Applicable Attachments

Attachment 1

Landfill Design Approach and Objectives
Section 4.5

4.5 DESIGN APPROACH AND OBJECTIVES

The design approach for the proposed Class I Landfill expansion was based on the Regulations, which state that the following factors shall be considered for the approval of a design:

- Minimize liquids
- Leachate collection system
- Liner design
- Closure
- Gas control
- Design drawings
- Any other relevant factors

Final construction plans and specifications, including quality control and quality assurance plans, must be approved by the Executive Secretary prior to the start of construction of any structure or feature of the landfill.

4.5.1 General Cell Design

The Class I disposal cell was designed to protect the waters of the State of Utah from degradation by pollutants or contaminants by maximizing evapotranspiration, minimizing percolation of water through the landfill, and diverting surface water run-on and run-off.

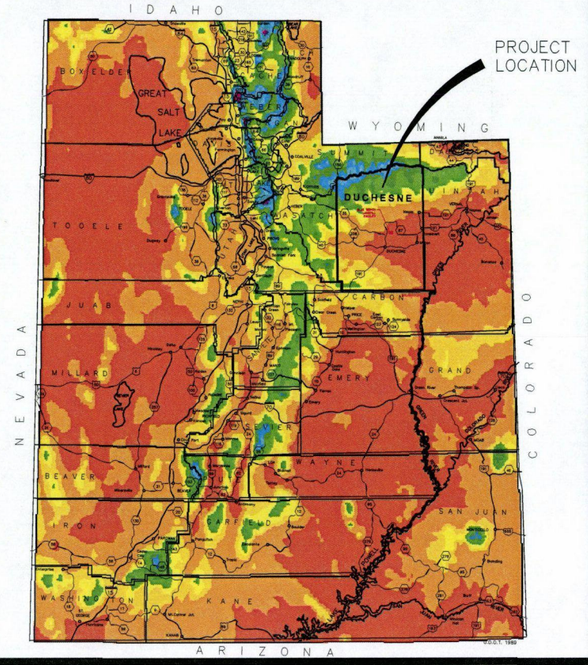
The climate at the Landfill Facility is defined as semi-arid with moderate precipitation rates, moderate temperatures, and low evaporation rates. Table 4.1 below lists estimated average climate data for Duchesne County.

Table 4.1 – Climate Data

Region	Average Annual Precipitation (in/yr)	Mean Temperature (°F)	Free Water Surface Evaporation (in/yr)
Duchesne County	9.55	44°-46°	35-39

See Figure 4.1 for an average annual precipitation map and Figure 4.2 for a free water surface evaporation map.

The proposed disposal cell would be separated into modules as indicated on the excavation plan as shown on Figure 4.3. The life expectancy of each module is also indicated. Figure 4.4 shows the module development plan using the area fill method of construction. This method involves excavation of



Average Annual Precipitation

Utah

Legend (in inches)

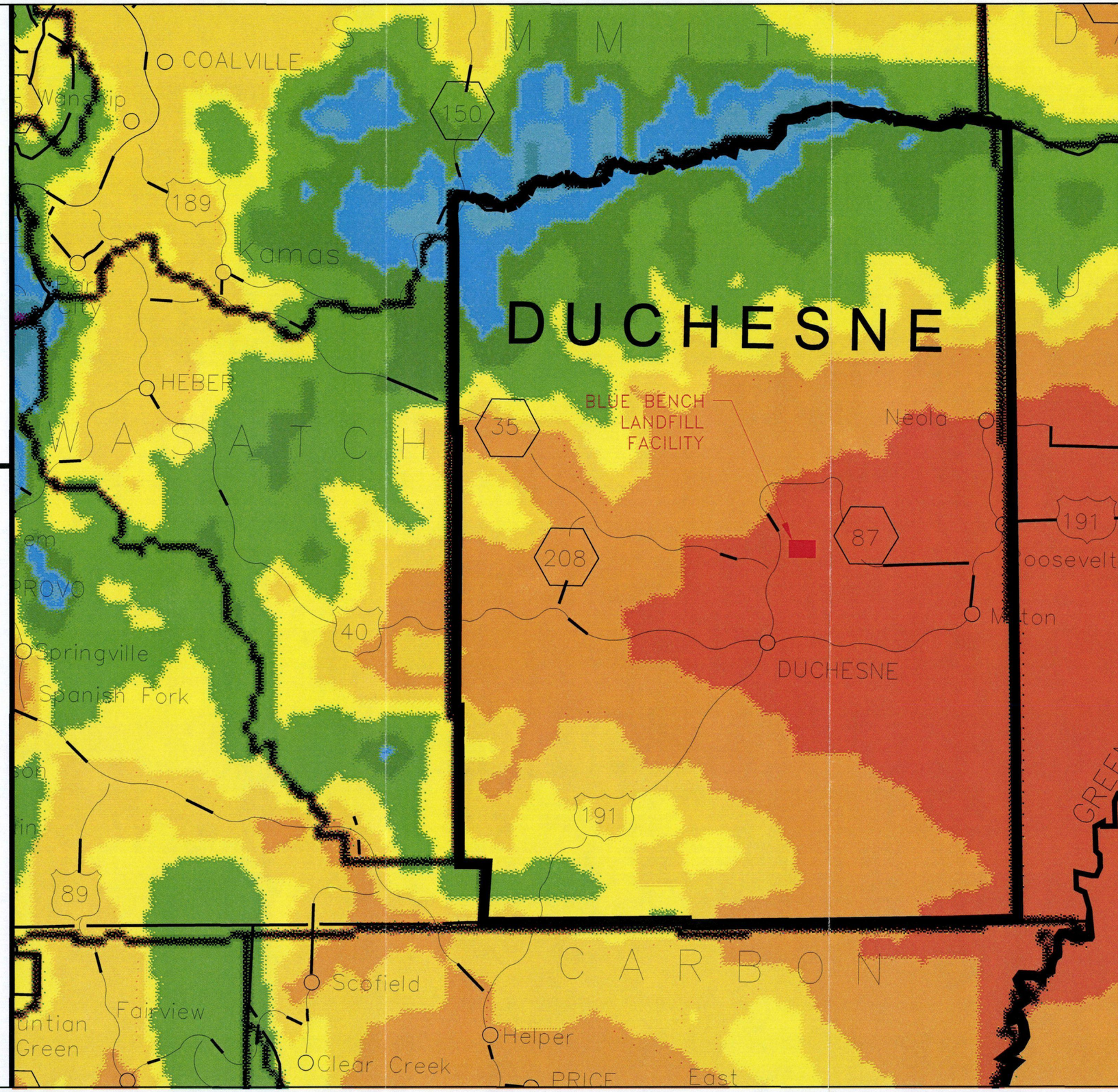
- Under 10
- 10 to 15
- 15 to 20
- 20 to 25
- 25 to 30
- 30 to 35
- 35 to 40
- 40 to 45
- 45 to 50
- 50 to 55
- Above 55

For information on the PRISM modeling system, visit the SCAS web site at http://www.ocs.orst.edu/prism

The latest PRISM digital data sets created by the SCAS can be obtained from the Climate Source at http://www.climatesource.com

This is a map of annual precipitation averaged over the period 1961-1990. Station observations were collected from the NOAA Cooperative and USDA-NRCS SnoTel networks, plus other state and local networks. The PRISM modeling system was used to create the gridded estimates from which this map was made. The size of each grid pixel is approximately 4x4 km. Support was provided by the NRCS Water and Climate Center.

Copyright 2000 by Spatial Climate Analysis Service, Oregon State University



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CLASS I & IVA LANDFILL PERMIT APPLICATION
AVERAGE ANNUAL PRECIPITATION MAP

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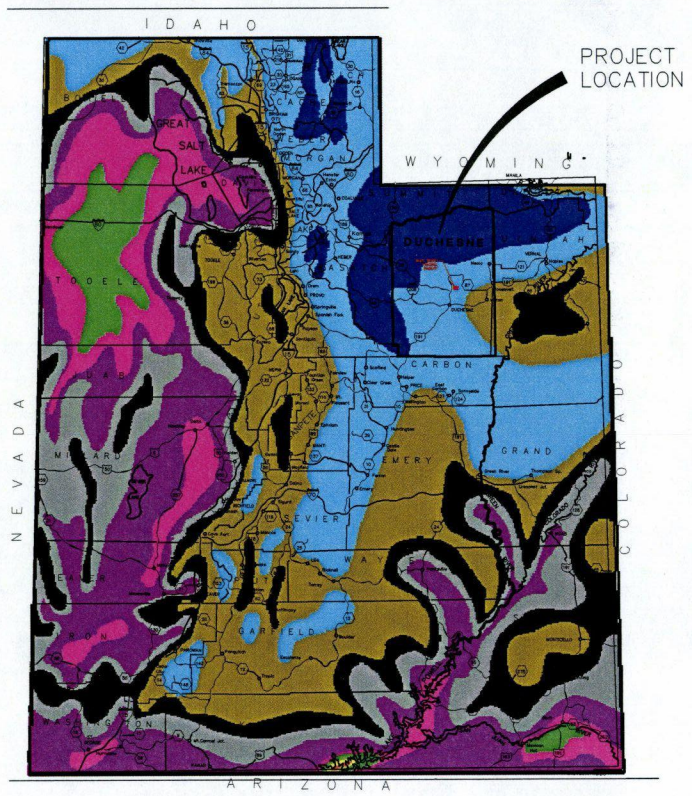
FIGURE:

4.1

RM 01 J07 W:\01103_Permit Application\dwg\Figures\FIG 4.1 4.2.dwg



LOCATION MAP

Free Water Surface Evaporation (Shallow Lake)

Annual

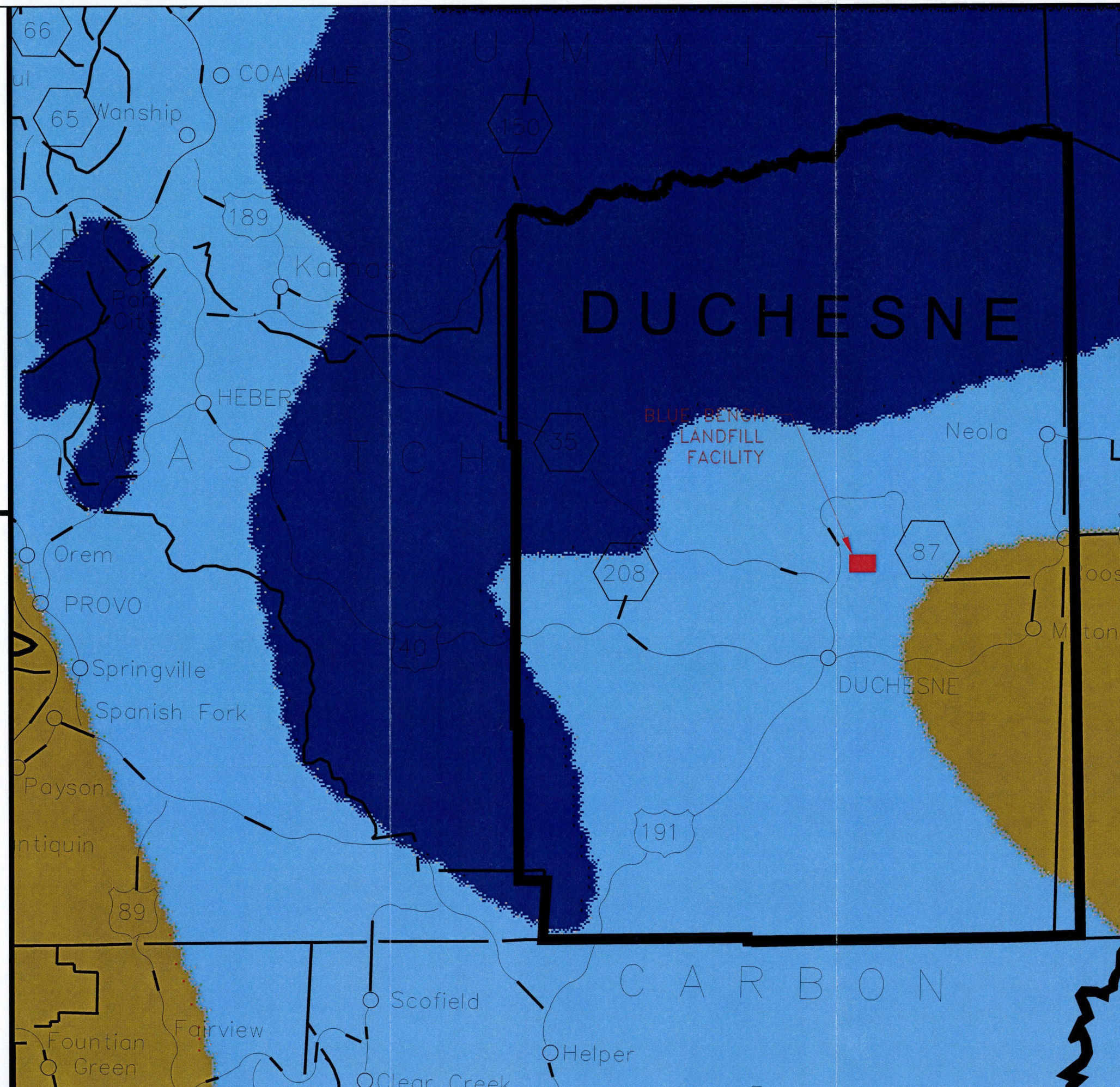
Legend

Annual FWS Evaporation (in inches)

80 or greater	60 - 64.9	40 - 44.9
75 - 79.9	55 - 59.9	35 - 39.9
70 - 74.9	50 - 54.9	less than 35
65 - 69.9	45 - 49.9	

0 25,000 50,000 75,000

Scale in Feet



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FREE WATER SURFACE EVAPORATION MAP

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FIGURE:

4.2

W:\01103_Permit Application\dwg\Figures\FIG 4.1 4.2.dwg

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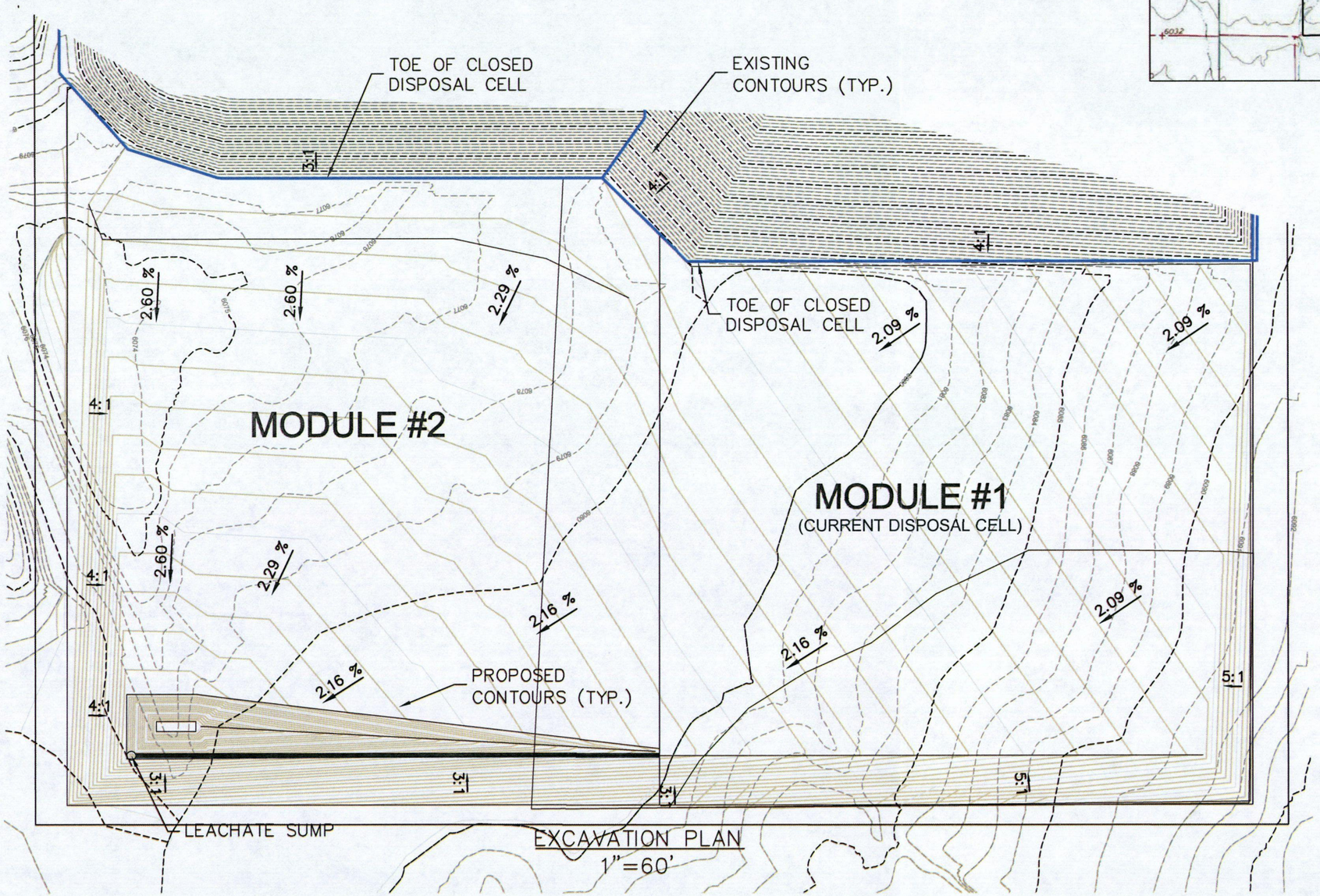
MODULE NO.	ACRES	LIFE EXPECTANCY
1	7.6	2012–2017
2	8.8	2017–2022

NOTE: POTENTIAL BORROW AREAS INCLUDE THE BUFFER ZONE UP TO BUT NOT EXCEEDING THE PROPERTY BOUNDARY.



EXCAVATION PLAN
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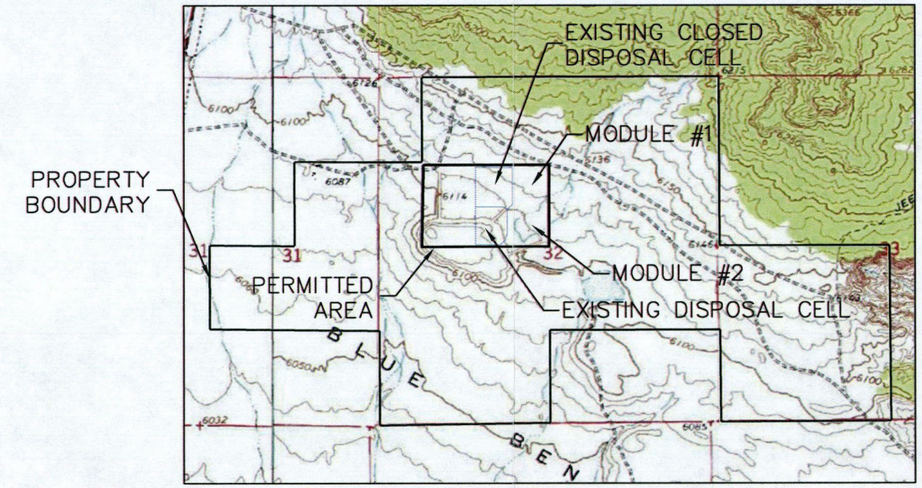

VICINITY MAP
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Scale in Feet

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CLASS I & IVA LANDFILL PERMIT APPLICATION
EXCAVATION PLAN

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FIGURE:
4.3

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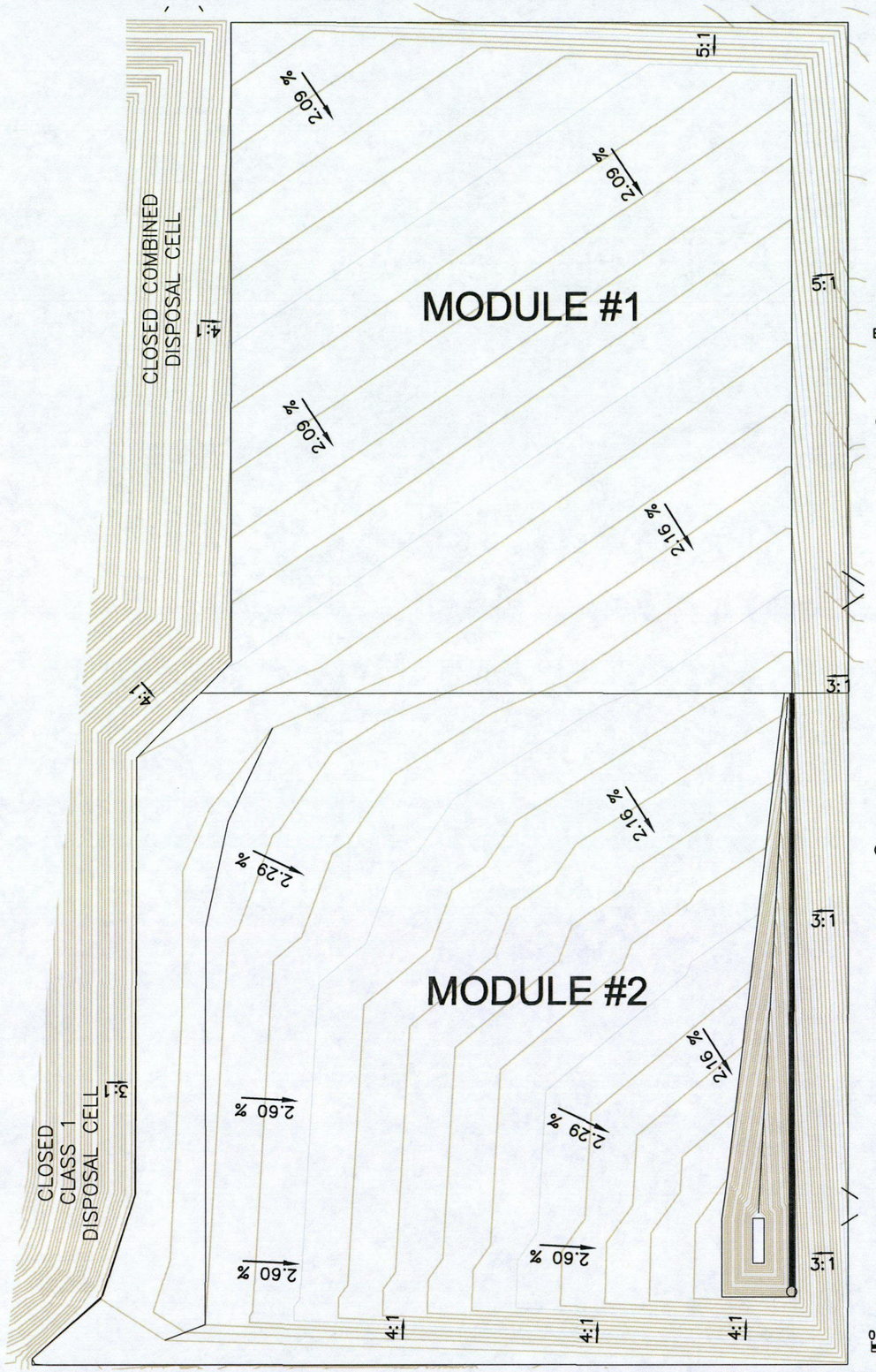
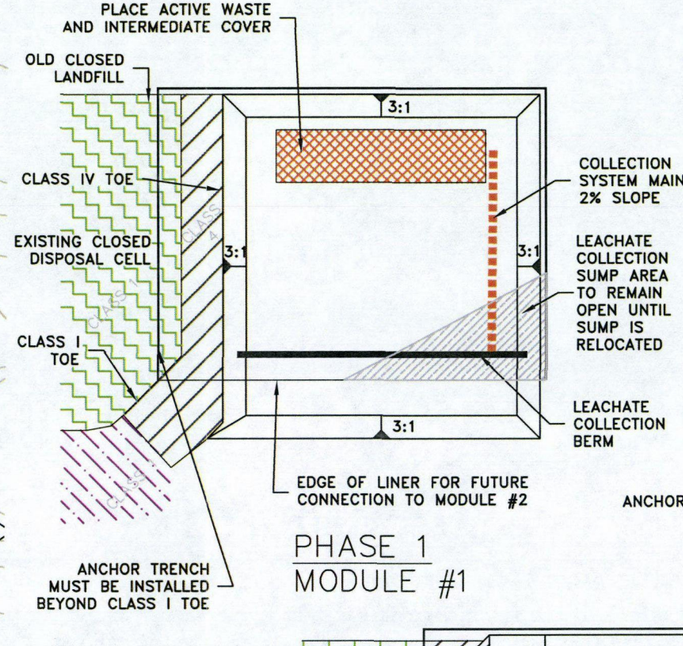
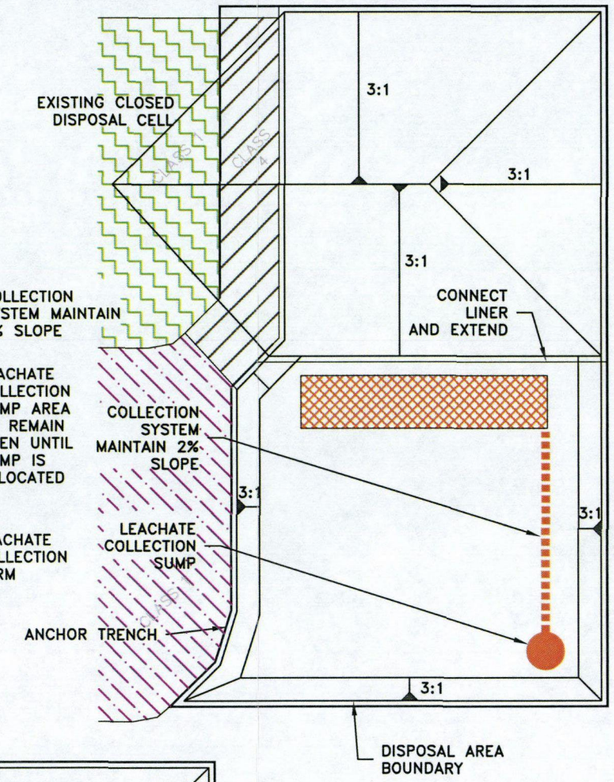
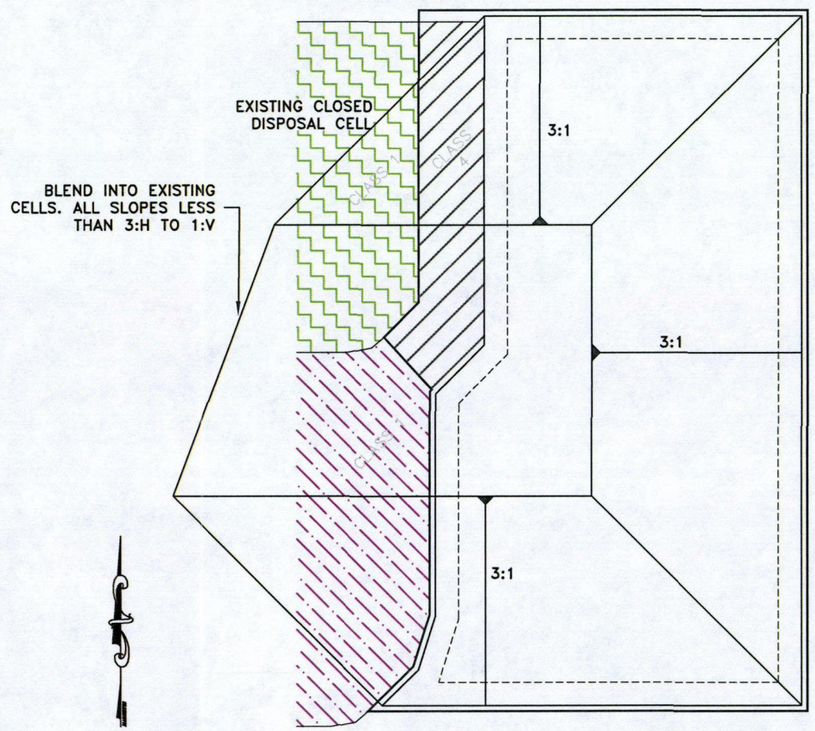




PHASE 1
MODULE #1



PHASE 2
MODULE #2



PHASE 3 – ULTIMATE BUILDOUT

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MODULE DEVELOPMENT PLAN

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FIGURE:
4.4

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a defined area, installation of a liner, leachate collection system, protection layer, select waste layer, and placement of refuse. The module would consist of excavated slopes as steep as 3 horizontal to 1 vertical and cover slopes of 3 horizontal to 1 vertical. The liner components would be placed at a minimum 2% slope extending outside the proposed module area for future connection. The protection layer may be constructed using screened bank run site soils. Select waste would exclude any items that may compromise the liner system. Select waste is typically obtained from residential MSW collection which is carefully placed to protect against sharp materials penetrating the protection layer or liner. Refuse would be placed in 2-foot layers and compacted to minimize the potential for sediment. Large debris would be separated and crushed to prevent possible bridging problems. A drainage berm would be constructed around the module to help divert run-on away from the refuse.

The refuse would be covered daily with 6 inches of soil or an approved alternative daily cover such as one the following; compost, mulch, foam, automobile fluff, and/or a geosynthetic blanket or any approved material that would be ready available and cost effective. If soil is chosen as the primary means for daily cover, it may be obtained by either exhumed soil from future modules or by importing soils from near by sites.

An intermediate cover consisting of 12 inches of soil or an approved alternative would be applied to any working face not receiving waste for a period exceeding 30 days.

4.5.2 Liner

The liner system was designed to prevent pollutants and contaminates from escaping the landfill. In order for the liner system to be successful, it cannot leach or fail due to settlement, puncture, or seismic activity. The liner would consist of a clay layer overlain by a HDPE layer. The clay layer would be placed on native soils, which are free of stones or other matter whose size and shape could puncture the clay layer. A clay layer with specifications equivalent to or greater than the physical properties of Bentomat (ST) would be used. Product specifications for all liner and leachate collection system components are located in Appendix D. The HDPE layer would be 60 mil or thicker to minimize puncture risk. The HDPE layer would be welded at all seams to provide containment. The HDPE would be protected from site soils by the clay layer. A drainage layer would be placed over the liner on the floor of the cell for leachate collection. The drainage layer would consist of a Bi-planar Fabri-Net Geocomposite with 6 oz Geotextile bonded to both sides.

4.5.3 Settlement

Settlement calculations were performed for the proposed cell design. Settlement estimates throughout the site ranged from 0-3 inches. These calculations were for the full utilization scenario with final cover slopes of 3 horizontal to 1 vertical.

4.5.4 Leachate Collection System

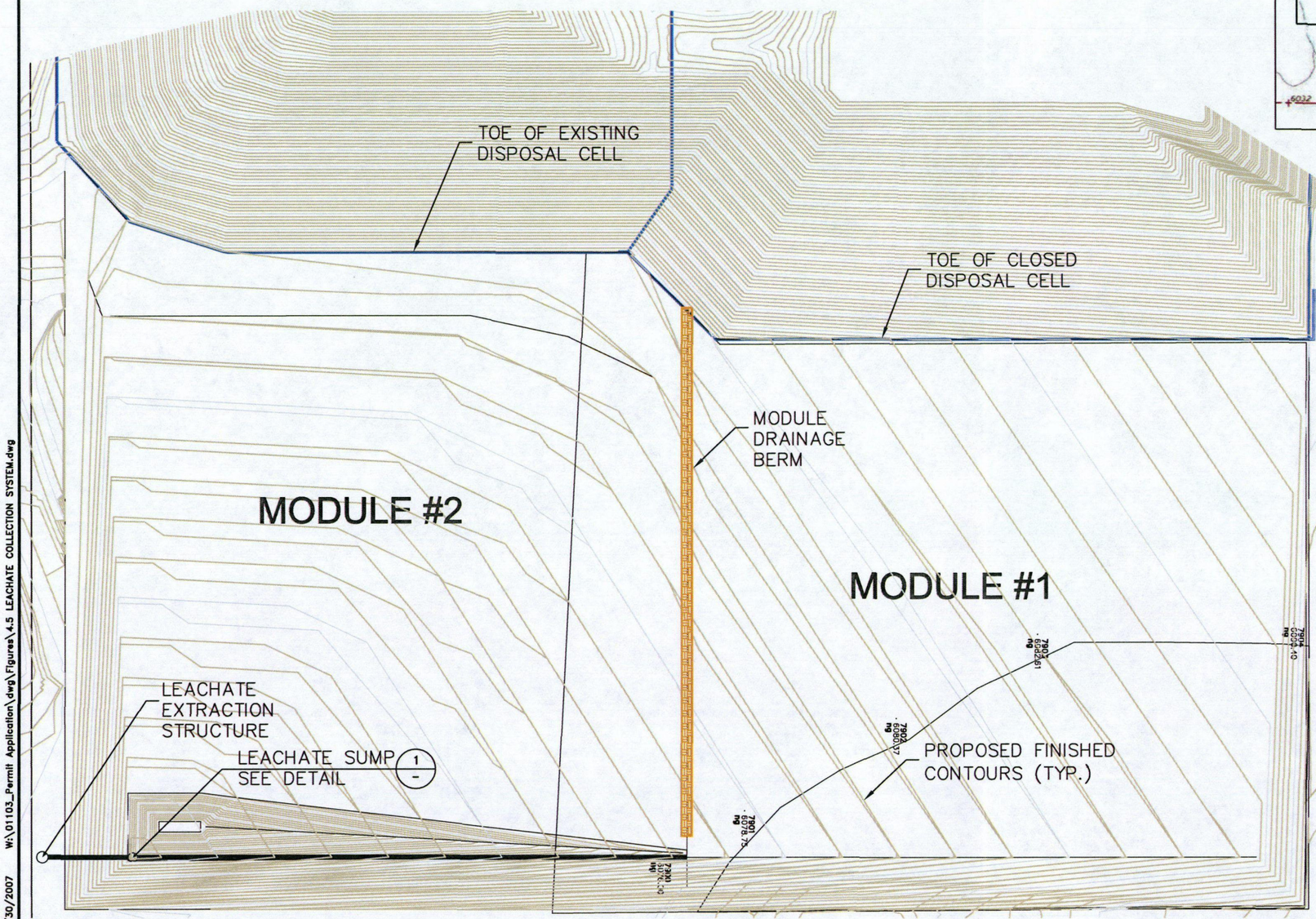
The proposed Class I Landfill would be equipped with a leachate monitoring and collection system as shown on Figure 4.5. The system is comprised of a drain system which gravity flows to a centrally located sump positioned at the lowest points of the landfill cell. The collection system piping would be designed to handle the specific site loading conditions. To help protect the collection system, the sump area would be filled w/ gravel overlain by a non-woven geo-textile. Leachate would be pumped on an as-needed basis to maintain a level of less than 1 foot of leachate over the liner system. Sump areas would be constructed as shown on Figure 4.5. The removed leachate would either be use as a suppressant for fugitive dust and compaction water on areas of the landfill that are overlaid by an approved liner system. Cleaning of the leachate collection system would be conducted on an as needed basis.

4.5.5 Final Cover

The disposal cells are designed to eliminate infiltration through the cover to prevent the generation of leachate. This is accomplished by promoting drainage and evapotranspiration from the cover, and by preventing percolation of precipitation into the disposal cell.

NOTES:

1. FINISHED SLOPES ARE 3:1 UNDER THE FULL UTILIZATION SCENARIO



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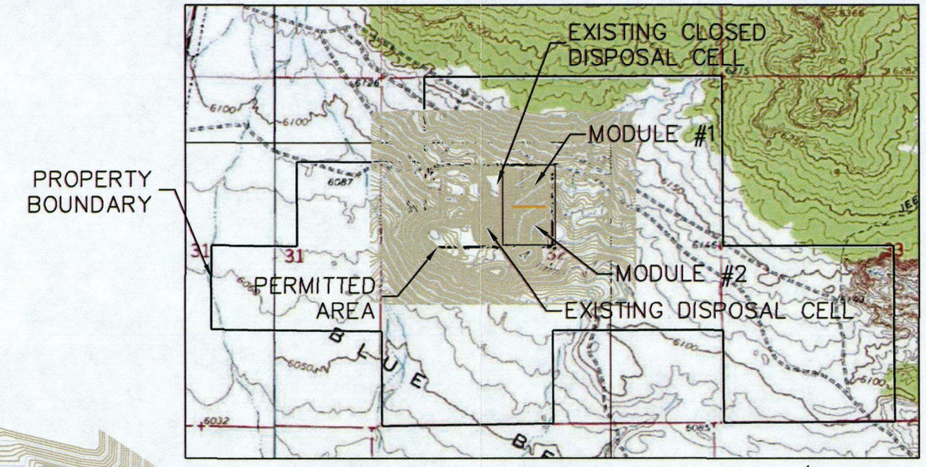

VICINITY MAP
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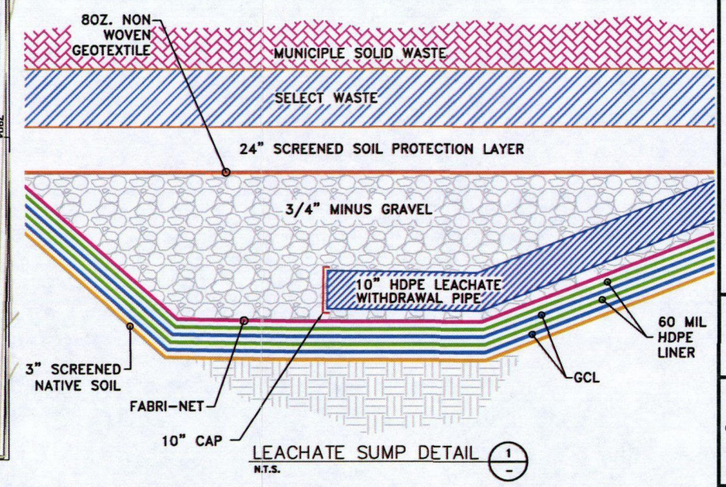

LEACHATE SUMP DETAIL 1
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CLASS I & IVA LANDFILL PERMIT APPLICATION
LEACHATE COLLECTION SYSTEM DETAIL

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FIGURE:
4.5
4-9

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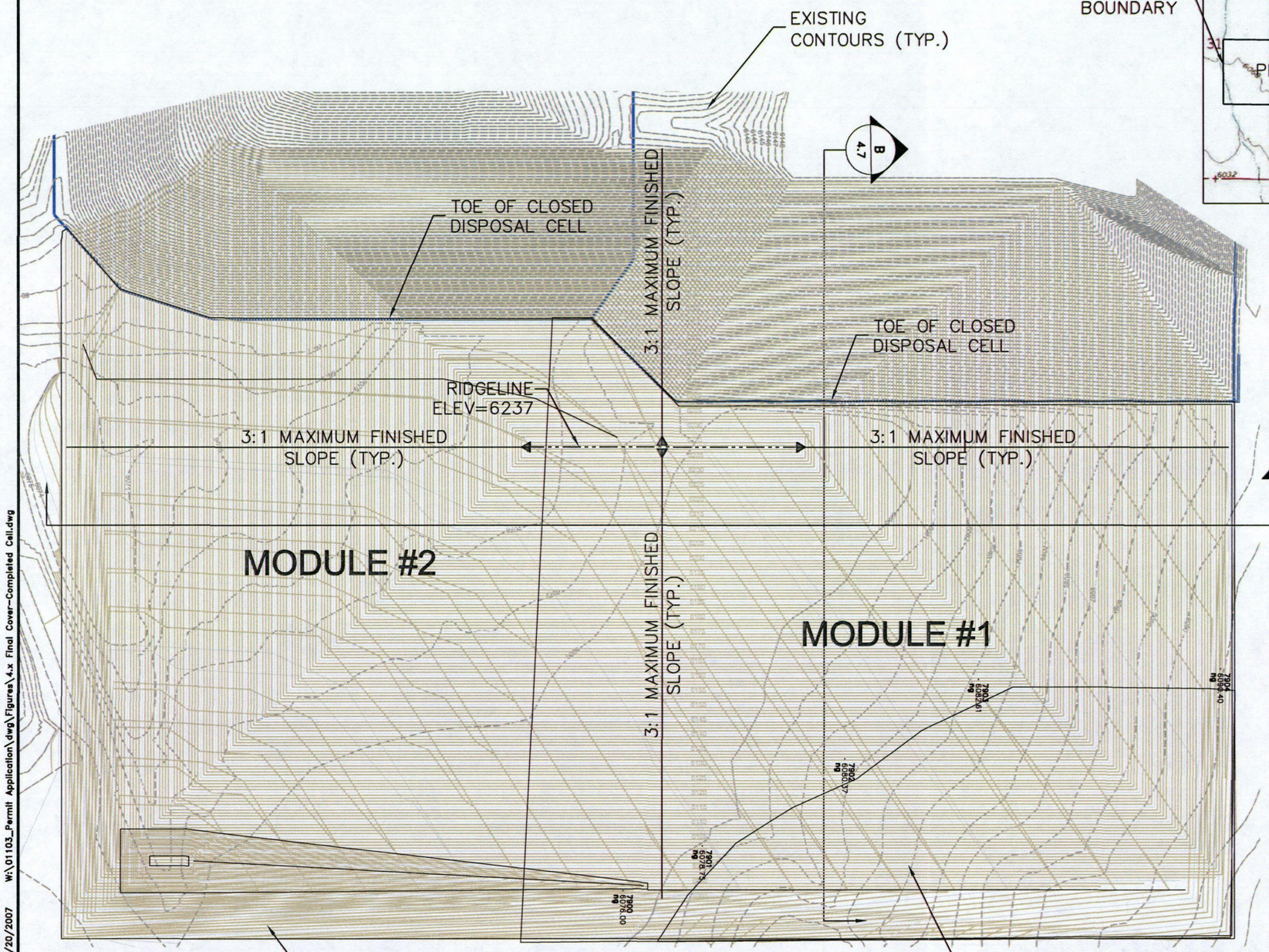
NOTES:

1. FOR SECTIONS A AND B DETAIL SEE SHEET 4.7
2. THE SLOPES ARE 3:1 UNDER THE FULL UTILIZATION SCENARIO



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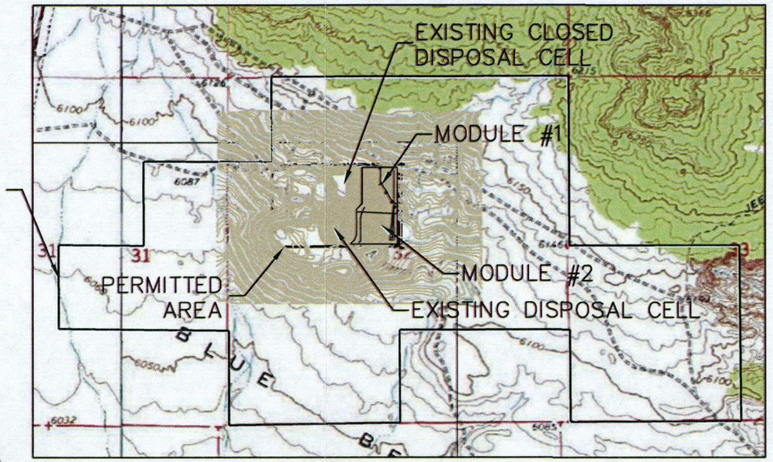
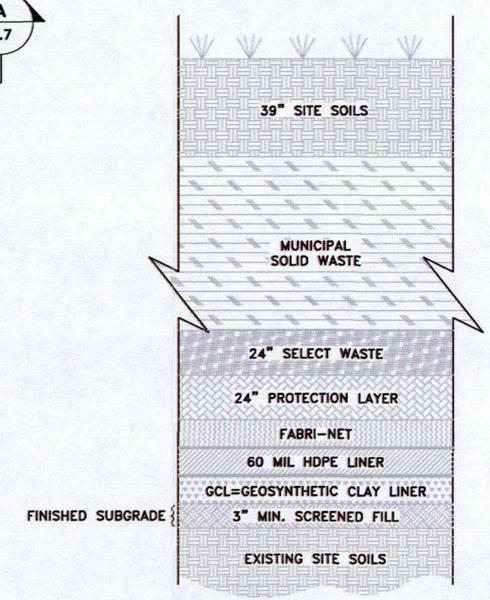


VICINITY MAP
N.T.S.

RUN-OFF DRAINAGE FROM INTERMEDIATE COVER AREAS WOULD BE CONSIDERED AS LEACHATE AND MAINTAINED WITHIN AREAS OF THE LANDFILL THAT ARE UNDERLAIN BY AN APPROVED LINER SYSTEM.



EVAPOTRANSPIRATION FINAL COVER SYSTEM (1)
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POST CELL DESIGN

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FIGURE:
4.6
4-10

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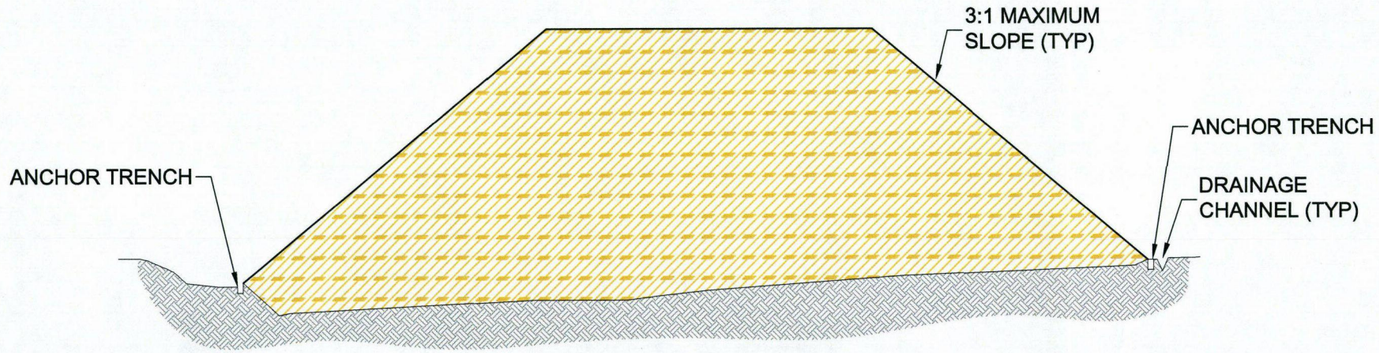

SECTION A / 4.6
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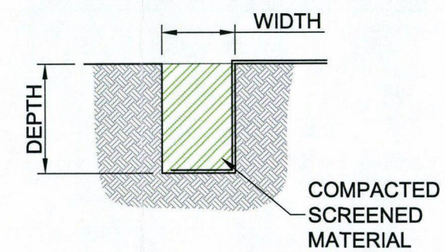
NOTE: WIDTH & DEPTH OF ANCHOR TRENCH AS PER MANUFACTURER'S RECOMMENDATIONS



ANCHOR TRENCH DETAIL 1 / –
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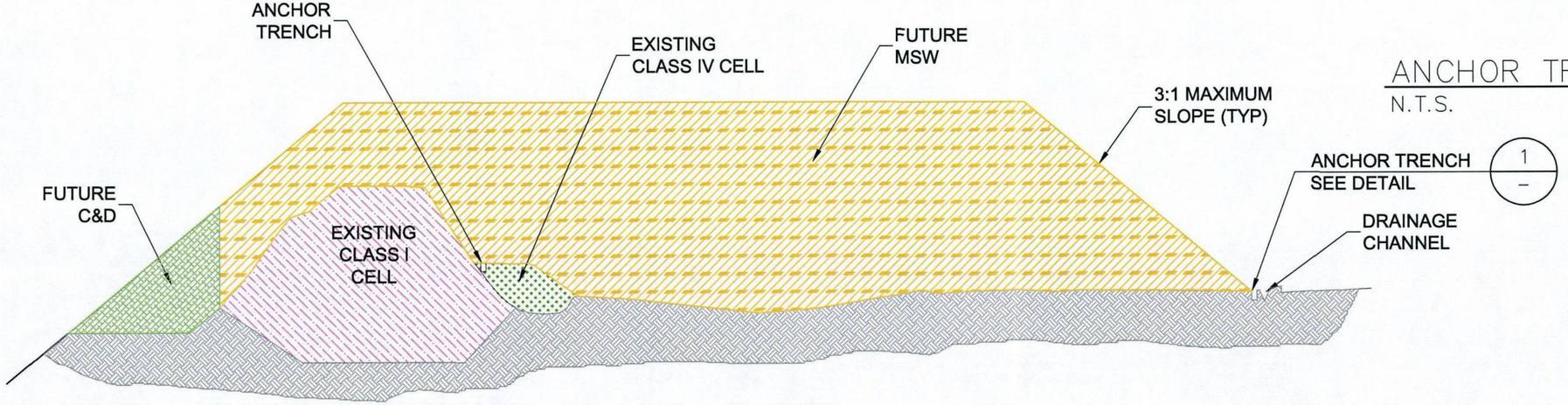

SECTION B / 4.6
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POST CELL SECTIONS

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FIGURE:
4.7

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4.5.5.1 Evapotranspiration Final Cover System

The cover has been designed to eliminate infiltration to prevent the generation of leachate. This was accomplished by promoting evapotranspiration from the cover, and by preventing percolation of precipitation into the disposal cell. The alternative final cover will consist of 1 meter of blow sand which will be obtained from onsite stock pile or excavation. The final cover will be graded to a slope of 3 horizontal to 1 vertical to promote adequate drainage. No additional compactive effort should be expended.

Hydrologic modeling was performed to assess the water balance and is contained in Appendix E. The hydrology was predicted using a validation tool and a computer model WinUNSAT-H.

The evaluations were completed using the variably saturated flow program WinUNSAT-H. Interpreting the model output indicates a 1 meter cap will perform as well as a traditional cap. The water balance graph shows the expected response of storage and release of water in response to precipitation and evapotranspiration. Runoff was modeled at zero, indicating that all of the precipitation infiltrated into the cover to insure a conservative estimate. Evapotranspiration exceeded precipitation during each year in the cycle, indicating that the cover dries during the meteorological year. Drying of the cover is also evident in the soil water storage, which is lower at the end of the year than at the beginning of the year. Cumulative percolation for the year at 1 m depth is negative.

Simulations were conducted with the variably saturated flow program WinUNSAT-H for a typical meteorological year (1996), the wettest year on record (1997), and the driest year with records (2002). A 5-yr simulation was conducted using the same data set each year and the output data is imported to the input data. For all three meteorological data sets, the percolation is negative at a depth of 1 m (i.e., the water flux is upward), as evapotranspirative demand removes water from the profile. This comparable to the EPA's Alternative Cover Assessment Program (ACAP) where composite RCRA covers averaged less than 5 mm percolation per year under normal conditions. The RCRA cover tested a HAFB in Layton averaged less than 2 mm percolation in a normal year. See Appendix E for Model Input Data, Results, Model Output Data, Validation Testing, and Geotechnical Results.

The waste surface will be prepared so as to be free of irregularities, protrusions, vegetation, excessive water, loose soil or abrupt changes in grade. The cover material would not be compacted to 85% max dry density per ASHTO T-99.

Drainage channels would be constructed around the cell as indicated by the drawings to help prevent erosion and divert any run-on and run-off in a controlled manner. Berms would be placed and used as needed.

4.5.6 Landfill Gas Collection System

The preliminary landfill gas collection system (LGCS), shown on Figure 4.8, would be implemented to eliminate potential problems associated with landfill gas including subsurface lateral migration, odor, and release of methane. Gas collection and management would need to be reviewed and approved by the Division of Air Quality prior to construction of the system.

Landfill gases typically consist of approximately 50% methane and 50% carbon dioxide and were modeled as such. Landfill Gas Emissions Model version 3.02 (EPA) was used to model gas generation. The parameters used in the model were default parameters specified by the Environmental Protection Agency (EPA).

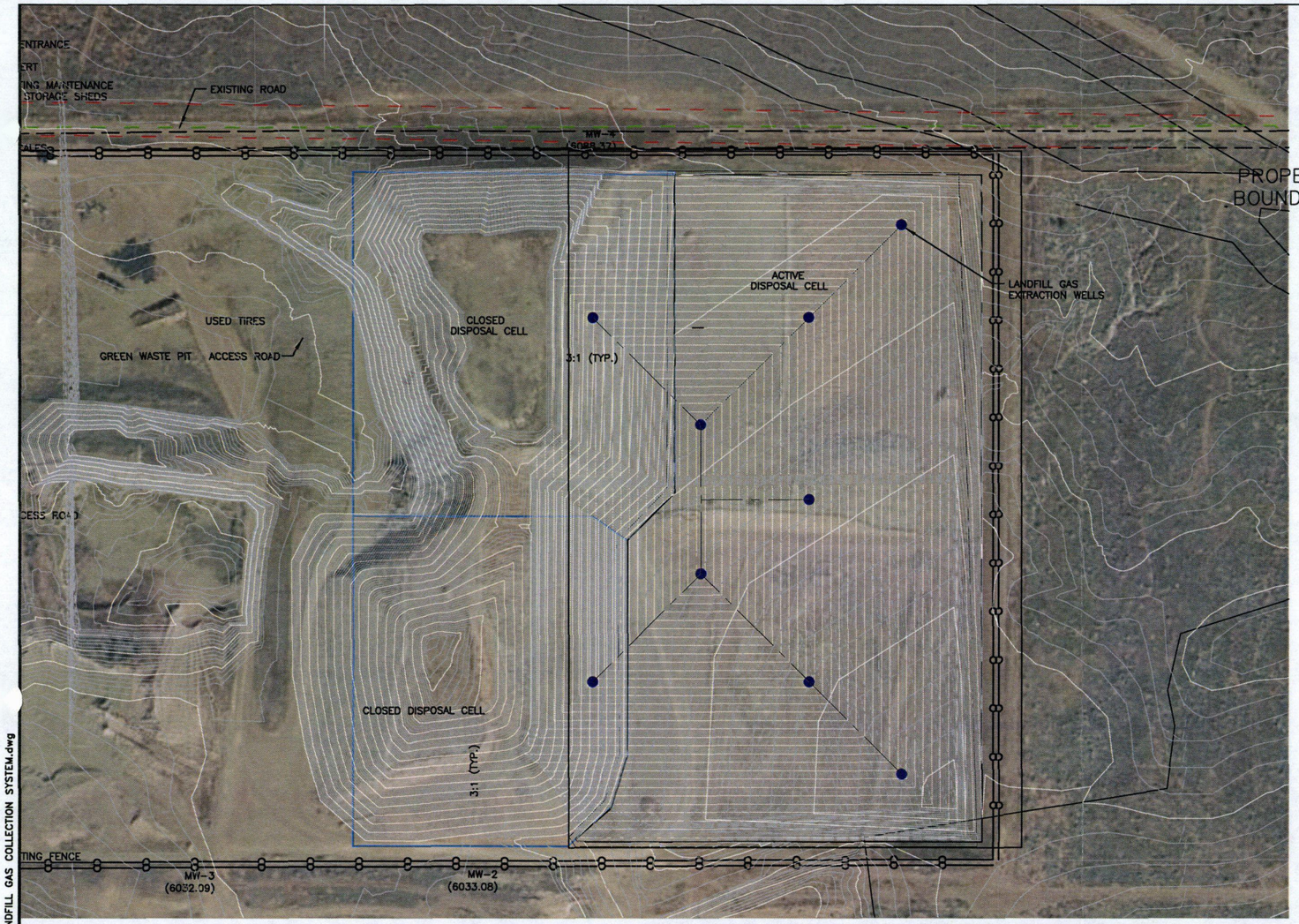
According to conversations with the Utah Department of Air Quality, this model typically overestimates gas production in this region when default arid climate parameters are used. This is evident in Table 4.2, which shows the dramatic difference in the peak emissions rate for the 50 year scenario using the default EPA parameters versus parameters used by the Salt Lake Valley Solid Waste Management Facility in their Permit Application. The modeling output files are included in Appendix F.

TABLE 4.2 – VALUES USED FOR LANDFILL GAS COLLECTION SYSTEM

Description	Lo (m^3/Mg)	K (1/yr)	NMOC (ppmv)	Year 2056 NMOC Emissions Rate (Mg/yr)
EPA Default	170	0.02	4000	1.815E+02
Salt Lake Valley	170	0.02	300	1.361E+01

* Value accounts for arid regions
NMOC: Nonmethane Organic Compounds
ppmv: Parts per million by volume
Lo: Generation Potential (amount of methane generated by a given amount of refuse)
K: Decay Rate (exponential rate of decomposition)

The landfill gas collection system was conservatively designed using the emissions rate generated for EPA default parameters. The active gas collection system would be put into service when NMOC emissions at the site were to exceed 50 Mg/yr (55 tons/yr) or concentrations of methane gas were to exceed the lower explosive limit at the property boundaries. This is



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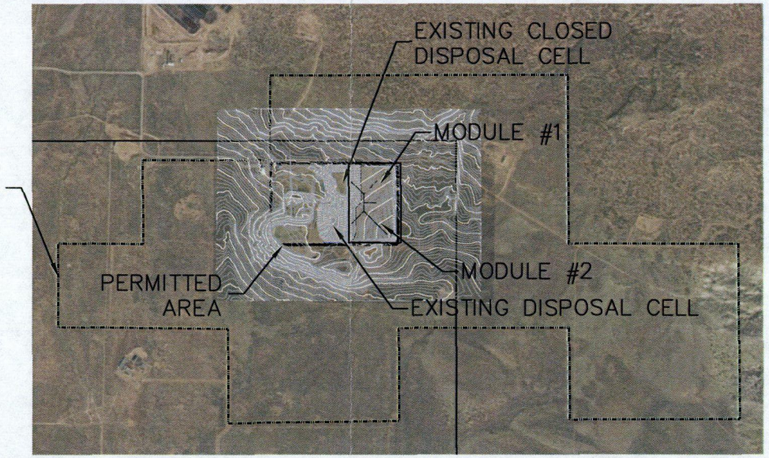

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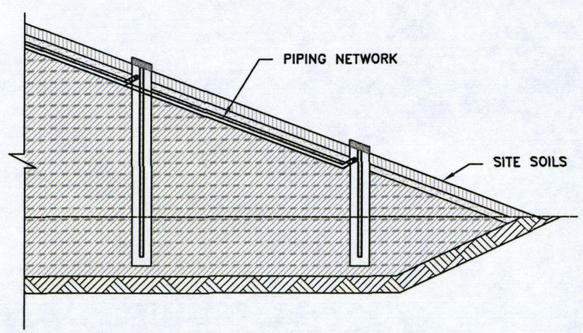

PRELIMINARY LANDFILL GAS COLLECTION SYSTEM DETAIL
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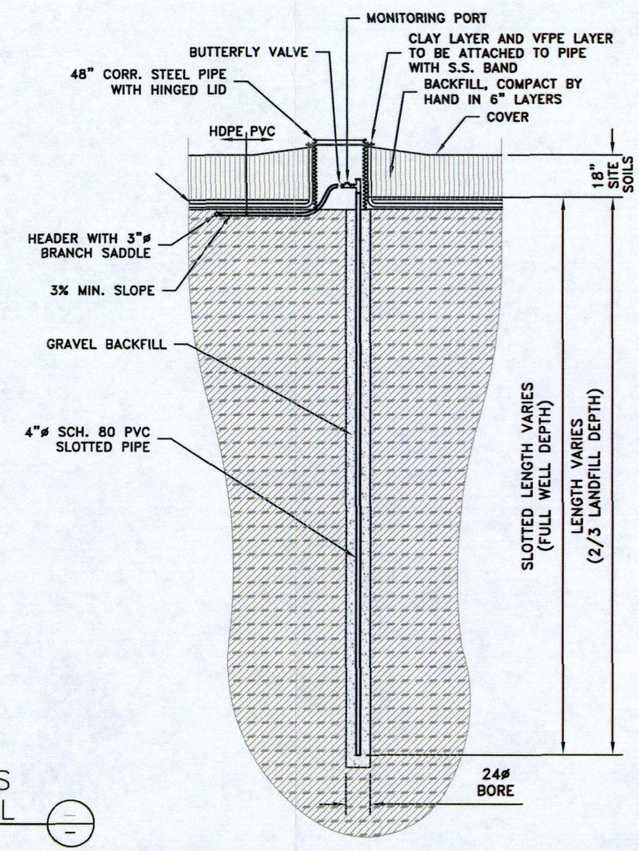

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LANDFILL GAS COLLECTION SYSTEM

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FIGURE:
4.8

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estimated to take place around the year 2019 using EPA default parameters and beyond the 50 year scenario utilizing Salt Lake Valley Solid Waste Management Facility parameters. Extraction wells and collection piping would be strategically placed for effective gas collection.

4.6 SITE WATER BALANCE

Hydrologic modeling of the Class 1 disposal cell was performed in order to assess the water balance for both the liner and cover.

4.6.1 Modeling Parameters

The hydrology of the disposal cell was predicted using the computer model Hydrologic Evaluation of Landfill Performance (HELP), Version 3.07 was used to evaluate the open case and WinUNSET-H was used to evaluate the cover case. Modeling of the cell was performed to design the leachate collection system and to determine the infiltration through the final cover.

HELP calculates the water balance for the proposed cell based on the cell design and climatic conditions. Cell design consists of soil and waste layer thickness, hydraulic conductivity of each layer, percent of total area where run-off could occur, and other characteristics of the proposed cell design.

Based on the average daily temperature, precipitation, and monthly solar radiation, HELP calculates the water balance for the site that includes evapotranspiration, run-off, percolation, and change in water storage of the subsurface soils. WinUNSAT-H is a one dimensional computer model which calculates water balance using many of the same parameters as HELP, but uses finite-difference implementation of a modified form of Richard's Equation. The liner case and cover case are discussed separately below.

Liner Case:
The assumed profile for the liner case consisted of 6 layers. These layers included a 6 inch layer of site soils simulating daily cover, a 15 foot layer of municipal solid waste, a 24 inch screened site soil protection layer, a drainage net layer, a 60 mil HDPE liner, and Bentomat (ST) liner. The model was set to run for five years.

The following assumptions and data were used in the model. The assumptions are considered conservative for the application of the model. Table 4.3 lists the soil values that were used in the analysis.

- The area of the cell is 8 acres.
- The evaporative zone depth is 18 inches
- The SCS runoff curve number of 81.3 was computed by HELP from default soil data base using soil texture #4 with bare ground conditions, a surface slope of 1% and slope length of 170 feet.

Attachment 2

Plan of Operations
Section 5 Submitted April 8, 2015 (updated)

CHAPTER 5
PLAN OF OPERATION

5.1 PURPOSE

The purpose of the Plan of Operation (OP) is to provide a written description of the daily operation of the Landfill Facility. The proposed permit renewal will continue the operation of both a Class I and Class IVa landfill.

A landfill is a dynamic system that undergoes continual development. Changes may occur in quantities of disposed materials, topography of the landfill, demographics of the service area, and administrative or regulatory requirements. These changes would be accomplished to conserve landfill space and protect human health and the environment. The intent of this OP is to provide an accurate description of the daily operations and procedures while allowing for modifications, which may be required to compensate for operational changes.

The existing Landfill Facility includes: a closed commingled unlined Class I Cell and a unclosed commingled lined Class 1 Cell; an active Class I and Class IV cell; a maintenance/scale house building; a tire and white goods (refrigerators, water heaters, other appliances, etc.) collection area; green waste disposal area; soil stockpile areas; future expansion areas; and access roads. The permitted area is currently secured with a chain link fence equipped with access gates.

5.2 OPERATIONAL PROCEDURES

5.2.1 Recycling and Diversion Programs

Recycling Programs are important for the Landfill Facility. The Landfill Facility currently recycles tires and metals. Customers with recyclables are given directions to the appropriate stockpile area. For further guidance, a material identification sign is posted at each stockpile area. Tires and metals from large commercial haulers are separated at the working face and transported by employees to the appropriate stockpile.

Rims are removed and Wasatch County back hauls tires to the Salt Lake area for recycling. All white goods containing freon are held in separate area until it is removed by a third party contractor. The cleared white goods are then moved to the metal recycling stockpile. When enough metal is collected, a recycling contractor is contacted and the metal is removed.

Over the past year, the Landfill Facility has been receiving a large volume of hdpe pipe from the oil industry. The Landfill Facility has been working with a recycler to find an economically viable recycling option. In the future, recycling options will continue to be investigated.

5.2.2 Procedures to Minimize Liquids

The waste inspection program and daily operations are designed to minimize liquids. Efforts to minimize liquids include:

Install Daily, Intermediate, and Final Cover
Prohibit Bulk Liquids (larger than household size >5 gallons)
Do not Accept Noncontainerized Liquids
Reject Liquid Waste or Sludge (not meeting the paint filter test)
Exclude Waste Containing Free Liquids in Containers Larger than Household Size
Prevent Run-on with Berms and Diversion Structures
Control Run-off with Collection Infrastructure and Retention Basin
Public Education
Waste Inspection

5.2.3 Excavation and Construction of the Cells

Excavation of future cells would begin with grubbing and removal of weeds, grass, and other vegetation. The surface soil would be stripped to a minimum depth of 6 inches and stockpiled. The cell would be excavated to the maximum extent possible maintaining a minimum slope of 2% and maintaining at least one foot of site soils over any exposed shallow bedrock. The surface would not contain stones or other matter of such composition, shape, or size which may be damaging to the liner system.

The refuse would be trucked to the tipping face and dumped and then compacted by a landfill compactor prior to placement of additional refuse. The unloading of refuse would be restricted to one area of the working face to limit the amount of refuse exposed.

The final cover for the Class I cell would be an Evapotranspiration Final Cover System consisting of 1 meter of blow sand obtained from onsite stock pile or excavation. The Evapotranspiration Cover would be seeded to reduce erosion and increase evapotranspiration.

5.2.4 Equipment

The Owner would maintain the necessary equipment to off-load, spread and compact waste, control dust, and perform other facility operations. All equipment is maintained at the manufacturer's recommended intervals with the use of on-site facilities. Minor maintenance activities are often performed using in-house personnel.

The Landfill Facility owns leachate extraction and groundwater monitoring equipment. This equipment is maintained according to the manufacturer's recommendation and stored on-site. Reserve funds have been budgeted for

replace and maintenance of the leachate and groundwater monitoring equipment.

The Landfill Facility has not met the requirements for a gas collection system. A third party contractor conducts monitoring of the landfill gas on behalf of the Landfill Facility.

5.3 ON-SITE SOLID WASTE HANDLING PROCEDURES

Daily operation of the Landfill Facility and related facilities is under the direction of the Landfill Manager. In the event of the Landfill Manager's absence, a Senior Operator would be the designee in charge of the landfill.

At the beginning of each working day, the Landfill Manager would be responsible for informing operators of any special off-loading conditions and where to direct solid waste for disposal. The Landfill Manager or Senior Operator would be responsible for directing each transport vehicle to the proper location for disposal of its waste. This could alternatively be accomplished through the placement of directional signs and instructions provided by the Scale House Operator. The Landfill Manager or the Senior Operator would be at the landfill during all operating hours.

The Scale House Operator would perform load counts on a daily basis and make a record of the load source. In addition for residential customers, the Scale House Operator asks about the nature of the waste and location of origin.

Incoming refuse directed toward the landfill would be deposited at the working face under direction the Landfill Manager or Senior Operator.

5.3.1 Special Waste Handling

The Landfill Facility currently processes and disposes of special waste. Special provisions have been established to handle these wastes in a safe and environmental friendly way. Each special waste is discussed separately below.

<u>Bulky Waste</u> – Bulky waste (trailers, furniture, tree stumps, etc.) are pushed or deposited near the toe of the working face. The bulky waste is deposited on a layer of compacted waste to protect the cell liner.

<u>Dead Animals</u> – Dead animals are managed and disposed of in a manner to minimize odors and attraction of vectors. Dead animals are disposed of at the toe of the working face and immediately covered with two feet of material.

<u>Petroleum Contaminated Soils</u> – Petroleum contaminated soil is disposed in the Class I Landfill Cell. The soil is often used as daily cover.

5.4 MONITORING SCHEDULE

A Monitoring Plan has been developed to help in the prevention of problems that may be preventable through careful monitoring and inspection. The schedule provides details on groundwater monitoring, leachate monitoring, and landfill gas monitoring. A copy of the Monitoring Plan is included in Appendix I.

5.5 EMERGENCY OPERATIONS PLAN

The Emergency Operations Plan for the proposed facility is included in Appendix J. The Emergency Operations Plan provides protocols for landfill employees in cases of emergency. Should an emergency happen, the DEQ may elect to waive daily cover requirements on C & D Materials.

5.6 CONTINGENCY PLAN

The Contingency Plan is designed to minimize hazards to human health or the environment from any unplanned sudden or non-sudden discharge to air, soil, surface, or groundwater. The provisions of this plan would be carried out immediately upon an emergency situation or release, which could threaten human health or the environment. Emergency evacuation of the site could be necessary given the nature of the waste materials stored and processed at the site. Incidents at the landfill could be caused by fire, explosion, or toxic vapor generation.

5.6.1 Fire or Explosion

The primary means of fire control at the Landfill Facility would be to isolate hot or burning solid waste. In the event that a fire were to erupt during operating hours, the burning material would be separated from the other materials and doused with water or controlled with fire suppression equipment. This action would be supported, when necessary, by the mobilization of additional equipment owned and operated by the Owner or Duchesne and Wasatch Counties.

5.6.2 Explosive Gas Release

Methane gas release would be detected using a methane detection meter capable of measuring methane levels below the 25% Lower Explosion Limit. Gas monitoring would be conducted around the disposal area and in any of the facility structures. Upon detection of explosive gases equal to or above the lower explosion limit, the Owner or Operator would take the following steps:

1. Immediately upon detection, steps would be taken to protect human health. These steps would include evacuation of surrounding area, shutdown of any electrical or mechanical devices that could cause

ignition, and determination of the cause of explosive gas. The area would remain closed until corrective actions were taken.

2. Within 24 hours the Executive Secretary would be notified.

3. Within seven days of detection, the explosive gas levels would be recorded in the operating record along with a description of the steps taken to protect human health.

4. Within 60 days of detection, a remediation plan that had been approved by the Executive Secretary would be implemented and a copy of the plan placed in the operating record. Upon implementation, the Executive Secretary would be notified.

5.6.3 Failure of Drainage Containment System

If the containment system were to fail, the following actions would be taken:

1. Construct berms and ditches to divert water around the containment failure area using site soils or readily available materials.

2. Analyze and evaluate the extent of damage to the containment system.

3. Identify the mechanism of failure.

4. If warranted call a qualified professional to discuss possible solutions.

5. Develop and implement corrective actions.

5.6.4 Corrective Action Program

If it is determined that there is a statistically significant increase over background in any parameter or constituent at any monitoring well at the compliance point, the Owner would begin the process outlined in R315-308-2(11). If a successful demonstration cannot be made, a corrective action program per R315-308-3 would be initiated.

5.6.5 Fugitive Dust Control

There are multiple ways the Landfill Manager may control fugitive dust at the site. The most effective control is to minimize the source generation through operations and best management techniques. The following is a list of examples to address fugitive dust generation.

Roadway surfaces (asphalt, concrete, gravel, road base, or site soils)
Adjust traffic flow patterns (roads, # of trips, weights, etc.)
Limit disturbance of soils

Minimize dropping heights
Trackout prevention
Revegetation

In some instances, source generation modifications are not enough. In these situations, dust suppressants can help to mitigate fugitive dust. A few of the common dust suppressants are listed below.

Water
Clay additives
Calcium chloride
Calcium oxide (lime)
Magnesium chloride
Organic non-petroleum projects
Synthetic polymers

The Landfill Supervisor is trained in best management practices and will be responsible for determining when fugitive dust control is warranted and what methods to employ.

5.6.6 Litter Control Program

One of the operational challenges of solid waste management is litter control and management. The Landfill Facility is aware and concerned with litter control and has established a Litter Control Program. Control of litter is an integral part of the daily operations. The Landfill Manager and personnel are regularly trained to keep abreast of new best management practices aimed at the reduction and management of litter.

For the Litter Control Program, litter is considered plastics, paper, and other solid waste materials that are improperly disposed of at the working face. Most landfill facilities have two primary generation sources of litter. These sources are improper transportation of waste in uncovered vehicles and refuse at the working face during unloading, spreading, and compaction.

The goal of the Litter Control Program is to implement economically viable best management practices and strategies to minimize litter. The Landfill Supervisor is trained in best management practices and will be responsible for determining when implement litter control is warranted and what methods to employ. A list of the current best management practices incorporated into the daily operations is provided below.

- Transporting refuse without being secured, tarped, or covered is not allowed. Signs located on the road leading to the landfill and at the main gate will indicate that all loads must be covered and a doubling of the fee is possible for not doing so. The operator at the entry gate will report violators to the Landfill Manager.

- The size of the working face is limited to minimize exposure of waste to the environment. However, the working face must always be large enough to allow for safe unloading of both residential and commercial customers. Under normal operations, the waste is immediately spread and compacted to minimize the area and debris subjected to breezes.

- On windy days, refuse is to be dumped at or near the base of the working face and is not spread out or compacted. Operations have concluded that working the waste results in more blowing litter. Wastes that are more susceptible to windblown distribution can be covered with a temporary layer of site soils.

- Wind fences have been tried at the Landfill Facility and have been marginally effective. The Landfill Facility will continue to investigate options for wind fences on a portable, semi-portable, or permanent basis.

- The Landfill Facility is fortunate to have a large buffer area. However, the Landfill Facility will continue to pursue additional buffer zone area as properties become available.

Access roads, working face, fences, and the buffer zones are monitored daily to determine the effectiveness of the Litter Control Plan. Best management practices are adjusted and modified based on daily monitoring, personnel input, and training.

Currently, litter is collected and properly disposed of on a routine basis. The use of equipment, personnel, and work-release parties from local correctional institutions all have been utilized in the past. It is anticipated that these methods of litter collection will continue in the future.

5.7 ALTERNATIVE WASTE HANDLING AND DISPOSAL PLAN

In the event of a major equipment failure, solid waste would be loaded and shipped to an alternative waste disposal facility such as Uintah County, Summit County, or other available landfills in the area.

5.8 PROCEDURES FOR CONTROLLING DISEASE VECTORS

The use of daily cover and the exclusion of specific types of solid waste are necessary to control vectors and the subsequent spread of disease. Special waste such as infectious waste, liquid waste and tires, which may directly carry disease or lead to the propagation of disease vectors, would be immediately covered at the working face. Landfill personnel to the extent possible would inspect the site for signs and indications of disease vectors. If observations were made, the Landfill Manager would be contacted immediately. If disease vectors were to become a

problem, pest control specialists would be contacted to reduce the spread of disease.

5.9 PROCEDURES FOR EXCLUDING THE RECEIPT OF HAZARDOUS WASTE

A "Prohibited Waste" control program designed to detect and deter attempts to dispose of hazardous and other unacceptable waste has been implemented at the Landfill Facility. The program was designed to protect the health and safety of employees, customers, and the general public, as well as protect against contamination of the environment. The Landfill Manager is in charge of hazardous waste activities.

The waste brought without the use of a publicly operated transfer station by Duchesne or Wasatch Counties, is visually inspected prior to final placement. The waste that is processed through a publicly operated transfer station by Duchesne or Wasatch Counties is inspected at the off-site transfer station and then again at the working face. Further information about each of these inspection locations are listed below:

- The Landfill Facility only accepts waste from publicly operated transfer stations by Duchesne or Wasatch Counties that have a waste inspection plan approved by the Executive Secretary. Operators at the transfer stations visually inspect waste for hazardous materials before loading for transit.

- On-site inspection would be conducted at the working face. Landfill operators are trained in the recognition of prohibited waste. A random testing program has been implemented on all waste that has not already been inspected at the publicly operated transfer stations by Duchesne and Wasatch Counties. These inspections have been conducted on one percent of all loads not obtained from these transfer stations with a waste inspection plan approved by the Executive Secretary. A sample form for these inspections has been included in Appendix K. All waste would be visually inspected, as it is being placed, spread and compacted in the cell. Upon finding unacceptable waste, it would be isolated and the Landfill Manager would be notified.

5.10 GENERAL TRAINING AND SAFETY PLAN

Each employee at the Landfill Facility would be trained to have a working knowledge of the maintenance and operational techniques necessary to operate and maintain the Landfill Facility in a manner to preserve human health, safety, and the environment. Training would be accomplished through on-the-job training (OJT) and classroom training sessions. The Landfill Manager, or a designated professional trainer, would be in charge of directing the training programs. Initial training would be completed within three months of employment followed by an annual review of basic waste management skills.

5.10.1 Training Schedule

The Landfill Manager may be required to pass a Certified Solid Waste Training Course for the Management of Landfill Operations. In addition, operators are required to take Certified Solid Waste Training Courses for Landfill Operator Training, and Waste Screening. Continuing education efforts include the following:

<u>Introductory Training</u>
Synopsis of solid waste regulations, record keeping, and transporter requirements.

- Requirement: All Personnel
- Method: OJT
- Review: Quarterly

<u>Policies and Procedures</u>
Security, inspections, and emergency response.

- Requirement: All Personnel
- Method: Lecture/Video Course, OJT
- Review: Quarterly

<u>Safety</u>
Personal protection, hazardous waste recognition, hazardous material handling, emergency response, and first aid.

- Requirement: All Personnel
- Method: Classroom/Video Course
- Review: Annual

A Safety Training meeting is held once a week taking a minimum of 15 minutes. Training documents would be kept with the Plan of Operation for a rolling five year period.

5.11 RECORD KEEPING AND REPORTING

The Landfill Manager would maintain the following operating records for the landfill:

- Records of maintenance
- Records of training and notification procedures
- Records of groundwater monitoring
- Records of landfill gas monitoring
- Records of weights and volume, number of vehicles

- Deviations from the Plan of Operation
- Records of placement or recirculation of leachate
- Records of any gas condensate
- Prepare an annual report and place the report in the facility's operating record.

Sample forms for maintenance and gas monitoring are provided in Appendix K.

Attachment 3

Security
Section 4.9

4.9 PERIMETER FENCING

Perimeter fencing is currently in place to provide both security and retention of windblown waste. The perimeter fencing will be maintained to enclose the facility's operational areas and is discussed further in Appendix H.

4.10 WIND EROSION

The Landfill Facility is located on an elevated bench. Thus, the site is subject to changing prevailing winds, but the predominant winds are from the west to the east. Wind erosion at the Landfill Facility is primarily from dust from earthwork operations, traffic, and fugitive waste. Each of these issues has been addressed to minimize man made causes of wind erosion.

Blowing dust and dirt is currently being minimized by prevention and response to areas where the problem occurs. Dust is mitigated on an as needed basis using dust suppressants and road surface treatments. Leachate may only be used as a suppressant on areas of the landfill that are overlain by an approved liner. Stockpiles of dirt are also monitored. Disturbances of natural vegetation at the site are minimized to the extent possible in non-operational areas.

Fugitive waste is being controlled by keeping incoming loads covered and periodic cleanup of fugitive waste around the site. All shipments of waste into the facility are required to be covered. Perimeter fencing has been constructed to help contain fugitive waste on site. Cleanups of spilled waste and captured waste help to reduce the potential for off-site fugitive waste. The site and surrounding area are inspected regularly to determine effectiveness of the perimeter fencing and clean up scheduling. A fugitive waste plan is included in Appendix H.

Attachment 4

Groundwater Monitoring
Leachate Monitoring
Landfill Gas Monitoring
Appendix J

APPENDIX J
MONITORING PLAN

The purpose of this monitoring schedule is to help prevent problems that may be preventable through identification and prompt remediation efforts. A sample schedule for monitoring and inspection of the landfill facilities to ensure proper operation and maintenance is provided in Appendix L. Listed below are monitoring guidelines for groundwater monitoring, leachate monitoring and control system, and landfill gas monitoring system.

1. Groundwater Monitoring System

Background concentrations have been determined and groundwater monitoring has been conducted semi-annually in the spring and fall from the up-gradient and down-gradient wells since 1997. Installation of all the monitoring wells was performed according to procedures required by the Utah Department of Environmental Quality. Groundwater monitor wells were installed using 2-inch diameter, schedule 40, flush threaded polyvinyl chloride (PVC) well casing and screen (0.010-inch slots). A sand pack consisting of 16-40 Colorado silica sand was placed in the annular opening, from the bottom of the borehole to a minimum of two feet above the top of the well screen. A minimum of two foot thick seal, consisting of bentonite pellets, was placed on top of the sand pack and hydrated. Hydrated granular bentonite was placed from the bentonite seal to within three feet of the ground surface. A weighted tape was used to verify continuous placement and depth of the sand and bentonite. All groundwater monitoring wells were completed above the ground with a locking well cover set in concrete. The attached Appendix A contains the well locations (Figure 1) and well log information and testing. Groundwater samples are analyzed for detection of constituents per the Utah State Administrative Code R315-308 Ground Water Monitoring Requirements. The list of constituents provided below is current as of June 2007 for detection monitoring. The Landfill Operator shall be responsible for insuring compliance with current regulations for detection monitoring.

CONSTITUENTS FOR DETECTION MONITORING				
		Groundwater Protection Standard	Detection Limits	
			EPA 6020	Cold Vapor AAS
Inorganic Constituents	CAS	(mg/l)	(mg/l)	(mg/l)
Ammonia (as N)	7664-41-7			
Carbonate/Bicarbonate				
Calcium				
Chemical Oxygen Demand (COD)				
Chloride				
Iron	7439-89-6			
Magnesium				
Manganese	7439-96-5			
Nitrate (as N)				
pH				
Potassium				
Sodium				
Sulfate				
Total Dissolved Solids (TDS)				
Total Organic Carbon (TOC)				
Heavy Metals				
Antimony	7440-36-0	0.006	0.003	
Arsenic	7440-38-2	0.01	0.005	
Barium	7440-39-3	2	0.005	
Beryllium	7440-41-7	0.004	0.001	
Cadmium	7440-43-9	0.005	0.001	

Chromium		0.1	0.005	
Cobalt	7440-48-4	2	0.03	
Copper	7440-50-8	1.3	0.012	
Lead		0.015	0.003	
Mercury	7439-97-6	0.002		0.0002
Nickel	7440-02-0	0.1	0.01	
Selenium	7782-49-2	0.05	0.001	
Silver	7440-22-4	0.1	0.002	
Thallium		0.002	0.001	
Vanadium	7440-62-2	0.3	0.03	
Zinc	7440-66-6	5	0.03	
Organic Constituents				
Acetone	67-64-1	4	0.005	0.005
Acrylonitrile	107-13-1	0.1	0.01	0.05
Benzene	71-43-2	0.005	0.0005	0.001
Bromochloromethane	74-97-5	0.01	0.0005	0.001
Bromodichloromethane[1]	75-27-4	0.1	0.0005	0.001
Bromoform[1]	75-25-2	0.1	0.0005	0.001
Carbon disulfide	75-15-0	4	0.0005	0.001
Carbon tetrachloride	56-23-5	0.005	0.0005	0.001
Chlorobenzene	108-90-7	0.1	0.0005	0.001
Chloroethane	75-00-3	15	0.0005	0.001
Chloroform[1]	67-66-3	0.1	0.0005	0.001
Dibromochloromethane[1]	124-48-1	0.1	0.0005	0.001
1,2-Dibromo-3-chloropropane	96-12-8	0.0002	0.000005	0.00001
1,2-Dibromoethane	106-93-4	0.00005	0.000005	0.00001
1,2-Dichlorobenzene (ortho)	95-50-1	0.6	0.0005	0.001
1,4-Dichlorobenzene (para)	106-46-7	0.075	0.0005	0.001
trans-1,4-Dichloro-2-butene	110-57-6		0.01	0.02

1,1-Dichloroethane	75-34-3	4	0.0005	0.001
1,2-Dichloroethane	107-06-2	0.005	0.0005	0.001
1,1-Dichloroethylene	75-35-4	0.007	0.0005	0.001
cis-1,2-Dichloroethylene	156-59-2	0.07	0.0005	0.001
trans-1,2-Dichloroethylene	156-60-5	0.1	0.0005	0.001
1,2-Dichloropropane	78-87-5	0.005	0.0005	0.001
cis-1,3-Dichloropropene	10061-01-5	0.002	0.0005	0.001
trans-1,3-Dichloropropene	10061-02-6	0.002	0.0005	0.001
Ethylbenzene	100-41-4	0.7	0.0005	0.001
2-Hexanone	591-78-6	1.5	0.005	0.01
Methyl bromide	74-83-9	0.01	0.0005	0.001
Methyl chloride	74-87-3	0.003	0.0005	0.001
Methylene bromide	74-95-3	0.4	0.0005	0.001
Methylene chloride	75-09-2	0.005	0.001	0.005
Methyl ethyl ketone	78-93-3	0.17	0.005	0.01
Methyl iodide	74-88-4		0.001	0.01
4-Methyl-2-pentanone	108-10-1	3	0.005	0.01
Styrene	100-42-5	0.1	0.0005	0.001
1,1,1,2-Tetrachloroethane	630-20-6	0.07	0.0005	0.001
1,1,2,2-Tetrachloroethane	79-34-5	0.005	0.0005	0.001
Tetrachloroethylene	127-18-4	0.005	0.0005	0.001
Toluene	108-88-3	1	0.0005	0.001
1,1,1-Trichloroethane	71-55-6	0.2	0.0005	0.001
1,1,2-Trichloroethane	79-00-5	0.005	0.0005	0.001
Trichloroethylene	79-01-6	0.005	0.0005	0.001
Trichlorofluoromethane	75-69-4	10	0.0005	0.001
1,2,3-Trichloropropane	96-18-4	0.04	0.0005	0.001
Vinyl acetate	108-05-4	37	0.005	0.01
Vinyl Chloride	75-01-4	0.002	0.0005	0.005
Xylenes	1330-20-7	10	0.0005	0.001

[1] The ground water protection standard of 0.1 mg/l is for the total of Bromodichloromethane, Bromoform, Chloroform, and Dibromochloromethane.

The water samples are collected using currently accepted and approved techniques and technologies. The protocols for sampling would consist of water level measurements, detection of immiscible layers, well purging, field measurements, sample collection, sample handling and preservation, and sample custody. Samples are tested using a state certified laboratory. Each sampling protocol is discussed in detail below.

- Water level measurements are read to the nearest 0.01 foot. If in the future a probe were to be used for measurement, it would be cleaned between each reading and calibrated according to Manufacturer's recommendations. Elevations at each well are known for cross-references and determination of ground water levels in the area. Measurements are taken from the same location at each well.

- Detection of immiscible layers begins with screening organic vapors with a monitor prior to any evacuation of water. If concentrations were to exceed 25 percent of the lower explosive limit, the Landfill Manager is immediately contacted. If concentrations were below 25 percent of the lower explosive limit, an interface probe would be lowered into the well to detect and measure the thickness of any possible immiscible layer that may develop. The probe would further be lowered to the bottom of the well to register the presence of any dense organic liquids. If any immiscible layers were found, samples would carefully be retrieved.

- In preparation for taking water samples, each monitoring well is micro-purged to obtain a fresh sample. Micro-purging of a well is performed by excavating water out of the well using the low flow pump. When purging a well, purging would continue until the pH, conductivity, and water

temperature has stabilized or until at least three well volumes of water would be purged from the well. Stabilization would occur when pH, conductivity, and water temperature readings do not exceed 3 percent deviation. If the well purged dry, an exception may be taken and the well would be allowed to recover to 85% of initial water level or for a two-hour period, whichever occurred first.

- Field measurement samples are collected in a clean beaker once the well was properly purged. All probes or instruments are kept in designated containers to prevent cross contamination between samples. All instruments are cleaned according to manufacturer's recommendations after and prior to taking any measurements. Field measurements and field notes include:

  1. name of collector
  2. time of sample
  3. weather conditions
  4. air temperature
  5. date of sample
  6. monitoring well identification number
  7. lower explosive limit
  8. immiscible layers found with thickness information
  9. water temperature
  10. turbidity
  11. electrical conductivity
  12. static water level
  13. pH
  14. dissolved oxygen
  15. well yield
  16. sampling procedures and methods
  17. sampling identification number
  18. preservatives used

19. containers used
20. parameters requested
21. daily instrument drift
22. and general comments section.

All of this information is kept in a field notebook. All measurement instruments are calibrated at the beginning of the day and rechecked after all the sampling are complete to record any possible instrument drift.

- The pumping rate shall not exceed 100 millimeter/minute. The degree of sensitivity to pH or volatilization would determine the order in which parameters are sampled. Sampling containers and procedures for preparations of samples are provided by the testing laboratory.

- Once the samples were collected and prepared to laboratories recommendations, the samples are immediately labeled, recorded in the field book, and placed in a sampling cooler. The samples are recorded on a chain-of-custody and remain with the sampler until formally released to another individual.

- Custody of the samples are documented on a chain of custody form. Samples remain in the custody of the sampler until samples are checked in and relinquished to the laboratory or until they were relinquished for transport to the laboratory.

All data received are reviewed to assess data validity. Each data report is checked to insure the following:

- Identification numbers of the samples match.

- Chain of custody and field notes matches the sample information.

- Sample analysis was performed using requested methods and acceptable time limits.
- Reporting limits conform to current detection limits.
- Blank results have been included and are acceptable.
- MS/MSD results are representative and are included.
- All QA/QC sampling results are included and acceptable.

If there were any potential problems with the data reports or discrepancies, the laboratory would be notified immediately. If necessary, new samples would be collected and tested. Data would be analyzed by:

- Concentrations of naturally occurring constituents plotted at each well on control charts for that specific well. Each constituent is analyzed to determine whether groundwater is being impacted.
- Look for the presence of non-naturally occurring compounds. If these compounds are reported, the validity of the results would be reviewed. If results appear to be potentially valid, new samples would be collected and tested.

Semi-annual reports are prepared and include the following in an electronic format:

- Description of procedures, including the quality assurance /quality control, followed during the collection of samples.
- Results of field measured parameters.

- Chain of custody and quality assurance /quality control procedures followed by the laboratory.

- Laboratory results with detection limits and testing methods used.

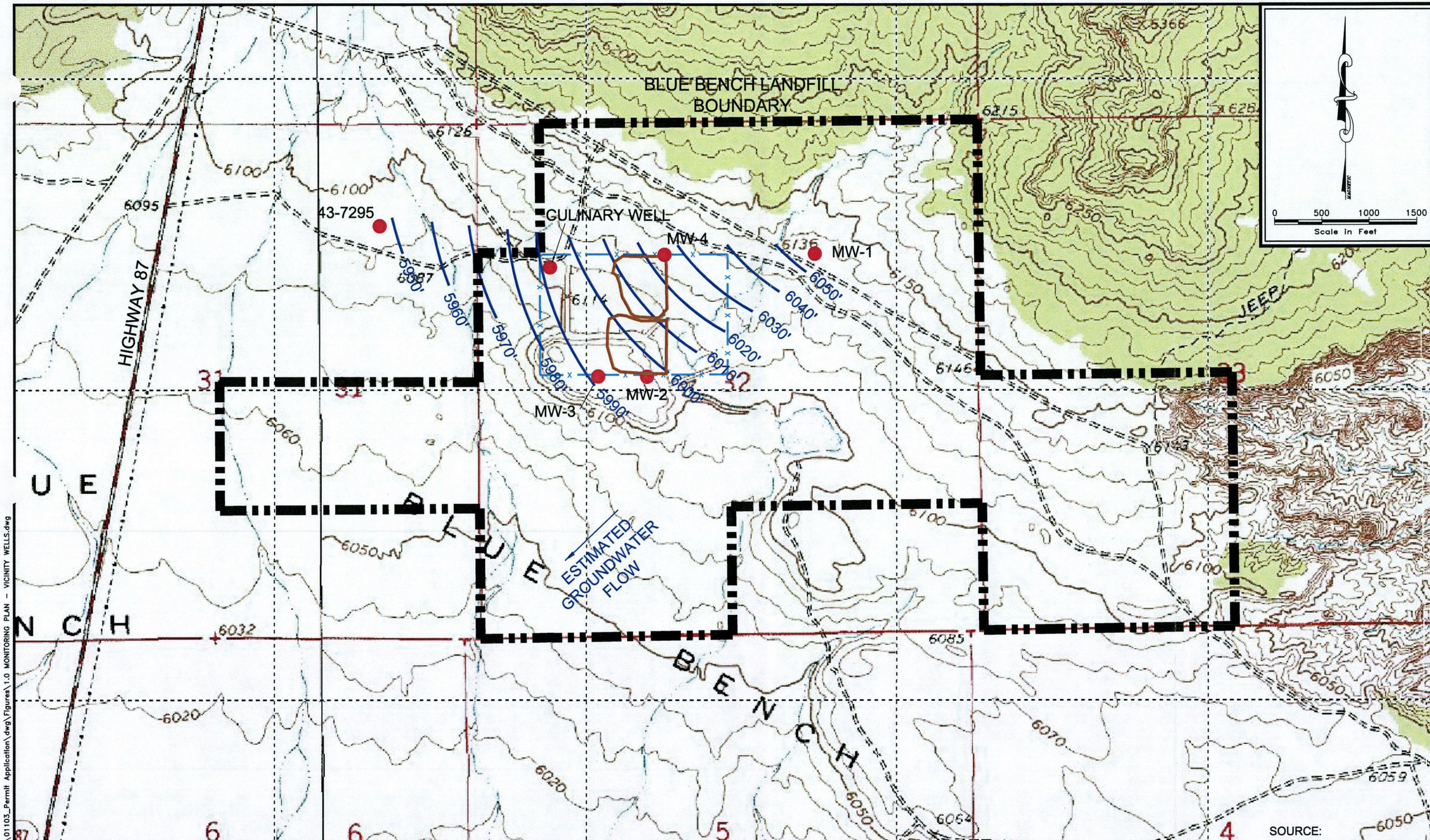
- Statistical analysis of the laboratory results.

2. Leachate Monitoring and Control System

The lined Class I disposal cells are equipped with a leachate monitoring and control system. The system is comprised of a conveyance system which gravity flows to centrally located sumps positioned at the lowest elevation of the cell. The sumps are monitored to be pumped prior to having one foot of standing leachate above the liner. The leachate is pumped at a low flow rate and dispersed over lined portions of the disposal for dust control and compaction water.

3. Landfill Gas Monitoring System

Rule R315-303 Landfilling Standards require landfill gases to be monitored to protect air quality and limit explosive gas emissions. A hand-held field explosive gas meter has been used for recording at the site. The meter is calibrated as recommended by the manufacturer by using a methane standard. Concentrations are not be allowed to exceed 25% of the lower limit in facility structures and 100% of the lower limit around the disposal area boundary. Quarterly monitoring is currently being performed by the local health department. If a monitoring event were to exceed the regulatory limit, procedures would be taken as noted in Section 5.2 Explosive Gas Release. The Owner would install permanent gas detectors in facility structures. The Owner would be committed to remedy any problems.



LEGEND	
●	EXISTING WELL
——	ESTIMATED GROUNDWATER CONTOUR
——	EXISTING CELLS
—x—	EXISTING FENCE

DESCRIPTION	GROUND SURFACE (FEET)	GROUNDWATER SURFACE (FEET)
MW-1	6101	6056
MW-2	6093	5995
MW-3	6103	5994
MW-4	6088	6026
CULINARY WELL	6073	5988
43-7295	6057	5946

NOTE:
GROUNDWATER CONTOURS WERE ESTIMATED USING GPS SURVEYING DATA AND WELL SOUNDING MEASUREMENTS TAKEN APRIL 2005.

SOURCE:
USGS ALTAMONT QUAD
AND
AQUA ENGINEERING, 2005

REVISIONS

NO.	DATE	

BLUE BENCH LANDFILL SSD

BLUE BENCH LANDFILL FACILITY
MONITORING PLAN
VICINITY WELLS

ADVANCED ENVIRONMENTAL ENGINEERING
1975 NORTH MAIN SUITE #3, LAYTON UTAH 84041
PHONE: 801.918.5107 FAX: 801.773.2699

0 1/2 1
DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1"

DESIGN: –
DRAWN: –
CHECKED: CAH
SCALE: HORZ. AS NOTED VERT. NONE
DATE: 9/07

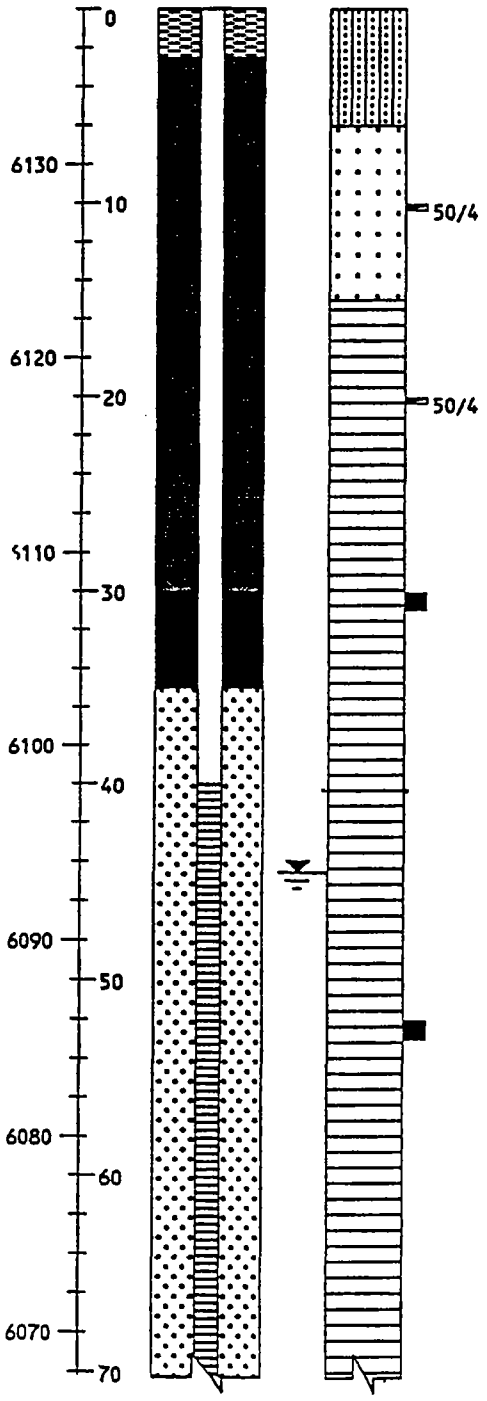
FIGURE: 1

W:\01103_Permit Application\dwg\Figures\1.0 MONITORING PLAN – VICINITY WELLS.dwg
RP 06/07

DRILL HOLE LOG
MONITOR WELL NO.: MW-1

PROJECT: Blue Bench Landfill
CLIENT/OWNER: Duchesne County
HOLE LOCATION: Northeast corner of proposed site.
DRILLER: PC Exploration
DRILL RIG: TH-60
DEPTH TO WATER: 44.5' HOLE DIAMETER: 5 5/8"

PROJECT NO.: 1572-008
DATE: 10-19-94
TOC ELEV.: 6140.8
GS ELEV.: 6138.0
LOGGED BY: DCH
WELL NO.: MW-1



USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
SM	SILTY SAND: Reddish brown, fine, moist.	B-1	1-2	
	...Grades gravely.			
	SANDSTONE: Reddish brown, fine grained, weathered, dry.	B-2	10-10.4	4/4
	SHALE: Greenish gray, dry.	B-3	20-20.4	3/4
		B-4	30-31	
	...grades olive, slightly moist.	B-5	52-53	

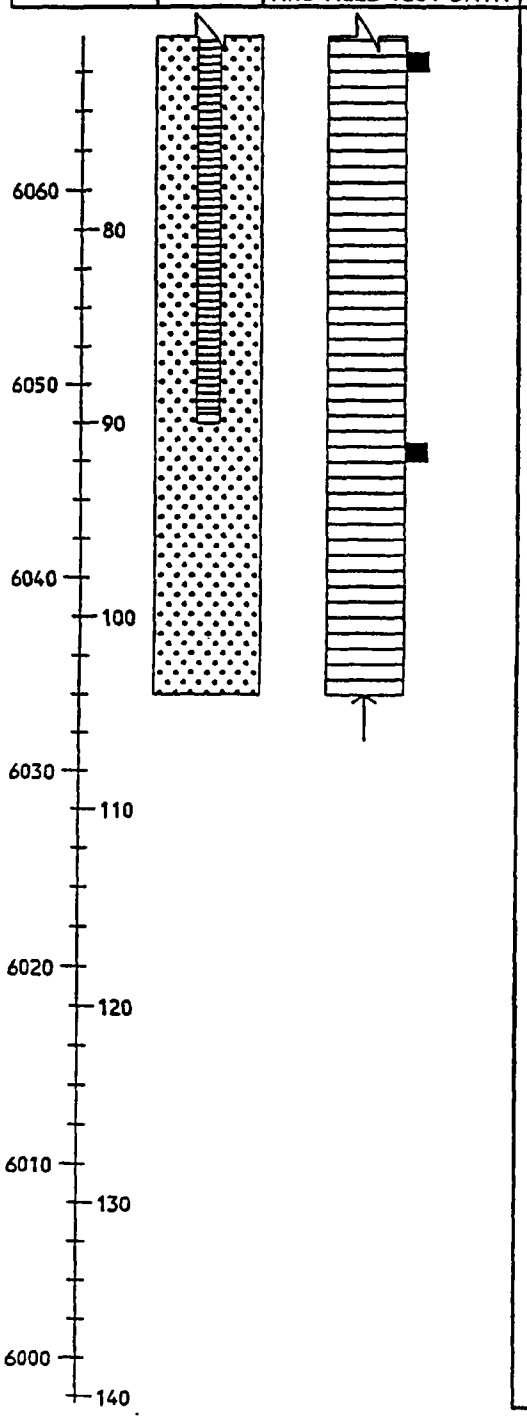
Figure No. 1

BINGHAM ENVIRONMENTAL

DRILL HOLE LOG
MONITOR WELL NO.: MW-1

PROJECT: Blue Bench Landfill
CLIENT/OWNER: Duchesne County
HOLE LOCATION: Northeast corner of proposed site.
DRILLER: PC Exploration
DRILL RIG: TH-60
DEPTH TO WATER: 44.5' HOLE DIAMETER: 5 5/8"

PROJECT NO.: 1572-008
DATE: 10-19-94
TOC ELEV.: 6140.8
GS ELEV.: 6138.0
LOGGED BY: DCH
WELL NO.: MW-1



ELEVATION / DEPTH	WELL DETAILS	SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
				...grades light gray.	B-6	71-72	
				...grades gray.	B-7	91-92	

Figure No. 2

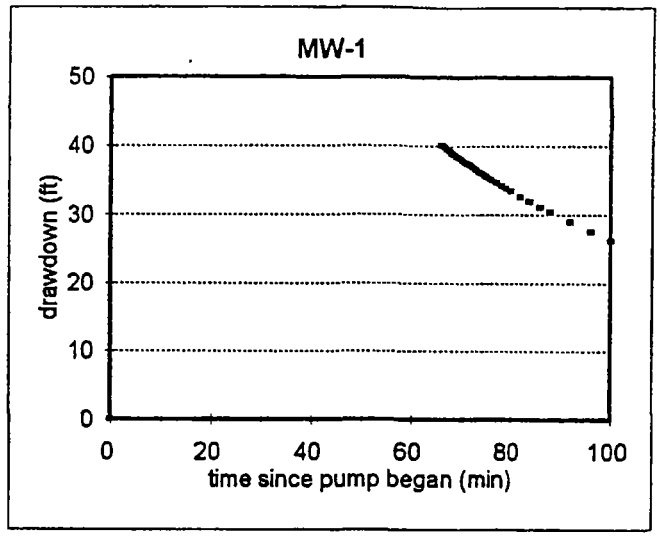
Blue Bench Landfill
MW-1
Pump Test - Hand Bailed
December 30, 1997

time (hr:min:s)	depth to water (ft)	drawdown (ft)	t time since pumping (min)	t' time since stopped (min)	t/t'
22:54:01	47.15	0	0.0		
00:00:00	87.34	40.19	66.0	0.0	ERR
00:00:30	87.07	39.92	66.5	0.5	133.0
00:01:00	86.69	39.54	67.0	1.0	67.0
00:01:30	86.44	39.29	67.5	1.5	45.0
00:02:00	86.14	38.99	68.0	2.0	34.0
00:02:30	85.88	38.73	68.5	2.5	27.4
00:03:00	85.64	38.49	69.0	3.0	23.0
00:03:30	85.40	38.25	69.5	3.5	19.9
00:04:00	85.14	37.99	70.0	4.0	17.5
00:04:30	84.88	37.73	70.5	4.5	15.7
00:05:00	84.65	37.5	71.0	5.0	14.2
00:05:30	84.44	37.29	71.5	5.5	13.0
00:06:00	84.17	37.02	72.0	6.0	12.0
00:06:30	83.93	36.78	72.5	6.5	11.2
00:07:00	83.71	36.56	73.0	7.0	10.4
00:07:30	83.47	36.32	73.5	7.5	9.8
00:08:00	83.22	36.07	74.0	8.0	9.3
00:08:30	83.00	35.85	74.5	8.5	8.8
00:09:00	82.78	35.63	75.0	9.0	8.3
00:09:30	82.54	35.39	75.5	9.5	7.9
00:10:00	82.32	35.17	76.0	10.0	7.6
00:11:00	81.89	34.74	77.0	11.0	7.0
00:12:00	81.48	34.33	78.0	12.0	6.5
00:13:00	81.08	33.93	79.0	13.0	6.1
00:14:00	80.68	33.53	80.0	14.0	5.7
00:16:00	79.84	32.69	82.0	16.0	5.1
00:18:00	79.12	31.97	84.0	18.0	4.7
00:20:00	78.35	31.2	86.0	20.0	4.3
00:22:00	77.64	30.49	88.0	22.0	4.0
00:26:00	76.25	29.1	92.0	26.0	3.5
00:30:00	74.83	27.68	96.0	30.0	3.2
00:34:00	73.48	26.33	100.0	34.0	2.9

MW-1 Hand Pump Test
Blue Bench Landfill

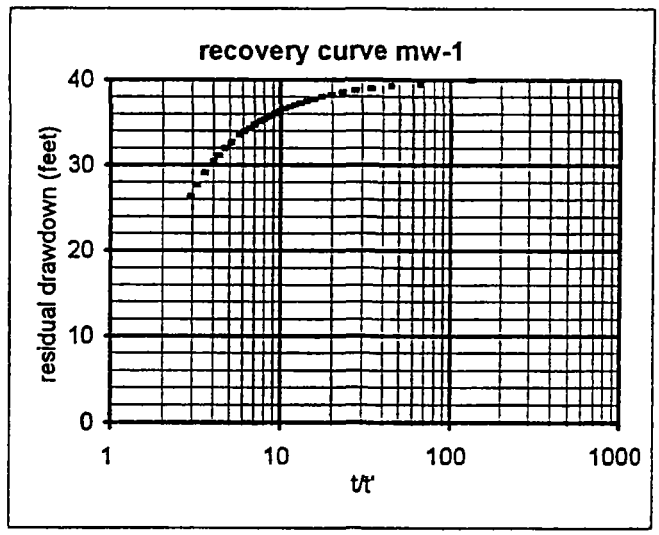
Parameters:

22 = Total volume bailed (gal)
66 = Pumping time (min)
57 = b (thickness of formation ft)
104-47
0.333333 = Q (gallons per minute)



Transmisivity estimated from recovery curve:

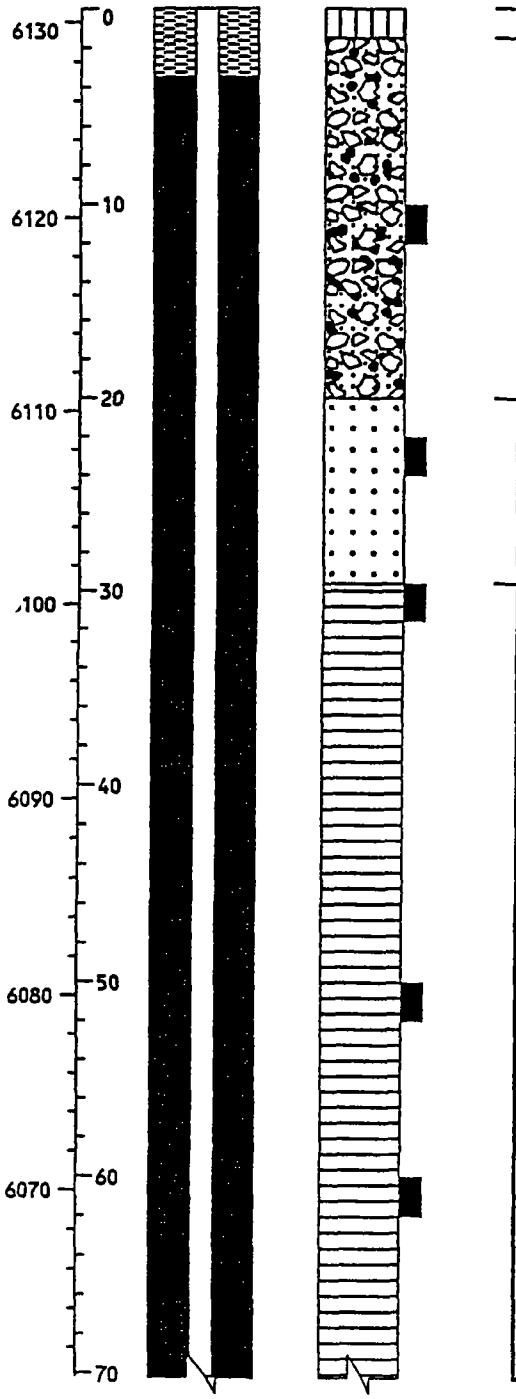
30 = delta S, change per log (ft)
2.933333 = T, transmissivity (gpd/ft)
T = 264*Q/delta s
4.5E-06 = T, transmissivity (ft2/s)
0.006879 = K, hydraulic conductivity (ft/day)
8E-08 = K, hydraulic conductivity (ft/s)
2.4E-06 = K, hydraulic conductivity (cm/s)



DRILL HOLE LOG
MONITOR WELL NO.: MW-2

PROJECT: Blue Bench Landfill
CLIENT/OWNER: Duchesne County
HOLE LOCATION: Southeast corner of new Landfill Cell
DRILLER: Layne Christensen
DRILL RIG: Speed Star
DEPTH TO WATER: 97.7' HOLE DIAMETER: 5 5/8"

PROJECT NO.: 1572-008
DATE: 11-10-97
TOC ELEV.: 6133.00
GS ELEV.: 6130.7
LOGGED BY: DCH
WELL NO.: MW-2



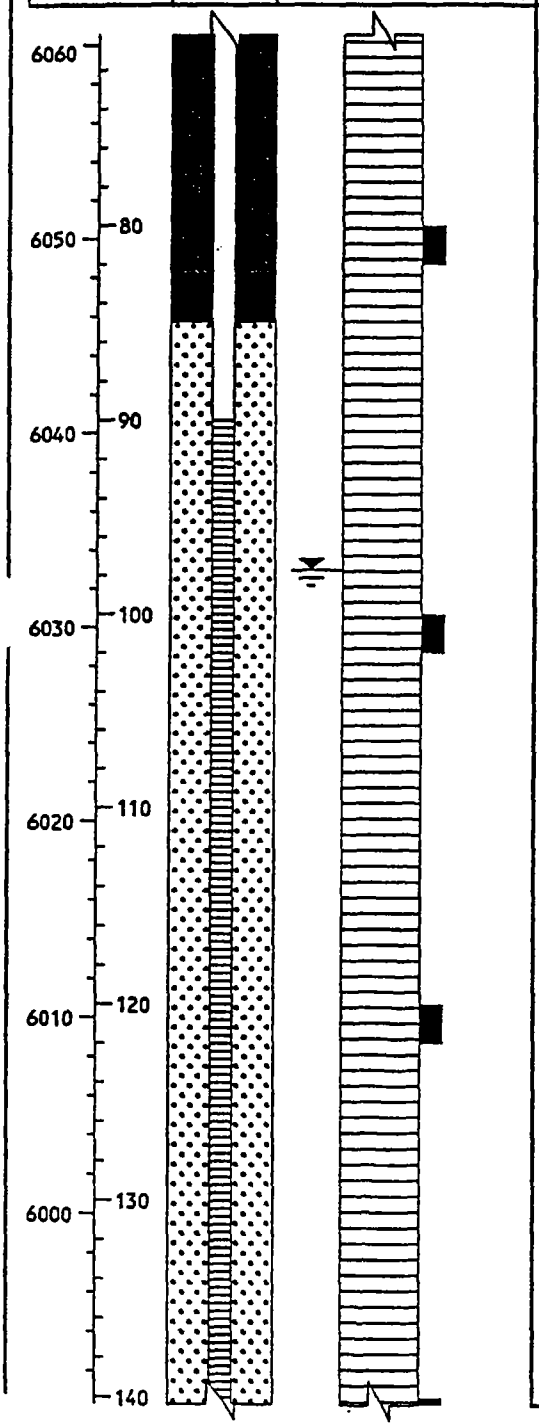
ELEVATION / DEPTH	WELL DETAILS	SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
			ML	SANDY SILT: Reddish brown, fine, moist.			
				Boulders & Cobbles in a silty gravelly sand matrix, dry.			
					B-1	10-12	
				SANDSTONE: Reddish brown to yellowish brown, fine grained, dry.	B-2	22-24	
				SHALE: Greenish gray, dry.	B-3	30-32	
				...grades olive	B-4	50-52	
				...grades dark gray.	B-5	60-62	
				...grades gray.			

Figure No. 3

DRILL HOLE LOG
MONITOR WELL NO.: MW-2

PROJECT: Blue Bench Landfill
CLIENT/OWNER: Duchesne County
HOLE LOCATION: Southeast corner of new Landfill Cell
DRILLER: Layne Christensen
DRILL RIG: Speed Star
DEPTH TO WATER: 97.7' HOLE DIAMETER: 5 5/8"

PROJECT NO.: 1572-008
DATE: 11-10-97
TOC ELEV.: 6133.00
GS ELEV.: 6130.7
LOGGED BY: DCH
WELL NO.: MW-2



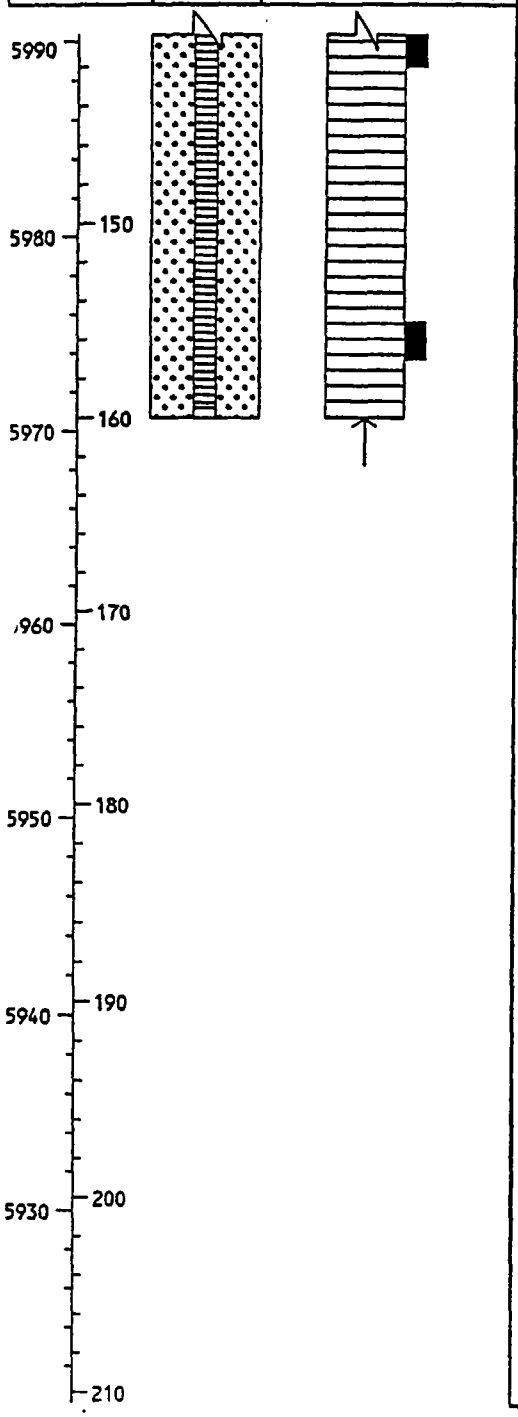
USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
		B-6	80-82	
		B-7	100-102	
		B-8	120-122	

Figure No. 4

DRILL HOLE LOG
MONITOR WELL NO.: MW-2

PROJECT: Blue Bench Landfill
CLIENT/OWNER: Duchesne County
HOLE LOCATION: Southeast corner of new Landfill Cell
DRILLER: Layne Christensen
DRILL RIG: Speed Star
DEPTH TO WATER: 97.7' HOLE DIAMETER: 5 5/8"

PROJECT NO.: 1572-008
DATE: 11-10-97
TOC ELEV.: 6133.00
GS ELEV.: 6130.7
LOGGED BY: DCH
WELL NO.: MW-2



USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
		B-9	140-142	
	...grades with moist cuttings.			
		B-10	155-157	

Figure No. 5

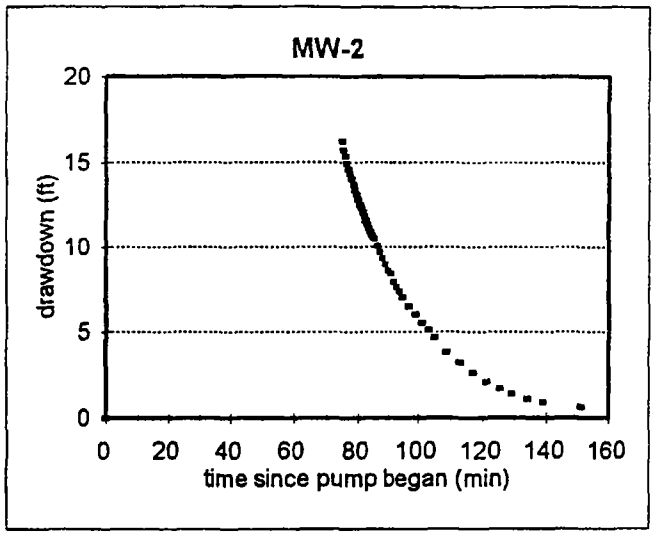
Blue Bench Landfill
MW-2
Pump Test - Hand Bailed
December 30, 1997

time (hr:min:s)	depth to water (ft)	drawdown (ft)	t time since pumping (min)	t' time since stopped (min)	t/t'
22:45:01	100.33	0	0.0		
00:00:00	116.5	16.17	75.0	0.0	ERR
00:00:30	116.01	15.68	75.5	0.5	151.0
00:01:00	115.64	15.31	76.0	1.0	76.0
00:01:30	115.24	14.91	76.5	1.5	51.0
00:02:00	114.9	14.57	77.0	2.0	38.5
00:02:30	114.61	14.28	77.5	2.5	31.0
00:03:00	114.31	13.98	78.0	3.0	26.0
00:03:30	113.97	13.64	78.5	3.5	22.4
00:04:00	113.68	13.35	79.0	4.0	19.8
00:04:30	113.41	13.08	79.5	4.5	17.7
00:05:00	113.11	12.78	80.0	5.0	16.0
00:05:30	112.80	12.47	80.5	5.5	14.6
00:06:00	112.60	12.27	81.0	6.0	13.5
00:06:30	112.33	12	81.5	6.5	12.5
00:07:00	112.12	11.79	82.0	7.0	11.7
00:07:30	111.87	11.54	82.5	7.5	11.0
00:08:00	111.65	11.32	83.0	8.0	10.4
00:08:30	111.45	11.12	83.5	8.5	9.8
00:09:00	111.22	10.89	84.0	9.0	9.3
00:09:30	111.02	10.69	84.5	9.5	8.9
00:10:00	110.82	10.49	85.0	10.0	8.5
00:11:00	110.4	10.07	86.0	11.0	7.8
00:12:00	110.01	9.68	87.0	12.0	7.3
00:13:00	109.65	9.32	88.0	13.0	6.8
00:14:00	109.31	8.98	89.0	14.0	6.4
00:15:00	108.91	8.58	90.0	15.0	6.0
00:16:00	108.75	8.42	91.0	16.0	5.7
00:17:00	108.22	7.89	92.0	17.0	5.4
00:18:00	107.93	7.6	93.0	18.0	5.2
00:19:00	107.67	7.34	94.0	19.0	4.9
00:20:00	107.34	7.01	95.0	20.0	4.8
00:22:00	106.8	6.47	97.0	22.0	4.4
00:24:00	106.33	6	99.0	24.0	4.1
00:26:00	105.85	5.52	101.0	26.0	3.9
00:28:00	105.42	5.09	103.0	28.0	3.7
00:30:00	105	4.67	105.0	30.0	3.5
00:34:00	104.15	3.82	109.0	34.0	3.2
00:38:00	103.52	3.19	113.0	38.0	3.0
00:42:00	102.91	2.58	117.0	42.0	2.8
00:46:00	102.4	2.07	121.0	46.0	2.6
00:50:00	102.02	1.69	125.0	50.0	2.5
00:54:00	101.68	1.35	129.0	54.0	2.4
00:59:00	101.41	1.08	134.0	59.0	2.3
01:04:00	101.22	0.89	139.0	64.0	2.2
01:16:00	100.95	0.62	151.0	76.0	2.0

MW-2 Hand Pump Test
Blue Bench Landfill

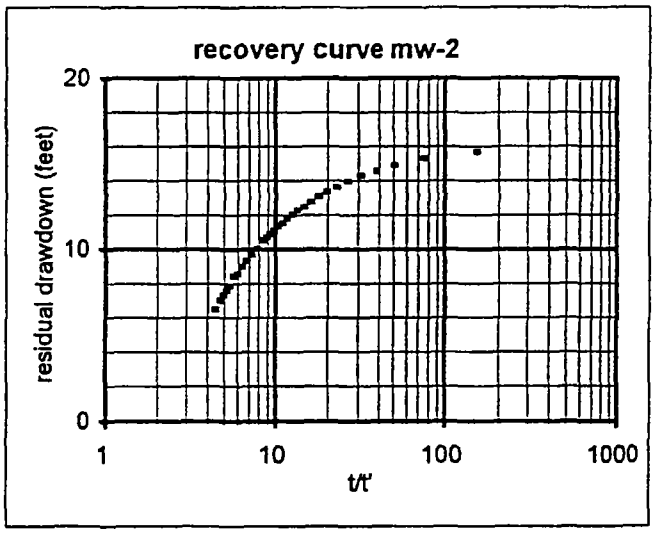
Parameters:

25 = Total volume bailed (gal)
75 = Pumping time (min)
60 = b (thickness of formation ft)
160-100
0.333333 = Q (gallons per minute)



Transmisivity estimated from recovery curve:

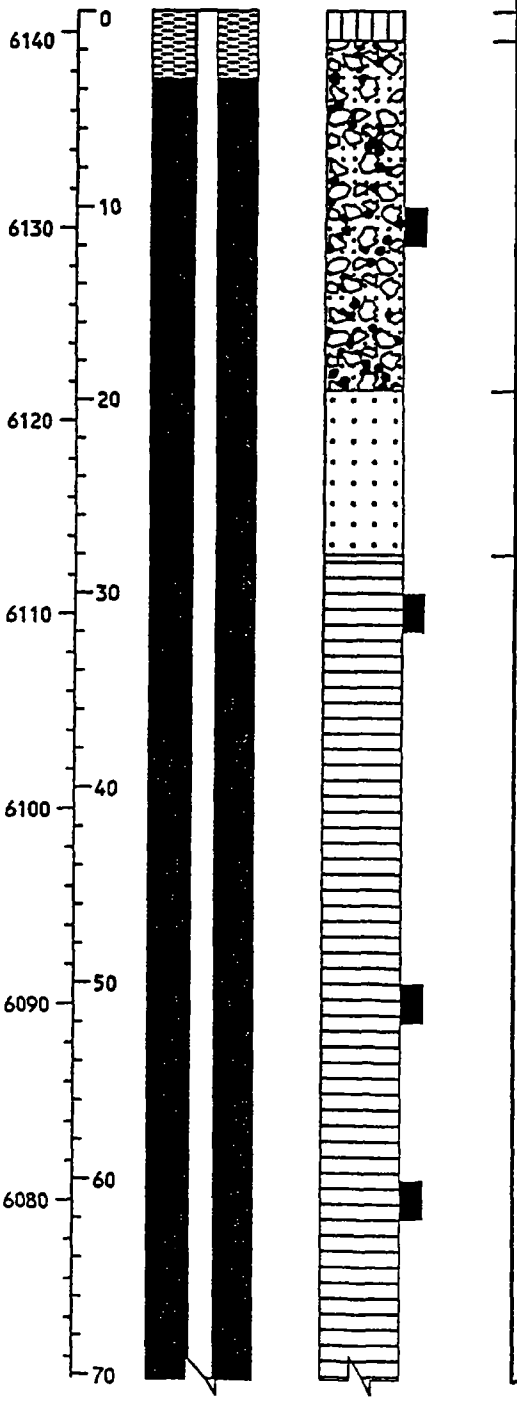
15 = delta S, change per log (ft)
5.866667 = T, transmissivity (gpd/ft)
T = 264*Q/delta s
9.1E-06 = T, transmissivity (ft2/s)
0.01307 = K, hydraulic conductivity (ft/day)
1.5E-07 = K, hydraulic conductivity (ft/s)
4.6E-06 = K, hydraulic conductivity (cm/s)



DRILL HOLE LOG
MONITOR WELL NO.: MW-3

PROJECT: Blue Bench Landfill
CLIENT/OWNER: Duchesne County
HOLE LOCATION: Southwest corner of new Landfill Cell
DRILLER: Layne Christensen
DRILL RIG: Speed Star
DEPTH TO WATER: 109.0' HOLE DIAMETER: 5 5/8"

PROJECT NO.: 1572-008
DATE: 11-10-97
TOC ELEV.: 6143.0
GS ELEV.: 6141.1
LOGGED BY: DCH
WELL NO.: MW-3



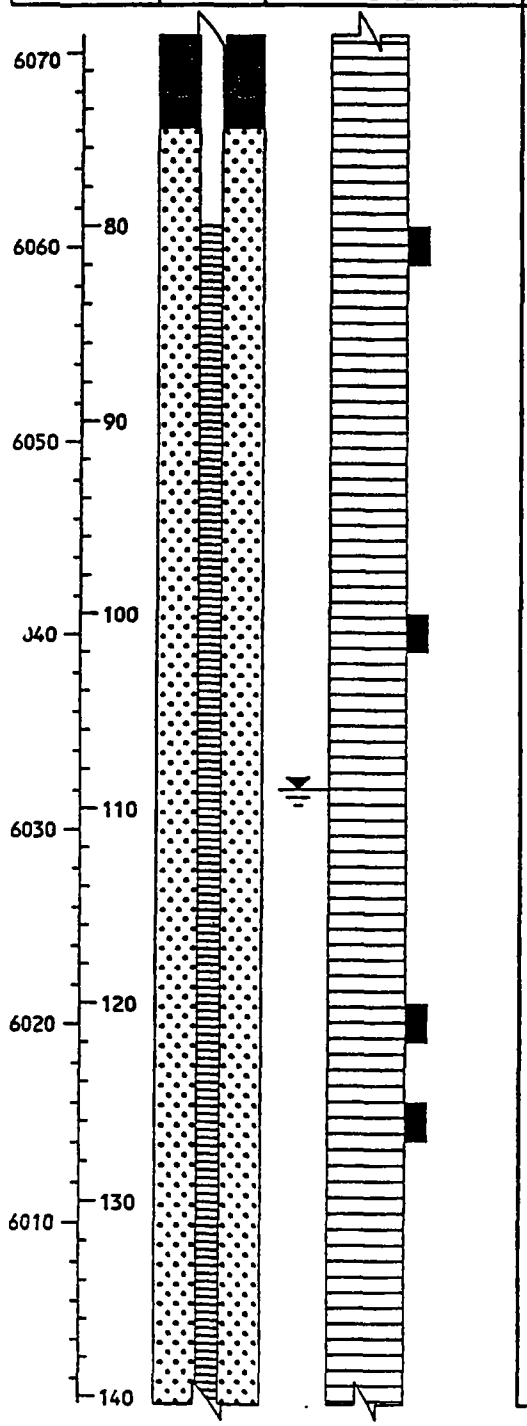
ELEVATION / DEPTH	WELL DETAILS	SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
			ML	SANDY SILT: Reddish brown, fine, moist.			
				Boulders & Cobbles in a silty gravelly sand matrix, dry.			
					B-1	10-12	
				SANDSTONE: Yellowish brown, fine grained, dry.			
				SHALE: Greenish gray, dry.			
				...grades gray.	B-2	30-32	
					B-3	50-52	
				...grades olive			
					B-4	60-62	

Figure No. 6

DRILL HOLE LOG
MONITOR WELL NO.: MW-3

PROJECT: Blue Bench Landfill
CLIENT/OWNER: Duchesne County
HOLE LOCATION: Southwest corner of new Landfill Cell
DRILLER: Layne Christensen
DRILL RIG: Speed Star
DEPTH TO WATER: 109.0' HOLE DIAMETER: 5 5/8"

PROJECT NO.: 1572-008
DATE: 11-10-97
TOC ELEV.: 6143.0
GS ELEV.: 6141.1
LOGGED BY: DCH
WELL NO.: MW-3



ELEVATION / DEPTH	WELL DETAILS	SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
				...grades gray.			
					B-5	80-82	
					B-6	100-102	
					B-7	120-122	
				...grades with wet cuttings.	B-8	152-127	

Figure No. 7

DRILL HOLE LOG
MONITOR WELL NO.: MW-3

PROJECT: Blue Bench Landfill
CLIENT/OWNER: Duchesne County
HOLE LOCATION: Southwest corner of new Landfill Cell
DRILLER: Layne Christensen
DRILL RIG: Speed Star
DEPTH TO WATER: 109.0' HOLE DIAMETER: 5 5/8"

PROJECT NO.: 1572-008
DATE: 11-10-97
TOC ELEV.: 6143.0
GS ELEV.: 6141.1
LOGGED BY: DCH
WELL NO.: MW-3

ELEVATION / DEPTH	WELL DETAILS	SOIL SYMBOLS, SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
6000							
150							
5990				...grades with dry cuttings.	B-10	155-157	
160							
5980							
170							
970							
180							
5960							
190							
5950							
200							
5940							
210							

Figure No. 8

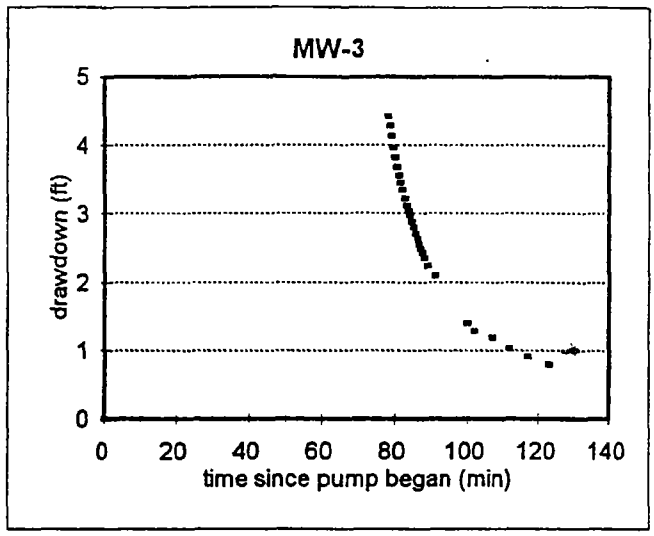
Blue Bench Landfill
MW-3
Pump Test - Hand Bailed
December 30, 1997

time (hr:min:s)	depth to water (ft)	drawdown (ft)	t time since pumping (min)	t' time since stopped (min)	t/t'
22:42:01	110.75	0	0.0		
00:00:00	115.17	4.42	78.0	0.0	ERR
00:00:30	115.03	4.28	78.5	0.5	157.0
00:01:00	114.88	4.13	79.0	1.0	79.0
00:01:30	114.71	3.96	79.5	1.5	53.0
00:02:00	114.57	3.82	80.0	2.0	40.0
00:02:30	114.43	3.68	80.5	2.5	32.2
00:03:00	114.3	3.55	81.0	3.0	27.0
00:03:30	114.2	3.45	81.5	3.5	23.3
00:04:00	114.09	3.34	82.0	4.0	20.5
00:04:30	113.97	3.22	82.5	4.5	18.3
00:05:00	113.87	3.12	83.0	5.0	16.6
00:05:30	113.79	3.04	83.5	5.5	15.2
00:06:00	113.72	2.97	84.0	6.0	14.0
00:06:30	113.63	2.88	84.5	6.5	13.0
00:07:00	113.55	2.8	85.0	7.0	12.1
00:07:30	113.46	2.71	85.5	7.5	11.4
00:08:00	113.39	2.64	86.0	8.0	10.8
00:08:30	113.3	2.55	86.5	8.5	10.2
00:09:00	113.24	2.49	87.0	9.0	9.7
00:09:30	113.18	2.43	87.5	9.5	9.2
00:10:00	113.11	2.36	88.0	10.0	8.8
00:11:00	112.99	2.24	89.0	11.0	8.1
00:13:00	112.85	2.1	91.0	13.0	7.0
00:22:00	112.15	1.4	100.0	22.0	4.5
00:24:00	112.03	1.28	102.0	24.0	4.3
00:29:00	111.94	1.19	107.0	29.0	3.7
00:34:00	111.78	1.03	112.0	34.0	3.3
00:39:00	111.66	0.91	117.0	39.0	3.0
00:45:00	111.55	0.8	123.0	45.0	2.7

MW-3 Hand Pump Test
Blue Bench Landfill

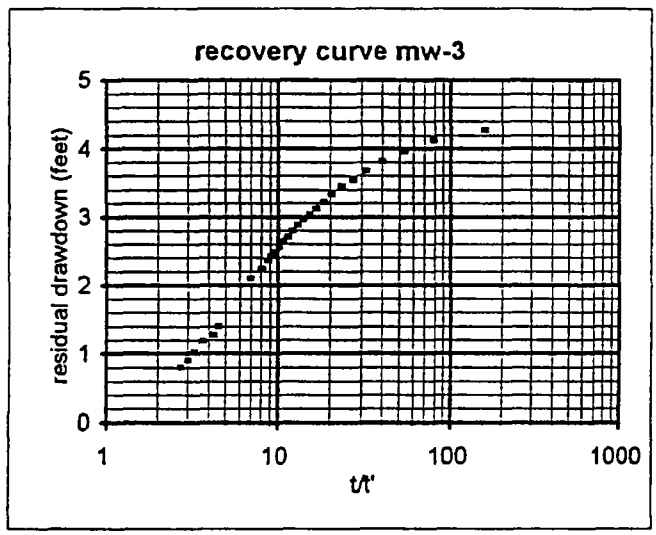
Parameters:

26 = Total volume bailed (gal)
78 = Pumping time (min)
50 = b (thickness of formation ft)
160-110
0.333333 = Q (gallons per minute)



Transmisivity estimated from recovery curve:

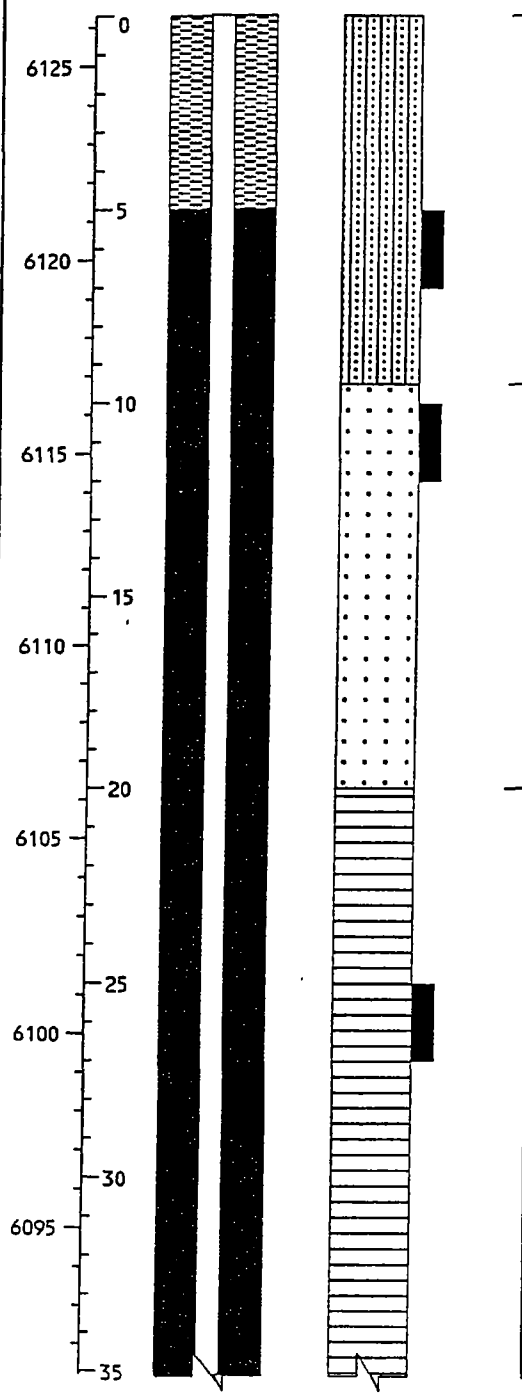
3 = delta S, change per log (ft)
29.33333 = T, transmissivity (gpd/ft)
T = 264*Q/delta s
4.5E-05 = T, transmissivity (ft2/s)
0.078421 = K, hydraulic conductivity (ft/day)
9.1E-07 = K, hydraulic conductivity (ft/s)
2.8E-05 = K, hydraulic conductivity (cm/s)



DRILL HOLE LOG
MONITOR WELL NO.: MW-4

PROJECT: Blue Bench Landfill
CLIENT/OWNER: Duchesne County
HOLE LOCATION: Northeast corner of landfill
DRILLER: Layne Christensen
DRILL RIG: Speed Star
DEPTH TO WATER: 62'
HOLE DIAMETER: 5 5/8"

PROJECT NO.: 1572-008
DATE: 4-17-98
TOC ELEV.: 6128.8'
GS ELEV.: 6126.3'
LOGGED BY: DCH
WELL NO.: MW-4



USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
SM	SILTY SAND: Reddish brown, fine, moist.			
		B-1	5-7	
	SANDSTONE: Light brown, fine grained, weathered, dry.	B-2	10-12	
	SHALE: Greenish gray, dry to wet.			
		B-3	25-27	

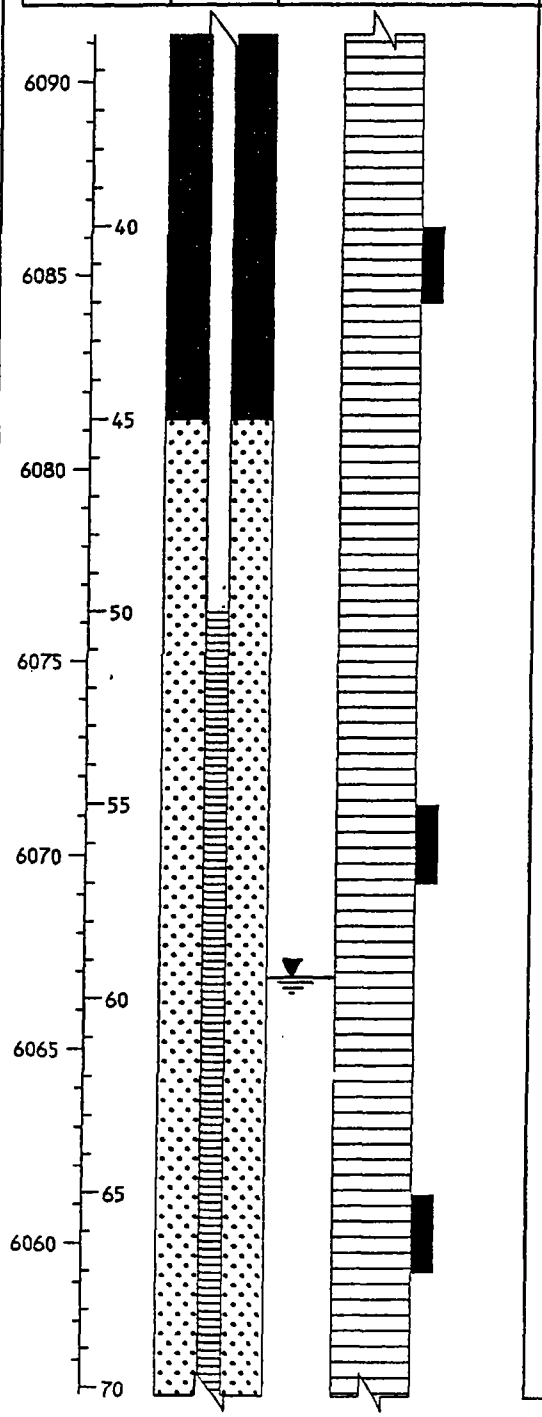
Figure No. 1

DRILL HOLE LOG
MONITOR WELL NO.: MW-4

PROJECT: Blue Bench Landfill
CLIENT/OWNER: Duchesne County
HOLE LOCATION: Northeast corner of landfill
DRILLER: Layne Christensen
DRILL RIG: Speed Star
DEPTH TO WATER: 62'

HOLE DIAMETER: 5 5/8"

PROJECT NO.: 1572-008
DATE: 4-17-98
TOC ELEV.: 6128.8'
GS ELEV.: 6126.3'
LOGGED BY: DCH
WELL NO.: MW-4



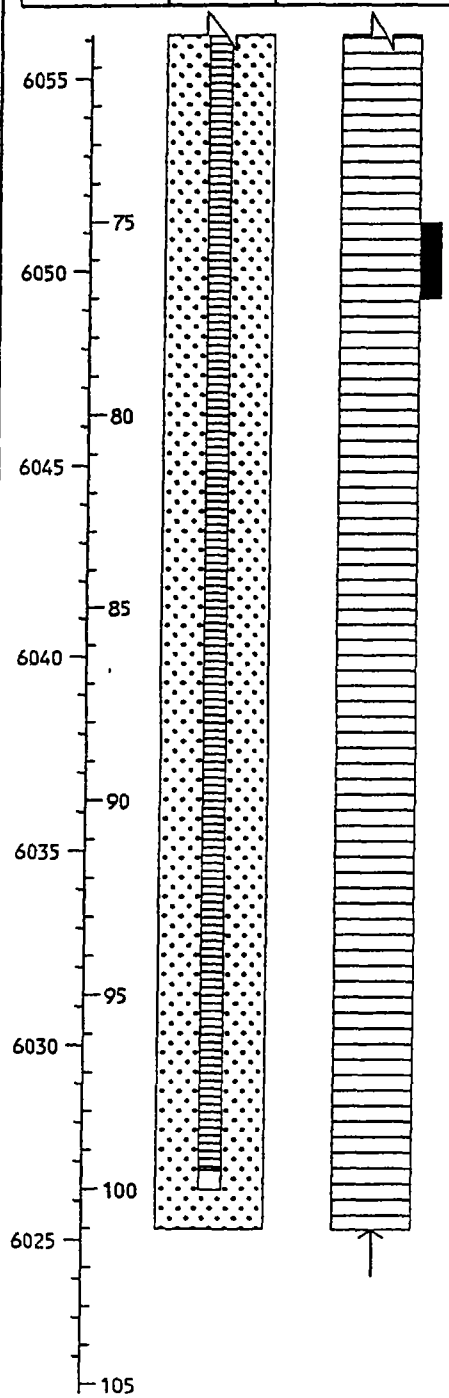
USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
	...grades yellowish brown.	B-4	45-47	
		B-5	55-57	
	...grades light gray.			
		B-6	65-67	

Figure No. 2

DRILL HOLE LOG
MONITOR WELL NO.: MW-4

PROJECT: Blue Bench Landfill
CLIENT/OWNER: Duchesne County
HOLE LOCATION: Northeast corner of landfill
DRILLER: Layne Christensen
DRILL RIG: Speed Star
DEPTH TO WATER: 62'
HOLE DIAMETER: 5 5/8"

PROJECT NO.: 1572-008
DATE: 4-17-98
TOC ELEV.: 6128.8'
GS ELEV.: 6126.3'
LOGGED BY: DCH
WELL NO.: MW-4



USCS	Description	Sample Number	Sample Depth (ft)	Recovery (in/in)
	...grades greenish gray.			
		B-7	75-77	

Figure No. 3

KEY TO SYMBOLS

Symbol	Description
Strata symbols	
	Silty sand
	Sandstone
	Shale
	Silty sand
	Boulders and cobbles in a silty gravelly sand matrix
Misc. Symbols	
	Boring continues
	Water table
	Drill hole completion depth

Symbol	Description
Soil Samplers	
	Standard penetration test (SPT)
	Drill cuttings
Monitor Well Details	
	Protective well cover set in concrete
	Bentonite grout blank 2" O.D. PVC pipe
	Bentonite pellets, blank 2" O.D. PVC pipe
	Silica sand blank 2" O.D. PVC pipe
	Silica sand 10 slot screen, 2" O.D. PVC pipe.
	Silica sand no PVC pipe

Notes:

1. Monitor well MW-1 was drilled and installed on October 19, 1994. The boring for the monitor well was drilled with the use of a truck mounted drill rig utilizing the ODEX drilling method for the upper 20 feet, and the remaining depth utilizing the reverse-air circulation rotary drilling method. Monitor wells MW-2 and MW-3 were drilled and installed on November 10 through 15, 1997. The borings for the monitor wells were drilled with the use of a truck mounted drill rig utilizing the ODEX drilling method for the upper 20 feet, and the remaining depth utilizing the reverse-air circulation rotary drilling method.

2. The water level indicated on the log was measured on November 15, 1997.

3. The monitor well locations and elevations were surveyed by Jerry D. Allred & Associates on December 1, 1997.

4. These logs are subject to the limitations, conclusions, and recommendations in this report.

Attachment 5

Final Cover Design (Section 4.5.5)
Evapotranspiration Cover Demonstration
(Section 4.5.5.1)

4.5.3 Settlement

Settlement calculations were performed for the proposed cell design. Settlement estimates throughout the site ranged from 0-3 inches. These calculations were for the full utilization scenario with final cover slopes of 3 horizontal to 1 vertical.

4.5.4 Leachate Collection System

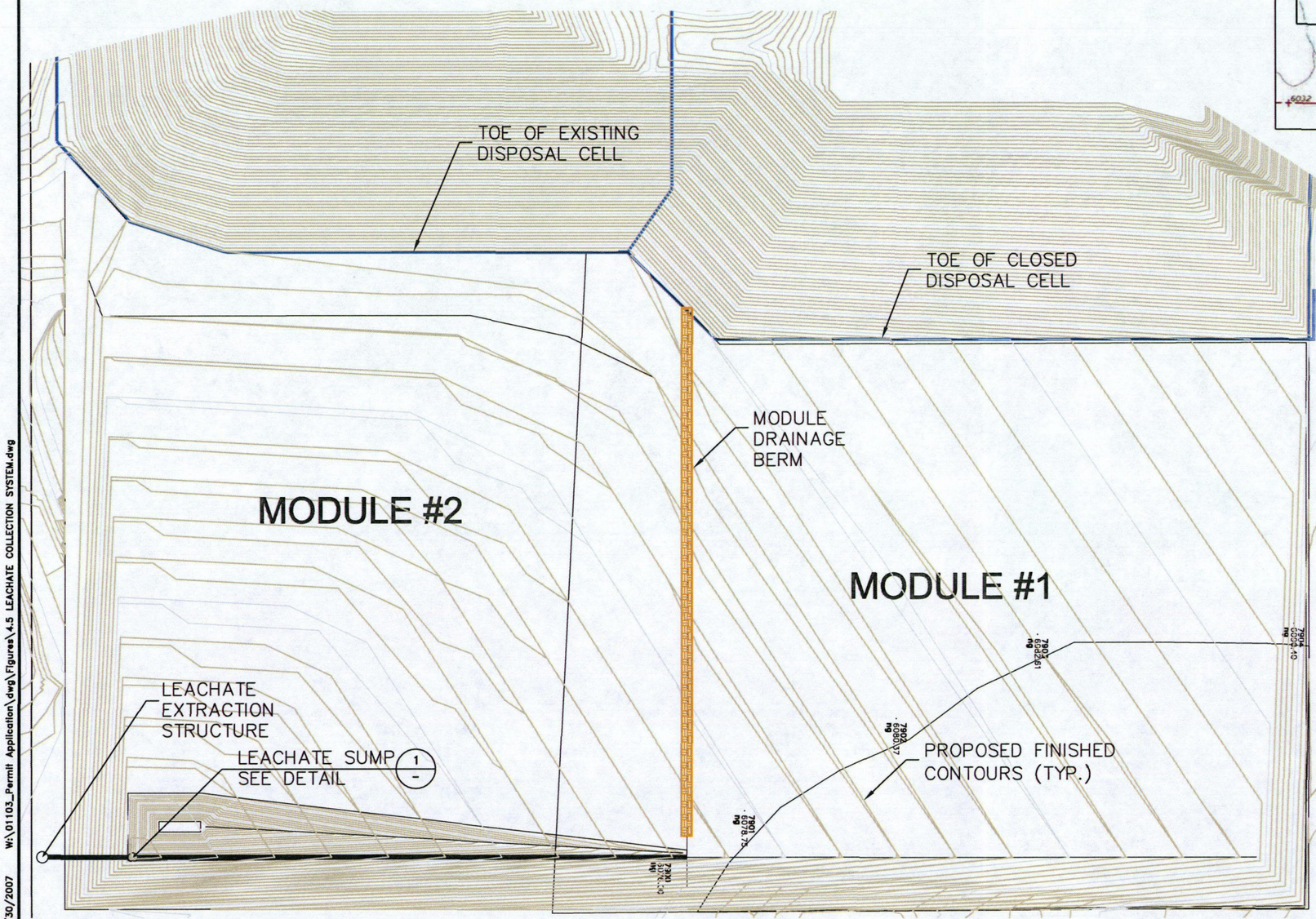
The proposed Class I Landfill would be equipped with a leachate monitoring and collection system as shown on Figure 4.5. The system is comprised of a drain system which gravity flows to a centrally located sump positioned at the lowest points of the landfill cell. The collection system piping would be designed to handle the specific site loading conditions. To help protect the collection system, the sump area would be filled w/ gravel overlain by a non-woven geo-textile. Leachate would be pumped on an as-needed basis to maintain a level of less than 1 foot of leachate over the liner system. Sump areas would be constructed as shown on Figure 4.5. The removed leachate would either be use as a suppressant for fugitive dust and compaction water on areas of the landfill that are overlaid by an approved liner system. Cleaning of the leachate collection system would be conducted on an as needed basis.

4.5.5 Final Cover

The disposal cells are designed to eliminate infiltration through the cover to prevent the generation of leachate. This is accomplished by promoting drainage and evapotranspiration from the cover, and by preventing percolation of precipitation into the disposal cell.

NOTES:

1. FINISHED SLOPES ARE 3:1 UNDER THE FULL UTILIZATION SCENARIO



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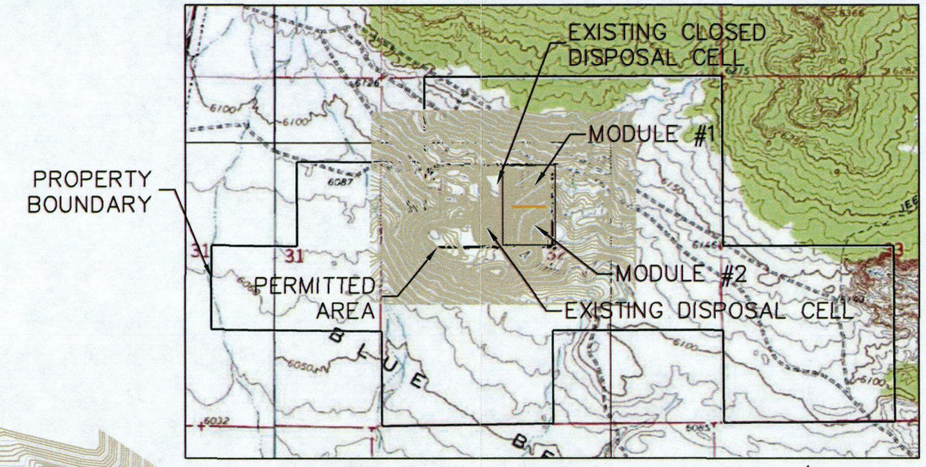
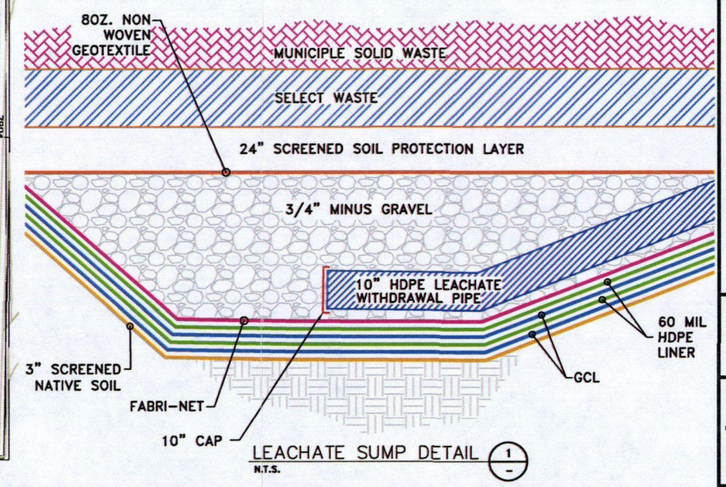


VICINITY MAP
N.T.S.



LEACHATE SUMP DETAIL 1
N.T.S.

REVISIONS

NO.	DATE	

BLUE BENCH LANDFILL SSD

BLUE BENCH LANDFILL FACILITY
CLASS I & IVA LANDFILL PERMIT APPLICATION
LEACHATE COLLECTION SYSTEM DETAIL

ADVANCED ENVIRONMENTAL ENGINEERING
1975 NORTH MAIN SUITE #3, LAYTON UTAH 84041
PHONE: 801-918-5107 FAX: 801-773-2699

0 1/2 1
DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1"

DESIGN: -
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SCALE: HORZ. AS NOTED VERT. NONE
DATE: 9/07

FIGURE:
4.5
4-9

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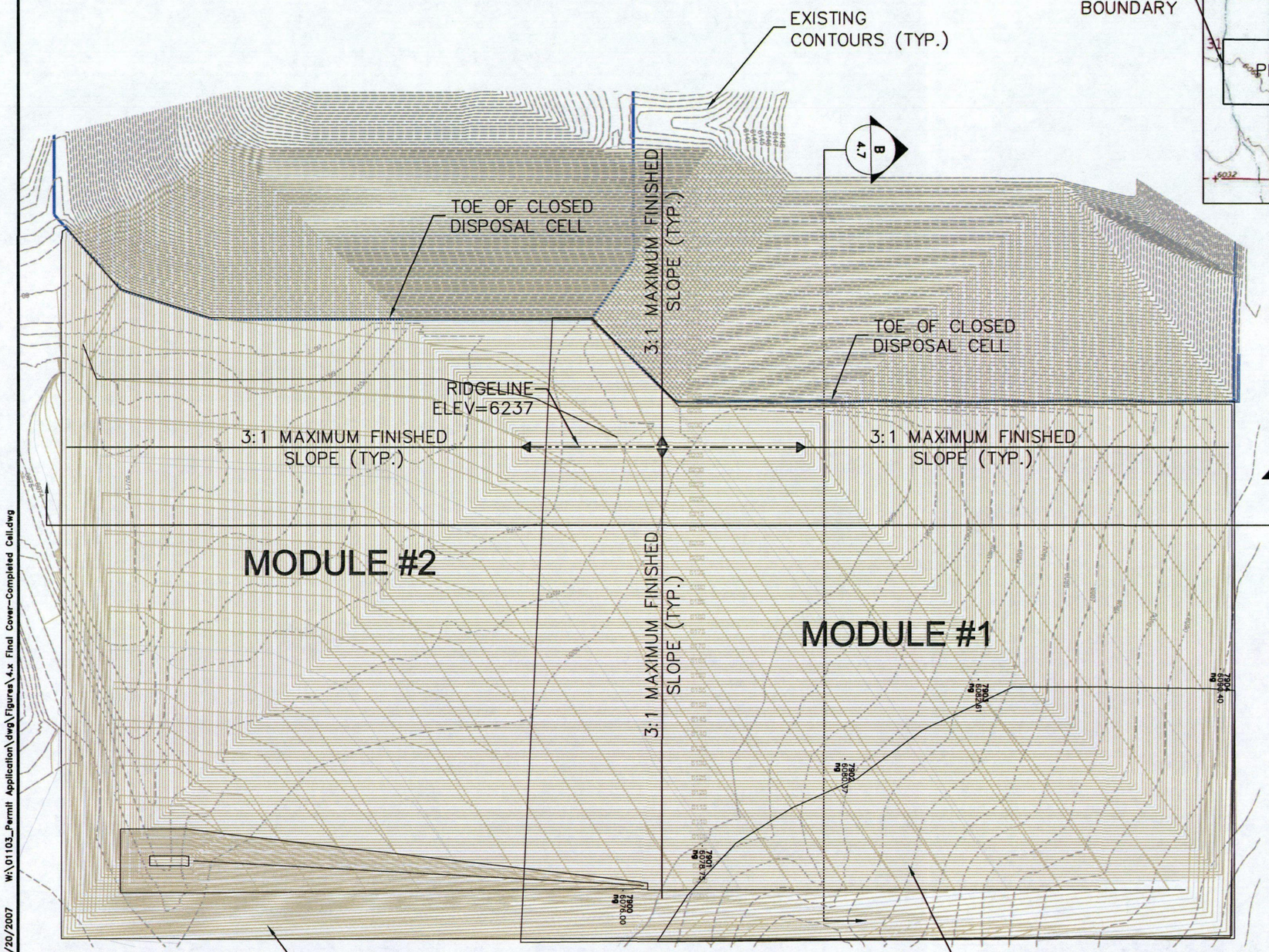
NOTES:

1. FOR SECTIONS A AND B DETAIL SEE SHEET 4.7
2. THE SLOPES ARE 3:1 UNDER THE FULL UTILIZATION SCENARIO



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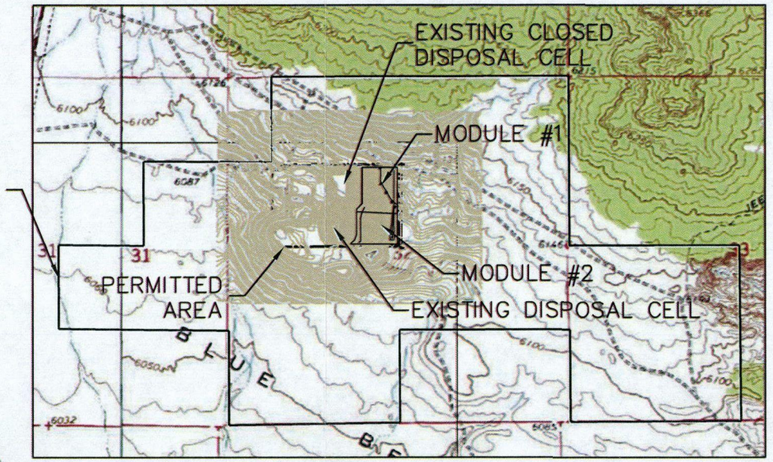
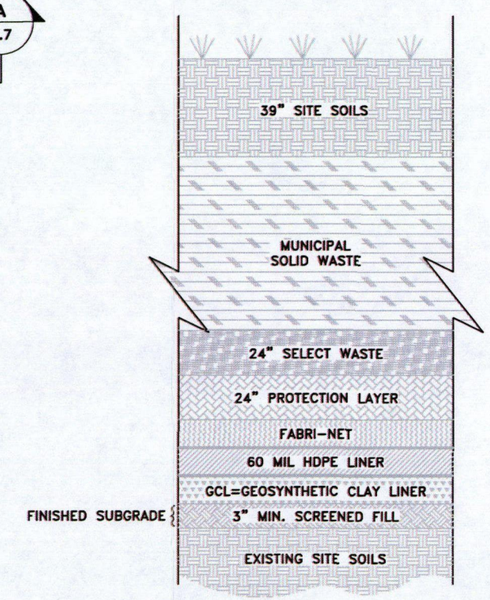


VICINITY MAP
N.T.S.

RUN-OFF DRAINAGE FROM INTERMEDIATE COVER AREAS WOULD BE CONSIDERED AS LEACHATE AND MAINTAINED WITHIN AREAS OF THE LANDFILL THAT ARE UNDERLAIN BY AN APPROVED LINER SYSTEM.



EVAPOTRANSPIRATION FINAL COVER SYSTEM (1)
N.T.S.

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BLUE BENCH LANDFILL SSD

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CLASS I & IVA LANDFILL PERMIT APPLICATION
POST CELL DESIGN

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PHONE: 801-918-5107 FAX: 801-773-2699

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FIGURE:
4.6
4-10

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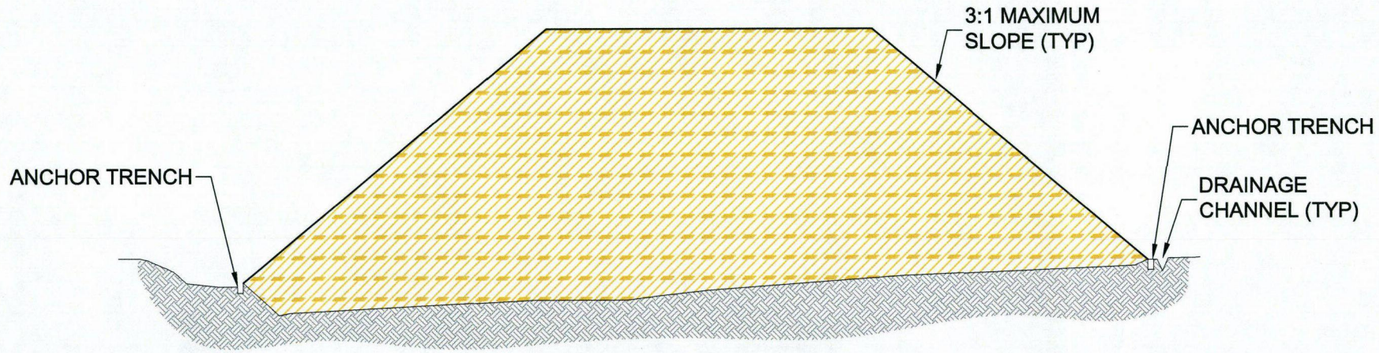
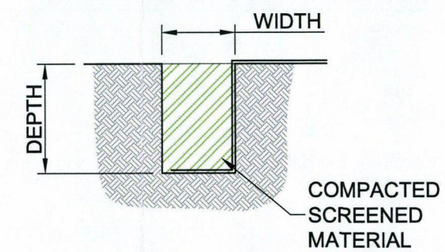


SECTION A / 4.6
N.T.S.

NOTE: WIDTH & DEPTH OF ANCHOR TRENCH AS PER MANUFACTURER'S RECOMMENDATIONS



ANCHOR TRENCH DETAIL 1 / –
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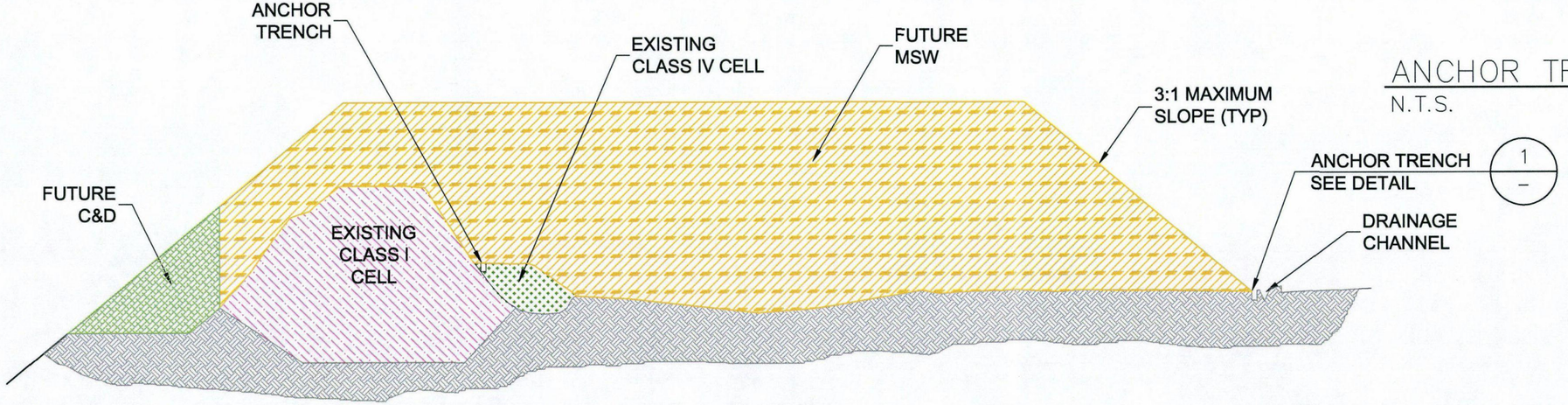

SECTION B / 4.6
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REVISIONS

NO.	DATE

BLUE BENCH LANDFILL SSD

BLUE BENCH LANDFILL FACILITY
CLASS I & IVA LANDFILL PERMIT APPLICATION
POST CELL SECTIONS

ADVANCED ENVIRONMENTAL ENGINEERING
1975 NORTH MAIN SUITE #3, LAYTON UTAH 84041
PHONE: 801-918-5107 FAX: 801-773-2699

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DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1"

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DATE: 9/07

FIGURE:
4.7

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4.5.5.1 Evapotranspiration Final Cover System

The cover has been designed to eliminate infiltration to prevent the generation of leachate. This was accomplished by promoting evapotranspiration from the cover, and by preventing percolation of precipitation into the disposal cell. The alternative final cover will consist of 1 meter of blow sand which will be obtained from onsite stock pile or excavation. The final cover will be graded to a slope of 3 horizontal to 1 vertical to promote adequate drainage. No additional compactive effort should be expended.

Hydrologic modeling was performed to assess the water balance and is contained in Appendix E. The hydrology was predicted using a validation tool and a computer model WinUNSAT-H.

The evaluations were completed using the variably saturated flow program WinUNSAT-H. Interpreting the model output indicates a 1 meter cap will perform as well as a traditional cap. The water balance graph shows the expected response of storage and release of water in response to precipitation and evapotranspiration. Runoff was modeled at zero, indicating that all of the precipitation infiltrated into the cover to insure a conservative estimate. Evapotranspiration exceeded precipitation during each year in the cycle, indicating that the cover dries during the meteorological year. Drying of the cover is also evident in the soil water storage, which is lower at the end of the year than at the beginning of the year. Cumulative percolation for the year at 1 m depth is negative.

Simulations were conducted with the variably saturated flow program WinUNSAT-H for a typical meteorological year (1996), the wettest year on record (1997), and the driest year with records (2002). A 5-yr simulation was conducted using the same data set each year and the output data is imported to the input data. For all three meteorological data sets, the percolation is negative at a depth of 1 m (i.e., the water flux is upward), as evapotranspirative demand removes water from the profile. This comparable to the EPA's Alternative Cover Assessment Program (ACAP) where composite RCRA covers averaged less than 5 mm percolation per year under normal conditions. The RCRA cover tested a HAFB in Layton averaged less than 2 mm percolation in a normal year. See Appendix E for Model Input Data, Results, Model Output Data, Validation Testing, and Geotechnical Results.

The waste surface will be prepared so as to be free of irregularities, protrusions, vegetation, excessive water, loose soil or abrupt changes in grade. The cover material would not be compacted to 85% max dry density per ASHTO T-99.

Drainage channels would be constructed around the cell as indicated by the drawings to help prevent erosion and divert any run-on and run-off in a controlled manner. Berms would be placed and used as needed.

4.5.6 Landfill Gas Collection System

The preliminary landfill gas collection system (LGCS), shown on Figure 4.8, would be implemented to eliminate potential problems associated with landfill gas including subsurface lateral migration, odor, and release of methane. Gas collection and management would need to be reviewed and approved by the Division of Air Quality prior to construction of the system.

Landfill gases typically consist of approximately 50% methane and 50% carbon dioxide and were modeled as such. Landfill Gas Emissions Model version 3.02 (EPA) was used to model gas generation. The parameters used in the model were default parameters specified by the Environmental Protection Agency (EPA).

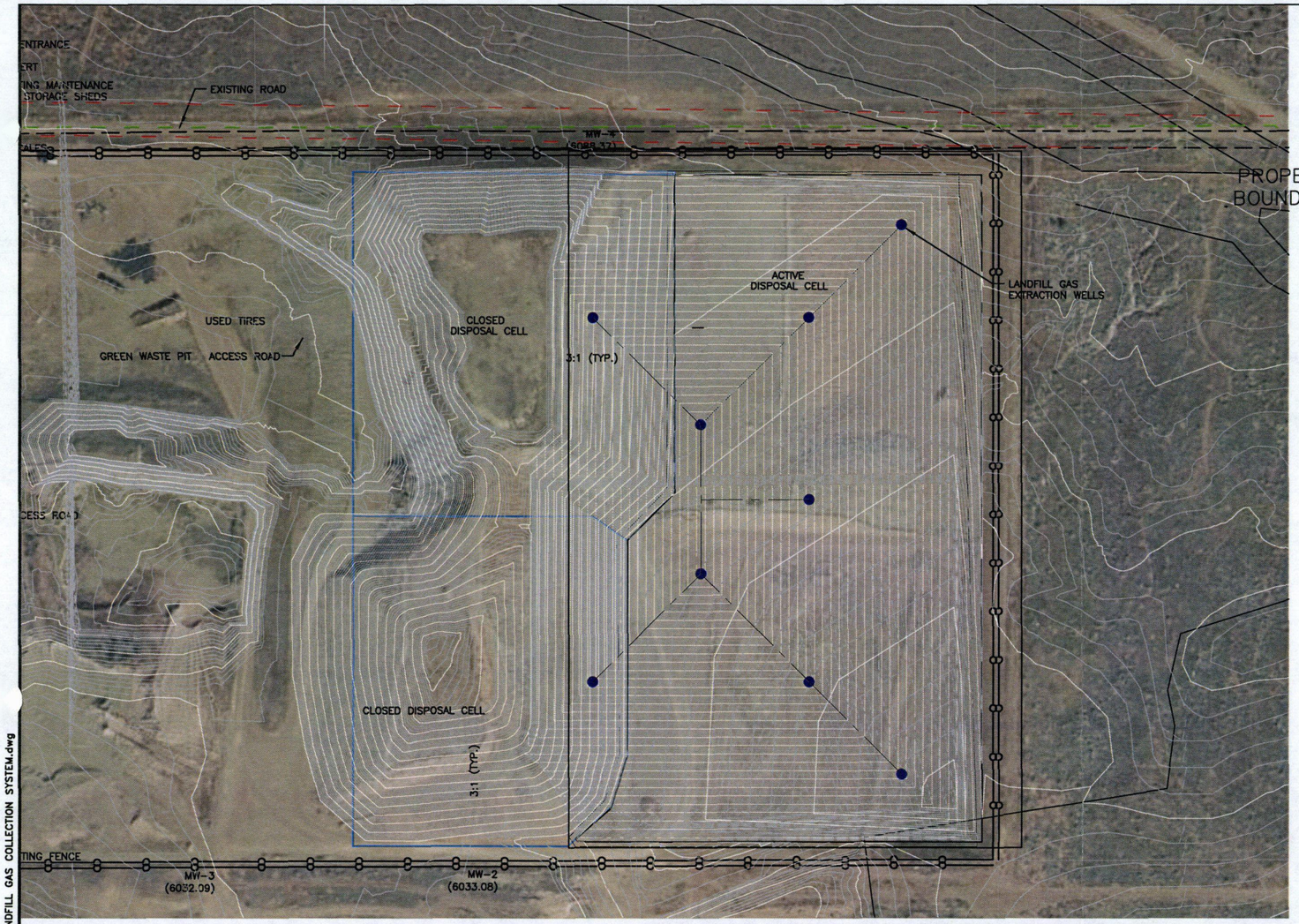
According to conversations with the Utah Department of Air Quality, this model typically overestimates gas production in this region when default arid climate parameters are used. This is evident in Table 4.2, which shows the dramatic difference in the peak emissions rate for the 50 year scenario using the default EPA parameters versus parameters used by the Salt Lake Valley Solid Waste Management Facility in their Permit Application. The modeling output files are included in Appendix F.

TABLE 4.2 – VALUES USED FOR LANDFILL GAS COLLECTION SYSTEM

Description	Lo (m^3/Mg)	K (1/yr)	NMOC (ppmv)	Year 2056 NMOC Emissions Rate (Mg/yr)
EPA Default	170	0.02	4000	1.815E+02
Salt Lake Valley	170	0.02	300	1.361E+01

* Value accounts for arid regions
NMOC: Nonmethane Organic Compounds
ppmv: Parts per million by volume
Lo: Generation Potential (amount of methane generated by a given amount of refuse)
K: Decay Rate (exponential rate of decomposition)

The landfill gas collection system was conservatively designed using the emissions rate generated for EPA default parameters. The active gas collection system would be put into service when NMOC emissions at the site were to exceed 50 Mg/yr (55 tons/yr) or concentrations of methane gas were to exceed the lower explosive limit at the property boundaries. This is



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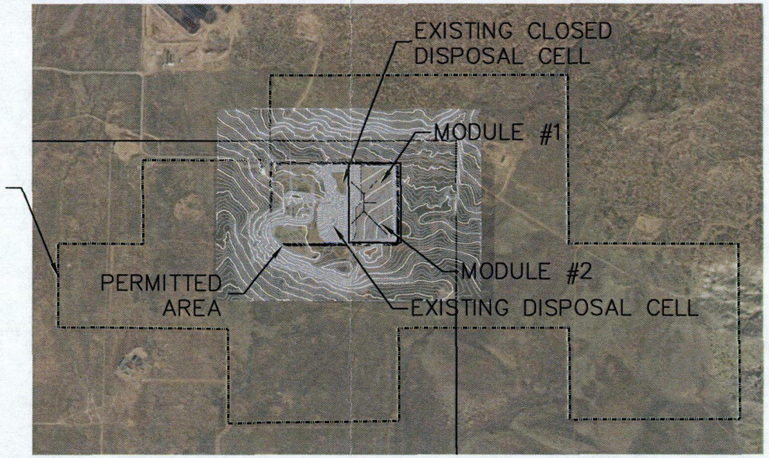

VICINITY MAP
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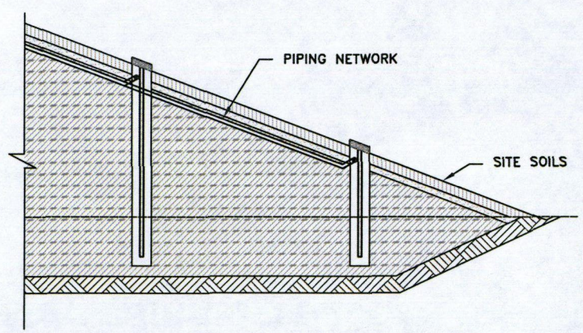

PRELIMINARY LANDFILL GAS COLLECTION SYSTEM DETAIL
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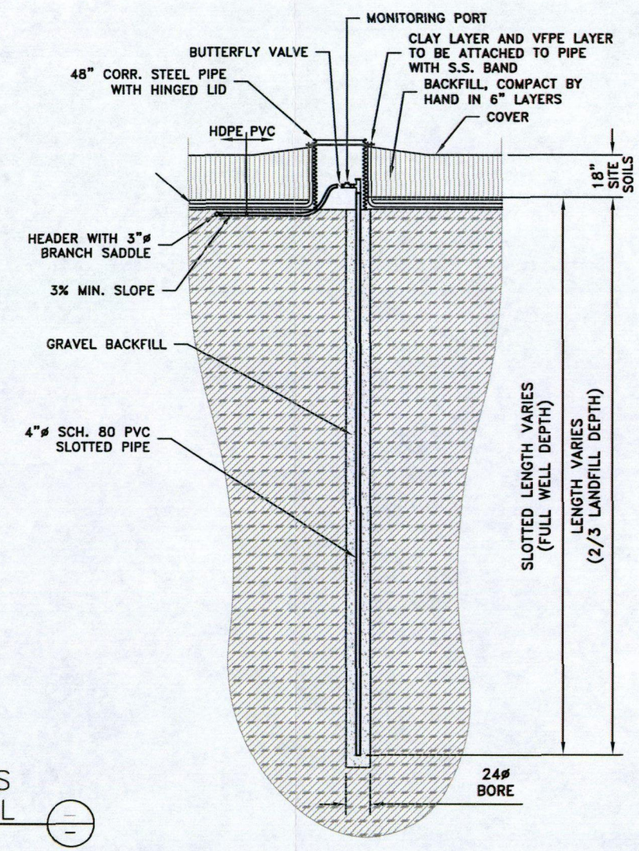

REVISIONS

NO.	DATE	

BLUE BENCH LANDFILL SSD

BLUE BENCH LANDFILL FACILITY
CLASS I & IVA LANDFILL PERMIT APPLICATION
LANDFILL GAS COLLECTION SYSTEM

ADVANCED ENVIRONMENTAL ENGINEERING
1975 NORTH MAIN SUITE #3, LAYTON UTAH 84041
PHONE: 801.918-5107 FAX: 801.773-2699

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FIGURE:
4.8

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RM

estimated to take place around the year 2019 using EPA default parameters and beyond the 50 year scenario utilizing Salt Lake Valley Solid Waste Management Facility parameters. Extraction wells and collection piping would be strategically placed for effective gas collection.

4.6 SITE WATER BALANCE

Hydrologic modeling of the Class 1 disposal cell was performed in order to assess the water balance for both the liner and cover.

4.6.1 Modeling Parameters

The hydrology of the disposal cell was predicted using the computer model Hydrologic Evaluation of Landfill Performance (HELP), Version 3.07 was used to evaluate the open case and WinUNSET-H was used to evaluate the cover case. Modeling of the cell was performed to design the leachate collection system and to determine the infiltration through the final cover.

HELP calculates the water balance for the proposed cell based on the cell design and climatic conditions. Cell design consists of soil and waste layer thickness, hydraulic conductivity of each layer, percent of total area where run-off could occur, and other characteristics of the proposed cell design.

Based on the average daily temperature, precipitation, and monthly solar radiation, HELP calculates the water balance for the site that includes evapotranspiration, run-off, percolation, and change in water storage of the subsurface soils. WinUNSAT-H is a one dimensional computer model which calculates water balance using many of the same parameters as HELP, but uses finite-difference implementation of a modified form of Richard's Equation. The liner case and cover case are discussed separately below.

Liner Case:
The assumed profile for the liner case consisted of 6 layers. These layers included a 6 inch layer of site soils simulating daily cover, a 15 foot layer of municipal solid waste, a 24 inch screened site soil protection layer, a drainage net layer, a 60 mil HDPE liner, and Bentomat (ST) liner. The model was set to run for five years.

The following assumptions and data were used in the model. The assumptions are considered conservative for the application of the model. Table 4.3 lists the soil values that were used in the analysis.

- The area of the cell is 8 acres.
- The evaporative zone depth is 18 inches
- The SCS runoff curve number of 81.3 was computed by HELP from default soil data base using soil texture #4 with bare ground conditions, a surface slope of 1% and slope length of 170 feet.

TABLE 4.3 – SOIL VALUES USED FOR THE LINER CASE

LAYER	THICKNESS (inches)	ZONE DESCRIP.	TOTAL POROSITY	FIELD CAPACITY	WILTING POINT	SATURATED HYDRAULIC CONDUCTIVITY (cm/sec)
1	6	Daily Cover	0.437	0.105	0.047	0.17 E-02
1	180	MSW	0.671	0.292	0.077	0.10 E-02
1	24	Protection Layer	0.437	0.105	0.047	0.17 E-02
2	.23	Drainage Layer	0.850	0.010	0.005	33
4	.23	HDPE	0.000	0.000	0.000	0.19 E-12
3	.23	Bentomat	0.750	0.747	0.400	0.30 E-08

Note: The HDPE liner was modeled assuming a pinhole density of 1-pinhole/acre and installation defects of 15-pinholes/acre. The quality of installation was modeled as poor. The drainage layer was modeled using a 3% slope and drainage length of 50 feet.

Cover Case:
Evapotranspiration Final Cover System will consist of 1 meter of blow sand which will be obtained from onsite stock pile or excavation. Hydrologic modeling was performed to assess the water balance. The Modeling was set to run for 5 years at each of the following conditions: Normal, Wettest, and Driest. The hydrology was predicted using the computer model WinUnsat-H. Interpreting the model output indicates a 1 meter cap will perform as well as the Barrier Final Cover System. The water balance graph shows the expected response of storage and release of water in response to precipitation and evapotranspiration.

TABLE 4.4 – SOIL VALUES USED FOR THE COVER CASE

LAYER	THICKNESS (inches)	ZONE DESCRIP.	TOTAL POROSITY	FIELD CAPACITY	WILTING POINT	SATURATED HYDRAULIC CONDUCTIVITY (cm/sec)
1	39	Cover	0.437	0.42	0.03	0.20 E-04

Note: The VFPE and HDPE liners were modeled assuming a pinhole density of 1-pinhole/acre and installation defects of 1-pinholes/acre. The quality of installation was modeled as good. The drainage layer was modeled using a 2% slope and drainage length of 2000 feet.

4.6.2 Modeling Results

Liner Case:
Table 4.5 summarizes the modeling results for the liner case. The results indicate that very little leachate would reach the leachate collection system.

TABLE 4.5 – RESULTS FOR THE LINER CASE

DESCRIPTION	RESULTS
Precipitation	9.61 inches/year
Runoff	0.00 inches/year
Evapotranspiration	8.895 inches/year
Leachate Collection	0.0004 inches/year
Percolation/Leakage	0.00003 ft^3/40 acres
Peak Percolation/Leakage	0.00020 ft^3/40 acres

Note: The result represent the average annual total for years 1 through 5.

The results above give a good indication of the amount of leachate that can be expected under the liner case. All leachate currently generated at the Landfill Facility is used for compaction and dust control on the working face of the lined cell. Input and output files are included in Appendix F.

Cover Case:
Table 4.6 summarizes the modeling results for the cover case.

TABLE 4.6 – RESULTS FOR THE COVER CASE

DESCRIPTION	RESULTS
Precipitation	9.61 inches/year
Runoff	0.0 inches/year
Percolation (Flux)	-13.3 (mm)

Note: The result represent the average annual total for years 1 through 5.

The results indicate that the generation of leachate will dramatically decrease once the final cover has been installed. The percolation leakage through the bottom liner will also decrease.

4.7 RUN-ON AND RUN-OFF CONTROLS

Run-on and run-off storm water would be controlled during both the open and closed phases of the disposal cells. Drainage swales would be used to divert water around the modules to the existing on-site washes. Final cover run-off would be routed to the perimeter run-off collection structures per the storm

Attachment 6

Inspection Forms
Appendix L

Appendix L
Sample Forms

RANDOM INSPECTION FORM

Date:_____ Time:_____

Inspected by:_____

Load Origin:_____

How was the inspection conducted?

_____
_____
_____
_____
_____

What was found during inspection?

_____
_____
_____
_____
_____
_____
_____
_____

Is corrective action necessary? If so what?

_____
_____
_____
_____
_____
_____

QUARTERLY INPECTION LOG
Blue Bench Landfill Facility

Area of Inspection	Needs Repair	Date of Repair	Comments
Maintenance Facility			
Scale House / Scales			
Run-on/Run-off			
Roads			
Harborage			
Leachate Collection			
Gas Collection			
Perimeter Fencing and Access Gates			
Fugitive Waste collection System			
Fugitive Waste			
Cell			
Date:	Inspector:		

Note: Annual Report due before March 1.

FAMILY NOTIFICATION LIST

Blue Bench Landfill Facility

	Emergency Contact		
Employee Name	Name	Telephone #	Address

Attachment 7

Recordkeeping
Section 5 Submitted April 8, 2015 (updated)

5.10.1 Training Schedule

The Landfill Manager may be required to pass a Certified Solid Waste Training Course for the Management of Landfill Operations. In addition, operators are required to take Certified Solid Waste Training Courses for Landfill Operator Training, and Waste Screening. Continuing education efforts include the following:

<u>Introductory Training</u>
Synopsis of solid waste regulations, record keeping, and transporter requirements.

- Requirement: All Personnel
- Method: OJT
- Review: Quarterly

<u>Policies and Procedures</u>
Security, inspections, and emergency response.

- Requirement: All Personnel
- Method: Lecture/Video Course, OJT
- Review: Quarterly

<u>Safety</u>
Personal protection, hazardous waste recognition, hazardous material handling, emergency response, and first aid.

- Requirement: All Personnel
- Method: Classroom/Video Course
- Review: Annual

A Safety Training meeting is held once a week taking a minimum of 15 minutes. Training documents would be kept with the Plan of Operation for a rolling five year period.

5.11 RECORD KEEPING AND REPORTING

The Landfill Manager would maintain the following operating records for the landfill:

- Records of maintenance
- Records of training and notification procedures
- Records of groundwater monitoring
- Records of landfill gas monitoring
- Records of weights and volume, number of vehicles

- Deviations from the Plan of Operation
- Records of placement or recirculation of leachate
- Records of any gas condensate
- Prepare an annual report and place the report in the facility's operating record.

Sample forms for maintenance and gas monitoring are provided in Appendix K.

Attachment 8

Litter Control
Section 5.6.6 Litter Control Program
Submittal April 8, 2015

Minimize dropping heights
Trackout prevention
Revegetation

In some instances, source generation modifications are not enough. In these situations, dust suppressants can help to mitigate fugitive dust. A few of the common dust suppressants are listed below.

Water
Clay additives
Calcium chloride
Calcium oxide (lime)
Magnesium chloride
Organic non-petroleum projects
Synthetic polymers

The Landfill Supervisor is trained in best management practices and will be responsible for determining when fugitive dust control is warranted and what methods to employ.

5.6.6 Litter Control Program

One of the operational challenges of solid waste management is litter control and management. The Landfill Facility is aware and concerned with litter control and has established a Litter Control Program. Control of litter is an integral part of the daily operations. The Landfill Manager and personnel are regularly trained to keep abreast of new best management practices aimed at the reduction and management of litter.

For the Litter Control Program, litter is considered plastics, paper, and other solid waste materials that are improperly disposed of at the working face. Most landfill facilities have two primary generation sources of litter. These sources are improper transportation of waste in uncovered vehicles and refuse at the working face during unloading, spreading, and compaction.

The goal of the Litter Control Program is to implement economically viable best management practices and strategies to minimize litter. The Landfill Supervisor is trained in best management practices and will be responsible for determining when implement litter control is warranted and what methods to employ. A list of the current best management practices incorporated into the daily operations is provided below.

- Transporting refuse without being secured, tarped, or covered is not allowed. Signs located on the road leading to the landfill and at the main gate will indicate that all loads must be covered and a doubling of the fee is possible for not doing so. The operator at the entry gate will report violators to the Landfill Manager.

- The size of the working face is limited to minimize exposure of waste to the environment. However, the working face must always be large enough to allow for safe unloading of both residential and commercial customers. Under normal operations, the waste is immediately spread and compacted to minimize the area and debris subjected to breezes.

- On windy days, refuse is to be dumped at or near the base of the working face and is not spread out or compacted. Operations have concluded that working the waste results in more blowing litter. Wastes that are more susceptible to windblown distribution can be covered with a temporary layer of site soils.

- Wind fences have been tried at the Landfill Facility and have been marginally effective. The Landfill Facility will continue to investigate options for wind fences on a portable, semi-portable, or permanent basis.

- The Landfill Facility is fortunate to have a large buffer area. However, the Landfill Facility will continue to pursue additional buffer zone area as properties become available.

Access roads, working face, fences, and the buffer zones are monitored daily to determine the effectiveness of the Litter Control Plan. Best management practices are adjusted and modified based on daily monitoring, personnel input, and training.

Currently, litter is collected and properly disposed of on a routine basis. The use of equipment, personnel, and work-release parties from local correctional institutions all have been utilized in the past. It is anticipated that these methods of litter collection will continue in the future.

5.7 ALTERNATIVE WASTE HANDLING AND DISPOSAL PLAN

In the event of a major equipment failure, solid waste would be loaded and shipped to an alternative waste disposal facility such as Uintah County, Summit County, or other available landfills in the area.

5.8 PROCEDURES FOR CONTROLLING DISEASE VECTORS

The use of daily cover and the exclusion of specific types of solid waste are necessary to control vectors and the subsequent spread of disease. Special waste such as infectious waste, liquid waste and tires, which may directly carry disease or lead to the propagation of disease vectors, would be immediately covered at the working face. Landfill personnel to the extent possible would inspect the site for signs and indications of disease vectors. If observations were made, the Landfill Manager would be contacted immediately. If disease vectors were to become a

Attachment 9

Closure and Post-Closure
Chapter 6

CHAPTER 6
CLOSURE AND POST–CLOSURE PLANS

6.1 PURPOSE

Closure activities would be implemented as each module within the disposal cell is completed. These closure activities would minimize the need for further maintenance, and minimize or eliminate the threat to human health and the environment from post-closure escape of solid waste constituents, leachate, contaminated run-off or waste decomposition products to the ground, groundwater, surface water, or the atmosphere. A Monitoring Plan has been developed to prevent problems through careful monitoring and inspection. The plan provides details on groundwater monitoring, leachate monitoring, and landfill gas and is included in Appendix I.

6.2 FINAL COVER AND GRADING

The final cover would commence no later than 30 days after the final volume of waste was received in each module and would be completed within 180 days after the beginning of the closure activities. The Evapotranspiration cover will consist of 1 meter of blow sand which will be obtained from onsite stock pile or excavation. The proposed cover of the Class IV Cells would consist of twenty-four inches of site blow sand.

6.2.1 Revegetation

Revegetating the cover would consist of using an appropriate seed mix for the area. The cover would be prepared to a clean, firm, and consistent seedbed. The seeds would be drilled ½ to ¼ inch deep or broadcasted in areas where drilling was found to be impractical.

6.3 FINAL INSPECTION

The Owner or Operator would notify the Executive Secretary of the Solid and Hazardous Waste Control Board (hereafter called Executive Secretary) of the intent to implement the closure plan 60 days prior to the projected final receipt of waste. The Owner or Operator would commence implementation of the closure plan within 30 days of final volume of waste and the cover would be completed within 180 days. The Owner or Operator then would have 90 days to submit the following items to the Executive Secretary: Closure plan sheets signed by a professional engineer registered in the State of Utah and a certificate from the engineer. The certificate would require a final inspection performed by the engineer to verify that the landfill was in compliance with all closure requirements as outlined in the permit and closure plans. Inspection would include cell cover design, run-on and run-off control, proper final grading to promote run-off, and restriction of access to the site by fencing. No later than 60 days after certification of closure, submit plats and a statement of fact concerning the location of any disposal site would be given to the county recorder to be recorded as part of the record of title. Proof of record of title then would be submitted to the Executive Secretary.

6.4 OPINION OF PROBABLE COSTS FOR CLOSURE AND POST-CLOSURE

The opinion of probable costs for the final closure and post-closure care of the Landfill Facility has been prepared to comply with the Financial Assurance requirements and is presented in Table 6.1. Note the costs were based on third party construction costs. The Owner may elect to stockpile cover materials in exchange for closure funds and would inventory stockpiled materials for each annual report.

TABLE 6.1
OPINION OF PROBABLE COSTS FOR CLOSURE AND POST-CLOSURE

CLOSURE COSTS				
Description	**Unit**	**Quantity**	**Unit Cost**	**Total**
Old Cell North Face Closure - Closed				
Closed			**Subtotal**	**$0.00**
Old Cell East and South Face Closure - Closed				
Closed			**Subtotal**	**$0.00**
New Lined Cell				
Evapotranspiration	CY	29,000	$2.25	$65,250
Revegetation	AC	6.0	$1,500	$9,000
Construction Management & QA/QC	LS	1.0	$30,000	$30,000
			Subtotal	**$104,250**
Old Cell West Face Closure				
Fill Material (Lower due to access road)	CY	35,926	$2.25	$80,334
Cell Cover Preparation	AC	3.0	$1,500.00	$4,500
Vegetative Soil Cover 6"	CY	2,420.0	$2.25	$5,445
Cover (C&D 18" Cover)	CY	7,260.0	$2.25	$16,335
Revegetation	AC	3.0	$1,500.00	$4,500
Construction Management & QA/QC Testing	LS	1.0	$30,000.00	$30,000
			Subtotal	**$141,614**
Completed Cell				
Evapotranspiration Cover	CY	29,040	$2.25	$65,340
Revegetation	AC	6.0	$1,500	$9,000
Construction Management & QA/QC Testing	LS	1.0	$30,000.00	$30,000.00
			Subtotal	**$104,340**
Post-Closure				
Gas Monitoring	YR	30.0	$8,000	$240,000
Groundwater Monitoring	YR	30.0	$1,600	$48,000
Quarterly Monitoring	YR	30.0	$1,200	$36,000
Erosion Control	YR	30.0	$2,000	$60,000
			Subtotal	**$384,000**
SUMMARY				
Old Cell North Face Closure – Closed				$0.00
Old Cell East and South Face Closure - Closed				$0.00
New Lined Cell				$104,250
Old Cell West Face Closure				$141,614
Completed Cell				$104,340
Post-Closure				$384,000
			Total	**$734,204**

6.5 POST-CLOSURE MAINTENANCE

Closure of the Class I Landfill would be as follows: The disposal modules are designed to eliminate infiltration through the cover to prevent the generation of leachate. This was accomplished by promoting drainage and evapotranspiration from the cover, and by preventing percolation of precipitation into the disposal area. The proposed final cover for the Class I modules would consist of 1 meter of blow sand obtained onsite.

The waste surface would be prepared so as to be free of irregularities, protrusions, vegetation, excessive water, loose soil or abrupt changes in grade. The cover material would be compacted to 85% max dry density per ASHTO T-99 and re-vegetated. Drainage channels would be constructed around the cell as indicated by the drawings to help prevent erosion and divert any run-on and run-off in a controlled manor. Berms would be placed and used as needed.

Post-closure care would be conducted in accordance with this Post-Closure Plan. The schedule for post-closure activities would begin on the date of completion of closure of the disposal cell and continue for 30 years, or until the Executive Secretary determined that the disposal unit had become stabilized and human health and the environment were sufficiently protected. The Owner would initiate post-closure activities within six months following completion of closure. Table 6.2 lists a monitoring and inspection schedule for post-closure care.

TABLE 6.2
POST-CLOSURE MONITORING AND INSPECTION SCHEDULE

Task	Schedule
Landfill Gas	Quarterly
Groundwater	Semiannually
Run-on/Run-off	Quarterly
Leachate Collection System	Quarterly
Cover Erosion	Quarterly
Settlement	Quarterly
Fencing	Quarterly
Vegetation	Quarterly

In the event that significant settlement occurred within the closed landfill, the area would be surveyed and additional soil would be obtained from the site and placed in a manner to preserve the design finish grade. Any such soil placed on the unit would be re-vegetated. Post-closure activities would be financed as outlined in the Financial Assurance Plan. Post-closure care and monitoring would be completed, as determined by the Executive Secretary, when either the 30 year post-closure period was complete, or the unit had stabilized. Upon completion of post-closure care, a post-closure period certificate would be submitted to the Executive Secretary signed by the Owner or Operator.

Closure of the Class IV Landfill would be as follows: the disposal cell was designed to eliminate infiltration through the cover to prevent the generation of leachate. This was accomplished by promoting drainage and evapotranspiration from the cover, and by preventing percolation of precipitation into the disposal cell. The proposed final cover would consist of twenty-four inches of site soils according to the Utah Solid Waste Permitting and Management Rules, R315-303-3(4). This rule states that the standard cover design shall consist of:

> *a layer to minimize infiltration, consisting of at least 18 inches of compacted soil, or equivalent, with a permeability of 1 X10 -5 cm/sec or less, or equivalent, shall be placed upon the final lifts.*
>
> *a layer to minimize erosion, consisting of at least 6 inches of soil capable of sustaining vegetative growth placed over the compacted soil cover and seeded with grass, or other shallow rooted vegetation or other native vegetation; or other suitable material, approved by the Executive Secretary.*

The cover material would be compacted to 85% max dry density per ASHTO T-99 and re-vegetated. Drainage channels would be constructed around the cell as indicated by the drawings to help prevent erosion and divert any run-on and run-off in a controlled manor. Berms would be placed and used as needed.