for the organic components of the C&D material system.

C&D waste is notably dry and generally inert. Its potential for creation of leachate is low, as evidenced by the small volume of leachate generated annually in the Phase II area. Given the waste exclusion and loadchecking programs implemented by PVT (see 2.3 below), the potential for a release of toxic or hazardous materials to air or water is minimal.

### 2.4.3 Asbestos Contaminated Waste

Asbestos contaminated waste is accepted and managed in accordance with the requirements of the site's Solid Waste Permit and applicable regulations including Chapter 342H, Hawaii Revised Statutes and 40 CFR Part 61, National Emission Standards for Hazardous Air Pollutants. The site accepts both friable and non-friable asbestos containing products, primarily consisting of roofing, ceiling, siding and insulating materials. All asbestos contaminated wastes received at the site are managed as friable asbestos, requiring it to be double bagged or double wrapped with plastic before being delivered to the site. Asbestos waste is accepted only on Tuesdays and Thursdays with 24-hours prior notice, or by appointment or other pre-arrangement

### 2.4.4 Petroleum Contaminated Soil

Petroleum contaminated soils for disposal or treatment are received primarily from site remediation projects associated with cleanup of leaks or spills from underground or aboveground storage tanks. The site accepts only soils contaminated with gasoline, diesel or heavier oils. Soils contaminated with petroleum products other than these are not accepted, nor are any soils containing TSCA-regulated levels of polychlorinated biphenyls (PCBs). Soils may not be hazardous or flammable, and may not contain heavy metals in excess of the amounts indicated in the site's Operations Plan.

### 2.4.5 Excluded Wastes

Solid wastes other than those described above are not accepted for disposal at PVT ISWMF. The following wastes are specifically excluded:

- Household waste, garbage, commercial solid waste or industrial solid waste as defined in HAR 11-58.1-03.
- All regulated hazardous wastes and TSCA-regulated PCB contaminated materials;
- Pesticide containers other than incidental empty small containers classified as C&D waste;
- Bulk green waste (grass, leaves, tree trimmings, etc.) or loads of land clearing debris or C&D waste containing more than 10 percent green waste.
- Whole tires or car parts;
- Free liquids and liquids products, including paints, solvents, sealers or adhesives (liquids are accepted for solidification only as described in Section 2.16); and
- Asbestos waste that is not properly packaged.

PVT ensures that excluded wastes are not accepted by its notices to customers, customer prequalifying procedures, and by inspections of loads at the scalehouse and at the disposal active face.

## 2.5 Proposed Ultimate Use of Land

Upon completion of its useful life as a landfill, the landfill site may be returned to its original use as open space. PVT may also consider other post-closure uses, in consultation with the community, such as recycling, nurseries, and parking. The landfill administrative office area may be retained in support of PVT Land Company's business, including management of PVT Landfill post-closure activities.

# 3. PHYSICAL SETTING

## 3.1 Climate

The Nanakuli area receives approximately 14 inches of rainfall per year, most of which falls between October and April. During this period, rainfall averages 1 to 2 inches per month, with less than 1 inch per month generally falling in the rest of the year.

Typical daily temperatures range from the low 60's to the upper 70's during the winter, and from the lower 70's to the upper 80's during the summer.

## 3.2 Floodplains

The Federal Emergency Management Agency has established the limits of the 100-year floodplain for the Ulehawa Stream. PVT ISWMF property lies above these limits. (Belt Collins Hawaii, 1995).

Due to its arid climate and high elevation, the PVT ISWMF site is not expected to be subject to flooding.

## 3.3 Site Access Control

The site is bounded by chain link or barbed wire fences on the south, east and north sides, with all access controlled at the main gate on Lualualei Naval Road. Ulehawa Stream provides a natural barrier to access on the west side of the landfill.

## 3.4 Surface Water Run-on and Run-off Control

The site is protected from run-on of storm water from upland areas by the Ulehawa Stream and by the roadside drainage ditch along the Lualualei Naval Road.

Stormwater is managed by controlled grading on the surface of the landfill and by maintaining an engineered system of drainage ditches, channels, pipes and basins. Drainage is managed to:

- prevent run-on of surface water to the active disposal face or uncovered refuse;
- minimize erosion in all areas of the site;
- maintain roads and other ancillary facilities in useable condition under all weather conditions; and
- prevent excessive runoff or sedimentation impacts to neighboring properties.

The landfill top deck and other areas in the vicinity of active disposal areas are graded at a slope of 2% to 5% away from the active area. Diversions are constructed upgradient of the active area if needed to prevent run-on from contacting the leachate, and divert drainage around any exposed waste. Similarly, diversions are constructed downgradient of exposed waste to prevent the runoff of any precipitation that has contacted waste. Such water is retained within the waste, for collection and management as leachate.

The site's stormwater management system is designed and constructed to manage runoff from a 25-year, 24-hour storm. Runoff is collected in a system of surface ditches, channels, pipes and ponds designed by PVT Land Company's engineering consultants. Figure 2 shows the surface water management system design at final development. As designed, the system will carry runoff from the design storm without flooding or excessive erosion from the site, and will retain a significant volume of water to minimize off-site runoff impacts and allow sediment in the runoff to be intercepted and removed before discharge from the site.

Figure 2 shows the location of existing and planned basins for collection of stormwater and removal of silt.

## 4. GROUNDWATER MONITORING PROGRAM

Groundwater monitoring requirements for PVT ISWMF are set forth in HAR 11-58.1-16(b)-(e). The site operates a system complying with these requirements, as described in the site's Groundwater Monitoring plan (Appendix A).

## 5. CLOSURE PLAN

### 5.1 Estimated Closure Date

[redacted]

### 5.2 Final Cover

Final cover for PVT Landfill has been designed and will be constructed to meet the State (HAR 58.1-19) and Federal (40 CFR 258.60(a)) prescriptive permeability requirements for bottom liner systems for C&D landfills. The final cover design contains the following prescriptive components:

a) an infiltration layer consisting of a minimum of two feet of earthen material and having a maximum permeability of $1 \times 10^{-5}$ cm per sec.; and

b) an erosion layer above the infiltration layer, containing a minimum of six inches of soil capable of sustaining native plant growth

PVT Landfill will be using this prescriptive cover for Phase I and Phase II areas. The final cover will be constructed using certified quality assurance procedures.

Final grades will be established and maintained to support effective surface water management, erosion control and revegetation.

### 5.3 Leachate and Gas Management Facilities

This section describes modifications to existing or future systems for managing landfill gas and leachate that will be required concurrently with construction of the final cover.

#### 5.3.1 Leachate Management Facilities

Leachate at PVT Landfill during the active life of Phase II will be managed by using it for dust control at the active working face in the Phase II area. This process will not be available after installation of the final cover. In its place, PVT Landfill will install a system to reintroduce leachate to the Phase II area of the landfill as provided in HAR 11-58.1-15(i).

Leachate pumped from the leachate collection and removal system (LCRS) sumps will be temporarily stored in a holding tank. Leachate will be pumped from the holding tank at a controlled rate to a network of perforated pipes placed in shallow trenches in the top layer of refuse prior to construction of the final cover cap. The liquid will permeate through the solid waste, providing moisture for the decomposition of organic materials during the post-closure period. Any leachate reaching the bottom of the landfill will re-enter the LCRS and be recirculated through the waste mass. It can be expected that leachate volume will decrease to a negligible level after construction of the final cover cap, due to the low organic content of the C&D waste and the elimination of potential rainfall infiltration.

#### 5.3.2 Landfill Gas Management Facilities

The rate and volume of methane gas generated by decomposition of C&D waste is extremely low compared to municipal solid waste landfills. The organic material in the waste is limited primarily to waste wood and clearing and grubbing debris, which decays slowly. To date, the site has not generated measurable quantities of methane.

If future testing indicates that measurable methane is being generated, a landfill gas (LFG) collection and treatment system will be constructed and placed in operation prior to closure. Some elements of the LFG system would require modification during construction of the final cover system in order to facilitate effective operation and maintenance during the post-closure period. The final design plans may include the following kinds of gas system modifications:

- Raising vertical gas wells above the final cover, with sleeved penetrations in geosynthetic components
- Burying collection header pipes below the final cover system
- Installing horizontal collectors in the upper waste layers
- Relocating or reconstructing condensate collection sumps to facilitate condensate management during the post-closure period.

Specific details of the LFG collection system will be described prior to implementation in future amendments to the Operations Plan and Closure Plan.

## 5.4 Largest Area Requiring Closure

Phase I-A, an area of 21.5 acres, was closed prior to 1995. The remaining entire permitted waste footprint of PVT Landfill will be closed after it reaches the permitted final grades. Therefore, the largest area ever requiring closure at the site is 104 acres, the combined areas of Phase I and Phase II, less Phase I-A. This area may be reduced in the future if designated areas of Phase I receive final closure cap and vegetation and are certified as closed.

## 5.5 Maximum Waste Inventory

On a daily basis, the largest amount of waste not buried in the landfill is the maximum daily tonnage received at the site, which is approximately 2,000 cubic yards of C&D and other inert material.

The total volume capacity of waste and daily/intermediate cover soil at PVT Landfill is approximately 14.5 million cubic yards. Based on an overall in-place density of 1,450 lb./cubic yard, the estimated tonnage of inert waste in place at closure will be approximately 10.5 million tons.

## 5.6 Closure Activities

Closure of PVT Landfill will be implemented by the following sequence of activities:

- <u>Final design and construction procurement.</u> Prior to receipt of final waste, detailed plans and specifications will be prepared by a Hawaii Registered Civil Engineer (RCE). Plans will include the final cover, storm water management system, demolition or removal of structures, any necessary revisions to site security or related systems, and modifications to environmental controls or monitoring systems. The plans and specifications will be used to secure one or more construction contracts to implement the closure.

- Closure cap construction. Construction of the final closure cap over the landfill surface will involve placing and grading soil and rock products, installation of low permeability soil cover, installation or modification of landfill gas and leachate management systems, and revisions to the surface water management system. Construction activities will be carried out by one or more contractors, under the supervision of a RCE and qualified construction quality assurance personnel to ensure conformance to project plans and specifications.

- Removal of structures and fixed equipment. Structures and fixed equipment, including equipment associated with the materials recovery operation, not required for support of post-closure maintenance activities will be demolished or removed from the site during the closure construction period. Any remaining stockpiles of recyclable materials or feedstock will also be removed. The administrative office area may be kept in use to support PVT Land Company's general business activities as well as to provide a base of operations for the post-closure program at PVT leachate collection and removal system.

- Closure documentation. Following completion of all closure construction activities, the RCE will prepare a final construction quality assurance report certifying that closure has been completed in accordance with the Closure Plan and applicable plans and specifications. PVT Land Company (PVT) will submit the report to the Hawaii Department of Health in accordance with HAR 11-58.1-17(a)(8). In addition, PVT will record on the deed to the property a notation that the site has been used as a landfill facility and that its use is restricted, as required under HAR 11.58.1-17(a)(9).

## 5.7 Closure Schedule

The closure activities described above will be implemented according to the following schedule, which will be refined as final closure plans are developed.

- Six months prior to final waste – Begin preparation of detailed plans and specifications

- Six months following receipt of final waste – Complete all closure construction activities including removal of structures

- Nine months following receipt of final waste – Complete documentation and notification requirements

# 6. POST-CLOSURE PLAN

## 6.1 Post-Closure Responsibility

PVT Land Company has responsibility for post-closure care of PVT Landfill for a thirty (30) year period following final closure, unless it can make a showing prior to that time that there are no potential environmental or other impacts due to the closed facility.

## 6.2 Monitoring and Maintenance Activities

This section describes the specific activities to be conducted during the post-closure period in conformance with HAR 11-58.1-17(b)(1), including:

- Maintenance of the final cover
- Operation and maintenance of leachate collection and removal systems
- Operation and maintenance of the LFG management system
- Ground water monitoring
- Landfill gas monitoring

### 6.2.1 Final Cover Maintenance

The following scheduled activities will be conducted throughout the post-closure period to ensure the integrity of final cover systems.

- Semi-annual inspection and maintenance. Inspections during fall (September-October) and spring (March-April) will identify any areas of eroded cover or other damage, and repairs will be made by adding soil or rock, grading or other activities as required. All storm water conveyances and structures will be inspected, cleaned of sediment and repaired as needed. Areas of cover with vegetation will be inspected to ensure that any plants with rooting systems deeper than the top vegetative cover are removed, in order to prevent root damage to underlying components.

- As-needed inspections and repairs. Unscheduled inspections will be made following any unusual events with potential to cause excessive erosion or damage to the liner systems. Such events would include extreme rainstorms or earthquakes. Any damage discovered during the inspection will be repaired on a timely basis.

- Five-year settlement surveys. Immediately after completion of final closure construction and at five-year intervals thereafter, the site will be surveyed and mapped using aerial topography. The maps will be reviewed to identify any areas where differential settlement may create flat spots that could cause surface water to pond or otherwise collect on the surface. Any areas so identified will be repaired at the next semi-annual inspection and maintenance event.

### 6.2.2 Leachate Collection and Removal System

Sumps in the leachate collection and removal system (LCRS) will be monitored and pumped on a regularly scheduled basis, at a frequency depending on the rate of leachate production at the site during the post-closure period. Leachate will be removed as needed to prevent a depth of leachate above the liner in excess of 30 centimeters (12 inches) as required by HAR 11-58.1-14(b).

Leachate will be managed by reintroducing it to Phase II of the landfill. The volume of leachate being managed is expected to decrease significantly after construction of the closure cap. It will continue to decrease during the post-closure period as any organic matter in the waste degrades.

### 6.2.3 Landfill Gas Management System

It is presently assumed that a landfill gas collection system will not be required at PVT ISWMF, due to the inert character of the waste in it. If a landfill gas collection system is installed in the future, however, it would require frequent operational and maintenance attention. The following activities are typically required:

Daily to weekly frequency:

- Monitor the performance of any flare or other final control device; maintain or repair as needed.

Weekly to monthly frequency:

- Visual inspection of aboveground pipe and fittings to detect and repair any significant leaks or damage.
- Check liquid levels in condensate sumps, pump and dispose of condensate by reintroducing it to the landfill or thermal destruction in the flare.

Quarterly frequency:

- Check wellfield and adjust vacuum and flows in wells and header pipes as needed to maintain optimum gas quality in each well (approximately 50% methane, with minimal oxygen content).

Semi-annual or annual frequency:

- Scheduled major preventive maintenance of flare or other final control device, according to manufacturer's recommendations.

Condensate management would be an ongoing operation throughout the post-closure period if a gas collection system is installed. Condensate would be pumped or drained by gravity to a storage tank, and be disposed of by one or a combination of two alternative methods. It may be reintroduced to the landfill using the same methods used for reintroduction of leachate. Alternatively, if the final LFG control device is a flare, condensate may be thermally destructed by injecting it into the flare at a controlled rate. Detailed procedures for condensate management would be developed after installation of the LFG system and determination of its gas and condensate production volumes.

### 6.2.4 Ground Water Monitoring

The groundwater monitoring program, described in Appendix A, will be continued throughout the post-closure period. Monitoring will be conducted on an annual basis during the post-closure period.

## 6.3 Contact Personnel

The name, address and telephone number of the person responsible for PVT Landfill post-closure activities will be maintained in the site's operating records and updated in this Post-Closure Maintenance Plan whenever it changes after the post-closure period begins. The person currently responsible is:

Albert Shigemura, President
PVT Land Company, Ltd.
87-2020 Farrington Highway
Waianae, Hawaii 96792
Telephone (808) 668-4561

## 6.4 Post-Closure Land Uses

The PVT ISWMF site may be maintained as open space during the post-closure period. PVT may also consider other uses consistent with post-closure management. The existing administrative area may be maintained as a business center for PVT Land Company. Other activities related to the company's business may also be conducted on the site, provided they are compatible with safe and effective management of all post-closure care operations at the closed landfill.

# 7. FINANCIAL ASSURANCE (HAR 11-58.1-18)

## 7.1 Applicable Requirements

This section responds to the requirements of HAR 11-58.1-18 for a financial assurance plan estimating the cost of closure and post-closure care for the largest site area ever requiring closure, and establishing financial assurance funding using financial assurance mechanisms approved by HAR 11-58.1-18(e).

## 7.2 Closure Cost Estimate

[redacted]

## 7.3 Post-Closure Care Cost Estimate

[redacted]

## 7.4 Incremental Financial Assurance Mechanism

[redacted]

[redacted]

[redacted]

[redacted]

## TABLE 7-1
## PVT LAND COMPANY LANDFILL
## CLOSURE / POST-CLOSURE COSTS

### SUMMARY – PRESCRIPTIVE FINAL COVER USING TWO FEET THICK LOW PERMEABILITY SOIL

### TOTAL SITE AREA - 104 ACRES

| **Closure 104 acres)** | **Costs (2015 Dollars)** |
|---|---|
| Final Cover | $ [redacted] |
| Revegetation | $ [redacted] |
| Landfill Gas Monitoring & Control | $ - |
| Groundwater Monitoring Installation | $ [redacted] |
| Drainage Installation | $ [redacted] |
| Security Installation | $ - |
| Removal of Structures | $ [redacted] |
| Subtotal Closure | $ [redacted] |
| Subtotal x 20% Contingency Costs | $ [redacted] |
| Total Closure Cost | $ [redacted] |
| **Post-Closure Monitoring and Maintenance - Annual Cost** | |
| Final Cover Maintenance | $ [redacted] |
| Leachate Management | $ [redacted] |
| Gas Management | $ - |
| Monitoring | $ [redacted] |
| Drainage | $ [redacted] |
| Security | $ [redacted] |
| Inspection | $ [redacted] |
| Subtotal - Annual Monitoring and Maintenance | $ [redacted] |
| Subtotal x 30 years | $ [redacted] |
| **Total Closure and 30 Years Post-Closure Cost** | $ [redacted] |

# FIGURES

# APPENDIX A

## Groundwater Monitoring Plan

# APPENDIX B

## Cost Estimates

# ATTACHMENT P-5

# ATTACHMENT P-5
# ZONING CLEARANCE FORM
# SOLID WASTE PERMIT APPLICATION

**TO THE APPLICANT**:

Please be advised that a requirement for the issuance of a solid waste management permit in Hawaii is that the facility meets local ordinances and zoning requirements, including the recording of its disposal facility with the Bureau of Conveyances.

In order that the Solid and Hazardous Waste Branch may determine whether the facility is in compliance with local land use policy, **we require that this attachment be completed and signed by the appropriate county land use/planning agency** (on Oahu, contact the Department of Planning and Permitting). No permit will be issued unless this form has been properly completed and returned. If a Use Permit or SMA Permit is required, submit a copy of

Name of Applicant: PVT Land Company, LTD.

Name and phone number of primary contact for applicant:
Stephen Joseph, (808) 668-4561

Address of proposed facility:
87-2020 Farrington Highway, Waianae, Hawaii 96792

Tax Map Key: 8-7-9: 25 and 8-7-21: 26

Description of proposed facility [e.g., waste processing, waste storage (indoor or outdoor), recycling, composting, waste disposal, etc.): Waste disposal and recycling.

**COUNTY AGENCY APPROVAL:**

The Current Zoning of the Proposed site for the Proposed Activity / Facility / Operation is: R-5

X Allowed — Identify Approved Use Permit/SMA, other Restrictions/Limitations: As a "Waste Disposal & Processing Facility", pursuant to Conditional Use Permit No. 85/CUP-6, and as modified up to March 24, 2011.

___ Not Allowed — Reason (ex: Use Permit/SMA required, application pending, etc.):

Name: for George I. Atta, FAICP

Title: Director, Department of Planning and Permitting

Agency: City and County of Honolulu

Signature:

Date: October 16, 2015

Enclosure: Receipt No. 104962
cc: SDOH, Solid and Hazardous Waste Branch

# ATTACHMENT P-6

# ATTACHMENT P-6
# PROPERTY OWNER APPROVAL FORM
# SOLID WASTE PERMIT APPLICATION

## TO THE APPLICANT:

In order that the SHWB may determine whether the property owner and/or master lessee is knowingly allowing the proposed solid waste activity, we require that this attachment be completed and signed by the property owner and the master lessee, if appropriate. **No permit will be issued unless this form has been properly completed and returned.**

Name of Applicant: PVT Land Company, LTD.

Name and phone number of primary contact for applicant:
Stephen Joseph, 808-668-4561

Address of proposed facility:
87-2020 Farrington Highway
Waianae, Hawaii 96792

Tax Map Key: (1) 8-7-009:025 and (1) 8-7-021:026

Description of proposed facility [e.g., waste processing, waste storage (indoor or outdoor), recycling, composting, waste disposal, etc.): Integrated Solid Waste Management Facility

## PROPERTY OWNER / MASTER LESSEE APPROVAL:

I/We certify that I/we have knowledge and approve of the applicant's proposed solid waste management facility for the subject location. I/We further certify that I/we fully understand the requirements under HAR Chapter 11-58.1, Subchapter 6, such that I/we am/are also responsible for the aesthetic, nonhazardous, sanitary storage, and removal of solid waste to approved solid waste management facilities.

If the property owner/master lessee is a partnership or group other than a corporation, a county, or state entity, one individual who is a member of the group shall sign this form. If the property owner/master lessee is a corporation, a county, or a state entity, an officer of the corporation, or an authorized representative of the county or state shall sign this form.

Property Owner:
Name of Authorized Representative: Albert Shigemura
Signature: Date:
Title: President Telephone: 808-668-4561
Company Name: PVT Land Company, LTD. Termination date of
Address: 87-2020 Farrington Hwy, Waianae, HI 96792 lease/approval:

Master Lessee:
Name of Authorized Representative:
Signature: Date:
Title: Telephone:
Company Name: Termination date of
Address: lease/approval: