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Division of Solid & Hazardous Waste
Utah Department of Environmental Quality

**APPLICATION
CLASS I PERMIT RENEWAL**

**KLONDIKE LANDFILL
Grand County, Utah**

April 2002

Prepared by

**Grand County Solid Waste Management Special Service District #1
1000 East Sand Flats Road
Post Office Box 980
Moab UT 84532**

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PART I. – GENERAL INFORMATION.

**UTAH DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF SOLID AND HAZARDOUS WASTE**

APPLICATION FOR A PERMIT TO OPERATE A CLASS I OR CLASS V LANDFILL

The applicant shall submit, in duplicate, an original permit application, a general report, and a technical report to:

Dennis R. Downs, Director
Division of Solid and Hazardous Waste
Utah Department of Environmental Quality
PO Box 144880
Salt Lake City, Utah 84114 - 4880

PART I - GENERAL INFORMATION

1. Name of Facility: Klondike Landfill
2. Site Location: S ½ of the NW ¼ of Section 14, Township 23 S, Range 19 E, Salt Lake Base and Meridian; 20 miles northwest of Moab, Grand County, approximately 1.2 miles west of Highway 191
3. Facility Owner: Grand County Solid Waste Management Special Service District #1
PO Box 980
Moab, Utah 84532
4. Facility Operator: Grand County Solid Waste Management Special Service District #1
5. Contact Person: Jane S. Jones, District Manager
Grand County Solid Waste Management Special Service District #1
P. O. Box 980
Moab Utah 84532
(435) 259-3867
6. Type of Facility: Class I Landfill
7. Type of Application: Permit Renewal, Original Permit Number 9509
8. Property Ownership: Presently Owned by Applicant

9. Certification of Submitted Information.

Jane S. Jones
Jane S. Jones

Jane S. Jones
District Manager

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

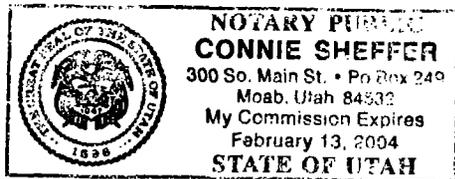
Signature: Jane S. Jones Date 4/26/01

SUBSCRIBED AND SWORN to before me this 26 day of April, 2001.

My commission expires on the 23 day of Feb, 20 04.

Connie Sheffer ut
Notary Public in and for

(SEAL) Moab County, Utah.



PART II - GENERAL REPORT

SECTION 1 GENERAL DATA

1.1 GENERAL FACILITY DESCRIPTION

The Grand County Landfill site, also known as the Klondike Landfill, is located 20 miles northwest of Moab, Utah, and approximately 1.2 miles west of Highway 191. The site can be reached by traveling north on Highway 191 to a turnoff on the west side of the highway at the AT&T microwave communications tower. The County-improved gravel road continues about 1.2 miles to the site (see Appendix B for site location map). The District has provided an improved road from the County road into the landfill site.

Elevations at the site range from 4,600 feet at the west quarter corner of Section 14 to 4,800 feet in the northeast quarter of the same section. The site slopes gently to the southwest at about 200 feet per mile, or 4 percent. The general slope is broken locally by resistant siltstone beds that stand somewhat higher than the more easily weathered shale bedrock. Vegetation on the site is limited to sparse grasses and low-lying sagebrush.

No permanent structures are currently planned for the landfill; however, the District may develop buildings to house the Landfill Attendant or maintenance facilities in the future. Facility plans showing the site location, permanent roads, and cell placement are provided in Appendix C.

1.1.1 Background

Because the quantities of Grand County waste warrant disposal in a Class I facility, the District authorized a feasibility study in early 1994. That study considered:

1. Retrofitting the current landfill located on the outskirts of Moab, Utah, to meet State of Utah Class I solid waste disposal facility criteria;

2. Transporting the County's waste to a commercial facility in East Carbon;
3. Permitting and constructing a Class I facility at Blue Hill in San Juan County adjacent to Grand County; and
4. Permitting and constructing a Class I facility at Klondike Flats in Grand County.

After considering the alternatives and their ramifications, the District concluded that Option #4, constructing a Class I Landfill at Klondike Flats in Grand County, was the preferred action.

1.2 AREA SERVED

The service area for the Klondike Landfill is comprised of one significant population center (Moab, Utah), several small-sized communities (Thompson, Castle Valley, Crescent Junction, and Cisco), and various ranching, agricultural, and recreational properties. The total population of these areas is approximately 7,000 people (1995 estimate).

Current trends in Grand County indicate increased recreational visitation and immigration. As summarized in Table I, the proposed 80-acre landfill site will provide waste disposal capacity for 50 to 100 years, depending on the rate of long term population change (see Appendix A for more detail.)

1.3 WASTE TYPES

Wastes that will be accepted in the Landfill include residential, commercial, yard, and farm wastes. Hazardous and other prohibited wastes will not be accepted at the Landfill. Industrial use in the area is extremely limited.

The District conducted a waste generation study at the Moab City Landfill between August 1993 and May 1994. The results show that Grand County produces an average of

37.5 tons of solid waste per day. Table 2 shows the total amount of waste, categorized by waste type, generated between August 17, 1993 and February 16, 1994.

Table 1
Projected Landfill Acreage

Period	Zero Percent Growth	2.5 Percent Growth
50 Years	20 acres	48.5 acres
100 Years	48.5 acres	184 acres

Assumptions:

1994 solid waste generation = 25 tons per day, not including recycled materials and C&D wastes

Minimum growth rate = 0%

Maximum growth rate = 2.5%

Planning period of 50 and 100 years

Table 2
Waste Generation Survey

Type of Waste (tons)	Source						Total by Type (tons)
	Bob	City Res	Contrctr	Cnty Res	Govt	Fed	
Commercial	1211.6	211.2	56.3	64.8	10.8	2.8	1557.5
Construction	495.1	187.9	810.5	124.8	298.8	39.7	1956.8
Household	1715.9	127.7	1.9	240.4	10.5	3.0	2099.4
Sludge/Carcass	10.6	4.4	1.0	29.8	7.4	5.2	58.4
Yard/Farm	18.2	270.7	91.4	214.4	407.3	49.9	1051.0
TOTALS	3451.4	801.9	961.1	674.2	734.8	99.7	6723.1

Where: Bob = Bob's Sanitation, City Res = Moab City residents, Contrtr = Contractor, Cnty Res = Grand County residents, Govt = City, County, and State government agencies, Fed = Federal government agencies.

SECTION 2
SOLID WASTE MANAGEMENT

During 1992, Grand County contracted with Beehive Enterprises in Panguitch, Utah, to conduct the studies necessary to produce a Solid Waste Management Plan (SWMP). The SWMP was developed in response to Senate Bill 255 to address county-wide planning for solid waste disposal over the next 20-year period.

Copies of this SWMP were submitted to the Utah Division of Solid and Hazardous Waste on June 22, 1993. Activities discussed in this permit application are consistent with the SWMP.

SECTION 3
LEGAL DESCRIPTION

The Klondike Landfill consists of the following parcels:

S ½ of the NW ¼ of Section 14, T 23 S, R 19 E as shown on the Valley City Quadrangle, 7.5 Minute Series (Topographic) (U.S. Geological Survey; Provisional Edition, 1991). The District has acquired these parcels from the Bureau of Land Management.

SECTION 4
OPERATIONS PLAN

The plan of Operation required by UAC 315-302-2(2) is contained in an Operator's Manual and is included in this permit application as Appendix D.

SECTION 5

RECORDS

As specified in section UAC 315-302-2(3) of the Administrative Rules, the District will maintain on-site, at their offices, or at another location approved by the UDEQ the following permanent records:

- Daily logs.
- Deviations from the approved plan of operation.
- Training and notification procedures.
- Gas monitoring results.
- Inspection logs.
- Documentation of groundwater exemption.
- Closure and post-closure care plans.
- Cost estimates and financial assurance documentation.
- Weights or volumes (maybe estimated), number of vehicles entering and, if available, the types of waste received each day.
- Design documentation for the placement or recirculation of leachate or gas condensate into the landfill.

SECTION 6
FINANCIAL ASSURANCE PLAN

6.1 **COST ESTIMATE FOR CLOSURE AND POST-CLOSURE CARE**

Appendix E presents estimates of the costs for closure and post-closure care of the Klondike landfill. These cost estimates were calculated using UDEQ spreadsheets developed for this purpose.

6.2 **FINANCIAL CAPABILITIES**

The District has established a closure/post-closure fund to finance future closure and post-closure activities using monies collected from the landfill users. Over a period of years, this fund will grow to provide funds sufficient to meet the closure and post-closure cost estimates. However, these funds will not be fully available within the period of this permit application.

6.3 **PROPOSED FINANCIAL ASSURANCE MECHANISM**

To meet its Financial Assurance requirements during the initial 5 years of the Permit, the District proposes to use a Governmental Guarantee to supplement the monies available in its closure/post-closure fund. Grand County and the City of Moab have agreed to guarantee closure and post-closure funding until the District's fund is sufficient to guarantee these activities. Documentation on the agreements among the County, City, and District are also presented in Appendix E, together with documentation that the County and City meet the Financial Test requirements of the Governmental Guarantee.

SECTION 7
CLOSURE PLAN

Landfill closure will be supervised by a State of Utah registered professional engineer. The registered engineer will be employed by the District, or will be a District-hired contractor. This section describes the final cover construction, site capacity, schedule of closure implementation, estimated costs for closure, and final inspection procedures for the existing and new expansion cells of the Klondike Landfill.

7.1 FINAL COVER INSTALLATION

7.1.1 Cover Design

The preliminary design of the capping system for both currently active cells and future cells has been completed. Final design of the capping system for new cells will be prepared prior to closure of the facility, which is not expected to occur during the current 5-year permit. The previously permitted preliminary cap design was a capillary barrier. Because of the high cost of the capillary barrier cap, and UDEQ's request to readdress its justification as an alternative final cover, the capping system for the landfill has been changed to a modified form of the final cover described in UAC 315-303-3 (4).

The capping system is described in Section 5.2 of Part III of this permit, cost estimates are contained in Appendix E, and the justification of the cap is in Appendix K. The capping system is designed to control the emission of gas, promote the establishment of vegetative cover, minimize infiltration and percolation of water into the waste, and prevent erosion of the waste throughout the post-closure care period.

The capping system will be constructed when one or more phases of the landfill have reached final elevations, and when closure will not impede future operations in adjacent phases.

7.1.2 Seeding

Early establishment of vegetation on the landfill's final slope surface will impede soil erosion and promote evapotranspiration. The District will periodically evaluate vegetative growth, vigor, and color so that the integrity of the final cover system is maintained. If stress signs on vegetation caused by landfill gas and leachate seeps are noted, the problem will be corrected. Corrective procedures will be conducted based on current design recommendations and will be built consistent with construction specifications.

The District will inspect the vegetative cover monthly during active filling on the site, and quarterly following final closure of all phases of the landfill. District staff or a licensed landscape contractor will make repairs.

7.1.3 Landscaping

The landfill facility, including all surrounding grounds, will be maintained in conjunction with any scheduled maintenance activities (i.e., vegetative control, road improvements, etc.). The landscape of the landfill will be designed to be both functional and aesthetically pleasing.

7.1.4 Contouring

The landfill's final grades will be inspected and maintained in order to ensure its integrity. Evaluation and inspection of the landfill final grades will include the items specified in Section 7.1.1.

Areas where water has collected (ponded) will be regraded. Erosion damage resulting from extremely heavy rainfall will be repaired. District staff will inspect and maintain the final grading on a quarterly basis.

7.2 SITE CAPACITY

Standard engineering calculations for the volume or capacity of landfill cells assume that daily and intermediate cover require approximately 20 percent of the air space landfill, and that each cubic yard placed and compacted in the landfill will contain 1,000 pounds of wastes. Grand County currently disposes of approximately 25 tons per day of solid waste, not including C&D and recycled wastes. The facility has approximately 25 acres of disposal capacity in the first 40 acre parcel planned for development into landfill, and more than 48 years of useful life, based on current disposal rates, in Phases 1 through 6 as described in the drawings in Appendix C. The first phase was filled level in approximately 2.5 years. Each of the remaining phases will be active for approximately 9-11 years. The site will have additional capacity as additional phases are planned in the second 40-acre parcel, this additional capacity is expected to extend the useful life of the landfill site by 30 to 60 years beyond the life of the currently planned phases, giving the total site an expected life of 60 to 90 years.

7.3 CLOSURE SCHEDULE

Closure activities, consisting of constructing the final cover and permanent drainage facilities, will be implemented periodically as areas of the landfill are filled to final grade. A Work Sequence Plan is included in the Klondike Landfill drawings in Appendix C.

7.4 **CLOSURE COST ESTIMATES**

Section 6 of this permit application, Financial Assurance Plan, discusses the cost estimates prepared for proper closure of the landfill.

7.5 **FINAL INSPECTION PROCEDURES**

Upon final closure, the District will submit to the Executive Secretary the following:

Facility or unit closure plan sheets signed by a professional engineer registered in the State of Utah and modified as necessary to represent as-built changes to final closure construction as approved in the closure plan; and

Certification by the District and a professional engineer registered in the State of Utah that the site or unit has been closed in accordance with the approved closure plan.

SECTION 8
POST-CLOSURE CARE PLAN

Post-closure care for the Landfill will consist of long-term maintenance of the closure cap and long-term sampling of the gas monitoring grid to ensure that the landfill cell has been closed in accordance with regulations.

This care period will be 30 years unless unexpected environmental contamination or continued subsidence occurs.

8.1 MONITORING AND MAINTENANCE

The following subsections offer a description of the monitoring program, which includes ground water monitoring systems, and leachate and gas collection and systems.

8.1.1 Ground Water

Ground water is not currently monitored at any points inside or outside the limits of the proposed landfill. Based on the Recreational and Public Purpose Report to the Bureau of Land Management (November, 1994), the depth to ground water is unknown but greater than 503 feet below ground level (bgl). Due to the combination of the depth to ground water, arid climate, and underlying geology, ground water monitoring will not be conducted at the site.

If UDEQ requires ground water monitoring, Grand County shall implement a ground water monitoring program in conformance with UAC 315-308 of the Solid Waste Permitting and Management Rules. Ground-water monitoring wells shall be sampled semi-annually, at a minimum, for those parameters listed in Table I of the State of Utah regulations.

8.1.2 Surface Water

Although no surface water sampling activities are scheduled for the landfill, District staff will inspect the drainage system monthly. Temporary repairs will be made until permanent repairs can be scheduled. The District or a licensed general contractor will replace drainage facilities, if necessary.

8.1.3 Leachate Collection and Treatment

As illustrated on the landfill drawings in Appendix C, a leachate collection sump was installed in cell 1 of the landfill; they are not planned for future cells. This sump will be monitored monthly for the presence of leachate; the sumps will also be monitored for leachate within one week of intense storm events. The first time leachate is detected in the sump, it will be sampled and analyzed to determine if it is hazardous. Monthly monitoring of the sump for presence of leachate will continue, and leachate will be sampled and analyzed annually thereafter.

Any leachate, whether determined to be hazardous or non-hazardous, will be pumped from the sump and will be transported to an approved facility for disposal.

Records of monitoring results, analytical results, leachate quantity pumped from the landfill, and ultimate disposition will be maintained in the operating record.

8.1.4 Landfill Gas

The decomposition of solid waste produces methane, a potentially explosive gas. The accumulation of methane in municipal solid waste landfill facility (MSWLF) structures can result in fire and explosions that can injure or kill employees, users of the landfill,

and occupants of nearby structures. Due to the arid climate, very little decomposition of the waste is expected and, therefore, very little methane produced as a byproduct.

No off-site buildings exist near the Klondike Landfill. The nearest building, the AT&T radio tower building, is located approximately 3,000 feet east of the landfill, and migration to this building is not expected based on the local geological conditions.

No on-site buildings are currently planned, however, the District may develop buildings to house the Landfill Attendant or maintenance facilities in the future. Any future on-site buildings will be designed with active or passive methane protection, as appropriate.

Utah Administrative Rules require the implementation of a routine monitoring program that is based on site-specific geology and facilities and/or list site-specific criteria that control the rate and extent of gas migration. These criteria should be considered in determining the type and frequency of monitoring (which in some instances, may be more than quarterly). These factors include soil conditions, hydrogeological conditions surround the site, hydraulic conditions surrounding the disposal site, and the location of facility structures relative to property boundaries.

In compliance with Utah Administrative Rules, which require the District to monitor for gas at least quarterly to ensure methane control, the landfill will be monitored using a hand held probe. In addition, if methane exceeds the specified limits, the District must immediately notify UDEQ of the level detected and take steps to protect human health. The District must implement a remediation plan to UDEQ within 60 days of the discovery of exceedance of methane limits.

District landfill personnel will be responsible for the inspection of all methane gas monitoring stations and facility landmarks. Such inspections shall involve searching for vegetation suspected of being affected by landfill gas(es). In the event that yellowing or dead vegetation is noted or the gas monitoring program indicates that explosive gases are

leaving the site, additional assessments will need to be undertaken to determine the quantity and extent of landfill gas migration. In the event of suspected gas migration, documentation of the incident will be placed in the operating record.

In addition to visual inspections of the facility, District landfill personnel shall conduct routine methane gas monitoring utilizing portable combustible gas indicators (e.g., Lumidor). In the event that readings are obtained that exceed the lower explosive limit (LEL) or the 25 percent of the LEL, the District shall notify UDEQ immediately and undertake corrective actions.

The concentration of methane gas generated by the landfill must not exceed 25 Percent of the LEL for methane in the facility structures (excluding gas control or recovery system components). The concentration of methane gas generated by the landfill must not exceed the LEL for methane at the facility boundary.

The location of site boundaries are illustrated in the Klondike Landfill drawings included as Appendix C.

8.2 MAINTENANCE PROGRAM

The following subsections offer a description of the maintenance of installed equipment including ground-water monitoring systems, and leachate and gas collection systems.

8.2.1 Ground Water

A groundwater monitoring system is not planned for the landfill. The site's geology, and its extremely arid climate are consistent with an exemption from groundwater monitoring.

All future groundwater monitoring wells, if deemed necessary, will be inspected for signs of failure or deterioration during each sampling event. If damage is discovered, the nature and extent of the problem will be recorded. A decision will be made to replace or repair the well. Possible repairs include redevelopment, chemical treatment, partial casing replacement or repair, sealing the annulus, or pumping and testing. If a well needs to be replaced, it will be properly decommissioned. Damaged wells will be scheduled for repair or replacement within 1 month after the damage is identified.

8.2.2 Surface Water

Drainage control problems can result in accelerated erosion of a particular area within the landfill. Differential settlement of drainage control structures can limit their usefulness and may result in a failure to properly direct stormwater off the site.

Implementation of a post-closure maintenance program will maintain the integrity of the final drainage system throughout the post-closure maintenance period. The final surface water drainage system will be routinely evaluated and inspected for ponded water, and blockage of and damage to drainage structures and swales. Where erosion problems are noted or drainage control structures need repair, proper maintenance procedures will be implemented as soon as site conditions permit so that further damage is prevented. Damaged drainage pipes and broken ditch linings will be removed.

District staff will inspect the drainage system monthly during active landfilling on the site, and quarterly following closure of the landfill. Temporary repairs will be made until permanent repairs can be scheduled. The District or a licensed general contractor will replace drainage facilities.

8.2.3 Leachate Collection

The leachate control and recovery system must be maintained so that it operates during the post-closure maintenance period. The system will be inspected quarterly by District staff for signs of deterioration. Needed repairs will be made by the District or a licensed contractor.

8.2.4 Landfill Gas

A landfill gas monitoring system is not included as part of the design for the Klondike Landfill. However, if in the future UDEQ requires a landfill gas collection and treatment, the landfill gas system will be inspected quarterly in conjunction with the scheduled monitoring tasks. The system will be repaired and parts replaced as required to maintain system capabilities. The program described previously for inspecting and maintaining the gas monitoring system will be followed during the post-closure maintenance period.

The landfill gas monitoring system will be inspected quarterly. Quarterly maintenance will include cutting weeds in a 2-foot radius around each monitoring location.

8.2.5 Facility and Facility Structures

The location of leachate and surface water management facilities are shown on the drawings included in Appendix C. The leachate facilities will consist of underground piping and sumps. The piping will transmit the leachate in cell 1 to the collection sump. The piping will be constructed and tested to meet sanitary sewer specifications for leakage control.

The stormwater management facilities will consist of surface water ditches and a detention pond. The surface water ditches will transmit stormwater from the vicinity of the landfill to the retention pond (Sheets 2 and 3, Appendix C). The retention pond will

allow settlement of sediments contained in the stormwater run off, and will discharge by overflow into intermittent streams south of the landfill site. Water in the stormwater retention pond will be tested annually for contaminants which may originate from the landfill.

8.2.6 Cover and Run-on/Run-off Systems

The final grades and capping system will incorporate features to manage stormwater, minimize erosion, and provide for efficient removal of stormwater collected in the drainage layer. Sheets 4 through 6 of the drawings provided in Appendix C show proposed final grades and Sheets 2 and 3 illustrate the extent of stormwater collection and surface water and erosions control systems on the surface of the cap.

Stormwater which percolates through the topsoil and vegetative layer will be impeded from further downward percolation, and will be stored in the vegetative layer until the next growing season. This percolate is not expected to reappear in surface drainage facilities.

Placement of all permanent drainage facilities will be completed during, or immediately following, installation of the final soil cover. Permanent drainage facilities, as shown on Drawings 2 and 3 (Appendix C), were designed to provide adequate drainage after settlement of the fill area(s).

8.3 SCHEDULE OF POST-CLOSURE ACTIVITIES

Post-closure activities, consisting of monitoring and maintaining the final cover and permanent drainage facilities, will be implemented periodically as areas of the landfill are filled to final grade. A Work Sequence Plan is included in the Klondike Landfill Permit drawings in Appendix C.

8.4

POST-CLOSURE COSTS

The District has developed a financial assurance plan for closure and post-closure of the landfill. A summary of this plan is included in Section 6.

SECTION 9
LAND TITLE, LAND USE, AND ZONING RESTRICTIONS

The District will notify the Grand County Recorder's Office at any such time when there is a change to the Record of Title, land use plan, or zoning restrictions. In addition, the District will notify the Recorder at that time when the post-closure care period has expired and has been accepted by the State.

PART III.—TECHNICAL AND ENGINEERING REPORT

SECTION 1
MAPS AND DRAWINGS

Appendix C (Sheet 2 of 6) contains a topographic map of the landfill unit drawn to a scale of 200 feet.

Appendix B contains a copy of the most recent United States Geological Survey (USGS) Topographic Map. The boundaries of the property are shown on this map. Appendix C presents the engineering drawings for the Landfill. These plans were prepared under the supervision of a Professional Engineer registered in the State of Utah.

SECTION 2 GEOHYDROLOGICAL EVALUATION

2.1 STRATIGRAPHY

The Klondike Landfill site is founded on the Upper Member of the Mancos Shale, overlain by varying thicknesses of residual clay soils and alluvial sand. Bedrock bedding surfaces dip gently (7 degrees) to the southwest, away from a resistant ridge of Ferron Sandstone that underlies the Upper Member of the Mancos Shale and borders the landfill site on the east.

The following fossils were recovered from test pits in the Mancos Shale at the Klondike Landfill site north of Moab, Utah:

Ammonites

Gastrolites sp.
Clioscaphtes vermiformis
Scaphites warreni
Baculites sweetgrassensi

Pelecypods

Gryphaea newberryi
Inoceramus labiatus

These fossils are characteristic of the Mancos Shale. More specifically, these fossils suggest a Turonian (early Late Cretaceous) age equivalent to the age of the uppermost part of the Tununk (lower) Member of the Mancos Shale.

Where exposed at the surface, Mancos Shale bedrock at the landfill site is undergoing active weathering and erosion.

2.2

INSTABILITY AND SEISMICITY

The Klondike Landfill is not adjacent to geologic features that could compromise the structural integrity of the facility. The landfill is not located in a subsidence area, a dam failure flood area, an underground mine, a salt dome, or a salt bed.

2.2.1

Fault Areas

The Klondike Landfill is not located within 200 feet of a Holocene fault. Suzanne Hecker (1993) located the closest probable Holocene fault activity along the Salt Valley graben, approximately 3 miles northeast of the site.

2.2.2

Seismic Impact Zones

Based on a site-specific hazard query (U.S. Geological Survey Web Page, 2002), the Klondike Landfill is located in an area where there is a 2% probability that ground accelerations will exceed 0.108 in a 50-year period (or, equivalently, there is a 10% probability of exceedance in 250 years). This estimate of potential seismic activity reflects changes in prediction modeling methodology that took place over the past three or four years since Klondike Landfill was opened. Based on this estimate, Klondike Landfill (and all of Grand County) is now considered to be within a Seismic Impact Zone. Klondike Landfill is located in the portion of Grand County where the lowest potential ground accelerations are predicted to occur (see map in Appendix G).

All containment structures at the Klondike Landfill will be designed to resist the maximum probably horizontal acceleration in lithified earth material for the site (0.06 g).

2.2.3 Unstable Areas

Engineering measures will be incorporated into the facility design to ensure that the integrity of the structural components of the facility will not be disrupted. Information discussed in the following sub-paragraphs has been considered to demonstrate that the site is stable.

2.2.3.1 On-Site or Local Soil Conditions

The Landfill site is founded on the Upper Member of the Mancos Shale, overlain by varying thicknesses of residual clay soils and alluvial sand.

Where exposed at the surface, Mancos Shale bedrock at the landfill site is undergoing active weathering and erosion. Soils formed on the Mancos are poorly developed residual silty clays, less than five feet thick. Soils on the Mancos Shale have been described by McGregor (1985):

Rs – Residuum from shale. Gray to grayish brown silty clay derived from underlying Mancos Shale. Contains sodium slats and gypsum that inhibit plant growth. The silty clays undergo hydration and dehydration with changes in humidity and moisture content and the particles of sediment swell and contract which contributes to the weathering process. The mixed-layer clay in the residuum allows only slight penetration of water below the surface and forces much precipitation to run off. During heavy rains, the residuum surfaces are impassable to vehicles due to formation of mud, although the material may be dry a few centimeters below. The surface generally dries out within a few hours after a drenching rainstorm. As an engineering unit the residuum is considered troublesome because of moderate to high shrink-swell potential, moderate to high susceptibility to erosion on slopes, low permeability, high salinity and high pH.

Commonly a thin veneer overlying shale. Generally not more than two meters thick.

The Mancos Shale is overlain locally at the Klondike Landfill by less than 2 to 9 feet of silty, gypsiferous alluvial sand. The sand is light brown to brown and massively to crudely bedded. Layers of sand are unconsolidated (loose) to moderately cemented with gypsum (calcium sulfate) and caliche (calcium carbonate).

SECTION 3 HYDROLOGY

3.1 SURFACE WATER

No permanent impoundments of surface water or perennial streams are present within a 1-mile radius of the site.

3.2 PUBLIC WATER SYSTEMS OR SURFACE IMPOUNDMENTS

No public water systems or impoundments are present at the landfill site. The land utilized by the landfill is not part of a watershed utilized for municipal drinking water, nor is it in a location that could cause contamination to a potable lake, reservoir, or pond.

3.3 SURFACE WATER RIGHTS

Water rights files of the Utah Division of Water Rights for section 14 and all eight sections surrounding the landfill were studied. No surface water rights have been claimed for surface waters at the site or within a 2,000-foot radius of the site.

The U. S. Bureau of Land Management has claimed water from intermittent streams for a stock-watering pond in section 22, T 23 S, R 19 E. The location is approximately 1-mile southwest of the center of section 14.

3.4 FLOODPLAINS

The Klondike Landfill site is not situated in a floodplain. However, minor intermittent drainages tributary to Tenmile Canyon cross the site. The drainage area of the intermittent streams is very limited: the northwest to southeast trending ridgeline of Ferron Sandstone along the east edge of section 14 is the eastern drainage divide.

Runoff from rainfall landing east of the ridge line flows northeasterly, away from the Landfill site, towards U. S. Highway 191. Any runoff that does not evaporate is then deflected to the northwest by the highway fill.

Runoff from rainfall landing in the northeast quarter of section 14, west of the Ferron Sandstone ridge, flows southwesterly towards the Landfill site. Runoff that does not evaporate can accumulate in an intermittent wash that crosses the center of section 14 from northeast to southwest.

3.5 WETLANDS

The Klondike Landfill site is not situated in a wetland.

3.6 GROUND WATER

The Upper Member of the Mancos Shale is that portion of the Mancos Shale that occurs at the surface and/or directly underlies sandy soils at the Klondike Landfill site. Usable quantities of potable quality ground water are rare in the Upper Member of the Mancos Shale.

The Upper Member is underlain by the Ferron Sandstone Member of the Mancos Shale approximately 250 to 525 feet bgl at the Landfill site. The results of a testing boring (GCL #1) indicate that thin, fine-grained sandstones in the Ferron Sandstone member do not contain ground water under the Landfill site.

Geophysical logs from nearby exploratory oil wells have been utilized to establish the depth below ground to the Ferron Sandstone. Appendix H is a structural contour map showing the elevation of the Top of the Ferron Sandstone. Known well data points are shown at each well location, and elevations between data points are interpolated.

Appendix H presents a map showing the estimated thickness of Upper Member shales above the Ferron Sandstone. This map was prepared by calculating the difference between elevations shown on the Top Ferron Sandstone structural contour map and ground surface elevations taken from published topographic maps.

For example, the elevation of the Ferron Sandstone at test boring GCL #1 near the west quarter of section 14 is approximately 4,370 feet above sea level. The Valley City, Utah topographic map shows that the ground level elevation at GCL #1 is about 4,625 feet. The difference between the two elevations is 255 feet, the approximate thickness of Upper Member shale above the Ferron Sandstone at the site of the test boring.

A cross section of the geology beneath the landfill site (Appendix H) also shows the depth to Ferron Sandstone at the site. The cross section was constructed by reference to surface topography, geologic materials exposed at the surface and geophysical logs from the nearest exploratory oil well, and the log of the test boring (GCL #1).

3.7 GROUND WATER RIGHTS

Water rights files of the Utah Division of Water Rights for section 14 and all eight sections surrounding the landfill were studied. One point of diversion has been constructed in the northwest quarter of section 13, T 23 S, R 19 E for American Telephone and Telegraph (AT&T).

3.8 STATIC WATER LEVELS

Based on the Recreational and Public Purpose Report for the BLM (November, 1994), the depth to ground water is unknown but greater than 503 feet bgl.

No other data points are available near the Landfill site for water levels. However, river channels in the deep canyons of the Green and Colorado rivers west and south of the site

are at elevations of approximately 4,000 feet. Ground water is most likely to flow with a gentle southwestwardly gradient from the Landfill site towards the canyons.

3.9 GROUND WATER CHEMISTRY

Water from the AT&T well was sampled on June 21, 1994. A complete culinary analysis was completed by the Southern Utah University water laboratory. Total dissolved solids (TDS) concentration was 2,600 milligrams per liter (mg/l), exceeding Utah's Secondary Limit for Drinking Water Standards by 2,100 mg/l.

Other constituents exceeding Utah's Secondary Limit for Drinking Water Standards included chloride, sulfate and pH. The analytical data for water from the AT&T well is included as Table 3 of this report.

3.10 SOLE SOURCE AQUIFERS

The Klondike Landfill is not underlain by a Sole Source Aquifer.

3.11 GROUND WATER CLASSIFICATION

Revised Administrative Rules for Ground Water Quality Protection have been promulgated by the UDEQ, Division of Water Quality, effective date: April 15, 1994. The new rules suggest that water in the nearby AT&T well would be classified as Class III: Limited Use Ground Water. Class III ground water has one or both of the following characteristics:

- A) TDS greater than 3,000 mg/l and less than 10,000 mg/l, or;
- B) One or more contaminants that exceed the ground water quality standards listed in Table 3 (of the April 15 1994 Rule).

Water from the AT&T well has pH of 10.5, exceeding the ground water quality standard of 6.5-8.5 listed in Table 3.

Table 3

Water Analysis
 Klondike Landfill Site
 AT&T Microwave Tower Well

Date Sampled: 6/21/94

Date Sampled	Units mg/ ^R
Alkalinity as CaCO ₃	343.000
Bicarbonate as CaCO ₃	258.000
Calcium, dissolved	1.600
Carbonate as CaCO ₃	557.000
Chloride	651.000
Hardness as CaCO ₃	5.200
Iron	0.23
Magnesium, Dissolved	<1.0
Nitrate/Nitrite, Dissolved	0.020 (by addition)
Nitrite as N, Dissolved	<.02
Nitrate as N, Dissolved	0.020
Potassium, Dissolved	2.600
SAR in Water	ND
Sodium, Dissolved	914.000
Sulfate	767.000
Cations (SUM)	ND
Anions (SUM)	ND
Cation/Anion Balance	ND
Solids, Total Dissolved	2600.000
Antimony, Total	ND
Arsenic, Total	0.001
Barium, Total	<0.100
Beryllium, Total	ND
Cadmium, Total	<0.002
Chromium, Total	<0.01
Cobalt, Total	ND
Copper, Total	0.010
Lead, Total	<0.001
Nickel, Total	ND
Selenium, Total	0.004
Silver, Total	<0.005
Thallium, Total	ND
Vanadium, Total	ND
Zinc, Total	1.500
pH	10.500
Temperature F.	ND
Specific Conductance (mhos/cm)	3860

ND = Not Determined

3.12

WATER BALANCE

The Utah Climate Center at Utah State University maintains data on eight Utah Cooperative Climate Stations in Grand County. Table 4 summarized the data from these eight stations, as well as for the Green River Aviation station in Emery County.

The Cisco, Green River Aviation, and Thompson stations most nearly approximate the conditions at the Klondike Landfill site, since all three stations are also located on the Mancos Shale plains. These stations are located 300 feet lower, 500 feet lower, and 500 feet higher than the Klondike Landfill, respectively. Because it nestles against the Book Cliffs, and may experience high precipitation due to the much higher elevation of the cliffs, this Engineering Report uses the Thompson data in estimating climatic conditions.

Table 4.
Climatological Data for Grand County

Station	Period	Average Temperature	Average Precipitation	Evaporation
Arches	1980-92	56.8	8.92	67.71(53.95)*
Castleton	1963-78	50.2	13.63	(45.82)
Castle Valley	1978-92	53.9	11.50	(51.03)
Cisco	1852-67	51.7	7.11	(55.09)
Dewey	1967-92	53.3	8.62	(57.49)
Green River Aviation	1893-1992	51.9	6.51	54.89(55.86)
Harley Dome	1959-63	51.1	9.20	(51.64)
Moab	1893-1992	56.8	9.00	73.52(56.38)
Thompson	1948-92	52.8	9.19	(49.18)

*Values in parentheses are evapotranspiration calculations using temperature and wind data. Values not in parentheses are actual pan evaporation data.

SECTION 4 LOCATION STANDARDS

UDEQ has adopted specific locational restrictions that include the locational criteria specified in the federal Subtitle D regulations. The Utah location restrictions for municipal solid waste landfills are outlined below. Subtitle D criteria are highlighted with an asterisk (*).

1. Land Use Compatibility (R315-302-1 (2) (a))
 - Parks and protected areas
 - Ecologically and scientifically significant areas
 - Prime farmland
 - Dwellings and structures*
 - Airport runways*
 - Archeological sites
 - Land use planning or zoning

2. Geology (R315-302-1 (2) (b))
 - Fault areas*
 - Seismic impact zones*
 - Unstable areas*

3. Surface Water (R315-302-1 (2) (c))
 - Floodplains*
 - Wetlands*

4. Ground Water (R315-302-1 (2) (d))
 - Ground water/landfill separation
 - Sole source aquifer
 - Ground water quality
 - Source protection areas

The following sections present the State of Utah location restrictions and discuss the Klondike Landfill's compliance with those requirements.

4.1

LAND USE COMPATIBILITY

The facility meets all criteria outlined in the Utah Administrative Rules R315-302-1 (2) (a) as shown below. Documentation of the items listed below is found in Appendix I.

- The facility is not within 1,000 feet of a national, state or county park, monument, or recreation area; designated wilderness or wilderness study area; or wild and scenic river area.

Source: Ms. Mary Von Koch, Grand Resource Area, U.S. Bureau of Land Management, Moab, Utah. See letter dated September 20, 1994 from Tahoma Companies to Ms. Koch.

- The facility is not within an ecologically and scientifically significant natural area, including wildlife management areas and habitat for threatened or endangered species as designated pursuant to the Endangered Species Act of 1982.

Source: Messrs. Clark D. Johnson, Henry Maddox and Larry England, U.S. Fish and Wildlife Service, Salt Lake City, Utah. See letter dated September 20, 1994 from Tahoma Companies to Mr. Robert Williams of the U.S. Fish and Wildlife Service.

- The facility is not within farmland classified as “prime,” “unique,” or of “statewide importance” by the U.S. Department of Agriculture Soil Conservation Service under the Prime Farmland Protection Act.

Source: Mr. Kyle “Jake” Jacobson, Utah Department of Agriculture, Salt Lake City, Utah. See letter dated September 20, 1994 from Tahoma Companies to the Utah Department of Agriculture.

- The facility is not within one-quarter mile of:
 - (a) existing permanent dwellings, residential areas and other incompatible structures such as schools or churches.

Source: Field investigation by Gary F. Player, Principal Geologist, Tahoma Companies, Inc.

- (b) historic structures or properties listed or eligible to be listed in the State or National Register of Historic Places.

Source: Mr. James L. Dykmann, Compliance Archaeologist, Utah Division of State History; and the National Register of Historic Places for Utah, September

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27, 1993. See letter dated September 29, 1994 from Dykmann to Tahoma Companies.

- The facility is not within 10,000 feet of any airport runway end used by turbojet aircraft or within 5,000 feet of any airport runway end used only by piston-type aircraft.

Source: Mr. Phillip Ashbaker, Director, Utah Division of Aeronautics, Salt Lake City, Utah. See letter dated September 20, 1994 from Tahoma Companies to Mr. Ashbaker.

- The facility is not within an archaeological site that would violate Section R9-8-204.

Source: Mr. Jim Dykmann of the Utah State Historical Preservation Office, Salt Lake City, Utah. See letter dated September 29, 1994 from Dykmann to Tahoma Companies.

The facility is not within an area that is at variance with the Grand County land use plan or zoning requirements. The current zoning is I-1 (light industrial). This zoning allows use of the property as a landfill.

Source: Mr. Jeff Whitney, Grand County Building Inspector. The ordinance rezoning the Klondike Flats property is attached in Appendix I.

4.2 GEOLOGY

When originally permitted, the Klondike Landfill was not located within a Seismic Impact Zone according to the definition at that time. However, due to changes in prediction modeling methodology, the Klondike Landfill (and all of Grand County) is now considered to be within a Seismic Impact Zone. Since the landfill is exempt from liner and leachate requirements, this change is expected to create no significant issues involving containment structures or systems at the landfill.

The facility meets all other criteria outlined in UAC 315-302-1 (2) (b) as described in the following paragraphs.

- The Landfill is not located in a subsidence area, a dam failure flood area, an underground mine, a salt dome, a salt bed, or on or adjacent to geologic features that could compromise the structural integrity of the facility.
- The Landfill is not within:
 - Fault Areas. The landfill, including all currently planned expansions, is not located within 200 feet of a Holocene fault. Based on Utah Geological Survey records, no active faults have been recorded in this portion of Grand County.
 - Unstable Areas. The landfill, including all currently planned expansions, is not located within an unstable area as defined by the regulations.

4.3 SURFACE WATER AND WETLANDS

The facility meets all criteria outlined in UAC 315-302-1 (2) (c) and (d) as described in the following paragraphs.

- The Landfill, including all currently planned expansions, is not located in a public water system watershed, or a 100-year floodplain. No public water system watersheds exist in this portion of Grand County. The dry washes transecting the site may represent 100-year floodplains; however, these dry washes have been designed to flow around the landfill footprint.
- The Landfill, including all currently planned expansions, is not located in a wetland. No wetlands are indicated on the USGS Topographic Map, and the biologist contracted to screen the site for black-footed ferrets did not note any wetlands on the site.

4.4 GROUND WATER

The facility meets all criteria outlined in UAC 315-302-1 (2) (e) as described in the following paragraphs.

- The Landfill is not located at a site:
 - Where the bottom of the liner is less than five feet above the historical high level of ground water; or where the waste is less than ten feet above the historical level of groundwater for an unlined site.

Groundwater appears to be at a depth of greater than 500 feet at the site.

- Over a sole source aquifer as defined in 40 CFR 149.
- Over groundwater classed as IB under Section R317-6-3.3

The facility is located above an aquifer containing groundwater, which has a TDS content between 1,000 and 3,000 mg/l. However, this aquifer exceeds at least one secondary contaminant standard (pH), and is at a depth of greater than 50 feet below the bottom of the planned landfill. The District is requesting a waiver of groundwater monitoring requirements because of the great depth to, and quality of the uppermost aquifer.

4.5 CERTIFICATION

The analysis of the Landfill compliance with the location standards is certified exactly as written in this section, being Section 4.1 and its subsections, by a professional engineer registered in the State of Utah. No certifications other than exactly as written are expressed or implied in this permit application.

SECTION 5 ENGINEERING DESIGN

The following sections discuss individual components and details involved in the landfill construction and closure design.

5.1 GENERAL DAILY OPERATION

The filling operation is specified in the Operator's Manual and is provided as an appendix to this application (Appendix D). Progressive lift filling techniques will be utilized to raise the landfill to its rough grade elevation prior to closure.

The cover details for closing the landfill cells are described in Section 5.2 below.

5.2. SOURCES FOR DAILY AND FINAL COVER

5.2.1 Daily and Intermediate Soil Cover

Daily and intermediate cover in the landfill will originate from on-site sources. Usually, the cover and capping material will come from the excavation provided by the preparation of the next operating phase (cell).

The cover soils will be obtained from excavation of expansion areas of the landfill. Based upon the nature of soils in the landfill area, as well as laboratory testing of on-site soils, these soils will meet the specifications referenced in Utah regulations. (See Appendix F.)

5.2.2 Final Cover

The District will place final cover system on each phase within 180 days after waste disposal ceases in the final lift or as soon thereafter, weather permitting, as possible. The

final cover system will be a modification of the so-called “prescriptive cap” described in UAC 315-303-3 (4), with 24 inches of compacted native soil added to the 18 inches described, to provide additional frost protection. The cover will consist of the following layers (from the bottom to the top):

- Six inches of daily cover or 12 inches of intermediate cover placed over the refuse.
- A layer of 36 inches of compacted native soil.
- At least 6 inches of soil capable of sustaining vegetative growth and seeded with native grasses and forbes.

This engineered final cover system will prevent migration of rain and snow melt water into the wastes following closure of each cell. Appendix K describes the process used in developing this design.

5.3 SOURCES FOR SOIL LINERS

The first landfill cell (Phase 1) was lined with a 6-inch thick liner constructed using selected on-site soils. This first cell was also provided with a leachate collection system. Justification for these exemptions from liner and leachate collection system requirements is presented in Appendix J. The landfill cells will be excavated to the depth indicated on the Landfill drawings (Appendix C) and waste will be landfilled directly on the excavated bedrock.

5.4 EQUIPMENT REQUIREMENTS AND AVAILABILITY

Each landfill phase will be designed with a planned operating life of 9-11 years for each cell. This operating life is calculated using the annual solid waste generation (refer to Section 2.1.4), and an in-place density of 1,000 pounds per cubic yard for the compacted solid waste. These are conservative estimates of the expected in-place density since this

is the lower range of density commonly achieved using compactors. The District will attempt to maximize the compacted density of the solid waste.

The District will maintain equipment on site to facilitate compaction of the solid wastes, placement of daily cover on the wastes, and excavation of soils for daily cover. It is recommended that this equipment include the following: a dozer or drum compactor with waste cleats; a front-end loader; and a scraper.

5.5 LEACHATE COLLECTION SYSTEM DESIGN

The first cell was constructed with a leachate collection system. Future cells will not include a leachate collection system.

As part of the original permit application, several HELP model runs were completed, and indicated that the maximum flow after closure is expected to occur within 2 years and will generate approximately 621 gallons of leachate per year. During the open fact operation of a cell, the 25-year 24-hour storm is expected to deliver approximately 29,500 gallons of liquid that could be treated as leachate. Any stormwater will be temporarily stored in the cell and allowed to evaporate. Given the high evaporation rates, this method of stormwater control is considered acceptable. Since these are very small quantities of leachate, and since evaporation rates are generally very high in the vicinity of the Klondike Landfill, additional leachate control facilities are not considered necessary.

If UDEQ requires additional leachate control facilities, these will be engineered to meet the design of future cells. All leachate that is pumped from the landfill will be transported to an approved facility for disposal.

5.6 RUN-ON AND RUN-OFF CONTROL SYSTEMS DESIGN

5.6.1 Run-On from a 24-Hour, 24-Year Storm

The design for the expansion of cells of the Klondike Landfill incorporates a run-on control system, which is capable of directing the flow away from the active portion of the landfill during the peak discharge of a 24-hour, 25-year storm (0.19 inches). The purpose of the run-on control is to minimize the amount of surface water entering the landfill facility. Run-on controls prevent: (1) erosion, which may damage the physical structure of the landfill; (2) surface discharge of wastes in solution or suspension; and (3) downward percolation of run-on through wastes, creating leachate.

District personnel will be responsible for the maintenance of the slopes and drainage systems to keep the run-on control systems operable.

5.6.2 Run-Off from a 24-Hour, 24-Year Storm

The design for the new expansion cells of the Klondike Landfill incorporates a run-off control system that will collect and contain the water volume that falls on the active landfill area but does not contact the working areas of the landfill resulting from a 24-hour, 25-year storm. Uncontrolled run-off water from the active portion of the landfill will be directed to the stormwater detention basins located at the southwest corner of the site. Berms and ditches will be incorporated into the active landfill areas to shed the precipitation away from the working faces and leachate collection system. This will greatly reduce the volume of precipitation that will need to be treated as leachate.

District landfill personnel will be responsible for the maintenance of the slopes and drainage systems to ensure the efficient operations of the run-off system. Precipitation that contacts the working face or otherwise enters the leachate collection system will be transported by the leachate collection system to the evaporation pond.

The Klondike Landfill is designed and shall be constructed so as not to cause point or non-point source discharges to surface waters, including wetlands, in violation of the Clean Water Act (CWA) or in violation of State of Utah water quality management plans approved under section 208 or 319 of the CWA.

5.7 LANDFILL GAS CONTROL

Landfill gases will be monitored using combustible gas indicators along the perimeter of the site and at leachate collection system cleanouts. Should routine monitoring of the site indicate gas conditions exceeding the regulatory requirements, a horizontal or vertical gas extraction system may be installed. Gas monitoring of the site since 1997 has shown no detectable gas levels. Due to the arid climate, very little decomposition of the waste is likely to occur and it is expected that no measurable volume of methane gas will accumulate under the final cover.

SECTION 6

CLOSURE AND POST-CLOSURE

6.1 CLOSURE AND POST-CLOSURE DESIGN

Section 5.2 of this Part describes the closure cap design for the Klondike Landfill. Appendix K provides the rationale used in formulating this design.

6.2 CLOSURE AND POST-CLOSURE CONSTRUCTION

Section 7 and 8 (Part II) detail the closure and posts-closure construction activities for the Klondike Landfill.

6.3 CLOSURE AND POST-CLOSURE MAINTENANCE

The District intends to close the existing landfill under UDEQ Administrative Rule R315-302-3. The landfill supervisor will inspect the closed landfill cells on a monthly basis, and correct any erosion or settlement deficiencies observed during this inspection.

A post-closure maintenance program will be implemented at the landfill in order to maintain the integrity of the landfill's final cover. The final cover areas will be routinely evaluated for any evidence of erosion, ponded water, odor, disposed refuse, cracks, settlement, slope failure, and leachate seeps.

Any erosion damage, which may be caused by extremely heavy rainfall, will be repaired. Temporary berms, ditches, and straw mulch will be used to prevent further erosion damage to soil cover areas until site conditions permit the final cover to be reestablished and vegetation to be reseeded. Preventive maintenance for the final cover should preclude problems regarding infiltration of surface water, gas venting through the cover, and vectors attracted by exposed refuse.

6.3.2 Drainage System

Drainage control problems can result in accelerated erosion of a particular area within the landfill. Differential settlement of drainage control structures can limit their usefulness and may result in a failure to properly direct storm water off the site.

Implementation of the post-closure maintenance program will maintain the integrity of the final drainage system throughout the post-closure maintenance period. The final drainage system will be routinely evaluated and inspected for ponded water, and blockage of and damage to drainage structures and swales. Where erosion problems are noted or drainage control structures need repair, proper maintenance procedures will be implemented as soon as site conditions permit so that further damage is prevented and the cause of the damage is eliminated. Damaged drainage pipes and broken ditch linings will be removed and replaced.

District staff will inspect the drainage systems monthly. Temporary repairs will be made until permanent repairs can be scheduled. The District or a licensed general contractor will repair drainage facilities.

6.3.3 Vegetative Cover

Early establishment of vegetation on the landfill's final slope surface will impede soil erosion and promote evapotranspiration. The District will periodically evaluate vegetative growth, vigor, and color so that the integrity of the final cover system is maintained. If stress signs on vegetation caused by landfill gas and leachate seeps are noted, the problem will be corrected. Corrective procedures will be conducted based on current design recommendations and will be built consistent with construction specifications.

The District will inspect the vegetative cover monthly. District staff or a licensed landscape contractor will make repairs.

6.3.4 Leachate Control System

The leachate control and recovery system in the first cell must be maintained so that it operates during the post-closure maintenance period. The system will be inspected periodically by District staff for signs of deterioration. Needed repairs will be made by the District or a licensed contractor.

6.3.5 Gas Monitoring System

The landfill gas monitoring system, if required in the future by UDEQ, will be regularly inspected in conjunction with the scheduled monitoring tasks. The system will be repaired and parts replaced as required to maintain system capabilities. The program described below for inspecting and maintaining the gas monitoring system will be followed during the post-closure maintenance period.

The landfill gas monitoring system will be inspected quarterly. Quarterly maintenance will include cutting weeds in a 2-foot radius around each well, if wells are required. Preventive maintenance will be performed on all mechanical equipment at manufacturer-recommended intervals. These tasks include cleaning, lubrication, and replacement of worn parts.

6.3.6 Ground-Water Monitoring System

All ground-water monitoring wells, if required in the future by UDEQ, will be inspected for signs of failure or deterioration during each sampling event. If damage is discovered, the nature and extent of the problem will be recorded. A decision will be made to replace or repair the well. Possible repairs include redevelopment, chemical treatment, partial

casing replacement or repair, sealing the annulus, or pumping and testing. If a well needs to be replaced, it will be properly decommissioned. Damaged wells will be scheduled for repair or replacement within 1 month after the problem is identified.

6.3.7 Final Grading

The landfill's final grades will be inspected and maintained in order to maintain their integrity. At the completion of closure activities, the surface of the cap will be surveyed to provide a reference basis for monitoring settlements and movements.

Areas where water has collected (ponded) will be regraded. Erosion damage resulting from extremely heavy rainfall will be repaired. District staff will inspect the final grading quarterly.

6.4 CLOSURE AND POST-CLOSURE LAND USE

District staff or a District contractor shall design a post-closure end use plan for the landfill. It is anticipated that the District will select an end use that will be limited to those that do not threaten the integrity of the existing control systems. All activities will be approved by the County prior to implementation. Typical end uses range from recycling operations (which compliment existing operations) to recreational activities. At a minimum, the site should be restored to its pre-landfill condition as much as possible. Although contours among the site may have changed, an effort to introduce native materials can help the site blend in with surrounding land uses. Since the closure of the site is 30 to 90 years in the future, it is not currently possible to develop these land use plans.

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Department of Environmental Quality

APPENDIX A

PROPERTY ACQUISITION AND ZONING

ORDINANCE NO. 270

AN ORDINANCE AMENDING THE GENERAL ZONING ORDINANCE AND ACCOMPANYING MAP KNOWN AS ORDINANCE NO. 134, PASSED SEPTEMBER 18, 1978. BY REZONING THE FOLLOWING PROPERTY FROM A-1 TO I-1.

THE BOARD OF COUNTY COUNCILMEN OF THE COUNTY OF GRAND, STATE OF UTAH, ORDAINS AS FOLLOWS:

The following property be rezoned from A-1 to I-1 (Light Industrial):

T23S, R19E, SLMSection 14, S1/2 NW 1/4

Subject to all easements and right-of-way of record.

(Solid Waste District)

PASSED, ADOPTED, AND APPROVED by the Grand County Council in open session this 10th day of July 1995 by the following vote:

Those voting aye: All

Those voting nay: _____

Ken Ballantyne
Ken Ballantyne, Chairman

ATTEST: Fran Townsend
Fran Townsend, Grand County
Clerk/Auditor

Published in the Times Independent, July 13, 1995

To: Sandi Sturm
From: Dick Sprague
Subject: BLM Property Acquisition

Date: May 11, 1994

I have evaluated the landfill "footprint" requirements to assist you in your discussions with the BLM. To accomplish this, I needed to make some assumptions regarding the growth over time of solid waste generation. I have calculated required acreage using the following assumptions:

- 1994 solid waste generation = 25 tons per day (Class I wastes)
- Minimum growth rate = 0%
- Maximum growth rate = 2.5%
- Planning period of 50 to 100 years

The following table summarizes the acreage requirements under the various assumptions:

Period	Growth	
	0%	2.5%
50 years	20 acres	48.5 acres
100 years	48.5 acres	184 acres

Based on this table, I recommend that you purchase 80 acres. This acreage will provide the District with assured landfill volume for a 50- to 100-year planning period, with reasonable assumptions on the future growth.

I also have evaluated Section 14 for the most favorable acreage for the initial acquisition. I recommend that the District pursue acquisition of the SW $\frac{1}{4}$ of the NE $\frac{1}{4}$ and the SE $\frac{1}{4}$ of the NW $\frac{1}{4}$ of Section 14. This property best combines accessibility, usable acreage, and minimization of visual impacts on the county road (dirt). The next acquisition will probably be the two quarter section directly south (the NW $\frac{1}{4}$ of the SE $\frac{1}{4}$ and the NE $\frac{1}{4}$ of the SW $\frac{1}{4}$).

The United States of America

To all to whom these presents shall come, Greeting:

24139
RECEIVED
ADDRESS
MAY 24 2002
RECEIVED 02.01700
Division of Solid & Hazardous Waste
with Department of Environmental Quality
AUG 5 1999
Ans'd.....

UTU-71889

WHEREAS,

Grand County Solid Waste Management Special Service District #1

is entitled to a land patent pursuant to the Recreation and Public Purposes Act of June 14, 1926 (44 Stat. 741), as amended by the Act of January 25, 1988 (102 Stat. 3815; 43 U.S.C. 869) for the Following described land:

Salt Lake Meridian, Utah

T. 23 S., R. 19 E.,
sec. 14, S $\frac{1}{2}$ NW $\frac{1}{4}$.

containing 80.00 acres

Entry No. **435167**
Recorded 11-3-95 11:47 AM.
Bk. 480 Pg. 405 Fee N/A
407
Mollana Masher
Recorder of Grand County

NOW KNOW YE, that the UNITED STATES OF AMERICA, in consideration of the premises, and in conformity with said Act of Congress, HAS GIVEN AND GRANTED, and by these presents DOES GIVE AND GRANT unto the said Grand County Solid Waste Management Special Service District #1, the land above described for use as a regional sanitary landfill: TO HAVE AND TO HOLD the same, together with all rights, privileges, immunities, and appurtenances, of whatsoever nature, thereunto belonging, unto the same Grand County Solid Waste Management Special Services District #1, forever; and

EXCEPTING AND RESERVING TO THE UNITED STATES

1. A right-of-way thereon for ditches or canals constructed by the United States pursuant to the Act of August 30, 1890 (43 U.S.C. 945).
2. All minerals, including oil and gas, in the land so patented with the right to prospect for, mine and remove the same. The Secretary of the Interior reserves the right to determine whether such mining and removal of minerals will interfere with the development, operation and maintenance of the sanitary landfill.

SUBJECT TO:

1. Outstanding oil and gas lease UTU-66023, issued October 1, 1989, for a 10 year period, and so long thereafter as quantities or other extensions granted consistent with the terms of the lease and applicable laws and regulations, with any funds generated under the lease for fees or royalties from production accruing to benefit of the United States;

2. Grand County Solid Waste Management Special Service District #1, its successors or assigns, assumes all liability for and shall defend, indemnify, and save the United States and its officers, agents, representatives, and employees (hereinafter referred to in this clause as the United States), from all claims, loss, damage, actions, causes of action, expense, and liability (hereinafter referred to in this clause as claims) resulting from, brought for, or on account of, any personal injury, threat of personal injury, or property damage received or sustained by any person or persons (including the patentee's employees) or property growing out of, occurring, or attributable directly or indirectly, to the disposal of solid waste on, or the release of hazardous substances from the land described above, regardless of whether such claims shall be attributable to: (1) the concurrent, contributory, or partial fault, failure, or negligence of the United States, or (2) the sole fault, failure, or negligence of the United States.
3. Provided, that title shall revert to the United States upon a finding, after notice and opportunity for a hearing, that the patentee has not substantially developed the lands on or before the date five years after the date of conveyance. No portion of the land shall under any circumstance revert to the United States if any such portion has been used for solid waste disposal or for any other purpose which may result in the disposal, placement, or release of any hazardous substance.
4. If, at any time, the patentee transfers to another party ownership of any portion of the land not used for the purpose specified in this document, the patentee shall pay the Bureau of Land Management the fair market value, as determined by the authorized officer, of the transferred portion as of the date of transfer, including the value of any improvements thereon.
5. The above described land has been conveyed for utilization as a regional sanitary landfill. Upon closure, the site may contain small quantities of commercial and household hazardous waste as determined in the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6901), and defined in 40 CFR 261.4 and 261.5. Although there is no indication these materials pose any significant risk to human health or the environment, future land uses should be limited to those which do not penetrate the final cover of this area unless excavation is conducted subject to applicable State and Federal requirements.
6. The Secretary of the Interior may take action to revest title in the United States if the patentee directly or indirectly permits its agents, employees, contractors, or subcontractors (including without limitation lessees, sublessees and permittees) to prohibit or restrict the use of any part of the patented land or any of the facilities thereon by any person because of such person's race, creed, sex, or national origin.

In addition to the above the grant of the herein described land is subject to the following reservations, conditions, and limitations:

1. The patentee and its successors or assigns in interest shall comply with and shall not violate any of the terms or provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 241), and requirements of the regulations, as modified or amended, of the Secretary of the Interior issued pursuant thereto (43 CFR 17) for the period that the lands conveyed herein are for the purpose for which the grant was made pursuant to the act cited above, or for another purpose involving the provision of similar services or benefits;

2. The United States shall have the right to seek judicial enforcement of the requirements of Title VI of the Civil Rights Act of 1964, and the terms and conditions of the regulations, as modified or amended, of the Secretary of the Interior issued pursuant to said Title, in the event of their violation by the patentee;
3. The patentee and its successors or assigns in interest will, upon request of the Secretary of the interior or his delegate, post and maintain on the property conveyed by this document signs and posters bearing legend concerning the applicability of Title VI of the Civil Rights Act of 1964 to the area or facility conveyed;
4. The reservations, conditions, and limitations contained in paragraphs (1) through (3) shall constitute a covenant running with the land, binding on the patentee and its successors or assigns in interest for the period for which the land described herein is used for the purpose for which this grant was made, or for another purpose involving the provision of similar services or benefits;
5. The assurances and covenant required by sections (1) through (4) above shall not apply to ultimate beneficiaries under the program for which this grant is made. "Ultimate beneficiaries" are identified in 43 CFR 17.12(h).



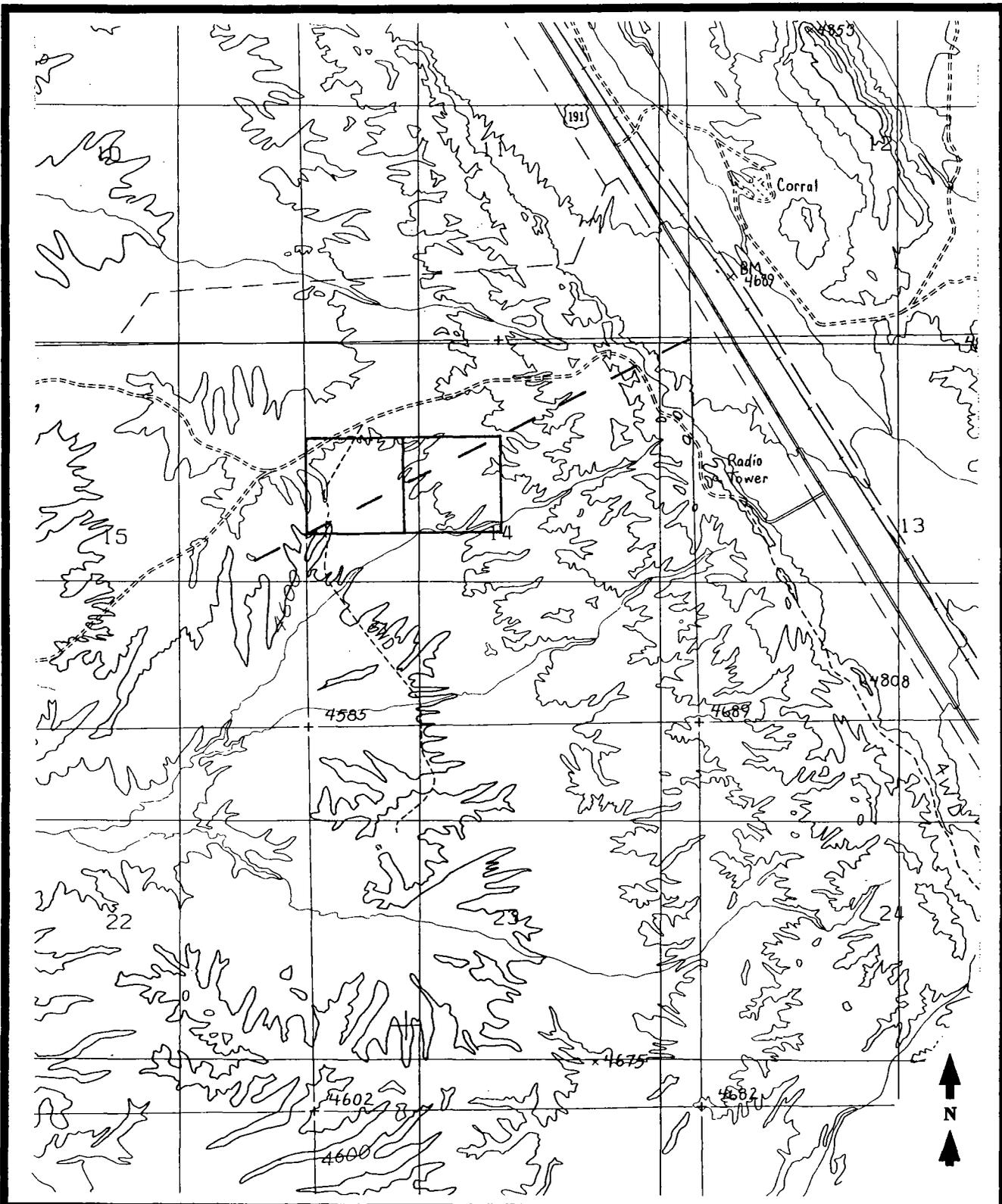
IN TESTIMONY WHEREOF, the undersigned authorized officer of the Bureau of Land Management, in accordance with the provisions of the Act of June 17, 1948 (62 Stat. 476), has, in the name of the United States, caused these letters to be made Patent, and the Seal of the Bureau to be hereunto affixed.

GIVEN under my hand, in Salt Lake City, Utah
the Seventh day of August
in the year of our Lord one thousand nine hundred and
Ninety-Five and of the Independence of the
United States the two hundred and Twentieth

By *Jessie K. Cott*

Chief, Branch of Lands
and Minerals Operation

APPENDIX B
SITE LOCATION MAP



from: USGS 7.5 QUAD., Valley City, Utah, 1991

Scale: 1" = 2000'

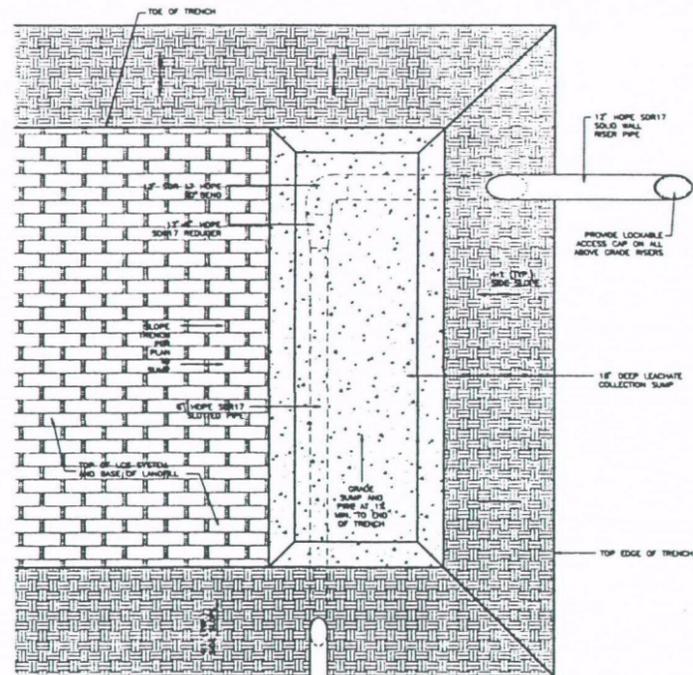
Grand County Solid Waste
 Management Special Service District #1
 P.O. Box 980 Moab, Utah 84532
 (435) 259-3867

SITE LOCATION MAP

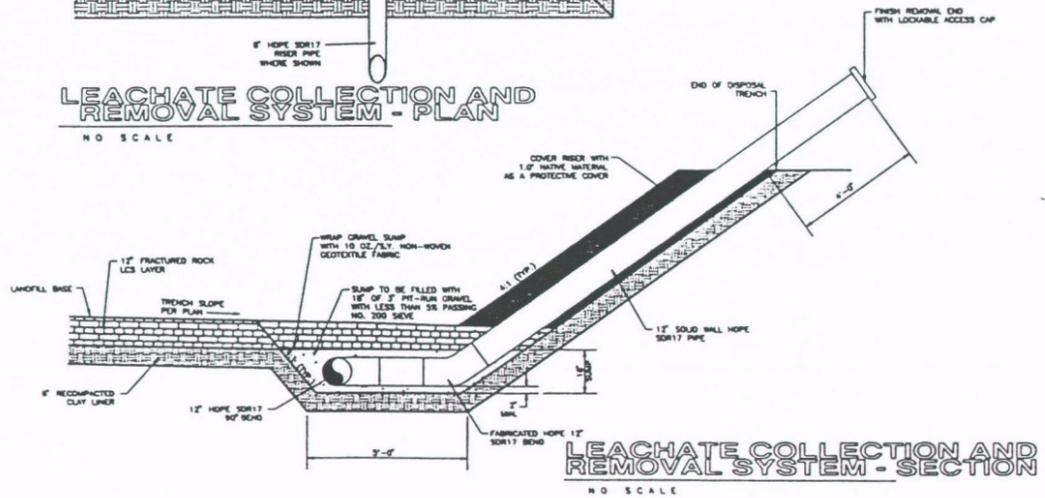
Figure

1

APPENDIX C
FACILITY PLANS AND DRAWINGS



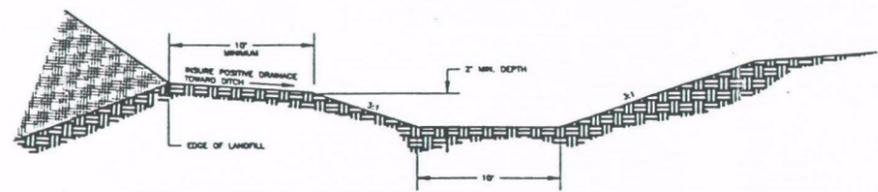
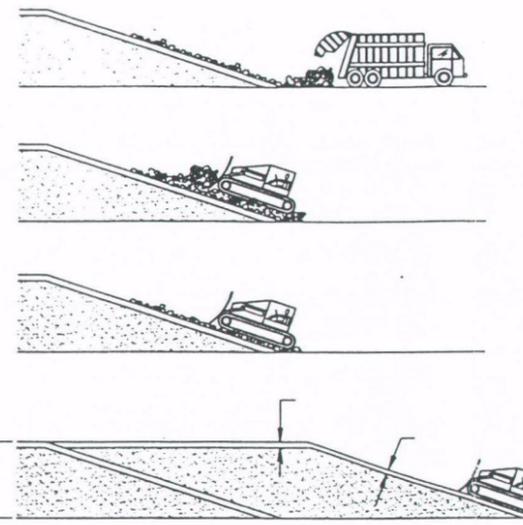
LEACHATE COLLECTION AND REMOVAL SYSTEM - PLAN
NO SCALE



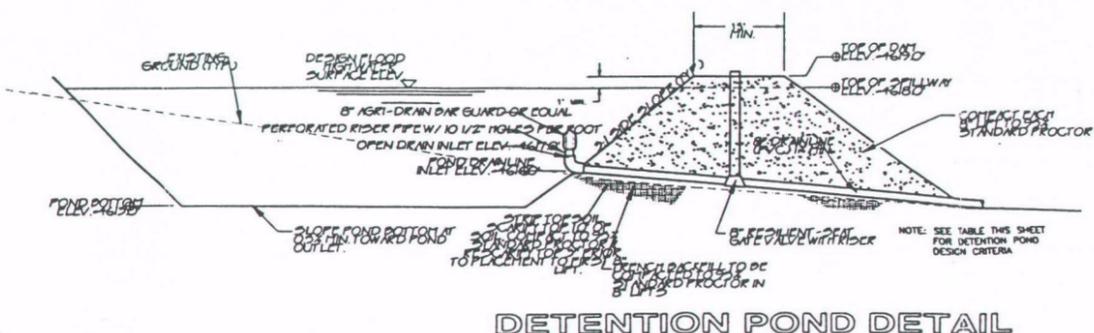
LEACHATE COLLECTION AND REMOVAL SYSTEM - SECTION
NO SCALE

DETENTION POND DESIGN CRITERIA	
HYDROLOGICAL DATA	
RUNOFF MODEL	SCS METHOD
RAINFALL EVENT	25 YR./24 HR.
DESIGN RAINFALL	2.5
RUNOFF CURVE NUMBER	79
DESIGN RUNOFF	0.8
DETENTION POND	
DRAINAGE AREA	38 ACRES
RUNOFF FROM DESIGN EVENT	107,000 CU. FT.
MAXIMUM CAPACITY	125,000 CU. FT.
MAXIMUM DEPTH	5 FT.
MAXIMUM HYDROSTATIC HEAD ON FILL	3 FT.
SIDE SLOPES	3:1
TOP WIDTH	15 FT.
POND AREA WHEN FULL	0.55 ACRES
TOP OF DAM ELEVATION	4819.0'
POND BOTTOM ELEVATION	4813.0'
SPILLWAY CAPACITY	50 CFS.
PEAK DISCHARGE	28 CFS.
DRAINLINE INLET INVERT	4816.0'
DRAINLINE TYPE	8" PVC W/ G.V.

CONCEPTUAL DESIGN VOLUMES	
WASTE PARAMETERS	
QUANTITY	9100 TONS/YEAR
COMPACTED WASTE DENSITY	1000#/C.Y.
WASTE-TO-SOL RATIO	3:1
QUANTITIES	
TOTAL EXCAVATION	279,000 C.Y.
FINAL COVER	82,000 C.Y.
DAILY COVER	197,000 C.Y.
WASTE VOLUME	590,000 C.Y.
WASTE QUANTITY	295,000 TONS
ESTIMATED LIFE	32 YEARS



TYPICAL DITCH SECTION
NO SCALE



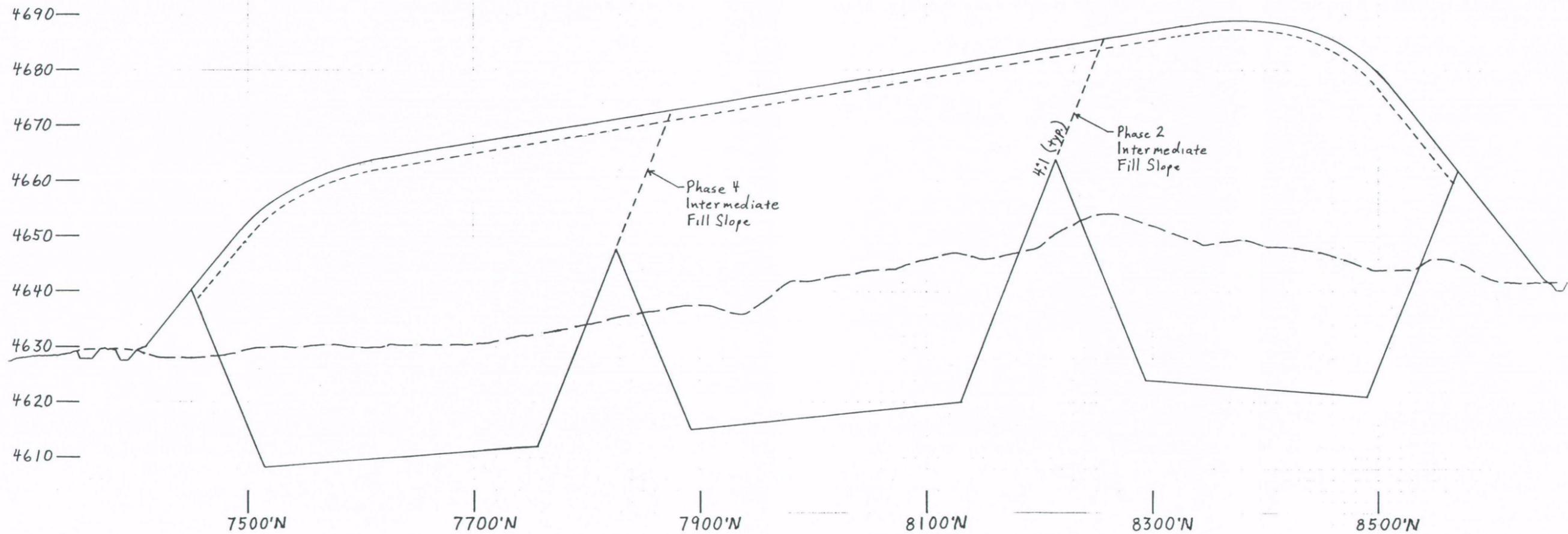
DETENTION POND DETAIL

For Permit /
Regulatory Compliance Only

HDR
HDR Engineering, Inc.

Details
Klondike Landfill

Date
Sheet
3



**For Permit/
 Regulatory Compliance Only**

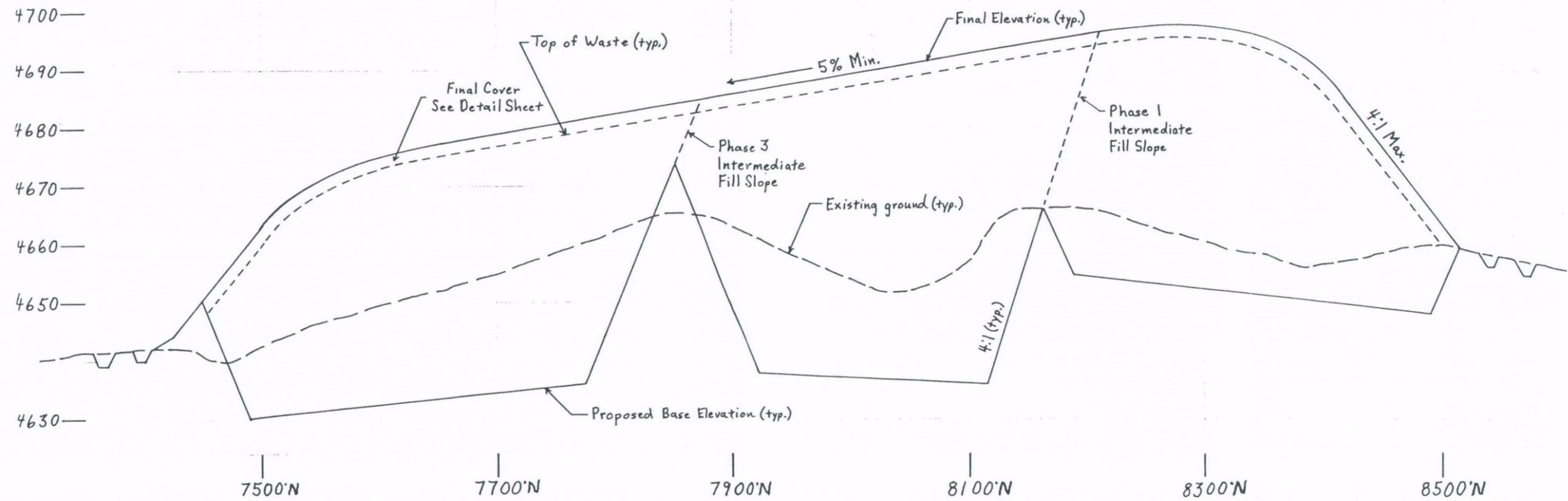
**Scale: Horizontal 1" = 100'
 Vertical 1" = 20'**

Grand County Solid Waste
 Management Special Service District #1
 P.O. Box 980 Moab, Ut. 84532
 (435) 259-3867

**North-South Cross Sections
 9100E
 Klondike Landfill**

Date: 20 Apr 2001

Drawn by:
 Anthony Martineau



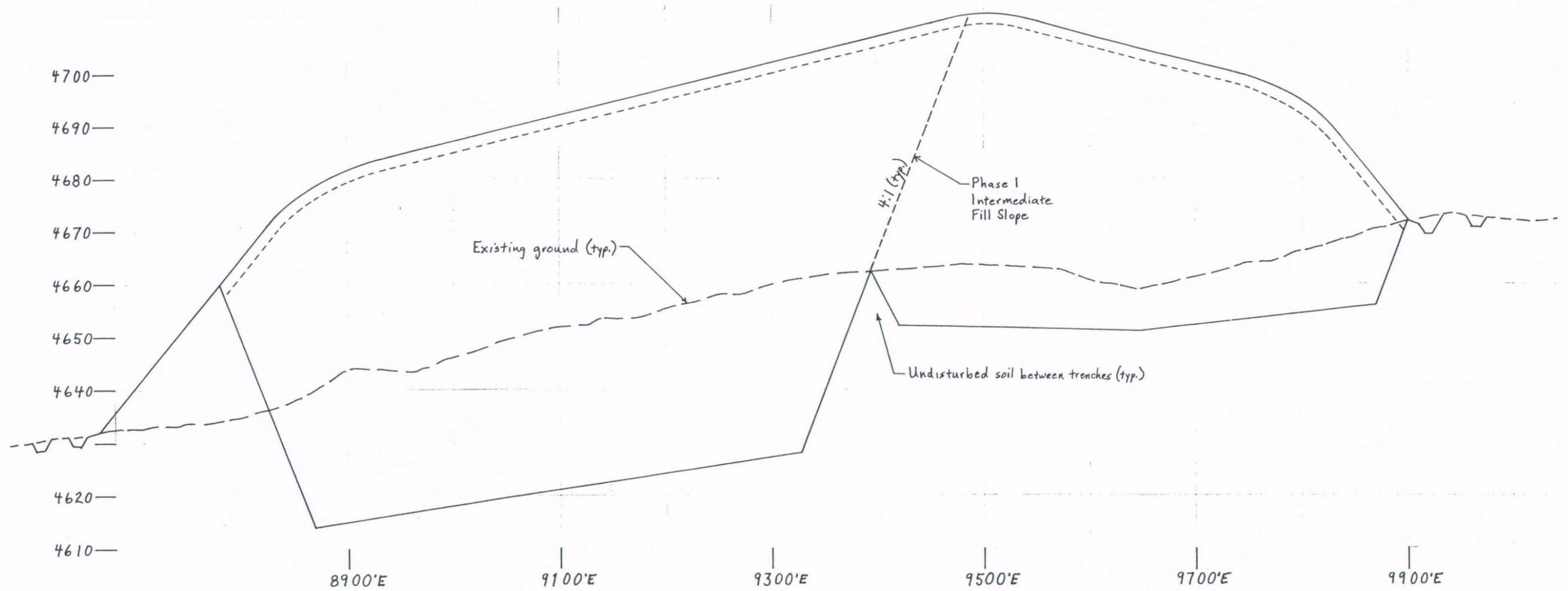
For Permit/
Regulatory Compliance Only

Scale: Horizontal 1" = 100'
Vertical 1" = 20'

Grand County Solid Waste
Management Special Service District #1
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North-South Cross Sections
9600E
Klondike Landfill

Date: 20 Apr 2001
Drawn by:
Anthony Martineau

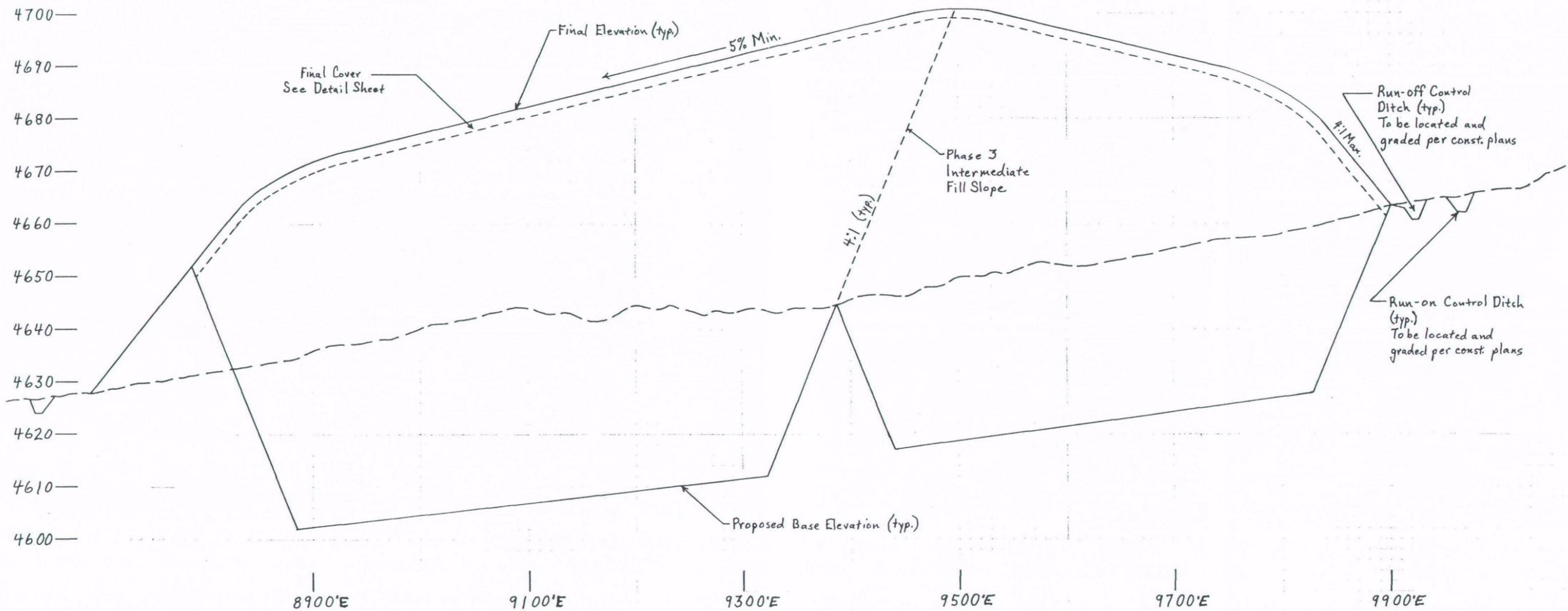


**For Permit/
Regulatory Compliance Only**

**Scale: Horizontal 1" = 100'
Vertical 1" = 20'**

Grand County Solid Waste
Management Special Service District #1
P.O. Box 980 Moab, Ut. 84532
(435) 259-3867

<p>East-West Cross Sections 8300N Klondike Landfill</p>	<p>Date: 20 Apr 2001 Drawn by: Anthony Martineau</p>
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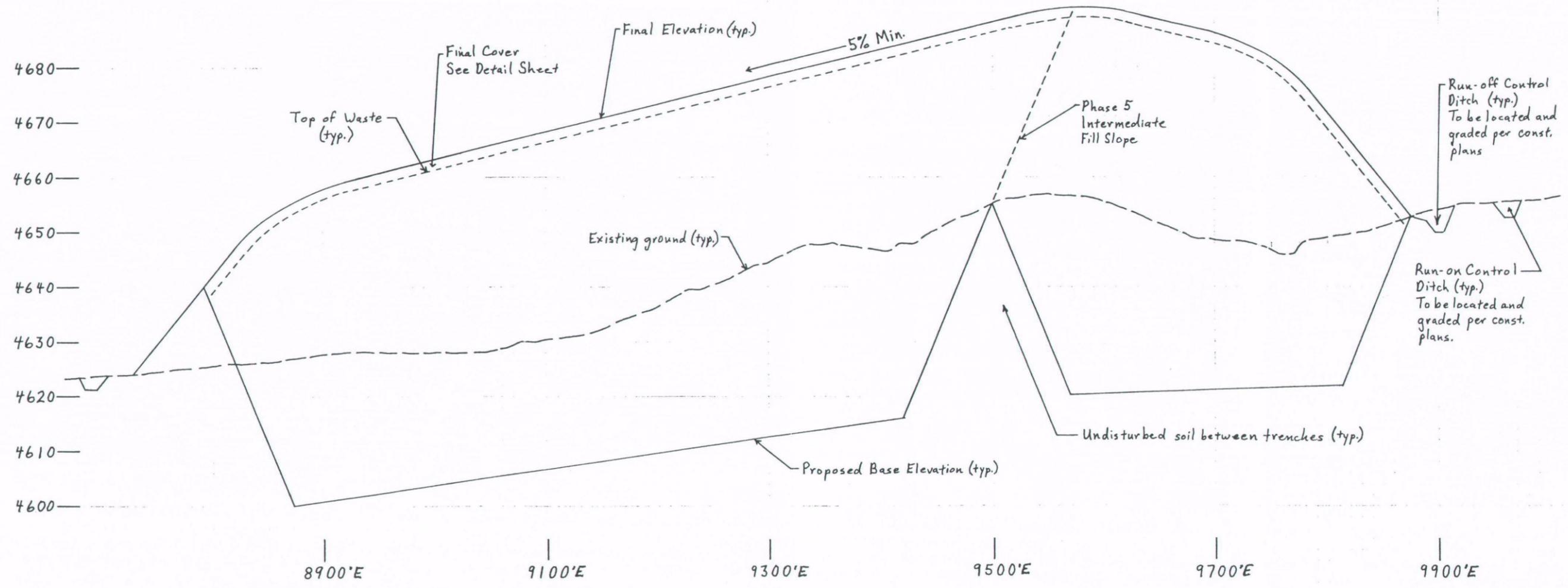


**For Permit/
Regulatory Compliance Only**

**Scale: Horizontal 1" = 100'
Vertical 1" = 20'**

Grand County Solid Waste
Management Special Service District #1
P.O. Box 980 Moab, Ut. 84532
(435) 259-3867

East-West Cross Sections 8050N Klondike Landfill	Date: 20 Apr 2001
	Drawn by: Anthony Martineau



**For Permit/
Regulatory Compliance Only**

**Scale: Horizontal 1" = 100'
Vertical 1" = 20'**

Grand County Solid Waste
Management Special Service District #1
P.O. Box 980 Moab, Ut. 84532
(435) 259-3867

<p>East-West Cross Sections 7700N Klondike Landfill</p>	<p>Date: 20 Apr 2001 Drawn by: Anthony Martineau</p>
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APPENDIX D
PLAN OF OPERATION

PLAN OF OPERATION KLONDIKE LANDFILL

INTRODUCTION

This Operator's Manual was prepared for the Klondike Landfill. It was written to conform to the requirements of Utah Administrative Rule (UAC) 315-302-2(2) (Plan of Operation). The purpose of the Operator's Manual is to provide the Grand County Solid Waste Management Special Service District #1 (the District) with standard procedures for day-to-day operation of the landfill.

A copy of this Operator's Manual is required to be kept on file at the landfill, the District's offices, or another location approved by the UDEQ. All employees or subcontractors of the District are required to read the manual as soon as possible after being hired, and will sign and date a log sheet to be kept at the back of this manual as Attachment 1.

SECTION 1 GENERAL DESCRIPTION

1.1 BACKGROUND

On October 9, 1991, the U.S. Environmental Protection Agency (EPA) published revisions to the Criteria for Classification of Solid Waste Disposal Facilities. These regulations, developed in response to requirements of Subtitle D of the 1984 Hazardous and Solid Wastes Amendments (HSWA), defined minimum criteria for municipal solid waste landfills, including facility design and operational requirements. Subtitle D regulations became effective on October 9, 1993.

RCRA Subtitle D establishes a framework for federal, state, and local government cooperation in controlling the management of nonhazardous solid wastes. The federal government sets minimum standards for protection of human health and the environment.

In conjunction with this role, the government provides technical assistance for individual states to plan and develop waste management practices. However, the actual planning, direct implementation, and enforcement remains in the hands of state and local governments.

On February 1, 1994, the Utah Department of Environmental Quality (UDEQ) issued final Administrative Rules implementing Subtitle D at the state level. These rules, titled *Solid Waste Permitting and Management Rules (R315-301 through 315)*, have been reviewed and authorized by EPA.

1.3 FACILITY DESCRIPTION

1.3.1 General Facility Description

The Klondike Landfill will accept more than 20 tons per day (TPD) of MSW, from contracted haulers only. The public, private garbage haulers, and commercial/industrial customers will

not generally have access to the landfill unless by franchise agreement. However, the District may grant limited direct access to the landfill to municipal or industrial facilities to protect public welfare or provide for orderly operation of the landfill.

The 80-acre site will be used as a Class I Landfill. No permanent structures or buildings are currently planned for the landfill; however, the District may develop buildings to house the landfill attendant, maintenance, or other facilities in the future. The entire site will be surveyed and marked to ensure that all improvements are performed within the boundaries of the property.

The landfill will be developed in six phases, each consisting of a four to five acre landfill cell. Each successive cell, constructed to a depth of approximately 40 feet, will have a service life of nine to eleven years. Cells will be filled in a manner designed to reduce windblown litter and conserve cover soil. Intermediate cover consisting of 12 inches of soil will be applied over any area of the landfill not used for a period of 30 days or more; final cover will be applied on intermediate cover left in place for more than two years. As adjoining cells are completed, proper slope will be achieved with additional waste and final cover as required (see Appendix C – Facility Plans and Drawings). A 100-foot buffer zone will surround the active and closed portions of the landfill site, and may include the landfill access road and stormwater conveyance ditches and a retention pond.

The active life of the first 40-acres is expected to be approximately 48 years. Excavation of successive cells will occur during filling of the previous, thereby lowering the costs associated with development of both cells.

1.3.2 Fencing

A 100-foot buffer zone will be kept around the landfill cells at all times. This will provide an area on landfill property in which the District can maintain its stormwater and litter control facilities, and monitor the landfill facilities. The active and closed portions of the landfill will

Be fenced to allow the District to control access to the landfill, and to assist in controlling litter blowing from the active portions of the landfill.

Access to the landfill will be restricted to prevent illegal dumping of hazardous materials, vandalism, and unauthorized dumping of refuse. The entrance will be fenced and include a lockable gate.

Appropriate signs will be posted at intervals along the fence and on the gate to inform people about the site and warn them of consequences for trespassing.

1.3.3 Roads

Access to the site will be provided via the existing County-improved gravel road and new gravel access road.

1.3.4 Buildings

No buildings are currently planned to be constructed at the landfill site; however, the District may develop buildings to house the landfill attendant, for vehicle maintenance facilities, or other purposes in the future.

1.3.5 Operating Hours

The landfill is generally not open to the public. A schedule will be maintained for contracted haulers. The following information is to be posted at the gate:

KLONDIKE LANDFILL

FRANCHISED HAULERS ONLY • NO PRIVATE HAULERS OR RESIDENTS •
SCAVENGING IS STRICTLY FORBIDDEN • LIQUIDS AND HAZARDOUS
WASTES ARE PROHIBITED

IN CASE OF EMERGENCY, CONTACT:

Grand County Solid Waste Management Special Service District #1

(435) 259-DUMP (-3867)

1.4 LANDFILL PERSONNEL

1.4.1 Job Descriptions

The following people are responsible and/or available for on-site operations at the Klondike Landfill:

District Manager (DM). The DM manages the overall operation of the solid waste management system, including the landfill; and production of annual environmental and financial reports. The DM reports to and takes direction from the District's Board of Directors. The other District personnel report directly to the DM.

Landfill Attendant (Attendant). The Attendant is responsible for all day-to-day operations at the landfill. His/her responsibilities include inspection/certification of wastes at the landfill and routine inspection of the facilities for compliance with permit requirements. The District may delegate this responsibility to its Contractor.

Landfill Contractor. The Landfill Contractor is responsible for the safe operation and daily maintenance of equipment; visual inspection of waste loads for unauthorized or hazardous wastes; daily operation on the working face of the landfill; directing traffic to the working

1.4.2 Personnel Training

Adequate training will be provided to ensure all personnel associated with the operation of the Klondike Landfill complies with the approved Plan of Operation (Operator's Manual) and the Permit. At least one employee of the District or its Contractor will be trained in landfill operations. Other landfill personnel will receive an initial on-the-job training from the trained staff member(s), and will receive an 8-hour refresher training annually covering landfill operations and waste screening. Refresher training will be provided as needed to ensure continued compliance. Certificates of completion are to be kept on file with the personnel records.

SECTION 2
SOLID WASTE HANDLING PROCEDURES

2.1 **DAILY TASKS**

2.1.1 **Prior to Opening**

1. Unlock the gate
2. Start a new page in the Daily Log (see Attachment 3 for Daily Log) with the correct date and time.
3. Inventory equipment to be sure that all is on-site and ready for day's operation.
4. Briefly check the fire extinguisher and other safety equipment. Once a week conduct this check more thoroughly.

2.1.2 **During Operating Hours**

1. Visually inspect each incoming load. Certify no prohibited wastes are present. Reject materials or loads as necessary.
2. Record the weight or volume, and description in the daily log and note the time of entry.
3. Fill out records on incoming loads, i.e., the daily log and the driver's manifest.
4. Clean/maintain equipment according to manufacturer's recommendations.
5. Ensure waste is compacted as soon as practical after delivery.
6. Apply cover material.

2.1.3 **At Closing**

1. Visually check the operating face and grounds to ensure no persons or animals are locked inside.
2. Make necessary summaries in log book.

3. Recheck grounds, then lock the gate.

2.2 WASTE ACCEPTANCE PROCEDURES

2.2.1 General Procedure

No hazardous wastes will be accepted at the Landfill. Section 7.2 describes these prohibited wastes. The Landfill Attendant will visually inspect all loads whether from direct haul or from a transfer station and will screen out prohibited and/or special wastes. He/she will then certify, along with the waste hauler, that no prohibited wastes are present in the load being accepted.

Log all vehicles entering the landfill into the Daily Log. Record the hauler's license number, a description of the wastes, weight or volume, and the time of entry.

2.2.2 Special Wastes

Special wastes are materials that require special handling if they are received at a landfill. They may require immediate burial, separation for recycling or recovery, or other non-routine handling. Hazardous wastes and prohibited wastes are not acceptable at the Klondike Landfill even under special handling. (See Section 7.2)

2.2.2.1 Asbestos and Medical Wastes

Friable asbestos and biohazard medical wastes will generally not be accepted by the Landfill since these wastes require special training and unusual handling procedures. Both types of wastes can transmit or cause diseases. Direct anyone inquiring about disposing of friable asbestos and medical wastes to a proper disposal facility. Under specific conditions to promote public welfare, the Board may approve limited disposal of friable asbestos or medical wastes.

Friable asbestos is material containing more than 1 percent asbestos which can easily be broken into dust-like particles. The US EPA has a definition of this material which all asbestos removal contractors are required to understand. Since this is the dangerous form of asbestos, asking the disposer if it is friable asbestos, and excluding any friable asbestos, is expected to protect landfill workers. The District will accept non-friable asbestos since this form of asbestos is expected to present little risk to landfill employees.

2.2.2.2 Bulky Wastes

Bulky wastes such as automobile bodies, furniture, and appliances should be recycled or reused wherever possible. Designated areas at the Class I and Class IV landfills will be set aside for separating these items. Recyclers may pick them up periodically. Bulky wastes that are not recycled at least once each year must be disposed of properly at either the Klondike or Moab Landfills.

If bulky wastes must be disposed of in the Class I landfill, crush them and push them onto the working face near the bottom of the cell. The preferred destination for disposal of bulky wastes is the Class IV landfill.

2.2.2.3. Used Oil and Anti-Freeze

Direct any one inquiring about disposing of used oil and anti-freeze to a proper facility. Do not accept used oil or anti-freeze.

2.2.2.4. Automobile Batteries

Automobile batteries, and similar lead-acid batteries, have a significant recycle value and cannot be landfilled UAC19-6-601. Collect any batteries discovered at the working face onto a skid for future disposal.

2.2.2.5. Tires

Tires are accepted and stockpiled for recycling at the Class IV landfill; this is the preferred place to send tires. If tires are disposed of in the Class I landfill, spread tires out along the working face, cover with other waste, and compact.

2.2.2.6. Grease Trap Waste

The City of Moab Waste Water Treatment Plant (WWTP) cannot currently accept restaurant grease trap wastes. The WWTP is the preferred disposal site for this material and the City of Moab is considering expansion that may include the capability for grease trap waste handling. Until the WWTP can accept it, grease trap waste from franchised haulers is accepted at the landfill and applied by spraying onto a separate managed area approved by the Southeastern Utah District Health Department. The area is within the fenced portion of the landfill site and is designed for run-on and run-off control, to prevent pooling of waste, and to facilitate liquid evaporation and infiltration within 24 hours of application. Once the waste has dehydrated, it will be landfilled. A random testing procedure is in place to prevent disposal of hazardous wastes. Refer to Appendix L for documentation and drawings.

2.2.2.7. Septage

In the past, the City of Moab WWTP has experienced temporary conditions that prevent its acceptance of septage, such as high Total Suspended Solids. Under a Memorandum of Understanding with the City of Moab, the District has agreed to accept emergency septage that qualifies under the agreement at the landfill, on a case by case basis as requested in writing by the City of Moab. The septage will be delivered by franchised hauler to the landfill, and will be applied by spraying onto a separate managed area approved by the Southeastern Utah District Health Department. The area is within the fenced portion of the landfill site and is designed for run-on and run-off control, to prevent pooling of waste, and to facilitate liquid evaporation and infiltration within 24 hours of application. Once the waste

has dehydrated, it will be landfilled. A random testing procedure is in place to prevent disposal of hazardous wastes. Refer to Appendix L for documentation and drawings.

2.3 WASTE DISPOSAL PROCEDURES

2.3.1 Working Face

Dump wastes at the toe of the working face and spread them up the slope in one (1) to two (2) foot layers. Keep the slope at 3:1 (horizontal to vertical).

Keep working face dimensions narrow enough to minimize blowing litter and reduce the amount of soil needed for cover. Dimensions should be wide enough to safely accommodate vehicles bringing garbage into the landfill. SWANA recommends the width of the working face to be no less than three times the width of the dozer blade.

It is recommended the dozer be operated with the blade facing uphill when spreading and compacting wastes. Avoid sideways movements as the equipment will be susceptible to tipping over. In addition, an uphill orientation provides the following benefits:

- Litter blows onto the face reducing litter problems.
- There is better visibility for waste placement and compaction.
- Loaded equipment moves up the face more easily.

Use grade stakes when necessary to control cell height and top surface grade. The top of the surface grade should range from 2' to 5' in 100', while the cell height is commonly 8 to 10 feet.

2.3.2 Waste Compaction

Compact wastes by making three (3) to five (5) passes up and down slope. Compaction reduces litter, differential settlement, and the quantities of cover soil needed. Compaction

also extends the life of the site, reduces unit costs, and leaves fewer voids where vermin can breed. Avoid holes in the compacted waste; fill these with additional waste as they develop.

2.4 COVER

Cover provides many benefits: it limits the production of leachate by keeping water from coming in contact with the wastes, reduces odors, prevents scavenging, cuts down on litter, prevents fires from spreading, and controls vermin.

2.4.1 Daily Cover

At least six (6) inches of soil, or an alternate daily cover approved by the UDEQ, must be placed over the wastes by the end of each day. Use grade stakes when necessary to control cell height and top surface grade for proper drainage.

Cover material will be borrowed from other portions of the landfill site.

2.4.2 Intermediate Cover

Place intermediate cover when the cell will be idle for an extended period of time to prevent water from coming in contact with waste materials. Intermediate cover consists of an additional 6 inches of soil for a total of 12 inches of soil. Intermediate cover material is the same as that used for daily cover.

2.4.3 Final Cover

2.4.3.1 Cover Placement

When the final planned grade height has been reached, or the time comes to close the landfill or section of the landfill, it is time to place the final cover specified in the Engineering Report section of the Landfill Permit Application. This cover is intended to prevent rain from

seeping into the waste during the life of the landfill, its 30-year post-closure period, and beyond. It allows light traffic and some settlement to occur without the risk of exposing buried waste. This cover should only be placed under the direct supervision of a registered professional engineer.

2.4.3.2 Revegetation

Each closed cell should be revegetated with native grasses and plants. After the final cover is compacted, spread and grade a six-inch layer of uncompacted top soil to form the base for reseeding. The seed mixture should include a minimum of four of the native grasses and plants. The exact mixture will depend on availability at the time of revegetation.

Plant the soil in accordance with current local BLM recommendations for the Klondike Flats area.

2.4.3.3 Drainage

The upper surface of the closed cell/section should slope at least two (2) percent but not more than five (5) percent. The two percent slope keeps water from pooling but anything greater than five percent would cause erosion.

2.5 EQUIPMENT

It is recommended that any equipment utilized at the landfill will be sufficiently sized for the operation of the Landfill, and that it contains an Occupational Safety and Health Administration (OSHA) approved safety cab, a fire extinguisher, a first aid kit, and a backup alarm.

All earthmoving and heavy equipment operation will be contracted, including waste compaction and daily cover. The contractor will be responsible for safe operation and maintenance of their equipment.

All landfill personnel are to be provided with two-way communication devices to facilitate communication with each other and the District. Emergency services can also be contacted if the need arises.

SECTION 3
INSPECTIONS AND MONITORING

3.1 **INSPECTIONS**

The Landfill Attendant, District Manager, or Contractor is responsible for conducting and recording routine inspections of the landfill facilities according to the schedule outlined below:

Daily Inspections:

- Daily and Intermediate Cover Integrity
- Main Gate Integrity
- Condition of Equipment

Monthly inspection:

- Perimeter Fence Integrity
- Drainage System (Run-On/Run-Off Control System)
- Final Cover Integrity (closed cells)
- Leachate Sump in Phase I

Quarterly Inspections:

- Equipment Maintenance
- Site Road Integrity
- Methane Gas Monitoring

As Needed Inspections:

- Complete Random Waste Inspection (1% of loads, minimum monthly)
- Litter Control (inside and outside fences, weekly or monthly)

It is the responsibility of the DM to make sure all records are complete on at least a quarterly basis. Copies of inspection and monitoring logs are provided in Attachment 4.

3.2 GROUND WATER MONITORING

Because of depth to ground water, the impermeable nature of the underlying soils, low rainfall, and high evaporation rates, the Klondike Landfill site has been exempted from groundwater monitoring.

3.3 METHANE GAS MONITORING

The Landfill will be monitored on a quarterly basis for methane gas releases using a hand-held photoionization detector (PID). A PID will be made available upon request by contacting David Ariotti, the District Engineer for the UDEQ, at (435) 637-3671. The DM will coordinate the monitoring events, and will arrange for interpretation of the monitoring results if combustible gasses are detected at any station.

The procedure will be to walk the perimeter of the landfill and record PID readings at each corner of the fence line. The readings will be recorded on the form provided in Attachment 4. If methane releases are detected in excess of 25 percent of the lower explosive limit (LEL) in a landfill building, or more than 100 percent LEL at the property boundary, follow the procedure outlined in Section 4.4, Release of Explosive Gases. If concentrations of combustible gasses exceed the standard set in UDEQ Rules, the District will implement the requirements imposed on the District by UDEQ regulations in effect at the time of the permit or revisions of the permit.

3.4 LEACHATE MONITORING

A gravity flow leachate collection system has been installed in the Phase 1 landfill cell and will be monitored monthly. The first time leachate is detected in a sump, it will be sampled and analyzed to determine if it is hazardous. Leachate will be sampled and analyzed annually thereafter.

If the leachate is determined to be nonhazardous, it will be pumped from the sump and used for dust control within the footprint of the landfill cells or transported to a local wastewater treatment plant for disposal. If the leachate is determined to be hazardous, it will be transported to an approved facility for disposal.

Records of monitoring results, analytical results, leachate quantity pumped from the landfill, and ultimate disposition will be maintained in the operating record.

3.5 RUN-ON/RUN-OFF

District staff will inspect the drainage system monthly. The run-on/run-off collection and drainage system will be routinely evaluated and inspected for ponded water, and blockage of and damage to drainage structures and swales. Temporary repairs will be made until permanent repairs can be scheduled.

Water in the stormwater detention pond will be tested annually for contaminants which may originate from the landfill.

SECTION 4

CONTINGENCY AND CORRECTIVE ACTION PLANS

The following sections outline procedures to be followed in the event of fire, explosion, ground water contamination, release of explosive gases, or failure of the run-off containment system. If the landfill is not operational for more than an hour or two, franchised haulers will be notified.

4.1 **FIRE**

If a fire is detected on board an incoming truck, direct the driver to the specified area where the load can be dumped and covered with soil. If the fire cannot be controlled, call the fire department. Allow the load to cool completely before taking it to the working face.

Unfortunately, most "hot" loads are not detected until after the load has been dumped. If such a situation arises, evacuate all non-essential personnel from the area. If possible, isolate the burning material and smother it with soil. Allow the burned material to cool completely before returning it the working face. Call the fire department if the fire cannot be controlled.

If a fire is burning below the soil cover and is difficult to access or isolate, call the fire department.

In the event of fire, call the District Manager. Notify the UDEQ immediately and submit a written report within 14 days of the fire.

4.2 EXPLOSION

If an explosion occurs, evacuate the landfill and account for all personnel and customers. Shut down and abandon any equipment if it is in the vicinity of the explosion. Corrective action will be immediately evaluated and implemented as soon as practicable. Call the fire department and the District Manager. Notify the UDEQ immediately and submit a written report within 14 days.

4.3 FAILURE OF RUN-OFF/RUN-ON SYSTEM

The purpose of the run-off/run-on systems is to prevent water from entering or leaving the landfill. Inspect the systems regularly and make repairs as soon as practicable after discovery. In the case of run-on system failure, use temporary berms, ditches, sandbags, or other water diversion methods to divert water from the landfill.

Use these same methods to prevent water from leaving the landfill if the run-off system is breached. Assess the impact of any release as soon as practicable.

Monitor and inspect any temporary berms or other structures at least every two hours. Make any needed permanent improvements or repairs as soon as practicable.

As soon as any breach is discovered, call the District Manager. Notify the UDEQ immediately of any releases and submit a written report within 14 days.

4.4 RELEASE OF EXPLOSIVE GASES

Methane gas is not expected to be produced in large quantities at the Klondike Landfill. However, landfill gas production will be monitored quarterly. If a release is detected in excess of 25 percent of the LEL in a future-developed landfill building, or more than 100 percent LEL at the property boundary, the following procedure will be followed:

- Halt landfill operations immediately. If personnel or buildings appear to be threatened, evacuate the landfill.
- If gas is detected in a building, open the doors and windows to allow the gas to escape.
- If off-site buildings or structures appear to be threatened, call the fire department, evacuate the property, and notify the property owners.
- Call the District Manager. Monitor the release and determine temporary corrective action as soon as possible. Implement permanent corrective action as soon as practicable.
- Notify the UDEQ immediately and submit a written report within 14 days of detecting the release.

4.5 GROUND WATER CONTAMINATION

Due to the extreme depth to ground water at the site (>500 ft below ground level) and the small quantities of leachate produced, it is unlikely that leachate will ever contaminate the ground water. If ground water contamination is ever suspected, a program to confirm this contamination will be developed and the extent of contamination documented. This program may include the installation of vadose or ground water monitoring wells. A ground water monitoring program will be developed and corrective action taken as deemed necessary.

ALTERNATIVE WASTE HANDLING/DISPOSAL SYSTEM

Landfill operations will be adapted for wet weather by constructing an all-weather roadway from the site entrance to the active cell. The site soils, including those used as daily cover, consist primarily of clays derived by the weathering of Mancos shales. These soils may be impassable when wet. Given the arid climate at the Landfill site, wet weather is not often expected to be a problem. If the access roads become impassable during storms or for other reasons, waste may be stored at a transfer station.

All reasonable caution and prudence will be exercised to not dispose of wastes during any unreasonable weather conditions. If unforeseen weather conditions occur, the DM, or a designee, shall be informed and shall coordinate any changes in operation. The District will consider the system-wide requirements (including transfer station requirements) in determining what changes, if any, need to be made in operations at the landfill.

SECTION 5 SYSTEM MAINTENANCE

5.1 LEACHATE COLLECTION SYSTEM

A gravity flow leachate collection system is installed in Phase 1 cell and will be monitored monthly. The system will be inspected periodically by District staff for signs of deterioration. Needed repairs will be made by the District or a licensed contractor.

5.2 GAS COLLECTION SYSTEM

Gas collection is not planned for the Landfill. However, gas monitoring location will be maintained on a routine basis to keep them free of weeds and debris. Weeds should be pulled at least two weeks prior to scheduled gas monitoring events.

5.3 RUN-ON/RUN-OFF COLLECTION SYSTEM

The run-on/run-off collection and drainage system will be routinely evaluated and inspected for ponded water, and blockage of and damage to drainage structures and swales. Where erosion problems are noted or drainage control structures need repair, proper maintenance procedures will be implemented as soon as site conditions permit so that further damage is prevented. Damaged drainage pipes and broken ditch linings will be removed.

District staff will inspect the drainage system monthly. Temporary repairs will be made until permanent repairs can be scheduled. The District or a licensed general contractor will replace drainage facilities.

SECTION 6 PROCEDURES FOR NUISANCE CONTROL

6.1 VECTOR CONTROL

Preventative measures for controlling disease vectors are outlined in the sections below.

6.1.1 Insects

Flies and mosquitoes can transmit disease and are nuisances. They come into the landfill with garbage and breed in moist areas. Flies and mosquitoes can be controlled by eliminating their food, shelter, and breeding areas.

Daily cover is the most effective way to control insects. If flies become a problem use fly bait. As long as there is no place for water to stagnate, mosquitoes should not be a problem.

6.1.2 Rodents

Rats, mice, and other obnoxious rodents come into the landfill in loads or through migration. Appliance storage areas, poorly compacted cover soils, and spaces within bulky items provide refuge, and MSW provides food. Once a colony is established, it's very difficult to get rid of it.

Look for tooth marks or other signs of gnawing and holes, droppings, burrows or nests. Rodents are usually not active during daylight hours, so if a rat or mouse is seen scurrying around, the problem is serious. Notify the District Manager. A professional exterminator will be called who will establish a protocol for pest control in accordance with any state, county, or federal agency (such as OSHA) regulations that may apply.

6.1.3 Birds

Scavenging birds, such as sea gulls and crows, pose few problems around the Landfill. A control program will be implemented should the need arise.

6.2 FUGITIVE DUST EMISSIONS

Dust is caused by traffic on unpaved roads, heavy equipment operating to dump and compact, and winds. The County-improved road into the landfill from U.S. 191 is unpaved and is the major dust source other than the landfill itself. If fugitive dusts become a problem, water the landfill or call County Road Department for water trucks that may water the unpaved areas upon request.

6.3 LITTER CONTROL

Litter is unsightly, can clog machinery, and causes public relations problems. It is your responsibility as a Landfill Attendant to keep litter under control and cleaned up. Keep the working face downwind as much as possible so the wind will blow loose litter back onto the working face. Prompt compaction also reduces litter.

Effective use of litter fences also keeps blowing litter under control. These fences prevent litter from leaving the landfill site. Place the fences downwind and as close as possible to the working face. Constantly shifting high velocity winds accompanying storms, and thermals known as “dust devils,” are common at this site. Small litter control catch fences are the most effective barrier method to control wind-blown litter. Several rows of fencing will be placed within the perimeter fence of the landfill, to break up wind patterns and allow litter to be contained and retrieved within the landfill site. District landfill attendants will regular patrol the catch fences and terrain surrounding the landfill.

SECTION 7 SPOTTING AND WASTE SCREENING

7.1 INTRODUCTION

The municipal waste stream is made up of many different types of waste. Some wastes are acceptable, some are regulated, and some are prohibited.

A vital part of your job is to know what is considered hazardous waste, plus how to recognize and exclude it. Landfill Attendants, or the District's contractor personnel, are required to receive periodic training in waste screening. This training consists of initial training and periodic refresher courses. Certificates of completion are to be kept on file with personnel records.

7.2 IDENTIFICATION OF REGULATED HAZARDOUS WASTE

Hazardous wastes have either physical or chemical characteristics that could harm human health or the environment. A waste is considered hazardous if it falls into either of two categories: 1) a listed waste, or 2) a characteristic waste.

These wastes are banned from disposal in the Klondike Landfill. However, small quantity generators (<100 kg/month) and households are exempt from hazardous waste regulation. Hazardous wastes are most likely to enter the landfill mixed in with common household waste.

Any material contaminated by a hazardous waste is also deemed to be a hazardous waste and must be managed as such. RCRA permits are also required to store, transport, and treat hazardous waste.

7.2.1 Listed Waste

Listed wastes have been defined as hazardous waste by the EPA because they present significant risks to human health and the environment. They are listed in 40 CFR 261, subpart D. This list is constantly being updated, so it is important to get a current copy periodically from the EPA. A copy of the most current list available is included in Attachment 5.

7.2.2 Characteristic Waste

Characteristic wastes are those considered hazardous because of their nature. Characteristic wastes exhibit one or more of the following characteristics:

- Ignitable. A flash point at temperature less than 140 degrees F; kindles under normal friction; or oxidizes. Examples are solvents, peroxide, and petroleum products. Dry cleaning establishments, machine shops and repair shops are common producers of these wastes.
- Corrosive. Acidic or alkaline, pH measures less than 2 or greater than 12.5. Examples are car batteries, oven cleaners, and drain decloggers.
- Reactive. Normally unstable; reacts violently with water; contains cyanide or sulfur or can easily be detonated or exploded.
- Electroplating operations and munitions manufacturers produce reactive wastes.
- TCLP toxic (Toxicity Characteristic Leaching Procedure). TCLP is a laboratory test designed to measure the "leachability" of heavy metals, pesticides, and some other inorganic compounds.

7.2.3 Other Prohibited Wastes

The U.S. EPA has developed lists of specific types of wastes that may not be disposed of in municipal landfill. However, these lists exempt "household quantities" of the wastes, and permit the disposal of household quantities in municipal landfill. Generally speaking, it is not possible to exclude "household quantities" of wastes generated in commercial establishments from landfills, since it may not be possible to determine exactly where a load originated. Therefore, small quantities of these wastes are generally considered acceptable for disposal in the Klondike Landfill.

7.2.3.1 PCB's

PCB's are toxic materials that do not degrade over time. Material that may contain PCB's include transformers, capacitors, and hydraulic systems that use PCB containing oils. PCB's may also be found in debris, rags, or soil contaminated by a PCB spill.

Small quantities of PCB's are found in fluorescent light ballast capacitors and household appliances or other common consumer electrical products. These are not considered regulated PCB waste and can be landfilled. However, commercial facilities may not dispose of large quantities of these wastes in the landfill.

7.2.3.2 Liquids

Liquids and wastes containing free moisture cannot be put in the landfill. These wastes have the potential to increase leachate production. A waste is classified as a liquid if it fails the Paint Filter Test.

7.2.3.3 Radioactive Waste

Radioactive wastes are under the control of the Nuclear Regulatory Commission and are banned from the landfill.

7.2.3.4 Pesticides

All pesticides are prohibited from the landfill, except those that originate at the household level. Empty pesticide containers originating from commercial or agricultural operations are prohibited unless they have been triple-rinsed, with the ends punctured or removed.

7.3 PROCEDURES FOR SCREENING WASTE

The Landfill Attendant will visually inspect all loads when unloaded and will screen out prohibited and/or special wastes for proper handling. He/she will then certify, along with the waste hauler, that no prohibited wastes are present in the load being accepted. A complete random waste inspection will be conducted at a minimum of 1% of incoming loads, but no less than one complete inspection per month. The Landfill Attendant will receive periodic training in detecting prohibited wastes. This training will consist of an initial training and annual refresher training.

7.4 HAZARDOUS WASTES DISCOVERED AFTER THE FACT

If hazardous wastes or wastes containing PCB's are discovered to have been inadvertently accepted (i.e., during the application of daily cover), the following:

- Restrict access to the area and conduct an inspection to assess the situation. If the waste can be safely removed from the working face, the equipment operator will transport it to a secure zone.

- Try to identify the waste and the generator. Note your observations in the daily log, including a description of the material, in the daily log.
- The Executive Secretary, the hauler, and the generator (if known) will be notified within 24 hours of the discovery.
- If known, the generator will be responsible for proper cleanup, transport, and disposal of the waste. If the generator cannot be determined, the District is responsible for proper disposal of the material.

7.5 NOTIFICATION PROCEDURES

The following agencies and people must be notified if any type of banned material is discovered during a screening procedure:

- District Manager..... (435) 259-3867
- County Health Department.....(435) 259-5602
- David Ariotti, District Engineer, UDEQ..... (435) 637-3671
- Sheriff's Office.....(435) 259-8115
- Highway Patrol..... (435) 259-5441

The persons or agencies you contacted with the dates should be noted in Daily Log.

SECTION 8

SAFETY

8.1 SAFETY EQUIPMENT

The following safety equipment is on-site at the landfill. It is the responsibility of all personnel to know where the equipment is located and how to use it properly.

8.1.1 Fire Extinguishers

The following fire extinguishers are to be kept on site during operating hours:

- Two (2) 5-pound Powder-Sentry Fire Extinguishers attached to each piece of equipment.
- One (1) 20-pound Powder-Sentry fire extinguisher is to be stored in the landfill gatehouse of in the District's on-site vehicle. In the event that the District delegated this responsibility to its contractor, the contractor shall maintain a 20-pound fire extinguisher.

8.1.2 Protective Gear

The following protective gear is to be kept on site during operating hours for use by Landfill Attendants or the District Manager:

- Earplugs
- Safety Glasses
- Gloves
- Hard Hat
- Two way communication device
- Safety shoes
- Coveralls or long-sleeved shirt and full length pants

- Respirator or dust mask
- Fluorescent vest or jacket

The District's contractor must maintain on-site during operating hours safety equipment required by OSHA for general construction contractors for all contractor personnel.

8.2 SAFETY PROGRAM

The District and any contractors of the District are responsible for obtaining the necessary training for their employees operating heavy equipment and working on a construction site. This training must comply with OSHA, and NIOSH regulations as applicable.

The District is responsible for maintaining a safe working environment. Periodic safety audits of District and contractor facilities will be performed by the District Manager.

8.3 EMERGENCY PROCEDURES

If an accident occurs, respond as directed by your supervisor. The following numbers may be useful in reporting an emergency:

EMERGENCY FIRE AND RESCUE	911
Fire Department	259-5557
Highway Patrol	259-5441
Sheriff's Office	259-8115
Hospital (Moab, Utah)	259-7191
Grand County Solid Waste Management	259-3867
Special Service District #1	

Grand County Solid Waste Management
Special Service District # 1

KLONDIKE LANDFILL INSPECTION CHECKLIST

Performed by _____ Date _____

Satisfactory

Needs Work

1. Tickets and Log-in Procedure _____		
2. Inspect any waste dumped but not yet covered _____		
3. Random Load Inspection Done License # _____ Driver _____		
4. Daily Cover _____		
5. Final Cover/Intermediate Cover		
a. Settling _____		
b. Vegetation _____		
c. Final Cover Integrity _____		
6. Special Wastes _____		
7. Run On Diversion System		
a. Ditches/Berms _____		
b. Dams/Ponds _____		
8. Run Off Control System		
a. Ditches/Berms _____		
b. Dams/Ponds _____		
9. Leachate System _____		
10. Gas Monitoring _____		
11. Roads _____		
12. Excavations _____		
13. Litter Control _____		
14. Gates _____		
15. Fences _____		
16. Buildings _____		
17. Safety Equipment		

Fire Extinguisher____, Cell Phone or Radio____,
 First Aid Kit____, Respirator____, Gloves____,
 Hard Hat____, Safety Shoes____, Long Sleeves and
 Pants____, Safety Glasses____, Ear Plugs____,
 Reflective Vest____, Apron____, Paint Filters____

Specify recommended repairs and/or actions taken (by item line #)

Empty box for specifying recommended repairs and/or actions taken.

Grand County Solid Waste Management Special Service District #1. The information in this statement is to certify Grand County Solid Waste Management Special Service District #1 receiving waste at Klondike Landfill from (name of hauler) _____
Bill to (if different) _____

No 5556

Date _____ Time _____ AM. PM. Cu. Yds. _____ Compacted Uncompacted

Plate No. _____ State _____ Name of Driver _____

CERTIFICATION

I certify under penalty of law I personally examined the contents of this truck. I have not inspected every piece of waste. Based on my training these materials are solid waste only, not subject to hazardous waste requirements as outlined. I personally certify that, other than materials discarded in normal residential refuse, none of the material in this truck exhibits hazardous characteristics as describe in 40 CFR 261, subpart C (e.g. ignitable, corrosive, reactive, toxic) or has been named as hazardous waste and is listed in 40 CFR 261.31,32, 33, or is a PCB waste regulated under 40 CFR 761. I am aware there is sufficient penalty for false information including fines and/or imprisonment.

Signature of Driver _____ Signature of Site Operator _____

Weather: Clear Partly cloudy Raining Snowing

Winds: Direction _____ Calm 0-15 mph Moderate 15-30 mph Heavy +30 mph

Comments

APPENDIX E
FINANCIAL ASSURANCE COST ESTIMATES

GRAND COUNTY SOLID WASTE MANAGEMENT SPECIAL SERVICE DISTRICT #1
 KLONDIKE LANDFILL
ESTIMATED CLOSURE COST -- for Permit Renewal
 Modified Prescriptive Cap (24" Frost Penetration Layer)
 04/11/2002

ITEM NO.	ITEM	UNITS	\$/UNIT	QUANTITY	COST
1.0	ENGINEERING				
1.1	Topographic Survey	LS	\$1,854	1	\$1,854
1.2	Boundary Survey	LS	\$1,545	1	\$1,545
1.3	Site Evaluation	LS	\$2,060	1	\$2,060
1.4	Development of Plans	LS	\$8,240	1	\$8,240
1.5	Contract Administration, Bidding, and Award	LS	\$1,545	1	\$1,545
1.6	Administration Costs for Certification of Final Cover and Affidavit to Public	LS	\$1,030	1	\$1,030
1.7	Project Management, Construction Observation, and Testing	LS	\$10,300	1	\$10,300
1.8	Monitor Well				
1.9	Other Environmental Permit Costs				
	Subtotal				\$26,574
	Contingency		10%		\$2,657
	Total -- Engineering				\$29,231
2.0	CONSTRUCTION				
2.1	Final Cover System	Acre		4	
2.1.1	Completion of Sidewall Liner				
2.1.1a	Soil Placement				
2.1.1b	Soil Processing				
2.1.1c	Soil Amendment				
2.1.1d	Soil Purchase				
2.1.1e	Soil Transportation				
2.1.2	Drainage Layer on Sidewall				
2.1.2a	Geotextile Filter Fabric				
2.1.2b	Geonet/Geotextile Composite				
2.1.2c	Geomembrane Sidewall Liner				
2.2	Completion of Top Cover				
2.2.1	Infiltration Layer				
2.2.1a	Soil Placement	Cu. Yd.	\$ 2.58	19,360	\$49,949
2.2.1b	Soil Processing (Compaction & Permeability Testing)	LS	\$ 10,000	1	\$10,000
2.2.1c	Soil Amendment				
2.2.1d	Soil Purchase				
2.2.1e	Soil Transportation				
2.2.2	Flexible Membrane Cover				
2.2.2a	Drainage Layer on Top				
2.2.2b	Sand Layer				
2.2.2c	Geotextile Filter Fabric				
2.2.3	Drainage Layer				
2.2.3a	Geonet/Geotextile				
2.2.3b	Collection Pipe				
2.2.3c	Soil Cover				
2.2.3d	Geonet/Geotextile Composite				
2.2.3e	Gravel Capillary Barrier				
2.3	Erosion Layer Placement				
2.4	Revegetation	Acre	\$ 412	4	\$1,648

GRAND COUNTY SOLID WASTE MANAGEMENT SPECIAL SERVICE DISTRICT #1
 KLONDIKE LANDFILL
ESTIMATED CLOSURE COST -- for Pennit Renewal
 Modified Prescriptive Cap (24" Frost Penetration Layer)
 04/11/2002

2.4.1	Seeding Included in 2.4				
2.4.2	Fertilizer Included in 2.4				
2.4.3	Mulch Included in 2.4				
2.5	Site Grading and Drainage	LS	\$ 2,060	1	\$2,060
2.6	Site Fencing and Security				
2.7	Leachate Collection System Completion				
2.8	Completion of Gas Monitoring System				
	Subtotal				\$63,657
	Contingency		10%		\$6,366
	Total Construction				\$70,022
3.0	GAS COLLECTION SYSTEM				
3.1	System Design				
3.2	Equipment Installation				
	Subtotal				\$0
	Contingency		10%		\$0
	Total Gas Coiiection				\$0
4.0	MONITOR WELL INSTALLATION COST				
4.1	Monitoring Well Installation				
4.2	Piezometer and Monitor Well Plugging				
	Subtotal				\$0
	Contingency		10%		\$0
	Total -- Ground Water Installation				\$0
	Calculation of Total Closure Costs				
	Total -- Engineering				\$29,231
	Total -- Construction				\$70,022
	Total -- Gas Coiiection				\$0
	Total -- Monitor Well				\$0
	Performance Bond		2.50%		\$2,481
	Subtotal				\$101,735
	Legal Fees		2.50%		\$2,543
	Total Closure Cost				\$104,279

APPENDIX F

ANALYTICAL DATA — PERMEABILITY

**FAX TRANSMITTAL SHEET
TAHOMA COMPANIES, INC., WDBE**

**444 S. Main Street, Suite C-7
Cedar City, Utah
(801) 865 0131 o FAX (801) 865 0161**

Date: January 10, 1995

To: Mr. Paul Baginsky, P.E.
WESTON Environmental

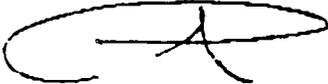
FAX #: (303) 980 1622

From: Gary F. Player

Subject: The following are results of permeability testing for
soils at the Grand County Landfill site, near Moab, Utah.

Number of Pages (including this Header): 4

Sincerely,



Gary Farnsworth Player
Principal Geologist
Registered California Geologist No. 4984

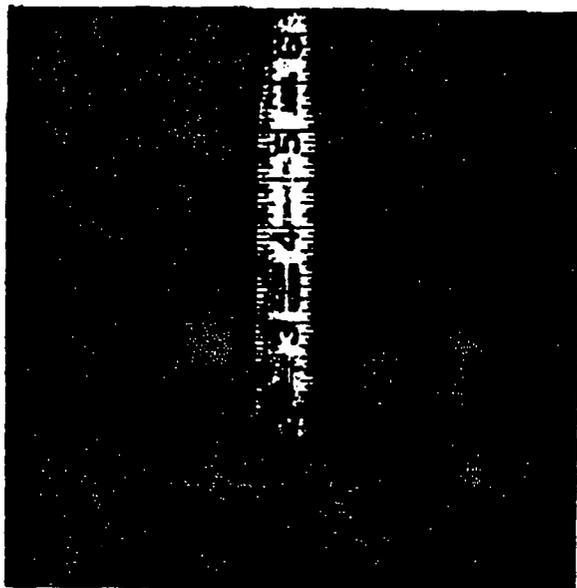
*Fax to
Damsden
406-411-
includes in
App. C ~~matrix~~
APP F*

Dames & Moore

PERMEABILITY TEST BY BACK PRESSURE CONSTANT HEAD (Pbp)

Owner TERRA COMPANIES
 Job # 29261-001
 Location _____
 Boring # _____
 Sample # GRAND COUNTY
 Depth 95% MOD at +31.044

Deflecting Speed 0 in/Hr
 Lateral Pressure 3 Min
 Saturated Field Moisture ESP
 Set-Up 12/22/94 Tested ELC 1620 Office
 Soil Type CL



	Initial	Final
Weight soil & dish no		
Dry weight soil & dish		
Net loss of moisture		
Weight of dish only		
Net weight of dry soil		
Moisture, % of dry weight	17.9	24.5

Wt. solids + moisture	W ₀ <u>452.2</u>	<u>475.4</u>	gms.
W ₀ + 454	W ₀		lbs.
Weight solids	W _s <u>381.9</u>		gms.
Wat density W ₀ ' - V ₀ '	<u>124.7</u>	<u>128.6</u>	pcf
Dry density	<u>105.7</u>	<u>103.5</u>	pcf

Net diameter	D ₀ <u>2.416</u>		in.
Area (0.785 D ₀ ²)	A ₀ <u>4.582</u>	<u>4.640</u>	sq. in.
Height	H ₀ <u>3.00</u>	<u>3.027</u>	in.
Volume (A ₀ H ₀) - 1728	V ₀ '		cu. ft.
Volume (A ₀ H ₀) x 16.4	V ₀ <u>225.44</u>	<u>230.93</u>	cc
Specific gravity of solids	G _s		
Volume of solids W _s - G _s	V _s		cc
(V ₀ - V _s) + V _s	V _i		
Initial burette reading			cc
Burette reading under pressure			cc
(V _p - V _s) - V _s	V _p		

$K_{AV} = 4.64 \times 10^{-8} \text{ cm/s}$

DAMES & MOORE

SATURATION DATA

PROJECT: TAIHOA NO.: 29261-001 LOCATION: GRAND CO.

Boring No.: _____ Sample: BULK Depth: _____ (ft./m.) Set up: EEL 12/22/94

σ_3 = 3 psi = _____ psi Type of Test: POP Cell No.: _____ Dial No.: _____

DATE	TIME		CHAMBER PRESSURE (PSI)	BACK PRESSURE (PSI)	EXTERNAL BURETTE OR DIAL ROD. (CC)/(IN.)	PORE PRESSURE (PSI)	Δ	σ	
	CLOSED	OPEN							
12/22/94	1147	1148	0/15	0 4/4	0.00 / -0.39	0.0 / 0.3	0.3/5		
	1358	1359	5/10	0 9/9	- / -	4.0 / 6.5	2.5/5		
	1449	1450	10/15	0 14/14	- / -	9.0 / 12.4	3.4/5		
	1573	1574	15/20	0 19/19	- / -	14.0 / 17.9	3.9/5		
	1557	1552	20/25	0 24/24	- / -	19.0 / 23.2	4.2/5		
	1612	1613	25/30	0 29/29	- / -	24.0 / 28.4	4.4/5		
	1730		30/35	0 34/34	- / -	29.0 / 33.9	4.9/5		
			35/37	0 39/39	- / -	0.45			
	1/22	1731	0	37	0 34/34	0.45			
		0721				0.47			
0723		0	37	0 34/34		15.1			
0910						14.1			
1103		113				13.5			
1713		370				12.4			
2/24/94		0628	795				11.6		
	0943	195				11.5			

PERMEABILITY TEST BY BACK PRESSURE CONSTANT-HEAD

Tahoma Companies, Inc

Sample from Grand County

Remold 95 % Mdd at + 3% omc

Mdd = 111.3 pcf, Omc = 15.9 %

	Initial	Final
Wet Density pcf	124.7	128.8
Dry density pcf	105.7	103.5
% Moisture	17.9	24.5

Height Initial	3.000	450.2	Wet soil and dish
Diameter Initial	2.416	381.9	Dry soil and dish
Area Initial	4.582	0	dish only
Volume Initial	225.44	450.2	Ws Initial
Initial dial	0.333	475.4	Final Ws
Final dial	0.306	381.9	Weight solids
Initial cc/in res	0.03		
Final cc/in res.	0.047		

Height Final	3.027	7.689	cm
Diameter Final	2.431		
Area Final	4.640	29.958	cm ²
Volume Final	230.33		

Height change	0.027		
cc/in reser.	0.013		
Volume change	-1.30769		
Cell Change	6.2	@ 37	psi
Net Volume Change	4.892308		
h= T/B PRESS. diff	3	210.30	cm

Standard Water .005 N CaSO₄

Hydraulic Gradient	Elapsed Time		K cm/sec
	minutes	cc's	
27.35	113.00	0.60	1.01E-07
	370.00	1.10	5.63E-08
	795.00	0.80	1.91E-08
	195.00	0.10	9.71E-09

```

+-----+
| K Average = 4.64E-08 cm/s |
+-----+

```

APPENDIX G
MAP OF PROBABLE HORIZONTAL ACCELERATIONS

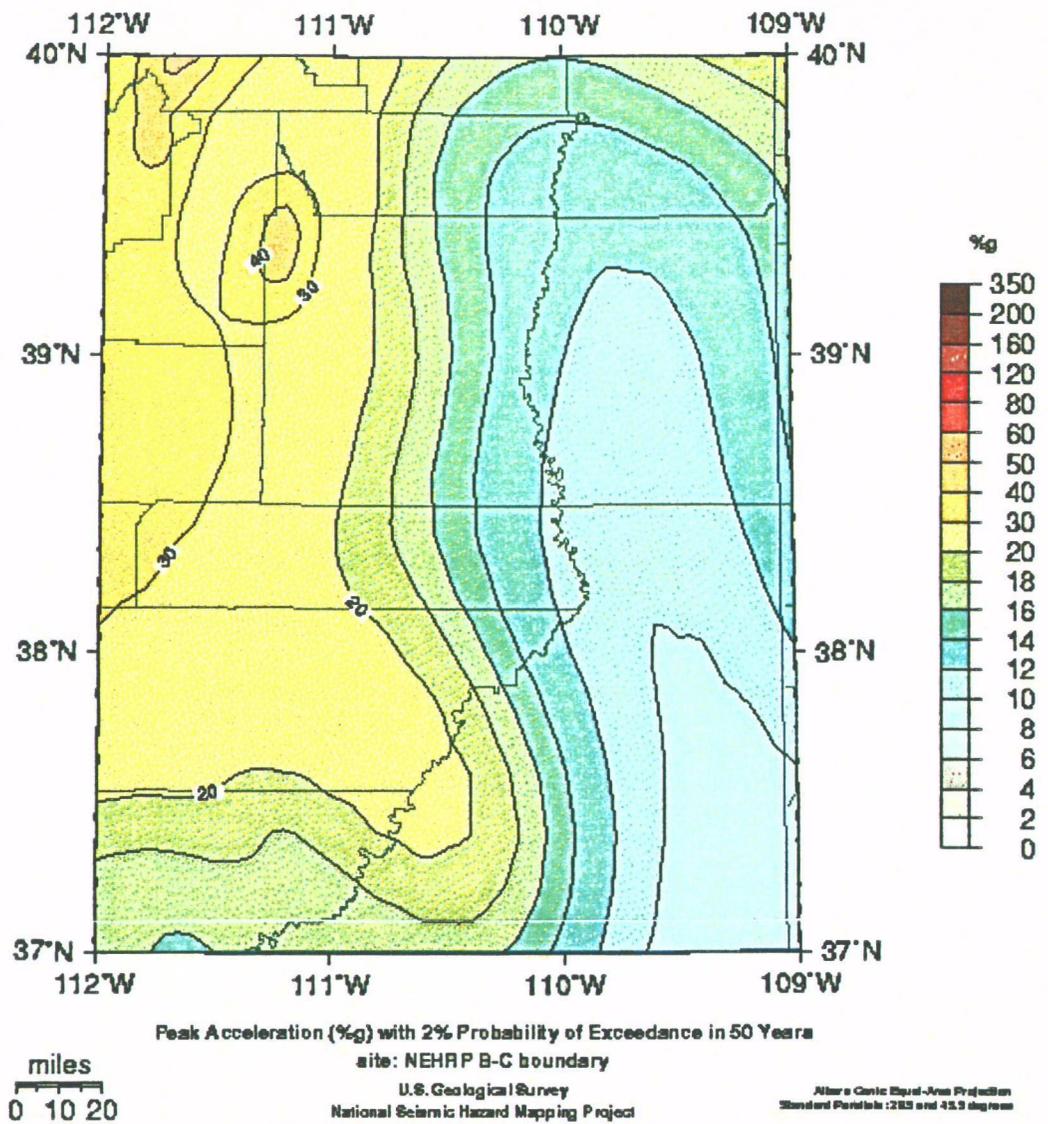
Vertical Acceleration

Custom Mapping Output!



CUSTOM MAPPING OUTPUT

The map below is a greatly reduced version of the map you generated, designed to fit on a web page. If these parameters look good for your final version and you want a full size printable postscript version click below

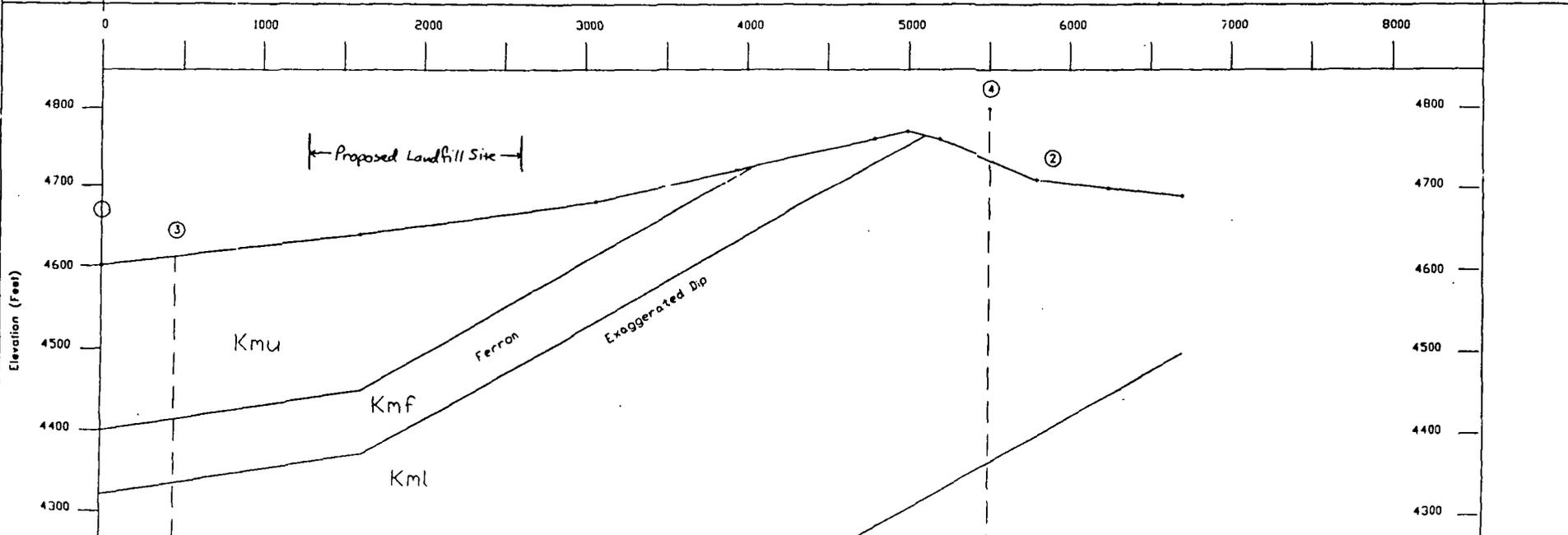
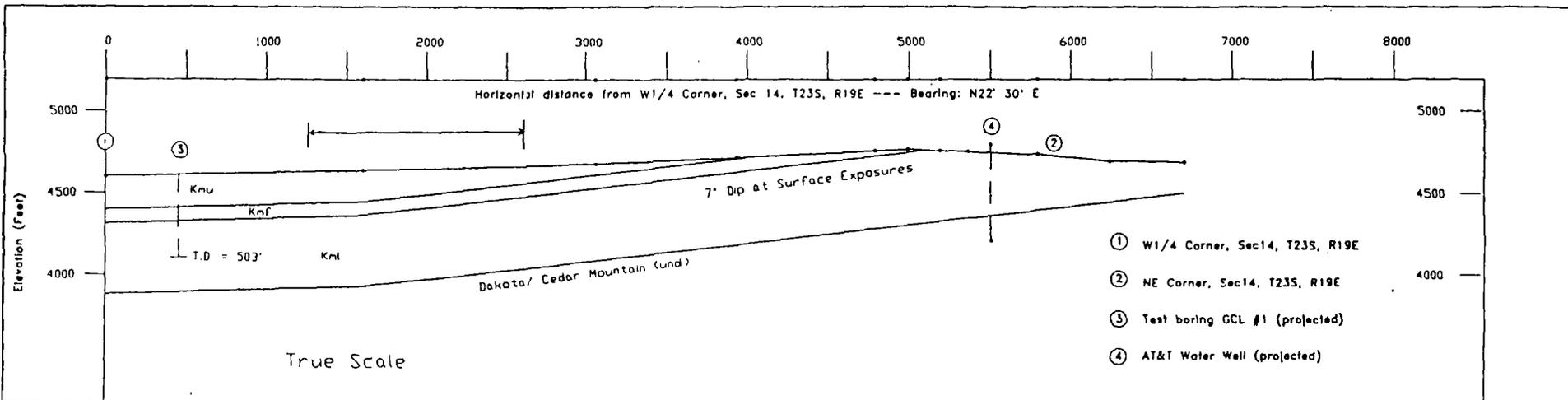


POSTSCRIPT VERSION

PROJECT INFO: Home Page
HAZARD MAPS: Custom Mapping

APPENDIX H

GEOLOGIC CROSS SECTIONS



Grand County Landfill - Geological Cross Section			
Client			
Project No.	Date	Job No.	Sheet
TABONA COMPANIES	May 94	94613-2	1/1
400 S MAIN, R-7 Cedar City, Utah 84703 (801) 836-4121 • (702) 886-9968	Updated Jan 95	File	Prepared by Gary J. Meyer May 94
Scale	1" = 500'	Academy 613-25	Plot 1 Jan

**TAHOMA COMPANIES, INC.
WDBE**

MEMORANDUM

TO: Mr. Paul Baginsky, WESTON
FROM: Gary F. Player
DATE: November 2, 1994
SUBJECT: RECENT GEOTECHNICAL STUDIES, GRAND COUNTY LANDFILL

We have completed the requested 37 test pits at the proposed Grand County Landfill site north of Moab. Twenty of the pits were excavated and logged on October 25, while the remainder (17) were excavated and logged on October 26, 1994.

Three basic units are present at the site.

The three units, from top down, are:

1. Silty sands (SM) at the surface and extending to depths of about 0.5' to 2.5' below ground level. The average thickness is 1 foot. This material is of alluvial (water carried) and/or eolian (wind blown) origin. The sands are loose where dry, and slightly cohesive where damp. Gypsum cement locally makes the sand friable rather than loose, but it is everywhere soft enough to excavate with a Case 580D backhoe.
2. Deeply weathered Mancos Shale that classifies as CL or SC. This material is present to depths of about five feet below ground. It has weathered in place and is soft and easily excavated.
3. Less weathered to virtually fresh Mancos "shale" bedrock. Most of this material is blocky, fractured mudstone and siltstone, with lesser amounts of weathered sandstone.

Engineering Implications

All of the materials are easily excavated, except for blocky mudstones of the Mancos Shale unit at the three most southwesterly test pits (21, 32 and 33). There the mudstones become very hard below eight feet. These three test pits are in areas slated for future expansion.

TAHOMA COMPANIES, INC.: MEMO -- November 2, 1994

Page 2

Test pits excavated in July disclosed the same hard mudstones further west at about the same depths. Therefore, it is likely that hard materials will be present beginning at 6 to 8 feet below ground level at the proposed locations of the stormwater detention basins and leachate evaporation ponds.

The three units are easily differentiated in the field by visual and tactile properties. Silty sands excavated from the surface can be stockpiled for use as daily cover, while the weathered Mancos clays and clayey sands can be saved for final cover, if desired. Enough SM will be available from future landfill units for use as vegetative cover when the first unit is closed.

The test pit log and a copy of the field map are attached. Please tell me if you want the information developed further or any additional work conducted. I will forward the lab test results to you as they have been completed.

Also, I contacted the surveyor, per our conversation Tuesday, to locate the test pits and test boring. Those results will also be sent to you ASAP.

Σ TT 11-HZ GEOSTDY.MEM

TAHOMA COMPANIES, INCORPORATED ♦ WDBE
444 South Main Street, Suite C-7
Cedar City, Utah 84720
(801) 865-0131 fax 865-0161

LOCATION: SE NW, SECTION 14, T19S, R23E, Moab, Utah

Note: Test pit locations are approximations and are for review purposes only. The perimeters of the tract and actual test pit locations should be determined by a registered land surveyor.

Log of Test Pits

Test Pit No.	Depth	Soil Description
P-1	0 - 2.5'	SM, gray, cohesive, friable Easily excavated.
	2.5'- 8.5'	Bedrock, Mudstone, blocky weathering, dark gray, fractured. Easily excavated with backhoe. Common shell molds- "Inoceramus." Thin (1-2") interbeds of site, light tan to Orange.
P-2	0 - 2'	SM, medium grained, brown, soft, cohesive, moist.
	2'- 3'	Shale, very soft, clayey, dark gray.
	3'- 10'	Shale, competent, fractured, easily excavated except for thin cemented streaks. Gray to dark gray Mancos. Microcrystalline white gypsum along fracture surfaces. fossil fragments - molluscs, hard below 9.5'.
P-3	0 - 1.5'	SM, med grained , trace coarse sand and granules, damp, cohesive, dark brown soft.
	1.5' - 3'	Shale, dark gray, soft, clayey, gypsiferous, trace orange siltstone and bentonite shale.
	3' - 11'	Shale, gray to dark gray, blocky weathering. common mollusc molds, gypsum in fractures, competent, but easily excavated with case 580D hoe. thin, fine sandy streaks (<.5") are deeply weathered, loose, tan below 8', common shell material below 10'. T.D. @ 11'.
P-4	0 - 2'	SM, med to coarse grained, tan, cohesive.
	2' - 3.5'	Clay, dark gray, sandy, soft.
	3.5' - 9'	Mancos shale, gray to dark gray, paper thin fragments in upper one foot of unit; blocky below. Common shell fragments. easily excavated. T.D. 9'.

Test Pit No.	Depth	Soil Description
P-5	0 - 1.5'	SM, tan to light brown, loose.
	1.5' - 4'	Clay, gray to light gray, soft, gypsiferous. Fibrous gypsum crystals in top one half foot.
	4' - 9'	Mancos shale. Gray to dark gray, soft, papery, deeply weathered. easily excavated. Common shell fragments. Blocky below six feet. Still easy digging. Thin tan to orange stained sandstone streaks (<.5") T.D. 9'.
P-6	0 - 2'	SM, gray-brown, loose to moderately cohesive.
	2' - 9'	Mancos Shale, dark gray to gray, papery in first 2 feet of unit (2'-4') soft, clayey. Below 4 feet material is blocky, with rare fossil fragments. Easily excavated due to fracturing. T.D. 9'.
P-7	0 - 2'	SM, tan, cohesive.
	2' - 4'	Clay (CL), gray to dark gray, soft, slightly gypsiferous.
	4' - 10.5'	Mancos Shale, gray to dark gray, papery in 4'-6', blocky below. Easily excavated. Common shell fragments. T.D. 10.5'.
P-8	0 - 1.5'	SM, tan, loose.
	1.5' - 2'	SM, dark brown, cemented with fibrous gypsum.
	2' - 4'	Clay, dark gray, with layers of weathered microcrystalline gypsum, soft, plastic.
	4' - 9'	Mancos shale, gray to dark gray, blocky to papery. Weathered gypsum along fracture planes, trace calcite nodules. easily excavated, silty, T. D. 9'0".
P-9	0 - 1.5'	SM, tan, trace coarse sand and granules, cohesive.
	1.5' - 2'	SM, gray-brown, gypsiferous.
	2' - 4'	Clay, dark gray, dry, trace gypsum in laminae.
	4" - 8.5'	Mancos shale, gray to dark gray, with gypsum coating fractures. Rare calcite nodules. Common shell molds and fragments. Easily excavated. T.D. 8.5'.

Test Pit No.	Depth	Soil Description
P-10	0 - 2'	SM, tan, cohesive, very soft to loose. Gypsiferous and darker gray locally in lowermost 6' - no continuous gypsum cement.
	2' - 3.5'	Clay, gray to dark gray, soft, gypsiferous.
	3.5' - 9'	Mancos "shale" - actually a blocky mudstone, dark gray, cemented with gypsum and calcite. Easily excavated because of fractures, but locally breaks in large chunks (3"x 24"x 16") caves readily from fracturing T.D. 9'.
P-11	0 - .5'	SM, tan, loose.
	.5' - 10'	Mancos "shale" - mostly siltstone and limestone, dark gray, weathers blocky along fractures, common fossil molds and shell fragments. Cemented with gypsum from 1.0'-2.0' below surface. Loose fractured blocks with silt soil in fractures. Sloughs readily into hole. T.D. 10'.
P-12	0 - 1'	SM, loose.
	1' - 3.5'	Clay, gray brownish gray, soft, dry, trace gypsum cement in uppermost foot (1'-2').
	3.5' - 8'	Mancos "shale", mostly siltstone and mudstone, tan, deeply weathered, fractured. Easily excavated. Lenses of coarse sandstone cemented with siderite, weathered to limonite. Common fossil molds and shell fragments (possible Ferron).
	8' - 10'	Mancos mudstone, dark gray, does not cave. Easily excavated. T.D. 10'.
P-13	0 - 1.5'	SM, tan, loose.
	1.5' - 3.5'	Clay, dark gray, banded with gypsum.
	3.5' - 8'	Mancos "shale", blocky mudstone, fractured, caves readily, gray to dark gray, easily excavated.
P-14	0 - 1.5'	SM, tan, slightly cohesive to loose, fine to medium grained sand, cemented locally with gypsum in lower .5' (1-1.5).
	1.5' - 3'	Clay, dark gray, laminated with gypsum cemented light colored zones. soft, damp.
	3' - 10'	Mancos shale, dark gray-brown and dark gray siltstones, mudstones and shales. Fractured, blocky, common shell mold and some original shell material (calcite). Easily excavated. Lenses of orange to tan sandstone, slight bituminous odor in black shales. T.D. 10'.

Test Pit No.	Depth	Soil Description
P-15	0 - 1'	SM, loose to slightly cohesive, brown.
	1' - 3'	Clay, dark gray, gypsiferous soft.
	3' - 9'	Mancos shale, gray to dark gray mudstone, siltstone and shale, fractured. Easily excavated, caves readily, common shell fragments.
P-16	0 - .5'	SM, tan, gypsiferous, friable.
	.5' - 3'	Clay, dark gray to gray-brown, banded with gray gypsum, soft, gradational contact with deeply weathered bedrock.
	3' - 10'	Mancos shale, gray-brown to dark gray, fractured. Easily excavated. Mostly siltstone and mudstone - some paper shale, common shell fragments and molluscan molds, caves readily.
P-17	0 - 1'	Clay, dark gray to gray-brown, soft (deeply weathered mancos shale).
	1' - 12'	Mancos shale, dark gray, fractured, gypsum fills horizontal and vertical fractures together gray siltstones are laminated with tan, very fine grained sandstone beds < 1/4" thick. Easily excavated. T.D. 12'.
P-18	0 - 1.5'	SM, tan to brown, cohesive, partially cemented with gypsum.
	1.5' - 4'	Clay, dark gray, silty, soft, damp, deeply weathered mancos shales.
	4' - 10'	Mancos shale, gray to dark gray siltstone, mudstone and shales, with tan to orange laminae of sandstone, common fossil molds and shell fragments. Easily excavated T.D. 10'.
P-19	0 - 1'	SM-SC, tan, cohesive, soft.
	1' - 3'	Clay, gray-brown to dark gray, soft.
	3' - 10'	Mancos shale, dark gray to black, papery, common fossil molds. Large cephaloped fragments. Fractured, blocky mudstone below 7 feet, caves readily.
P-20	1 - .5'	SM, tan, loose.
	.5' - 10'	Mancos "shale", blocky mudstone, dark gray to gray, mixed with laminated sandstone, tan to orange. Common fossil molds and rare shell fragments, fractured, easily excavated. Some fractures filled with fibrous gypsum. One streak (6") thick of white sandstone, very fine grained, cemented with calcite, "salt and pepper" chert grains. Easily excavated. T.D. 10'.

Test Pit No.	Depth	Soil Description
P-21	0 - 1'	SM.
	1' - 3.5'	Clay, dark gray, banded with light gray gypsum.
	3.5' - 11.5'	Mancos "shale" 6 inch streak of sandstone from 6'-6'6", blocky, easily excavated. T.D. 11.5'.
P-22	0 - 1'	SM, gray brown, loose, dry.
	1' - 4'	Clay, dark gray-brown, gypsiferous.
	4' - 8.5'	Mancos "shale", blocky mudstone, fractured, gray to dark gray. Becomes difficult to excavate below eight feet. Backhoe refusal on hard mudstone bedrock @ 8.5'. Not many fossils, especially compared to Ferron sandstone member. T.D. 8.5'.
P-23	0 - 1'	SM, tan to brown, slightly cohesive to loose.
	1' - 3.5'	Clay, gray-brown to gray, banded with microcrystalline gypsum, soft.
	3.5' - 9.5'	Mancos shale, gray to dark gray, blocky, easily excavated. Common large cephalopod fragments. T.D. 9.5'.
P-24	0 - 1'	SM, dark brown, cohesive, damp, soft.
	1' - 3.5'	Clay (CL), dark gray to dark gray-brown, banded with light gray gypsum.
	3.5' - 10'	Mancos shale, dark gray-brown to dark gray, fractured, breaks into thin shaley fragments, easily excavated, common fossil impressions.
P-25	0 - 2'	SM, tan to brown, loose, dry.
	2' - 4'	Clay, dark gray-brown, soft, deeply weathered shale.
	4' - 10'	Mancos "shale" - flaggy siltstone, light gray and blocky mudstone. Easily excavated due to common fractures. T.D. 10'.
P-26	0 - 1.5'	SM, gray-brown, cohesive, damp, soft, gypsiferous.
	1.5' - 2.5'	SC/CL, banded brown, gray and light gray, cohesive, soft.
	2.5' - 11'	Mancos shale, dark gray, papery to blocky, common shell fragments and fossil molds. Some gray-brown siltstone, fractured, easily excavated.

Test Pit No.	Depth	Soil Description
P-27	0 - .5'	SM.
	.5' - 2'	CL/SC, banded dark brown, gray and light gray, soft, cohesive.
	2' - 10'	Mancos "shale", gray siltstone and mudstone. Dips not apparent, fracturing is pervasive. Easily excavated. Caves readily.
P-28	0 - 1.5'	SM.
	1.5' - 4.5'	SC/CL, dark gray to gray brown, moderately soft, cohesive.
	4.5' - 10'	Mancos "shale", dark gray-brown and gray mudstone, fractured, easily excavated. Common fossil molds and shell fragments.
P-29	0 - 1.5'	SM.
	1.5' - 3.5'	SC/CL, tan to dark gray, banded with gypsum.
	3.5' - 9'	Mancos "shale", gray to dark gray mudstone, fractured, easily excavated.
P-30	0 - 1.5'	SM, brown, slightly cohesive, gypsum cement.
	1.5' - 2'	SM, orange, yellow, cohesive, moderately hard.
	2' - 7'	SC/CL, dark gray to gray, damp, soft, slightly cohesive.
	7' - 11.5'	Mancos shale, fractured, dark gray, blocky. Easily excavated to 11', hard below 11'. T. D. 11.5' in mudstone.
P-31	0 - 1'	SM, loose, gray-brown.
	1' - 4'	SC/CL, banded.
	4' - 11'	Mancos shale, blocky mudstone, fractured, gray to dark gray-brown, easily excavated to T.D.
P-32	0 - 1'	SM, brown, loose.
	1' - 3'	SC/CL, banded gray, brown and light gray, gypsiferous.
	3' - 6'	Mancos "shale", blocky Mudstone. Backhoe refusal at 6'.
P-33	0 - 1.5'	SM, brownish gray, loose to slightly cohesive, dry.
	1.5' - 4.5'	SC, dark gray to dark gray-brown, slightly cohesive, damp, soft.
	4.5' - 9'	Mancos shale becomes hard, blocky mudstone below 7'. Easily excavated above 7'. T.D. 9' in hard blocky mudstone, dark gray, calcareous.

Test Pit No.	Depth	Soil Description
P-34	0 - 1.5'	SM, dark gray-brown, cohesive, damp.
	1.5' - 3'	SC/CL, dark gray, banded with gypsum.
	3' - 6'	Mancos shale, dark gray, fractured, easily excavated.
	6' - 7'	Mancos mudstone, hard, broke through into looser, fractured shale and siltstone below.
	7' - 10'	Mancos siltstone, fractured; gypsum coating along fractures. Easily excavated, T.D. 10'.
P-35	0 - 1'	SM, gray-brown.
	1' - 3'	SC/CL, banded gray-brown and light gray-brown, soft cohesive.
	3' - 8'	Mancos "shale", dark gray-brown siltstone with thin laminae of light gray ss., common fossil fragments, including large cephalopods to 1' in diameter. Rare siderite cemented concretions. Easily excavated.
P-36	0 - 1'	SM.
	1' - 8'	Mancos "shale", deeply weathered siltstone, gray and sandstone. fine grained, white to light gray, with black papery shale. Easily excavated. T. D. 8'.
P-37	0 - 1'	SM, brown, loose.
	1' - 3.5'	SC/CL, gray-brown, cohesive, cemented partially with gypsum, banded appearance.
	3.5' - 8'	Mancos shale, weathered, fractured, dark gray-brown siltstone and gray mudstone. Easily excavated.

FILE: TT 11-HVTESTPIT.TBL

TAHOMA COMPANIES, INCORPORATED WDBE
(Member of the Utah Better Business Bureau)
444 South Main Street, Suite C-7
Cedar City, Utah 84720
(801) 865-0131 fax 865-0161

November 3, 1994

To File:

I have identified the following fossils from test pits in the Mancos Shale at the proposed Grand County Landfill site north of Moab, Utah:

Ammonites

Gastrolites sp.
Clioscaphites vermiformis
Scaphites warreni
Baculites sweetgrassensi

Pelecypods

Gryphaea newberryi
Inoceramus labiatus

These fossils are characteristic of the Mancos Shale. More specifically, these fossils suggest a Turonian (early Late Cretaceous) age equivalent to the age of the uppermost part of the Tununk Member of the Mancos Shale.



Gary F. Player
Principal Geologist

File:TT11C/FOSSILS

TAHOMA COMPANIES, INCORPORATED ♦ WDBE
444 South Main Street, Suite C-7
Cedar City, Utah 84720
(801) 865-0131 fax 865-0161

October 18, 1994

Mr. Paul Baginsky
WESTON Environmental
215 Union Boulevard
Lakewood, CO 80228-1842

SUBJECT: DRILLING RESULTS, GRAND COUNTY LANDFILL

Dear Paul:

We successfully completed a test boring along the western edge of the proposed Grand County Landfill (GCL) on October 3, 1994. Total depth of the test boring (GCL #1) was 503 feet, measured from the Kelly Bushing, 5.5 feet above ground level. No water was encountered in the test boring.

GCL #1 was started in the upper, or Blue Gate Member of the Mancos Shale. It continued in the Blue Gate until it entered the Ferron Sandstone Member of the Mancos Shale at about 200 feet. The Ferron Sandstone Member was present from about 200 to 270 feet. Thin sandstones in the Ferron were totally cemented with calcite (calcium carbonate) and contained no water. Drilling then continued to total depth of 503 feet in gray siltstones and dark gray shales of the lower, or Tununk Member of the Mancos Shale.

The location was about 550 feet north and 250 feet east from the west quarter corner of section 14, T. 23 S., R. 19 E. The enclosed boring log shows only the approximate location of the test boring--the location will be surveyed after excavation of the test pits next week. The drillsite was within the northeastern portion of a 100' X 100' staked area that had been "cleared" for our use by the Bureau of Land Management.

Sincerely,



Gary F. Player, Principal Geologist
Tahoma Companies, Inc.
Registered California Geologist No. 4984

FILE:DOCUMENT\WESTON\GCL#1.LET

TAHOMA COMPANIES, INCORPORATED

LOG OF TEST BORING GCL-1

DATE DRILLED: OCTOBER 3, 1994

JOB NUMBER 613-2

GRAND COUNTY LANDFILL

FROM	TO	t1	t2	TIME	LITHOLOGY AND COMMENTS
0	23	11:21	11:28	18	SHALE, DARK GRAY, SLI. SILTY, TR. GYPSUM. MANCOS SHALE. WIND FROM S. AT 10 MPH CLOUDY, COOL. 8.5" SURFACE HOLE.
23	43	12:11	12:21	10	SHALE, AS ABOVE, SILTY
43	63	12:31	12:44	13	SHALE, AS ABOVE, SILTY
63	83	12:56	13:09	13	SHALE, DK. GRAY, LOCALLY FRACTURED AND WEATHERED TO LIGHT GRAY CLAY.
83	103	13:18	13:32	14	SHALE, DK. GRAY, SILTY, HARD
103	123	13:38	13:51	13	SHALE, AS ABOVE
123	143	13:58	14:11	13	SHALE, AS ABOVE
143	163	14:17	14:30	13	SHALE, AS ABOVE, TRACE SHELL FRAGMENTS
163	183	14:35	14:49	14	SHALE, DARK GRAY, SHELL FRAGMENTS
183	203	14:57	15:10	13	SHALE, AS ABOVE, BUT TRACE SAND GRAINS. SANDSTONE, WHITE, V. FINE GRAINED, CALCITE CEMENT, TIGHT, DRY, BELOW 200'
203	223	15:17	15:30	13	SHALE, DK. GRAY TO GRAY, TR. SAND
223	243	15:38	15:50	12	SHALE, DK. GRAY, NO SAND
243	263	15:57	16:11	14	SHALE, AS ABOVE. SANDY FROM 258-263: SANDSTONE V. FINE GRAINED, WHITE, DRY, TIGHT
263	283	16:17	16:29	12	SILTSTONE, LT. GRAY TO GRAY, AND SHALE
283	303	16:36	16:48	12	SILTSTONE, LIGHT BLUISH GRAY
303	323	16:54	17:07	13	SILTSTONE, LIGHT BLUISH GRAY
323	343	17:12	17:26	14	SILTSTONE, MED. TO DARK GRAY
343	363	17:31	17:43	12	SILTSTONE, TRACE DARK GRAY SHALE
363	383	17:48	18:01	13	SILTSTONE, DARK BLUISH GRAY
383	403	18:06	18:19	13	SILTSTONE, TRACE DARK GRAY SHALE
403	423	18:24	18:33	9	SILTSTONE, AS ABOVE. INCREASED RPM
423	443	18:38	18:49	11	SILTSTONE, DARK BLUISH GRAY
443	463	18:54	19:04	10	SILTSTONE, AS ABOVE
463	483	19:09	19:21	12	SILTSTONE, AS ABOVE
483	503	19:27	19:40	13	SILTSTONE, AS ABOVE

TOTAL DEPTH: 503 FEET
TOTAL DRILLING TIME: 317 MINUTES
AVE. DRILLING RATE: 0.630 MINUTES PER FOOT
AVE. DRILLING RATE: 95.20 FEET PER HOUR

TOTAL DEPTH: 503 FEET
NO WATER ENCOUNTERED

DEPTH MEASURED FROM KELLY BUSHING, 5.5 FEET ABOVE GROUND LEVEL

LOGGED BY: GARY F. PLAYER, REGISTERED GEOLOGIST

TAHOMA COMPANIES, INCORPORATED

HEADER SHEET: LOG OF TEST BORING

Test Boring Name: GCL 1
Client: Grand County Solid Waste Mgmt SSD # 1 Project: Landfill Design
Purpose: Explore for groundwater Location: T23S, R19E, section 14,
SW 1/4 of NW 1/4
County: Grand, Utah

Elevation (G.L.) ± 4640' Elevation (Top Casing): N/A

Drilling Contractor: Jody Shumway (#648) Rig: Porta Drill 1500
EPA Classification: D Drilling Method: Rotary
Circulation Method: air Sampling Method: grab

Date Begun: 10/3/94 Date at Total Depth: 10/3/94
Date Completed: N/A Total Depth: 503'
Hole Size(s): 8 1/2" 0-23; 6 1/4" 23-503'
Completion Interval(s): N/A

Casing O.D.: N/A Casing I.D.: N/A
Logger(s): Barry A. Plater

Aquifer(s): None - Dry hole
Datum Point: Kelly Boring, 5.5' above Ground Level

Water Level:	Date:	Time:
<u>N/A</u>		

Depths All Measured in Feet
Diameters All Measured in Inches

GCL # 1

Sheet 1 of 2

ate 10/3/94

From time To Time @ at
~~11:00~~ 11:10 23 K.B. 11:28 18
 (3 1/4" surface hole)
 8 1/2"

Lithology/Comments

Shale, dark gray, silty siltstone
 Trace gypsum. Marcos
 Wind out of south @ 10 mph.
 Cloudy, cool.

Measured depths from Kelly Bushing, 5'6" above ground level.

6 1/4" bit now on below 23'

From	To	To	T②	Δt	Rate
23	12:11	43	12:21	10	Shale, as above, silty 120 ft/hr
43	12:31	63	12:44	13	" " " " 92 ft/hr
●	12:56	83	13:09	13	Shale, locally fractured and weathered to light gray clay.
83	13:18	103	13:32	14	Shale, dark gray, silty, hard 85 ft/hr
03	13:38.5	123	13:51.5	13	" " " " " 92 ft/hr
123	13:58	143	14:11	13	" " " " " 92
143	14:17.5	163	14:30.5	13	" " " " " 92
Trace <u>Inoceramus</u> fragments					
163	14:35	183	14:49	14	Shale, dark gray, shell frags. 85
83	14:57	203	15:10	13	As above, one sand grain: Below 200', Sandstone, white, calcareous, v-f. grained, tight, dry.
03	15:17.5	223	15:30.5	13	Shale, gray to dark gray, trace ss
2	15:38	243	15:50	12	Shale, dk gray, no sand. 100
13	15:57.5	263	16:11	13.5	Shale: sandy from 258-263. Sandstone v-f. grained, white.

GCL #1

Sheet 2 of 2

Date 10/3/94

From	to	T ₁	to	Δt	Lith / Comments	Rate
263	16:17	283	16:29	12	Ste, lt gray to gray, and shale, dk gray ¹⁰⁰	
283	16:36	303	16:48.5	12.5	Ste, lt gray, slight bluish cast	
303	16:54	323	17:07	13	Ste, lt bluish gray	
323	17:12	343	17:26	14	Ste, as above, st darker gray	
343	17:31	363	17:43.5	12.5	Ste, as above, trace dk gray shale	
363	17:48.5	383	18:01.5	13	Ste, dark blue-gray.	
383	18:06.5	403	18:19	12.5	Ste, trace dk gray shale	
403	18:24	423	18:38.5	12.5 7.5	Ste, as above	
423	18:38	443	18:49	11	Ste, as above	
443	18:54	463	19:04.5	10.5	ste, as above	
463	19:09.5	483	19:21	11.5	Ste, as above, dry	
483	19:27	503	19:40	13	Ste, as above, dry	

Jogger Gary F. Plamn

Ste = siltstone

APPENDIX I

LOCATION STANDARDS LETTERS



State of Utah

Department of Community & Economic Development
Division of State History
Utah State Historical Society



Michael O. Leavitt
Governor
Max J. Evans
Director

300 Rio Grande
Salt Lake City, Utah 84101-1182
(801) 533-3500
FAX: (801) 533-3503

September 29, 1994

OCT 03 1994

Gary F. Player
Principal Geologist
Tahoma Companies, Incorporated WDBE
444 South main Street, Suite C-7
Cedar City, Utah 84720

RE: Grand County Landfill

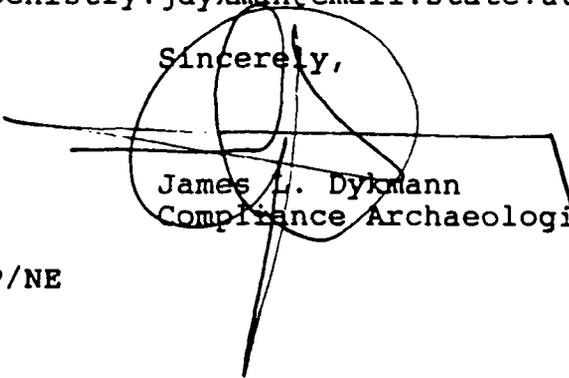
In Reply Please Refer to Case No. 94-0606

Dear Mr. Player:

The Utah State Historical Preservation Office received the above referenced project on September 26, 1994. After review of the material provided, the Utah Preservation Office recommends that there would be No Effect upon cultural resources by the project.

This information is provided on request to assist Grand County with its Section 106 responsibilities as specified in 36CFR800. If you have questions, please contact me at (801) 533-3555. My computer address on internet is:
internet:cedomain.cehistory.jdykman@email.state.ut.us

Sincerely,


James H. Dykman
Compliance Archaeologist

JLD:94-0606 BLM/NP/NE

FILE COPY

*TAHOMA COMPANIES, INCORPORATED
444 S. MAIN STREET, SUITE C-7
CEDAR CITY, UTAH 84720
(801) 865 0131 FAX (801) 865 0161*

September 20, 1994

Mr. Phillip Ashbaker
Director
Utah Division of Aeronautics
135 N 2400 W
Salt Lake City, Utah 84116

Dear Mr. Ashbaker:

Our company is currently applying for a license for the proposed Grand County Landfill under new Utah state regulations. I spoke on the telephone with your administrative assistant today.

She and I briefly discussed the proposed Grand County Landfill (GCL) near Moab, Utah. The GCL is located west of U.S. Highway 191 in section 14, T. 23 S., R. 19 E., SLB&M. Grand County has operated a landfill in Moab for several years, but must now license a new location under new state regulations effective September, 1993.

The following information is pertinent to the license application:

The facility is not within ten thousand feet of any airport runway end used by turbojet aircraft or within 5,000 feet of any airport runway end used only by piston-type aircraft.

Tahoma Companies will soon be involved in license applications for several other Utah landfills. It is nice to know where we can get help on aviation issues.

Please contact us if you have any comments concerning this landfill license application.

Sincerely,



Gary Farnsworth Player
Principal Geologist
Registered California Geologist No. 4984

FILE COPY

TAHOMA COMPANIES, INCORPORATED WDBE
444 S MAIN STREET, SUITE C-7
CEDAR CITY, UTAH 84720
(801) 865 0131 FAX (801) 865 0161

September 20, 1994

Mr. Jim Dykmann
Compliance Archaeologist
Utah Division of State History
300 Rio Grande
Salt Lake City, Utah 84101-1182

Dear Jim:

Thank you for your help last spring in our discussion of archaeological issues associated with landfills. At your suggestion, I am now requesting a consultation with your Division for the proposed Grand County Landfill (GCL) near Moab, Utah.

The GCL is located west of U.S. Highway 191 in section 14, T. 23 S., R. 19 E., SLB&M. The landfill site has been reviewed by archaeologists for the U.S. Bureau of Land Management preparatory to transfer of ownership from the BLM to Grand County Special Services District No. 1, and must now be licensed under new state regulations effective September, 1993.

It is my opinion that this area will not require additional field site archaeological clearances for the following reasons:

- (1) The lands have been inspected by BLM archaeologists;
- (2) No water courses or impoundments occur on the property; and
- (3) No registered Historic Places have been identified within a mile of the landfill site.

I look forward to your comments on this site.

Sincerely,



Gary F. Player
Principal Geologist

Enclosure: Topographic Map of Emery County Landfill site.

TAHOMA COMPANIES, INCORPORATED
NOTES TO FILE

DATE: May 23, 1994

JOB NUMBER: 613-2

SUBJECT OR TASK: Threatened and Endangered Species at GCL

Today I spoke by telephone with Mr. Larry England of the U.S. Fish and Wildlife Service about possible T&E issues at the GCL. I mentioned two potentially problematic species: (1) Jones Cycladenia (*Cycladenia humilis*, var. *jonesii*) and (2) Spineless Hedgehog Cactus (*Echinocereus triglochidiatus*, var. *inermis*).

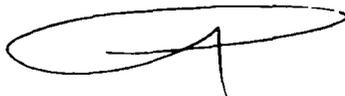
Both of these are terrestrial plants.

The Spineless Hedgehog Cactus has been removed from the list of T&E species.

The Cycladenia grows only on Chinle Shale outcrops and is present north and east of Moab. This plant does not occur on Mancos shale because of the alkaline nature of residual soils.

No fish species will be effected because of the death of perennial or even intermittent streams on the GCL site.

Raptors will not be effected because there are no trees for potential nesting sites. I should explore all of the hogbacks on the property to look for nesting sites. I will also be on the lookout for nesting sites on the Ferron Sandstone outcrop when I measure the section. I will measure the section off the GCL property to the east in order to project rock types into the proposed location of one or more monitor wells.



File TT 11 \ GCL NOTE 1

TAHOMA COMPANIES, INCORPORATED ♦ WDBE
444 South Main Street, Suite C-7
Cedar City, Utah 84720
(801) 865-0131 fax 865-0161

November 7, 1994

Ms. Terry Nixon
Grand County Solid Waste Management Special Services District No. 1
P.O. Box 980
Moab, Utah 84532

**SUBJECT: ZONING AT PROPOSED LANDFILL SITE: NEED FOR CONDITIONAL
USE PERMIT**

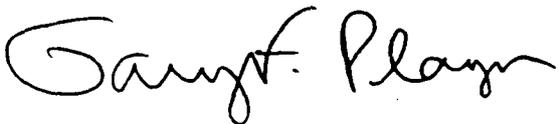
Dear Terry:

I have spoken by telephone with Debbie Hilger and Jeff Whitney of the Grand County Building Department. They told me the following:

1. The proposed landfill site is zoned G-1 (grazing);
2. Landfilling is not a specified use in zone G-1;
3. "All other uses" may be allowed, but only by application to the Board of Adjustment.

I told Jeff Whitney that Emery County had revised their zoning statute to specifically allow landfilling in their I-1 (industrial) zone. He suggested that application for a Conditional Use Permit within the G-1 zone would be a more appropriate option for the proposed Grand County landfill site. We recommend that the Special Services District board apply for the Conditional Use Permit soon.

Sincerely,



Gary F. Player, Principal Geologist
Tahoma Companies, Inc.
Registered California Geologist No. 4984

cc: Mr. Leo Dutilly, GGSWMSSD#1
Mr. Paul Baginsky, WESTON

FILE COPY

*TAHOMA COMPANIES, INCORPORATED WDBE
444 S. MAIN STREET, SUITE C-7
CEDAR CITY, UTAH 84720
(801) 865 0131 FAX (801) 865 0161*

September 20, 1994

Mrs. Mary Von Koch
U.S. Bureau of Land Management
Grand Resource Area
885 South Sand Flats Road
Moab, Utah 84532

Dear Mrs. Von Koch:

Thank you for your useful advice on wilderness issues associated with landfill licensing given in our telephone conversation this morning.

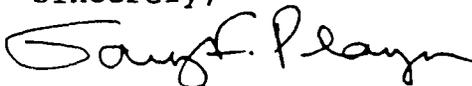
You and I briefly discussed the Grand County Landfill (GCL) near Moab, Utah. The GCL is located west of U.S. Highway 191 in section 14, T. 23 S., R. 19 E., SLB&M. The landfill site has been selected for transfer of ownership from the BLM to Grand County Special Services District No. 1, and must now be licensed under new state regulations effective September, 1993.

You informed me that the GCL is not located within a designated wilderness or wilderness study area. The landfill site is not within 1,000 feet of any national, state or county park, monument, or recreation area; designated wilderness or wilderness study area; or wild and scenic river area.

It is our opinion that the GCL will not impact wilderness or recreation areas.

Thanks again for the prompt advice from your agency. Tahoma Companies will soon be involved in license applications for several other Utah landfills. It is nice to know where we can get help on wilderness area issues so readily.

Sincerely,



Gary F. Player
Principal Geologist

FILE COPY

*TAHOMA COMPANIES, INCORPORATED WDBE
444 S. MAIN STREET, SUITE C-7
CEDAR CITY, UTAH 84720
(801) 865 0131 FAX (801) 865 0161*

September 20, 1994

Mr. Kyle "Jake" Jacobson
Utah Department of Agriculture
350 North Redwood Road
Salt Lake City, Utah 84116

Dear Jake:

Thanks again for another beneficial discussion of Important Farmland issues associated with landfill licensing yesterday afternoon. We briefly discussed the Grand County Landfill (GCL) near Moab, Utah. The GCL is located west of U.S. Highway 191 in section 14, T. 23 S., R. 19 E., SLB&M. It must now be licensed under new state regulations effective September, 1993.

At your suggestion, I have reviewed Utah Agricultural Experiment Station Research Report Number 76, "Important Farmlands of parts of Carbon, Emery, Grand and Sevier Counties." I have concluded that no classified "Important Farmlands" are present at the proposed Grand County Landfill.

Thanks again for your help.

Sincerely,



Gary F. Player
Principal Geologist

FILE COPY

TAHOMA COMPANIES, INCORPORATED ♦ WDBE
444 South Main Street, Suite C-7
Cedar City, Utah 84720
(801) 865-0131 fax 865-0161

September 20, 1994

SUBJECT: PROPOSED GRAND COUNTY LANDFILL

Mr. Robert Williams
U.S. Fish and Wildlife Service
2060 Administration Building
1745 West 1700 South
Salt Lake City, Utah 84104

Dear Mr. Williams:

Please thank Mr. Clark D. Johnson for his useful advice on Threatened and Endangered Species issues associated with landfill licensing. At his suggestion, I have reviewed the USFWS list of Endangered, Threatened and Candidate Species in Utah by Latilong Block, dated September 24, 1992.

I am now informing the Service of the proposed Grand County Landfill (GCL) near Moab, Utah.

Location

The GCL is located west of U.S. Highway 191 in section 14, T. 23 S., R. 19 E., SLB&M. The landfill site has been reviewed by biologists of the U.S. Bureau of Land Management preparatory to transfer of ownership from the BLM to Grand County Special Services District No. 1, and must now be licensed under new state regulations effective September, 1993.

Critical Habitat

I have concluded that the GCL is not located within a designated Critical Habitat Zone for any terrestrial species. It is my understanding that the only critical habitat near the Grand County Landfill site is aquatic habitat identified for the Colorado River squawfish and the associated native fish community in most drainages of the Colorado, Green and San Juan river basins.

It is our opinion that the GCL will not impact aquatic habitats for the following reason:

No surface water courses or impoundments occur on the property.

Threatened and Endangered Species

At Mr. Johnson's suggestion, I also contacted Mr. Larry England and Mr. Henry Maddox of your staff for further information on endangered, threatened and candidate species in Grand County. Mr. England told me that critical habitat for listed or candidate plant species is not likely to be

present at the Grand County Landfill. He plans to review biological clearance documents prepared by the U.S. Bureau of Land Management when they are available.

Water Use Issues

Mr. Maddox explained to me USFWS concerns about consumptive ground water use in the Colorado and Green River drainage basins. He informed me that use may be restricted in aquifers physically connected to the floodplain of either or both rivers. I told him that future construction and operation of the landfill could require the use of water for dust control.

The Grand County Landfill is underlain at approximately 250 feet by low quality ground water in a fractured shale and tight sandstone aquifer. Water has a pH of 10.5 and Total Dissolved Solids (TDS) of 2600 mg/Liter. This data was obtained from a single sample of water produced from a well at the old AT&T microwave tower one half mile east of the proposed landfill site. Additional information will be obtained from a monitor well scheduled to be drilled in October of this year.

The water level in the aquifer underlying the proposed landfill site is about 500 feet above the surface elevation of the Colorado River at Moab. The water level differences, low permeability of the fractured shale and tight sandstone and the poor water quality suggest that rapid communication of ground water between the landfill site and the river floodplain is unlikely.

It is our understanding that any water used for dust control at the landfill must be obtained from sources licensed by the Utah Division of Water Rights. Surface water from the Colorado River, if utilized, will be obtained only from legally licensed points of diversion.

o O o

Thanks again for the prompt advice from your agency personnel. Tahoma Companies will soon be involved in license applications for several other Utah landfills. It is nice to know where we can get help on biological issues so readily.

Sincerely,



Gary F. Player
Principal Geologist

Enclosure: Topographic Map of Grand County Landfill site.

File: WP51\DOCUMENTS\WESTON\USFWSLTR

TAHOMA COMPANIES, INCORPORATED
NOTES TO FILE

DATE: May 23, 1994

JOB NUMBER: 613-2

SUBJECT OR TASK: Threatened and Endangered Species at GCL

Today I spoke by telephone with Mr. Larry England of the U.S. Fish and Wildlife Service about possible T&E issues at the GCL. I mentioned two potentially problematic species: (1) Jones Cycladenia (*Cycladenia humilis*, var. *jonesii*) and (2) Spineless Hedgehog Cactus (*Echinocereus triglochidiatus*, var. *inermis*).

Both of these are terrestrial plants.

The Spineless Hedgehog Cactus has been removed from the list of T&E species.

The Cycladenia grows only on Chinle Shale outcrops and is present north and east of Moab. This plant does not occur on Mancos shale because of the alkaline nature of residual soils.

No fish species will be effected because of the death of perennial or even intermittent streams on the GCL site.

Raptors will not be effected because there are no trees for potential nesting sites. I should explore all of the hogbacks on the property to look for nesting sites. I will also be on the lookout for nesting sites on the Ferron Sandstone outcrop when I measure the section. I will measure the section off the GCL property to the east in order to project rock types into the proposed location of one or more monitor wells.



File TT 11 \ GCL NOTE 1

FILE COPY

*TAHOMA COMPANIES, INCORPORATED WDBE
444 S. MAIN STREET, SUITE C-7
CEDAR CITY, UTAH 84720
(801) 865 0131 FAX (801) 865 0161*

September 20, 1994

Mr. Jim Dykmann
Compliance Archaeologist
Utah Division of State History
300 Rio Grande
Salt Lake City, Utah 84101-1182

Dear Jim:

Thank you for your help last spring in our discussion of archaeological issues associated with landfills. At your suggestion, I am now requesting a consultation with your Division for the proposed Grand County Landfill (GCL) near Moab, Utah.

The GCL is located west of U.S. Highway 191 in section 14, T. 23 S., R. 19 E., SLB&M. The landfill site has been reviewed by archaeologists for the U.S. Bureau of Land Management preparatory to transfer of ownership from the BLM to Grand County Special Services District No. 1, and must now be licensed under new state regulations effective September, 1993.

It is my opinion that this area will not require additional field site archaeological clearances for the following reasons:

- (1) The lands have been inspected by BLM archaeologists;
- (2) No water courses or impoundments occur on the property;
and
- (3) No registered Historic Places have been identified within a mile of the landfill site.

I look forward to your comments on this site.

Sincerely,



Gary F. Player
Principal Geologist

Enclosure: Topographic Map of Emery County Landfill site.



State of Utah

Department of Community & Economic Development
Division of State History
Utah State Historical Society



Michael O. Leavitt
Governor
Max J. Evans
Director

300 Rio Grande
Salt Lake City, Utah 84101-1182
(801) 533-3500
FAX: (801) 533-3503

September 29, 1994

OCT 03 1994

Gary F. Player
Principal Geologist
Tahoma Companies, Incorporated WDBE
444 South main Street, Suite C-7
Cedar City, Utah 84720

RE: Grand County Landfill

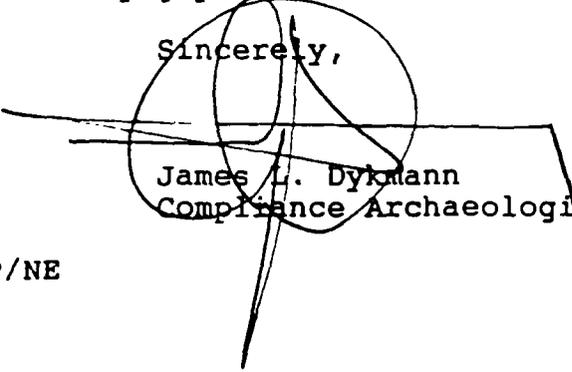
In Reply Please Refer to Case No. 94-0606

Dear Mr. Player:

The Utah State Historical Preservation Office received the above referenced project on September 26, 1994. After review of the material provided, the Utah Preservation Office recommends that there would be No Effect upon cultural resources by the project.

This information is provided on request to assist Grand County with its Section 106 responsibilities as specified in 36CFR800. If you have questions, please contact me at (801) 533-3555. My computer address on internet is:
internet:cedomain.cehistory.jdykman@email.state.ut.us

Sincerely,


James L. Dykman
Compliance Archaeologist

JLD:94-0606 BLM/NP/NE

APPENDIX J
LINER AND CAPILLARY BARRIER JUSTIFICATION

Originally Submitted March 1998

**(Only Section 1.1 and 1.2 of the original appendix are relevant to this Permit
Renewal and are included here.)**

**ALTERNATIVE DESIGN JUSTIFICATION
AND EXCEPTION REQUEST
LINER, LEACHATE, AND CAP SYSTEMS
Klondike Landfill**

1 INTRODUCTION

1.1 Klondike Landfill

The Klondike Landfill is located approximately 20 miles north of Moab, and approximately 1.5 miles west on U.S. Highway 191. The site is located within the Mancos shale plains, and is essentially in a desert environment. The shale formation underlying the site extends to a depth of more than 1,000 feet, with one or more sandstone members contained within the shale. The shallowest, continuous sandstone member, the Ferron sandstone, lies more than 500 feet below the western boundary of the site.

The site lies within the Mancos shale plain, in the Green River Desert and directly adjacent to the San Rafael Desert. Annual precipitation is predicted to average between 6- and 9-inches, based on nearby climatological stations, making the site essentially a desert environment. This is enhanced by the high evaporation rate that predominates on the Mancos shale plains, averaging between 50 and 70 inches per year in the vicinity of the landfill site.

The first cell of the Klondike Landfill was lined with a 6-inch thick clay liner composed of weathered Mancos shale excavated from directly above competent rock. This liner was intended to seal any vertical fissures that may have occurred in the Mancos shale host formation. Future cells will not be lined, and will be excavated directly into competent rock.

Similarly, the first cell was provided with a leachate collection system, including a drainage layer sloping toward a gravel sump provided with a pipe and riser system. The future cells will not be provided with a leachate collection system.

Finally, the original permit application stated that the landfill cells would be closed with a traditional clay cap. Recognizing that a clay cap will likely desiccate and crack over time, a change to a capillary barrier cap is planned.

This Justification provides a rationale to allow permitting of alternative liner, leachate, and cap designs consistent with the geological and climatological setting of the landfill.

The District is requesting exceptions from the standard liner, leachate, and capping system designs specified in Utah regulations.

1.2 Liner and Leachate Systems

As part of its 1996 Permit Application, the District submitted a request for exception from the liner requirements of UAC 315-303-4. The District requested approval of an alternate liner system consisting of a 6-inch thick barrier layer. This 6-inch barrier layer was intended to seal vertical fractures in the Mancos shale, causing any leachate to migrate through massive shale. The District also requested approval of an alternate leachate collection system consisting of on-site fractured shale material. Based on the information provided in the requests, both alternatives were approved by UDEQ. The District has further considered its options, and is not requesting approval of further exceptions which eliminate all liner and leachate collection system requirements.

Rationale: The request for exception from all liner and leachate system requirements is based on the following factors:

- The site is located in a remote area which received extremely low annual precipitation. The site is located approximately 20 miles north of Moab, and approximately 3.5 miles north of Canyonlands Airport. The nearest known neighbors, other than the airport, are located approximately 10 miles to the north of the landfill site, in Crescent Junction. The average precipitation at the landfill site is estimated at between 6.5 and 8.5 inches per year based on the data presented in Table 1 and on-site vegetation. The average evapotranspiration at the site is estimated at between 55 and 60 inches per year. This means that there is an annual water deficit at the site exceeding 45 inches per year, and that deep percolation of precipitation is insignificant except in unusual precipitation years.
- The site is underlain by a thick sequence of Mancos shale. Mineral exploration wells indicate that the total thickness of this shale is approximately 1,200 feet at the site. Local wells demonstrate that the depth to the shallowest groundwater is highly mineralized, based on sampling of a well located approximately ¼ mile east of the site. The groundwater from this well is alkaline (i.e. pH >10) and brackish (i.e. TDS >2,600 mg/l). This well is screened in a low-yielding (i.e., ~ 1 gpm) sandstone member of the Mancos shale, the Ferron sandstone. The shallowest groundwater is not now or in the foreseeable future a source of drinking water.
- Migration of leachate from the alternate liner and leachate system is expected to be environmentally insignificant. Modeling of leachate migration in the massive Mancos shale predicts that it would require more than 10,000 years for leachate to reach the uppermost aquifer. This modeling used the output of the HELP model (presented in the 1996 Permit Application), using conservative assumptions, and the time needed for a wetting front to migrate through the Mancos shale to a depth of 500 feet. Table 2 summarizes these modeling calculations.

- No evidence of significant vertical fracturing was observed during construction of the first cell at the landfill site. Absence of vertical fracturing means that migration of leachate through the massive Mancos shale is the most probable pathway.
- The first cell is provided with a leachate collection system. The District has monitored this system quarterly during the first year of filling in the first cell, and has not detected measurable leachate in the sump. Since the HELP model predicted the greatest generation of leachate during the first year of filling (100,000 gallons), it appears questionable that the landfill will ever produce significant quantities of leachate. In any case, the leachate system in cell 1 will provide an early warning of significant leachate being produced in the landfill as a whole. In the event of unexpected volumes of leachate, the District and UDEQ could evaluate alternatives to remove this leachate.

These factors demonstrate that exception from all liner and leachate system requirements for the Klondike Landfill is protective of the environment, and qualifies for approval as an alternate to the standard design requirements.

APPENDIX K
FINAL COVER JUSTIFICATION

FINAL COVER JUSTIFICATION

Klondike Landfill

UDEQ submitted a letter to the District on May 4, 1999, stating that the current alternative final cover system, the capillary barrier cap, would need closure plan revision. The letter outlined the particulars of the information necessary for a revised demonstration of equivalency of the cap. The letter also suggested the District was free to change the design of its final cover, and that either process could be accomplished by permit modification or at the time of permit renewal.

There is currently much activity throughout the regulatory and engineering communities in the Western United States, addressing final cover issues common to landfills such as the Klondike landfill that are located in the arid West. The shortcomings of the so-called "prescriptive cap" (UAR 315-303-3 {4}) are well documented, but it remains as of this writing as the regulatory closure design for landfill final covers in Utah.

At some point in the future, and probably long before this landfill nears closure, almost certainly final cover designs will have to be adjusted to the new engineering information being provided, tested, and actually experienced by landfills in the arid West, producing a change in the federal and state regulations so that the required final cover systems perform more adequately in this landfill's soil type and climate. Since the Klondike Landfill's current disposal capacity for the first half of the site is estimated at 48 years, the District doesn't believe it is justified in spending thousands of dollars on engineering costs to revise the capillary barrier cap equivalency demonstration now, when regulatory requirements are sure to change long before closure of the landfill is contemplated.

Instead, the District sought to modify the prescriptive cap to increase its performance. According to a U. S. Corps of Engineers Frost Penetration map for this area, the landfill is in the 20-30 inch range for depth of frost penetration. The prescriptive cap is

composed of at least an 18 inch compacted soil layer. It has already been determined that the native soil at the landfill is less permeable than the 1×10^{-5} cm/sec required for the prescriptive cap (see Appendix F "Analytical Data – Permeability). Soil analysis (see Kleinfelder memorandum dated 4/8/02 that follows), indicates that a 24 inch soil cap placed on top of the 18 inch prescriptive cap will provide adequate frost protection at the site. The modified prescriptive cap proposed here will therefore consist of 18 inches of final cover followed by 24 inches of extra soil for frost protection, which includes six inches of soil on top for vegetative growth.

In analyzing its options, the District also compared cost estimates for several closure systems. In this area of the state, the capillary barrier cap is the most expensive system, because of the separate layers required, and the prescriptive cap is the least expensive, because of its simplicity. The cost estimate for the modified prescriptive cap proposed here, is still approximately \$80,000 less than the capillary barrier cap estimate.

For all of these reasons, it seems reasonable and prudent, and in the best interests of the community for the District to propose the modified prescriptive cap described, which exceeds the regulatory requirements, as the final cover design for this five year permit renewal period.

Date: April 8, 2002

To: Ms. Jane Jones
Grand County Solid Waste Management Special Service District #1

From: Renee Zollinger, PG
Kleinfelder

Subject: **Estimated Frost Depth - Klondike Landfill
Grand County, Utah**

The following outline summarizes the methodology, parameters, assumptions used in our analysis, as well as its results.

- 1) Methodology
 - a) Use modified-Berggren method (Aldrich, 1956)

- 2) Parameters
 - a) Climatic (based on Moab 4 NW station)
 - i) Freezing Index = 660 F-degree-days, based on 30-year return period interpolated from air freezing index return period calculations (100-year maximum) performed by NOAA using 1951-1980 data set
 - ii) Mean Annual Temperature = 56.6 F-degrees, same source as above
 - iii) Duration of Freezing Period based on equivalent sinusoidal temperature curves (Sanger, 1963)
 - b) Soil
 - i) Type is silt/clay derived from native, residual shale
 - ii) Dry Unit Weight = 94 pounds per cubic foot (pcf) based on 85% ASTM D 1557 (modified proctor) of Sample #1 provided by Owner; assumes dry unit weight of material placed for frost protection will not exceed this compaction value
 - iii) Moisture Content = 13%; assumes material placed for frost protection will be no wetter than optimum based on same as above
 - iv) Thermal Conductivity of frozen and unfrozen soil based on soil type and density correlations (Kersten, 1949)

- 3) Additional Assumptions
 - a) Finished ground surface is bare ground

- 4) Results
 - a) Estimated frost depth is 24 inches or less

Frost Depth Estimation

Dry Density (pcf)	94
Moisture Content (%)	13
Freezing Index (degree day)	660
Mean Annual Air Temperature (deg F)	56.6
Vo (deg F)	24.6
Amplitude of Equivalent Sine Curve	35.35297211
Length of Sine-Curve Freezing Period (day)	93.08683236
Length of Analysis Freezing Period (day)	93
Vs (deg F)	7.096774194

$V_s = \text{freezing index} / \text{length of freezing period}$

Latent Heat of Fusion "L" (Btu/ft³) **1752.348**

	Unfrozen	Frozen	Average
Volumetric Heat "C" (Btu/ft ³ /degF)	28.2	22.09	25.145
Thermal Conductivity of Soil "k" (Btu/ft ² /hr/degF/in)	7	7.4	7.2
Thermal Conductivity of Soil "k" (Btu/ft ³ /hr/degF)	0.583333333	0.616666667	0.6
Thermal Diffusivity "a" (ft ² /hr)	0.020685579	0.027916101	

	Simplified Averaging Graphical Solution	Computational Solution
$\alpha = V_o/V_s$ → Thermal Ratio "alpha"	3.466363636	4.425145068
$\mu = \frac{C V_s}{L}$ → Fusion Parameter "mu"	0.101833875	0.089461535
	del	1.161698788
	alpha del	3.941424171
	Z	0.128868586
Correction Coefficient "lambda"	0.61	0.609317834

Frost Depth (ft)	2.00903669	2.034471144
Frost Depth (in)	24.1	24.4

→ basic equation: $Z = \lambda \sqrt{\frac{48(F)}{(L/k)}}$ say 24"

where: Z = depth of frost penetration

F = freezing index (degree(F) • day)

other variables as identified above (k in Btu/A³/hr/oi)

Calculations

$\alpha = \frac{56.6 - 32.2}{660/93} = 3.438; \quad \mu = \frac{25.145 \cdot (660/93)}{1752.348} = 0.102;$

from graph w/ α and μ , $\lambda \approx 0.61$

$\therefore Z = 0.61 \sqrt{\frac{48(660)}{(1752.348/0.6)}} = 2.009 \text{ ft} \approx 24.1 \text{ in}$

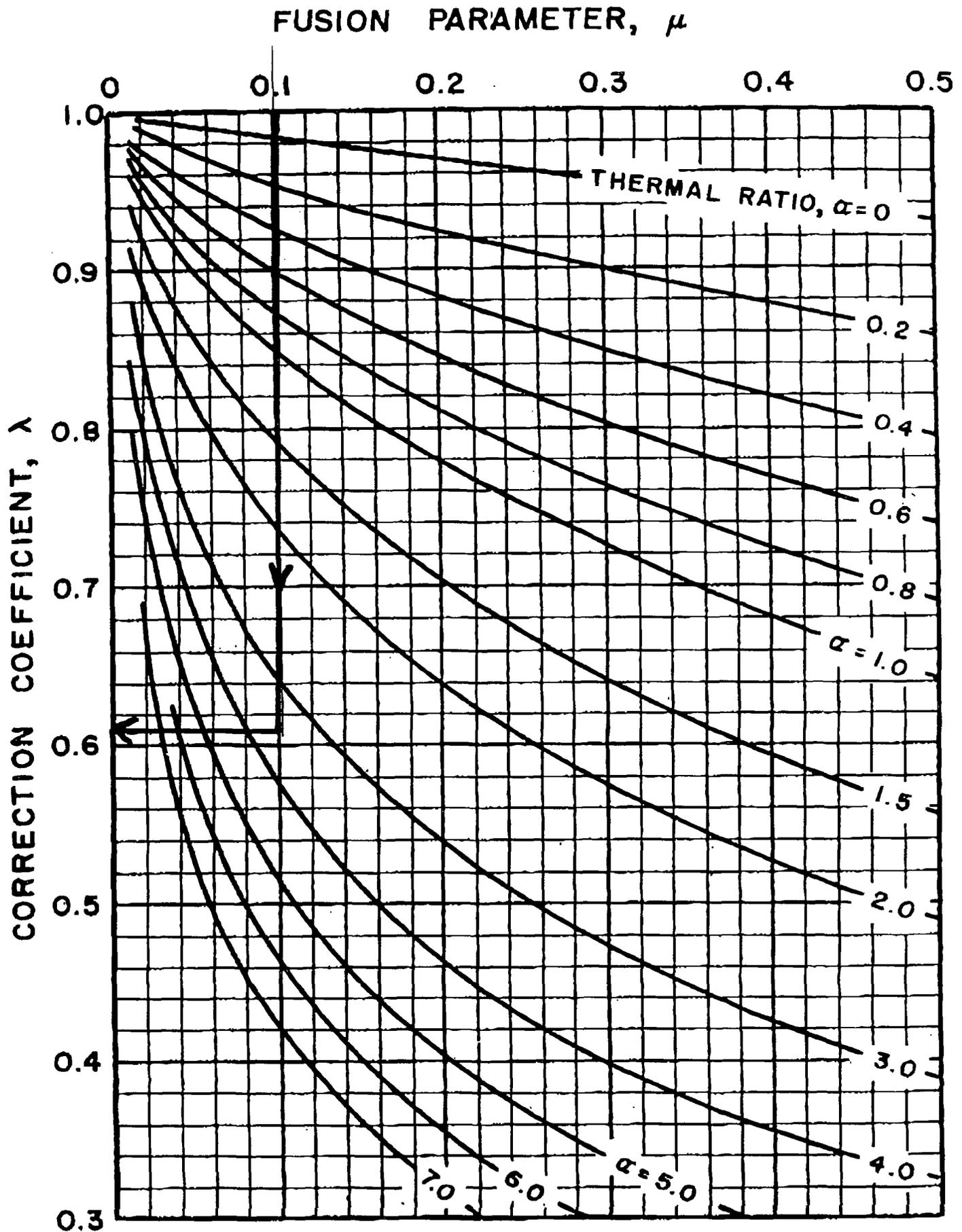


Figure 5. Correction coefficient in the modified Berggren formula.

APPENDIX L
GREASE AND SEPTAGE

**Memorandum of Understanding
By and Between the City of Moab and the Grand County Solid Waste Management
Special Service District #1 Regarding the Disposal of Septage and Grease Trap
Waste**

This Agreement is made and entered into this 24th day of October 2000 by and between the Grand County Solid Waste Management District #1 (hereafter "District") and the City of Moab (hereafter "City").

RECITALS

Whereas, the City of Moab owns and operates the Moab City Waste Water Treatment Plant (hereafter WWTP); and

Whereas, the District operates the Klondike Landfill; and

Whereas, the City accepts septage according to the provisions of the Moab Municipal Code, Chapter 13.26; and

Whereas, the District accepts septage on a limited and emergency basis only when the WWTP is experiencing temporary conditions which prevent its acceptance of septage, such as high Total Suspended Solids; and

Whereas, the District only accepts septage in a special handling site at the Klondike Landfill according to franchise agreements with haulers; and

Whereas, the City and the District desire to set up procedures for the temporary acceptance of septage at the Landfill during times in which the WWTP is unable to accept said septage.

AGREEMENT

The parties agree as follows:

1. Acceptance of Septage at WWTP- The City agrees to accept septage at the WWTP according to the provisions of Moab Municipal Code Chapter 13.26, the Wastewater and Septage Hauling Agreements between the City and individual haulers, and the individual Wastewater and Septage Hauling Permits issued at the WWTP.
2. Notification to District – The City agrees to notify the District in writing when the City temporarily suspends the issuance of Septage Dumping Permits at the WWTP. Said notice will state the reasons for the suspension that qualify as emergency conditions at the WWTP and the estimated duration of the emergency

suspension. The City will provide written notification to the District upon reinstatement of permit issuance.

3. Acceptance of Septage at Klondike Landfill – The District agrees to consider acceptance of septage on a case by case basis for each load of septage that qualifies under this agreement as rejected from the WWTP under the aforesaid temporary, limited, and emergency conditions, upon notification from the City of the City's suspension of the issuance of Septage Dumping Permits at the WWTP, subject to the terms of the franchise agreements between the District and individual septage haulers.

4. Effect of this Agreement – This Memorandum of Understanding is intended to outline procedures of the acceptance of septage by the parties under certain conditions. This Memorandum of Understanding is between the parties hereto only, and does not confer any rights on third parties whatsoever. Either party may withdraw from this agreement upon 10 (ten) days notice to the other party.

APPROVED AND ACCEPTED

City of Moab:

By: Karla R. Hancock
Mayor Karla Hancock

10-24-00
Date

Attest:

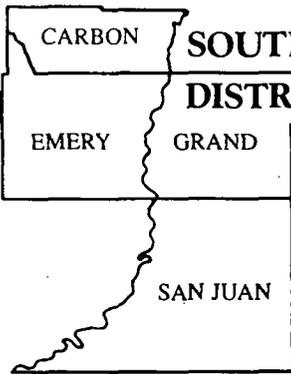
Rachel Ellison
Rachel Ellison, City Recorder

10-24-00
Date

Grand County Solid Waste Management Special Service District #1:

By: Dave Sakrison
Dave Sakrison, Vice Chair

Oct 13 2000
Date



**SOUTHEASTERN UTAH
DISTRICT HEALTH DEPARTMENT**

28 S. 100 E.
P.O. Box 800
Price, Utah 84501
(435) 637-3671
Fax (435) 637-1933

DAVE CUNNINGHAM, RN
Health Director

JOYCE PIERCE, RN
Nursing Director

CLARON BJORK, Ph.D.
Environmental Health Director

JEAN RODRIGUEZ
Budget & Accounting Officer

P.O. Box 644, Castle Dale, Utah 84513 • 381-2252
P.O. Drawer E, Moab, Utah 84532 • 259-5602
P.O. Box 127, Monticello, Utah 84535 • 587-2021
P.O. Box E, Blanding, Utah 84511 • 678-2723

RECEIVED
NOV 15 2000

November 13, 2000

Jane S. Jones, District Manager
Grand County Solid Waste Management
Special Service District # 1
P. O. Box 980
Moab, Utah 84532

Dear Ms. Jones,

An inspection of the Klondike septage area was made by Jim Adamson of the Southeastern Utah District Health Department for septage dehydration. The area is approved for accepting septage.

As needed after dehydration the septage is to be placed on the working face of the landfill and covered that same day.

If I may be of further assistance in this matter please contact the Moab office.

Sincerely,



William J. Adamson
Licensed Environmental Health Scientist

file KL
Sept 2, 2000



DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF SOLID AND HAZARDOUS WASTE

Michael O. Leavitt
Governor
Dianne R. Nielson, Ph.D.
Executive Director
Dennis R. Downs
Director

288 North 1460 West
P.O. Box 144880
Salt Lake City, Utah 84114-4880
(801) 538-6170
(801) 538-6715 Fax
(801) 536-4414 T.D.D.
www.deq.state.ut.us Web

RECEIVED
9/11/00

September 6, 2000

Jane S. Jones, District Manager
Grand County Solid Waste Management Special Service District #1
P.O. Box 980
Moab Utah 84532

Subject: Septage and Restaurant Grease Trap Waste Disposal at Klondike Landfill

Dear Ms. Jones:

The Division is in receipt of your letter of August 11, 2000. Your request to dispose of septage and restaurant grease trap waste at the Klondike Landfill is approved with the conditions listed below.

No liquid waste may be disposed of in an area that has received solid waste.

All waste accepted must be non-hazardous.

Waste must not be allowed to pool.

Liquids must evaporate or infiltrate within 24 hours.

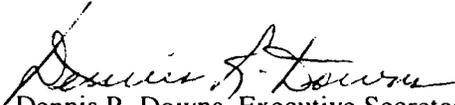
Waste must be applied in a manner that spreads the waste such as spraying.

The number of loads received must be recorded in the landfill operating record.

Although the Division recognizes the need to dispose of these types of liquid wastes, the landfill is not the best place for this disposal. Every effort should be made to dispose of septage and grease trap waste in a wastewater treatment facility. The landfill disposal option, as is suggested in your letter, should only be used on a limited or emergency basis.

If you have any questions please contact Phil Burns at 801-538-6170.

Sincerely,


Dennis R. Downs, Executive Secretary
Solid and Hazardous Waste Control Board

179625'N

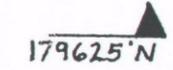


2488050'E



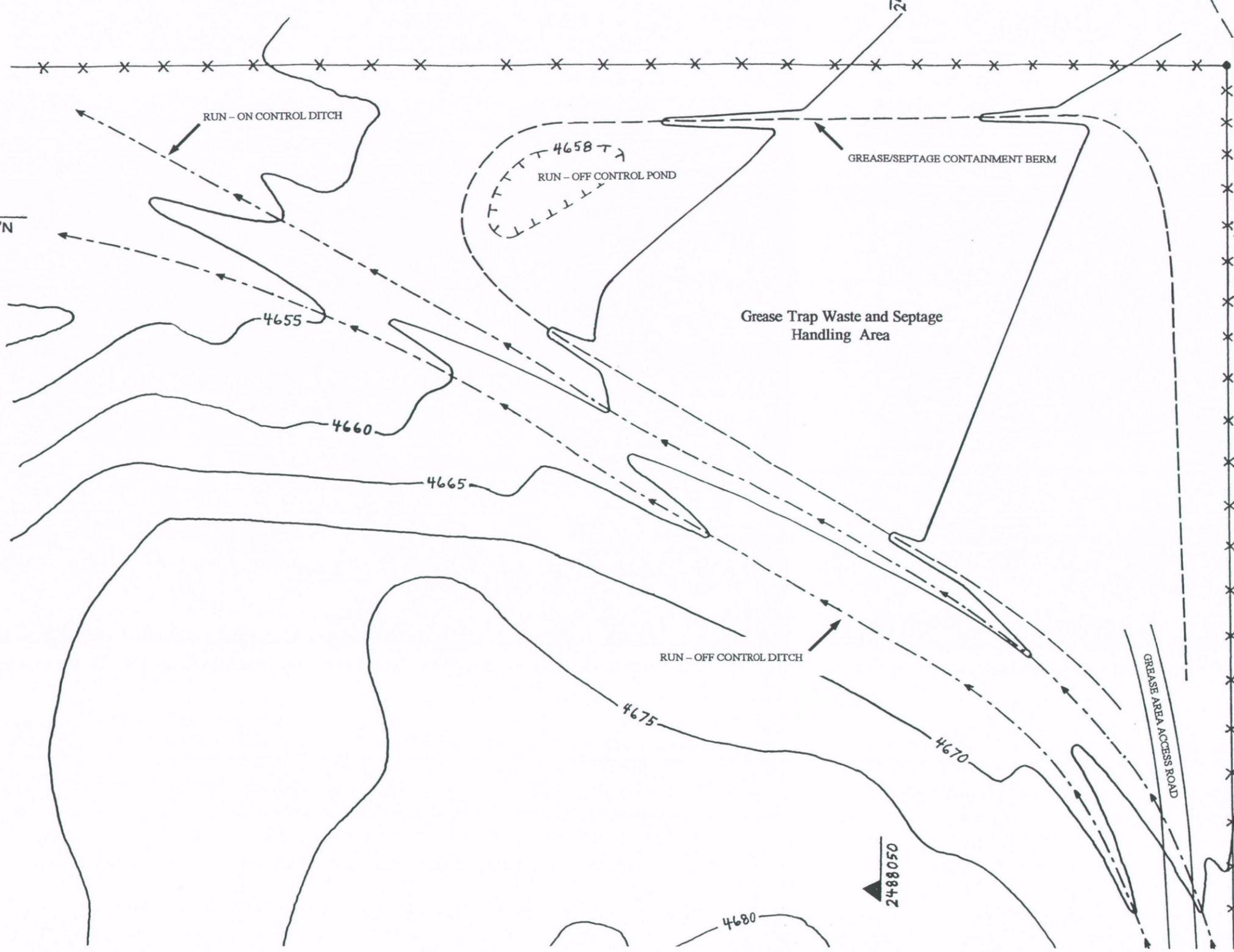
NOTES:
TOPOGRAPHY BASED ON GPS SURVEYS
WITH GRAND COUNTY ROADS DEPT
EQUIPMENT SEPTEMBER 8, 2000 AND
NOVEMBER 21, 2000.

179625'N



LEGEND

- 4660 CONTOUR
- 4658 INTERMEDIATE CONTOUR
- 3 STRAND BARBED WIRE
- BERM
- DITCH
- PROPERTY CORNER
- ROADS



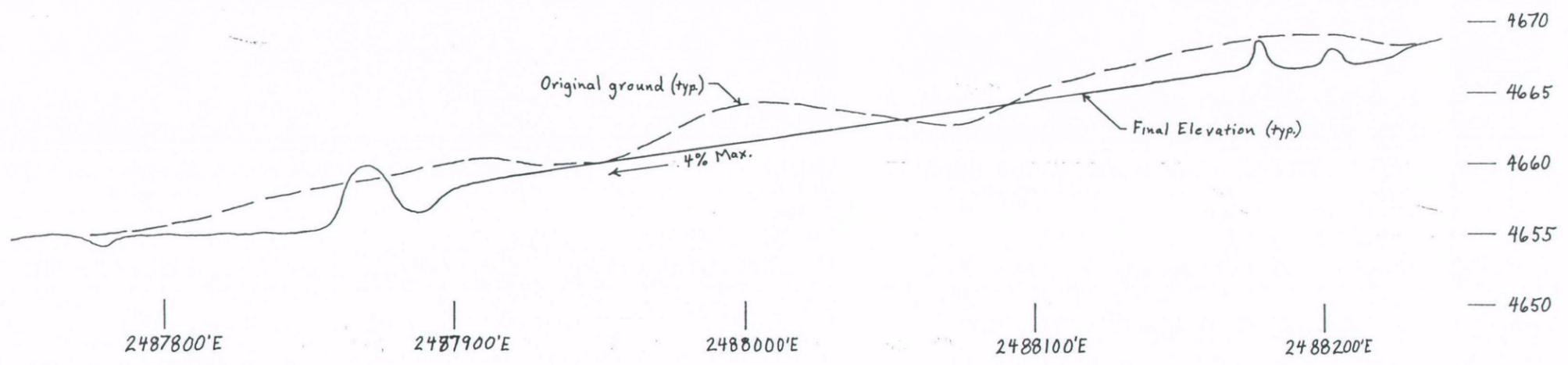
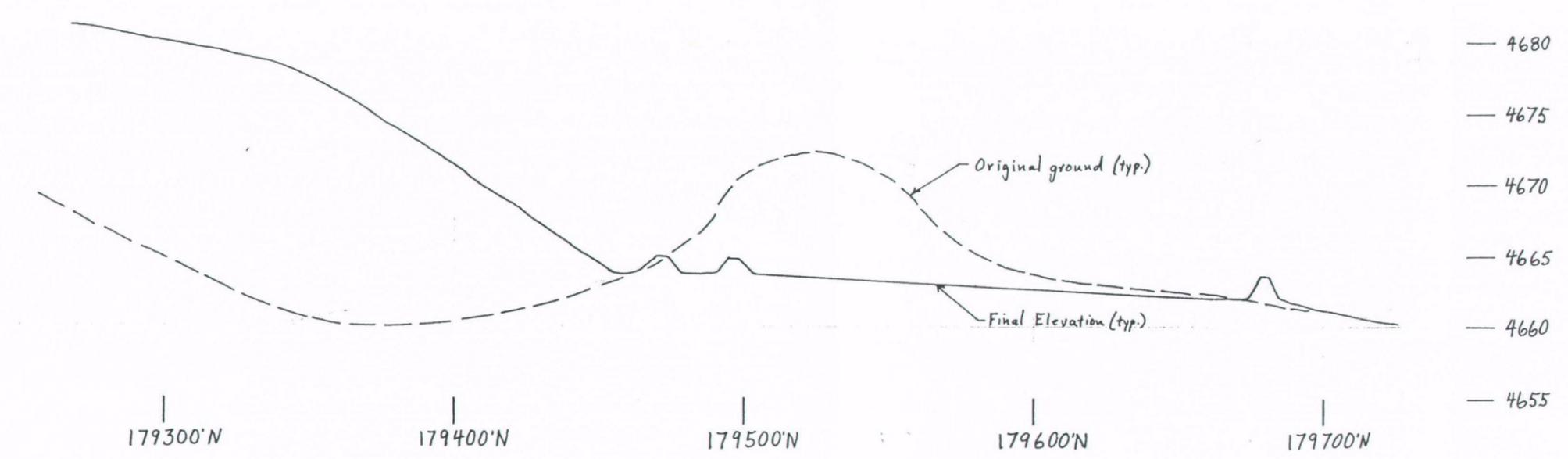
GRAND COUNTY
SOLID WASTE MANAGEMENT
SPECIAL SERVICE DISTRICT #1
Box 980 Moab, Utah 84532
(435) 259-3867

Klondike Landfill

Grease Trap Waste and Septage
Handling Area

Date: 25 Apr. 2001

Drawn by: Anthony Martineau



Scale: Horizontal 1" = 50'
Vertical 1" = 10'

GRAND COUNTY
SOLID WASTE MANAGEMENT
SPECIAL SERVICE DISTRICT #1
Box 980 Moab, Utah 84532
(435) 259-3867

Grease Trap Waste and Septage
Handling Area
Date: 25 Apr. 2001 Drawn by: Anthony Martineau
North - South Cross Section 2488050' E
East - West Cross Section 179625' N
Klondike Landfill

**Grand County Solid Waste Management
Special Service District #1**

1000 E. Sand Flats Road
P. O. Box 980, Moab Utah 84532
Phone 435-259-3867 ~ Fax 435-259-5218
Email gcswmss@yahoo.com

RECEIVED

APR 29 2002
02.01424
Division of Solid & Hazardous Waste
Utah Department of Environmental Quality

Denise Swanke, Chair
Dave Sakrison, Vice Chair
Bruce Keeler, Secretary
Al McLeod
Audrey Graham

April 26, 2002

Dennis R. Downs, Director
Division of Solid and Hazardous Waste
Utah Department of Environmental Quality
PO Box 144880
Salt Lake City UT 84114-4880

**Re: Permit Renewal Application Review
Klondike Landfill – Permit #9509**

Dear Mr. Downs:

The following corrections have been made to our draft permit renewal, in response to your letter of October 19, 2001:

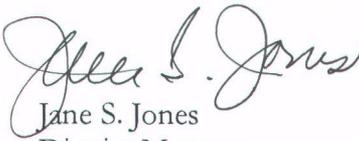
- 1) Rules Reference All incorrect references to “UAR” have been corrected to “UAC.”
- 2) Seismic Impact Zones Map Changes in prediction modeling methodology have occurred since Klondike Landfill was opened, and now the landfill is considered to be within a Seismic Impact Zone. Therefore, the reference in Part III, p. 3 has been rewritten and the new USGS map is included, which will replace the old map in Appendix G.
- 3) Final Cover Design Reference to a gravel layer has been deleted on Page 22, Part III and statements regarding the low probability of methane gas accumulation are added.
- 4) Intermediate Cover The third paragraph of Section 1.3.1 in the Plan of Operation (Appendix D) has been revised to clarify that inactive areas of the landfill will be covered with 12 inches of soil as an intermediate cover, that final cover will be applied after 2 years, and that final slopes will be achieved with additional waste and appropriate cover as adjoining cells are completed. The estimated disposal life of the first 40-acres of the landfill remains at 48 years with cells 2 through 6 conservatively estimated to have a lifetime of at least nine years each.

5) Closure Cost Estimate Appendix E "Financial Assurance Cost Estimate" has been corrected and is enclosed. It reflects inflation-adjusted costs, with an additional \$10,000 lump sum for compaction and permeability testing, and a final cover system of 42 inches (incorporating a frost protection layer of 24 inches, see next paragraph).

6) Frost Protection The District's consultant, Kleinfelder, Inc., has tested soil from the Klondike Landfill, and the result was an estimated site-specific frost depth of 24 inches or less (see April 8, 2002 memorandum enclosed in Appendix K). Therefore, we have corrected the wording in Appendix K "Final Cover Justification" and adjusted the figures in the cost estimates accordingly.

Two copies of the complete text of our draft renewal permit are enclosed, incorporating both the previously submitted changes to the text of the original permit, and the above changes. Also enclosed are copies of the Table of Contents that indicates all the revised portions of the draft. Please let me know if you need anything further.

Very truly yours,


Jane S. Jones
District Manager

Enc: Klondike Landfill Permit Renewal Application (2)