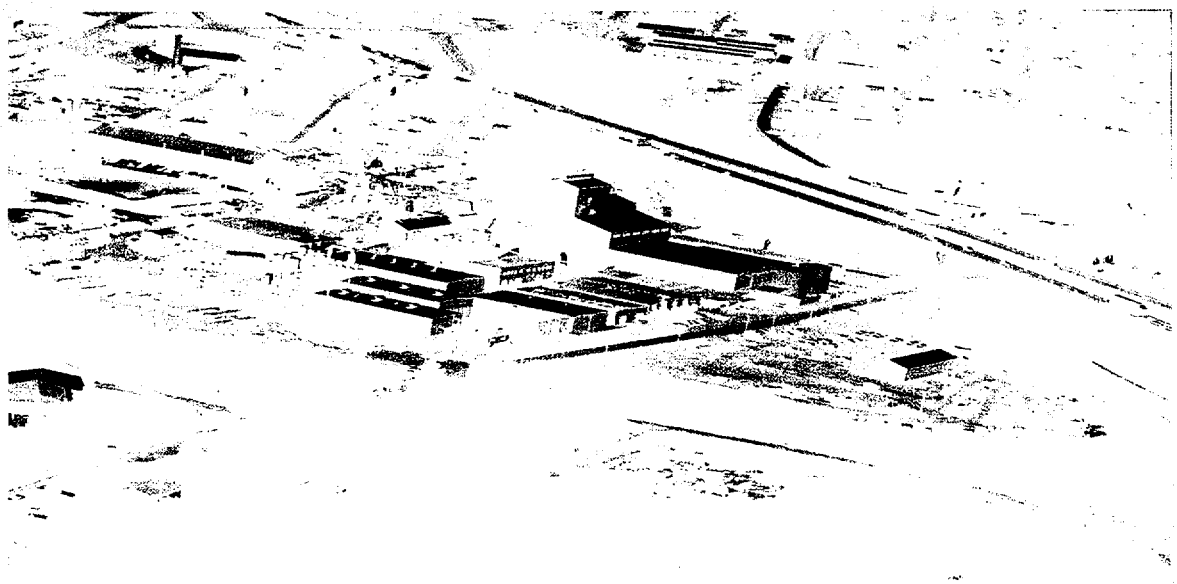
Molycorp



Washington, PA Facility
Decommissioning Plan
Part 2 Revision

July 14, 2000

RSI

RADIOLOGICAL SERVICES

DESIGN ANALYSIS

60% STORAGE CELL DESIGN

MOLYCORP, INC
WASHINGTON, PA

Prepared for:
Radiological Services, Inc

June 2000

VOLUME 1

Stone & Webster Engineering Corporation
Boston, Massachusetts

TABLE OF CONTENTS

VOLUME 1

1.0	**INTRODUCTION**	**1**
1.1	**PROJECT SCOPE**	**1**
1.2	**SITE HISTORY**	**1**
1.3	**SITE CONDITIONS**	**2**
1.4	**GEOLOGY AND HYDROLOGY**	**2**
2.0	**EXISTING INFORMATION SURVEY**	**5**
2.1	**DOCUMENT REVIEW**	**5**
2.2	**STORAGE CELL SITE GEOLOGY/HYDROGEOLOGY**	**6**
2.3	**GROUND WATER**	**7**
2.4	**SURFACE WATER**	**7**
3.0	**STORAGE CELL DESIGN**	**8**
3.1	**SCOPE AND PURPOSE**	**8**
3.2	**APPLICABLE REGULATIONS**	**8**
3.3	**WASTE CHARACTERISTICS**	**8**
3.4	**SITE LAYOUT**	**8**
3.5	**CELL CAPACITY**	**9**
3.6	**CELL LINER**	**9**
3.7	**GROUND WATER MONITORING**	**9**
3.8	**STORM WATER MANAGEMENT**	**10**
3.9	**EROSION AND SEDIMENT CONTROL**	**10**
3.10	**STRUCTURAL STABILITY ANALYSES**	**11**
3.11	**STORAGE CELL CONSTRUCTION**	**12**
4.0	**WASTE PLACEMENT**	**14**
4.1	**WASTE PLACEMENT**	**14**
4.2	**OPERATING REQUIREMENTS**	**14**
4.2.1	TRUCK MANAGEMENT	14
4.2.2	DUST CONTROL	14
4.2.3	STORM WATER MAINTENANCE	15

5.0 STORAGE CELL FINAL COVER **16**

5.1 FINAL COVER GRADING **16**
5.2 CAPPING SYSTEM COMPONENTS **16**
5.3 FINAL DRAINAGE **16**

ATTACHMENTS

1. Calculations
2. Boring Logs
3. Specifications

VOLUME 2

ATTACHMENTS (Cont)

4. Drawings

1.0 INTRODUCTION

1.1 Project Scope

Stone & Webster Engineering Corporation has been tasked by Radiological Services, Inc (RSI) to prepare a 60% design of a new storage cell for low level radioactive wastes located at the Molycorp Washington, Pennsylvania property. The storage cell will be located on property owned by Molycorp adjacent to their Washington County Pennsylvania facility. Approximately 125,000 cy of waste are on-site that will be removed and deposited in the new storage cell as part of the site closure activities.

1.2 Site History

Molycorp has owned and operated a ferroalloy plant on the outskirts of Washington, Pennsylvania for over 70 years. The facility is entirely within Canton Township, less than one-half mile southwest of the city of Washington and approximately 35 miles southwest of Pittsburgh. The Molycorp Washington facility consists of approximately 55 acres and is divided by paved roads and creeks, and bounded by paved roads and highways, industrial and commercial properties and private residences. The current 55 acres is divided into three main areas: the north process area; the southeast low lying storage area; and the southwest hill area. The new storage cell will be located on the southwest hill area. (See drawing 10034.01-EY-2A)

The southwest hill area is the former site of a coal gasification plant originally owned by the Hazel Atlas Glass Company. The gasification plant produced coal gas used as a fuel source for the plant furnaces. A tar-like residue from the coal gasification facility was discovered after Molycorp purchased the property. The tar-like residue lies outside the area affected by the thorium and contains no NRC regulated material. Molycorp constructed a tar containment area in the southeast corner of the property in 1985. The containment area consists of a diked area into which the tar material was placed prior to being covered with clean soil, vegetated and fenced-in. Prior to any construction of the storage cell, the past contamination from the gasification plant will be removed. Removal of the gasification wastes will be by others outside the scope of the storage cell construction.

Molycorp began producing molybdenum in the 1920's and continued to produce a variety of ferroalloys and produced ferro-columbium (FeCb) involved in the processing of ore concentrates. These ore concentrates contained 0.05 percent (or greater) by weight of thorium, uranium or a combination of both necessitating a Source Materials License, SMB-744, which was issued on December 1, 1963. In 1972, the license was renewed and the license number changed to SMB-1393. The ore material was a pyrochlore from Companhia Brasileira de Metalugia e Mineracao's Araxa mine in Brazil whose ore contained thorium as an accessory mineral above 0.05 percent. The slag which resulted from the production of the ferroalloy was retained onsite along with the larger quantity of ferro-molybdenum slag that were normally used as landfill on plant property.

1.3 Site Conditions

The Molycorp site is situated in Canton Township, Washington County, southwest of Pittsburgh. Although the facility is in close proximity to the city of Washington's urbanized area, it is separated from the populated city neighborhoods by the ramps and structures associated with Interstate 70 (I-70).

There are seven zoning districts in Canton Township; five of the seven districts are present within 0.5 km of the Molycorp site. Less than one-half of the site area is zoned for residential purposes including low density and medium density residential districts. The bulk of the residential district within 0.5 km of the site is zoned R-1 for low density residential development. Commercial land use is intense along the major roadways such as Jefferson Avenue and West Chestnut Street located approximately 1.4 km and 0.6 km, respectively, from the nearest property line of the Molycorp site. Other commercial centers include Franklin Mall and the Ramada Inn complex. Farther out in a 2 km radius, the land is vacant (without buildings but buildable), residential (largely single family with an occasional development or high density area in the city of Washington) or agricultural (mainly grazing pasture).

Currently, the Molycorp facility is in an extended standby mode with a small active area leased to a vendor. Purchasing and reselling alloys, maintenance and decommissioning are the principal current activities. No alloy processing is conducted. However, the site will continue to be used for some heavy industrial use in the future. The thoriated material, which requires transport to the proposed storage cell, is located within the plant area, in the open storage area, in roll off bins and in a slag pile. Access to the thoriated material is restricted by fences with locked gates and signs posted around the circumference warning of the presence of radioactivity in those areas.

Approximately 20 acres of the 55 acre site was used by Molycorp for plant operations. The remainder of the Molycorp property is comprised of the open storage area, former coal gasification plant foundation, forest and wetlands.

1.4 Geology and Hydrology

The Washington facility lies within the Pittsburgh Low Plateau Section of the Appalachian Plateaus Physiographic Province. This section is characterized by nearly flat-lying to gently folded sedimentary rock that has been maturely dissected by stream erosion. The geomorphology of this area generally consists of rounded hills and ridges separated by open valleys. The elevations of the hills and ridges in northern Washington County range from 1200 to 1500 ft-msl. The Molycorp facility, which lies in the Chartiers Valley of central Washington County, ranges from approximately 1010 ft-msl along the Chartiers Creek to 1128 ft-msl at the top of the hill along the southern edge of the facility where the storage cell will be located.

The bedrock beneath the facility is gently folded. The facility lies approximately 0.5 mile northwest of the axial trace of the north plunging, Washington anticline and

approximately 1.1 miles southeast of the axial trace of the south plunging, Finney syncline. The folded bedrock generally trends north 23-30 degrees east. Based on this regional structure, bedrock beneath the Washington facility is expected to dip gently to the northwest toward the Finney syncline. Dips in the area are reported to be less than 10 degrees and no major faults have been mapped in the area.

The bedrock is mapped as the Permian Age Washington formation and the underlying Pennsylvanian-Permian Age Waynesburg formation. The Washington formation consists of alternating beds of shale and sandstone with several coal beds. Most of these units vary horizontally in composition and texture. Discontinuous, thin-bedded, limestone members are also present. Most sandstone within this formation are light gray, medium grained and cross bedded. The limestone units are generally gray and finely crystalline. The limestone may also be very argillaceous with interbeds of gray shale. The total thickness of this unit ranges from approximately 160 to 234 ft. Due to erosion, the formation is only present on the hill along the southern edge of the facility. The entire thickness of the Washington formation is not present. Maximum thickness of this unit appears to be less than 50 ft and is believed to be the Lower Limestone Member of the Washington formation. The limestone units, however, are discontinuous and do not occur in all areas. The base of the unit is identified as the base of the Washington coal bed that is at an elevation of approximately 1,080 ft-msl in the vicinity of the facility.

The Waynesburg formation stratigraphically underlies the Washington formation. The Waynesburg formation is the uppermost bedrock unit on portions of the facility below an elevation of 1080 ft-msl. The unit consists of cyclic sequences of sandstone, shale, limestone and siltstone with some claystone and coal. Most units vary horizontally in texture and composition. The limestone is typically gray, argillaceous and interbedded with claystone. The sandstone is light gray, very fine to medium grained, and crossbedded. The shale is gray and locally calcareous. The total thickness of this unit generally ranges from approximately 100 to 245 ft. The base of this unit is marked by the Waynesburg coal that is present at an elevation of approximately 920 ft-msl in the facility area.

The portion of the site comprising the main manufacturing area is situated on an alluvial floodplain that has been built up with fill over the life of the facility. Much of the site ground surface is covered with asphalt and/or concrete.

Data presented by the USGS National Earthquake Information Center did not indicate recent measurable seismic activity at the facility. The nearest known seismic activity (magnitude unknown) occurred approximately 12.4 miles northeast of the facility on September 26, 1885. Two earthquakes, with magnitudes of 3.0 (Richter Scale), occurred October 8, 1995 and were centered approximately 25.5 miles and 28 miles east of the Molycorp Washington facility.

The facility hydrogeology can be divided into two sections: The lowland section which lies east of Chartiers Creek and comprises the main production areas of the plant; and the

upland section which consists of the southwest hill adjacent to the production area on southern edge of the site where the storage cell will be located. A further discussion of the hydrogeology of the storage cell site can be found in Section 2.2 of the Design Analysis.

2.0 EXISTING INFORMATION SURVEY

2.1 Document Review

Several site studies have been conducted at the Molycorp facility in Washington, Pennsylvania. Two of those studies were available for this project. One was the "Site Characterization Report for License Termination of the Washington, PA Facility" completed by the Foster Wheeler Corporation in January 1995 and other was the "Washington Facility Environmental Report" completed by ICF Kaiser in April 1997.

The Foster Wheeler study submitted in 1995 was a site characterization report of the Molycorp facility. Much of the fieldwork required to support the study was conducted in the spring, summer and fall of 1994. The objectives of the fieldwork was to understand the geology and hydrogeology of the Molycorp site and the area immediately surrounding the site; to determine the distribution of thoriated material; and to determine if thoriated material was migrating off-site via pathways such as ground and surface waters. The Foster Wheeler study, however, did not include the Hill area where the proposed storage cell will be located and therefore the report was used primarily for general background information.

The ICF Kaiser report prepared in 1997 evaluated the potential environmental impacts associated with decommissioning the Molycorp Washington, Pennsylvania facility. Several alternative plans were reviewed in the report that could be implemented for decommissioning the facility including three on-site waste storage options, off-site storage and no-action. The no-action alternative was rejected by Molycorp since it would not provide long term controlled storage of the waste material. The off-site alternative, although a viable plan, was not considered since it would require Molycorp to release physical control of the waste material when shipping it off-site via public roads and/or railways.

The environmental impacts evaluated in the ICF Kaiser report included land use, community resources, groundwater, surface water, air quality, noise, human health and ecological resources. For proposed storage cell location, the hill area, ICF Kaiser conducted borings, pressure packer tests, ground water seep mapping and water table measurements and are described in more detail in subsequent sections of the design analysis.

The ICF Kaiser report reviewed three storage cell location options for the waste material. Option 1 included a storage cell located at the southwest hill area near the southern property line. Option 2 included a storage cell located in the southeast area of the property south of Caldwell Avenue and east of Chartiers Creek. Option 3 included a storage cell located in the former railroad right-of-way that lies between the hill area and Sugar Creek. Each of these options could store about 70,000 cy yards of material. The required storage volume of 70,000 cy was based on excavating material from the Molycorp site with radiation levels greater than 30 pci/gm. Since that time, Molycorp has decided to

excavate material with radiation levels greater than 10 pci/gm that results in more material requiring storage. The new storage cell will be sized to contain approximately 125,000 cy of waste material. Thus none of the sites identified in the ICF Kaiser report is large enough. The new storage cell will be located within the area identified for Options 1 and 3.

2.2 Storage Cell Site Geology/Hydrogeology

The hydrogeological information regarding the hill area of the facility was derived from previously mapped groundwater seeps, test borings (TB-01, TB-02, TB-03, TB-04, TB-05), pressure packer tests and piezometric water level measurements. The tests were conducted by ICF Kaiser in 1997 as part of an environmental study on the Molycorp Washington facility. The results of the hydrogeological tests and borings are discussed below. The location of the borings in relation to the storage cell can be found on drawing 10034.01-EY-4A. The boring logs for these borings can be found in Attachment 2.

The Washington coal at the base of the Washington formation (el 1098-1115) was the shallowest geological unit tested. The coal is fractured and has an average permeability of approximately 1.31×10^{-3} cm/sec. The sandstone located beneath the Washington coal has a permeability slightly lower than the overlying coal with permeability decreasing with depth. The sandstone is underlain by the Little Washington Coal seam which tested to have a permeability of 9.2×10^{-6} cm/sec at TB-01. Groundwater was observed perched just over the Little Washington Coal seam. However, in TB-03, the water level observed in the piezometer screened within the sandstone was at a higher elevation. The sandstone unit outcrops along the railroad cut just north of TB-01 and TB-03 within the foot print of the storage cell. Groundwater seeps were observed from the top to the bottom of the sandstone outcrop and may be due to percolation through vertical stress relief fractures. Vertical stress fractures are generally more prevalent at the extremities of hills than at their centers.

Between the Little Washington and Wayneburg coal seams are interbedded shales, sandstones and limestones. The limestones at one test bore (TB-01) had minor fractures and pressure packer tests indicated these units' permeability as 2.8×10^{-4} cm/sec. Two other test bores (TB-04, TB-05) which are outside and below the bottom of the foot print of the storage cell indicated a lower limestone unit more highly fractured and slightly more permeable at 7.85×10^{-4} to 1.2×10^{-3} cm/sec.

In TB-02, tests indicated the limestone to have a permeability of less than 1.6×10^{-5} cm/sec. The overlying mudstone (el 1048 - 1058) indicated a permeability of 4.0×10^{-3} cm/sec. These tests were performed at about the same elevation as an identified seep. The contrast between the permeabilities of the limestone and mudstone may explain the seep.

The Waynesburg 'A' coal seam at test bore TB-04 had a permeability of less than 1.8×10^{-5} cm/sec. At TB-05, the tested zone included the overlying limestone and is not believed to be representative of the coal. The permeability measured at TB-05 was 4.0×10^{-3} cm/sec. The limestone below the Waynesburg 'A' coal was pressure tested in TB-01,

TB-04 and TB-05. TB-01 and TB-04 indicated a permeability of less than 1.2 x 10^{-5} cm/sec. TB-05 indicated permeability at the top and decreasing to impermeability at the bottom of the hole (from 8 x 10^{-3} to less than 2.2 x 10^{-5} cm/sec). The groundwater in TB-01 in the lower unit was found to be at an elevation approximately 22 feet below the water level in the Waynesburg coal bed just above.

2.3 Ground Water

Ground water found in the top most layers of the hill area is believed to be from direct precipitation onto the hill area since the hill area is surrounded by cuts in the landscape, Sugar Creek and Chartiers creek on the north and east sides and the CSX Railroad right-of-way (ROW) which has a top most elevation of el 1080.

Ground water seeps mapped along the CSX railroad were observed from the sandstone at the top of the Washington formation (el 1080 – el 1090). These rocks are relatively permeable. This unit was saturated in test bore TB-03 and unsaturated in test boreTB-01.

A seep located along the existing access road is at an elevation about 1049 msl. This elevation correlates to the sandstone seam observed in TB-01 approximately 15 feet above the Waynesburg coal seam and at the contact between the permeable mudstone and less permeable limestone bed in TB-02.

These seeps are believed to form when the downward percolation of groundwater encounters a lower permeable bed, resulting in perched water lenses and horizontal groundwater movement along the top of the low permeability unit.

2.4 Surface Water

Surface water enters the Molycorp facility via Chartiers Creek and Sugar Creek. Chartiers creek enters from the southeast and crosses the site to run along the western property line of the production area of the plant. The average stream flow through the facility in Chartiers Creek is estimated to be over 8,000 gpm. The 100-year flood plain elevation of Chartiers Creek ranges from 1023.5 ft-msl at the north end to 1025 ft-msl at the south end.

Sugar Creek enters Molycorp from the west and joins Chartiers Creek in the southeast corner of the facility. Stream flows were measured between 131 and 188 cfm. The 100-year flood plain elevation of Sugar Creek ranges from 1025 ft-msl at the confluence of Sugar Creek and Chartiers Creek and 1027 ft-msl at the west end of the Molycorp property.

3.0 STORAGE CELL DESIGN

3.1 Scope and Purpose

The scope of this effort is to prepare a 60% design of a new storage cell for 125,000 cy of low level radioactive wastes.

3.2 Applicable Regulations

The storage cell will be permitted under NRC regulations 10CFR20.1401-7. These regulations provide performance-based standards for the design of the storage cell. The performance-based standard that has direct impact on the design of the storage cell is:

- The dose to the average member of the critical group from the storage cell will not be more than 25 mrem/yr. A calculation estimating the dose can be found in the body of the Decommissioning Plan, Part 2. This calculation indicates that the maximum dose that could be received is less than 25 mrem/yr.

In order to derive other cell design standards that may be applicable, Pennsylvania landfill regulations were reviewed. Pertinent design standards from the regulations that were considered in the cell design include:

- The cap will contain a two foot layer of clay with an in-place permeability of 1×10^{-7} cm/sec or less, and that the clay layer will be protected from the action of frost using a suitable depth of material over the clay.
- The haul road will have a maximum grade of 12% (Designed haul road maximum grade is 8%)
- The maximum slope on a landfill is 33%. The minimum slope is 5% to promote drainage
- The landfill will have a minimum of 1 up-gradient well and 3 down-gradient wells

3.3 Waste Characteristics

The waste consists of thoriated slag from the production of ferro-columbium mixed with soils, since the waste was initially landfilled on the plant site. Representative samples were tested and found not toxic-hazardous under the Resource Conservation and Recovery Act (RCRA).

3.4 Site Layout

The location of storage cell in relation to Molycorp and nearby properties can be found on drawing10034.01-EY-2A. The storage cell is located on top and on the north face of a small hill located in the south most extent of Molycorp's property. The existing site contours can be found on drawing 10034.01-EY-3A. The total disturbed area not including the haul road east of the Sugar Creek crossing is approximately seven acres.

The storage cell will be accessed using a new haul road to be constructed with the storage cell. The new haul road will run from the south side of Caldwell Avenue across from the main plant gate over Chartiers Creek and Sugar Creek near the locations of the old railroad bridges and up to the top of the storage cell by traversing the hillside. The maximum grade for the haul road will be 8%. The construction of the haul road will allow for access to the storage cell throughout its construction. The haul road plans and profiles can be found on drawing 10034.01-EY-9A. The haul road will be constructed of crushed rock and will be crowned in the center to promote drainage.

The storage cell generally runs from a low point at el 1070 to an elevation of el 1138. The storage cell side slopes are 3 horizontal to 1 vertical (33%). The top of the storage cell is sloped at 5% to promote drainage.

A storm water pond is provided on the eastern side of the storage cell. Storm water will be collected in perimeter drains generally located between the haul road and the storage cell that will convey the storm water to the detention pond. The outfall from the pond will flow to Sugar Creek near the confluence with Chartiers Creek. (See drawing 10034.01-EY-8A)

3.5 Cell Capacity

The nominal capacity of the storage cell is 125,000 cy of material. If the volume of material requiring disposal in the storage cell is found to be less than the design amount, the storage cell will be completed to a lower final elevation. However, the slopes of the storage cell sides and top will remain the same. The areal extent of the storage cell will also remain the same.

3.6 Cell Liner

Pursuant to discussions with the Nuclear Regulatory Commission at a December 15, 1999 meeting, the storage cell will not be required to have a constructed bottom liner. This will allow for any small quantities of leachate to flow out of the storage cell precluding ponding within the storage cell. The calculation that addresses the long-term dose for the storage cell takes this into consideration.

3.7 Ground Water Monitoring

A total of six ground water monitoring wells will be installed to monitor the storage cell. Since the storage cell will be located on top of the hill there is no real up-gradient location for a monitoring well. The six wells, see drawing 10034.01-EY-6A, will be located around the perimeter of the storage cell. It should be noted that one well will be located near and screened at the depth of the existing seeps that outcrop at the CSX railroad right-of-way and one well will be located near the seep at the existing haul road near the northeast corner of the storage cell screened at the seep depth.

Selection of the depth of the monitoring wells is based on the existing geology of the site. The majority of the storage cell will be located above the Little Washington Coal layer (el 1074 – el 1080) which has a lower permeability than the sandstone layer located directly above it. Therefore, any leachate migration that is located above the Little Washington Coal layer will be collected by the coal layer and will then run horizontally within the sandstone layer as indicated by the seep located at the CSW ROW. Monitoring wells MW-1, MW-2, and MW-3 will be screened in the sandstone layer to monitor this elevation. The north portion of the storage cell will be located over an area where the Little Washington Coal layer has been eroded away. Leachate from this portion of the storage cell will likely percolate along the excavated bedrock slope to the perimeter ditches. A small amount may percolate down through the fractures in the interbedded shales, sandstone, and limestone between the little Washington and the Waynesburg coal seams into the sandstone layer located above the Waynesburg coal seam. The leachate would then likely flow horizontally to the north with in the sandstone layer. Therefore, monitoring wells MW-4, MW-5, and MW-6 will be screened in this sand stone layer.

3.8 Storm Water Management

The storage cell has been designed to contain and collect all storm water that may land on the storage cell during its construction using a perimeter collection system located between the storage cell and the haul road, which conveys the run off to a storm water detention basin. The storm water collection system is sized to completely contain the 100 year-24 hr storm event. The storm water pond is located on the eastern side of the storage cell. The storm water pond will be constructed using 2: 1 side slopes. The pond will designed to remove solids in the storm water runoff prior to the runoff being discharged to Sugar Creek. The side slopes of the storm water pond will be grassed except for the inlet which will be have riprap protection. In addition, the perimeter ditch will also have riprap to minimize erosion.

Potentially contaminated sediment will be collected in the detention pond prior to discharge of the storm water. Just before closure of the storage cell, sediment collected in the storm water detention pond will be removed from the pond and disposed of in the storage cell.

After the storage cell is closed the function of the storm water detention pond will change. The pond outfall will be modified so that the pond becomes a retention pond. The primary focus of the storm water retention pond will be to hold up storm water so that runoff from the affected area is no greater than it was prior to construction. The storm water design calculations can be found in Attachment 1.

3.9 Erosion and Sediment Control

Conceptual soil erosion and sediment control requirements can be found on drawing 10034.01-EY-4A. In general hay bales and silt curtains will be placed at the base of all sloped disturbed areas. In addition, the haul road will have hay bales and silt curtains on sides not adjacent to the storage cell until grass is established. All finished slopes

associated with the haul road construction and the storm water pond construction will be immediately stabilized upon reaching final elevations using appropriate native grass seed mixes. Hay mulch will be used to cover the seeded areas to assist in germination of the seed. Necessary watering to promote grass development will be with a watering truck.

3.10 Structural Stability Analyses

The structural stability of storage cell is dependent on the storage cell configuration and geometry, the physical and strength properties of the foundation materials and the physical and strength properties of storage waste material and cap cover system. Based on review of the available information from the hill site test borings, it is estimated that the hill top rock can be economically excavated by mechanical methods without resorting to blasting to elevation 1090 feet. In order to achieve the required storage capacity for the thoriated slag waste, the storage cell design includes additional storage capacity from the striped hill side slope to sound bedrock. The storage cell final site preparation plan and final grading plan are presented on drawing 10034.01-EY-5A. The cross sections of the storage cell are presented on drawings 1034.01-EY-7A-E. A cap system including 2 feet of compacted clay liner, one foot of filter drainage/biotic layer 18 in of cover soil and 6 in of seeded top soil, see drawing 10034.01-EY-10B for a cap cross section detail.

Based on the review of the geological information of the bedrock and geometry of storage cell, it is concluded that structural instability through the essentially horizontally bedded sound rock formation is very unlikely. Therefore the structural stability analyses of the storage cell through bedrock foundational material need not be evaluated.

The structural stability of the storage cell and its cap cover system were analyzed for four sections, utilizing the two-dimensional slope stability computer software SLOPE/W developed by GEO-SLOPE International. Results of these analyses are included in Appendix B. Each section was found to exhibit satisfactory factors of safety for slope stability of all four sections analyzed. Analyses indicate that the lowest values of factor of safety are the shallow slope failure surface lying just below the cap cover system along the side slopes of the sections. The factors of safety for static loading conditions are equal to or greater than 1.77. Factors of safety for seismic loading conditions are equal to or greater than 1.52. The factors of safety of shallow slope failure surface for static loading conditions are all higher than the theoretical low bound value of 1.74 for the infinite 3H:1V slope of cohesionless material with $\phi = 30^{\circ}$, which is conservatively estimated for the compacted thoriated slag waste material at the site. The factors of safety for deep seated slope failure surface increase rapidly with the depth from the lowest value of 1.8 at shallow depth to the value of approximate 2.5 for mid-depth of slope at the top of storage cell.

Although, it is extreme unlikely, the cap cover system will ever be completely saturated for any storm event. Nevertheless, the slope stability of the completely saturated cap cover was analyzed using the analysis of infinite slope with seepage parallel to slope. At this extremely unlike event, it is calculated that a factor of safety 1.0 for the sheeted failure through the interface between the clay liner and filter drainage bedding will

require the friction angle $\phi = 31°$ for the filter drainage/bedding and c=30 psf $\phi = 25°$ for the clay liner. It is anticipated that the compacted filter drainage/bedding of crushed stone will have friction angle ϕ greater than 32° and the compacted clay liner will have cohesion equal to or greater than 100 psf and friction angle $\phi = 25°$. Therefore, the factor of safety of the cap cover system for this extreme unlikely event will be greater than 1.0 which is considered satisfactory for the extreme conditions assumed.

The structural stability analyses of the storage cell and cap cover system discussed above are based on the two-dimensional slope stability of the steepest sections. The storage cell and cap cover system is a three-dimensional half round shaped hill earth structure. Because of the smaller dimension at the hill top and larger dimension at the hill base, the slope stability of a round shaped hill slope will be higher than the factors of safety analyzed based on the two dimensional slope stability of the steepest sections. The results of structural stability analyses indicate that the storage cell and cap cover system with 3H:1V side slope exhibit satisfactory factors of safety under both static and seismic loading conditions.

3.11 Storage Cell Construction

The construction of the storage cell will be in phased approach. Initial efforts will include:

- Placement of soil erosion and sediment control structures
- Clearing and Grubbing
- Construction of the sugar and Chartiers Creek crossings
- Initial excavation of surface soils and stock piling of top soils
- Construction of the haul road and storm water pond with available excavated soils
- Seeding and mulching the finished side slopes of the haul road and storm water pond
- Completion of the excavation of the area to the contours shown on drawing 10034.01-EY-5A with stock piling of excess soils for use as back fill on the production site after removal of the waste materials.
- Installation of the monitoring wells
- Installation of perimeter fence prior to the initiation of waste placement in the storage cell

Since suitable soils from the initial excavation will be used to help build the haul road and berm for the storm water pond, initial access to the site will be by using the existing crossing of Sugar Creek and the existing gravel road on the hill. As construction of the haul road and storm water pond progress the existing haul road will require rerouting until the new haul road is available for access.

Preparation of the area for waste placement will require the excavation of approximately 110,000 cy of overburden and fractured rock and the filling of approximately 65,000 cy for the construction of the haul road and storm water berm. Excavated soils may be suitable for the required filling.

Prior to using available soils, it is likely that the available soils will require either screening or sizing. Available space for this effort is limited to an area located north of Sugar Creek west of Chartiers Creek and an area located south of the main plant east of Chartiers Creek. It should be noted that the use of the area east of Chartiers Creek will have to be coordinated with the removal of waste material presently located in the area. If the contractor feels that the space available is not adequate then he will be required to truck the soils to an off-site screening location.

4.0 WASTE PLACEMENT

4.1 Waste Placement

The waste material will be trucked to the storage cell site where the waste material will be spread in a maximum of two foot lifts. The waste material will then be compacted using vibratory rollers until an adequate density is reached. The placement of waste will begin in the northeast corner of the site and will progress towards the west and the south. During construction, care will be taken so that storm water does not become ponded within the waste material. Drainage using the perimeter trenches shall always be provided.

During initial filling operations temporary access from the haul road will be required that crosses the perimeter ditches. Temporary culverts will be installed to allow collected water to be routed through the perimeter drainage system.

Upon reaching final contours the storage cell will be closed. This will minimize the generation of fugitive dust from the waste. The active area of waste placement will be kept to a minimum for dust control.

4.2 Operating Requirements

4.2.1 Truck Management

Truck access to the storage cell site area is by the haul road. The width of the haul road ranges from one lane to two lanes of traffic. It is anticipated that there will be about 50-75 truck trips per day at 15-20 cy per trip for a total of 1000 cy/day. The haul road will generally be wide enough for two lanes of traffic except where existing conditions only allow for one lane. It is anticipated that the creek crossings will be one lane to minimize construction costs.

4.2.2 Dust Control

Dust will be controlled using water sprays or other approved means and by minimizing open areas of the storage cell. During operation, the haul road will be watered at least twice a day when it is not raining. A water truck will be provided for this. The water truck will also be used to wet the waste prior to compaction to control dust and to provide moisture when needed to aid in the compaction effort. Water for the dust control effort will be provided at the main production area of Molycorp.

The perimeter of the storage cell site will be monitored for dust. If excessive quantities of dust are monitored, additional wetting of waste material with in the cell will occur.

Truck wash stations will be provided to minimize the spreading of waste material along the haul road. Water used for truck washing will be discharged to the storm water pond via the perimeter drain system. The location of the truck washing station will change as the storage cell is constructed.

The trucks will be covered between the manufacturing area and the storage cell to preclude potential contaminated dust from being spread over the haul road.

4.2.3 Storm Water Maintenance

During the placement of wastes within the storage cell periodic inspection and maintenance of the perimeter trenches and storm water pond will be required. If there is a buildup of collected debris or sediment in the perimeter ditches or pond, the sediment and debris will promptly be removed and disposed of within the storage cell.

While the storage cell is being constructed, periodic storm water samples will be taken for analysis. It is envisioned that sampling will be accomplished using an ISCO or equivalent battery operated automatic sampler device. Samples will be taken as required (grab samples or composite samples) to determine the effectiveness of the storm water pond. Corrective action will be taken if the results of the sample analyses indicate excellence with discharge limits. Corrective action could include the use of temporary cover to minimize exposure of the waste material and/or modifications to the storm water collection system.

5.0 STORAGE CELL FINAL COVER

5.1 Final Cover Grading

The storage cell final grades consist of 33% grades on the sides of the storage cell with a top slope of 5%.

5.2 Capping System Components

The storage cell will be closed when final contours are reached. The storage cell cap will consist of 2 ft of clay topped with 12 inches of a drainage layer/biotic layer, 18 inches of clean fill cover soil and 6 in of seeded top soil.

The bottom most component will be 2 ft of compacted clay with an in-place permeability of less than 1×10^{-7} cm/sec. The 12 in intermediate layer will serve two functions. The first function will be as a drainage layer to keep water from percolating into the clay layer. The drainage layer will consist if coarse graded sands and gravels and will have a permeability of $1 \times 10^{-1} - 1 \times 10^{-2}$ cm/sec. The second function of the intermediate layer will be as a biotic layer to minimize the impacts of burrowing animals.

The thickness of the top two layers was partially predicated on frost depths for this part of Pennsylvania. Normal frost depth is about 15 in (ICF Kaiser, 1997). However, in extreme cases the frost can be as great as 36 inches (Soil Mechanics Design Manual 7.1, Department of the Navy, Navel Facilities Engineering Command, NAVFAC DM-7.1, May 1982, page 7.1-42). Therefore, the minimum cover selected for the clay layer was three feet.

5.3 Final Drainage

After the storage cell is closed, the storm water pond outlet will be modified. The change will allow the pond to retain peak storm water flows to pre-construction flows. The new arrangement for the storm water pond outfall can be found on drawing 10034.01-EY-8A. The calculations supporting the design can be found in Attachment 1. The revised outlet for the pond will consist of a series of weirs and a riprap outfall which will minimize erosion in down stream areas.

ATTACHMENT 1

CALCULATIONS

Calculation No.	Calculation Title
10034.01-H(B)-2	Storm water Runoff for the Project Site/ Pre-development and Post-development
10034.01-H(B)-3	Sediment/retention Basin Preliminary Design for Storm Water Runoff of the Project Site/Construction Phase and Post Construction
10034.01-H(B)-4	Riprap Sizing for the Drainage Ditch Along Haul Road
10034.01-G(B)-6	Storage Cell Stability Analysis

STONE & WEBSTER ENGINEERING CORPORATION

CALCULATION TITLE PAGE

CLIENT & PROJECT: **Molycorp, Storage Cell, Washington, PA**	PAGE 1 OF 11 + Attachment A (4p), Attachment B (5p) & Attachment C (34p)
CALCULATION TITLE (Indicative of Objective): **Stormwater Runoff for the Project Site / Pre-development and Post-development**	QA CATEGORY ☒ ☐ - I Nuclear Safety Related ☐ - II ☐ - III ☒ - Non-Safety Related ☐ - ☐ - Fossil/Industrial Plant

CALCULATION IDENTIFICATION NUMBER

J.O. or W.O. NO.	DIVISION & GROUP	CURRENT CALC NO.	OPTIONAL TASK CODE	OPTIONAL WORK PACKAGE NO.
1003401	**H(B)**	**2**		**N/A**

APPROVALS – SIGNATURE & DATE

PREPARER(S)/DATE(S)	REVIEWER(S)/DATE(S)	INDEPENDENT REVIEWER(S)/ DATES(S)	REV. NO. OR NEW CALC. NO.	SUPERCEDES CALC. NO. OR REV. NO.	CONFIRMATION REQUIRED ☒ YES	CONFIRMATION REQUIRED ☒ NO
George Liang 04/21/2000 George Liang	Bruce McCampbell 04/21/00 B McCampbell		0	N/A	☐	☒
					☐	☐
					☐	☐
					☐	☐
					☐	☐

DISTRIBUTION

GROUP	NAME & LOCATION	COPY SENT	GROUP	NAME & LOCATION	COPY SENT
Records Mgmt Fire File	Records Center	☐			☐
PROJECT FILE		☐			☐
		☐			☐

TABLE OF CONTENTS

Section/Title — Page

TITLE PAGE 1
TABLE OF CONTENTS 2
RECORD OF CHANGES 3

1. **INTRODUCTION** 4
2. **OBJECTIVE** 4
3. **ASSUMPTIONS** 4
4. **METHODOLOGY** 4
5. **DETAILS OF CALCULATION** 5
6. **REFERENCES** 9
7. **RESULTS** 9
8. **CONCLUSIONS** 10
9. **ATTACHMENTS** 11

9.1 ATTACHMENT A DRAINAGE AREAS (3 PAGES) 11
9.2 ATTACHMENT B 24 HOUR RAINFALL INTENSITY DATA MAPS (4 PAGES) 11
9.3 ATTACHMENT C TR-20/TR-55 MODELING COMPUTER RUNS OUTPUT 11
C-1 Pre-Construction *11*
C-2 Post -Construction *11*

RECORD OF CHANGES

Rev No.	Description of Changes	Pages Revised	Pages Added	Pages Replaced
0	Original Issue	N/A	N/A	N/A

1. INTRODUCTION

Stormwater information is developed for comparison of the quantity of stormwater runoff peak discharge from the site for the pre-development and post-development conditions.

2. OBJECTIVE

The objective is to calculate the change in runoff quantity from the developed site due to the site modifications for the storage cell project. Surface runoff peak discharges are calculated for storm frequencies of 2-, 10-, 25-, and 100-year, 24-hour precipitation.

3. ASSUMPTIONS

For the pre-development calculation, the ground cover condition of the site area is based on the boring data which is clay loam, silty clay. The Hydrologic Soil Group is Type D in accordance with the classification of Technical Report No. 55 (TR-55)"Urban Hydrology for Small Watersheds", published by USDA, Soil Conservation Service (SCS) (Reference 1).

After development, the ground cover type and hydrologic condition of the site will consist of the following categories:

2 feet of grassed top soil
1 foot of drainage bedding
2 feet of clay

4. METHODOLOGY

1. The drainage area of the site to be used for development is measured based on a recently surveyed map .
2. For post-development, the area of project site will be re-graded in accordance with engineering/design requirements.
3. The rainfall intensity data for Washington County, PA where the project is located, were collected from SCS publication and used as input to the TR-20 computer model
4. The Runoff Curve Number (CN) was calculated by a subroutine in TR-55 model based on input data of cover type, and hydrologic soil group (HSG). The site is considered as HSG "D" type with soil textures of clay loam or silty clay.
5. The Time of Concentration (T_c) was calculated by a subroutine in TR-55 based on the length of the flow path.
6. The Peak Discharge of each rainfall intensity was calculated by TR-20, based on input of drainage area, runoff curve number, time of concentration, and rainfall type.

5. DETAILS OF CALCULATION

- The 24-hour Rainfall Intensity Data, from Reference (4):

Rainfall Event	Rainfall Amount(in)
2-Year	2.6
10-Year	3.8
25-Year	4.5
100-Year	5.25

- Based on the slope of the site, the runoff would flow through 3 drainage areas. Using Autocad, the size of each of the drainage area was calculated:

Drainage Area	Area (acres)
1	3.21
2	2.21
3	1.44
Total	***6.86***

§ Pre-development

Stormwater Runoff Analysis / Input Data / SCS TR-20 or TR-55 Model

- Drainage Area 1

Ground Cover Condition & Curve Number (CN)			
Description – (Condition)	Area -sq ft (acres)	Hydrologic Soil Group	Runoff Curve Number (CN)
Woods-grass combination(fair)	139,930 (3.21)	D (clay loam, silty clay)	82
Total area	139,930 (3.21)		

Flow Path & Slope for Time of Concentration Calculation			
Flow Path Segment	Length (feet)	Delta Elevation (feet) & Slope(ft/ft)	Description
AB (1121' – 1091') BC (1091' – 1084') CD (1084' – 1044)	(500 – 750) = 250 (750 – 785) = 35 (785 – 950) = 165 Total length = 450	30/250=0.12 7/35 = 0.20 40/165 = 0.24	Wood/grass Wood/grass Wood/grass

- Drainage Area 2

Ground Cover Condition & Curve Number (CN)			
Description – (Condition)	Area -sq ft (acres)	Hydrologic Soil Group	Runoff Curve Number (CN)
Woods-grass combination(fair)	96,219 (2.21)	D (clay loam, silty clay)	82
Total area	96,219 (2.21)		

Flow Path & Slope for Time of Concentration Calculation			
Flow Path Segment	Length (feet)	Delta Elevation (feet) & Slope(ft/ft)	Description
AB (1123' – 1120')	(205 – 175) = 30	3/30=0.10	Wood/grass
BC (1120' – 1090')	(345 – 205) = 140	30/140 = 0.21	Wood/grass
CD (1090' – 1075')	(400 – 345) = 55	15/55 = 0.27	Wood/grass
DE (1075' – 1070')	(415 – 400) = 15	5/15 = 0.33	Wood/grass
EF (1070' – 1058')	(435 – 415) = 20	12/20 = 0.6	Wood/grass
	total length = 260 ft		

- Drainage Area 3

Ground Cover Condition & Curve Number (CN)			
Description – (Condition)	Area -sq ft (acres)	Hydrologic Soil Group	Runoff Curve Number (CN)
Woods-grass combination (fair)	62,846 (1.44)	D (clay loam, silty clay)	82
Total area	62,846 (1.44)		

Flow Path & Slope for Time of Concentration Calculation			
Flow Path Segment	Length (feet)	Delta Elevation (feet) & Slope(ft/ft)	Description
AB (1123' – 1120')	(390 – 350) = 40	3/40=0.075	Wood/grass
BC (1120' – 1114')	(350 – 300) = 50	6/50 = 0.12	Wood/grass
CD (1114' – 1111')	(300 – 250) = 50	3/50 = 0.06	Wood/grass
DE (1111' – 1103')	(250 – 135) = 115	8/115 = 0.07	Wood/grass
EF (1103' – 1097')	(135 – 85) = 50	6/50 = 0.12	Wood/grass
	total length = 305 ft		

§ Post-development

Stormwater Runoff Modeling by TR-20
Post-Construction
Molycorp/Storage Cell/Washington, PA

Drainage Area 1 (3.21 acres)

The area will be filled with clay and covered with 2-ft deep grassed top soil. Curve Number = 89
Type D Hydrological Soil Group (HSG)

Flow path and slope:

	A	B	C	D	E	F
Distance	390	450	535	740	790	820
Elevation	1137.0	1136.5	1136.0	1097.0	1082.0	1075.0

	AB	BC	CD	DE	EF
L	60	85	205	80	30
H	0.5	0.5	39.0	22.0	11.0
Slope	0.0083	0.0059	0.1902	0.2750	0.3667

Drainage Area 2 (2.21 acres)

The area will be filled with clay and covered with 2-ft deep rip-rap on top. Curve Number = 89
Type D Hydrological Soil Group (HSG)

Flow path and slope:

	A	B	C
Distance	-175	-220	-435
Elevation	1138.0	1136.0	1064.0

	AB	BC
L	45	215
H	2.0	72.0
Slope	0.0444	0.3349

Drainage Area 3 (1.44 acres)

The area will be filled with clay and covered with 2-ft deep grassed top soil. Curve Number = 89
Type D Hydrological Soil Group (HSG)

Flow path and slope:

	A	B	C	D
Distance	390	235	135	85
Elevation	1137.0	1136.0	1118.0	1102.0

	AB	BC	CD
L	155	100	50
H	1.0	18.0	16.0
Slope	0.0065	0.1800	0.3200

With the drainage area, and the 24-hour rainfall intensity as input, the Runoff Curve Number (CN), Time of Concentration T_c, and Peak Discharge were computed by utilizing TR-20 model (Reference 2), and details of the computation and results are presented in Appendix C.

- *Computer Run for Pre-development Phase*

  See Appendix C-1

- *Computer Run for Post-development Phase*

  See Appendix C-2

6. REFERENCES

1. TR-55, Urban Hydrology for Small Watersheds, 2nd ed., 1986, USDA, SCS
2. HydroCad, Stormwater Modeling System, Owner's Manual, Version 5, Applied Microcomputer Systems.
3. King, H.W., Brater, E.F., Handbook of Hydraulics, 5th Edition, 1963.
4. Figure B-3 to Figure B-9 in Appendix B, TR-55, 2nd ed., 1986 (see Reference 1).

7. RESULTS

Summary of Peak Discharges
Pre-development (Existing Site)
Storage Cell, Washington, PA

Frequency (yrs)		2	10	25	100
24-Hr Rainfall (in)		2.60	3.80	4.50	5.25
Area (acres)	**Peak Runoff (cfs) --->**				
Area 1 = 3.21		6.35	11.85	15.23	18.91
Area 2 = 2.21		4.67	8.74	11.22	13.91
Area 3 = 1.44		2.78	5.23	6.73	8.35
Total Area = 6.86					
	Total Peak Runoff (cfs) --->	13.80	25.82	33.18	41.17

Summary of Peak Discharges
Post-development

Frequency (yrs)		2	10	25	100
24-Hr Rainfall (in)		2.60	3.80	4.50	5.25
Area (acres)	**Peak Runoff (cfs) --->**				
Area 1 = 3.21		7.65	12.78	15.79	19.01
Area 2 = 2.21		6.49	10.79	13.30	15.99
Area 3 = 1.44		3.49	5.84	7.22	8.69
Total Area = 6.86					
	Total Peak Runoff (cfs) --->	17.63	29.41	36.31	43.69

8. CONCLUSIONS

Summary of Stormwater Analysis (TR-20 Modeling)
Molycorp/Storage Cell/Washington, PA

Storm		Peak Runoff, Q(cfs)			Peak Runoff Differential	
Frequency(yr)	Rainfall(in)	D. Area	Pre-Const	Post-Const	ΔQ(Post-Pre)- (cfs)	% of Increase
2	2.6					
		1	6.35	7.65	1.30	20.47%
		2	4.67	6.49	1.82	38.97%
		3	2.78	3.49	0.71	25.54%
		Total	***13.8***	***17.63***	***3.83***	***27.75%***
10	3.8					
		1	11.85	12.78	0.93	7.85%
		2	8.74	10.79	2.05	23.46%
		3	5.23	5.84	0.61	11.66%
		Total	***25.82***	***29.41***	***3.59***	***13.90%***
25	4.5					
		1	15.23	15.79	0.56	3.68%
		2	11.22	13.3	2.08	18.54%
		3	6.73	7.22	0.49	7.28%
		Total	***33.18***	***36.31***	***3.13***	***9.43%***
100	5.25					
		1	18.91	19.01	0.10	0.53%
		2	13.91	15.99	2.08	14.95%
		3	8.35	8.69	0.34	4.07%
		Total	***41.17***	***43.69***	***2.52***	***6.12%***

9. ATTACHMENTS

9.1 Attachment A Drainage Areas (3 pages)

9.2 Attachment B 24 Hour Rainfall Intensity Data Maps (4 pages)

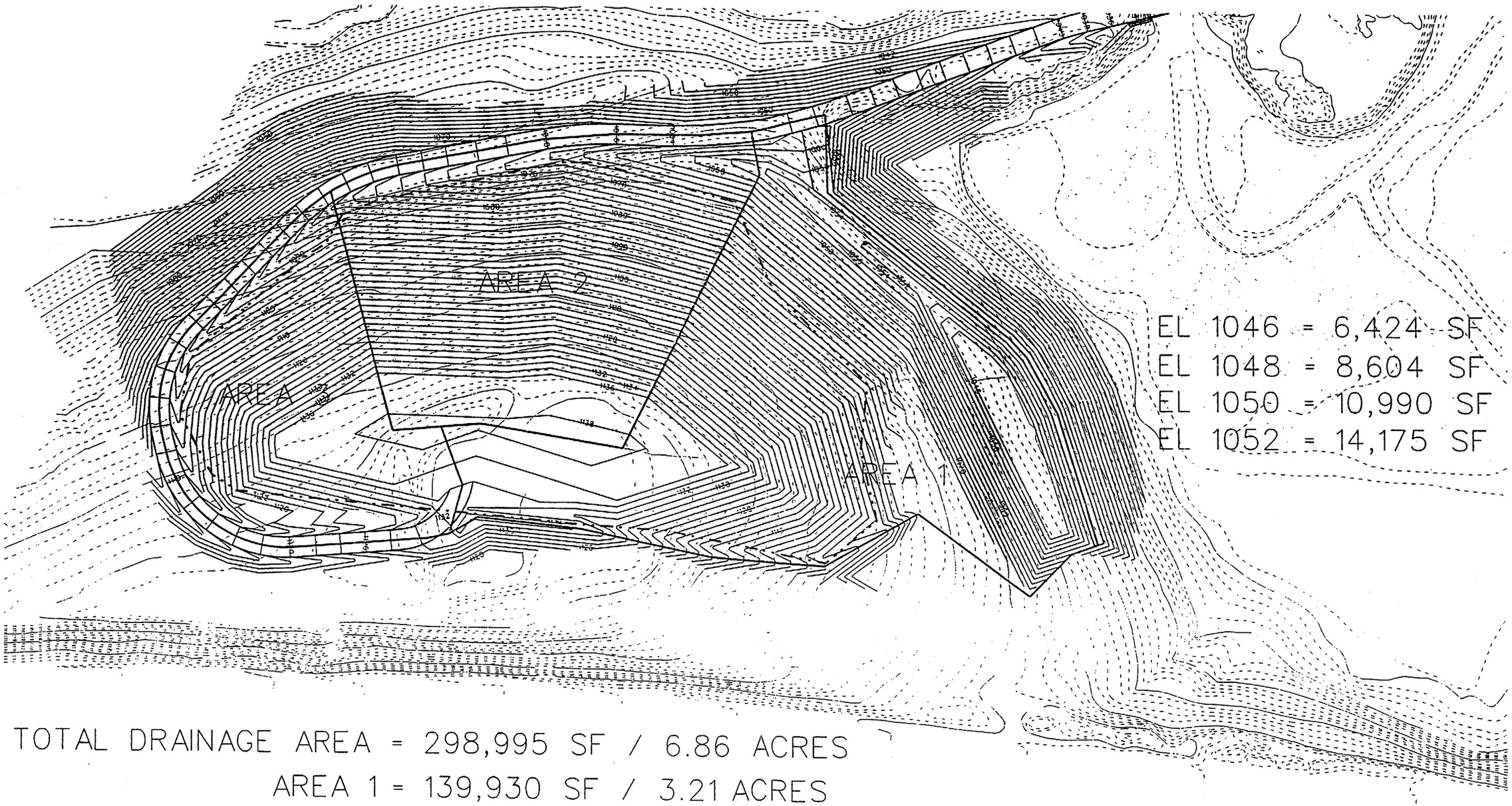
9.3 Attachment C TR-20/TR-55 Modeling Computer Runs Output

C-1 Pre-Construction

C-2 Post -Construction

Attachment A

Drainage Area

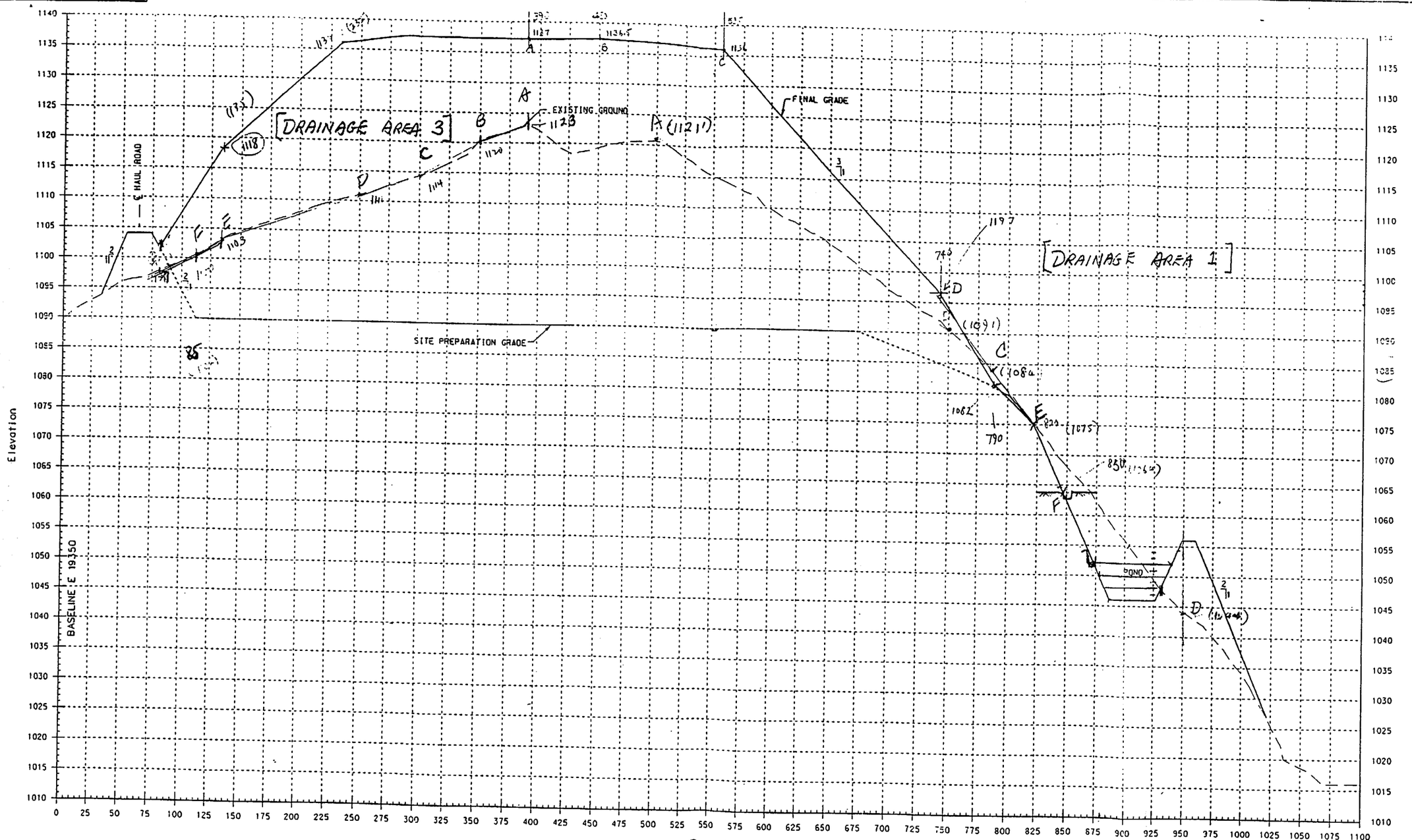


TOTAL DRAINAGE AREA = 298,995 SF / 6.86 ACRES

AREA 1 = 139,930 SF / 3.21 ACRES

AREA 2 = 96,219 SF / 2.21 ACRES

AREA 3 = 62,846 SF / 1.44 ACRES



ISSUE 4	DESCRIPTION	CHECKED	ISSUE 3	DESCRIPTION	CHECKED	ISSUE 2	DESCRIPTION	CHECKED	ISSUE 1	DESCRIPTION	CHECKED
		CORRECT			CORRECT			CORRECT			CORRECT
		APPR / DATE			APPR / DATE			APPR / DATE			APPR / DATE

MODEL | ARCH | CIVIL | CONC | STL | L & P | MST | M.B. | P.S. | S.A. | FAC | ELEC | LTG | MATL

NORTH CROSS SECTION STORAGE CELL DESIGN

MOLYCORP, INC.
300 CALDWELL AVENUE WASHINGTON, PA

STONE & WEBSTER ENGINEERING CORPORATION

DRAWING NUMBER

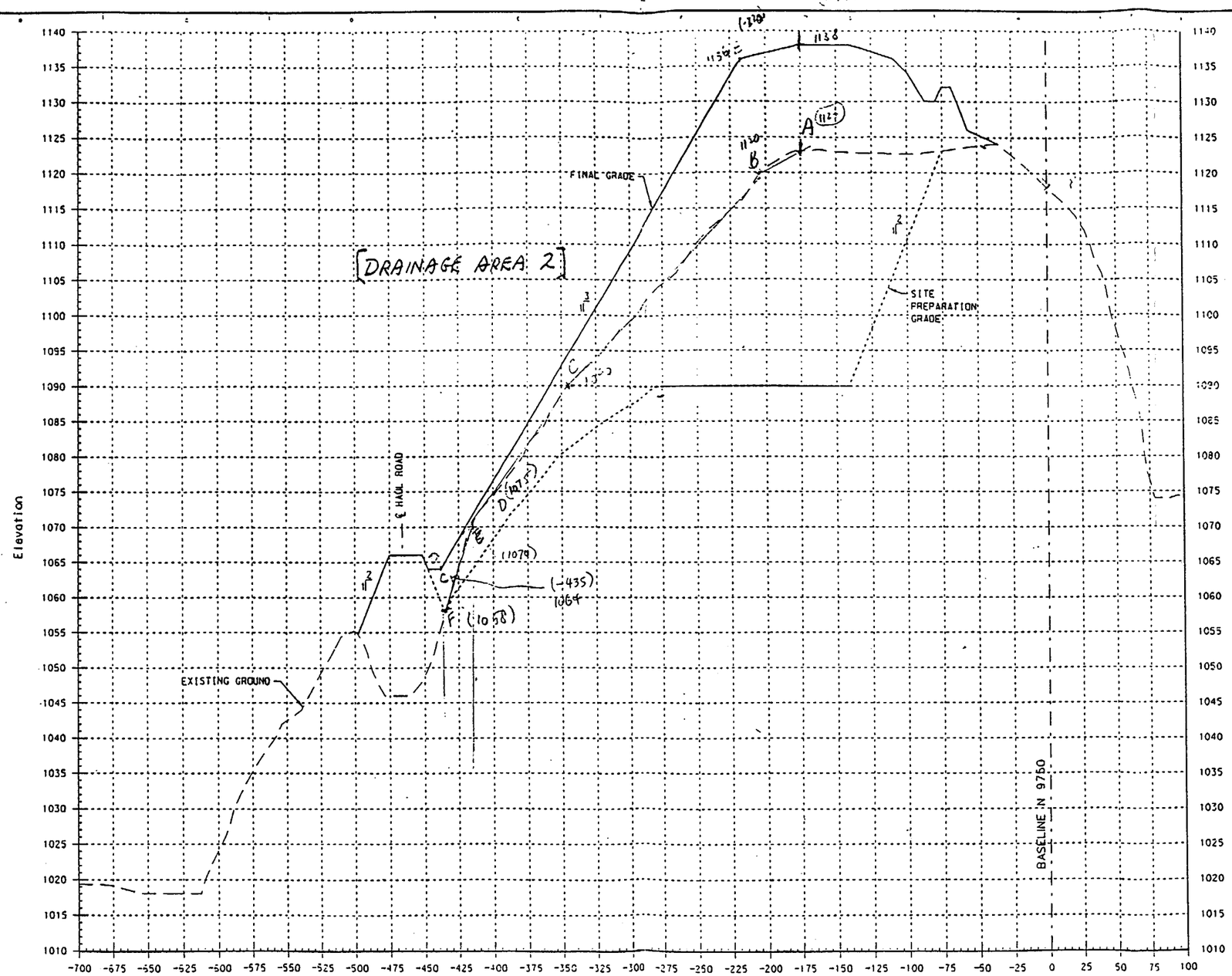
FIGURE 4

DESIGNED BY R.DONOVAN | DRAWN BY R.DONOVAN | CAD MODEL MOLYSH4 | LEVELS | WORK PKG

DSGN CHKD BY | CHKD BY

REV | DATE | DWN | CHKD | APP

REP ENGR B.MCCAMPBELL
SUPV G.DOTOH



5+00

SCALE : 1" = 40' (HORZ)
1" = 8' (VERT)

40 0 40 80 120
SCALE IN FEET

EAST CROSS SECTION
STORAGE CELL DESIGN

MOLYCORP, INC.
300 CALDWELL AVENUE WASHINGTON, PA

STONE & WEBSTER ENGINEERING CORPORATION

DRAWING NUMBER

FIGURE 5

DESIGNED BY R.DONOVAN
DRAWN BY R.DONOVAN
DSGN CHK'D BY
CHK'D BY
SAB MODEL
LEVELS
WOL FSHS
HORIZ PKG
NET

ISSUE A | DESCRIPTION | CHECKED | CORRECT | APPRD | DATE
ISSUE 3 | DESCRIPTION | CHECKED | CORRECT | APPRD | DATE
ISSUE 2 | DESCRIPTION | CHECKED | CORRECT | APPRD | DATE
ISSUE 1 | DESCRIPTION | CHECKED | CORRECT | APPRD | DATE

MODEL ARCH CIVIL CONC STL L & P MET M.B. P.S. S.A. FAC ELEC LTG MATL

Attachment B

24 Hour Rainfall Intensity Data Maps

Figure B-3 Two-year, 24-hr rainfall

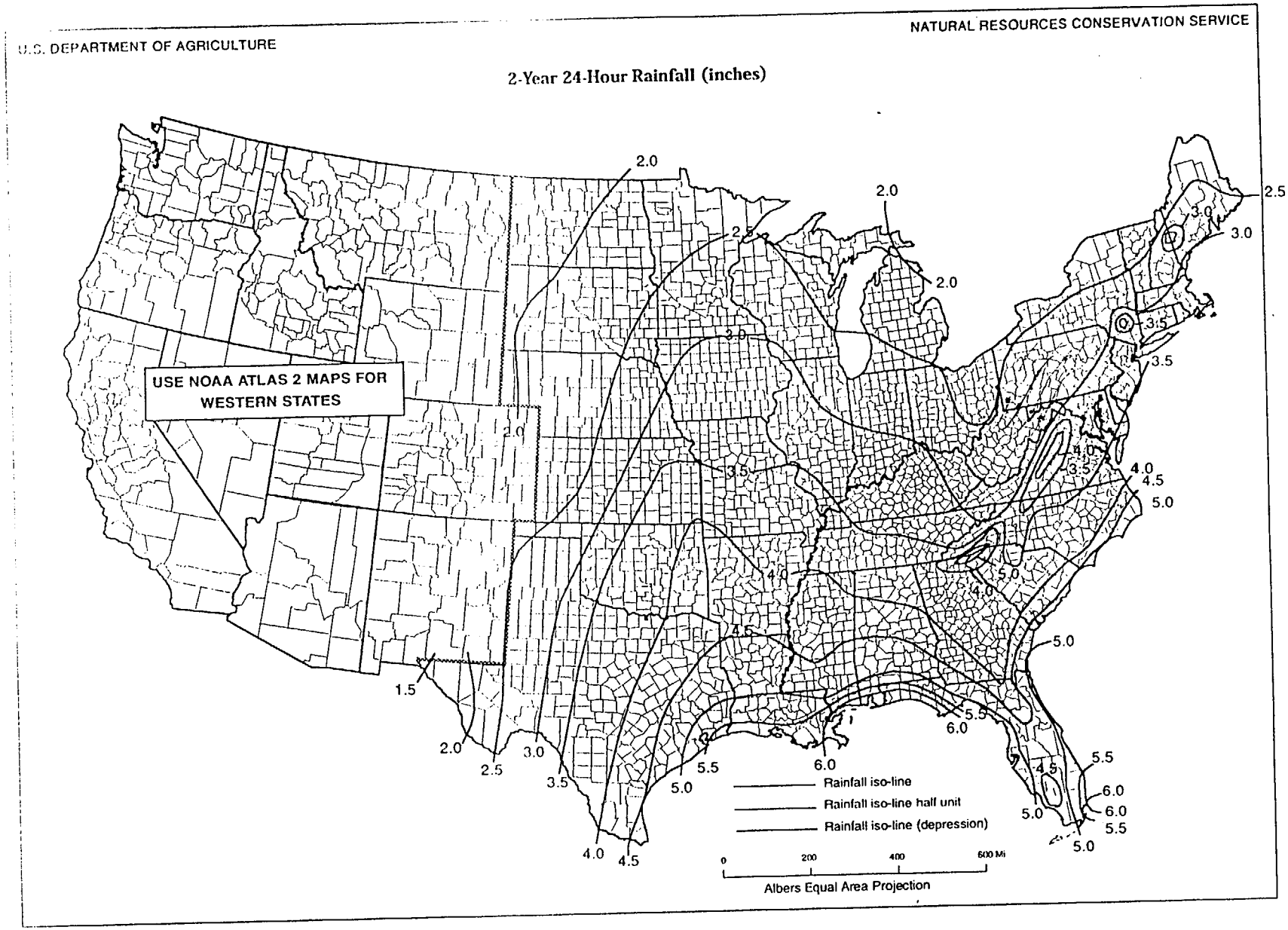


Figure B-5 Ten-year, 24-hr rainfall

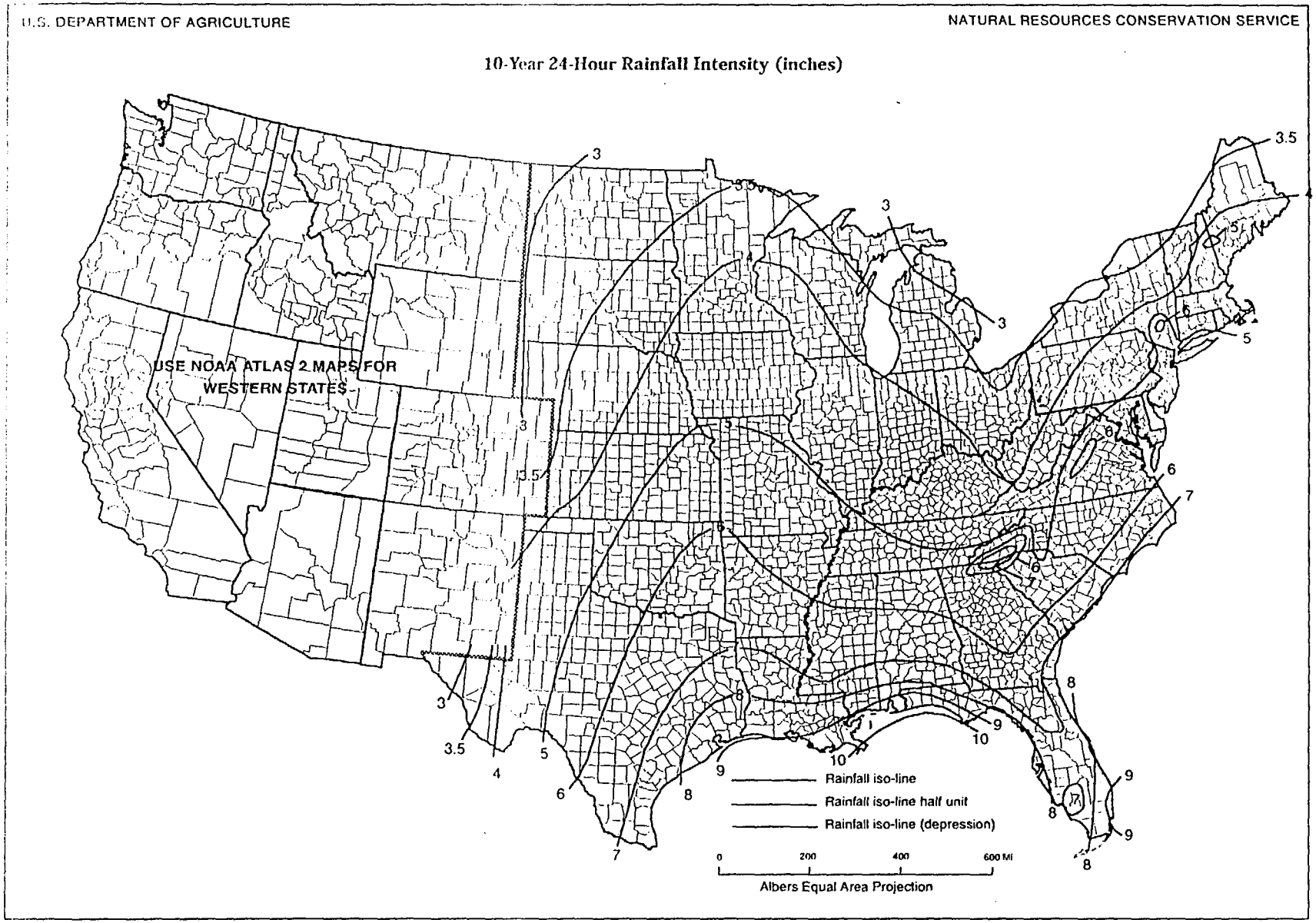


Figure B-6 Twenty-five-year, 24-hr rainfall

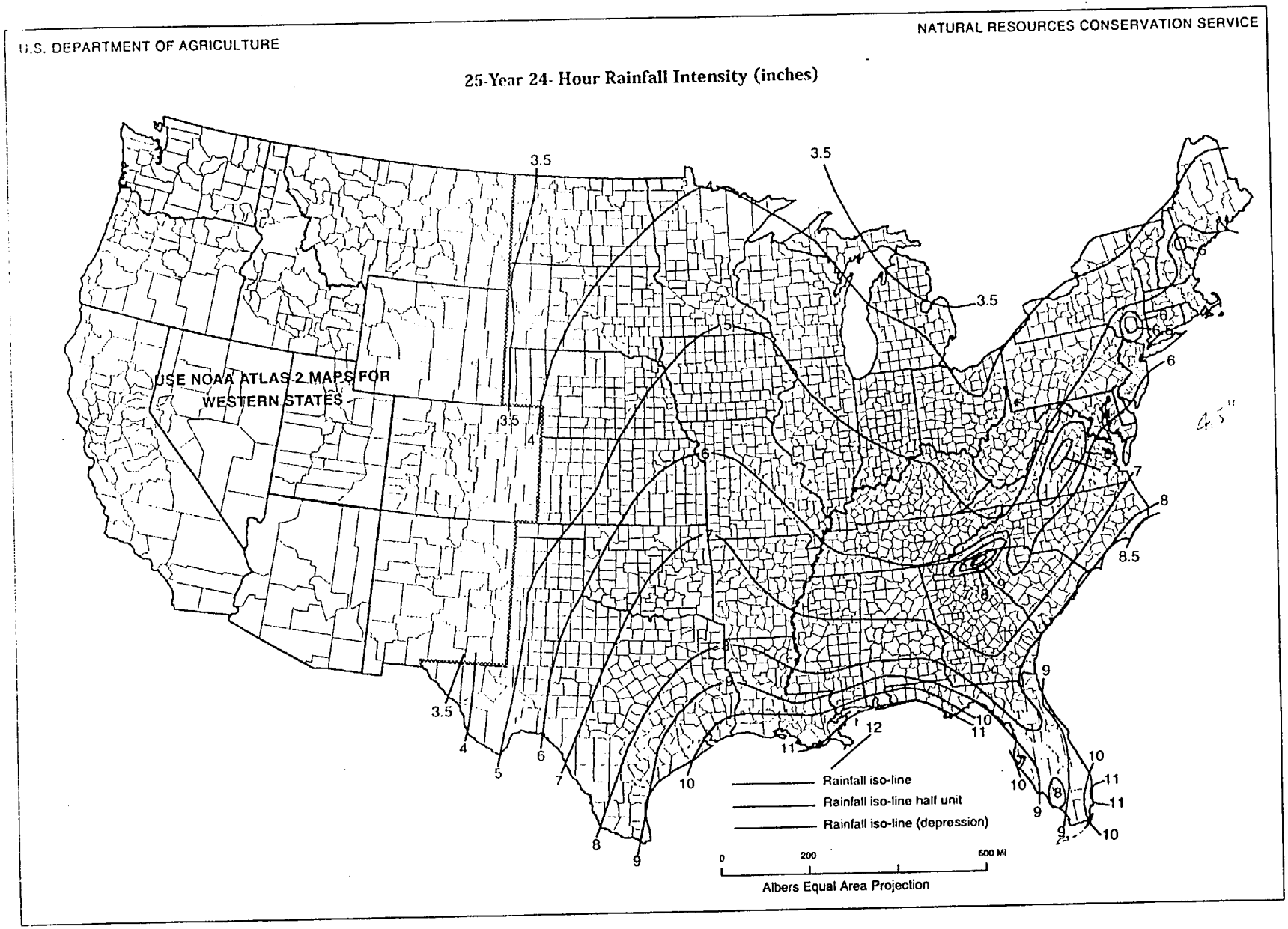
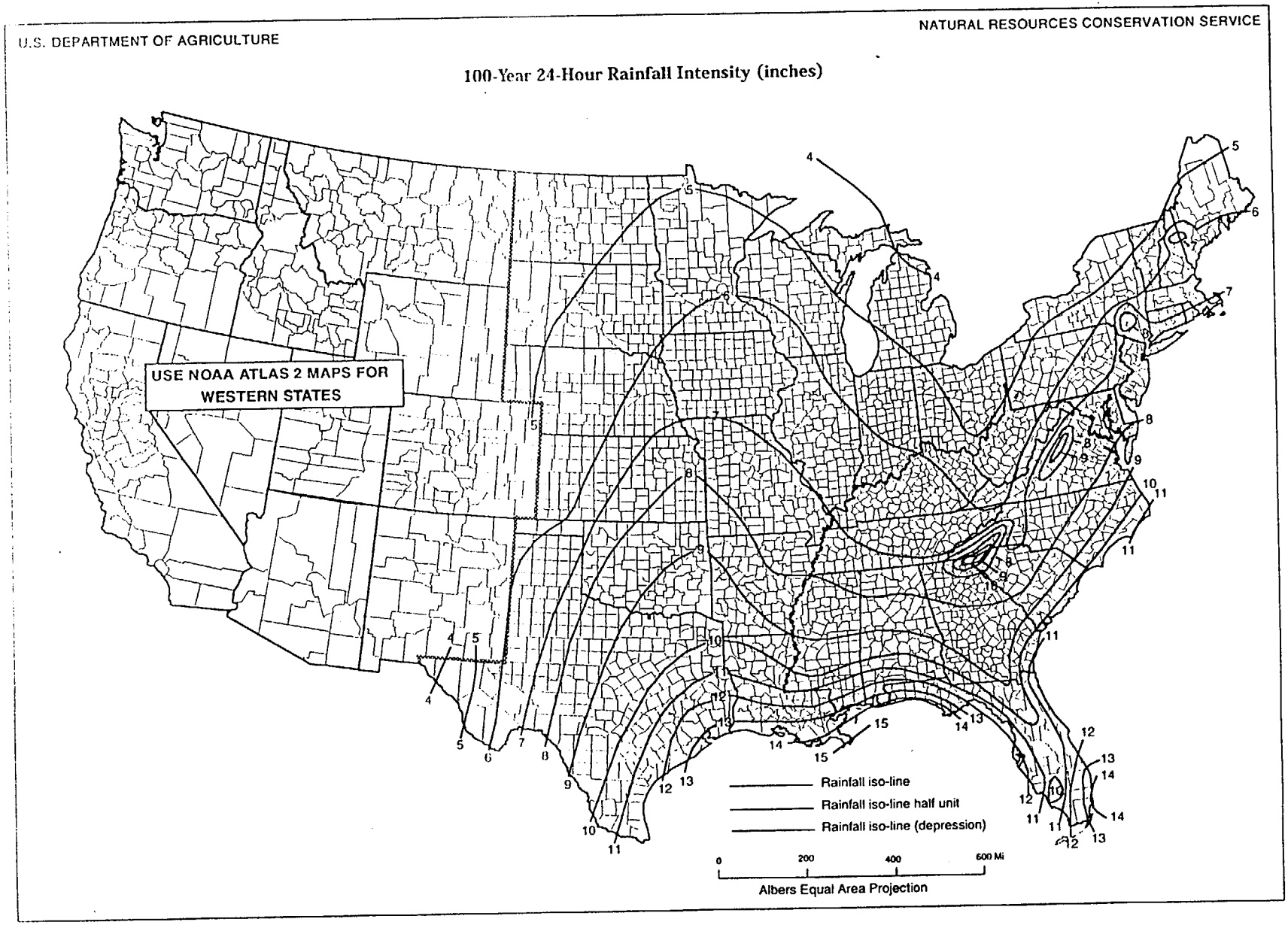


Figure B-9 One-hundred-year, 24-hr rainfall

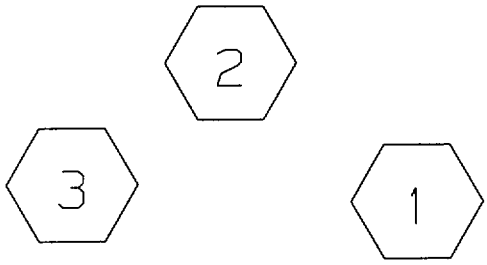


Attachment C-1

TR-20 Model Computer Run Output

Pre-Construction

WATERSHED ROUTING ==========



SUBCATCHMENT 1 **Pre-Construction, 2-yr/24-hr Storm**

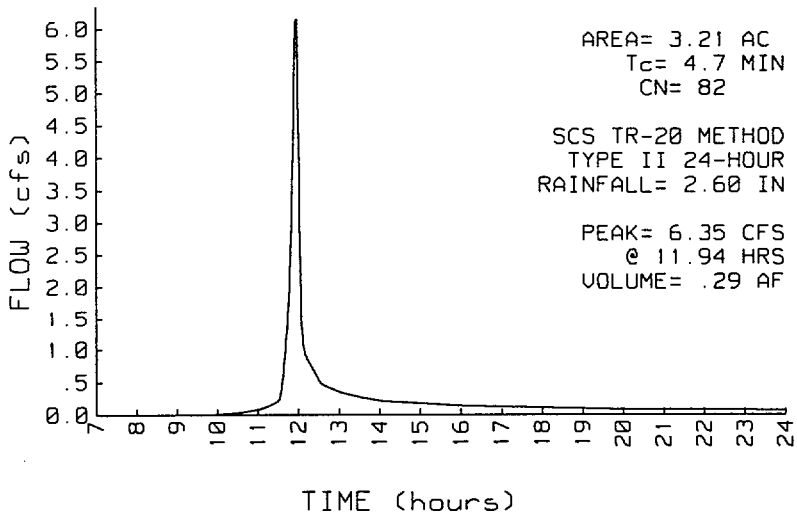
PEAK= 6.35 CFS @ 11.94 HRS, VOLUME= .29 AF

ACRES	CN	
3.21	82	wood/grass, fair, type D HSG

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 2.60 IN
SPAN= 7-24 HRS, dt=.04 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	2.8
L=250' s=.12 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	.5
L=35' s=.2 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	1.4
L=165' s=.24 '/'		
	Total Length= 450 ft Total Tc=	4.7

SUBCATCHMENT 1 RUNOFF
Pre-Construction, 2-yr/24-hr Storm



SUBCATCHMENT 2 **Pre-Construction, 2-yr/24-hr Storm**

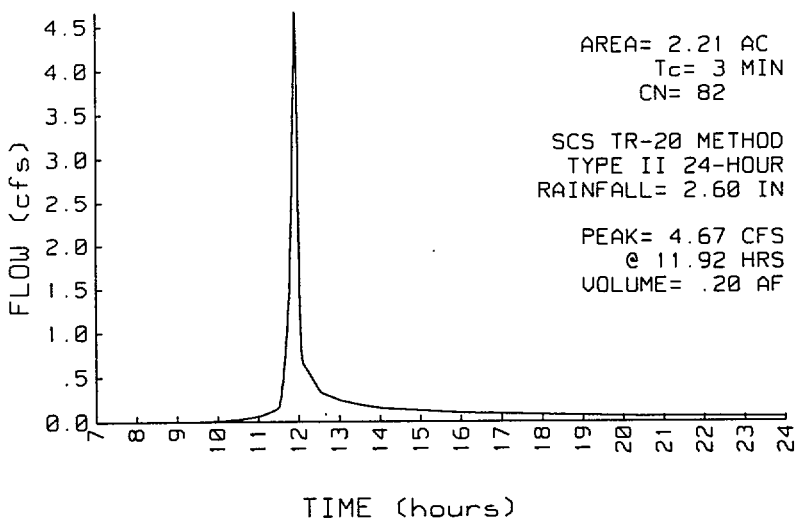
PEAK= 4.67 CFS @ 11.92 HRS, VOLUME= .20 AF

ACRES	CN	
2.21	82	wood/grass combo, fair, type D H

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 2.60 IN
SPAN= 7-24 HRS, dt=.04 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD L=30' s=.1 '/'	**AB**	.6
CURVE NUMBER (LAG) METHOD L=140' s=.2 '/'	**BC**	1.4
CURVE NUMBER (LAG) METHOD L=55' s=.27 '/'	**CD**	.6
CURVE NUMBER (LAG) METHOD L=15' s=.33 '/'	**DE**	.2
CURVE NUMBER (LAG) METHOD L=20' s=.6 '/'	**EF**	.2
	Total Length= 260 ft Total Tc=	3.0

SUBCATCHMENT 2 RUNOFF
Pre-Construction, 2-yr/24-hr Storm



SUBCATCHMENT 3 **Pre-Construction, 2-yr/24-hr Storm**

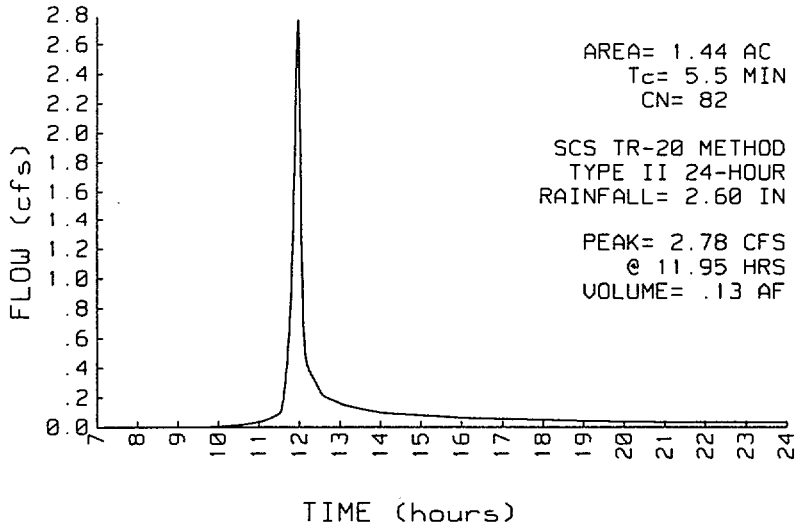
PEAK= 2.78 CFS @ 11.95 HRS, VOLUME= .13 AF

ACRES	CN	
1.44	82	wood/grass combo, fair, type D H

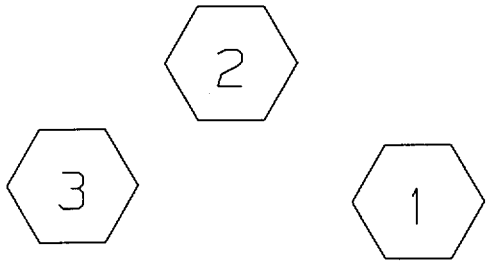
SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 2.60 IN
SPAN= 7-24 HRS, dt=.04 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	.8
L=40' s=.075 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	.8
L=50' s=.12 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	1.1
L=50' s=.06 '/'		
CURVE NUMBER (LAG) METHOD	**DE**	2.0
L=115' s=.07 '/'		
CURVE NUMBER (LAG) METHOD	**EF**	.8
L=50' s=.12 '/'		
	Total Length= 305 ft Total Tc=	5.5

SUBCATCHMENT 3 RUNOFF
Pre-Construction, 2-yr/24-hr Storm



WATERSHED ROUTING ==========



SUBCATCHMENT 1 **Pre-Construction, 10-yr/24-hr Storm**

PEAK= 11.85 CFS @ 11.94 HRS, VOLUME= .54 AF

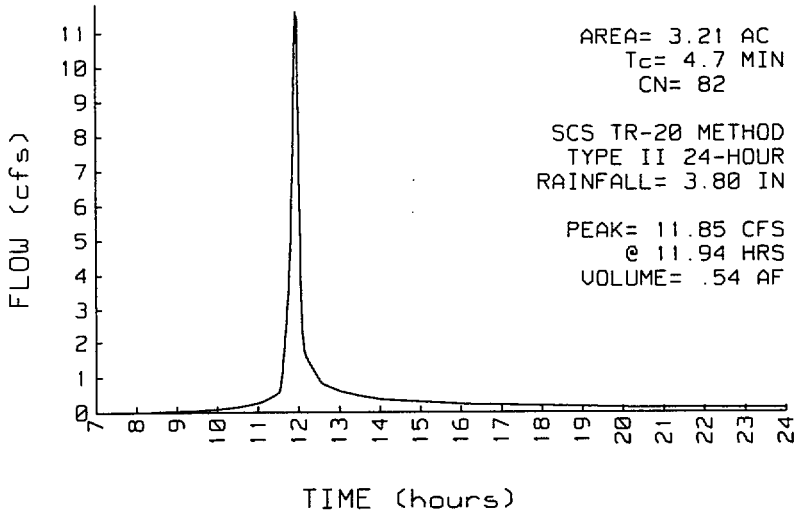
ACRES	CN	
3.21	82	wood/grass, fair, type D HSG

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 3.80 IN
SPAN= 7-24 HRS, dt=.04 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	2.8
L=250' s=.12 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	.5
L=35' s=.2 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	1.4
L=165' s=.24 '/'		

	Total Length= 450 ft Total Tc=	4.7

SUBCATCHMENT 1 RUNOFF
Pre-Construction, 10-yr/24-hr Storm



SUBCATCHMENT 2 **Pre-Construction, 10-yr/24-hr Storm**

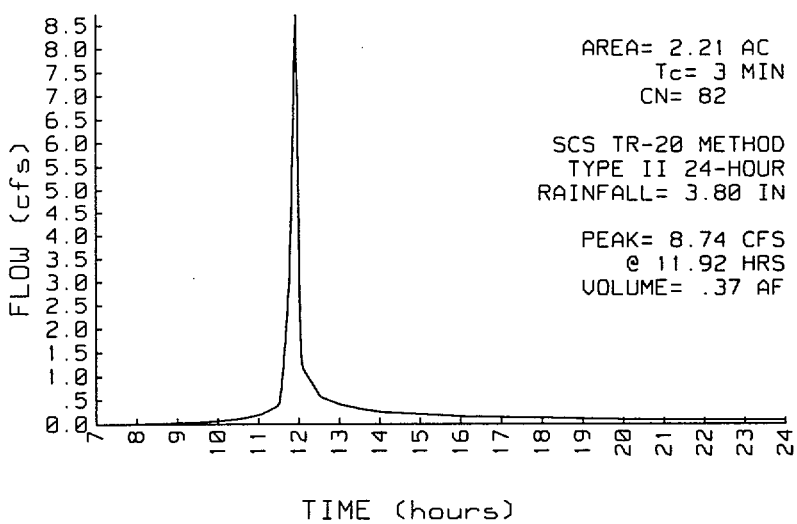
PEAK= 8.74 CFS @ 11.92 HRS, VOLUME= .37 AF

ACRES	CN	
2.21	82	wood/grass combo, fair, type D H

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 3.80 IN
SPAN= 7-24 HRS, dt=.04 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD L=30' s=.1 '/'	**AB**	.6
CURVE NUMBER (LAG) METHOD L=140' s=.2 '/'	**BC**	1.4
CURVE NUMBER (LAG) METHOD L=55' s=.27 '/'	**CD**	.6
CURVE NUMBER (LAG) METHOD L=15' s=.33 '/'	**DE**	.2
CURVE NUMBER (LAG) METHOD L=20' s=.6 '/'	**EF**	.2
	Total Length= 260 ft Total Tc=	3.0

SUBCATCHMENT 2 RUNOFF
Pre-Construction, 10-yr/24-hr Storm



SUBCATCHMENT 3 **Pre-Construction, 10-yr/24-hr Storm**

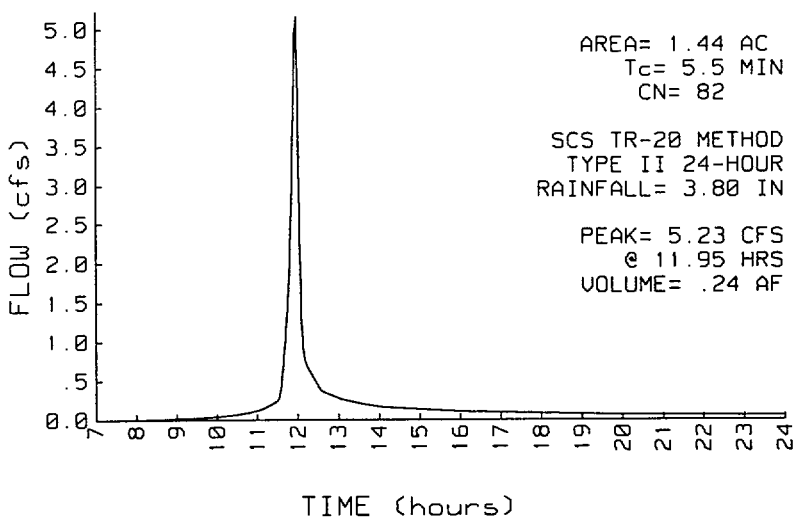
PEAK= 5.23 CFS @ 11.95 HRS, VOLUME= .24 AF

ACRES	CN	
1.44	82	wood/grass combo, fair, type D H

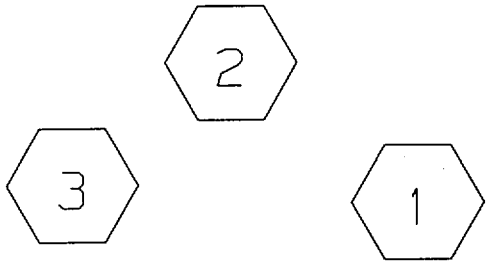
SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 3.80 IN
SPAN= 7-24 HRS, dt=.04 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD L=40' s=.075 '/'	**AB**	.8
CURVE NUMBER (LAG) METHOD L=50' s=.12 '/'	**BC**	.8
CURVE NUMBER (LAG) METHOD L=50' s=.06 '/'	**CD**	1.1
CURVE NUMBER (LAG) METHOD L=115' s=.07 '/'	**DE**	2.0
CURVE NUMBER (LAG) METHOD L=50' s=.12 '/'	**EF**	.8
	Total Length= 305 ft Total Tc=	5.5

SUBCATCHMENT 3 RUNOFF
Pre-Construction, 10-yr/24-hr Storm



WATERSHED ROUTING ==========



SUBCATCHMENT 1 **Pre-Construction, 25-yr/24-hr Storm**

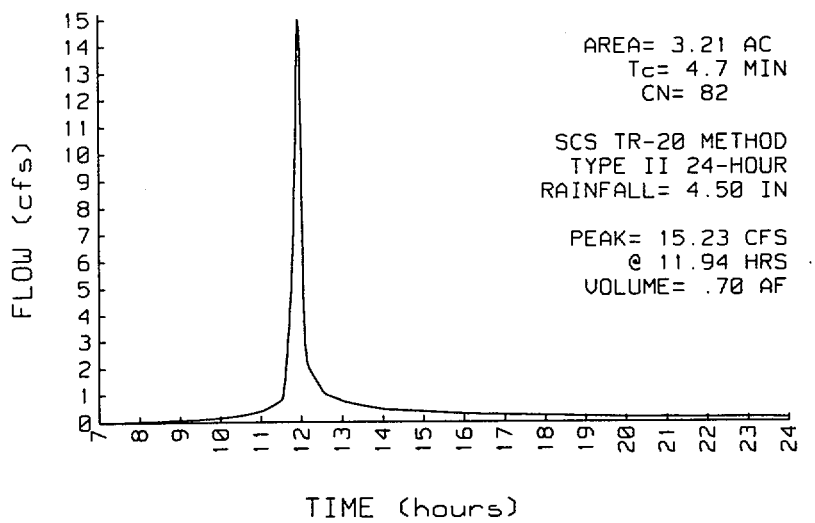
PEAK= 15.23 CFS @ 11.94 HRS, VOLUME= .70 AF

ACRES	CN	
3.21	82	wood/grass, fair, type D HSG

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 4.50 IN
SPAN= 7-24 HRS, dt=.04 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD L=250' s=.12 '/'	**AB**	2.8
CURVE NUMBER (LAG) METHOD L=35' s=.2 '/'	**BC**	.5
CURVE NUMBER (LAG) METHOD L=165' s=.24 '/'	**CD**	1.4
	Total Length= 450 ft Total Tc=	4.7

SUBCATCHMENT 1 RUNOFF
Pre-Construction, 25-yr/24-hr Storm



SUBCATCHMENT 2 **Pre-Construction, 25-yr/24-hr Storm**

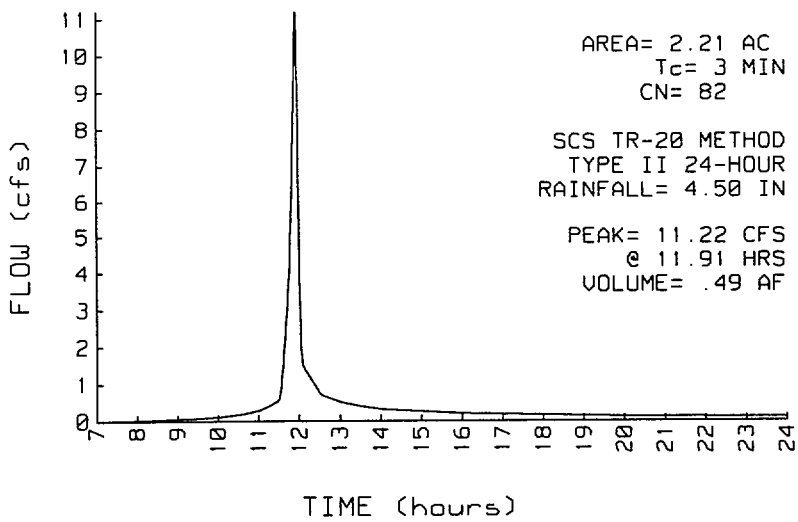
PEAK= 11.22 CFS @ 11.91 HRS, VOLUME= .49 AF

ACRES	CN	
2.21	82	wood/grass combo, fair, type D H

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 4.50 IN
SPAN= 7-24 HRS, dt=.04 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD L=30' s=.1 '/'	**AB**	.6
CURVE NUMBER (LAG) METHOD L=140' s=.2 '/'	**BC**	1.4
CURVE NUMBER (LAG) METHOD L=55' s=.27 '/'	**CD**	.6
CURVE NUMBER (LAG) METHOD L=15' s=.33 '/'	**DE**	.2
CURVE NUMBER (LAG) METHOD L=20' s=.6 '/'	**EF**	.2
	Total Length= 260 ft Total Tc=	3.0

SUBCATCHMENT 2 RUNOFF
Pre-Construction, 25-yr/24-hr Storm



SUBCATCHMENT 3 **Pre-Construction, 25-yr/24-hr Storm**

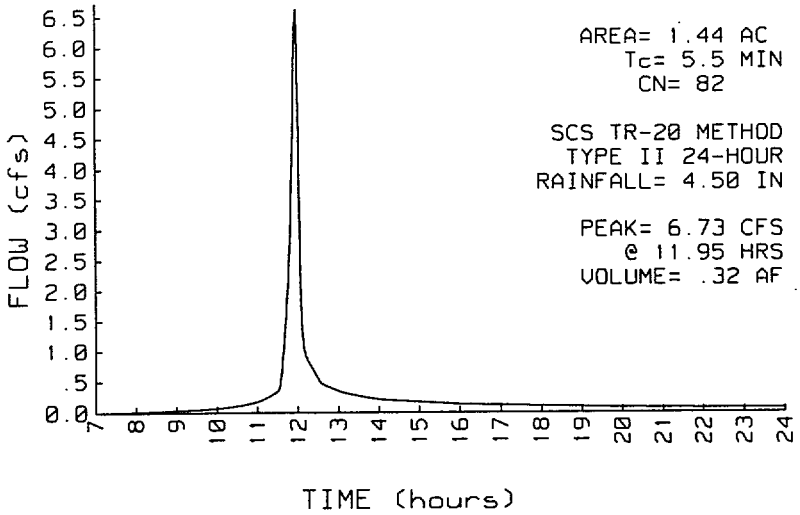
PEAK= 6.73 CFS @ 11.95 HRS, VOLUME= .32 AF

ACRES	CN	
1.44	82	wood/grass combo, fair, type D H

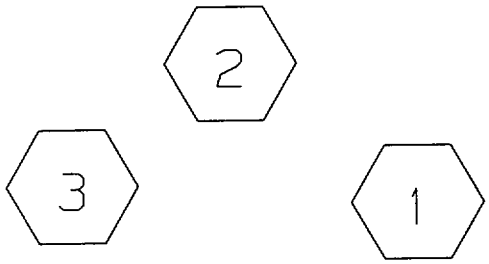
SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 4.50 IN
SPAN= 7-24 HRS, dt=.04 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD L=40' s=.075 '/'	**AB**	.8
CURVE NUMBER (LAG) METHOD L=50' s=.12 '/'	**BC**	.8
CURVE NUMBER (LAG) METHOD L=50' s=.06 '/'	**CD**	1.1
CURVE NUMBER (LAG) METHOD L=115' s=.07 '/'	**DE**	2.0
CURVE NUMBER (LAG) METHOD L=50' s=.12 '/'	**EF**	.8
	Total Length= 305 ft Total Tc=	5.5

SUBCATCHMENT 3 RUNOFF
Pre-Construction, 25-yr/24-hr Storm



WATERSHED ROUTING ==========



SUBCATCHMENT 1 **Pre-Construction, 100-yr/24-hr Storm**

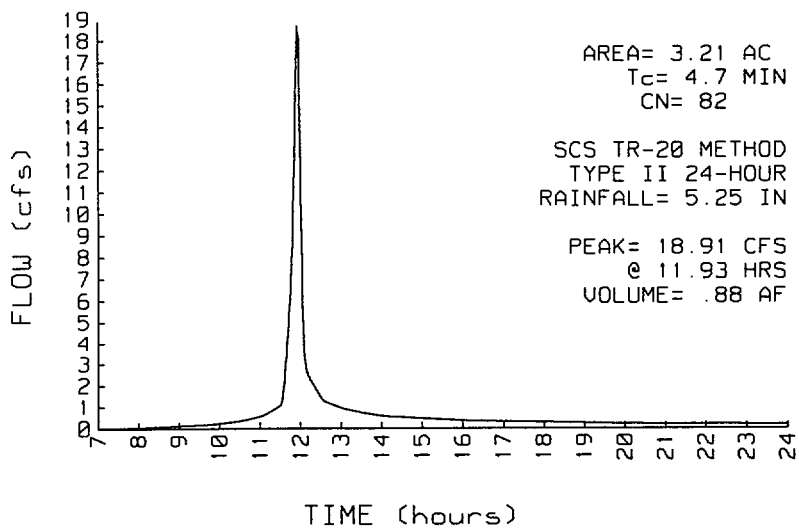
PEAK= 18.91 CFS @ 11.93 HRS, VOLUME= .88 AF

ACRES	CN	
3.21	82	wood/grass, fair, type D HSG

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 5.25 IN
SPAN= 7-24 HRS, dt=.04 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	2.8
L=250' s=.12 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	.5
L=35' s=.2 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	1.4
L=165' s=.24 '/'		
	Total Length= 450 ft Total Tc=	4.7

SUBCATCHMENT 1 RUNOFF
Pre-Construction, 100-yr/24-hr Storm



SUBCATCHMENT 2 **Pre-Construction, 100-yr/24-hr Storm**

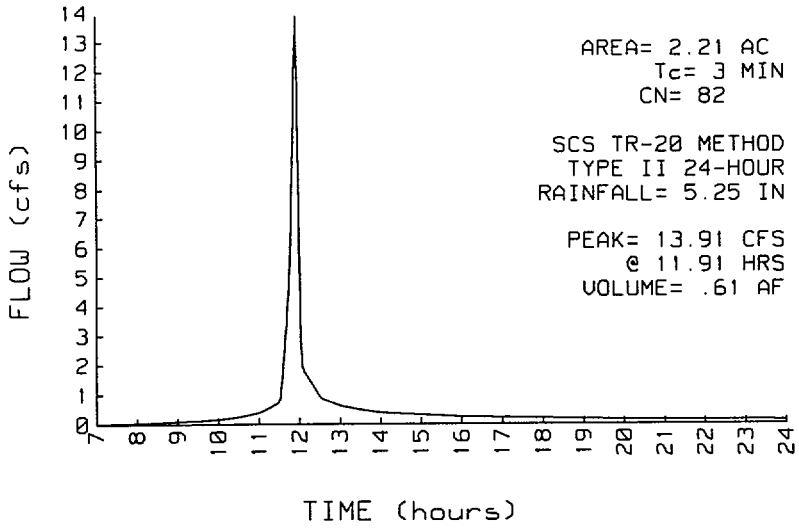
PEAK= 13.91 CFS @ 11.91 HRS, VOLUME= .61 AF

ACRES	CN	
2.21	82	wood/grass combo, fair, type D H

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 5.25 IN
SPAN= 7-24 HRS, dt=.04 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD L=30' s=.1 '/'	**AB**	.6
CURVE NUMBER (LAG) METHOD L=140' s=.2 '/'	**BC**	1.4
CURVE NUMBER (LAG) METHOD L=55' s=.27 '/'	**CD**	.6
CURVE NUMBER (LAG) METHOD L=15' s=.33 '/'	**DE**	.2
CURVE NUMBER (LAG) METHOD L=20' s=.6 '/'	**EF**	.2
	Total Length= 260 ft Total Tc=	3.0

SUBCATCHMENT 2 RUNOFF
Pre-Construction, 100-yr/24-hr Storm



SUBCATCHMENT 3 **Pre-Construction, 100-yr/24-hr Storm**

PEAK= 8.35 CFS @ 11.95 HRS, VOLUME= .40 AF

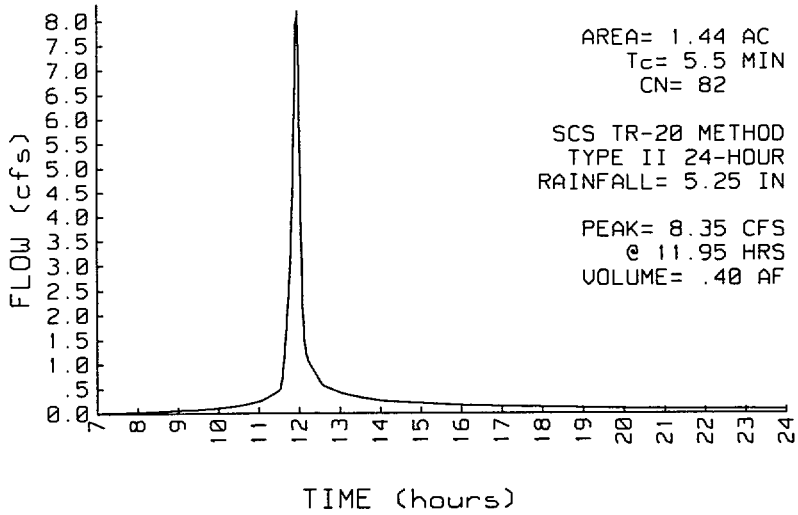
ACRES	CN	
1.44	82	wood/grass combo, fair, type D H

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 5.25 IN
SPAN= 7-24 HRS, dt=.04 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	.8
L=40' s=.075 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	.8
L=50' s=.12 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	1.1
L=50' s=.06 '/'		
CURVE NUMBER (LAG) METHOD	**DE**	2.0
L=115' s=.07 '/'		
CURVE NUMBER (LAG) METHOD	**EF**	.8
L=50' s=.12 '/'		

	Total Length= 305 ft Total Tc=	5.5

SUBCATCHMENT 3 RUNOFF
Pre-Construction, 100-yr/24-hr Storm

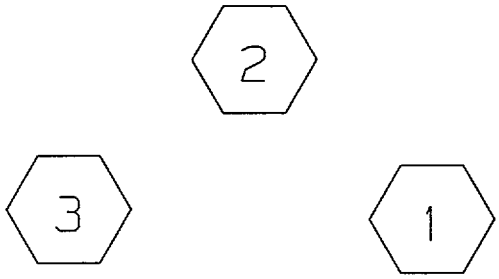


Attachment C-2

TR-20 Model Computer Run Output

Post-Construction

WATERSHED ROUTING ==========



SUBCATCHMENT 1 **Post-Construction, 2-yr/24-hr storm**

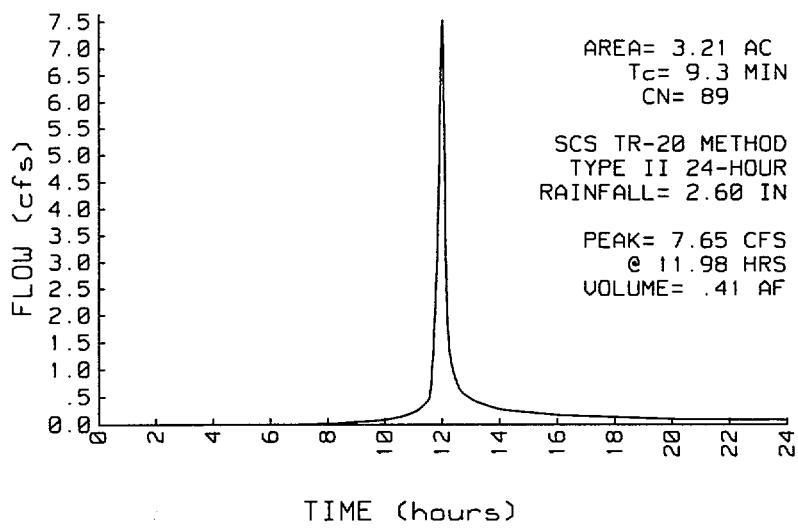
PEAK= 7.65 CFS @ 11.98 HRS, VOLUME= .41 AF

ACRES	CN	
.02	91	Rip-rap/gravel, Haul road
3.19	89	pasture, grassland, poor type D
3.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 2.60 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	2.7
L=60' s=.0083 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	4.2
L=85' s=.0059 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	1.5
L=205' s=.1902 '/'		
CURVE NUMBER (LAG) METHOD	**DE**	.6
L=80' s=.275 '/'		
CURVE NUMBER (LAG) METHOD	**EF**	.2
L=30' s=.3667 '/'		
RECT/VEE/TRAP CHANNEL	**FG**	.1
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=73' Capacity=635.3 cfs		
	Total Length= 533 ft Total Tc=	9.3

SUBCATCHMENT 1 RUNOFF
Post-Construction, 2-yr/24-hr storm



SUBCATCHMENT 2 **Post-Construction, 2-yr/24-hr storm**

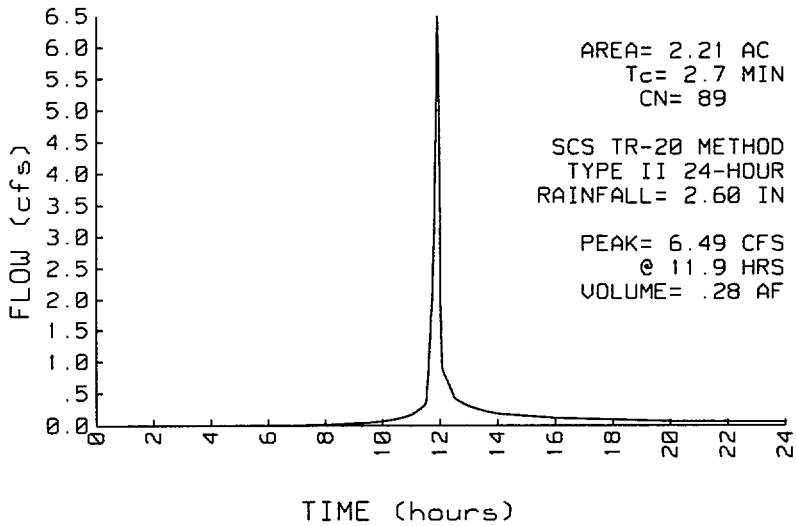
PEAK= 6.49 CFS @ 11.90 HRS, VOLUME= .28 AF

ACRES	CN	
.10	91	Rip-rap/gravel, Haul road
2.11	89	pasture, glassland, poor, type D
2.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 2.60 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	.9
L=45' s=.0444 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	1.2
L=215' s=.3349 '/'		
RECT/VEE/TRAP CHANNEL	**CD**	.6
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=425' Capacity=635.3 cfs		
	Total Length= 685 ft Total Tc=	2.7

SUBCATCHMENT 2 RUNOFF
Post-Construction, 2-yr/24-hr storm



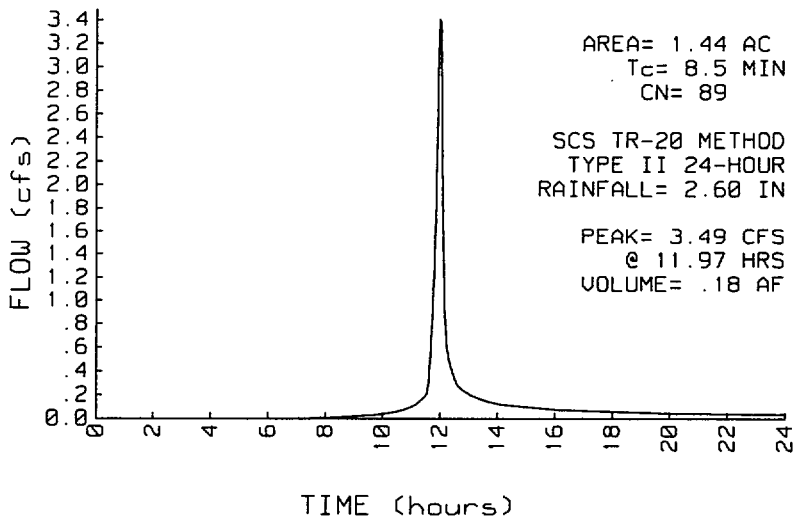
SUBCATCHMENT 3 **Post-Construction, 2-yr/24-hr storm**

PEAK= 3.49 CFS @ 11.97 HRS, VOLUME= .18 AF

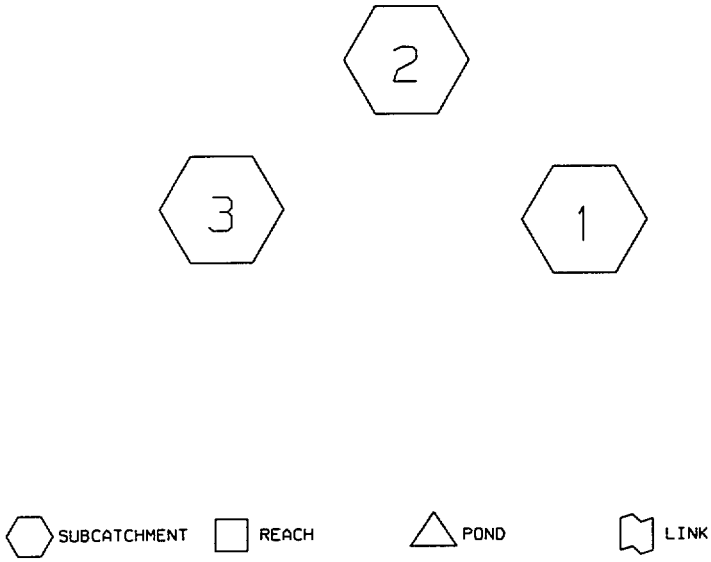
ACRES	CN		
.14	91	Rip-rap/gravel, Haul road	SCS TR-20 METHOD
1.30	89	Pasture, glassland, poor, Type D	TYPE II 24-HOUR
1.44	89		RAINFALL= 2.60 IN
			SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	6.4
L=155' s=.0066 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	.9
L=100' s=.18 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	.4
L=50' s=.32 '/'		
RECT/VEE/TRAP CHANNEL	**DE**	.8
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=625' Capacity=635.3 cfs		
	Total Length= 930 ft Total Tc=	8.5

SUBCATCHMENT 3 RUNOFF
Post-Construction, 2-yr/24-hr storm



WATERSHED ROUTING ==========



SUBCATCHMENT 1 **Post-Construction, 10-yr/24-hr storm**

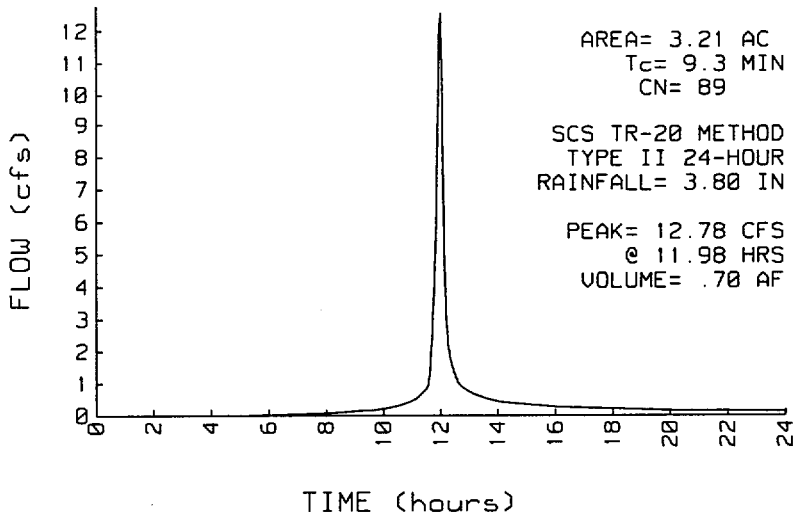
PEAK= 12.78 CFS @ 11.98 HRS, VOLUME= .70 AF

ACRES	CN	
.02	91	Rip-rap/gravel, Haul road
3.19	89	pasture, grassland, poor type D
3.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 3.80 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	2.7
L=60' s=.0083 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	4.2
L=85' s=.0059 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	1.5
L=205' s=.1902 '/'		
CURVE NUMBER (LAG) METHOD	**DE**	.6
L=80' s=.275 '/'		
CURVE NUMBER (LAG) METHOD	**EF**	.2
L=30' s=.3667 '/'		
RECT/VEE/TRAP CHANNEL	**FG**	.1
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=73' Capacity=635.3 cfs		
	Total Length= 533 ft Total Tc=	9.3

SUBCATCHMENT 1 RUNOFF
Post-Construction, 10-yr/24-hr storm



SUBCATCHMENT 2 **Post-Construction, 10-yr/24-hr storm**

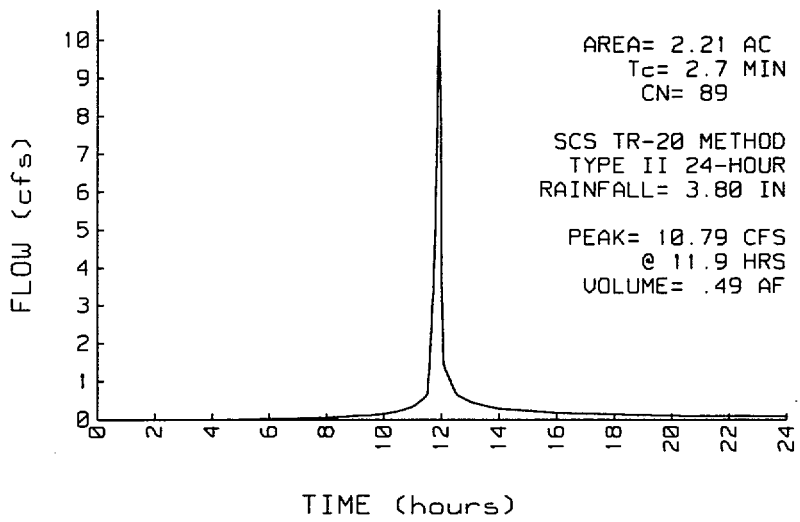
PEAK= 10.79 CFS @ 11.90 HRS, VOLUME= .49 AF

ACRES	CN	
.10	91	Rip-rap/gravel, Haul road
2.11	89	pasture, glassland, poor, type D
2.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 3.80 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	.9
L=45' s=.0444 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	1.2
L=215' s=.3349 '/'		
RECT/VEE/TRAP CHANNEL	**CD**	.6
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=425' Capacity=635.3 cfs		
	Total Length= 685 ft Total Tc=	2.7

SUBCATCHMENT 2 RUNOFF
Post-Construction, 10-yr/24-hr storm



SUBCATCHMENT 3 **Post-Construction, 10-yr/24-hr storm**

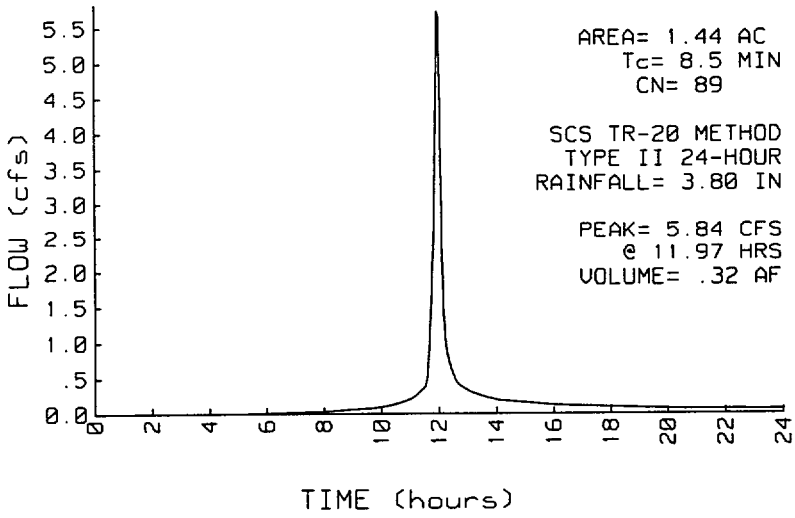
PEAK= 5.84 CFS @ 11.97 HRS, VOLUME= .32 AF

ACRES	CN	
.14	91	Rip-rap/gravel, Haul road
1.30	89	Pasture, glassland, poor, Type D
1.44	89	

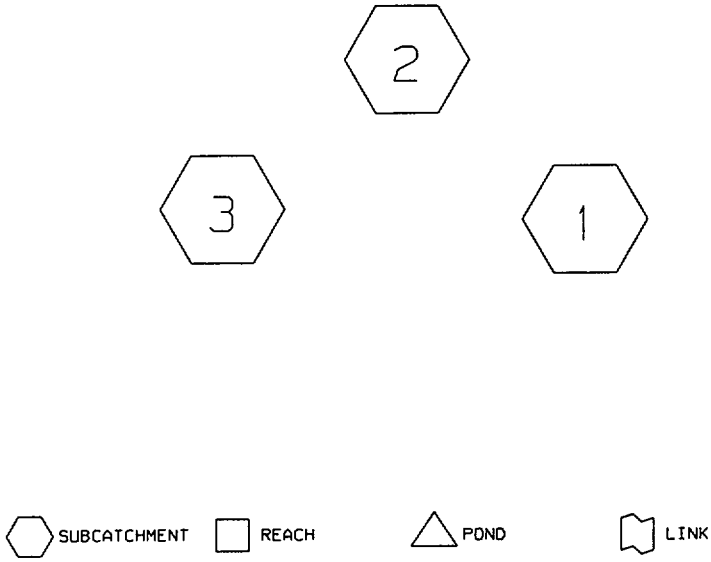
SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 3.80 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	6.4
L=155' s=.0066 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	.9
L=100' s=.18 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	.4
L=50' s=.32 '/'		
RECT/VEE/TRAP CHANNEL	**DE**	.8
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=625' Capacity=635.3 cfs		
	Total Length= 930 ft Total Tc=	8.5

SUBCATCHMENT 3 RUNOFF
Post-Construction, 10-yr/24-hr storm



WATERSHED ROUTING ==========



SUBCATCHMENT 1 **Post-Construction, 25-yr/24-hr storm**

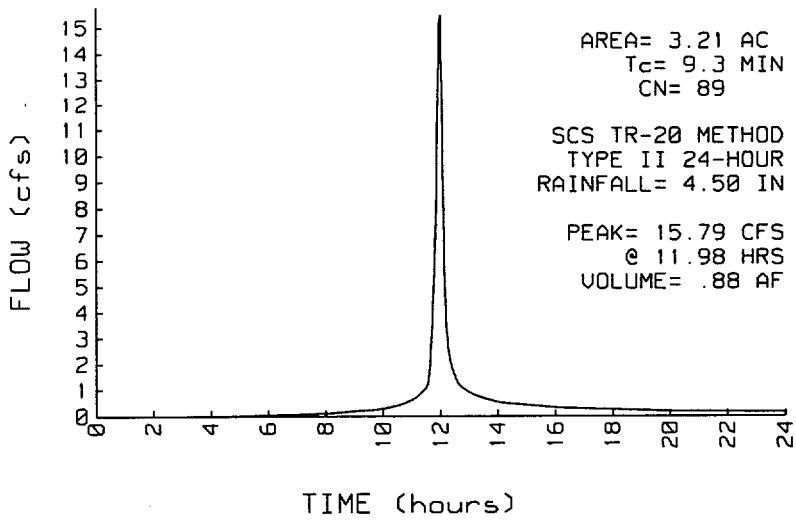
PEAK= 15.79 CFS @ 11.98 HRS, VOLUME= .88 AF

ACRES	CN	
.02	91	Rip-rap/gravel, Haul road
3.19	89	pasture, grassland, poor type D
3.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 4.50 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	2.7
L=60' s=.0083 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	4.2
L=85' s=.0059 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	1.5
L=205' s=.1902 '/'		
CURVE NUMBER (LAG) METHOD	**DE**	.6
L=80' s=.275 '/'		
CURVE NUMBER (LAG) METHOD	**EF**	.2
L=30' s=.3667 '/'		
RECT/VEE/TRAP CHANNEL	**FG**	.1
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=73' Capacity=635.3 cfs		
	Total Length= 533 ft Total Tc=	9.3

SUBCATCHMENT 1 RUNOFF
Post-Construction, 25-yr/24-hr storm



SUBCATCHMENT 2 **Post-Construction, 25-yr/24-hr storm**

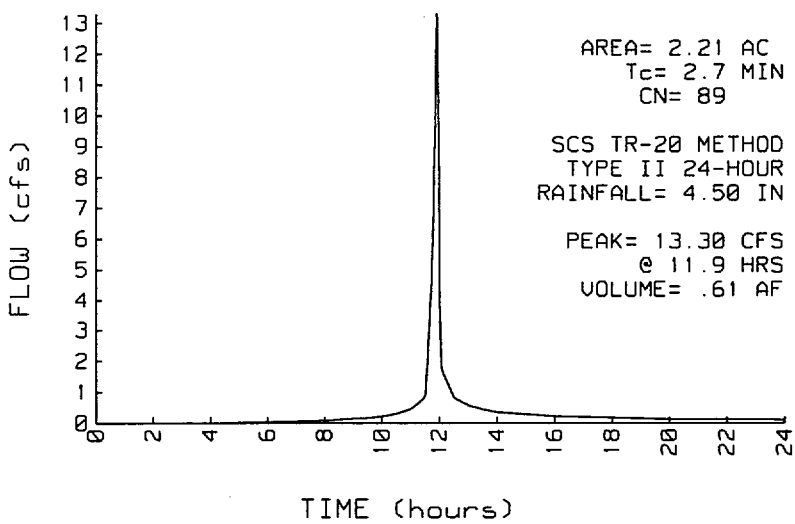
PEAK= 13.30 CFS @ 11.90 HRS, VOLUME= .61 AF

ACRES	CN	
.10	91	Rip-rap/gravel, Haul road
2.11	89	pasture, glassland, poor, type D
2.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 4.50 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	.9
L=45' s=.0444 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	1.2
L=215' s=.3349 '/'		
RECT/VEE/TRAP CHANNEL	**CD**	.6
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=425' Capacity=635.3 cfs		
	Total Length= 685 ft Total Tc=	2.7

SUBCATCHMENT 2 RUNOFF
Post-Construction, 25-yr/24-hr storm



SUBCATCHMENT 3 **Post-Construction, 25-yr/24-hr storm**

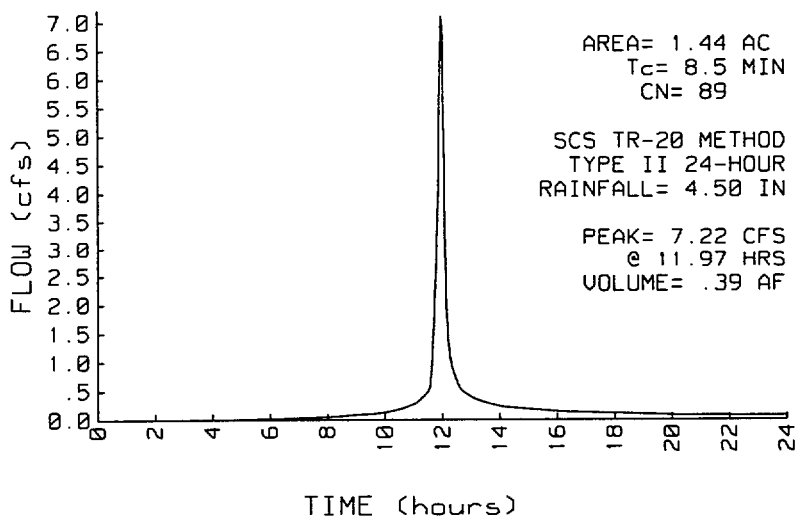
PEAK= 7.22 CFS @ 11.97 HRS, VOLUME= .39 AF

ACRES	CN	
.14	91	Rip-rap/gravel, Haul road
1.30	89	Pasture, glassland, poor, Type D
1.44	89	

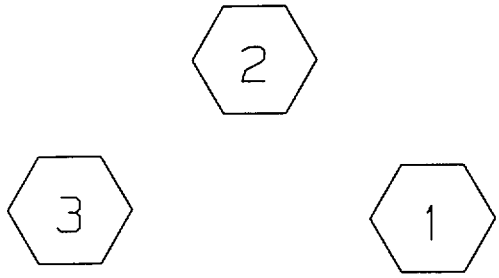
SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 4.50 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	6.4
L=155' s=.0066 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	.9
L=100' s=.18 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	.4
L=50' s=.32 '/'		
RECT/VEE/TRAP CHANNEL	**DE**	.8
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=625' Capacity=635.3 cfs		
	Total Length= 930 ft Total Tc=	8.5

SUBCATCHMENT 3 RUNOFF
Post-Construction, 25-yr/24-hr storm



WATERSHED ROUTING ==========



SUBCATCHMENT 1 **Post-Construction, 100-yr/24-hr storm**

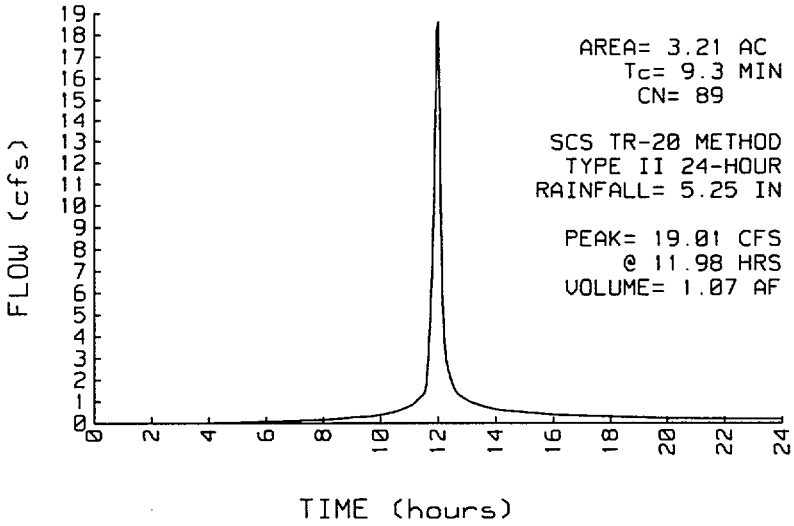
PEAK= 19.01 CFS @ 11.98 HRS, VOLUME= 1.07 AF

ACRES	CN	
.02	91	Rip-rap/gravel, Haul road
3.19	89	pasture, grassland, poor type D
3.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 5.25 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	2.7
L=60' s=.0083 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	4.2
L=85' s=.0059 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	1.5
L=205' s=.1902 '/'		
CURVE NUMBER (LAG) METHOD	**DE**	.6
L=80' s=.275 '/'		
CURVE NUMBER (LAG) METHOD	**EF**	.2
L=30' s=.3667 '/'		
RECT/VEE/TRAP CHANNEL	**FG**	.1
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=73' Capacity=635.3 cfs		
	Total Length= 533 ft Total Tc=	9.3

SUBCATCHMENT 1 RUNOFF
Post-Construction, 100-yr/24-hr storm



SUBCATCHMENT 2 **Post-Construction, 100-yr/24-hr storm**

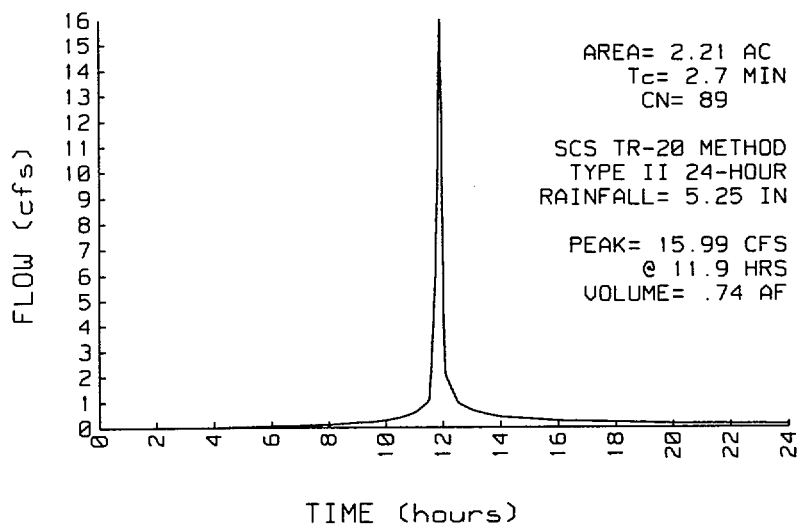
PEAK= 15.99 CFS @ 11.90 HRS, VOLUME= .74 AF

ACRES	CN	
.10	91	Rip-rap/gravel, Haul road
2.11	89	pasture, glassland, poor, type D
2.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 5.25 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	.9
L=45' s=.0444 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	1.2
L=215' s=.3349 '/'		
RECT/VEE/TRAP CHANNEL	**CD**	.6
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=425' Capacity=635.3 cfs		
	Total Length= 685 ft Total Tc=	2.7

SUBCATCHMENT 2 RUNOFF
Post-Construction, 100-yr/24-hr storm



SUBCATCHMENT 3 **Post-Construction, 100-yr/24-hr storm**

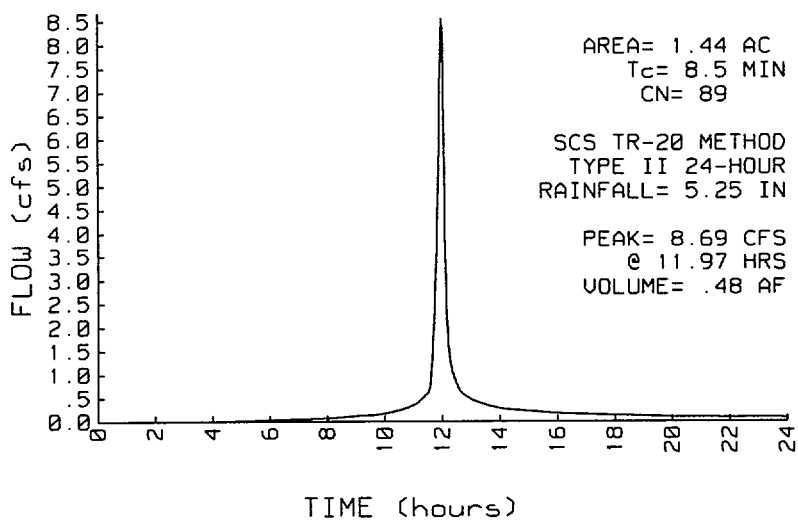
PEAK= 8.69 CFS @ 11.97 HRS, VOLUME= .48 AF

ACRES	CN	
.14	91	Rip-rap/gravel, Haul road
1.30	89	Pasture, glassland, poor, Type D
1.44	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 5.25 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	6.4
L=155' s=.0066 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	.9
L=100' s=.18 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	.4
L=50' s=.32 '/'		
RECT/VEE/TRAP CHANNEL	**DE**	.8
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=625' Capacity=635.3 cfs		
	Total Length= 930 ft Total Tc=	8.5

SUBCATCHMENT 3 RUNOFF
Post-Construction, 100-yr/24-hr storm



TIME (hours)

STONE & WEBSTER ENGINEERING CORPORATION

CALCULATION TITLE PAGE

CLIENT & PROJECT: **Molycorp, Storage Cell, Washington, PA**	PAGE **1** OF 9 + Attachment A (2 p) + Attachment B (2 p) & Attachment C (50 p) + Attachment D (2 p)
CALCULATION TITLE (Indicative of Objective): **Sediment/Retention Basin Preliminary Design for Stormwater Runoff of the Project Site / Construction Phase and Post-Construction**	QA CATEGORY ☒ ☐ - I Nuclear Safety Related ☐ - II ☐ - III ☒ - Non-Safety Related ☐ - ☐ - Fossil/Industrial Plant

CALCULATION IDENTIFICATION NUMBER

J.O. or W.O. NO.	DIVISION & GROUP	CURRENT CALC NO.	OPTIONAL TASK CODE	OPTIONAL WORK PACKAGE NO.
1003401	**H(B)**	**3**		**N/A**

APPROVALS – SIGNATURE & DATE

PREPARER(S)/DATE(S)	REVIEWER(S)/DATE(S)	INDEPENDENT REVIEWER(S)/ DATES(S)	REV. NO. OR NEW CALC. NO.	SUPERCEDES CALC. NO. OR REV. NO.	CONFIRMATION REQUIRED ☒ YES	NO
George Liang 06/06/2000 George Liang	Bruce McCambell 06/09/2000 B McCambell		0	N/A	☐	☒
					☐	☒
					☐	☐
					☐	☐
					☐	☐
					☐	☐

DISTRIBUTION

GROUP	NAME & LOCATION	COPY SENT	GROUP	NAME & LOCATION	COPY SENT
Records Mgmt Fire File	Records Center	☐			☐
PROJECT FILE		☒			☐
		☐			☐

TABLE OF CONTENTS

Section/Title — Page

TITLE PAGE 1
TABLE OF CONTENTS 2
RECORD OF CHANGES 3
1. INTRODUCTION 4
2. OBJECTIVE 4
3. ASSUMPTIONS 4
4. METHODOLOGY 4
5. DETAILS OF CALCULATION 5
6. REFERENCES 7
7. RESULTS 8
8. CONCLUSIONS 8
9. ATTACHMENTS 9
9.1 ATTACHMENT A 9
PRELIMINARY POND SIZE AND LOCATION, OUTLET & EMERGENCY SPILLWAY DETAILS – CONSTRUCTION PHASE 9
9.2 ATTACHMENT B 9
PRELIMINARY POND SIZE AND LOCATION, OUTLET (SPILLWAY) DETAILS – POST-CONSTRUCTION PHASE 9
9.3 ATTACHMENT C ELEVATION VS. SURFACE AREA (FINAL GRADING) 9
9.4 ATTACHMENT D TR-20/TR-55 MODEL COMPUTER RUN OUTPUT 9
D-1 CONSTRUCTION PHASE 9
D-2 POST-CONSTRUCTION PHASE 9

STONE & WEBSTER ENGINEERING CORPORATION

CALCULATION SHEET

CALCULATION IDENTIFICATION NUMBER				PAGE 3
J.O. OR W.O. NO.	DIVISION & GROUP	CALCULATION NO.	OPTIONAL TASK CODE	
1003401	H(B)	3		

RECORD OF CHANGES

Rev No.	Description of Changes	Pages Revised	Pages Added	Pages Replaced
0	Original Issue	N/A	N/A	N/A

1. INTRODUCTION

The stormwater management will include a sediment/retention basin to collect runoff from the site areas. The basin will be designed to provide a required sediment storage zone and a dewatering zone for the stormwater runoff based on the Pennsylvania's stormwater management regulations.

Sediment/retention ponds or basins are designed to permanently store the volume of runoff generated from a given frequency storm event or water quality design storm. The outlet of a sediment /retention pond is designed to maintain the specified control volume while discharging stormwater in exceedance of this volume. Therefore, the water in the basin will be exchanged as new stormwater runoff flows in and overtops the outlet orifice.

2. OBJECTIVE

The objective is to determine the size a sediment/retention basin, which will have adequate capacity to treat the stormwater runoff for water quality purpose before discharging into the vicinity of the storage cell site.

3. ASSUMPTIONS

1. A sediment storage zone of 1,000 ft^3 per disturbed acre and a dewatering zone of 5,000 ft^3 for each acre tributary to the basin are used as design parameters for the basin. The depth of the basin is assumed to be 4 feet.
2. TSS removal rate (efficiency) for parking lot, driveways, and sidewalk in drainage area (Ref. 2):

Parking lot sweeping (BMP1)	10%
Deep sump catch basins (BMP2)	25%
Wet pond (Sediment/Retention Basin) (BMP3)	80%

4. METHODOLOGY

The drainage area of site is calculated by Autocad program based on a preliminary plant layout map

The sediment basin is sized according to the Commonwealth of Pennsylvania's erosion and sediment criteria and guidelines (Ref. 3). The performance of the basin and the peak runoff discharge through the designed outlet structure(s) are verified by routing the flow through the basin using SCS TR-20 model for 2-, 10-, 25-, and 100-year, 24 hour storms.

5. DETAILS OF CALCULATION

Detention/Retention Pond Design
Storage Cell / Molycorp / Washington, PA

According to Ref. (3), the design criteria of sediment basins include :

1. A sediment storage zone of 1,000 cubic feet per disturbed acre within the watershed of the basin is required.
2. A dewatering zone of 5,000 cubic feet for each acre tributary to the basin is to be provided.
3. Sediment basins must have a flow length to width ratio of at least 2:1.
4. Every sediment basin should be provided with an emergency spillway with a minimum bottom width of 8'.
5. The elevation of the emergency spillway crest must be at least 6" above that of the principal spillway (top of dewatering zone).
6. Sediment basin spillways must be able to discharge 2 cfs/acre from the entire contributing Watersjed.
7. A minimum of 24 inches of freeboard is required above the elevation of the 2 cfs/acre. If the Emergency spillway is being used to provide part of the 2 cfs/acre discharge, the freeboard must be provided above the design flow elevation in the emergency spillway.
8. When a perforated riser is selected as the means to dewater the basin, the diameter of the riser should be at least 1.25 times that of the outlet barrel. The minimum riser diameter is 15". The Minimum barrel diameter is 12".

V_{ss} = volume of sediment storage zone
V_{dw} = volume of dewatering zone

Drainage Area 1 =	139,930 ft^2		
Drainage Area 2 =	96,219 ft^2		
Drainage Area 3 =	62,846 ft^2		
Total =	298,995 ft^2	or	6.86 acres

Sizing of the Sediment Basin/Detention Pond :

1. Area (DA1+DA2+DA3 = 298,995 ft^2) = 6.86 acres
2. V_{dw} = Volume of dewatering zone = 6.86 x 5,000 = 34,300.00 ft^3
3. V_{ss} = Volume of sediment storage = 6.86 x 1,000 = 6,860.00 ft^3
4. VB = required basin volume = $V_{dw} + V_{ss}$ = 41,160.00 ft^3
5. D = Average Water Depth of the basin (assumed) = 4.00 ft
6. TV = Total basin volume = (VB) = 41,160.00 ft^3

7. Determine the basin surface area (SA)

SA = TV / (average depth) = TV/4 = 10,290.00 ft^2

8. Convert the average depth (D) and total volume (TV) requirements to physical basin dimensions Based on the length to width and side slope ratios:

A rough estimate of the wet pool surface length (LS) and width (WS) may be determined based on The surface area (SA) calculated in step 7 and employing the 3:1 length to width criteria: (Design Criteria No. 3 requires a flow length to width ratio at least 2:1)

SA = (LS) (WS) LS = 3 (WS) SA = 3 (WS) (WS)
WS = SQRT (SA/3) = $(SA / 3)^{1/2}$ = 58.57 ft
Use WS = 60 ft 60.00 ft
LS = 3 (WS) = 3 x (58.57 ft) = 175.70 ft
Use LS = 180 ft 180.00 ft
The required minimum size of the basin is 60 ft (width) x 180 ft (length).

A basin depth (H) of 4 ft is assumed, then bottom basin dimensions for a 2:1 side slope ratio (S) Are as follows:

Bottom witdth = WB = WS - 2 (S) (H)
Bottom length = LB = LS - 2 (S) (H)
Where, S = side slope = 2, and H = basin height = 4 ft

WB = WS - 2 (2) (4) = 44.00 Ft
Use WB = 50 ft
LB = LS - 2 (2) (4) = 164.00 Ft
Use LB = 170 ft

Elevation/Area/Volumn Relationship of the Pond:

Based on the minimum required basin size:			Based on topography, actual elev.vs.area	
Elev. (ft)	Dimension	Area (ft^2)	Elev. (ft)	Area (ft^2)
1048	50' x 170'	8,500	1048	8,580
1050	58 x 178	10,324	1050	10,990
1052	66 x 186	12,276	1052	14,152
1054	74 x 194	14,356	1054	19,060
1056	82 x 202	16,564	1056	24,100

The basin size which will be constructed to accommodate the final grading is larger than the minimum required.

Design of the Detention Pond Outlets

Construction Phase

See Attachment A for Preliminary Pond Size and Location, Outlet & Emergency Spillway Details. Using TR-20 model, stormwater runoff flow is routed through the detention pond with a 12 in. diameter CMP pipe. TR-20 model computer run output is presented in Appendix C-1.

Post-Construction Phase

See Attachment B for Preliminary Pond Size and Location, Spillway Details. Using TR-20 model, stormwater runoff flow is routed through the detention pond with a V-notch weir. . TR-20 model computer run output is presented in Appendix C-2.

6. REFERENCES

1. Methodology for Analysis of Detention Basins for Control of Urban Runoff Qaility EPA 440/5-87-001, September 1986.

2. Design of stormwater pond system. Schueler. Center for Watershed Protection, 1996.

3. Erosion and Sediment Pollution Control Program Manual, Department of Environmental Protection, Commonwealth of Pennsylvania, 363-2134-008, March 13, 2000.

4. Storm Water Management For Construction Activities – Developing Pollution Prevention Plans And Best Management Practices, EPA 832-R-92-005, September 1992.

5. SWEC Dwg. No. 1003401-EY-8A-1, EY-8B-1.

6. SWEC Calc. No. 1003401-H(B)-2.

7. RESULTS

According to guidelines (Reference 2) using the 3:1 length to width criteria, the size of the sediment basin/retention pond has the following approximate dimensions:

- At the top of the basin (El 1052), it should have a minimum of 60 ft (width) x 180 ft (length)
- The bottom of the pond will be set at EL 1048 ft with a minimum dimension of 50 ft x 170 ft, and a side slope of 2:1
- Depth of the pond: 4 ft
- The sediment basin/retention pond will be constructed to a size larger than the minimum required to accommodate the final grading of the site.

8. CONCLUSIONS

Summary of Stormwater Analysis (TR-20 Modeling)					
Molycorp/Storage Cell/Washington, PA					
Storm		Total Peak Rate of Runoff Discharge Q(cfs)			
Freq.(yr)	Rainfall(in)	Pre-Construction	Post-Construction (w/o Pond)	Construction Phase (w/Pond)	Post-Construction (w/Pond)
2	2.6	***13.80***	***17.63***	***2.59***	***8.99***
10	3.8	***25.82***	***29.41***	***3.51***	***19.17***
25	4.5	***33.18***	***36.31***	***3.94***	***25.46***
100	5.25	***41.17***	***43.69***	***4.33***	***31.44***

In all cases, the peak rate of runoff discharge for the Construction Phase and the Post-Construction is less than that for the Pre-Construction condition, which is in compliance with the federal and state stormwater runoff management regulations.

9. ATTACHMENTS

9.1 Attachment A

Preliminary Pond Size and Location, Outlet & Emergency Spillway Details – Construction Phase

9.2 Attachment B

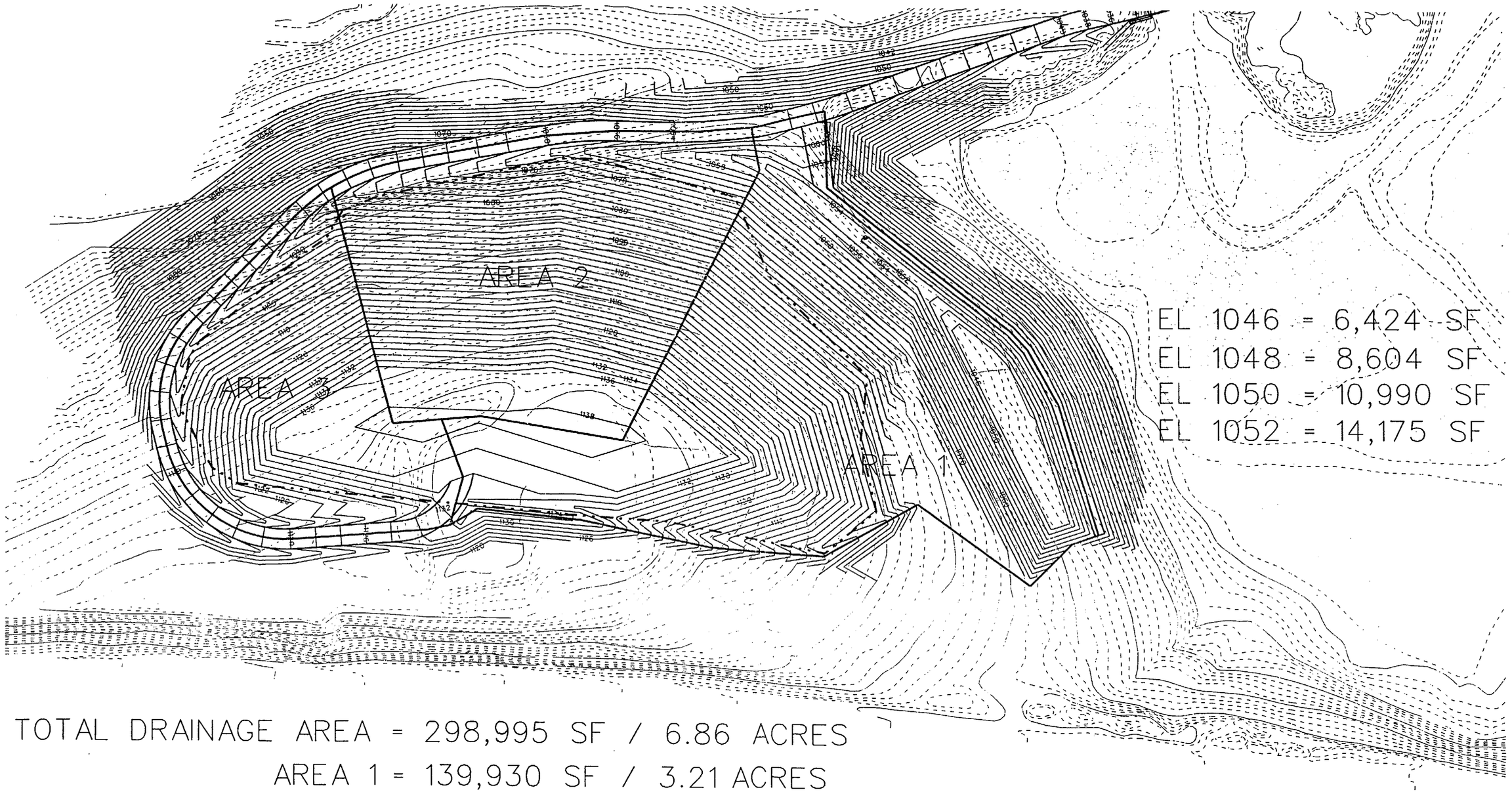
Preliminary Pond Size and Location, Outlet (Spillway) Details – Post-Construction Phase

9.3 Attachment C Elevation vs. Surface Area (Final Grading)

9.4 Attachment D TR-20/TR-55 Model Computer Run Output

D-1 Construction Phase

D-2 Post-Construction Phase

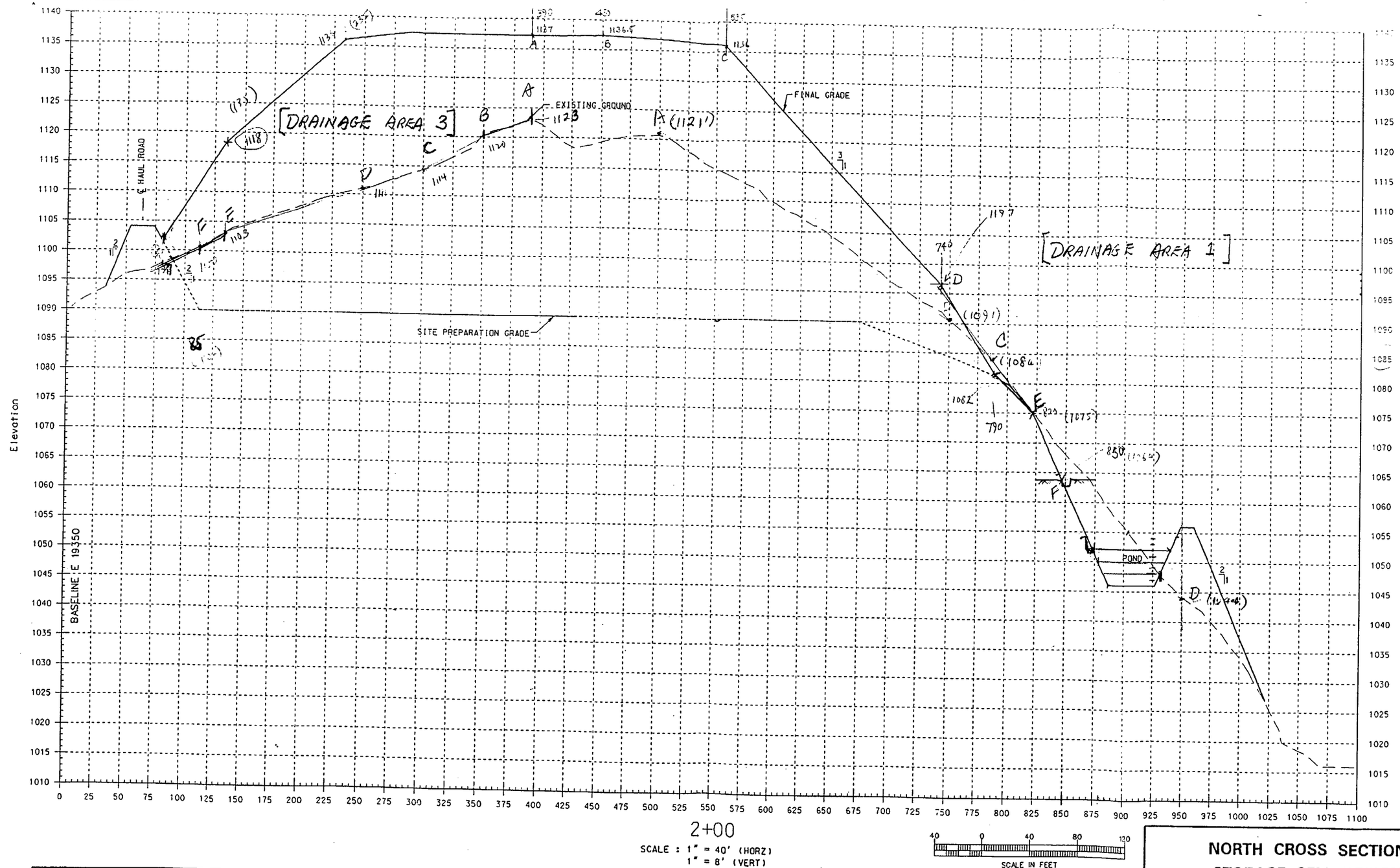


TOTAL DRAINAGE AREA = 298,995 SF / 6.86 ACRES

AREA 1 = 139,930 SF / 3.21 ACRES

AREA 2 = 96,219 SF / 2.21 ACRES

AREA 3 = 62,846 SF / 1.44 ACRES



ISSUE 4	DESCRIPTION	CHECKED	ISSUE 3	DESCRIPTION	CHECKED	ISSUE 2	DESCRIPTION	CHECKED	ISSUE 1	DESCRIPTION	CHECKED
		CORRECT			CORRECT			CORRECT			CORRECT
		APPR / DATE			APPR / DATE			APPR / DATE			APPR / DATE

MODEL | ARCH | CIVL | CONC | STL | L & P | INST | M.D. | P.E. | S.A. | FAC | ELEC | LTG | MAT'L

NORTH CROSS SECTION STORAGE CELL DESIGN

MOLYCORP, INC.
300 CALDWELL AVENUE WASHINGTON, PA

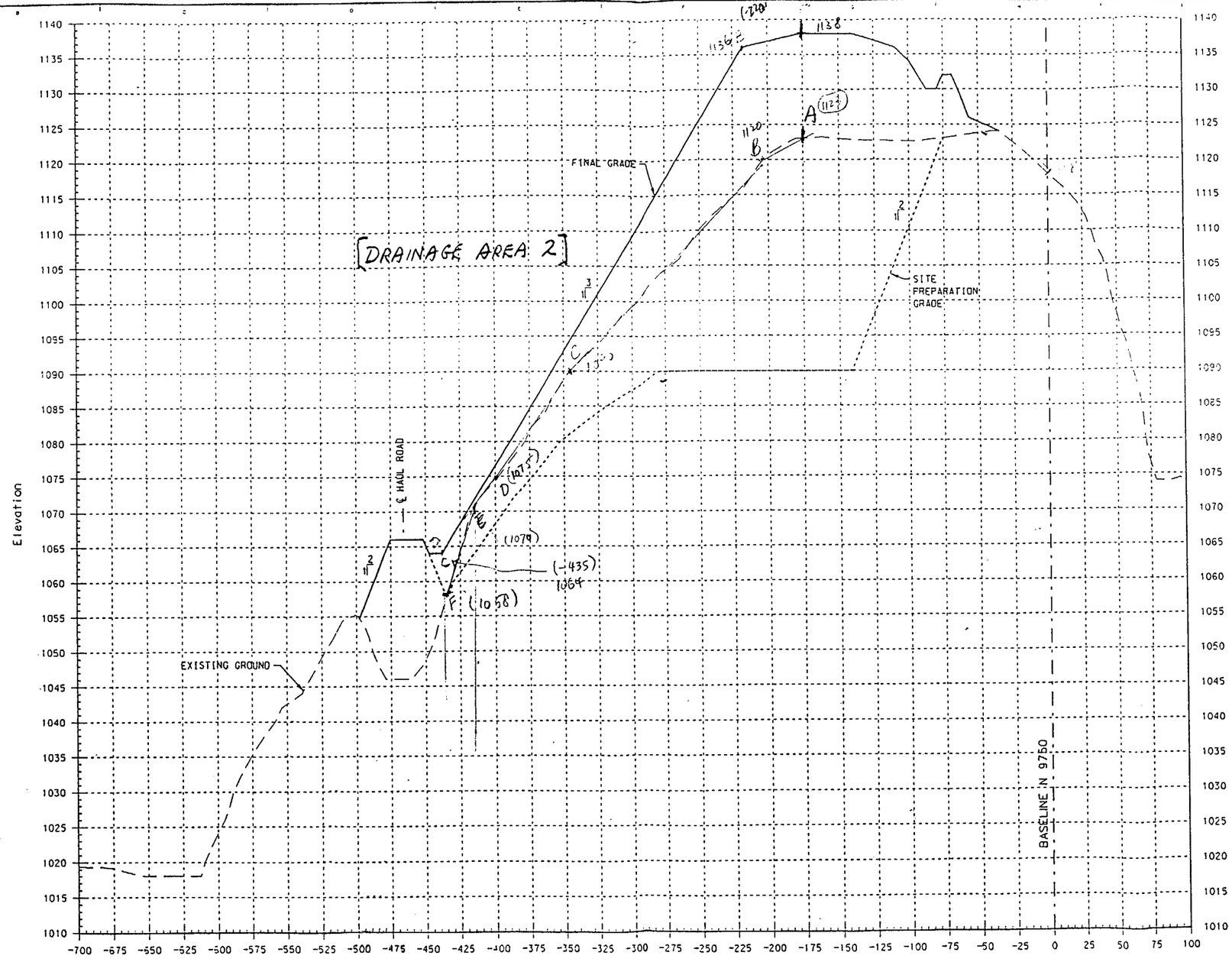
STONE & WEBSTER ENGINEERING CORPORATION

DRAWING NUMBER **FIGURE 4**

DESIGNED BY R.DONOVAN | DRAWN BY R.DONOVAN | CAD MODEL MOLYSH4 | LEVELS | WORK PKG | PCT
DSGN CHK'D BY | CHK'D BY

SCALE | HALF-SIZE | APP. CARD

REP. ENGR. B.MCCAMPBELL
SUPV. C. DOTON



5+00

SCALE : 1" = 40' (HORZ)
1" = 8' (VERT)

SCALE IN FEET

EAST CROSS SECTION STORAGE CELL DESIGN

MOLYCORP, INC.
300 CALDWELL AVENUE WASHINGTON, PA

STONE & WEBSTER ENGINEERING CORPORATION

DRAWING NUMBER **FIGURE 5**

DESIGNED BY R.DONOVAN
DRAWN BY R.DONOVAN
DSGN CHKD BY
CHKD BY
CAD MODEL MOLYSH5
LEVELS
NORM. PKG
MCT

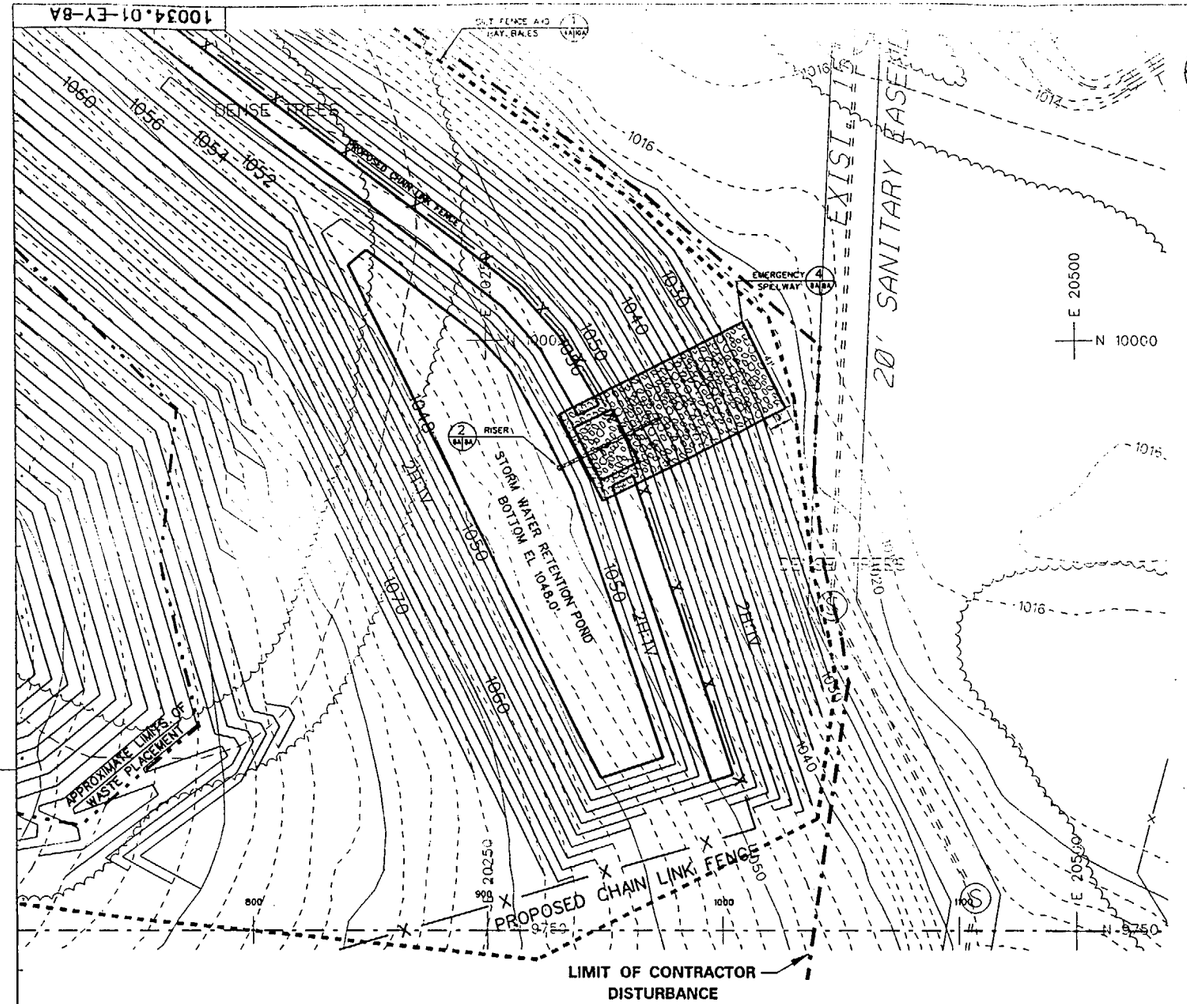
ISSUE	DESCRIPTION	CHECKED	CORRECT	APPR	DATE
4					
3					
2					
1					

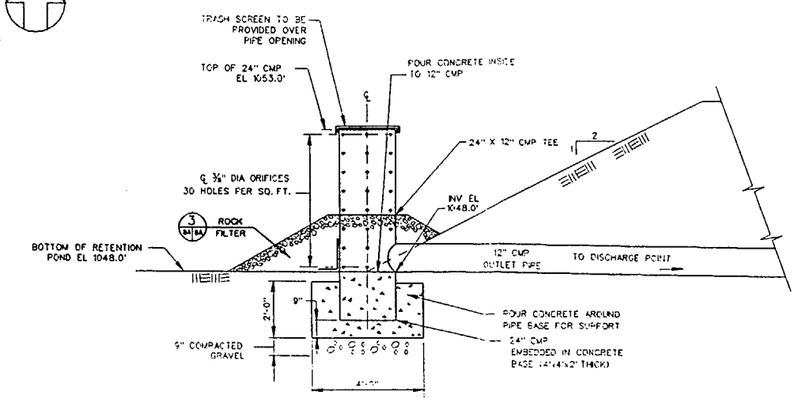
MODEL | ARCH | CIVIL | CONC | STL | L & P | INST | M.D. | P.S. | S.A. | FAC | ELEC | LTG | MAT'L

Attachment A

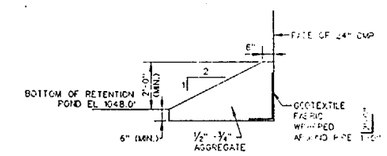
Preliminary Pond Size and Location
Outlet & Emergency Spillway Details
Construction Phase

10034.01-EY-8A



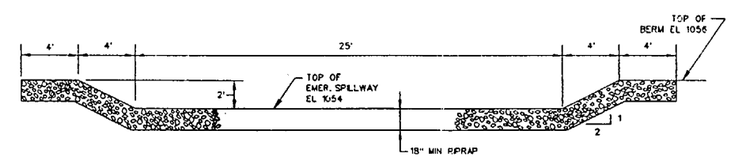


RISER DETAIL 2 SH 8A
NOT TO SCALE



ROCK FILTER DETAIL 3 SH 8A
NOT TO SCALE

NOTE:
SEDIMENT SHALL BE REMOVED FROM THE POND AND THE ROCK FILTER SHALL BE MAINTAINED AS REQUIRED.



EMERGENCY SPILLWAY DETAIL 4 SH 8A
NOT TO SCALE

THIS DRAWING CREATED ELECTRONICALLY

SCALE IN FEET

REVISION	CHECKED
PRELIMINARY FOR REVIEW APRIL 14,2000	

STORM WATER RETENTION POND
CONSTRUCTION PHASE
STORAGE CELL DESIGN

MOLYCORP, INC.
300 CALDWELL AVENUE WASHINGTON, PA

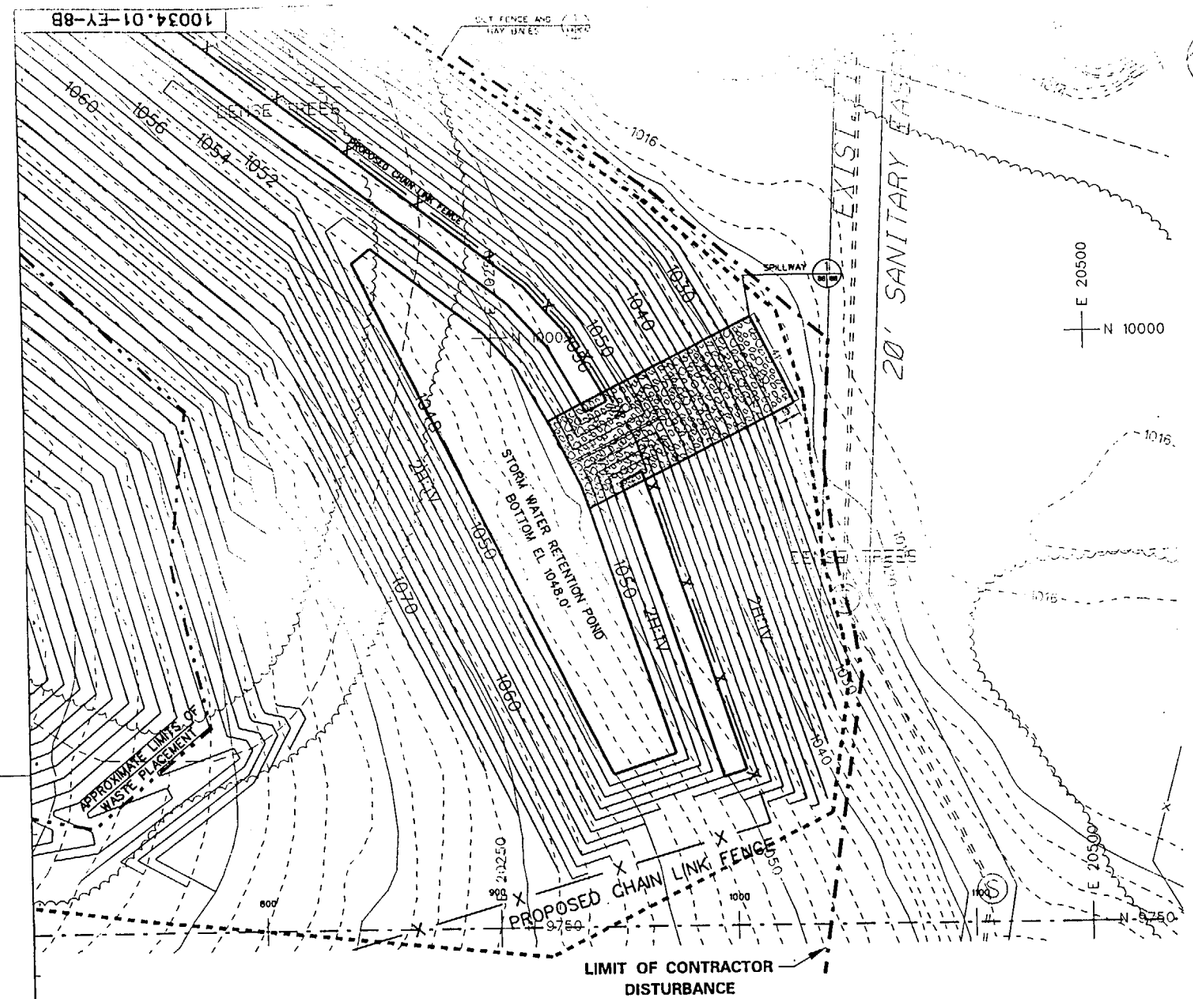
STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASS.

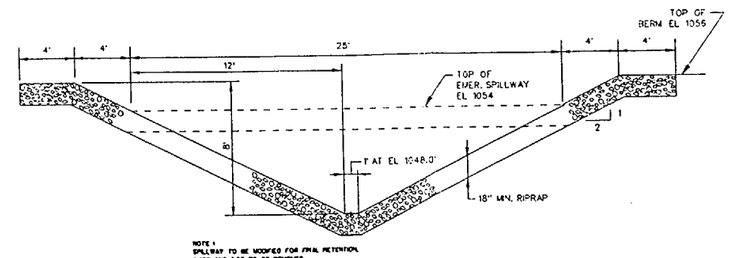
DRAWING NUMBER 10034.01-EY-8A-1

Attachment B

Preliminary Pond Size and Location
Outlet (Spillway) Details
Post-Construction Phase

10034.01-EY-8B





SPILLWAY DETAIL
NOT TO SCALE

SCALE IN FEET

THIS DRAWING CREATED ELECTRONICALLY

PRELIMINARY FOR REVIEW
APRIL 14, 2000

STORM WATER RETENTION POND
FINAL PHASE
STORAGE CELL DESIGN

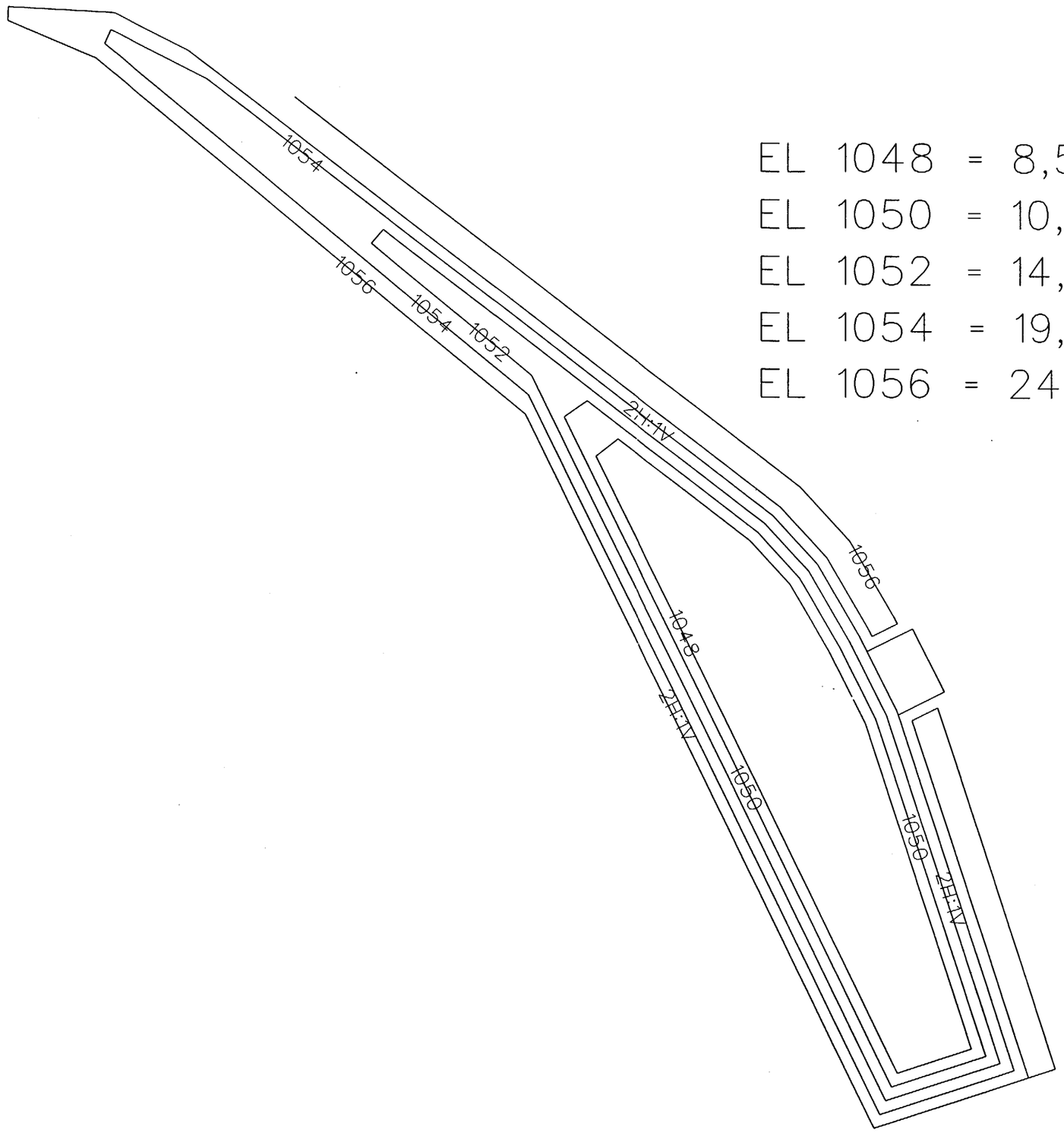
MOLYCORP, INC.
300 CALDWELL AVENUE WASHINGTON, PA

STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASS.

DRAWING NUMBER **10034.01-EY-8B-1**

Attachment C

Elevation
vs.
Surface Area (Final Grading)



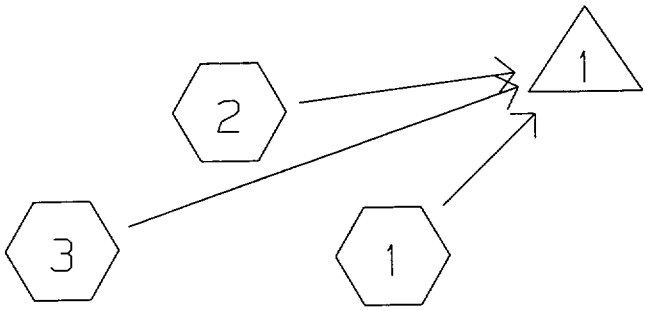
EL 1048 = 8,580 SF
EL 1050 = 10,990 SF
EL 1052 = 14,152 SF
EL 1054 = 19,060 SF
EL 1056 = 24,100 SF

Attachment D-1

TR-20 Model Computer Run Output

Construction Phase

WATERSHED ROUTING ==========



SUBCATCHMENT 1	= DA 1: Post- Construction Phase	->	POND 1
SUBCATCHMENT 2	= DA 2: Post-Construction Phase	->	POND 1
SUBCATCHMENT 3	= DA 3: Post-Construction Phase	->	POND 1
POND 1	= Sediment Basin/Construction Phase	->	

SUBCATCHMENT 1 **DA 1: Post- Construction Phase**

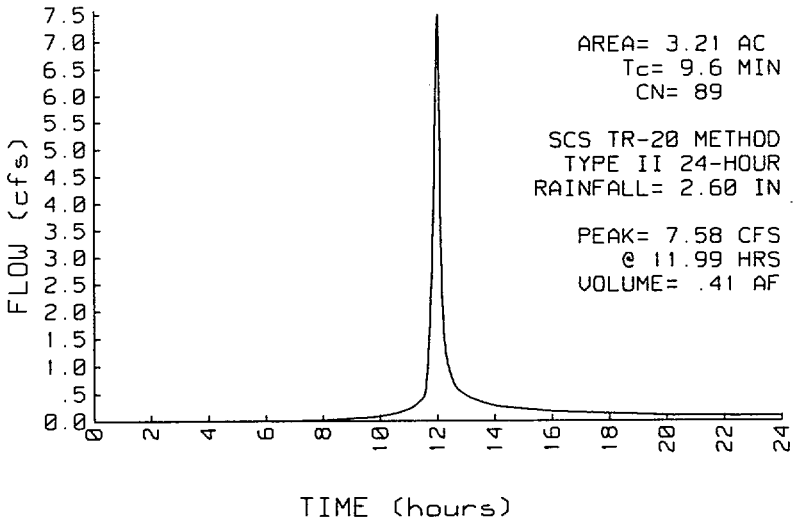
PEAK= 7.58 CFS @ 11.99 HRS, VOLUME= .41 AF

ACRES	CN	
.02	91	Gravel, Haul Road
3.19	89	Pasture, grassland, poor, Type D
3.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 2.60 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	2.7
L=60' s=.0083 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	4.2
L=85' s=.0059 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	1.5
L=205' s=.1902 '/'		
CURVE NUMBER (LAG) METHOD	**DE**	.6
L=80' s=.275 '/'		
CURVE NUMBER (LAG) METHOD	**EF**	.2
L=30' s=.3667 '/'		
RECT/VEE/TRAP CHANNEL	**FG**	.4
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=313' Capacity=635.3 cfs		
	Total Length= 773 ft Total Tc=	9.6

SUBCATCHMENT 1 RUNOFF
DA 1: Post- Construction Phase



SUBCATCHMENT 2 **DA 2: Post-Construction Phase**

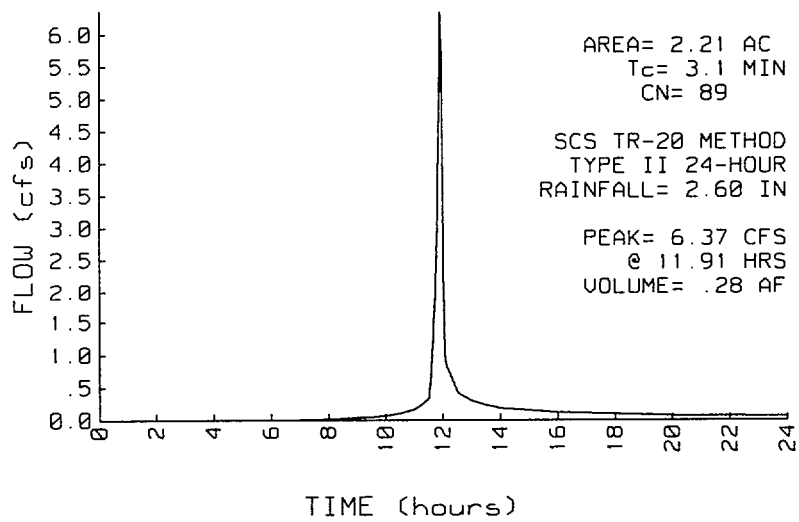
PEAK= 6.37 CFS @ 11.91 HRS, VOLUME= .28 AF

ACRES	CN	
.10	91	Gravel, Haul Road
2.11	89	Pasture, grassland, poor, Type D
2.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 2.60 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	.9
L=45' s=.0444 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	1.2
L=215' s=.3349 '/'		
RECT/VEE/TRAP CHANNEL	**CD**	1.0
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=738' Capacity=635.3 cfs		
	Total Length= 998 ft Total Tc=	3.1

SUBCATCHMENT 2 RUNOFF
DA 2: Post-Construction Phase



SUBCATCHMENT 3 **DA 3: Post-Construction Phase**

PEAK= 3.41 CFS @ 11.99 HRS, VOLUME= .18 AF

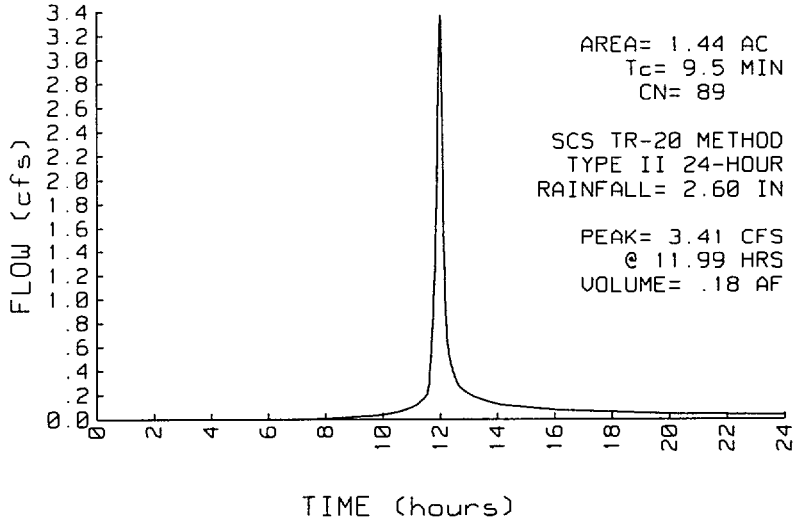
ACRES	CN	
.14	91	Gravel, Haul road
1.30	89	Pasture, grassland, poor, Type D
1.44	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 2.60 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	6.5
L=155' s=.0065 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	.9
L=100' s=.18 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	.4
L=50' s=.32 '/'		
RECT/VEE/TRAP CHANNEL	**Segment ID:**	1.7
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=1323' Capacity=635.3 cfs		

	Total Length= 1628 ft Total Tc=	9.5

SUBCATCHMENT 3 RUNOFF
DA 3: Post-Construction Phase



POND 1 **Sediment Basin/Construction Phase**

Qin = 15.69 CFS @ 11.95 HRS, VOLUME= .88 AF
Qout= 2.59 CFS @ 12.27 HRS, VOLUME= .82 AF, ATTEN= 83%, LAG= 19.6 MIN
Qpri= 2.59 CFS @ 12.27 HRS, VOLUME= .82 AF
Qsec= 0.00 CFS @ 0.00 HRS, VOLUME= 0.00 AF

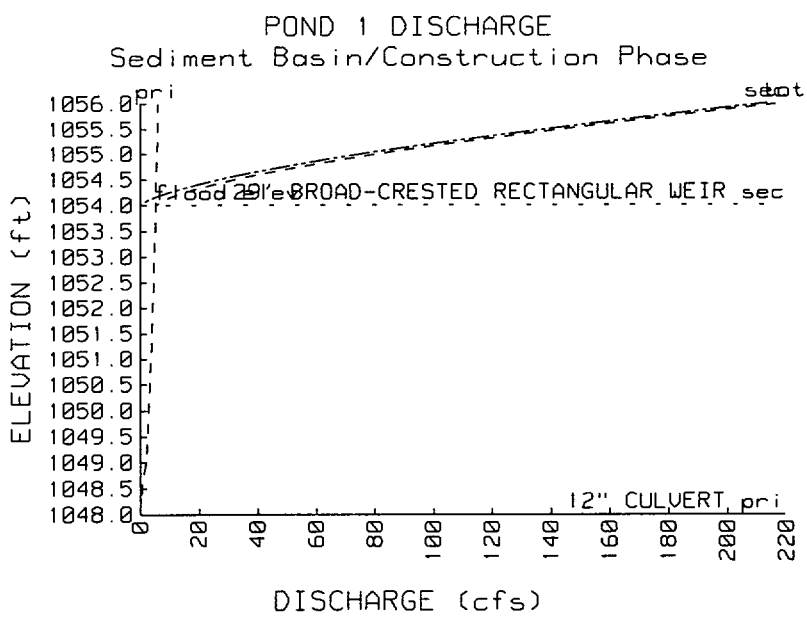
ELEVATION (FT)	AREA (SF)	INC.STOR (CF)	CUM.STOR (CF)
1048.0	8580	0	0
1050.0	10990	19570	19570
1052.0	14152	25142	44712
1054.0	19060	33212	77924
1056.0	24100	43160	121084

STOR-IND METHOD
PEAK STORAGE = 17190 CF
PEAK ELEVATION= 1049.8 FT
FLOOD ELEVATION= 1054.0 FT
START ELEVATION= 1048.0 FT
SPAN= 0-24 HRS, dt=.05 HRS
4 x FINER ROUTING
Tdet= 118.2 MIN (.82 AF)

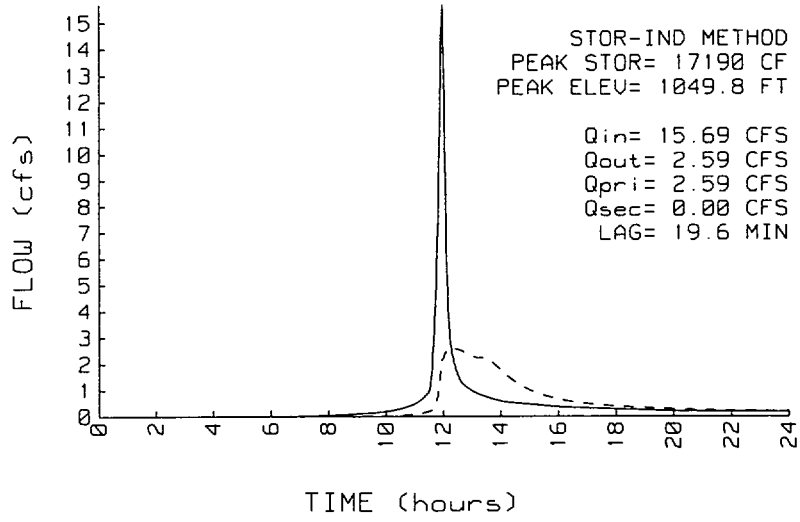
#	ROUTE	INVERT	OUTLET DEVICES
1	S	1054.0'	**29' BROAD-CRESTED RECTANGULAR WEIR**
			Q=C L H^1.5 C=2.6, 2.6, 2.6, 0, 0, 0, 0, 0
2	P	1048.0'	**12" CULVERT**
			n=.026 L=50' S=.012'/' Ke=.8 Cc=.9 Cd=.5

Primary Discharge
└─2=Culvert

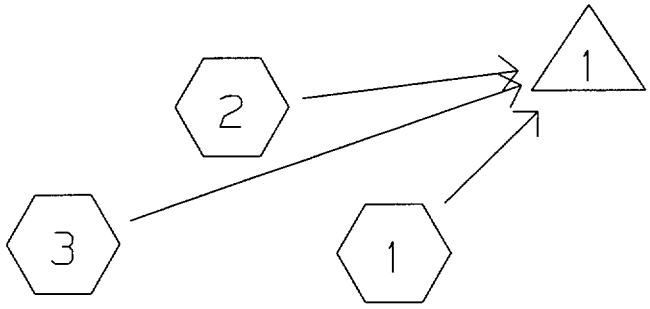
Secondary Discharge
└─1=Broad-Crested Rectangular Weir



POND 1 INFLOW & OUTFLOW
Sediment Basin/Construction Phase



WATERSHED ROUTING ==========



SUBCATCHMENT 1	= DA 1: Post- Construction Phase	->	POND 1
SUBCATCHMENT 2	= DA 2: Post-Construction Phase	->	POND 1
SUBCATCHMENT 3	= DA 3: Post-Construction Phase	->	POND 1
POND 1	= Sediment Basin/Construction Phase	->	

SUBCATCHMENT 1 **DA 1: Post- Construction Phase**

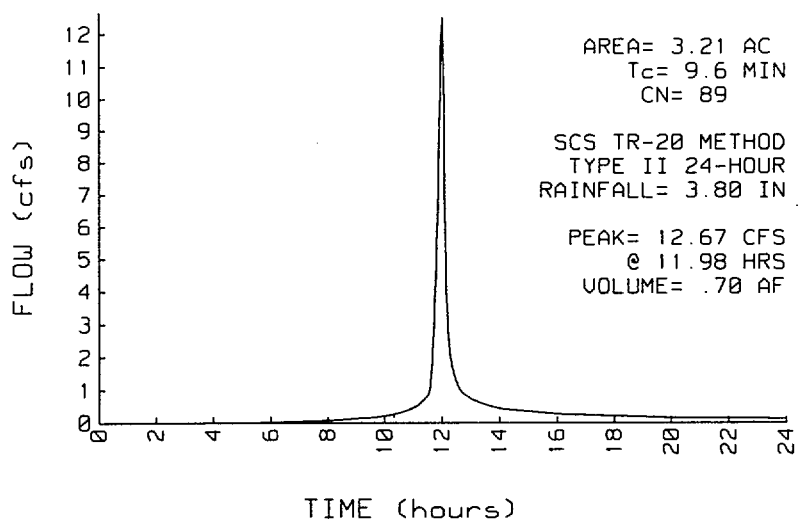
PEAK= 12.67 CFS @ 11.98 HRS, VOLUME= .70 AF

ACRES	CN	
.02	91	Gravel, Haul Road
3.19	89	Pasture, grassland, poor, Type D
3.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 3.80 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	2.7
L=60' s=.0083 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	4.2
L=85' s=.0059 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	1.5
L=205' s=.1902 '/'		
CURVE NUMBER (LAG) METHOD	**DE**	.6
L=80' s=.275 '/'		
CURVE NUMBER (LAG) METHOD	**EF**	.2
L=30' s=.3667 '/'		
RECT/VEE/TRAP CHANNEL	**FG**	.4
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=313' Capacity=635.3 cfs		
	Total Length= 773 ft Total Tc=	9.6

SUBCATCHMENT 1 RUNOFF
DA 1: Post- Construction Phase



SUBCATCHMENT 2 **DA 2: Post-Construction Phase**

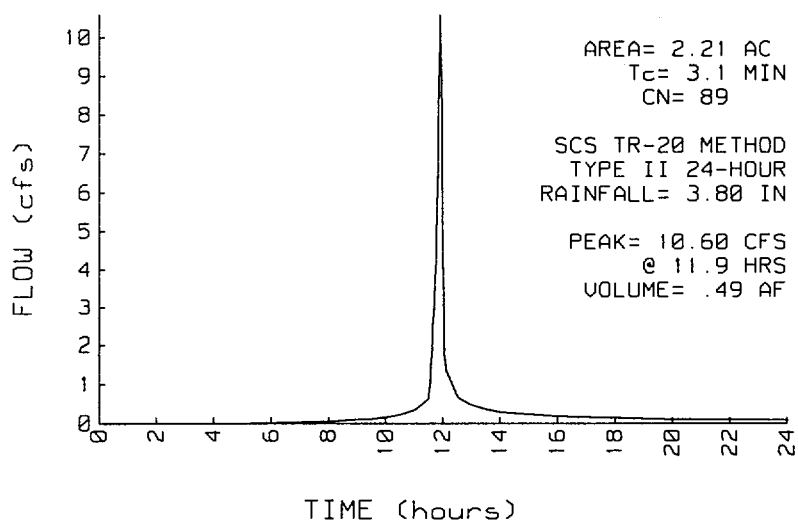
PEAK= 10.60 CFS @ 11.90 HRS, VOLUME= .49 AF

ACRES	CN	
.10	91	Gravel, Haul Road
2.11	89	Pasture, grassland, poor, Type D
2.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 3.80 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	.9
L=45' s=.0444 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	1.2
L=215' s=.3349 '/'		
RECT/VEE/TRAP CHANNEL	**CD**	1.0
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=738' Capacity=635.3 cfs		
	Total Length= 998 ft Total Tc=	3.1

SUBCATCHMENT 2 RUNOFF
DA 2: Post-Construction Phase



SUBCATCHMENT 3 **DA 3: Post-Construction Phase**

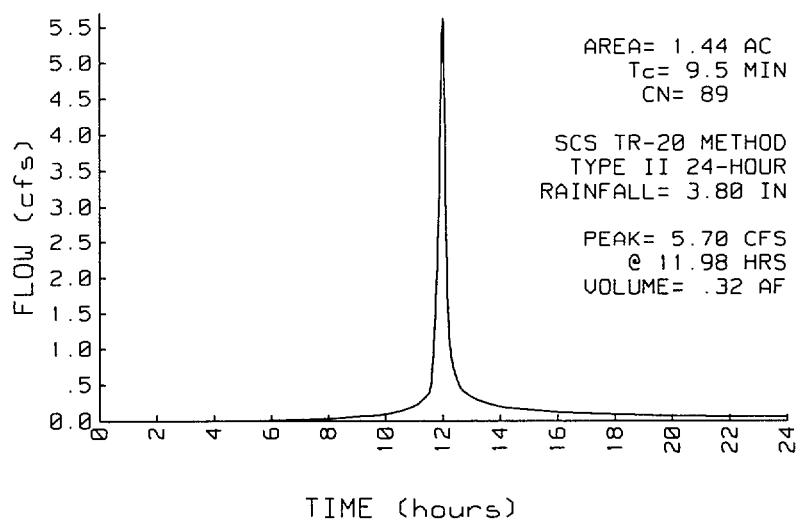
PEAK= 5.70 CFS @ 11.98 HRS, VOLUME= .32 AF

ACRES	CN	
.14	91	Gravel, Haul road
1.30	89	Pasture, grassland, poor, Type D
1.44	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 3.80 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	6.5
L=155' s=.0065 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	.9
L=100' s=.18 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	.4
L=50' s=.32 '/'		
RECT/VEE/TRAP CHANNEL	**Segment ID:**	1.7
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=1323' Capacity=635.3 cfs		
	Total Length= 1628 ft Total Tc=	9.5

SUBCATCHMENT 3 RUNOFF
DA 3: Post-Construction Phase



POND 1 **Sediment Basin/Construction Phase**

Qin = 26.30 CFS @ 11.94 HRS, VOLUME= 1.51 AF
Qout= 3.51 CFS @ 12.34 HRS, VOLUME= 1.43 AF, ATTEN= 87%, LAG= 23.9 MIN
Qpri= 3.51 CFS @ 12.34 HRS, VOLUME= 1.43 AF
Qsec= 0.00 CFS @ 0.00 HRS, VOLUME= 0.00 AF

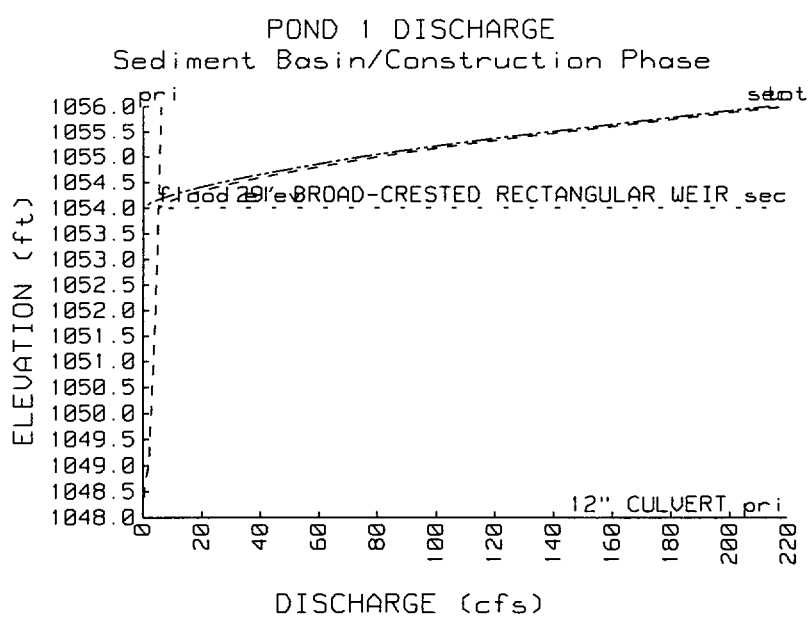
ELEVATION (FT)	AREA (SF)	INC.STOR (CF)	CUM.STOR (CF)
1048.0	8580	0	0
1050.0	10990	19570	19570
1052.0	14152	25142	44712
1054.0	19060	33212	77924
1056.0	24100	43160	121084

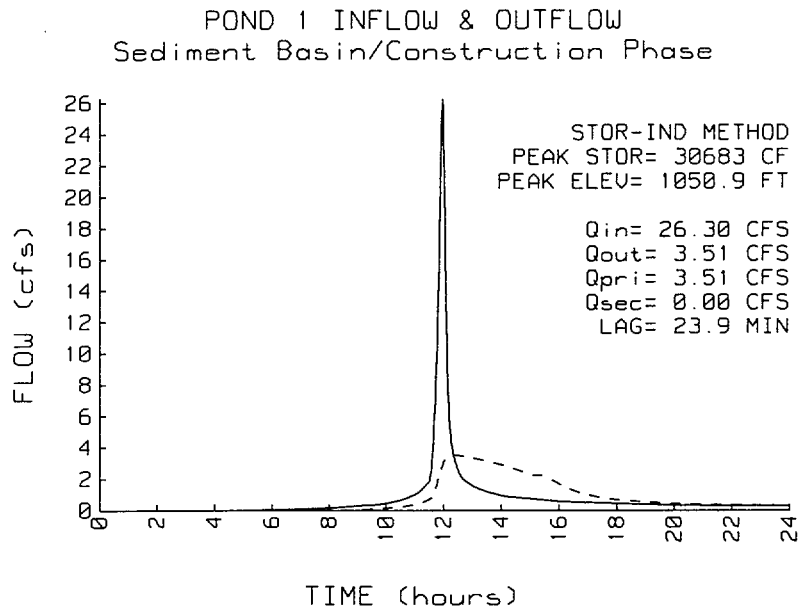
STOR-IND METHOD
PEAK STORAGE = 30683 CF
PEAK ELEVATION= 1050.9 FT
FLOOD ELEVATION= 1054.0 FT
START ELEVATION= 1048.0 FT
SPAN= 0-24 HRS, dt=.05 HRS
4 x FINER ROUTING
Tdet= 124.2 MIN (1.42 AF)

#	ROUTE	INVERT	OUTLET DEVICES
1	S	1054.0'	**29' BROAD-CRESTED RECTANGULAR WEIR**
			Q=C L H^1.5 C=2.6, 2.6, 2.6, 0, 0, 0, 0, 0
2	P	1048.0'	**12" CULVERT**
			n=.026 L=50' S=.012'/' Ke=.8 Cc=.9 Cd=.5

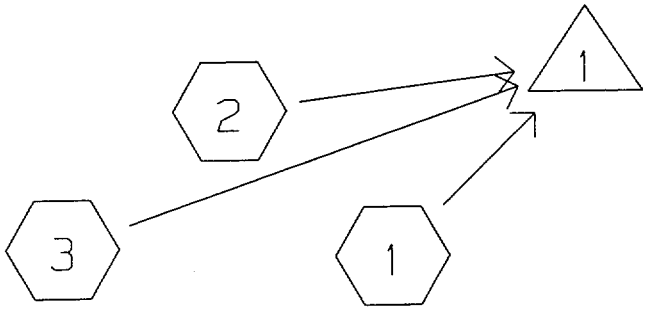
Primary Discharge
└─2=Culvert

Secondary Discharge
└─1=Broad-Crested Rectangular Weir




POND 1 INFLOW & OUTFLOW
Sediment Basin/Construction Phase
STOR-IND METHOD
PEAK STOR= 30683 CF
PEAK ELEV= 1050.9 FT
Qin= 26.30 CFS
Qout= 3.51 CFS
Qpri= 3.51 CFS
Qsec= 0.00 CFS
LAG= 23.9 MIN
FLOW (cfs)
TIME (hours)
0
2
4
6
8
10
12
14
16
18
20
22
24
26

WATERSHED ROUTING ==========



SUBCATCHMENT 1	= DA 1: Post- Construction Phase	->	POND 1
SUBCATCHMENT 2	= DA 2: Post-Construction Phase	->	POND 1
SUBCATCHMENT 3	= DA 3: Post-Construction Phase	->	POND 1
POND 1	= Sediment Basin/Construction Phase	->	

SUBCATCHMENT 1 **DA 1: Post- Construction Phase**

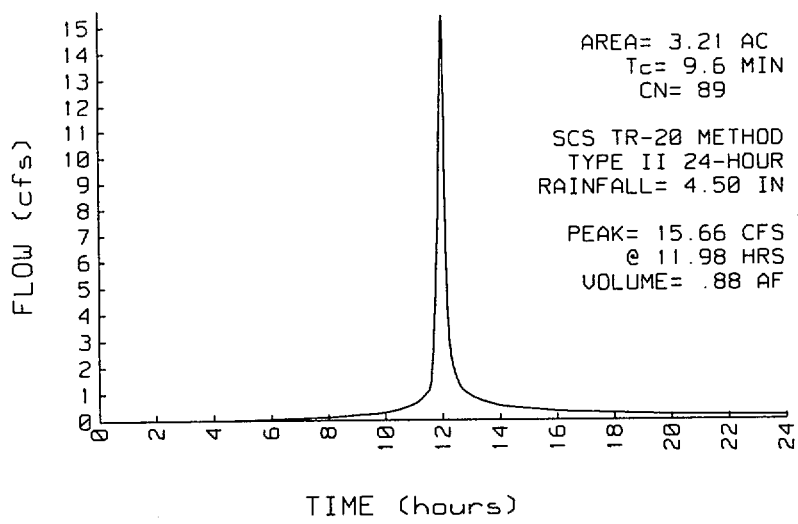
PEAK= 15.66 CFS @ 11.98 HRS, VOLUME= .88 AF

ACRES	CN	
.02	91	Gravel, Haul Road
3.19	89	Pasture, grassland, poor, Type D
3.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 4.50 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	2.7
L=60' s=.0083 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	4.2
L=85' s=.0059 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	1.5
L=205' s=.1902 '/'		
CURVE NUMBER (LAG) METHOD	**DE**	.6
L=80' s=.275 '/'		
CURVE NUMBER (LAG) METHOD	**EF**	.2
L=30' s=.3667 '/'		
RECT/VEE/TRAP CHANNEL	**FG**	.4
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=313' Capacity=635.3 cfs		
	Total Length= 773 ft Total Tc=	9.6

SUBCATCHMENT 1 RUNOFF
DA 1: Post- Construction Phase



SUBCATCHMENT 2 **DA 2: Post-Construction Phase**

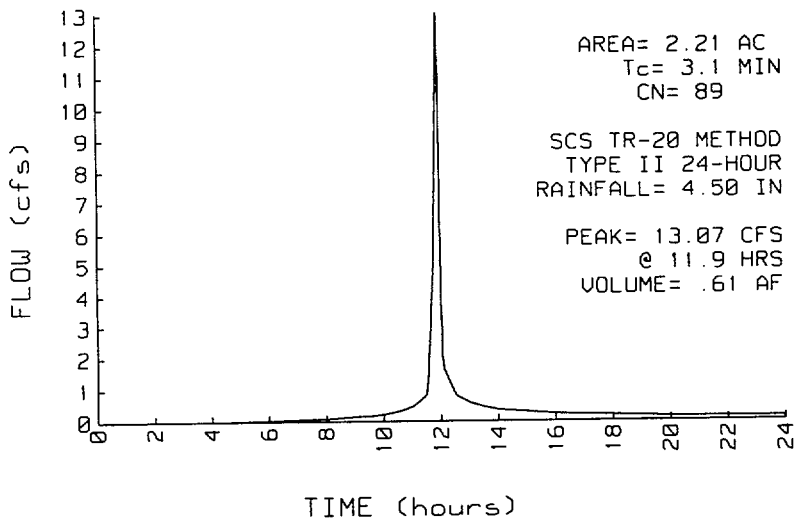
PEAK= 13.07 CFS @ 11.90 HRS, VOLUME= .61 AF

ACRES	CN	
.10	91	Gravel, Haul Road
2.11	89	Pasture, grassland, poor, Type D
2.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 4.50 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	.9
L=45' s=.0444 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	1.2
L=215' s=.3349 '/'		
RECT/VEE/TRAP CHANNEL	**CD**	1.0
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=738' Capacity=635.3 cfs		
	Total Length= 998 ft Total Tc=	3.1

SUBCATCHMENT 2 RUNOFF
DA 2: Post-Construction Phase



SUBCATCHMENT 3 **DA 3: Post-Construction Phase**

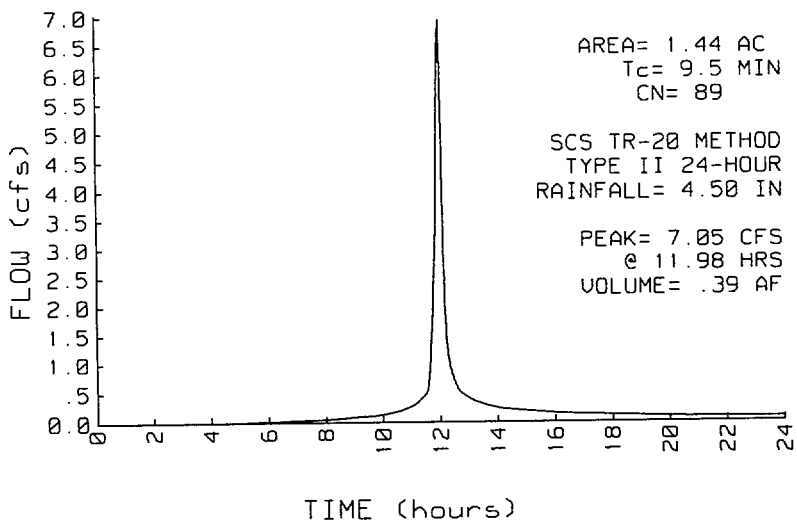
PEAK= 7.05 CFS @ 11.98 HRS, VOLUME= .39 AF

ACRES	CN	
.14	91	Gravel, Haul road
1.30	89	Pasture, grassland, poor, Type D
1.44	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 4.50 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	6.5
L=155' s=.0065 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	.9
L=100' s=.18 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	.4
L=50' s=.32 '/'		
RECT/VEE/TRAP CHANNEL	**Segment ID:**	1.7
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=1323' Capacity=635.3 cfs		
	Total Length= 1628 ft Total Tc=	9.5

SUBCATCHMENT 3 RUNOFF
DA 3: Post-Construction Phase



POND 1 **Sediment Basin/Construction Phase**

Qin = 32.52 CFS @ 11.94 HRS, VOLUME= 1.88 AF
Qout= 3.94 CFS @ 12.38 HRS, VOLUME= 1.80 AF, ATTEN= 88%, LAG= 26.2 MIN
Qpri= 3.94 CFS @ 12.38 HRS, VOLUME= 1.80 AF
Qsec= 0.00 CFS @ 0.00 HRS, VOLUME= 0.00 AF

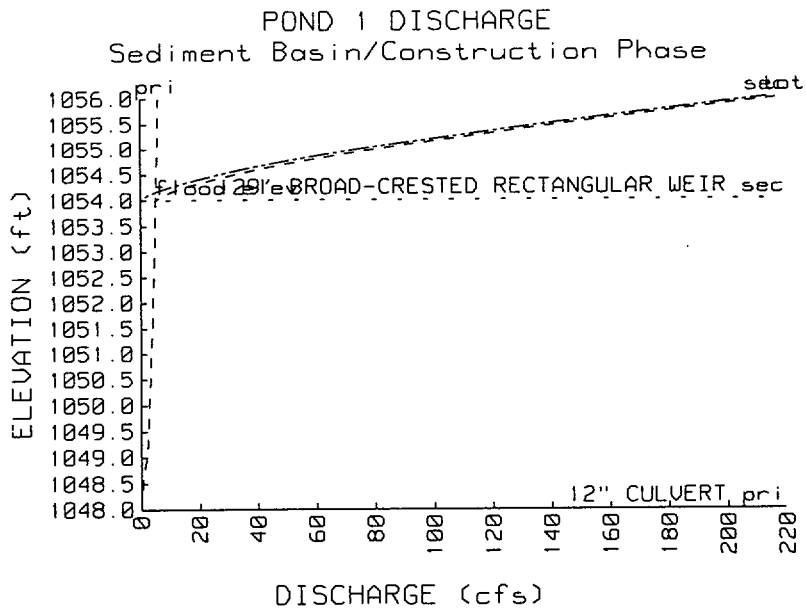
ELEVATION (FT)	AREA (SF)	INC.STOR (CF)	CUM.STOR (CF)
1048.0	8580	0	0
1050.0	10990	19570	19570
1052.0	14152	25142	44712
1054.0	19060	33212	77924
1056.0	24100	43160	121084

STOR-IND METHOD
PEAK STORAGE = 38839 CF
PEAK ELEVATION= 1051.5 FT
FLOOD ELEVATION= 1054.0 FT
START ELEVATION= 1048.0 FT
SPAN= 0-24 HRS, dt=.05 HRS
4 x FINER ROUTING
Tdet= 131.2 MIN (1.8 AF)

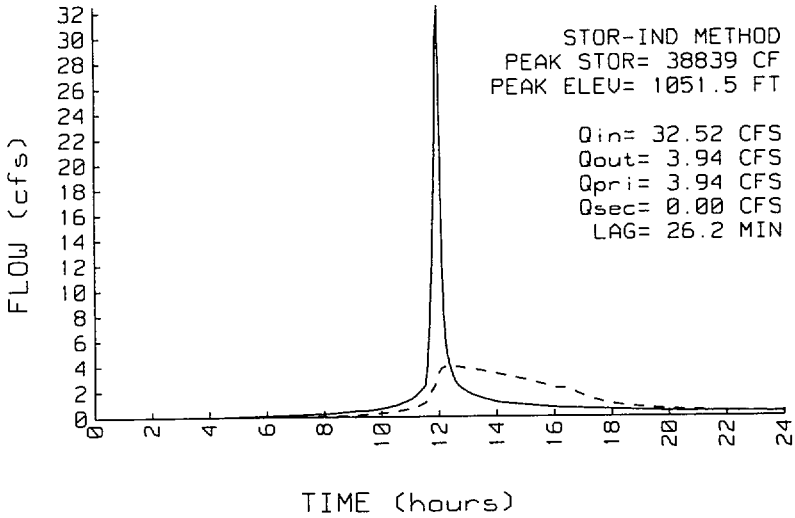
#	ROUTE	INVERT	OUTLET DEVICES
1	S	1054.0'	**29' BROAD-CRESTED RECTANGULAR WEIR** Q=C L H^1.5 C=2.6, 2.6, 2.6, 0, 0, 0, 0, 0
2	P	1048.0'	**12" CULVERT** n=.026 L=50' S=.012'/' Ke=.8 Cc=.9 Cd=.5

Primary Discharge
└─2=Culvert

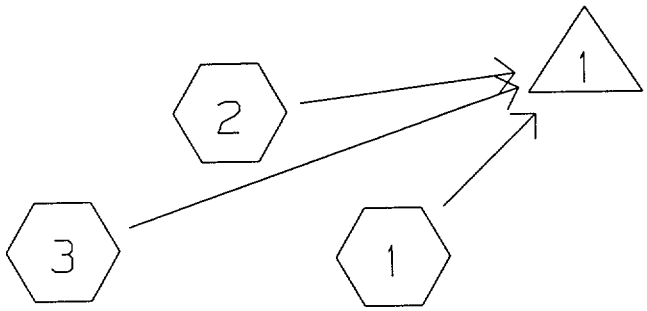
Secondary Discharge
└─1=Broad-Crested Rectangular Weir



POND 1 INFLOW & OUTFLOW
Sediment Basin/Construction Phase



WATERSHED ROUTING ==========



SUBCATCHMENT 1	= DA 1: Post- Construction Phase	->	POND 1
SUBCATCHMENT 2	= DA 2: Post-Construction Phase	->	POND 1
SUBCATCHMENT 3	= DA 3: Post-Construction Phase	->	POND 1
POND 1	= Sediment Basin/Construction Phase	->	

SUBCATCHMENT 1 **DA 1: Post- Construction Phase**

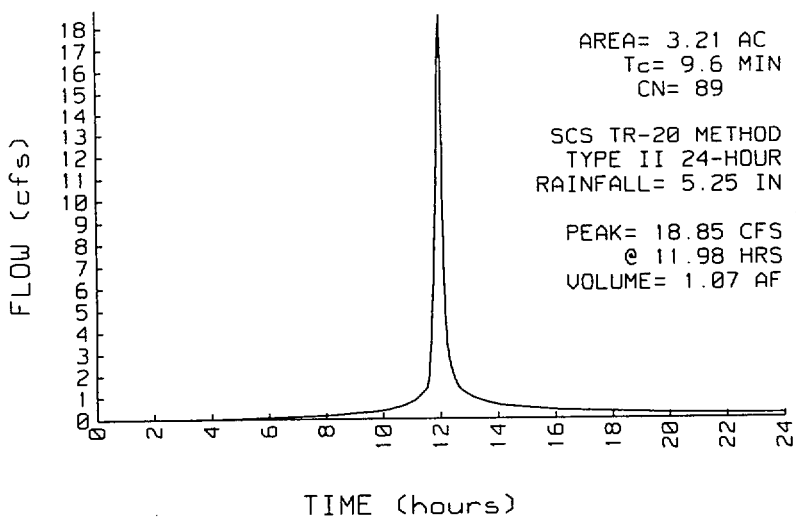
PEAK= 18.85 CFS @ 11.98 HRS, VOLUME= 1.07 AF

ACRES	CN	
.02	91	Gravel, Haul Road
3.19	89	Pasture, grassland, poor, Type D
3.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 5.25 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	2.7
L=60' s=.0083 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	4.2
L=85' s=.0059 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	1.5
L=205' s=.1902 '/'		
CURVE NUMBER (LAG) METHOD	**DE**	.6
L=80' s=.275 '/'		
CURVE NUMBER (LAG) METHOD	**EF**	.2
L=30' s=.3667 '/'		
RECT/VEE/TRAP CHANNEL	**FG**	.4
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=313' Capacity=635.3 cfs		
	Total Length= 773 ft Total Tc=	9.6

SUBCATCHMENT 1 RUNOFF
DA 1: Post- Construction Phase



SUBCATCHMENT 2 **DA 2: Post-Construction Phase**

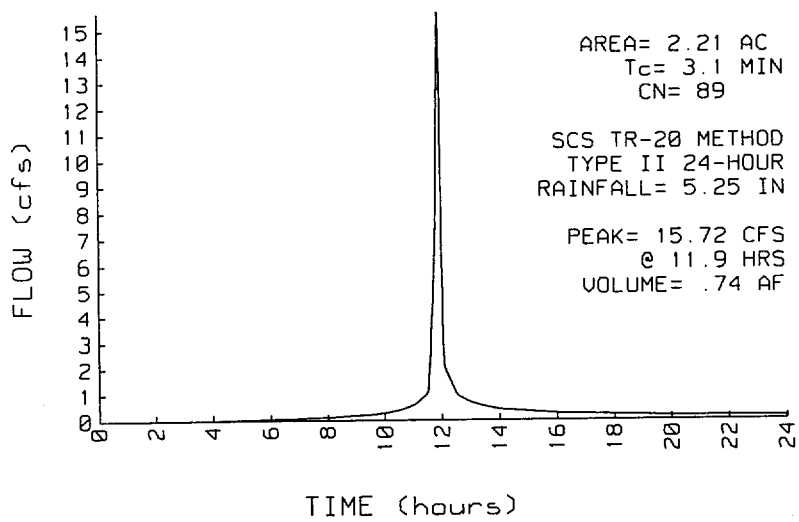
PEAK= 15.72 CFS @ 11.90 HRS, VOLUME= .74 AF

ACRES	CN	
.10	91	Gravel, Haul Road
2.11	89	Pasture, grassland, poor, Type D
2.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 5.25 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	.9
L=45' s=.0444 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	1.2
L=215' s=.3349 '/'		
RECT/VEE/TRAP CHANNEL	**CD**	1.0
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=738' Capacity=635.3 cfs		
	Total Length= 998 ft Total Tc=	3.1

SUBCATCHMENT 2 RUNOFF
DA 2: Post-Construction Phase



SUBCATCHMENT 3 **DA 3: Post-Construction Phase**

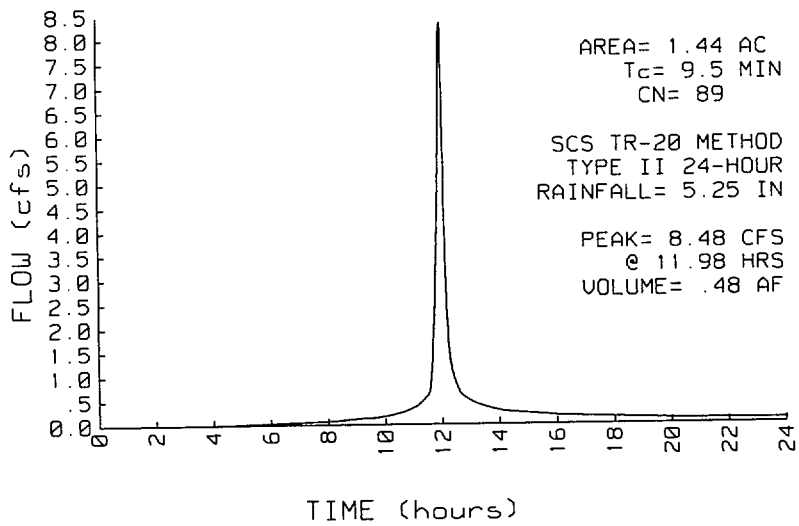
PEAK= 8.48 CFS @ 11.98 HRS, VOLUME= .48 AF

ACRES	CN	
.14	91	Gravel, Haul road
1.30	89	Pasture, grassland, poor, Type D
1.44	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 5.25 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	6.5
L=155' s=.0065 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	.9
L=100' s=.18 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	.4
L=50' s=.32 '/'		
RECT/VEE/TRAP CHANNEL	**Segment ID:**	1.7
D=5' SS= .5 '/' a=50 sq-ft	Pw=22.4' r=2.236'	
s=.01 '/' n=.02 V=12.71 fps	L=1323' Capacity=635.3 cfs	
	Total Length= 1628 ft Total Tc=	9.5

SUBCATCHMENT 3 RUNOFF
DA 3: Post-Construction Phase



POND 1 **Sediment Basin/Construction Phase**

Qin = 39.18 CFS @ 11.94 HRS, VOLUME= 2.29 AF
Qout= 4.33 CFS @ 12.42 HRS, VOLUME= 2.20 AF, ATTEN= 89%, LAG= 28.6 MIN
Qpri= 4.33 CFS @ 12.42 HRS, VOLUME= 2.20 AF
Qsec= 0.00 CFS @ 0.00 HRS, VOLUME= 0.00 AF

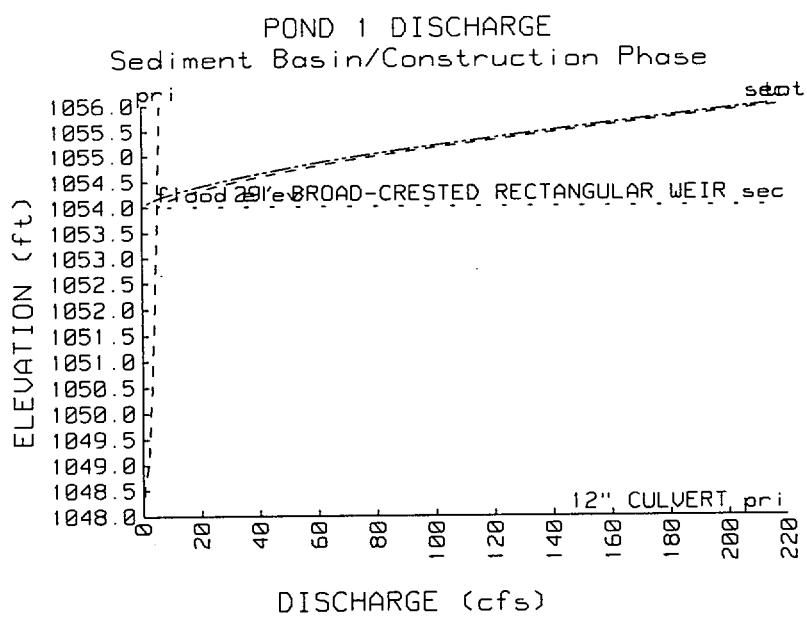
ELEVATION (FT)	AREA (SF)	INC.STOR (CF)	CUM.STOR (CF)
1048.0	8580	0	0
1050.0	10990	19570	19570
1052.0	14152	25142	44712
1054.0	19060	33212	77924
1056.0	24100	43160	121084

STOR-IND METHOD
PEAK STORAGE = 47744 CF
PEAK ELEVATION= 1052.2 FT
FLOOD ELEVATION= 1054.0 FT
START ELEVATION= 1048.0 FT
SPAN= 0-24 HRS, dt=.05 HRS
4 x FINER ROUTING
Tdet= 139.2 MIN (2.2 AF)

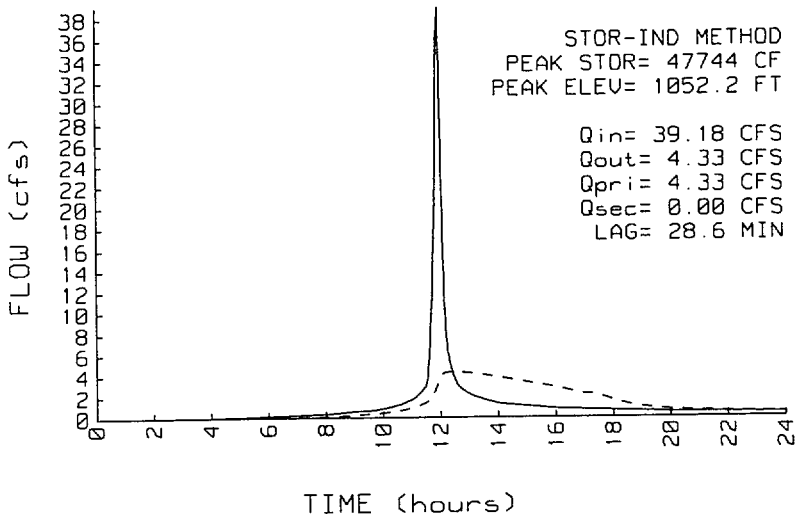
#	ROUTE	INVERT	OUTLET DEVICES
1	S	1054.0'	**29' BROAD-CRESTED RECTANGULAR WEIR** Q=C L H^1.5 C=2.6, 2.6, 2.6, 0, 0, 0, 0, 0
2	P	1048.0'	**12" CULVERT** n=.026 L=50' S=.012'/' Ke=.8 Cc=.9 Cd=.5

Primary Discharge
└─2=Culvert

Secondary Discharge
└─1=Broad-Crested Rectangular Weir



POND 1 INFLOW & OUTFLOW
Sediment Basin/Construction Phase

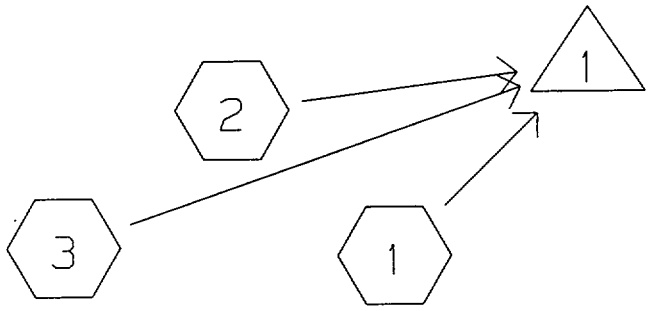


Attachment D-2

TR-20 Model Computer Run Output

Post-Construction

WATERSHED ROUTING ==========



SUBCATCHMENT 1	= DA 1: Post-Construction Phase	->	POND 1
SUBCATCHMENT 2	= DA 2: Post-Construction Phase	->	POND 1
SUBCATCHMENT 3	= DA 3: Post-Construction Phase	->	POND 1
POND 1	= Proposed Retention Pond/Post-Construction	->	

SUBCATCHMENT 1 **DA 1: Post-Construction Phase**

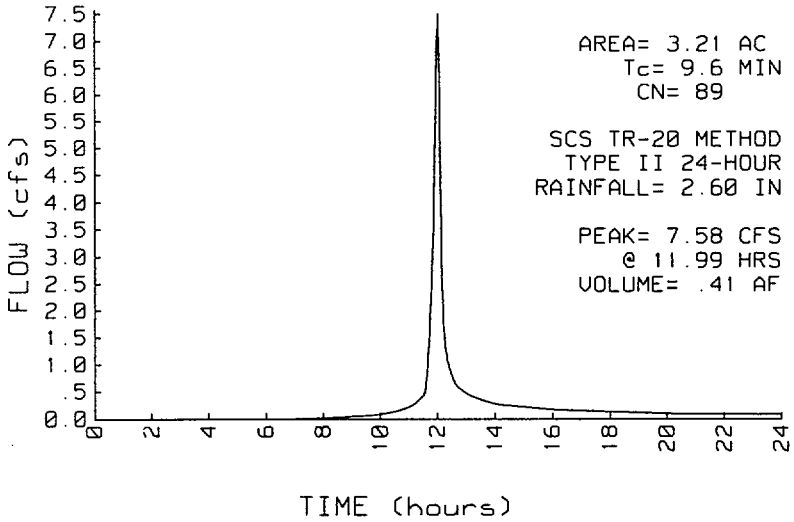
PEAK= 7.58 CFS @ 11.99 HRS, VOLUME= .41 AF

ACRES	CN	
.02	91	Gravel, Haul Road
3.19	89	Pasture, grassland, poor, Type D
3.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 2.60 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	2.7
L=60' s=.0083 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	4.2
L=85' s=.0059 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	1.5
L=205' s=.1902 '/'		
CURVE NUMBER (LAG) METHOD	**DE**	.6
L=80' s=.275 '/'		
CURVE NUMBER (LAG) METHOD	**EF**	.2
L=30' s=.3667 '/'		
RECT/VEE/TRAP CHANNEL	**FG**	.4
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=313' Capacity=635.3 cfs		
	Total Length= 773 ft Total Tc=	9.6

SUBCATCHMENT 1 RUNOFF
DA 1: Post-Construction Phase



SUBCATCHMENT 2 **DA 2: Post-Construction Phase**

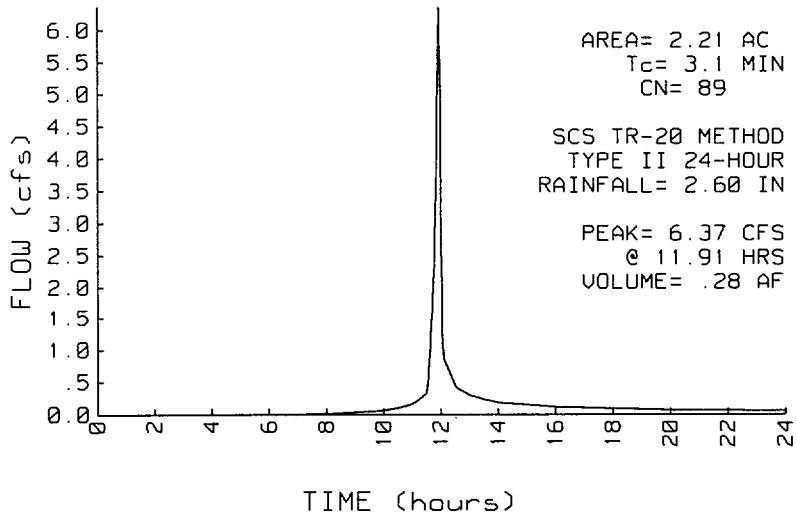
PEAK= 6.37 CFS @ 11.91 HRS, VOLUME= .28 AF

ACRES	CN	
.10	91	Gravel, Haul Road
2.11	89	Pasture, grassland, poor, Type D
2.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 2.60 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	.9
L=45' s=.0444 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	1.2
L=215' s=.3349 '/'		
RECT/VEE/TRAP CHANNEL	**CD**	1.0
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=738' Capacity=635.3 cfs		
	Total Length= 998 ft Total Tc=	3.1

SUBCATCHMENT 2 RUNOFF
DA 2: Post-Construction Phase



SUBCATCHMENT 3 **DA 3: Post-Construction Phase**

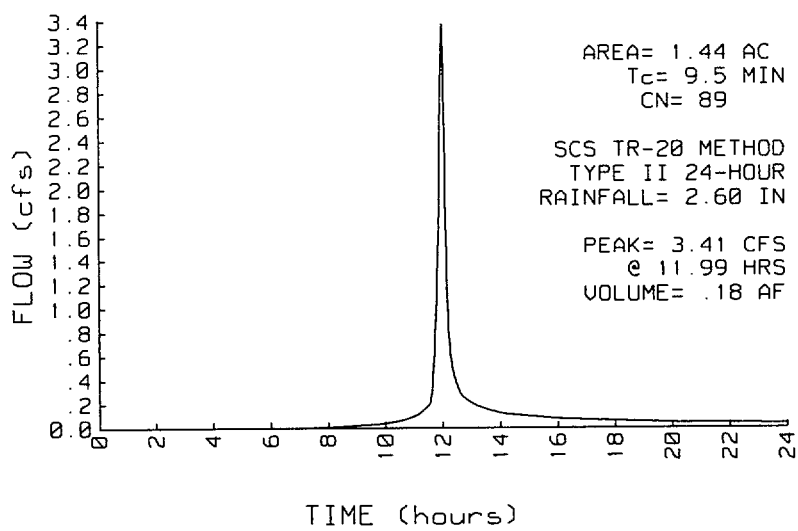
PEAK= 3.41 CFS @ 11.99 HRS, VOLUME= .18 AF

ACRES	CN	
.14	91	Gravel, Haul road
1.30	89	Pasture, grassland, poor, Type D
1.44	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 2.60 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	6.5
L=155' s=.0065 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	.9
L=100' s=.18 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	.4
L=50' s=.32 '/'		
RECT/VEE/TRAP CHANNEL	**Segment ID:**	1.7
D=5' SS= .5 '/' a=50 sq-ft	Pw=22.4' r=2.236'	
s=.01 '/' n=.02 V=12.71 fps	L=1323' Capacity=635.3 cfs	
	Total Length= 1628 ft Total Tc=	9.5

SUBCATCHMENT 3 RUNOFF
DA 3: Post-Construction Phase



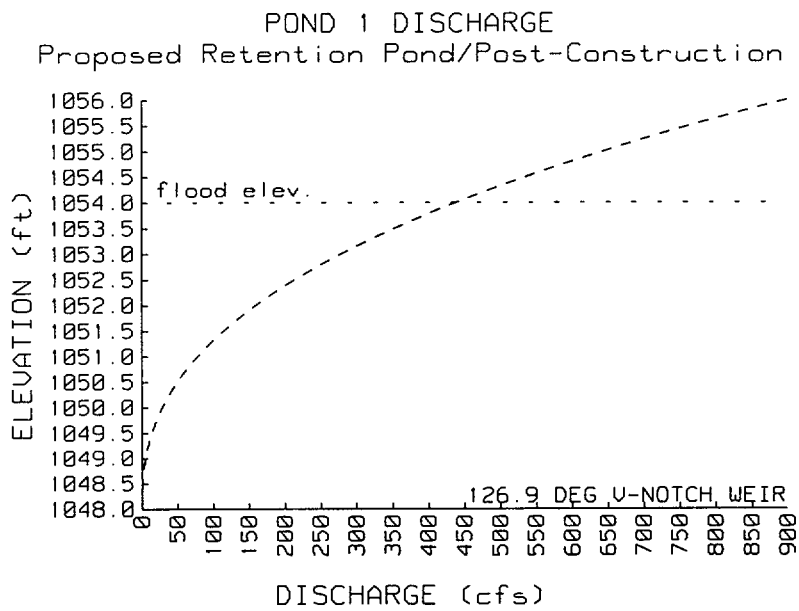
POND 1 **Proposed Retention Pond/Post-Construction**

Qin = 15.69 CFS @ 11.95 HRS, VOLUME= .88 AF
Qout= 8.99 CFS @ 12.06 HRS, VOLUME= .82 AF, ATTEN= 43%, LAG= 7.1 MIN

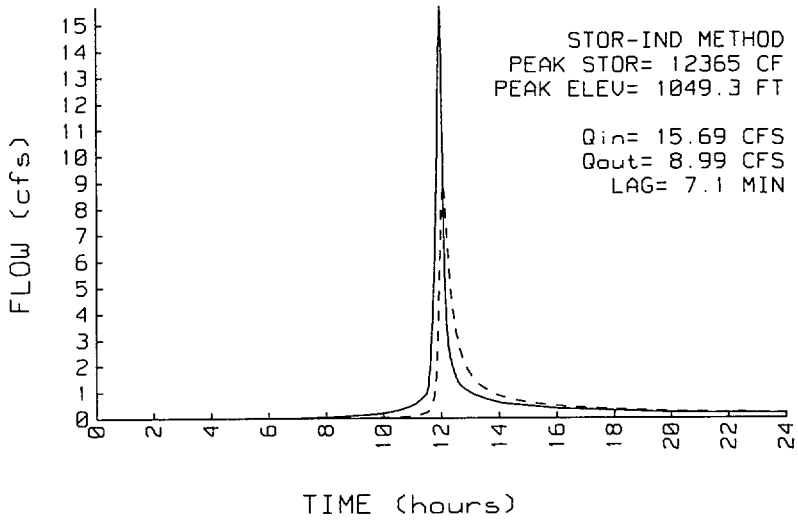
ELEVATION (FT)	AREA (SF)	INC.STOR (CF)	CUM.STOR (CF)
1048.0	8580	0	0
1050.0	10990	19570	19570
1052.0	14152	25142	44712
1054.0	19060	33212	77924
1056.0	24100	43160	121084

STOR-IND METHOD
PEAK STORAGE = 12365 CF
PEAK ELEVATION= 1049.3 FT
FLOOD ELEVATION= 1054.0 FT
START ELEVATION= 1048.0 FT
SPAN= 0-24 HRS, dt=.05 HRS
4 x FINER ROUTING
Tdet= 79.9 MIN (.82 AF)

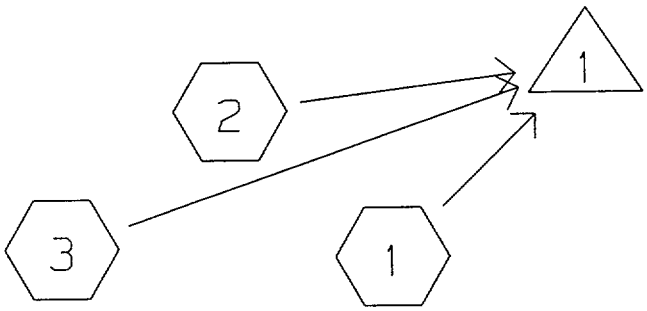
#	ROUTE	INVERT	OUTLET DEVICES
1	P	1048.0'	**126.9 DEG V-NOTCH WEIR**
			Q=2.48 TAN(Theta/2) H^2.5



POND 1 INFLOW & OUTFLOW
Proposed Retention Pond/Post-Construction



WATERSHED ROUTING ==========



SUBCATCHMENT 1	= DA 1: Post-Construction Phase	->	POND 1
SUBCATCHMENT 2	= DA 2: Post-Construction Phase	->	POND 1
SUBCATCHMENT 3	= DA 3: Post-Construction Phase	->	POND 1
POND 1	= Proposed Retention Pond/Post-Construction	->	

SUBCATCHMENT 1 **DA 1: Post-Construction Phase**

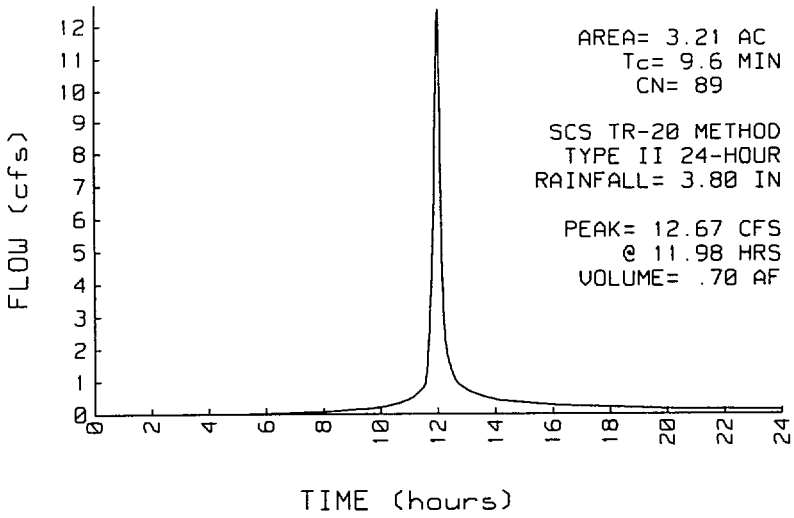
PEAK= 12.67 CFS @ 11.98 HRS, VOLUME= .70 AF

ACRES	CN	
.02	91	Gravel, Haul Road
3.19	89	Pasture, grassland, poor, Type D
3.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 3.80 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	2.7
L=60' s=.0083 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	4.2
L=85' s=.0059 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	1.5
L=205' s=.1902 '/'		
CURVE NUMBER (LAG) METHOD	**DE**	.6
L=80' s=.275 '/'		
CURVE NUMBER (LAG) METHOD	**EF**	.2
L=30' s=.3667 '/'		
RECT/VEE/TRAP CHANNEL	**FG**	.4
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=313' Capacity=635.3 cfs		
	Total Length= 773 ft Total Tc=	9.6

SUBCATCHMENT 1 RUNOFF
DA 1: Post-Construction Phase



SUBCATCHMENT 2 **DA 2: Post-Construction Phase**

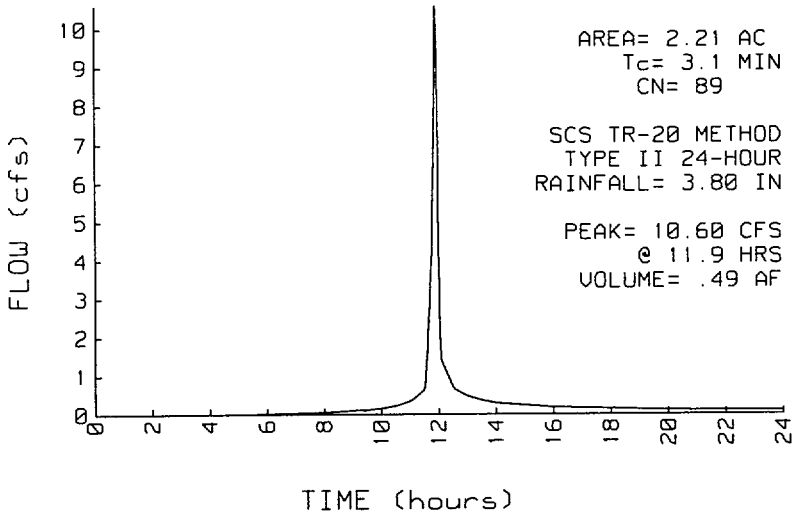
PEAK= 10.60 CFS @ 11.90 HRS, VOLUME= .49 AF

ACRES	CN	
.10	91	Gravel, Haul Road
2.11	89	Pasture, grassland, poor, Type D
2.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 3.80 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	.9
L=45' s=.0444 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	1.2
L=215' s=.3349 '/'		
RECT/VEE/TRAP CHANNEL	**CD**	1.0
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=738' Capacity=635.3 cfs		
	Total Length= 998 ft Total Tc=	3.1

SUBCATCHMENT 2 RUNOFF
DA 2: Post-Construction Phase



SUBCATCHMENT 3 **DA 3: Post-Construction Phase**

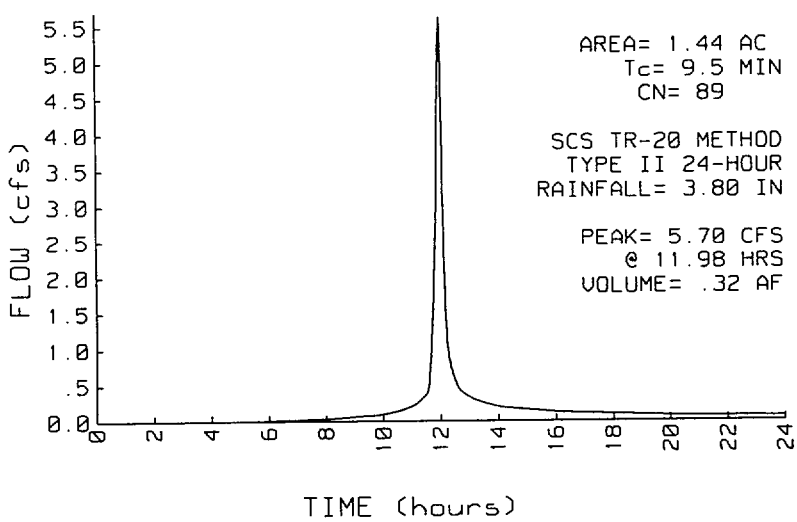
PEAK= 5.70 CFS @ 11.98 HRS, VOLUME= .32 AF

ACRES	CN	
.14	91	Gravel, Haul road
1.30	89	Pasture, grassland, poor, Type D
1.44	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 3.80 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	6.5
L=155' s=.0065 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	.9
L=100' s=.18 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	.4
L=50' s=.32 '/'		
RECT/VEE/TRAP CHANNEL	**Segment ID:**	1.7
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=1323' Capacity=635.3 cfs		
	Total Length= 1628 ft Total Tc=	9.5

SUBCATCHMENT 3 RUNOFF
DA 3: Post-Construction Phase



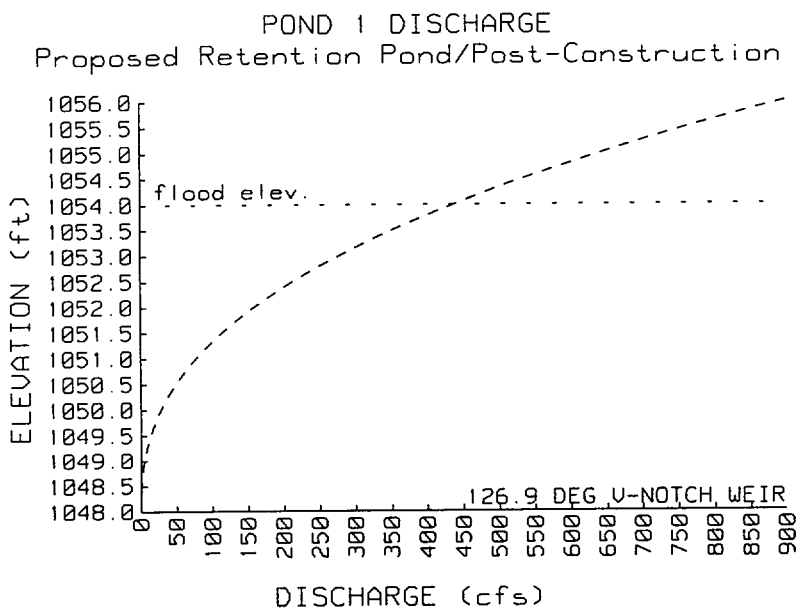
POND 1 **Proposed Retention Pond/Post-Construction**

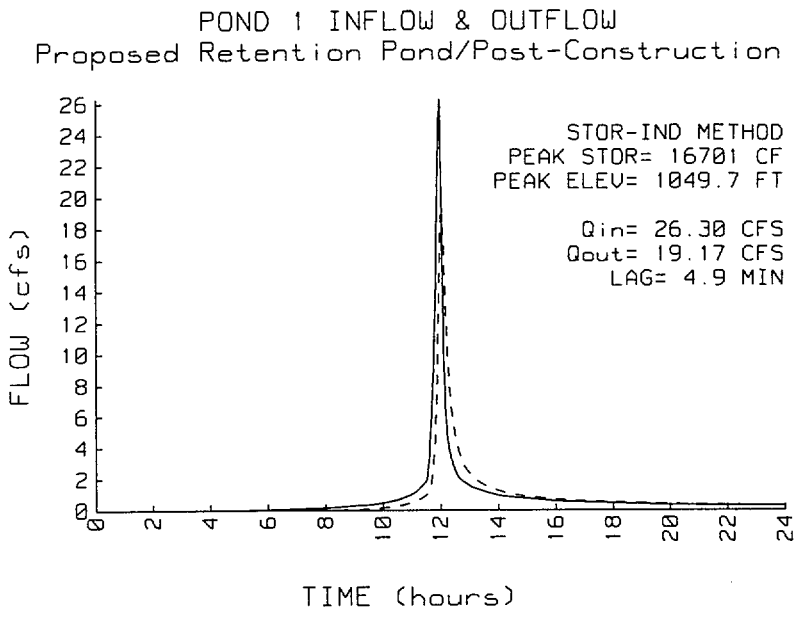
Qin = 26.30 CFS @ 11.94 HRS, VOLUME= 1.51 AF
Qout= 19.17 CFS @ 12.03 HRS, VOLUME= 1.43 AF, ATTEN= 27%, LAG= 4.9 MIN

ELEVATION (FT)	AREA (SF)	INC.STOR (CF)	CUM.STOR (CF)
1048.0	8580	0	0
1050.0	10990	19570	19570
1052.0	14152	25142	44712
1054.0	19060	33212	77924
1056.0	24100	43160	121084

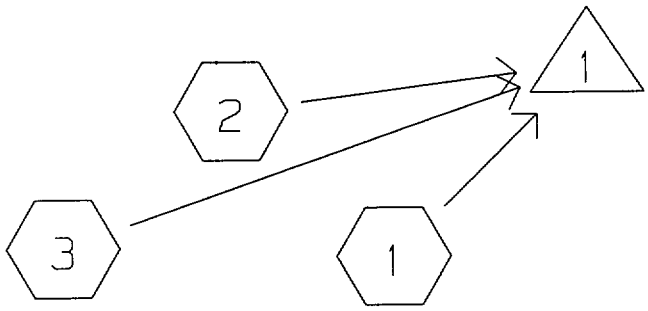
STOR-IND METHOD
PEAK STORAGE = 16701 CF
PEAK ELEVATION= 1049.7 FT
FLOOD ELEVATION= 1054.0 FT
START ELEVATION= 1048.0 FT
SPAN= 0-24 HRS, dt=.05 HRS
4 x FINER ROUTING
Tdet= 60.9 MIN (1.43 AF)

#	ROUTE	INVERT	OUTLET DEVICES
1	P	1048.0'	**126.9 DEG V-NOTCH WEIR**
			Q=2.48 TAN(Theta/2) H^2.5




POND 1 INFLOW & OUTFLOW
Proposed Retention Pond/Post-Construction
STOR-IND METHOD
PEAK STOR= 16701 CF
PEAK ELEV= 1049.7 FT
Qin= 26.30 CFS
Qout= 19.17 CFS
LAG= 4.9 MIN
FLOW (cfs)
TIME (hours)
0
2
4
6
8
10
12
14
16
18
20
22
24
26

WATERSHED ROUTING ==========



SUBCATCHMENT 1	= DA 1: Post-Construction Phase	->	POND 1
SUBCATCHMENT 2	= DA 2: Post-Construction Phase	->	POND 1
SUBCATCHMENT 3	= DA 3: Post-Construction Phase	->	POND 1
POND 1	= Proposed Retention Pond/Post-Construction	->	

SUBCATCHMENT 1 **DA 1: Post-Construction Phase**

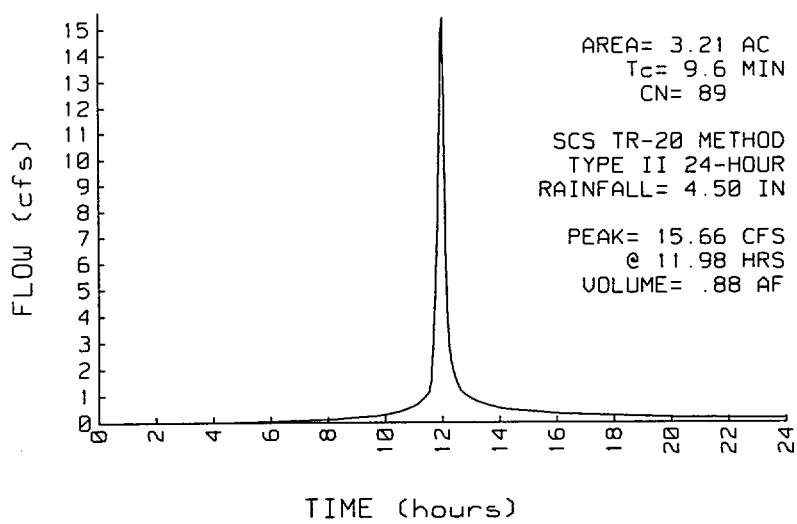
PEAK= 15.66 CFS @ 11.98 HRS, VOLUME= .88 AF

ACRES	CN	
.02	91	Gravel, Haul Road
3.19	89	Pasture, grassland, poor, Type D
3.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 4.50 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	2.7
L=60' s=.0083 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	4.2
L=85' s=.0059 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	1.5
L=205' s=.1902 '/'		
CURVE NUMBER (LAG) METHOD	**DE**	.6
L=80' s=.275 '/'		
CURVE NUMBER (LAG) METHOD	**EF**	.2
L=30' s=.3667 '/'		
RECT/VEE/TRAP CHANNEL	**FG**	.4
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=313' Capacity=635.3 cfs		
	Total Length= 773 ft Total Tc=	9.6

SUBCATCHMENT 1 RUNOFF
DA 1: Post-Construction Phase



SUBCATCHMENT 2 **DA 2: Post-Construction Phase**

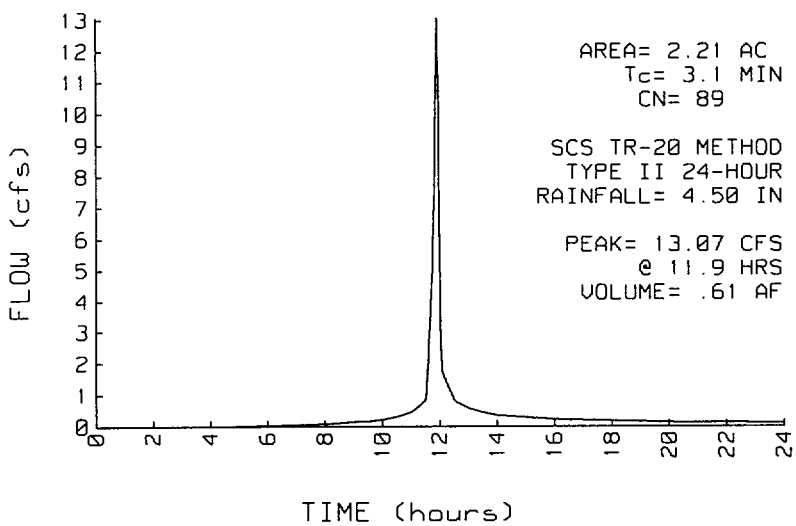
PEAK= 13.07 CFS @ 11.90 HRS, VOLUME= .61 AF

ACRES	CN	
.10	91	Gravel, Haul Road
2.11	89	Pasture, grassland, poor, Type D
2.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 4.50 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	.9
L=45' s=.0444 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	1.2
L=215' s=.3349 '/'		
RECT/VEE/TRAP CHANNEL	**CD**	1.0
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=738' Capacity=635.3 cfs		
	Total Length= 998 ft Total Tc=	3.1

SUBCATCHMENT 2 RUNOFF
DA 2: Post-Construction Phase



SUBCATCHMENT 3 **DA 3: Post-Construction Phase**

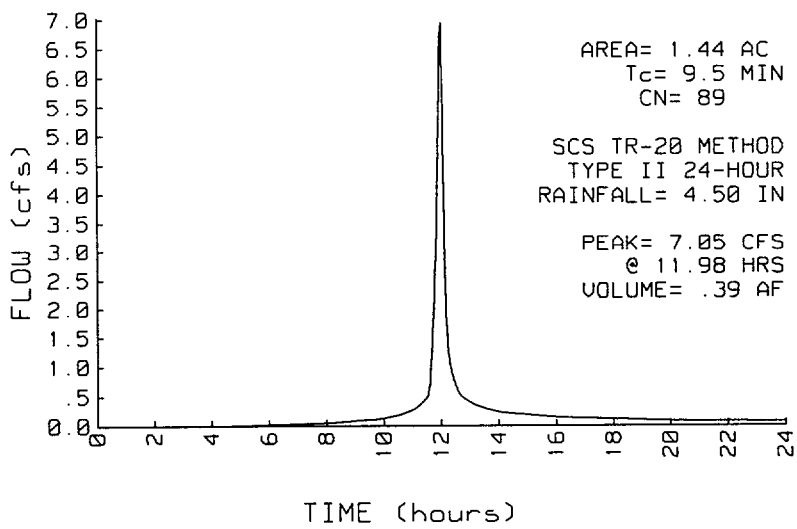
PEAK= 7.05 CFS @ 11.98 HRS, VOLUME= .39 AF

ACRES	CN	
.14	91	Gravel, Haul road
1.30	89	Pasture, grassland, poor, Type D
1.44	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 4.50 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	6.5
L=155' s=.0065 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	.9
L=100' s=.18 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	.4
L=50' s=.32 '/'		
RECT/VEE/TRAP CHANNEL	**Segment ID:**	1.7
D=5' SS= .5 '/' a=50 sq-ft	Pw=22.4' r=2.236'	
s=.01 '/' n=.02 V=12.71 fps	L=1323' Capacity=635.3 cfs	
	Total Length= 1628 ft Total Tc=	9.5

SUBCATCHMENT 3 RUNOFF
DA 3: Post-Construction Phase



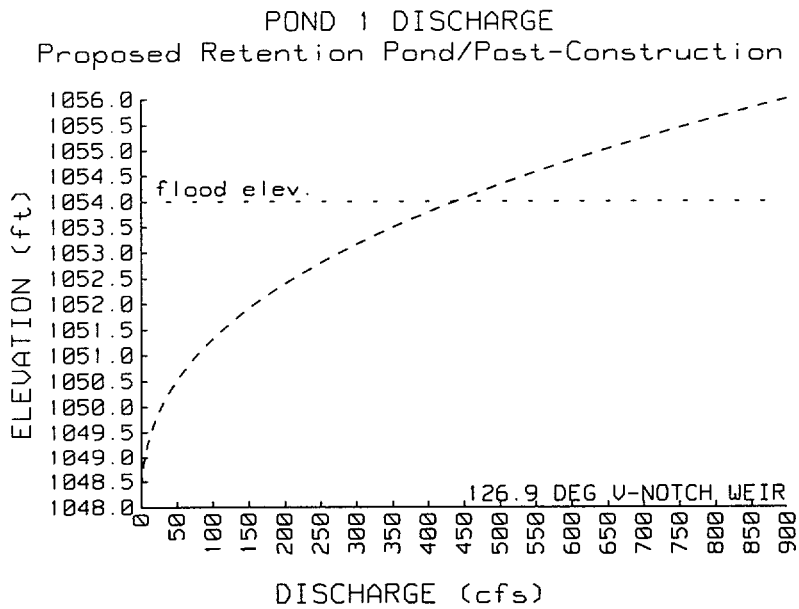
POND 1 **Proposed Retention Pond/Post-Construction**

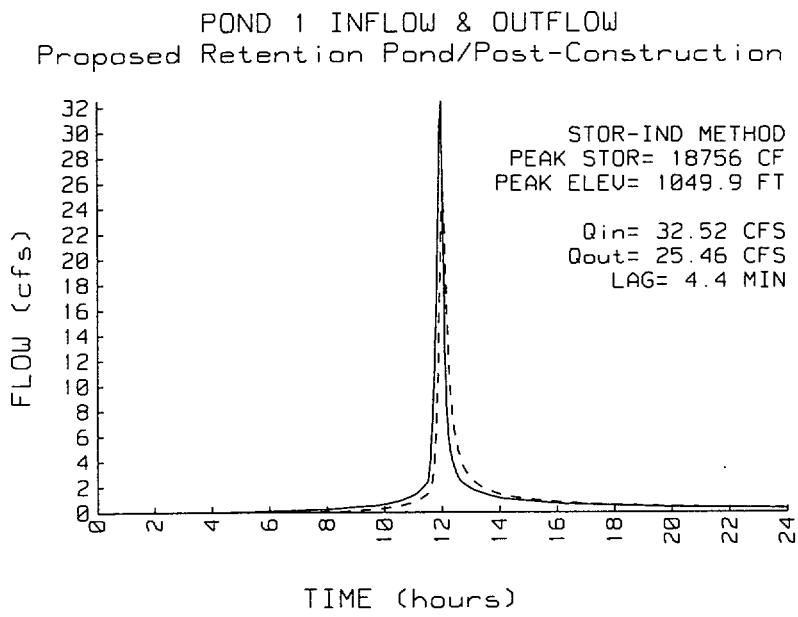
Qin = 32.52 CFS @ 11.94 HRS, VOLUME= 1.88 AF
Qout= 25.46 CFS @ 12.01 HRS, VOLUME= 1.81 AF, ATTEN= 22%, LAG= 4.4 MIN

ELEVATION (FT)	AREA (SF)	INC.STOR (CF)	CUM.STOR (CF)
1048.0	8580	0	0
1050.0	10990	19570	19570
1052.0	14152	25142	44712
1054.0	19060	33212	77924
1056.0	24100	43160	121084

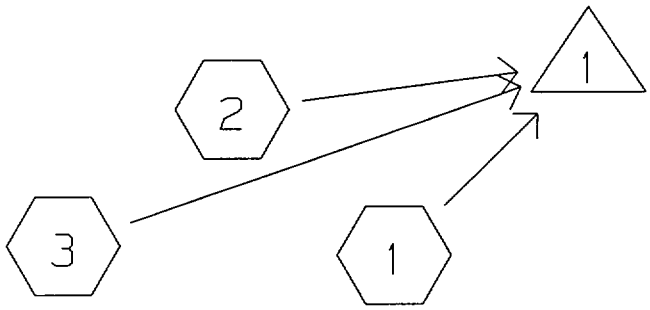
STOR-IND METHOD
PEAK STORAGE = 18756 CF
PEAK ELEVATION= 1049.9 FT
FLOOD ELEVATION= 1054.0 FT
START ELEVATION= 1048.0 FT
SPAN= 0-24 HRS, dt=.05 HRS
4 x FINER ROUTING
Tdet= 54.7 MIN (1.8 AF)

#	ROUTE	INVERT	OUTLET DEVICES
1	P	1048.0'	**126.9 DEG V-NOTCH WEIR**
			Q=2.48 TAN(Theta/2) H^2.5




POND 1 INFLOW & OUTFLOW
Proposed Retention Pond/Post-Construction
STOR-IND METHOD
PEAK STOR= 18756 CF
PEAK ELEV= 1049.9 FT
Qin= 32.52 CFS
Qout= 25.46 CFS
LAG= 4.4 MIN
FLOW (cfs)
TIME (hours)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32

WATERSHED ROUTING ==========



SUBCATCHMENT 1	= DA 1: Post-Construction Phase	->	POND 1
SUBCATCHMENT 2	= DA 2: Post-Construction Phase	->	POND 1
SUBCATCHMENT 3	= DA 3: Post-Construction Phase	->	POND 1
POND 1	= Proposed Retention Pond/Post-Construction	->	

SUBCATCHMENT 1 **DA 1: Post-Construction Phase**

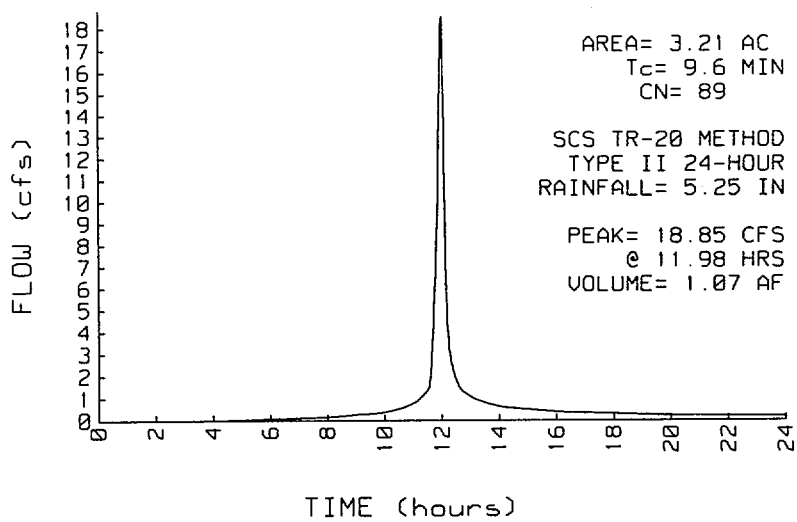
PEAK= 18.85 CFS @ 11.98 HRS, VOLUME= 1.07 AF

ACRES	CN	
.02	91	Gravel, Haul Road
3.19	89	Pasture, grassland, poor, Type D
3.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 5.25 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	2.7
L=60' s=.0083 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	4.2
L=85' s=.0059 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	1.5
L=205' s=.1902 '/'		
CURVE NUMBER (LAG) METHOD	**DE**	.6
L=80' s=.275 '/'		
CURVE NUMBER (LAG) METHOD	**EF**	.2
L=30' s=.3667 '/'		
RECT/VEE/TRAP CHANNEL	**FG**	.4
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=313' Capacity=635.3 cfs		
	Total Length= 773 ft Total Tc=	9.6

SUBCATCHMENT 1 RUNOFF
DA 1: Post-Construction Phase



SUBCATCHMENT 2 **DA 2: Post-Construction Phase**

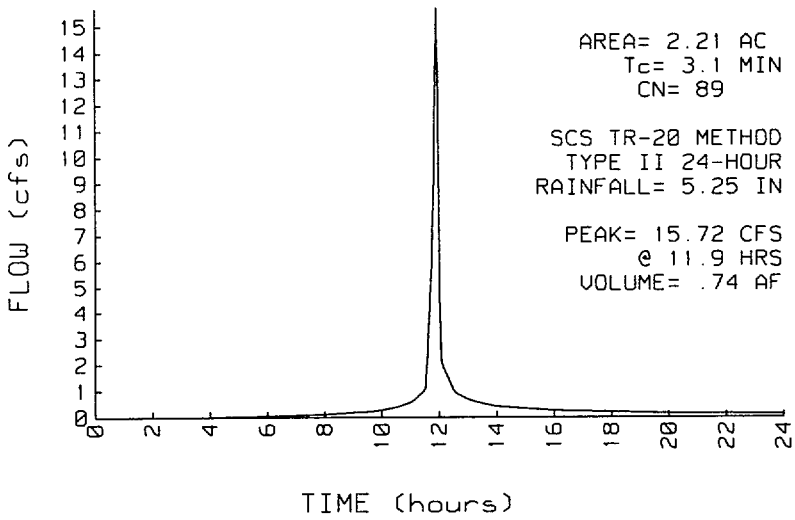
PEAK= 15.72 CFS @ 11.90 HRS, VOLUME= .74 AF

ACRES	CN	
.10	91	Gravel, Haul Road
2.11	89	Pasture, grassland, poor, Type D
2.21	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 5.25 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	.9
L=45' s=.0444 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	1.2
L=215' s=.3349 '/'		
RECT/VEE/TRAP CHANNEL	**CD**	1.0
D=5' SS= .5 '/' a=50 sq-ft	Pw=22.4' r=2.236'	
s=.01 '/' n=.02 V=12.71 fps	L=738' Capacity=635.3 cfs	
	Total Length= 998 ft Total Tc=	3.1

SUBCATCHMENT 2 RUNOFF
DA 2: Post-Construction Phase



SUBCATCHMENT 3 **DA 3: Post-Construction Phase**

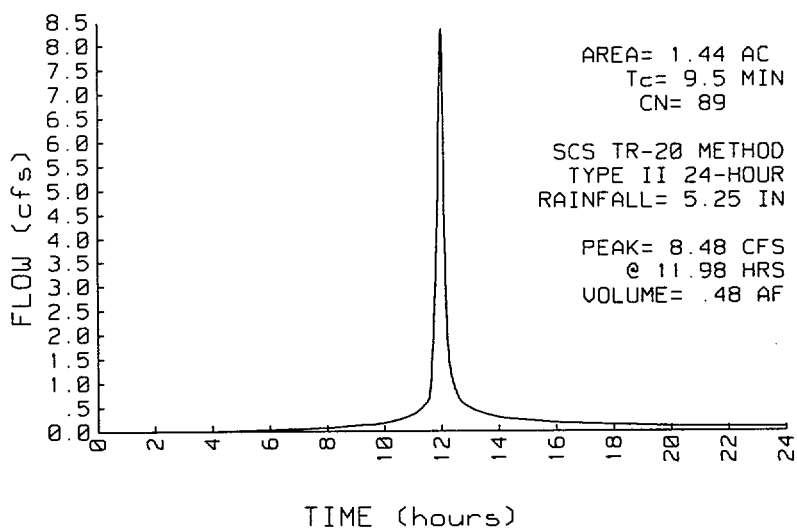
PEAK= 8.48 CFS @ 11.98 HRS, VOLUME= .48 AF

ACRES	CN	
.14	91	Gravel, Haul road
1.30	89	Pasture, grassland, poor, Type D
1.44	89	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 5.25 IN
SPAN= 0-24 HRS, dt=.05 HRS

Method	Comment	Tc (min)
CURVE NUMBER (LAG) METHOD	**AB**	6.5
L=155' s=.0065 '/'		
CURVE NUMBER (LAG) METHOD	**BC**	.9
L=100' s=.18 '/'		
CURVE NUMBER (LAG) METHOD	**CD**	.4
L=50' s=.32 '/'		
RECT/VEE/TRAP CHANNEL	**Segment ID:**	1.7
D=5' SS= .5 '/' a=50 sq-ft Pw=22.4' r=2.236'		
s=.01 '/' n=.02 V=12.71 fps L=1323' Capacity=635.3 cfs		
	Total Length= 1628 ft Total Tc=	9.5

SUBCATCHMENT 3 RUNOFF
DA 3: Post-Construction Phase



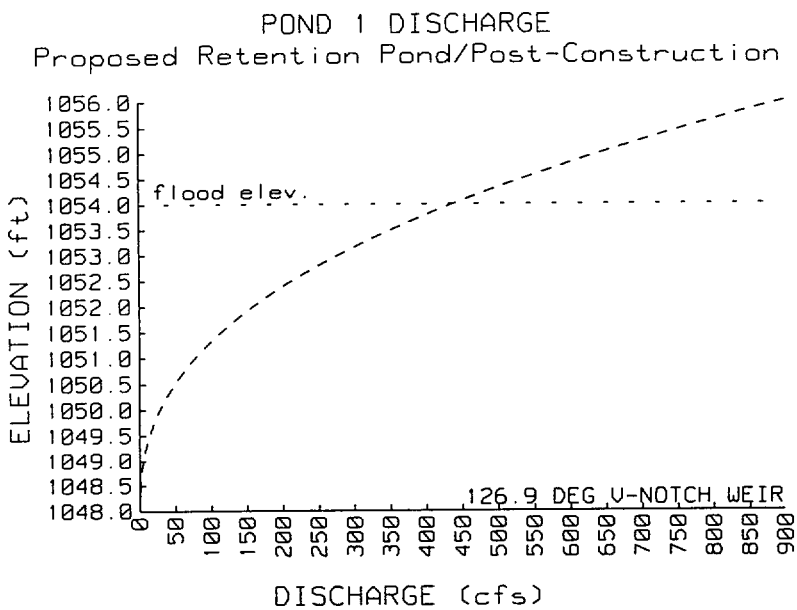
POND 1 **Proposed Retention Pond/Post-Construction**

Qin = 39.18 CFS @ 11.94 HRS, VOLUME= 2.29 AF
Qout= 31.44 CFS @ 12.01 HRS, VOLUME= 2.21 AF, ATTEN= 20%, LAG= 4.1 MIN

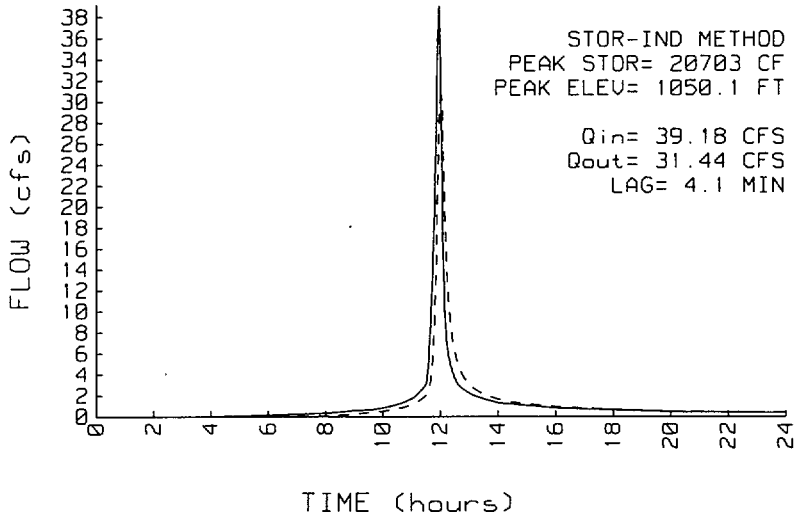
ELEVATION (FT)	AREA (SF)	INC.STOR (CF)	CUM.STOR (CF)
1048.0	8580	0	0
1050.0	10990	19570	19570
1052.0	14152	25142	44712
1054.0	19060	33212	77924
1056.0	24100	43160	121084

STOR-IND METHOD
PEAK STORAGE = 20703 CF
PEAK ELEVATION= 1050.1 FT
FLOOD ELEVATION= 1054.0 FT
START ELEVATION= 1048.0 FT
SPAN= 0-24 HRS, dt=.05 HRS
4 x FINER ROUTING
Tdet= 49.8 MIN (2.21 AF)

#	ROUTE	INVERT	OUTLET DEVICES
1	P	1048.0'	**126.9 DEG V-NOTCH WEIR**
			Q=2.48 TAN(Theta/2) H^2.5



POND 1 INFLOW & OUTFLOW
Proposed Retention Pond/Post-Construction



STONE & WEBSTER ENGINEERING CORPORATION

CALCULATION TITLE PAGE

CLIENT & PROJECT: **Molycorp, Storage Cell, Washington, PA**	PAGE 1 OF 11 + Attachment A (2 p) + Attachment B (3p) & Attachment C (6p)
CALCULATION TITLE (Indicative of Objective): **Riprap Sizing and Freeboard Estimate for the Drainage Ditch along Haul Road**	QA CATEGORY ☒ ☐ - I Nuclear Safety Related ☐ - II ☐ - III ☒ - Non-Safety Related ☐ - ☐ - Fossil/Industrial Plant

CALCULATION IDENTIFICATION NUMBER

J.O. or W.O. NO.	DIVISION & GROUP	CURRENT CALC NO.	OPTIONAL TASK CODE	OPTIONAL WORK PACKAGE NO.
1003401	**H(B)**	**4**		**N/A**

APPROVALS – SIGNATURE & DATE

PREPARER(S)/DATE(S)	REVIEWER(S)/DATE(S)	INDEPENDENT REVIEWER(S)/ DATES(S)	REV. NO. OR NEW CALC. NO.	SUPERCEDES CALC. NO. OR REV. NO.	CONFIRMATION REQUIRED ☒ YES	NO
George Liang 06/22/2000 George Liang	Bruce McCambell 06/23/2000 Bruce McCambell		0	N/A	☐	☒
					☐	☒
					☐	☐
					☐	☐
					☐	☐
					☐	☐

DISTRIBUTION

GROUP	NAME & LOCATION	COPY SENT	GROUP	NAME & LOCATION	COPY SENT
Records Mgmt Fire File	Records Center	☐			☐
PROJECT FILE		☒			☐
		☐			☐

TABLE OF CONTENTS

Section/Title — Page

TITLE PAGE 1
TABLE OF CONTENTS 2
RECORD OF CHANGES 3
1. INTRODUCTION 4
2. OBJECTIVE 4
3. ASSUMPTIONS 4
4. METHODOLOGY 4
5. DETAILS OF CALCULATION 4
6. REFERENCES 10
7. RESULTS 10
8. CONCLUSIONS 10
9. ATTACHMENTS 11
9.1 ATTACHMENT A – DRAINAGE AREA 1, 2, & 3 11
9.2 ATTACHMENT B – SWEC DWG. NO. 10034.01-EY-6B-1, & 10034.01-EY-9B-1 11
9.3 ATTACHMENT C - RIPWIN MODEL COMPUTER OUTPUT FOR: 11
- DRAINAGE AREA 1, DITCH SEGMENT AB 11
- DRAINAGE AREA 2, DITCH SEGMENT BC 11
- DRAINAGE AREA 3, DITCH SEGMENT CD 11
- DRAINAGE DITCH SEGMENT EF 11
- RETENTION POND OUTLET AREA 11

CALCULATION IDENTIFICATION NUMBER				PAGE 3
J.O. OR W.O. NO.	DIVISION & GROUP	CALCULATION NO.	OPTIONAL TASK CODE	
1003401	H(B)	4		

RECORD OF CHANGES

Rev No.	Description of Changes	Pages Revised	Pages Added	Pages Replaced
0	Original Issue	N/A	N/A	N/A

1. INTRODUCTION

The drainage ditch along the Haul Road at Storage Cell site, Washington, PA is used to convey the stormwater runoff to the sediment basin. For protection of the channel against erosion, the channel needs to be riprapped.

2. OBJECTIVE

The objective is to determine (1) the size of the riprap in the drainage ditch for protection against erosion, and (2) the required freeboard for the channel.

3. ASSUMPTIONS

1. Specific Gravity (SG) of the riprap is 2.65.
2. Subsoil Properties:
   - D_{85} (the sieve size 85% of the soil passes) = 0.032 in
   - D_{50} = 0.018 in
   - D_{15} = 0.001 in
3. Coefficient of Uniformity $C_u = 2$
   The coefficient of uniformity is defined as the ratio between D_{60} and D_{10} particle diameters. Small values of C_u imply uniform gradations, and larger values imply non-uniform gradations.

4. METHODOLOGY

Use reprap sizing software "RipWin" (Ref. 1) to determine the riprap size and grading for the drainage ditch. Freeboard is estimated based on equations recommended in Reference 2.

Method Selection:

For steep slopes: 1% (0.01) to 20% (0.2), RipWin program uses a method that was developed for Nuclear Regulatory Commission by Colorado State University , Fort Collins, Colorado, to size riprap for protection against erosion on steep slopes. This method is referenced as the Nuclear Regulatory Commission (NRC) method.

5. DETAILS OF CALCULATION

Channel Design Parameters:

Soil type: Based on ICF Kaiser Engineers, Boring Log

Location	Depth (ft)	Material Description
E12,367.75 N 9,925.52	0 - 11	Silt & Clay
E 9,783.07 N12,655.12	0 -11	Silty clay
E 9,871.97 N11,999.30	0 - 8.3	Clay

Based on Pennsylvania DEP, "Erosion and Sediment Pollution Control Program Manual", March' 00 (Ref. 2):

For design of Temporary Channels:
1.6 cfs/acre or the peak discharge from a 2-yr frequency storm
2.25 cfs/acre or the peak discharge from a 5-yr frequency storm in special protection watersheds

For design of all permanent channels
2.75 cfs/acre or the peak discharge from a 10-yr storm event

Total runoff flow in the ditch section within the drainage area (see Attachment A)

Area 3 = 1.44 acres	Q3=1.44 x 2.75 =	3.96 cfs
Area 2 = 2.21 acres	Q2=(1.44+2.21) x 2.75=	10.04 cfs
Area 1 = 3.21 acres	Q1=(1.44+2.21+3.21) x 2.75=	18.87 cfs

Based on TR-20 computer runs (Calc. No. 1003401-H(B)-2, page 10), peak runoff for post-construction:

Summary of Stormwater Analysis (TR-20 Modeling)
Molycorp/Storage Cell/Washington, PA

Storm Freq'cy(yr)	Rainfall (in)	Peak Runoff (cfs) D. Area	Pre-Const	Post-Const
2	2.6			
		1	6.35	7.65
		2	4.67	6.49
		3	2.78	3.49
		Total	***13.8***	***17.63***
10	3.8			
		1	11.85	12.78
		2	8.74	10.79
		3	5.23	5.84
		Total	***25.82***	***29.41***
25	4.5			
		1	15.23	15.79
		2	11.22	13.3
		3	6.73	7.22
		Total	***33.18***	***36.31***

100	5.25			
		1	18.91	19.01
		2	13.91	15.99
		3	8.35	8.69
		Total	***41.17***	***43.69***

For a nuclear related project, to be conservative, use the peak runoff flow for 100-year rainfall:
Total runoff flow in the ditch section within the drainage area (see Attachment A):

Q3 =	8.69	cfs
Q2 = 8.69 +15.99	24.68	cfs
Q1 = 8.69 +15.99 +19.01	43.69	cfs

Based on DWG # 10034.01-Ey-10A, Section 3, Rip-Rap Ditch Details:

Estimate the cross-section area of the ditch: (bottom width = 2', and assume 1.5 ft water depth)

Area (A) = [2 x 1.5] + 2 x [3 x 1.5 x 1/2] = 3 + 4.5 = 7.5 ft^2

Calculate slope of the ditch: (DWG No. 10034.01-EY-9B-1)

For drainage Area 3 (Ditch Segment AB) :

Final Haul Road to top:	Station	Distance	Elevation	
At top of Haul Road	26+73	2673	1138	
At boundary of Area 1&2	19+00	1900	1082	
Horizontal Distance L= 2673 - 1900 =		773		
Vertical Distance VD = 1138 - 1082 =			56	
Slope s = VD/L =				0.072

For drainage Area 2 (Ditch Segment BC) :

Haul Road Station 19+00		1082	
At boundary of Area 2&1		1055	
Horizontal distance 5.2" x 82.5'/in =	429		
Vertical distance = 1082 - 1055 =		27	
Slope s=VD/L =			0.063

For drainage Area 1 (Ditch Segment CD) :

At boundary of Area 1&2		1055	
At inlet of sediment basin (pond)		1048	
Horizontal distance 2.9" x 82.5'/in =	239		
Vertical distance VD = 1055 -1048 =		7	
Slope s = VD/L =			0.029

For Ditch Segment EF :

Horizontal distance L = (2"+1.4") x 40'/0.32" =	425 ft		
Vertical distance VD = 1130 – 1048 =		82 ft	
Slope s = VD/L = 82/425 =			0.192

Retention Pond Outlet Area :

Horizontal Distance L = 0.6" x 40'/0.32" =	75 ft	
Vertical Distance VD = 1048 – 1036 =		12 ft

Slope s = VD/L = 12/75 0.160

Calculate flow velocity in the drainage ditch, V = [1.486/n] x $r^{2/3}$ x $s^{1/2}$:

Roughness coefficient n=	0.03
p=wetted perimenter of channel = 2+2 x 1.5 x $(5)^{1/2}$ =	8.71 ft
Area A = [2 x 1.5] + 2 x [3 x 1.5 x 1/2] = 3 + 4.5 =	7.50 ft^2
r = hydraulic radius = A/p =	0.86 ft

	Ditch in Area 1	Ditch in Area 2	Ditch in Area 3	D.Seg. EF
N =	0.03	0.03	0.03	0.03
r (ft) =	0.86	0.86	0.86	0.86
$r^{2/3}$ =	0.90	0.90	0.90	0.90
s =	0.03	0.06	0.07	0.19
$s^{1/2}$ =	0.17	0.25	0.27	0.44
V (ft/sec) =	***7.66***	***11.24***	***12.06***	***19.62***

<u>Calculate the Required Freeboard (Ref. 2):</u>

Determine whether stable or unstable flow conditions exist. Uniform flow at or near "critical depth" is unstable due to waves present at the water's surface. Since the height of the waves may exceed the t op of the channel, sufficient freeboard must be provided to prevent channel failure.

Computer the channel's critical slope:

$S_c = 14.46\ n^2\ D_m / R^{4/3}$ (Equation 1)

Where
S_c = critical slope (ft/ft)
n = Manning's coefficient
D_m = mean depth of flow = A/T (ft)
A = cross-section area of the channel (ft^2)
T = channel top width at the water surface (ft)
R = hydraulic radius = A/P (ft)
P = wetted perimeter (ft)

Unstable flow occurs when S_o is between $0.7S_c$ and $1.3S_c$ where: S_o = channel bed slope.

Compute the minimum required freeboard:

If unstable flow conditions exist, compute the minimum required freeboard as follows:

F = (0.025 V) (3 D) = 0.075 VD (Equation 2)

Where:

F = freeboard in ft
V = velocity in fps
D = flow depth in feet

For stable flow conditions, the minimum freeboard should be 25% of the flow depth. The minimum Freeboard for any channel is 6".

	Ditch in Area 1	Ditch in Area 2	Ditch in Area 3	Ditch Segment EF
n =	0.03	0.03	0.03	0.03
D_m (ft) =	1.50	1.50	1.50	1.50
R =	0.86	0.86	0.86	0.86
S_0 =	0.0293	0.0629	0.0724	0.192
V (ft/sec)=	7.66	11.24	12.06	19.62
S_c=(Eq.1)	0.0240	0.0240	0.0240	0.024
$0.7S_c$ =	0.0168	0.0168	0.0168	0.0168
$1.3S_c$ =	0.0312	0.0312	0.0312	0.0312
S_0>0.7&<1.3S_c	yes	no	no	no
Flow Cond.	Unstable	Stable	Stable	Stable
Freeboard	0.86 ft	0.375 ft	0.375 ft	0.375 ft
Eq. 2 or 25% of flow depth, or Minimum 6"	***use 1.0 ft***	***use 0.5 ft***	***use 0.5 ft***	***use 0.5 ft***

Input to RipWin Program

RipWin requires data to be entered into four input categories, e.g. hydraulic characteristics, flow Conditions, subsoil characteristics and riprap characteristics:

Hydraulic Characteristics:

Unit Discharge = discharge per unit width of flow
For example, to discharge 100 cfs evenly over a width of 10 ft,
then the unit discharge would be 100/10 = 10 cfs/ft.

Slope:

The slopes that were tested by CSU during development of the method range from 1% to 20% (0.20)

Flow Conditions:

Riprap can be sized for three flow conditons:

- Overland sheet flow
- Concentrated flow
- Channelized flow

Subsoil Properties:

The subsoil properties are specified by entering the D_{85}, D_{50}, and D_{15} particle diameters. The term D_{85} is the sieve size through which 85% of the soil passes. Similar interpretations are applicable to the variables D_{50} and D_{15}.

For the Haul Road section within drainage Area 1, Ditch Segment CD:
Unit Discharge: Q1 = 43.69/2 = 21.85 cfs/ft
Slope = 0.029

For the Haul Road section within drainage Area 2, Ditch Segment BC:
Unit Discharge: Q2 = 24.68/2 = 12.34 cfs/ft
Slope = 0.063

For the Haul Road section within drainage Area 3, Ditch Segment AB:
Unit Discharge: Q3 = 8.69/2 = 4.35 cfs/ft
Slope = 0.072

For Ditch Segment EF:
Unit Discharge: Q=3.21 x 2.75/2 (PA State Reg., Ref. 2) = 8.8 cfs/2, = 4.4 cfs/ft, use 4 cfs/ft
Slope = 0.19

6. REFERENCES

1. User's Guide, RipWin, Riprap Sizing Software, River & Stream Management Software Company 1996.

2. Erosion and Sediment Pollution Control Program Manual, Department of Environmental Protection, Commonwealth of Pennsylvania, 363-2134-008, March 13, 2000.

5. SWEC Dwg. No. 1003401-EY-9A-1, EY-9B-1.

5. SWEC Dwg. No. 1003401-EY-10A.

6. SWEC Calc. No. 1003401-H(B)-2.

7. RESULTS

See Attachment C

8. CONCLUSIONS

Summary of Riprap Sizing

Riprap Grading

	For Drainage Ditch Bed				For
Percent Smaller	Segment AB Dia (ft)	Segment BC Dia (ft)	Segment CD Dia (in)	Segment EF Dia (ft)	Pond Outlet Dia (ft)
100	2.6[2]	2.6[2]	18.5	2.2	2.7[2]
85	2.1	2.1	15	1.8	2.2
50	1.6	1.6	11.5	1.4	1.7
15	0.8	0.8	5.8	0.7	0.8
NSA No.[1]	R-7	R-7	R-5	R-6	R-7
Thickness	3.2 ft	3.3 ft	23.1 in	2.8 ft	3.4 ft
Freeboard	1.0 ft	0.5 ft	0.5 ft	0.5 ft	0.5 ft

Filter

Percent Smaller	For Drainage Ditch Segment AB (in)	Segment BC (in)	Segment CD (in)	Segment EF (in)	For Pond Outlet (in)
85	1.9	2	1.2	1.7	2.0
15	1	1	0.6	0.8	1.0
NSA No.(1)	FS-3	FS-3	FS-2	FS-3	FS-3
Thickness (in)	19	20	12	17	20
Notes: Bed: Geofabric required at interface between subsoil and reprap.					

Note (1) See Page 24 Table 9 in Reference 2.
(2) The computer model result is an estimate. Using engineering judgement, the maximum size of the riprap is set at 2.5 ft or 30 in to be specified in the specification.

9. ATTACHMENTS

9.1 Attachment A – Drainage Area 1, 2, & 3

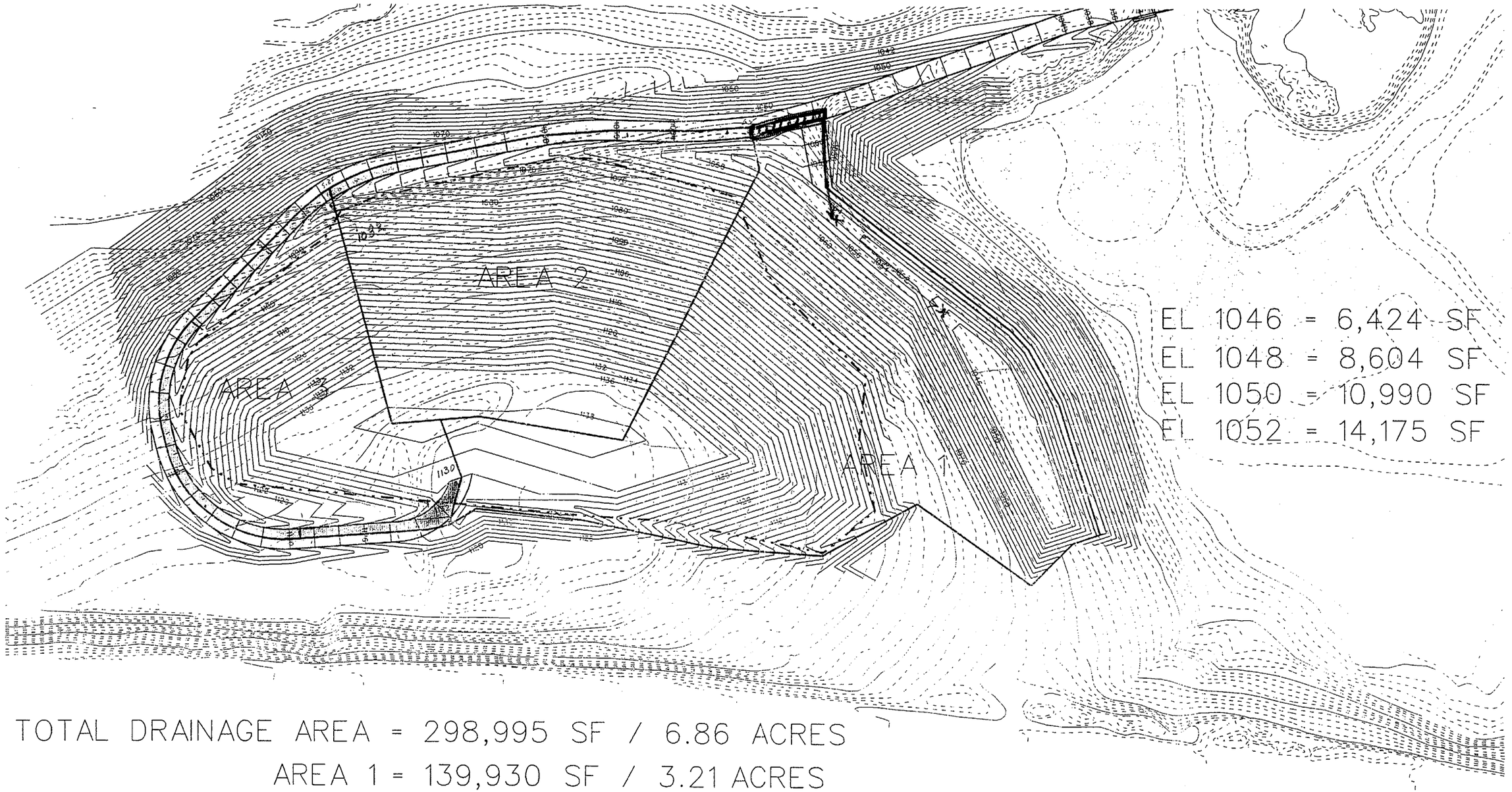
9.2 Attachment B – SWEC DWG. No. 10034.01-EY-6B-1, & 10034.01-EY-9B-1

9.3 Attachment C - RipWin Model Computer Output for:

- ***Drainage Area 1, Ditch Segment AB***
- ***Drainage Area 2, Ditch Segment BC***
- ***Drainage Area 3, Ditch Segment CD***
- ***Drainage Ditch Segment EF***
- ***Retention Pond Outlet Area***

Attachment A

Sketch Showing Drainage Area 1, 2, & 3



TOTAL DRAINAGE AREA = 298,995 SF / 6.86 ACRES

AREA 1 = 139,930 SF / 3.21 ACRES

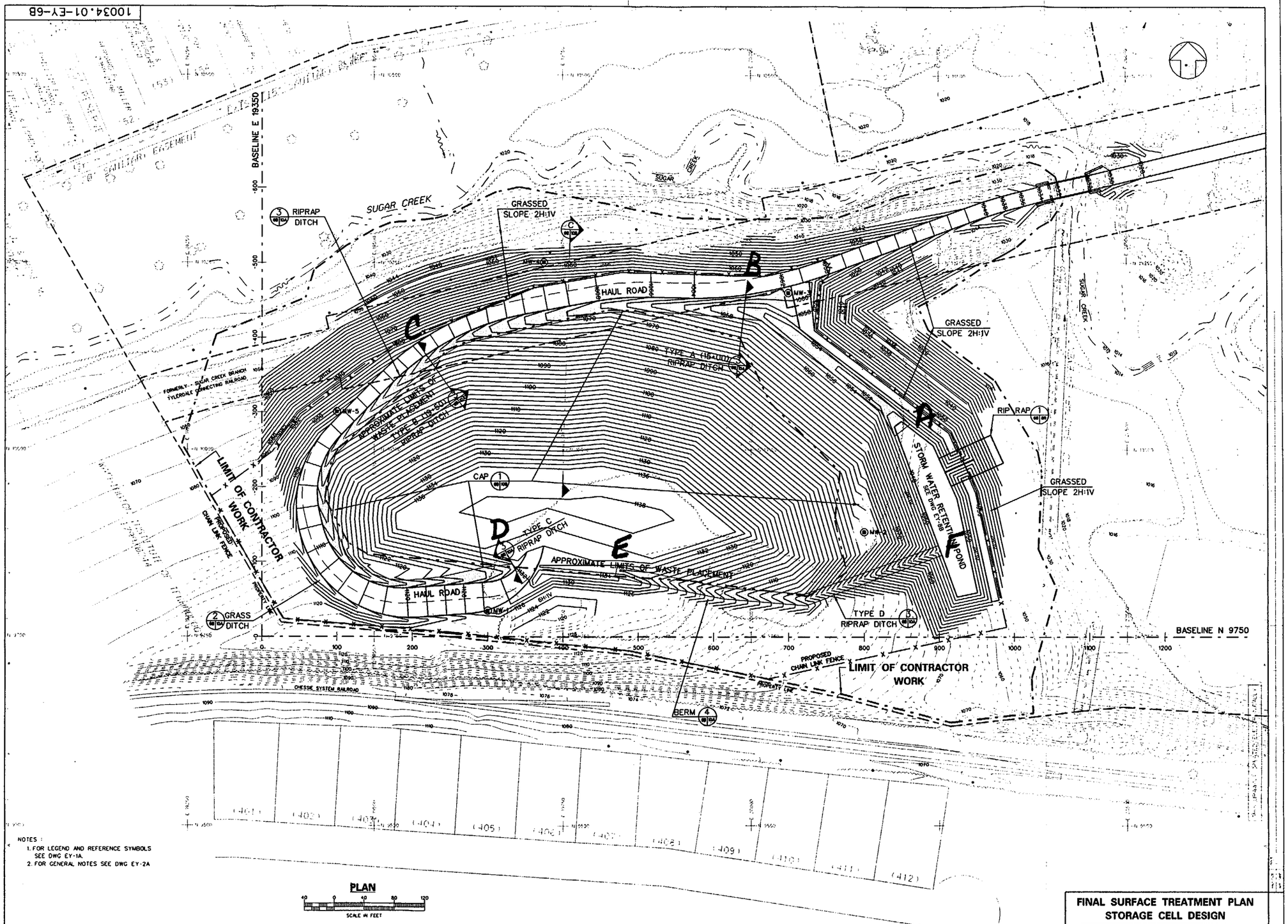
AREA 2 = 96,219 SF / 2.21 ACRES

AREA 3 = 62,846 SF / 1.44 ACRES

Attachment B

SWEC DWG. No. 10034.01-EY-6B-1
&
10034.01-EY-9B-1

10034.01-EY-6B



NOTES :
1. FOR LEGEND AND REFERENCE SYMBOLS SEE DWG EY-1A.
2. FOR GENERAL NOTES SEE DWG EY-2A

PLAN

SCALE IN FEET

FOR NRC DECOMISSIONING PLAN
NOT FOR CONSTRUCTION

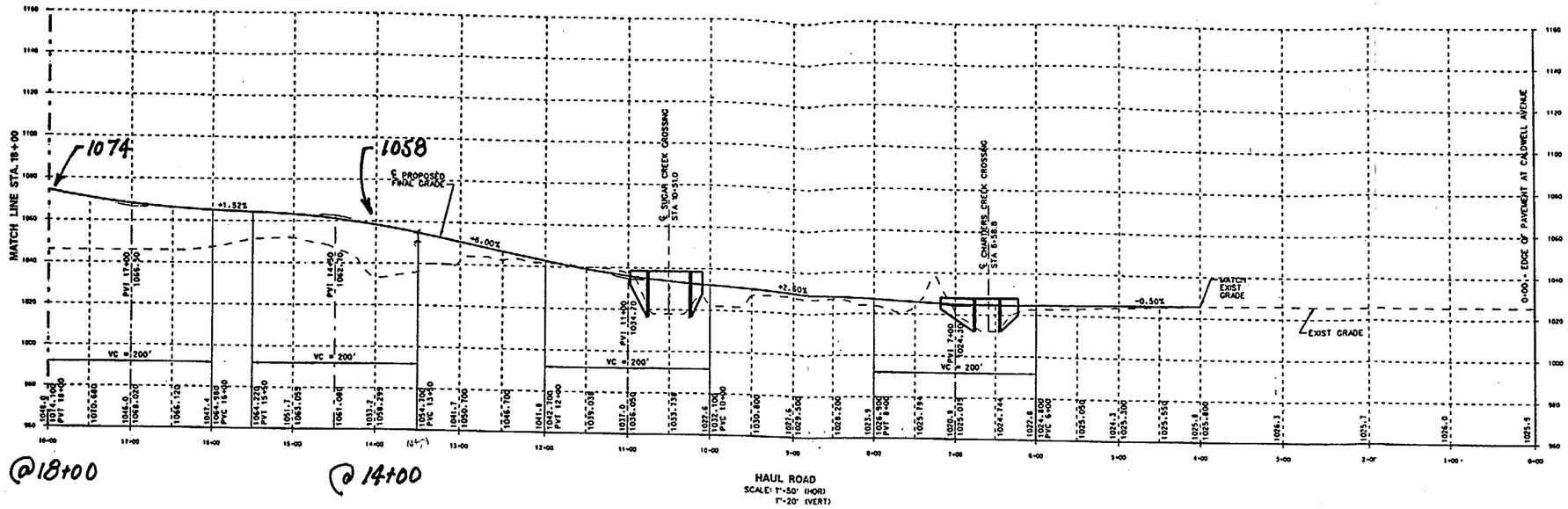
FINAL SURFACE TREATMENT PLAN
STORAGE CELL DESIGN

MOLYCORP, INC.
300 CALDWELL AVENUE WASHINGTON, PA

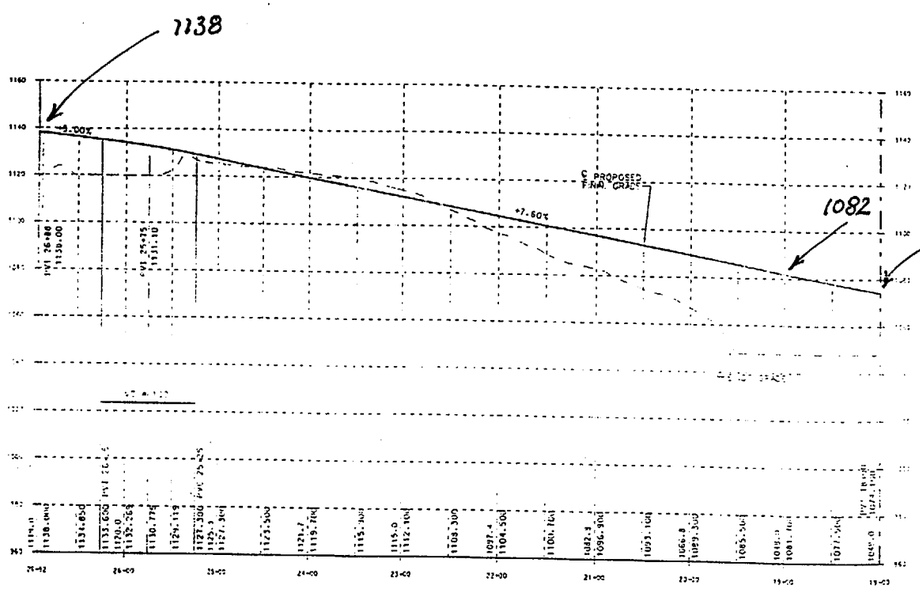
STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASS.

DRAWING NUMBER 10034.01-EY-6B-1

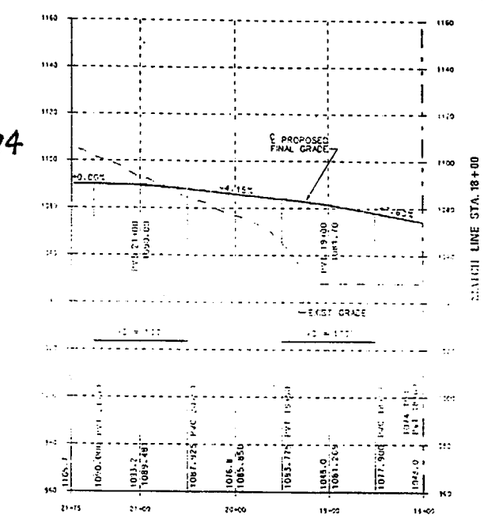
10034.01-EY-98



HAUL ROAD
SCALE: 1"=50' (HOR)
1"=20' (VERT)



FINAL HAUL ROAD TO TOP
SCALE: 1"=50' (HOR)
1"=20' (VERT)



HAUL ROAD TO SITE PREPARATION AREA
SCALE: 1"=50' (HOR)
1"=20' (VERT)

SCALE IN FEET

PRELIMINARY FOR REVIEW

THIS DRAWING CONTAINS CLASSIFIED INFORMATION

HAUL ROAD - PROFILE
STORAGE CELL DESIGN

MOLYCORP, INC.
300 CALDWELL AVENUE WASHINGTON, PA.

STONE & WEBSTER ENGINEERING CORPORATION
DENVER, COLO.

10034.01-EY-98-1

Attachment C

RipWin Model Computer Output
for:

- Drainage Area 1, Ditch Segment AB
- Drainage Area 2, Ditch Segment BC
- Drainage Area 3, Ditch Segment CD
- Drainage Ditch Segment EF
- Retention Pond Outlet Area

Riprap Sizing

Project Name:	Storage Cell/Moly	Engineer:	Liang
Project Number:	1003401	Date:	06-20-00
Task:	Area 1, Ditch Segment AB	Checked:	
Method:	NRC	Date Checked:	
		Units:	English
Filename:	A:\100-A1.STP		

Riprap Grading

Percent Smaller	Bed		Banks			
			Left		Right	
	Diameter (ft)	Weight (lb)	Diameter (in)	Weight (lb)	Diameter (in)	Weight (lb)
100	2.6	1475.0				
85	2.1	791.1				
50	1.6	360.1				
15	0.8	45.0				
Thickness	3.2					

Filter

Percent Smaller	Bed (in)	Left (in)	Right (in)
85	1.9		
15	1.0		
Thickness (in)	19.		

Notes: Bed: Geofabric required at interface between subsoil and bed riprap

Hydraulic Parameters

Hydraulic parameters specified by user: see Input Data

Input Data

Unit Discharge:	21.85 cfs/ft
Slope:	0.029
Flow Condition:	Channelized Flow
Riprap SG:	2.65
Riprap Shape:	Rounded
Riprap Cu:	2.
Subsoil D85:	0.032 in
Subsoil D50:	0.018 in
Subsoil D15:	0.001 in

Riprap Sizing

Project Name:	Storage Cell/Moly	Engineer:	Liang
Project Number:	1003401	Date:	06-20-00
Task:	Area 2, Ditch Segment BC	Checked:	
Method:	NRC	Date Checked:	
		Units:	English
Filename:	A:\100-A2.STP		

Riprap Grading

Percent Smaller	Bed		Banks			
			Left		Right	
	Diameter (ft)	Weight (lb)	Diameter (in)	Weight (lb)	Diameter (in)	Weight (lb)
100	2.6	1535.5				
85	2.1	823.6				
50	1.6	374.9				
15	0.8	46.9				
Thickness	3.3					

Filter

Percent Smaller	Bed (in)	Left (in)	Right (in)
85	2.0		
15	1.0		
Thickness (in)	20.		

Notes: Bed: Geofabric required at interface between subsoil and bed riprap

Hydraulic Parameters

Hydraulic parameters specified by user: see Input Data

Input Data

Unit Discharge:	12.34 cfs/ft
Slope:	0.063
Flow Condition:	Channel
Riprap SG:	2.65
Riprap Shape:	Rounded
Riprap Cu:	2.
Subsoil D85:	0.032 in
Subsoil D50:	0.018 in
Subsoil D15:	0.001 in

Riprap Sizing

Project Name:	Storage Cell/Moly	Engineer:	Liang
Project Number:	1003401	Date:	06-20-00
Task:	Area 3, Ditch Segment CD	Checked:	
Method:	NRC	Date Checked:	
		Units:	English
Filename:	A:\100-A3.STP		

Riprap Grading

Percent Smaller	Bed		Banks			
			Left		Right	
	Diameter (in)	Weight (lb)	Diameter (in)	Weight (lb)	Diameter (in)	Weight (lb)
100	18.5					
85	15.0	Weight				
50	11.5	Not				
15	5.8	Calc'd				
Thickness		23.1				

Filter

Percent Smaller	Bed (in)	Left (in)	Right (in)
85	1.2		
15	0.6		
Thickness (in)	12.		

Notes: Bed: Geofabric required at interface between subsoil and bed riprap

Hydraulic Parameters

Hydraulic parameters specified by user: see Input Data

Input Data

Unit Discharge:	4.35 cfs/ft
Slope:	0.072
Flow Condition:	Channel
Riprap SG:	2.65
Riprap Shape:	Rounded
Riprap Cu:	2.
Subsoil D85:	0.032 in
Subsoil D50:	0.018 in
Subsoil D15:	0.001 in

Riprap Sizing

Project Name:	Storage Cell/Moly	Engineer:	Liang
Project Number:	1003401	Date:	06-20-00
Task:	Area 1A, Ditch Segment EF	Checked:	
Method:	NRC	Date Checked:	
		Units:	English
Filename:	A:\100-A1A.STP		

Riprap Grading

Percent Smaller	Bed		Banks			
			Left		Right	
	Diameter (ft)	Weight (lb)	Diameter (in)	Weight (lb)	Diameter (in)	Weight (lb)
100	2.2	957.1				
85	1.8	513.4				
50	1.4	233.7				
15	0.7	29.2				
Thickness	2.8					

Filter

Percent Smaller	Bed (in)	Left (in)	Right (in)
85	1.7		
15	0.8		
Thickness (in)	17.		

Notes: Bed: Geofabric required at interface between subsoil and bed riprap

Hydraulic Parameters

Hydraulic parameters specified by user: see Input Data

Input Data

Unit Discharge:	4. cfs/ft
Slope:	0.19
Flow Condition:	Channel
Riprap SG:	2.65
Riprap Shape:	Rounded
Riprap Cu:	2.
Subsoil D85:	0.032 in
Subsoil D50:	0.018 in
Subsoil D15:	0.001 in

Riprap Sizing

Project Name:	Storage Cell/Moly	Engineer:	Liang
Project Number:	1003401	Date:	06-20-00
Task:	Retention Pond Outlet Area	Checked:	
Method:	BuRec	Date Checked:	
		Units:	English
Filename:	A:\POND-OUT.SPL		

Riprap Grading

Percent Smaller	Bed		Banks			
			Left		Right	
	Diameter (ft)	Weight (lb)	Diameter (ft)	Weight (lb)	Diameter (ft)	Weight (lb)
100	2.7	1703.5	2.7	1703.5	2.7	1703.5
85	2.2	913.7	2.2	913.7	2.2	913.7
50	1.7	415.9	1.7	415.9	1.7	415.9
15	0.8	52.0	0.8	52.0	0.8	52.0
Thickness	3.4		3.4		3.4	

Filter

Percent Smaller	Bed (in)	Left (in)	Right (in)
85	2.0	2.0	2.0
15	1.0	1.0	1.0
Thickness (in)	20.	20.	20.

Notes: Bed: Geofabric required at interface between subsoil and bed riprap
Banks: Geofabric required at interface between subsoil and bank riprap

Hydraulic Parameters

Flow Velocity:	10.95 fps	Manning's n:	0.035
Flow Depth:	0.8 ft	Froude Number:	2.16

Input Data

Discharge:	31.441 cfs
Left Side Slope:	2.
Right Side Slope:	2.
Base Width:	2. ft
Channel Slope:	0.16
Manning's n:	0.035
Riprap SG:	2.65
Subsoil D85:	0.032 in
Subsoil D50:	0.018 in
Subsoil D15:	0.001 in

STONE & WEBSTER ENGINEERING CORPORATION

5010.64

CALCULATION SHEET

CLIENT & PROJECT	PAGE 1 OF 10
MOLYCORP, INC, PA/ STORAGE CELL DESIGN	+Attachments (236 pp)
CALCULATION TITLE **STORAGE CELL STRUCTURAL STABILITY ANALYSES**	QA CATEGORY (✓) I NUCLEAR SAFETY RELATED ☐ II ☐ III ☑ (other)

CALCULATION IDENTIFICATION NUMBER				OPTIONAL WORK PACKAGE NO.
JOB ORDER NO.	DISCIPLINE	CURRENT CALC NO	OPTIONAL TASK CODE	
1003401	**G(B)**	**06**		N/A

APPROVALS - SIGNATURE & DATE			REV. NO. OR NEW CALC NO.	SUPERSEDES CALC NO. OR REV NO.	CONFIRMATION REQUIRED ☑	
PREPARER(S)/DATE(S)	REVIEWER(S)/DATES(S)	INDEPENDENT REVIEWER(S)/DATE(S)			YES	NO
J.C. Shiau 4-14-00 JC Shiau	Thomas Y. Chang 4-14-00 Thomas Y. Chang		0	N/A		✓

DISTRIBUTION

GROUP	NAME & LOCATION	COPY SENT (✓)	GROUP	NAME & LOCATION	COPY SENT (✓)
RECORDS MGT. FILES (OR FIRE FILE IF NONE)	JOB BOOK	ORIG			
	FIRE FILE	☑			

5010.65

CALCULATION SHEET

CALCULATION IDENTIFICATION NUMBER				PAGE 2 OF 10
J.O. OR W.O. NO.	DIVISION & GROUP	CALCULATION NO.	OPTIONAL TASK CODE	
1003401	G(B)	06	N/A	

TABLE OF CONTENTS

Page No.

TITLE PAGE 1

TABLE OF CONTENTS 2

RECORD OF REVISIONS 3

OBJECTIVE OF CALCULATION 4

CALCULATION METHOD/ASSUMPTIONS 4

Soil Properties 4-5

Stability of Filter Drainage Bedding/Riprap over Clay Liner During a Large Storm 5-7

Stability of Filter Drainage Bedding/Topsoil & Cover Soil over Clay Liner During a Prolonged Rainfall 7-8

RESULTS 8-9

CONCLUSIONS 9

REFERENCES 9

ATTACHMENTS 8-9

A FIGURES 5pp

B STABILITY ANALYSES - COMPUTER INPUT / OUTPUT ..... 231 PP

RECORD OF REVISIONS

REVISION 0

Original Issue

OBJECTIVE OF CALCULATION:

The objective of this calculation is to determine the structural stability (minimum factor of safety) of storage cell.

CALCULATION METHOD/ASSUMPTIONS:

Structural stability analyses were performed for storage cell based on the 60% design plan. Location and geometry of the cross section analyzed are shown on Figures 1 through Figure 5. Both static and seismic analyses were performed for each section. The SLOPE/W computer software program developed by GEO-SLOPE International was used to evaluate two-dimensional slope stability of the section. The input parameters and stability results are discussed below.

Soil Properties

The following soil properties were used for the analysis:

Cap Systems:

(Soil 1)

Filter Drainage Bedding / Riprap	$\phi = 32°$ cohesion = 0 psf Total Unit Weight = 130 pcf
Or	
Clay Liner	$\phi = 25°$ cohesion = 100 psf Total Unit Weight = 130 pcf
Or	
Filter Drainage Bedding/Topsoil & Cover Soil	$\phi = 28°$ cohesion = 0 psf Total Unit Weight = 120 pcf

Thoriated Slag:
(Soil 2)

$\phi = 30°$
cohesion = 0 psf
Total Unit Weight = 115 pcf

Embankment:
(Soil 3)

$\phi = 32°$
cohesion = 0 psf
Total Unit Weight = 125 pcf

Seismic Coefficient: $a_h = 0.05g$

The storage cell and cap cover systems are founded directly on the essentially horizontally bedded sound rock. Slope stability failure through foundation bedrock is unlikely, therefore, they are not calculated. The failure surfaces of soil along storage cell slopes were analyzed.

Circular failure surfaces through the slag material and cap system for deep-seated slope and shallow slope were evaluated. For simplicity, the cap cover system including 2 feet of compacted clay liner, one foot of filter drainage bedding and 2 feet of riprap biotic and slope erosion protection cover was modeled as either a single 5 feet layer of filter drainage bedding/riprap or a single 5 feet layer of clay liner. The cap cover section including 2 feet of compacted clay, one foot of filter drainage bedding and 2 feet of topsoil (6")/Cover soil (18") was modeled as a single 5 feet layer of drainage bedding/topsoil and cover soil. For this vegetated cap cover system, the storage cell slope stability analyses were performed only for the steepest slope of Section 3-3. A critical failure surface was searched through a trial and error method by moving the failure circular from deeper location toward shallow surface.

<u>Stability of Filter Drainage Bedding / Riprap over Clay Liner during a Large Storm</u>

During a large storm, the surface water will percolate down through riprap and filter drainage bedding and perch on top of the clay liner then flow down along storage cell slope to the base. It is extreme unlikely the filter drainage bedding/riprap cover will ever be completely saturated for any storm. However, for conservative reason, the slope stability of the completely saturated cap cover is evaluated using the analysis of infinite slope with seepage parallel to slope.

Cap cover consists of 2' riprap, 1' filter drainage bedding over 2' clay liner.

Assume the saturated total unit weight for riprap/filter drainage bedding is $\gamma_t = 140$ pcf, then buoyant unit weight $\gamma_b = 140-62.4 = 77.6$ pcf.

The maximum slope of the storage cell is 3H : 1V. Therefore slope angle is $i = \tan^{-1} 1/3 = 18.4°$.

Assume failure surface go through bottom of filter drainage bedding, for F.S. =1,

$\tan i = \gamma_b/\gamma_t \tan \phi$ (P.354 Ref. 1).

For slope to be stable, it is required that

$\tan \phi >= (\gamma_t/\gamma_b) \tan i$

$= (140/77.6) \tan (18.4°) = 0.6$

$\phi = \tan^{-1} (0.6) = 31°$.

The compacted filter drainage bedding will have friction angle equal to or greater than 32°, therefore the cap cover will be stable even in this extreme unlikely event.

Assume failure surface go through top of clay liner, for F.S. =1,

$C/(\gamma_t H_c) = (\cos^2 i)(\tan i - \gamma_b/\gamma_t \tan \phi)$ (P.355 Ref. 1).

Where H_c is the depth measured vertically to the failure plane.

For cap cover of 2' riprap, 1' filter drainage bedding over 2' clay liner, the depth is

$H_c = (2+1)/\cos (18.4°) = 3.16'$.

Assume clay liner $\phi = 25°$ to determine c required for F.S. =1,

$c= (\gamma_t H_c) (\cos^2 i)(\tan i - \gamma_b/\gamma_t \tan \phi)$

$= (140x3.16) \cos^2 (18.4°)(\tan 18.4° - 77.6/140 \tan 25°)$

$=442.4x\ 0.9x(.33-.26)$

$=27.9$ psf, say 30 psf.

The compacted clay liner will have cohesion equal to or greater than 100 psf and friction $\phi = 25°$, therefore, the riprap/filter drainage bedding will be stable even under this extreme unlikely event.

Stability of Filter Drainage Bedding / Topsoil and Cover Soil over Clay Liner during a Prolonged Rainfall

During a prolonged rainfall, the surface water will slowly percolate down through vegetated topsoil and cover soil and may completely saturate the topsoil and cover soil cap. The water then continuously percolate down through drainage bedding and perch on top of the clay liner and flow along storage cell slope to the bases. The drainage bedding has the permeability value several order magnitude higher than the topsoil/cover soil cap. It is extreme unlikely, the drainage bedding/topsoil and cover soil will ever be completely saturated for any prolonged rainfall. However, for conservative reason, the soil stability of the completely saturated cap cover is evaluated using the analysis of infinite slope with flow parallel to the slope.

For a frictional material with no cohesion under the conditions of flow parallel to the slope (i.e., pore-pressure characterized by r_u, the factor of safety is calculated as the following equation.

Factor of Safety = $(1- r_u \sec^2 \alpha) \tan \phi / \tan \alpha$ (Ref. 2).

Where α = Angle of the slope

ϕ = Friction angle of soil

$r_u = u/\gamma h$

u = Pore water pressure

γ = Unit weight of soil

h = The depth of the point in the soil mass below the ground surface.

At the interface of the drainage bedding and topsoil/cover soil cap, conservatively assuming the pore pressure will be 50% of the value of hydrostatic pressure from the slope ground surface,

Then,

r_u =(0.5*2*62.4/125*2)=.25.

Therefore, the factor of safety for the saturated topsoil/cover soil cap sliding along the interface between drainage bedding, and topsoil/cover soil cap is calculated as:

$$F.S. = (1 - 0.25\sec^2 18.4°) \tan 28°/\tan 18.4°$$
$$=(1-0.25*1.11)*1.60$$
$$=1.16 > 1.0.$$

Therefore, the topsoil/cover soil cap will be stable even under this extreme unlikely conditions.

Results

The results of stability analyses are presented in the Attachment B.

Minimum values of factors of safety for each section analyzed are summarized in the following table.

Minimum Factor of Safety

Section	Slope Failure Mode	Cap Cover System Modeled As			
		Filter Drainage Bedding/Riprap		Clay Liner	
		Static	Seismic	Static	Seismic
1-1	Shallow/Lower	2.24	1.87	2.30	1.92
2-2	Shallow/Lower	1.85	1.58	1.92	1.64
2-2	Shallow/Upper	1.87	1.60	1.94	1.66
3-3	Shallow/Lower	1.83	1.57	1.88	1.61
3-3	Shallow/Upper	1.85	1.58	1.91	1.64
3-3	Middle/Upper	2.46	2.08	2.47	2.09
4-4	Shallow/Lower	1.85	1.58	1.91	1.63
4-4	Shallow/Upper	1.86	1.59	1.91	1.63

Minimum Factor of Safety

Section	Slope Failure Mode	Cap Cover System Modeled As	
		Filter Drainage Bedding/Topsoil & Cover Soil	
		Static	Seismic
3-3	Shallow/Lower	1.77	1.52

Circular failure surfaces were also performed for different depths at upper slope for Section 3-3 to demonstrate the change of factor of safety as failure surface moves from deeper-seated failure surface to shallow surface. Factor of safety for deep-seated slope failure surface at mid-depth is 2.46 and decreases as circular of failure surface closes to the shallow depth to be 1.85 under static loading condition as demonstrated in section 3-3. Factor of safety is converging to similar value if failure reaches to the similar shallow depth for either failure along lower shallow slope or upper deep-seated slope as shown on sections 2-2, 3-3 and 4-4. Section 1-1 has slightly flatter slope, therefore the factor of safety for shallow failure is slightly higher than the factors of safety of sections 2-2, 3-3, and 4-4.

CONCLUSIONS

Based on the above discussion, the minimum factor of safety is approximately 1.52 for storage cell slope under seismic condition. Under static condition, the minimum factor of safety is 1.77. This is for the condition of cap system which including 2 feet of compacted clay liner, one foot of drainage bedding, and 2 feet of topsoil (6")/cover soil (18") with vegetation.

Reference:

1 Lamb and Whitman, 1969, "Soil Mechanics".
2 Geo-Slope International, 1998, "SLOPE/W for Slope Stability Analysis", Version 4.

Attachments

A Figures (5 pp)

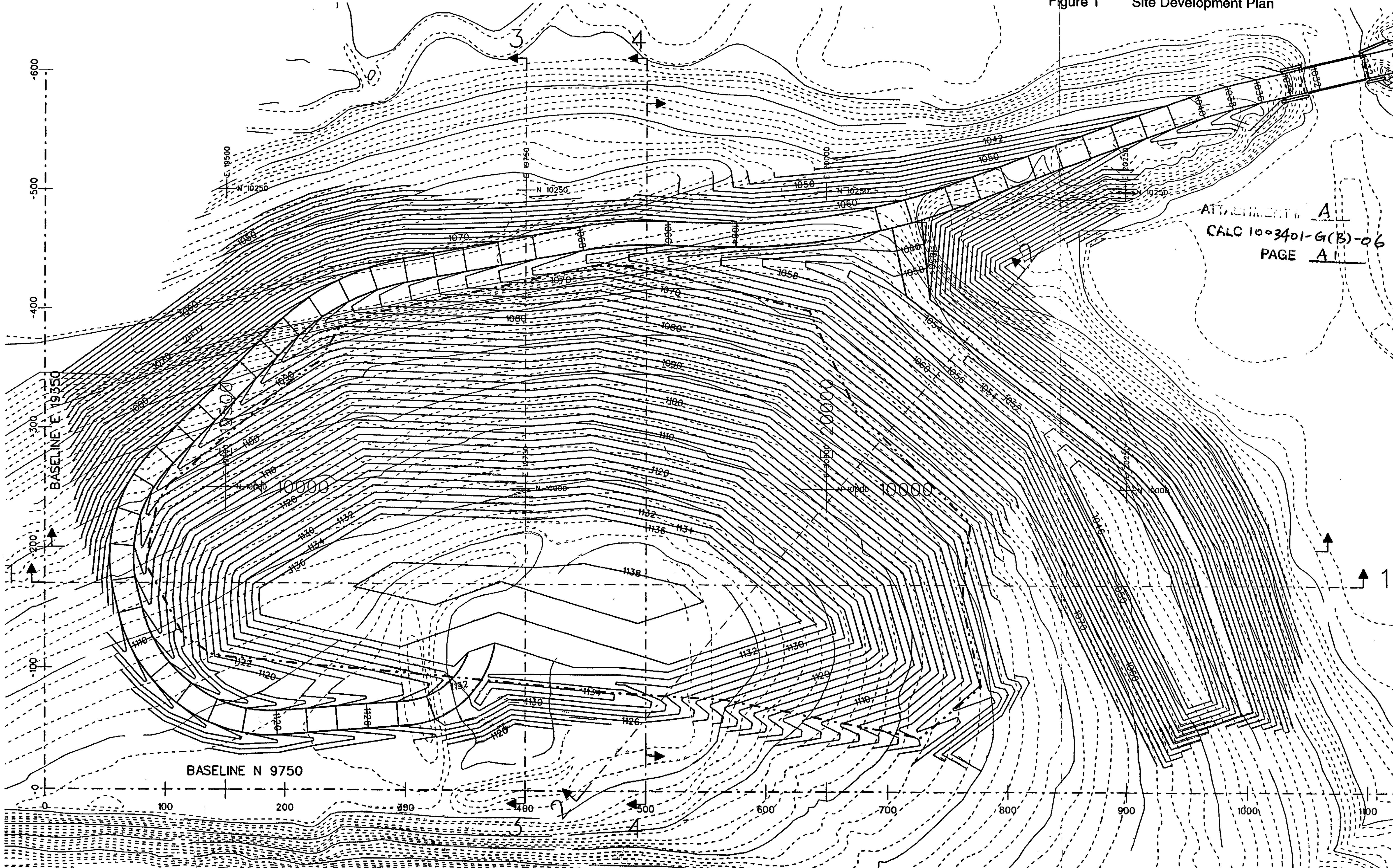
Figure 1	Site Development Plan (p.1)
Figure 2	Section 1-1 Profile (p.2)
Figure 3	Section 2-2 Profile (p.3)
Figure 4	Section 3-3 Profile (p.4)
Figure 5	Section 4-4 Profile (p.5)

B Stability Analyses - Computer Input / Output (217 pp)

Section 1-1 (Lower Shallow)	5' Filter Drainage/Bedding Cover with Static Loading (1-7)
	5' Filter Drainage/Bedding Cover with Seismic Loading (8-14)
	5' Clay Liner Cover with Static Loading (15-21)
	5' Clay Liner Cover with Seismic Loading (22-28)

Section 2-2 (Lower Shallow)	5' Filter Drainage/Bedding Cover with Static Loading (29-34) 5' Filter Drainage/Bedding Cover with Seismic Loading (35-40) 5' Clay Liner Cover with Static Loading (41-46) 5' Clay Liner Cover with Seismic Loading (47-53)
Section 2-2 (Upper Shallow)	5' Filter Drainage/Bedding Cover with Static Loading (54-59) 5' Filter Drainage/Bedding Cover with Seismic Loading (60-65) 5' Clay Liner Cover with Static Loading (66-71) 5' Clay Liner Cover with Seismic Loading (72-77)
Section 3-3 (Lower Shallow)	5' Filter Drainage/Bedding Cover with Static Loading (78-84) 5' Filter Drainage/Bedding Cover with Seismic Loading (85-91) 5' Clay Liner Cover with Static Loading (92-98) 5' Clay Liner Cover with Seismic Loading (99-105)
Section 3-3 (Upper Shallow)	5' Filter Drainage/Bedding Cover with Static Loading (106-112) 5' Filter Drainage/Bedding Cover with Seismic Loading (113-119) 5' Clay Liner Cover with Static Loading (120-126) 5' Clay Liner Cover with Seismic Loading (127-133)
Section 3-3 (Upper Middle)	5' Filter Drainage/Bedding Cover with Static Loading (134-140) 5' Filter Drainage/Bedding Cover with Seismic Loading (141-147) 5' Clay Liner Cover with Static Loading (148-154) 5' Clay Liner Cover with Seismic Loading (155-161)
Section 4-4 (Lower Shallow)	5' Filter Drainage/Bedding Cover with Static Loading (162-168) 5' Filter Drainage/Bedding Cover with Seismic Loading (169-175) 5' Clay Liner Cover with Static Loading (176-182) 5' Clay Liner Cover with Seismic Loading (183-189)
Section 4-4 (Upper Shallow)	5' Filter Drainage/Bedding Cover with Static Loading (190-196) 5' Filter Drainage/Bedding Cover with Seismic Loading (197-203) 5' Clay Liner Cover with Static Loading (204-210) 5' Clay Liner Cover with Seismic Loading (211-217)
Section 3-3 (Lower Shallow)	5' Drainage Bedding/Topsoil & Cover Soil with Static Loading (218-224) 5' Drainage Bedding/Topsoil & Cover Soil with Seismic Loading (225-231)

Figure 1 Site Development Plan



ATTACHMENT A
CALC 1003401-G(B)-06
PAGE A1

Figure 2 Section 1-1 Profile

ATTACHMENT # A
CALC 1003401-G(B)-06
PAGE A2

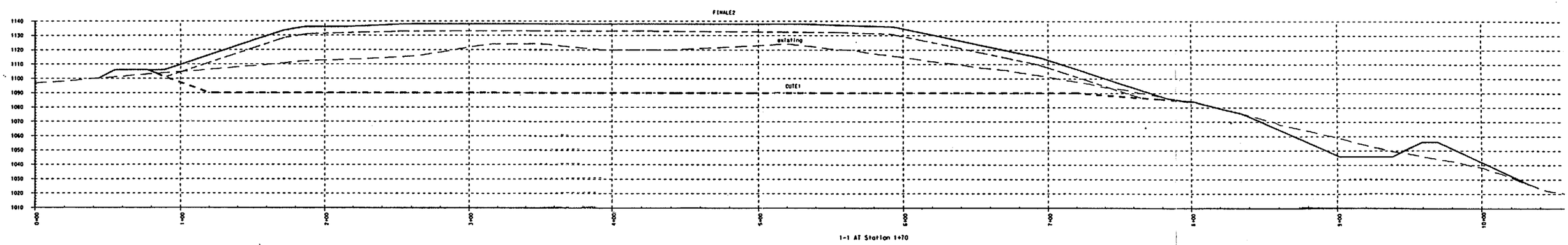
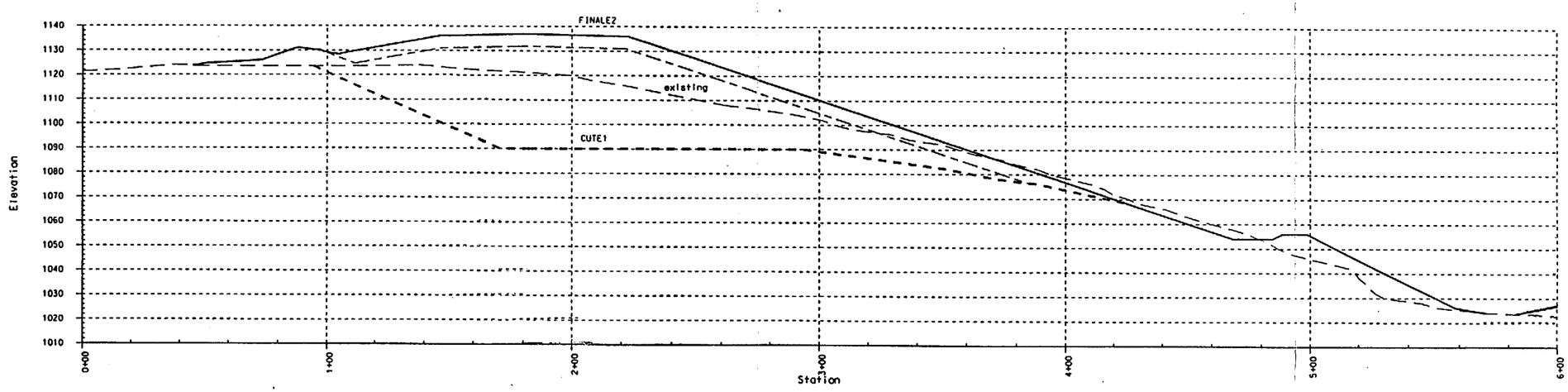


Figure 3 Section 2-2 Profile

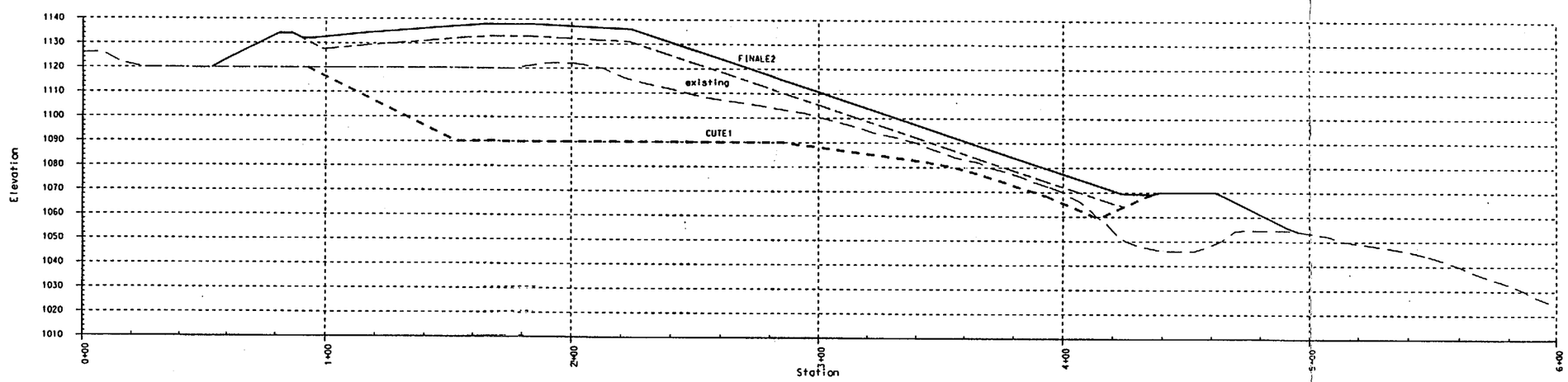
ATTACHMENT # A
CALC 1003401-G(B)-06
PAGE A3



2-2 AT Station 4+50 AA=50°

Figure 4 Section 3-3 Profile

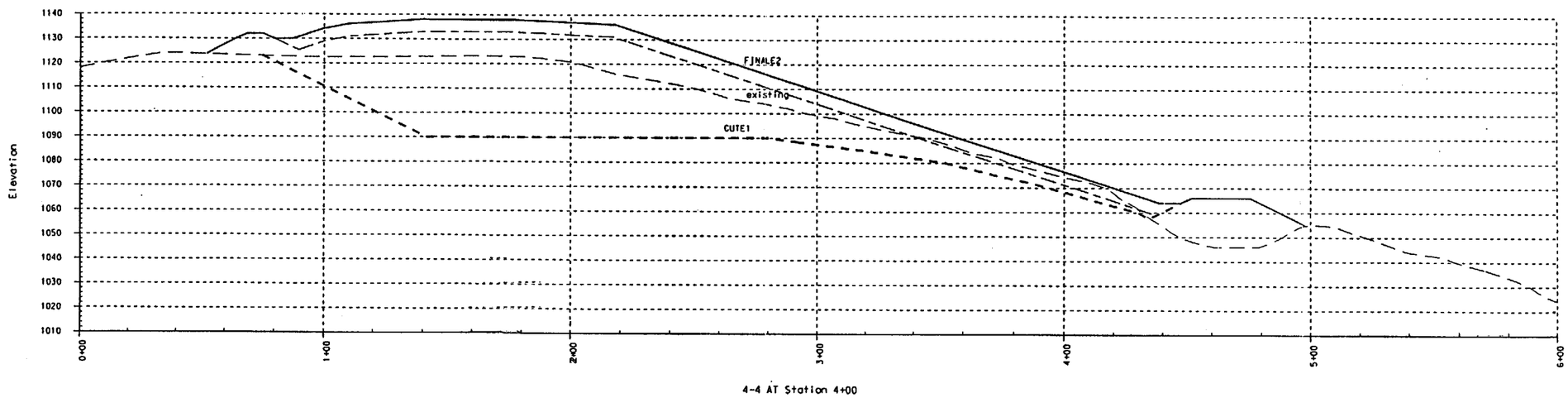
ATTACHMENT # A
CALC 1003401-G(B)-06
PAGE 4



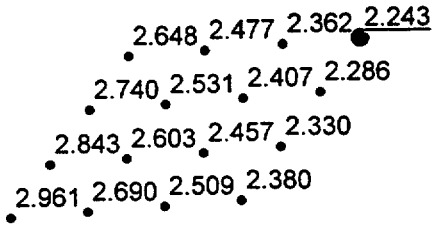
3-3 AT Station 5+00

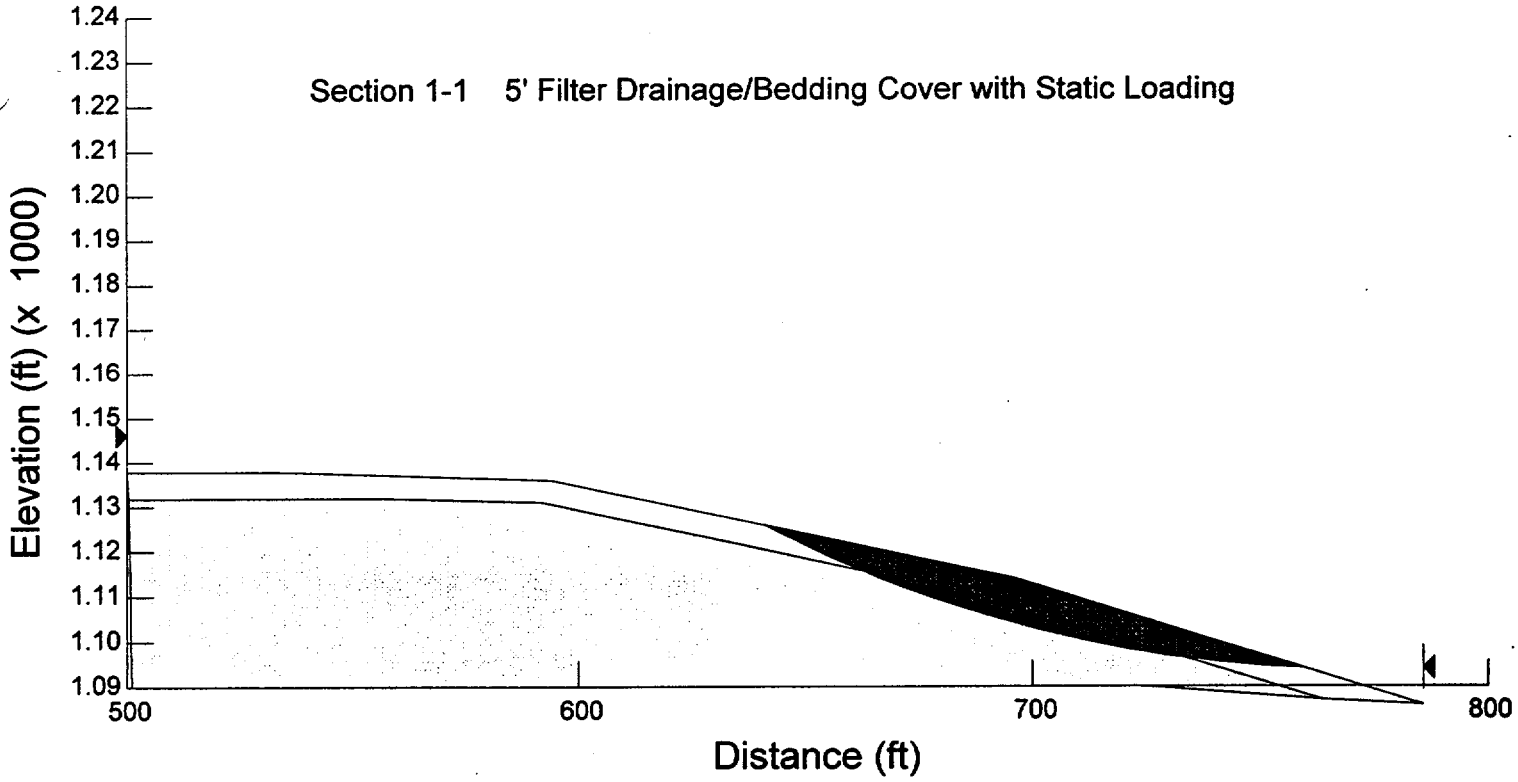
Figure 5 Section 4-4 Profile

ATTACHMENT # A
CALO 10034-6(B)-06
PAGE 5



ATTACHMENT # B
CALC 10034-01-G(B)-06
PAGE 1





```
FILEINFO
SLOPEW 4.22
TITLE


03/28/2000
3:54:39 PM
ANALYSIS
    1     2     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL           3
    1 +1.3000e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Soil
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION      0
AFUNCTION      0
POINT         19
    1 +5.0000e+002 +1.1380e+003
    2 +5.3400e+002 +1.1380e+003
    3 +5.9400e+002 +1.1360e+003
    4 +6.9600e+002 +1.1140e+003
    5 +7.8600e+002 +1.0860e+003
    6 +5.0042e+002 +1.1319e+003
    7 +5.5500e+002 +1.1320e+003
    8 +5.9200e+002 +1.1310e+003
    9 +6.9300e+002 +1.1090e+003
   10 +7.6400e+002 +1.0870e+003
   11 +5.0100e+002 +1.0900e+003
   12 +7.2500e+002 +1.0900e+003
   13 +5.5989e+002 +1.0961e+003
   14 +6.9654e+002 +1.0961e+003
   15 +6.9654e+002 +1.0917e+003
   16 +5.6022e+002 +1.0917e+003
   17 +7.2000e+002 +1.3699e+003
   18 +6.9391e+002 +1.3338e+003
   19 +7.4477e+002 +1.3377e+003
LINE           3
    1     5
    1
    2
```

```
    3
    4
    5
    2      7
    1
    6
    7
    8
    9
   10
    5
    3      6
    1
    6
   11
   12
   10
    5
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000      0
GRID
   18    19    17     3     3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
   13    14    16    15     2    13    14
AXIS
    0
LIMIT
0 +5.0000e+002 +7.8600e+002
SLIP           0
BLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
PORU           3 +0.0000e+000
    1 +0.0000e+000     0
    2 +0.0000e+000     0
    3 +0.0000e+000     0
PIEZ           3 +0.0000e+000
    1     0     0
    2     0     0
    3     0     0
PCON           0 +0.0000e+000
POGH           0 +0.0000e+000
POGP           0 +0.0000e+000
POGR           0 +0.0000e+000
PORA           3
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
LOAD           0
ANCHOR         0
PBOUNDARY      0
SEISMIC
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE           0
ELEMENT        0
MATLCOLOR      3
    1   255   255   128
```

2	191	255	128
3	128	255	128

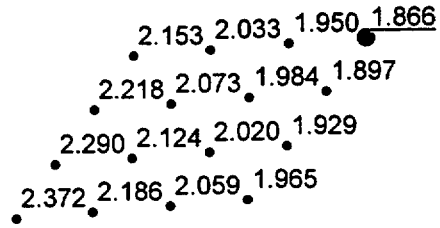
03/28/2000
3:54:39 PM
1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

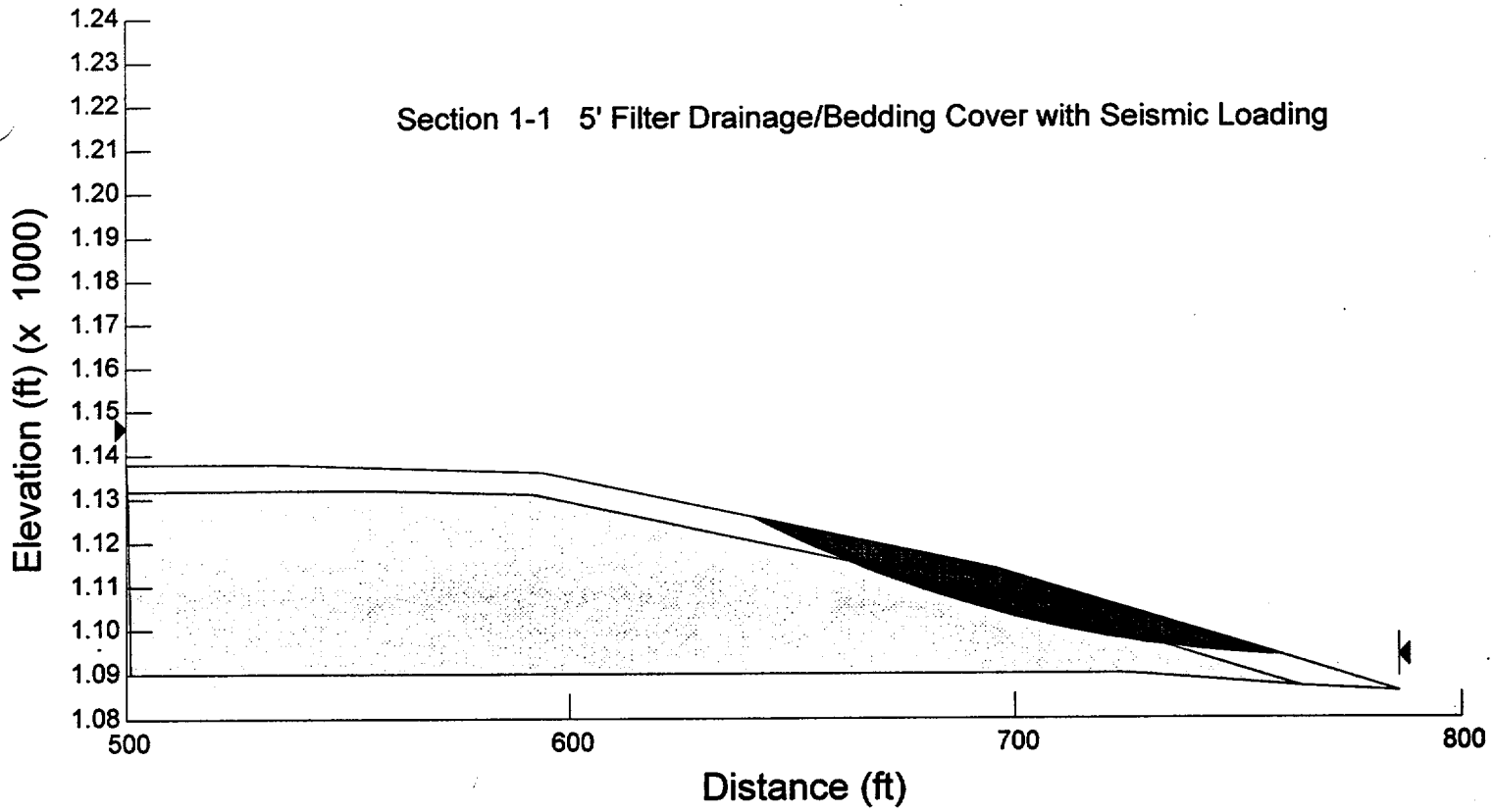
SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	693.910	1333.800	237.700	1	0.0000	2.863	2.962
1	693.910	1333.800	237.700	4	0.0000	2.961	2.863
2	693.910	1333.800	239.900	1	0.0000	2.887	2.994
2	693.910	1333.800	239.900	4	0.0000	2.993	2.887
3	693.910	1333.800	242.100	1	0.0000	2.910	3.025
3	693.910	1333.800	242.100	4	0.0000	3.024	2.910
4	710.863	1335.100	239.000	1	0.0000	2.611	2.691
4	710.863	1335.100	239.000	4	0.0000	2.690	2.610
5	710.863	1335.100	241.200	1	0.0000	2.629	2.717
5	710.863	1335.100	241.200	4	0.0000	2.715	2.628
6	710.863	1335.100	243.400	1	0.0000	2.649	2.745
6	710.863	1335.100	243.400	4	0.0000	2.743	2.648
7	727.817	1336.400	240.300	1	0.0000	2.449	2.511
7	727.817	1336.400	240.300	4	0.0000	2.509	2.448
8	727.817	1336.400	242.500	1	0.0000	2.448	2.517
8	727.817	1336.400	242.500	4	0.0000	2.516	2.447
9	727.817	1336.400	244.700	1	0.0000	2.455	2.532
9	727.817	1336.400	244.700	4	0.0000	2.530	2.453
10	744.770	1337.700	241.600	1	0.0000	2.339	2.380
10	744.770	1337.700	241.600	4	0.0000	2.380	2.339
11	744.770	1337.700	243.800	1	0.0000	2.336	2.385
11	744.770	1337.700	243.800	4	0.0000	2.385	2.336
12	744.770	1337.700	246.000	1	0.0000	2.337	2.394
12	744.770	1337.700	246.000	4	0.0000	2.394	2.337
13	702.607	1345.833	249.733	1	0.0000	2.759	2.844
13	702.607	1345.833	249.733	4	0.0000	2.843	2.759
14	702.607	1345.833	251.933	1	0.0000	2.781	2.874
14	702.607	1345.833	251.933	4	0.0000	2.873	2.781
15	702.607	1345.833	254.133	1	0.0000	2.804	2.904
15	702.607	1345.833	254.133	4	0.0000	2.903	2.803
16	719.560	1347.133	251.033	1	0.0000	2.535	2.604
16	719.560	1347.133	251.033	4	0.0000	2.603	2.534
17	719.560	1347.133	253.233	1	0.0000	2.550	2.626
17	719.560	1347.133	253.233	4	0.0000	2.625	2.549
18	719.560	1347.133	255.433	1	0.0000	2.568	2.651
18	719.560	1347.133	255.433	4	0.0000	2.649	2.567
19	736.513	1348.433	252.333	1	0.0000	2.407	2.457
19	736.513	1348.433	252.333	4	0.0000	2.457	2.407
20	736.513	1348.433	254.533	1	0.0000	2.404	2.461
20	736.513	1348.433	254.533	4	0.0000	2.461	2.403
21	736.513	1348.433	256.733	1	0.0000	2.403	2.468
21	736.513	1348.433	256.733	4	0.0000	2.467	2.402
22	753.467	1349.733	253.633	1	0.0000	2.298	2.330
22	753.467	1349.733	253.633	4	0.0000	2.330	2.299
23	753.467	1349.733	255.833	1	0.0000	2.295	2.334
23	753.467	1349.733	255.833	4	0.0000	2.334	2.295
24	753.467	1349.733	258.033	1	0.0000	2.295	2.341
24	753.467	1349.733	258.033	4	0.0000	2.341	2.295
25	711.303	1357.867	261.767	1	0.0000	2.668	2.741

25	711.303	1357.867	261.767	4	0.0000	2.740	2.667
26	711.303	1357.867	263.967	1	0.0000	2.687	2.768
26	711.303	1357.867	263.967	4	0.0000	2.767	2.687
27	711.303	1357.867	266.167	1	0.0000	2.708	2.795
27	711.303	1357.867	266.167	4	0.0000	2.794	2.708
28	728.257	1359.167	263.067	1	0.0000	2.475	2.532
28	728.257	1359.167	263.067	4	0.0000	2.531	2.474
29	728.257	1359.167	265.267	1	0.0000	2.483	2.547
29	728.257	1359.167	265.267	4	0.0000	2.546	2.482
30	728.257	1359.167	267.467	1	0.0000	2.497	2.568
30	728.257	1359.167	267.467	4	0.0000	2.567	2.496
31	745.210	1360.467	264.367	1	0.0000	2.368	2.407
31	745.210	1360.467	264.367	4	0.0000	2.407	2.368
32	745.210	1360.467	266.567	1	0.0000	2.363	2.410
32	745.210	1360.467	266.567	4	0.0000	2.410	2.363
33	745.210	1360.467	268.767	1	0.0000	2.362	2.416
33	745.210	1360.467	268.767	4	0.0000	2.416	2.362
34	762.163	1361.767	265.667	1	0.0000	2.262	2.286
34	762.163	1361.767	265.667	4	0.0000	2.287	2.263
35	762.163	1361.767	267.867	1	0.0000	2.255	2.285
35	762.163	1361.767	267.867	4	0.0000	2.286	2.255
36	762.163	1361.767	270.067	1	0.0000	2.255	2.292
36	762.163	1361.767	270.067	4	0.0000	2.292	2.255
37	720.000	1369.900	273.800	1	0.0000	2.586	2.649
37	720.000	1369.900	273.800	4	0.0000	2.648	2.585
38	720.000	1369.900	276.000	1	0.0000	2.604	2.673
38	720.000	1369.900	276.000	4	0.0000	2.672	2.603
39	720.000	1369.900	278.200	1	0.0000	2.623	2.699
39	720.000	1369.900	278.200	4	0.0000	2.698	2.623
40	736.953	1371.200	275.100	1	0.0000	2.429	2.477
40	736.953	1371.200	275.100	4	0.0000	2.477	2.429
41	736.953	1371.200	277.300	1	0.0000	2.428	2.483
41	736.953	1371.200	277.300	4	0.0000	2.482	2.427
42	736.953	1371.200	279.500	1	0.0000	2.435	2.496
42	736.953	1371.200	279.500	4	0.0000	2.495	2.434
43	753.907	1372.500	276.400	1	0.0000	2.330	2.361
43	753.907	1372.500	276.400	4	0.0000	2.362	2.330
44	753.907	1372.500	278.600	1	0.0000	2.325	2.362
44	753.907	1372.500	278.600	4	0.0000	2.363	2.325
45	753.907	1372.500	280.800	1	0.0000	2.323	2.368
45	753.907	1372.500	280.800	4	0.0000	2.368	2.323
46	770.860	1373.800	277.700	1	0.0000	2.240	2.257
46	770.860	1373.800	277.700	4	0.0000	2.258	2.241
47	770.860	1373.800	279.900	1	0.0000	2.219	2.242
47	770.860	1373.800	279.900	4	0.0000	2.243	2.220
48	770.860	1373.800	282.100	1	0.0000	2.216	2.246
48	770.860	1373.800	282.100	4	0.0000	2.246	2.217

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    770.8600=X-COOR.   1373.7999=Y-COOR.    282.1000=RADIUS      2.216=F.S.    48=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    770.8600=X-COOR.   1373.7999=Y-COOR.    279.9000=RADIUS      2.243=F.S.    47=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    770.8600=X-COOR.   1373.7999=Y-COOR.    282.1000=RADIUS      2.217=F.S.    48=SLIP#
```

NORMAL TERMINATION OF SLOPE


2.153
2.033
1.950
1.866
2.218
2.073
1.984
1.897
2.290
2.124
2.020
1.929
2.372
2.186
2.059
1.965


Section 1-1 5' Filter Drainage/Bedding Cover with Seismic Loading
Elevation (ft) (x 1000)
1.24
1.23
1.22
1.21
1.20
1.19
1.18
1.17
1.16
1.15
1.14
1.13
1.12
1.11
1.10
1.09
1.08
500
600
700
800
Distance (ft)

```
ILEINFO
SLOPEW 4.22
TITLE


03/29/2000
4:10:14 PM
ANALYSIS
    1     2     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            3
    1 +1.3000e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Soil
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          19
    1 +5.0000e+002 +1.1380e+003
    2 +5.3400e+002 +1.1380e+003
    3 +5.9400e+002 +1.1360e+003
    4 +6.9600e+002 +1.1140e+003
    5 +7.8600e+002 +1.0860e+003
    6 +5.0042e+002 +1.1319e+003
    7 +5.5500e+002 +1.1320e+003
    8 +5.9200e+002 +1.1310e+003
    9 +6.9300e+002 +1.1090e+003
   10 +7.6400e+002 +1.0870e+003
   11 +5.0100e+002 +1.0900e+003
   12 +7.2500e+002 +1.0900e+003
   13 +5.5989e+002 +1.0961e+003
   14 +6.9654e+002 +1.0961e+003
   15 +6.9654e+002 +1.0917e+003
   16 +5.6022e+002 +1.0917e+003
   17 +7.2000e+002 +1.3699e+003
   18 +6.9391e+002 +1.3338e+003
   19 +7.4477e+002 +1.3377e+003
LINE            3
    1     5
    1
    2
```

```
     3
     4
     5
     2      7
     1
     6
     7
     8
     9
    10
     5
     3      6
     1
     6
    11
    12
    10
     5
TENSION
     0 +9.8070e+000 +0.0000e+000 +0.0000e+000      0
GRID
    18     19     17      3      3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
    13     14     16     15      2     13     14
AXIS
     0
LIMIT
0 +5.0000e+002 +7.8600e+002
SLIP            0
BLOCK
     0      0      0      0      0 +1.3500e+002 +1.3500e+002 0 0
     0      0      0      0      0 +4.5000e+001 +4.5000e+001 0 0
PORU            3 +0.0000e+000
     1 +0.0000e+000      0
     2 +0.0000e+000      0
     3 +0.0000e+000      0
PIEZ            3 +0.0000e+000
     1      0      0
     2      0      0
     3      0      0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            3
     1 +0.0000e+000
     2 +0.0000e+000
     3 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+5.0000e-002 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       3
     1    255    255    128
```

2	191	255	128
3	128	255	128

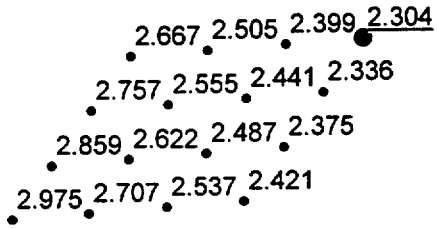
03/29/2000
4:10:14 PM
1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

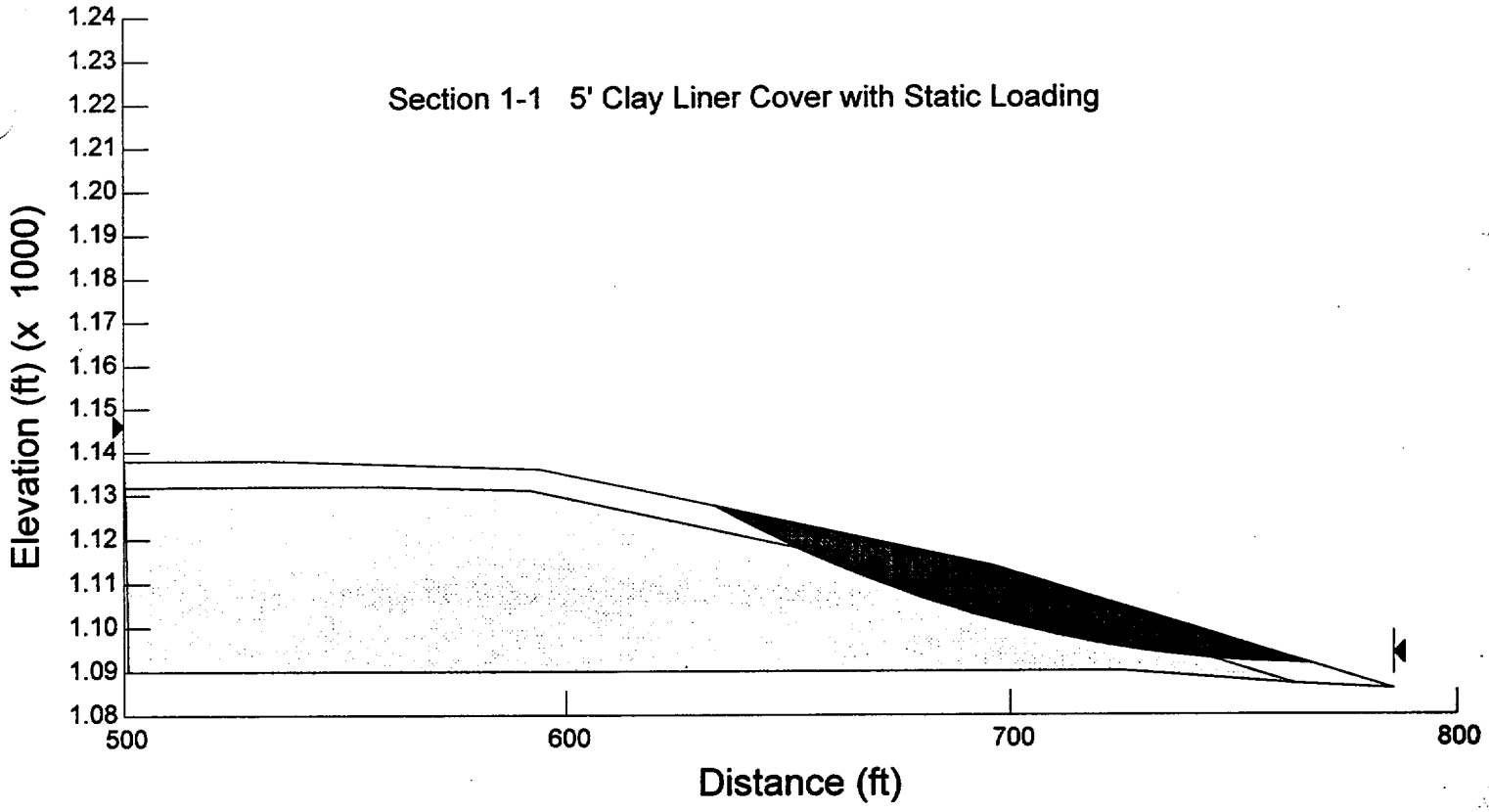
SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	693.910	1333.800	237.700	1	0.0000	2.291	2.335
1	693.910	1333.800	237.700	4	0.0000	2.372	2.287
2	693.910	1333.800	239.900	1	0.0000	2.308	2.355
2	693.910	1333.800	239.900	4	0.0000	2.395	2.304
3	693.910	1333.800	242.100	1	0.0000	2.325	2.375
3	693.910	1333.800	242.100	4	0.0000	2.418	2.320
4	710.863	1335.100	239.000	1	0.0000	2.121	2.160
4	710.863	1335.100	239.000	4	0.0000	2.186	2.118
5	710.863	1335.100	241.200	1	0.0000	2.134	2.177
5	710.863	1335.100	241.200	4	0.0000	2.206	2.131
6	710.863	1335.100	243.400	1	0.0000	2.149	2.195
6	710.863	1335.100	243.400	4	0.0000	2.227	2.145
7	727.817	1336.400	240.300	1	0.0000	2.008	2.040
7	727.817	1336.400	240.300	4	0.0000	2.059	2.006
8	727.817	1336.400	242.500	1	0.0000	2.008	2.044
8	727.817	1336.400	242.500	4	0.0000	2.066	2.006
9	727.817	1336.400	244.700	1	0.0000	2.014	2.054
9	727.817	1336.400	244.700	4	0.0000	2.078	2.011
10	744.770	1337.700	241.600	1	0.0000	1.930	1.952
10	744.770	1337.700	241.600	4	0.0000	1.965	1.929
11	744.770	1337.700	243.800	1	0.0000	1.929	1.955
11	744.770	1337.700	243.800	4	0.0000	1.971	1.928
12	744.770	1337.700	246.000	1	0.0000	1.930	1.960
12	744.770	1337.700	246.000	4	0.0000	1.978	1.929
13	702.607	1345.833	249.733	1	0.0000	2.221	2.260
13	702.607	1345.833	249.733	4	0.0000	2.290	2.217
14	702.607	1345.833	251.933	1	0.0000	2.237	2.279
14	702.607	1345.833	251.933	4	0.0000	2.312	2.233
15	702.607	1345.833	254.133	1	0.0000	2.253	2.298
15	702.607	1345.833	254.133	4	0.0000	2.334	2.249
16	719.560	1347.133	251.033	1	0.0000	2.068	2.102
16	719.560	1347.133	251.033	4	0.0000	2.124	2.065
17	719.560	1347.133	253.233	1	0.0000	2.079	2.117
17	719.560	1347.133	253.233	4	0.0000	2.141	2.076
18	719.560	1347.133	255.433	1	0.0000	2.092	2.133
18	719.560	1347.133	255.433	4	0.0000	2.160	2.089
19	736.513	1348.433	252.333	1	0.0000	1.978	2.004
19	736.513	1348.433	252.333	4	0.0000	2.020	1.977
20	736.513	1348.433	254.533	1	0.0000	1.976	2.006
20	736.513	1348.433	254.533	4	0.0000	2.024	1.975
21	736.513	1348.433	256.733	1	0.0000	1.977	2.011
21	736.513	1348.433	256.733	4	0.0000	2.031	1.975
22	753.467	1349.733	253.633	1	0.0000	1.902	1.918
22	753.467	1349.733	253.633	4	0.0000	1.929	1.901
23	753.467	1349.733	255.833	1	0.0000	1.899	1.920
23	753.467	1349.733	255.833	4	0.0000	1.932	1.898
24	753.467	1349.733	258.033	1	0.0000	1.900	1.924
24	753.467	1349.733	258.033	4	0.0000	1.939	1.899
25	711.303	1357.867	261.767	1	0.0000	2.158	2.193

25	711.303	1357.867	261.767	4	0.0000	2.218	2.155
26	711.303	1357.867	263.967	1	0.0000	2.172	2.210
26	711.303	1357.867	263.967	4	0.0000	2.238	2.169
27	711.303	1357.867	266.167	1	0.0000	2.188	2.228
27	711.303	1357.867	266.167	4	0.0000	2.259	2.184
28	728.257	1359.167	263.067	1	0.0000	2.025	2.055
28	728.257	1359.167	263.067	4	0.0000	2.073	2.023
29	728.257	1359.167	265.267	1	0.0000	2.031	2.064
29	728.257	1359.167	265.267	4	0.0000	2.085	2.029
30	728.257	1359.167	267.467	1	0.0000	2.042	2.078
30	728.257	1359.167	267.467	4	0.0000	2.101	2.039
31	745.210	1360.467	264.367	1	0.0000	1.950	1.971
31	745.210	1360.467	264.367	4	0.0000	1.984	1.949
32	745.210	1360.467	266.567	1	0.0000	1.947	1.972
32	745.210	1360.467	266.567	4	0.0000	1.987	1.946
33	745.210	1360.467	268.767	1	0.0000	1.947	1.976
33	745.210	1360.467	268.767	4	0.0000	1.993	1.945
34	762.163	1361.767	265.667	1	0.0000	1.877	1.889
34	762.163	1361.767	265.667	4	0.0000	1.898	1.877
35	762.163	1361.767	267.867	1	0.0000	1.871	1.887
35	762.163	1361.767	267.867	4	0.0000	1.897	1.870
36	762.163	1361.767	270.067	1	0.0000	1.871	1.890
36	762.163	1361.767	270.067	4	0.0000	1.903	1.870
37	720.000	1369.900	273.800	1	0.0000	2.101	2.132
37	720.000	1369.900	273.800	4	0.0000	2.153	2.099
38	720.000	1369.900	276.000	1	0.0000	2.114	2.148
38	720.000	1369.900	276.000	4	0.0000	2.172	2.112
39	720.000	1369.900	278.200	1	0.0000	2.129	2.165
39	720.000	1369.900	278.200	4	0.0000	2.191	2.126
40	736.953	1371.200	275.100	1	0.0000	1.993	2.018
40	736.953	1371.200	275.100	4	0.0000	2.033	1.991
41	736.953	1371.200	277.300	1	0.0000	1.993	2.021
41	736.953	1371.200	277.300	4	0.0000	2.038	1.991
42	736.953	1371.200	279.500	1	0.0000	1.998	2.030
42	736.953	1371.200	279.500	4	0.0000	2.049	1.996
43	753.907	1372.500	276.400	1	0.0000	1.923	1.940
43	753.907	1372.500	276.400	4	0.0000	1.950	1.923
44	753.907	1372.500	278.600	1	0.0000	1.920	1.939
44	753.907	1372.500	278.600	4	0.0000	1.952	1.919
45	753.907	1372.500	280.800	1	0.0000	1.919	1.942
45	753.907	1372.500	280.800	4	0.0000	1.957	1.918
46	770.860	1373.800	277.700	1	0.0000	1.864	1.873
46	770.860	1373.800	277.700	4	0.0000	1.879	1.864
47	770.860	1373.800	279.900	1	0.0000	1.846	1.858
47	770.860	1373.800	279.900	4	0.0000	1.866	1.845
48	770.860	1373.800	282.100	1	0.0000	1.843	1.859
48	770.860	1373.800	282.100	4	0.0000	1.869	1.843

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    770.8600=X-COOR.   1373.7999=Y-COOR.   282.1000=RADIUS      1.843=F.S.    48=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    770.8600=X-COOR.   1373.7999=Y-COOR.   279.9000=RADIUS      1.866=F.S.    47=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    770.8600=X-COOR.   1373.7999=Y-COOR.   282.1000=RADIUS      1.843=F.S.    48=SLIP#
```

NORMAL TERMINATION OF SLOPE


2.667
2.505
2.399
2.304
2.757
2.555
2.441
2.336
2.859
2.622
2.487
2.375
2.975
2.707
2.537
2.421


Section 1-1 5' Clay Liner Cover with Static Loading
Elevation (ft) (x 1000)
1.24
1.23
1.22
1.21
1.20
1.19
1.18
1.17
1.16
1.15
1.14
1.13
1.12
1.11
1.10
1.09
1.08
500
600
700
800
Distance (ft)

```
FILEINFO
SLOPEW 4.22
TITLE


03/28/2000
4:03:37 PM
ANALYSIS
    1     2     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            3
    1 +1.3000e+002 +1.0000e+002 +2.5000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Soil -Clay
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          19
    1 +5.0000e+002 +1.1380e+003
    2 +5.3400e+002 +1.1380e+003
    3 +5.9400e+002 +1.1360e+003
    4 +6.9600e+002 +1.1140e+003
    5 +7.8600e+002 +1.0860e+003
    6 +5.0042e+002 +1.1319e+003
    7 +5.5500e+002 +1.1320e+003
    8 +5.9200e+002 +1.1310e+003
    9 +6.9300e+002 +1.1090e+003
   10 +7.6400e+002 +1.0870e+003
   11 +5.0100e+002 +1.0900e+003
   12 +7.2500e+002 +1.0900e+003
   13 +5.5989e+002 +1.0961e+003
   14 +6.9654e+002 +1.0961e+003
   15 +6.9654e+002 +1.0917e+003
   16 +5.6022e+002 +1.0917e+003
   17 +7.2000e+002 +1.3699e+003
   18 +6.9391e+002 +1.3338e+003
   19 +7.4477e+002 +1.3377e+003
LINE            3
    1     5
    1
    2
```

```
     3
     4
     5
     2      7
     1
     6
     7
     8
     9
    10
     5
     3      6
     1
     6
    11
    12
    10
     5
TENSION
     0 +9.8070e+000 +0.0000e+000 +0.0000e+000      0
GRID
    18    19    17     3     3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
    13    14    16    15     2    13    14
AXIS
     0
LIMIT
0 +5.0000e+002 +7.8600e+002
SLIP            0
BLOCK
     0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
     0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
PORU            3 +0.0000e+000
     1 +0.0000e+000     0
     2 +0.0000e+000     0
     3 +0.0000e+000     0
PIEZ            3 +0.0000e+000
     1     0     0
     2     0     0
     3     0     0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            3
     1 +0.0000e+000
     2 +0.0000e+000
     3 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       3
     1   255   255   128
```

2	191	255	128
3	128	255	128

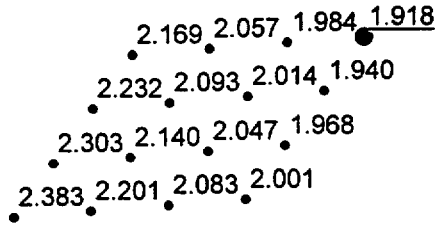
03/28/2000
4:03:37 PM
1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

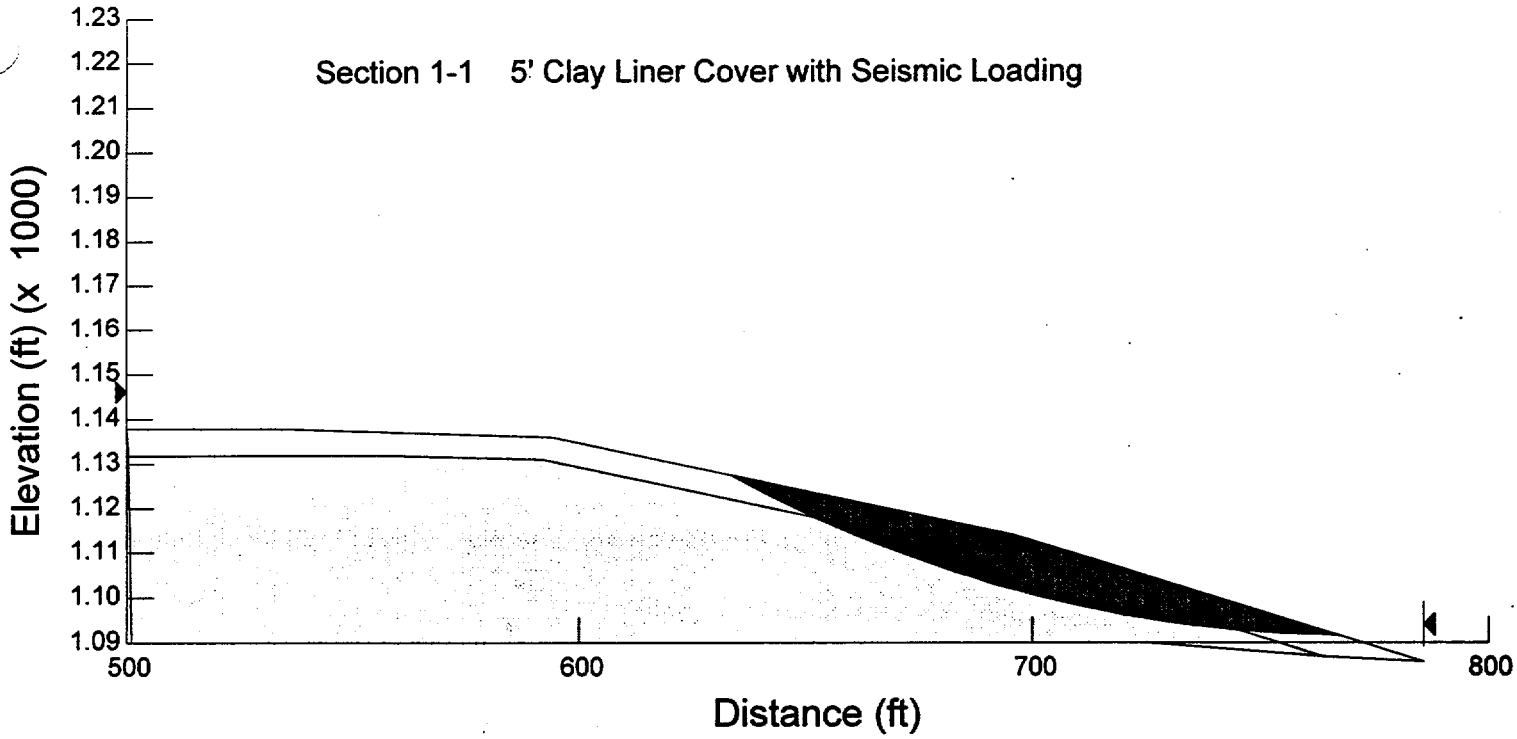
SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	693.910	1333.800	237.700	1	0.0000	2.879	2.978
1	693.910	1333.800	237.700	4	0.0000	2.975	2.878
2	693.910	1333.800	239.900	1	0.0000	2.901	3.008
2	693.910	1333.800	239.900	4	0.0000	3.005	2.899
3	693.910	1333.800	242.100	1	0.0000	2.922	3.037
3	693.910	1333.800	242.100	4	0.0000	3.034	2.921
4	710.863	1335.100	239.000	1	0.0000	2.630	2.710
4	710.863	1335.100	239.000	4	0.0000	2.707	2.627
5	710.863	1335.100	241.200	1	0.0000	2.645	2.733
5	710.863	1335.100	241.200	4	0.0000	2.730	2.643
6	710.863	1335.100	243.400	1	0.0000	2.663	2.758
6	710.863	1335.100	243.400	4	0.0000	2.755	2.661
7	727.817	1336.400	240.300	1	0.0000	2.481	2.542
7	727.817	1336.400	240.300	4	0.0000	2.539	2.478
8	727.817	1336.400	242.500	1	0.0000	2.471	2.540
8	727.817	1336.400	242.500	4	0.0000	2.537	2.468
9	727.817	1336.400	244.700	1	0.0000	2.472	2.549
9	727.817	1336.400	244.700	4	0.0000	2.546	2.469
10	744.770	1337.700	241.600	1	0.0000	2.392	2.432
10	744.770	1337.700	241.600	4	0.0000	2.430	2.390
11	744.770	1337.700	243.800	1	0.0000	2.375	2.423
11	744.770	1337.700	243.800	4	0.0000	2.421	2.373
12	744.770	1337.700	246.000	1	0.0000	2.367	2.423
12	744.770	1337.700	246.000	4	0.0000	2.421	2.365
13	702.607	1345.833	249.733	1	0.0000	2.776	2.861
13	702.607	1345.833	249.733	4	0.0000	2.859	2.774
14	702.607	1345.833	251.933	1	0.0000	2.796	2.888
14	702.607	1345.833	251.933	4	0.0000	2.886	2.794
15	702.607	1345.833	254.133	1	0.0000	2.817	2.916
15	702.607	1345.833	254.133	4	0.0000	2.914	2.815
16	719.560	1347.133	251.033	1	0.0000	2.557	2.625
16	719.560	1347.133	251.033	4	0.0000	2.622	2.554
17	719.560	1347.133	253.233	1	0.0000	2.568	2.644
17	719.560	1347.133	253.233	4	0.0000	2.641	2.566
18	719.560	1347.133	255.433	1	0.0000	2.583	2.665
18	719.560	1347.133	255.433	4	0.0000	2.663	2.581
19	736.513	1348.433	252.333	1	0.0000	2.446	2.495
19	736.513	1348.433	252.333	4	0.0000	2.493	2.444
20	736.513	1348.433	254.533	1	0.0000	2.434	2.490
20	736.513	1348.433	254.533	4	0.0000	2.488	2.431
21	736.513	1348.433	256.733	1	0.0000	2.426	2.490
21	736.513	1348.433	256.733	4	0.0000	2.487	2.423
22	753.467	1349.733	253.633	1	0.0000	2.368	2.399
22	753.467	1349.733	253.633	4	0.0000	2.398	2.367
23	753.467	1349.733	255.833	1	0.0000	2.344	2.381
23	753.467	1349.733	255.833	4	0.0000	2.380	2.342
24	753.467	1349.733	258.033	1	0.0000	2.331	2.377
24	753.467	1349.733	258.033	4	0.0000	2.375	2.330
25	711.303	1357.867	261.767	1	0.0000	2.686	2.759

25	711.303	1357.867	261.767	4	0.0000	2.757	2.685
26	711.303	1357.867	263.967	1	0.0000	2.703	2.783
26	711.303	1357.867	263.967	4	0.0000	2.781	2.702
27	711.303	1357.867	266.167	1	0.0000	2.722	2.809
27	711.303	1357.867	266.167	4	0.0000	2.806	2.720
28	728.257	1359.167	263.067	1	0.0000	2.501	2.558
28	728.257	1359.167	263.067	4	0.0000	2.555	2.498
29	728.257	1359.167	265.267	1	0.0000	2.503	2.567
29	728.257	1359.167	265.267	4	0.0000	2.565	2.501
30	728.257	1359.167	267.467	1	0.0000	2.513	2.584
30	728.257	1359.167	267.467	4	0.0000	2.582	2.511
31	745.210	1360.467	264.367	1	0.0000	2.417	2.455
31	745.210	1360.467	264.367	4	0.0000	2.454	2.415
32	745.210	1360.467	266.567	1	0.0000	2.400	2.446
32	745.210	1360.467	266.567	4	0.0000	2.444	2.398
33	745.210	1360.467	268.767	1	0.0000	2.390	2.444
33	745.210	1360.467	268.767	4	0.0000	2.441	2.388
34	762.163	1361.767	265.667	1	0.0000	2.362	2.385
34	762.163	1361.767	265.667	4	0.0000	2.384	2.361
35	762.163	1361.767	267.867	1	0.0000	2.319	2.349
35	762.163	1361.767	267.867	4	0.0000	2.348	2.318
36	762.163	1361.767	270.067	1	0.0000	2.300	2.337
36	762.163	1361.767	270.067	4	0.0000	2.336	2.299
37	720.000	1369.900	273.800	1	0.0000	2.606	2.669
37	720.000	1369.900	273.800	4	0.0000	2.667	2.605
38	720.000	1369.900	276.000	1	0.0000	2.621	2.690
38	720.000	1369.900	276.000	4	0.0000	2.688	2.619
39	720.000	1369.900	278.200	1	0.0000	2.638	2.713
39	720.000	1369.900	278.200	4	0.0000	2.711	2.636
40	736.953	1371.200	275.100	1	0.0000	2.466	2.513
40	736.953	1371.200	275.100	4	0.0000	2.510	2.464
41	736.953	1371.200	277.300	1	0.0000	2.453	2.507
41	736.953	1371.200	277.300	4	0.0000	2.505	2.451
42	736.953	1371.200	279.500	1	0.0000	2.454	2.515
42	736.953	1371.200	279.500	4	0.0000	2.512	2.452
43	753.907	1372.500	276.400	1	0.0000	2.394	2.424
43	753.907	1372.500	276.400	4	0.0000	2.423	2.393
44	753.907	1372.500	278.600	1	0.0000	2.370	2.407
44	753.907	1372.500	278.600	4	0.0000	2.405	2.368
45	753.907	1372.500	280.800	1	0.0000	2.357	2.401
45	753.907	1372.500	280.800	4	0.0000	2.399	2.356
46	770.860	1373.800	277.700	1	0.0000	2.396	2.412
46	770.860	1373.800	277.700	4	0.0000	2.412	2.396
47	770.860	1373.800	279.900	1	0.0000	2.310	2.332
47	770.860	1373.800	279.900	4	0.0000	2.331	2.309
48	770.860	1373.800	282.100	1	0.0000	2.276	2.304
48	770.860	1373.800	282.100	4	0.0000	2.304	2.275

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    770.8600=X-COOR.   1373.7999=Y-COOR.   282.1000=RADIUS      2.276=F.S.    48=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    770.8600=X-COOR.   1373.7999=Y-COOR.   282.1000=RADIUS      2.304=F.S.    48=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    770.8600=X-COOR.   1373.7999=Y-COOR.   282.1000=RADIUS      2.275=F.S.    48=SLIP#
```

NORMAL TERMINATION OF SLOPE


2.169
2.057
1.984
1.918
2.232
2.093
2.014
1.940
2.303
2.140
2.047
1.968
2.383
2.201
2.083
2.001


Section 1-1 5' Clay Liner Cover with Seismic Loading
Elevation (ft) (x 1000)
1.23
1.22
1.21
1.20
1.19
1.18
1.17
1.16
1.15
1.14
1.13
1.12
1.11
1.10
1.09
500
600
700
800
Distance (ft)

```
FILEINFO
SLOPEW 4.22
TITLE


03/29/2000
4:02:40 PM
ANALYSIS
    1     2     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            3
    1 +1.3000e+002 +1.0000e+002 +2.5000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Soil -Clay
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          19
    1 +5.0000e+002 +1.1380e+003
    2 +5.3400e+002 +1.1380e+003
    3 +5.9400e+002 +1.1360e+003
    4 +6.9600e+002 +1.1140e+003
    5 +7.8600e+002 +1.0860e+003
    6 +5.0042e+002 +1.1319e+003
    7 +5.5500e+002 +1.1320e+003
    8 +5.9200e+002 +1.1310e+003
    9 +6.9300e+002 +1.1090e+003
   10 +7.6400e+002 +1.0870e+003
   11 +5.0100e+002 +1.0900e+003
   12 +7.2500e+002 +1.0900e+003
   13 +5.5989e+002 +1.0961e+003
   14 +6.9654e+002 +1.0961e+003
   15 +6.9654e+002 +1.0917e+003
   16 +5.6022e+002 +1.0917e+003
   17 +7.2000e+002 +1.3699e+003
   18 +6.9391e+002 +1.3338e+003
   19 +7.4477e+002 +1.3377e+003
LINE            3
    1     5
    1
    2
```

```
    3
    4
    5
    2     7
    1
    6
    7
    8
    9
   10
    5
    3     6
    1
    6
   11
   12
   10
    5
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000     0
GRID
   18    19    17     3     3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
   13    14    16    15     2    13    14
AXIS
    0
LIMIT
0 +5.0000e+002 +7.8600e+002
SLIP           0
BLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
PORU           3 +0.0000e+000
    1 +0.0000e+000     0
    2 +0.0000e+000     0
    3 +0.0000e+000     0
PIEZ           3 +0.0000e+000
    1     0     0
    2     0     0
    3     0     0
PCON           0 +0.0000e+000
POGH           0 +0.0000e+000
POGP           0 +0.0000e+000
POGR           0 +0.0000e+000
PORA           3
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
LOAD           0
ANCHOR         0
PBOUNDARY      0
SEISMIC
+5.0000e-002 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE           0
ELEMENT        0
MATLCOLOR      3
    1   255   255   128
```

2	191	255	128
3	128	255	128

ATTACHMENT # B
CALC 100340T-G(B)-06
PAGE 26

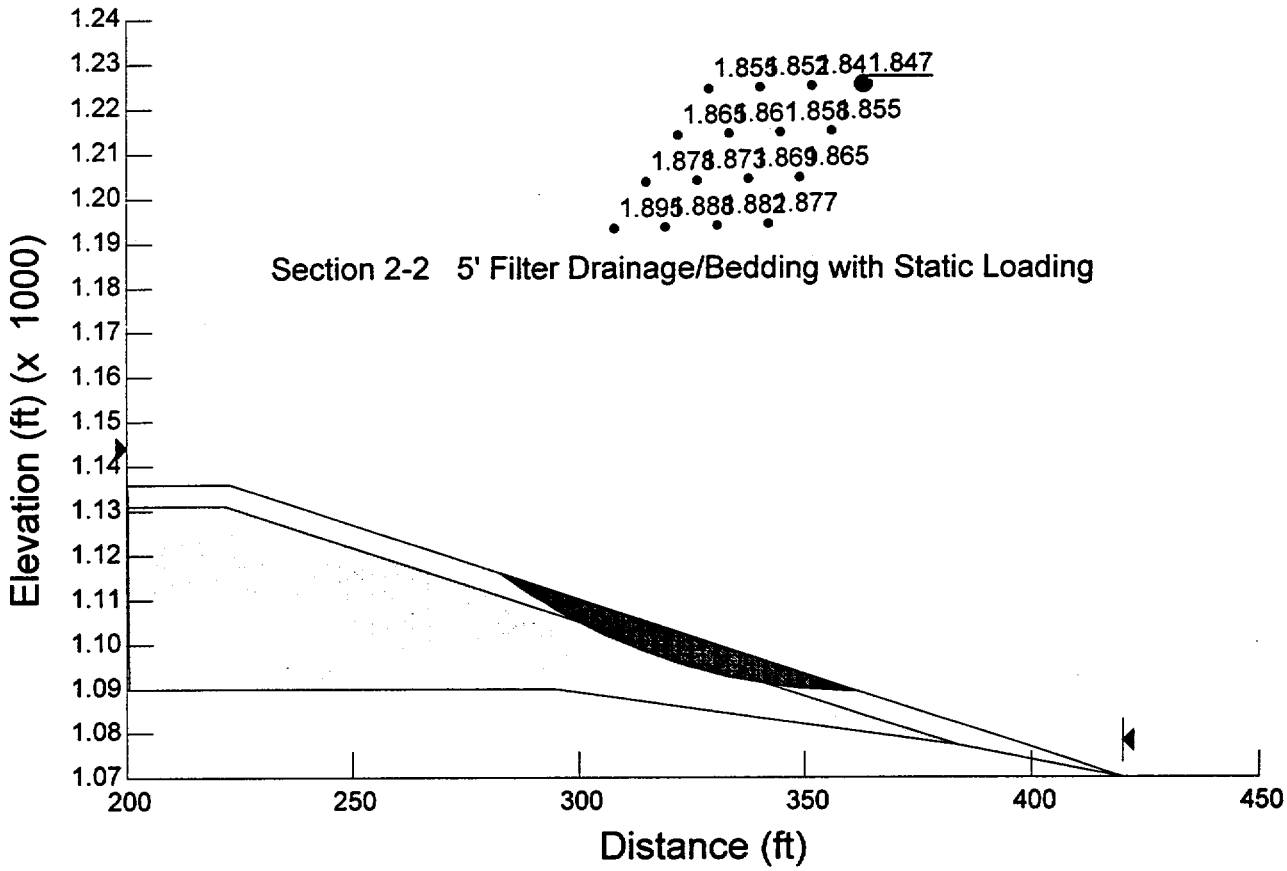
03/29/2000
4:02:40 PM
1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	(FORCE)
1	693.910	1333.800	237.700	1	0.0000	2.304	2.348
1	693.910	1333.800	237.700	4	0.0000	2.383	2.299
2	693.910	1333.800	239.900	1	0.0000	2.320	2.366
2	693.910	1333.800	239.900	4	0.0000	2.405	2.314
3	693.910	1333.800	242.100	1	0.0000	2.335	2.385
3	693.910	1333.800	242.100	4	0.0000	2.427	2.329
4	710.863	1335.100	239.000	1	0.0000	2.136	2.175
4	710.863	1335.100	239.000	4	0.0000	2.201	2.132
5	710.863	1335.100	241.200	1	0.0000	2.147	2.190
5	710.863	1335.100	241.200	4	0.0000	2.218	2.143
6	710.863	1335.100	243.400	1	0.0000	2.161	2.206
6	710.863	1335.100	243.400	4	0.0000	2.237	2.156
7	727.817	1336.400	240.300	1	0.0000	2.035	2.066
7	727.817	1336.400	240.300	4	0.0000	2.083	2.032
8	727.817	1336.400	242.500	1	0.0000	2.028	2.063
8	727.817	1336.400	242.500	4	0.0000	2.083	2.024
9	727.817	1336.400	244.700	1	0.0000	2.029	2.068
9	727.817	1336.400	244.700	4	0.0000	2.091	2.025
10	744.770	1337.700	241.600	1	0.0000	1.975	1.995
10	744.770	1337.700	241.600	4	0.0000	2.008	1.973
11	744.770	1337.700	243.800	1	0.0000	1.962	1.987
11	744.770	1337.700	243.800	4	0.0000	2.001	1.959
12	744.770	1337.700	246.000	1	0.0000	1.956	1.985
12	744.770	1337.700	246.000	4	0.0000	2.001	1.952
13	702.607	1345.833	249.733	1	0.0000	2.235	2.273
13	702.607	1345.833	249.733	4	0.0000	2.303	2.230
14	702.607	1345.833	251.933	1	0.0000	2.249	2.290
14	702.607	1345.833	251.933	4	0.0000	2.323	2.244
15	702.607	1345.833	254.133	1	0.0000	2.263	2.308
15	702.607	1345.833	254.133	4	0.0000	2.344	2.258
16	719.560	1347.133	251.033	1	0.0000	2.085	2.119
16	719.560	1347.133	251.033	4	0.0000	2.140	2.082
17	719.560	1347.133	253.233	1	0.0000	2.094	2.131
17	719.560	1347.133	253.233	4	0.0000	2.155	2.090
18	719.560	1347.133	255.433	1	0.0000	2.105	2.145
18	719.560	1347.133	255.433	4	0.0000	2.171	2.101
19	736.513	1348.433	252.333	1	0.0000	2.011	2.036
19	736.513	1348.433	252.333	4	0.0000	2.050	2.008
20	736.513	1348.433	254.533	1	0.0000	2.002	2.031
20	736.513	1348.433	254.533	4	0.0000	2.047	1.998
21	736.513	1348.433	256.733	1	0.0000	1.996	2.029
21	736.513	1348.433	256.733	4	0.0000	2.048	1.992
22	753.467	1349.733	253.633	1	0.0000	1.961	1.977
22	753.467	1349.733	253.633	4	0.0000	1.987	1.959
23	753.467	1349.733	255.833	1	0.0000	1.941	1.960
23	753.467	1349.733	255.833	4	0.0000	1.972	1.938
24	753.467	1349.733	258.033	1	0.0000	1.931	1.954
24	753.467	1349.733	258.033	4	0.0000	1.968	1.928
25	711.303	1357.867	261.767	1	0.0000	2.173	2.207

25	711.303	1357.867	261.767	4	0.0000	2.232	2.169
26	711.303	1357.867	263.967	1	0.0000	2.185	2.223
26	711.303	1357.867	263.967	4	0.0000	2.250	2.181
27	711.303	1357.867	266.167	1	0.0000	2.199	2.239
27	711.303	1357.867	266.167	4	0.0000	2.269	2.194
28	728.257	1359.167	263.067	1	0.0000	2.047	2.076
28	728.257	1359.167	263.067	4	0.0000	2.093	2.044
29	728.257	1359.167	265.267	1	0.0000	2.048	2.080
29	728.257	1359.167	265.267	4	0.0000	2.100	2.045
30	728.257	1359.167	267.467	1	0.0000	2.056	2.091
30	728.257	1359.167	267.467	4	0.0000	2.113	2.052
31	745.210	1360.467	264.367	1	0.0000	1.991	2.011
31	745.210	1360.467	264.367	4	0.0000	2.023	1.989
32	745.210	1360.467	266.567	1	0.0000	1.978	2.001
32	745.210	1360.467	266.567	4	0.0000	2.016	1.975
33	745.210	1360.467	268.767	1	0.0000	1.971	1.998
33	745.210	1360.467	268.767	4	0.0000	2.014	1.968
34	762.163	1361.767	265.667	1	0.0000	1.962	1.973
34	762.163	1361.767	265.667	4	0.0000	1.981	1.961
35	762.163	1361.767	267.867	1	0.0000	1.926	1.941
35	762.163	1361.767	267.867	4	0.0000	1.950	1.924
36	762.163	1361.767	270.067	1	0.0000	1.910	1.928
36	762.163	1361.767	270.067	4	0.0000	1.940	1.907
37	720.000	1369.900	273.800	1	0.0000	2.118	2.149
37	720.000	1369.900	273.800	4	0.0000	2.169	2.115
38	720.000	1369.900	276.000	1	0.0000	2.129	2.162
38	720.000	1369.900	276.000	4	0.0000	2.185	2.125
39	720.000	1369.900	278.200	1	0.0000	2.141	2.177
39	720.000	1369.900	278.200	4	0.0000	2.202	2.137
40	736.953	1371.200	275.100	1	0.0000	2.024	2.047
40	736.953	1371.200	275.100	4	0.0000	2.061	2.021
41	736.953	1371.200	277.300	1	0.0000	2.014	2.041
41	736.953	1371.200	277.300	4	0.0000	2.057	2.011
42	736.953	1371.200	279.500	1	0.0000	2.014	2.045
42	736.953	1371.200	279.500	4	0.0000	2.064	2.011
43	753.907	1372.500	276.400	1	0.0000	1.978	1.993
43	753.907	1372.500	276.400	4	0.0000	2.002	1.976
44	753.907	1372.500	278.600	1	0.0000	1.958	1.977
44	753.907	1372.500	278.600	4	0.0000	1.988	1.956
45	753.907	1372.500	280.800	1	0.0000	1.948	1.970
45	753.907	1372.500	280.800	4	0.0000	1.984	1.945
46	770.860	1373.800	277.700	1	0.0000	1.998	2.006
46	770.860	1373.800	277.700	4	0.0000	2.012	1.997
47	770.860	1373.800	279.900	1	0.0000	1.923	1.934
47	770.860	1373.800	279.900	4	0.0000	1.942	1.922
48	770.860	1373.800	282.100	1	0.0000	1.894	1.909
48	770.860	1373.800	282.100	4	0.0000	1.918	1.893

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    770.8600=X-COOR.   1373.7999=Y-COOR.   282.1000=RADIUS      1.894=F.S.    48=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    770.8600=X-COOR.   1373.7999=Y-COOR.   282.1000=RADIUS      1.918=F.S.    48=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    770.8600=X-COOR.   1373.7999=Y-COOR.   282.1000=RADIUS      1.893=F.S.    48=SLIP#
```

NORMAL TERMINATION OF SLOPE


Section 2-2 5' Filter Drainage/Bedding with Static Loading
1.855
1.852
1.841
1.847
1.865
1.861
1.858
1.855
1.878
1.873
1.869
1.865
1.895
1.888
1.882
1.877
Elevation (ft) (x 1000)
1.24
1.23
1.22
1.21
1.20
1.19
1.18
1.17
1.16
1.15
1.14
1.13
1.12
1.11
1.10
1.09
1.08
1.07
200
250
300
350
400
450
Distance (ft)

```
FILEINFO
SLOPEW 4.22
TITLE


04/04/2000
3:23:21 PM
ANALYSIS
    1     2     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL          3
    1 +1.3000e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Filter Drainage
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION      0
AFUNCTION      0
POINT         15
    1 +2.0000e+002 +1.1360e+003
    2 +2.2300e+002 +1.1360e+003
    3 +4.2000e+002 +1.0700e+003
    4 +2.0020e+002 +1.1310e+003
    5 +2.2200e+002 +1.1310e+003
    6 +3.8400e+002 +1.0770e+003
    7 +2.0050e+002 +1.0900e+003
    8 +2.9500e+002 +1.0900e+003
    9 +2.8800e+002 +1.1070e+003
   10 +3.4900e+002 +1.0870e+003
   11 +3.4800e+002 +1.0840e+003
   12 +2.8600e+002 +1.1040e+003
   13 +3.2900e+002 +1.2240e+003
   14 +3.0800e+002 +1.1930e+003
   15 +3.4200e+002 +1.1940e+003
LINE          3
    1     3
    1
    2
    3
    2     5
    1
    4
```

```
    5
    6
    3
    3     6
    1
    4
    7
    8
    6
    3
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000     0
GRID
   14    15    13     3     3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
    9    10    12    11     2    12    10
AXIS
    0
LIMIT
0 +2.0000e+002 +4.2000e+002
SLIP           0
BLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
PORU           3 +0.0000e+000
    1 +0.0000e+000     0
    2 +0.0000e+000     0
    3 +0.0000e+000     0
PIEZ           3 +0.0000e+000
    1     0     0
    2     0     0
    3     0     0
PCON           0 +0.0000e+000
POGH           0 +0.0000e+000
POGP           0 +0.0000e+000
POGR           0 +0.0000e+000
PORA           3
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
LOAD           0
ANCHOR         0
PBOUNDARY      0
SEISMIC
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE           0
ELEMENT        0
MATLCOLOR      3
    1   255   255   128
    2   191   255   128
    3   128   255   128
```

```
FILEINFO
SLOPEW 4.22
PAGE
MM
+2.6000e+002 +2.0000e+002
-1.1582e+002 -6.4008e+002 +0.0000e+000 +0.0000e+000
ENGINEERING
FT
+5.0000e+002 +5.0000e+002
WINDOW
    0 -2100
VIEW
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
FONTVIEW
Arial
  400   0   0   0
+6.0000e+000 +1.0000e+001
AXIS
  1   0   0   1   1
Distance (ft)
Elevation (ft)
    5    17 +2.0000e+002 +4.5000e+002 +1.2400e+003 +1.0700e+003
ZOOM
+1.0000e+000
GRID
  1   1 +1.0000e+000 +1.0000e+000
TEXT          0
 INE          5
    1 +2.0000e+002 +1.1360e+003 +2.2300e+002 +1.1360e+003
    2 +2.2300e+002 +1.1360e+003 +4.2000e+002 +1.0700e+003
    3 +4.2000e+002 +1.0700e+003 +3.8400e+002 +1.0770e+003
    4 +3.8400e+002 +1.0770e+003 +2.9500e+002 +1.0900e+003
    5 +2.9500e+002 +1.0900e+003 +2.0200e+002 +1.0900e+003
CIRCLE        0
ARC           0
CUSTSTRINGS     0

IMAGE         1
OBJECT
CUSTCOLORS
    63    63    63
    63    63    63
    63    63    63
    63    63    63
    63    63    63
    63    63    63
    63    63    63
    63    63    63
    63    63    63
    63    63    63
    63    63    63
    63    63    63
    63    63    63
    63    63    63
    63    63    63
    63    63    63
```

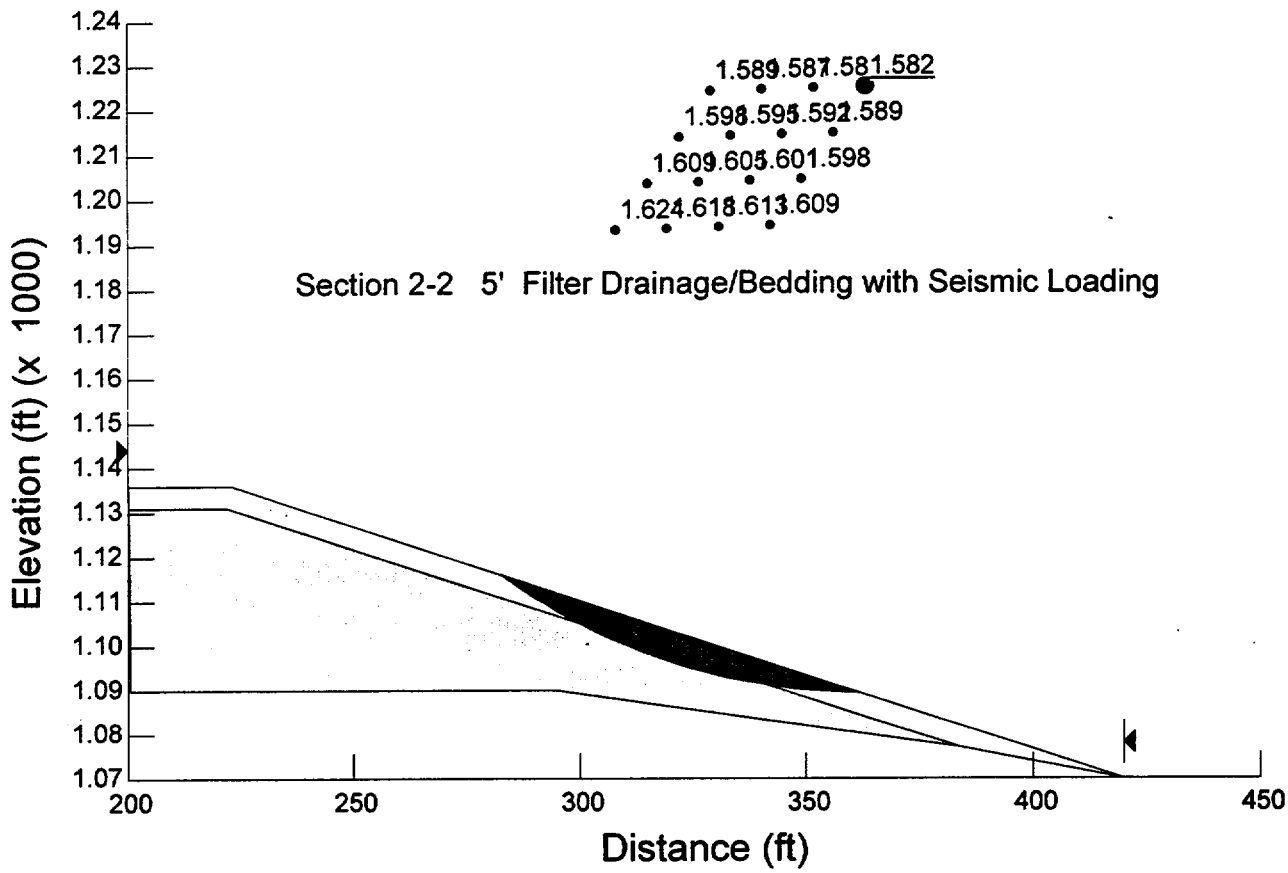
04/04/2000
3:23:21 PM
1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	308.000	1193.000	87.951	1	0.0000	1.827	1.894
1	308.000	1193.000	87.951	4	0.0000	1.895	1.829
2	308.000	1193.000	89.705	1	0.0000	1.826	1.909
2	308.000	1193.000	89.705	4	0.0000	1.909	1.827
3	308.000	1193.000	91.456	1	0.0000	1.833	1.933
3	308.000	1193.000	91.456	4	0.0000	1.932	1.833
4	319.333	1193.333	91.798	1	0.0000	1.824	1.887
4	319.333	1193.333	91.798	4	0.0000	1.888	1.826
5	319.333	1193.333	93.527	1	0.0000	1.822	1.901
5	319.333	1193.333	93.527	4	0.0000	1.901	1.823
6	319.333	1193.333	95.253	1	0.0000	1.829	1.923
6	319.333	1193.333	95.253	4	0.0000	1.922	1.829
7	330.667	1193.667	95.646	1	0.0000	1.822	1.881
7	330.667	1193.667	95.646	4	0.0000	1.882	1.823
8	330.667	1193.667	97.349	1	0.0000	1.819	1.893
8	330.667	1193.667	97.349	4	0.0000	1.893	1.820
9	330.667	1193.667	99.049	1	0.0000	1.824	1.913
9	330.667	1193.667	99.049	4	0.0000	1.912	1.825
10	342.000	1194.000	99.494	1	0.0000	1.820	1.877
10	342.000	1194.000	99.494	4	0.0000	1.877	1.822
11	342.000	1194.000	101.171	1	0.0000	1.815	1.886
11	342.000	1194.000	101.171	4	0.0000	1.886	1.816
12	342.000	1194.000	102.846	1	0.0000	1.820	1.904
12	342.000	1194.000	102.846	4	0.0000	1.904	1.821
13	315.000	1203.333	99.951	1	0.0000	1.819	1.877
13	315.000	1203.333	99.951	4	0.0000	1.878	1.821
14	315.000	1203.333	101.697	1	0.0000	1.816	1.888
14	315.000	1203.333	101.697	4	0.0000	1.888	1.817
15	315.000	1203.333	103.440	1	0.0000	1.822	1.908
15	315.000	1203.333	103.440	4	0.0000	1.908	1.822
16	326.333	1203.667	103.798	1	0.0000	1.817	1.872
16	326.333	1203.667	103.798	4	0.0000	1.873	1.818
17	326.333	1203.667	105.519	1	0.0000	1.813	1.881
17	326.333	1203.667	105.519	4	0.0000	1.882	1.814
18	326.333	1203.667	107.236	1	0.0000	1.818	1.900
18	326.333	1203.667	107.236	4	0.0000	1.899	1.818
19	337.667	1204.000	107.646	1	0.0000	1.816	1.868
19	337.667	1204.000	107.646	4	0.0000	1.869	1.817
20	337.667	1204.000	109.340	1	0.0000	1.810	1.875
20	337.667	1204.000	109.340	4	0.0000	1.876	1.811
21	337.667	1204.000	111.033	1	0.0000	1.814	1.892
21	337.667	1204.000	111.033	4	0.0000	1.892	1.815
22	349.000	1204.333	111.494	1	0.0000	1.814	1.864
22	349.000	1204.333	111.494	4	0.0000	1.865	1.815
23	349.000	1204.333	113.162	1	0.0000	1.808	1.870
23	349.000	1204.333	113.162	4	0.0000	1.870	1.809
24	349.000	1204.333	114.829	1	0.0000	1.811	1.885
24	349.000	1204.333	114.829	4	0.0000	1.885	1.812
25	322.000	1213.667	111.951	1	0.0000	1.813	1.864

25	322.000	1213.667	111.951	4	0.0000	1.865	1.814
26	322.000	1213.667	113.688	1	0.0000	1.808	1.872
26	322.000	1213.667	113.688	4	0.0000	1.872	1.809
27	322.000	1213.667	115.423	1	0.0000	1.812	1.889
27	322.000	1213.667	115.423	4	0.0000	1.889	1.813
28	333.333	1214.000	115.798	1	0.0000	1.812	1.860
28	333.333	1214.000	115.798	4	0.0000	1.861	1.813
29	333.333	1214.000	117.510	1	0.0000	1.806	1.867
29	333.333	1214.000	117.510	4	0.0000	1.867	1.807
30	333.333	1214.000	119.219	1	0.0000	1.809	1.882
30	333.333	1214.000	119.219	4	0.0000	1.882	1.810
31	344.667	1214.333	119.646	1	0.0000	1.810	1.857
31	344.667	1214.333	119.646	4	0.0000	1.858	1.812
32	344.667	1214.333	121.332	1	0.0000	1.804	1.862
32	344.667	1214.333	121.332	4	0.0000	1.862	1.805
33	344.667	1214.333	123.016	1	0.0000	1.806	1.876
33	344.667	1214.333	123.016	4	0.0000	1.876	1.807
34	356.000	1214.667	123.493	1	0.0000	1.809	1.854
34	356.000	1214.667	123.493	4	0.0000	1.855	1.810
35	356.000	1214.667	125.154	1	0.0000	1.802	1.857
35	356.000	1214.667	125.154	4	0.0000	1.858	1.803
36	356.000	1214.667	126.813	1	0.0000	1.804	1.870
36	356.000	1214.667	126.813	4	0.0000	1.870	1.804
37	329.000	1224.000	123.950	1	0.0000	1.808	1.854
37	329.000	1224.000	123.950	4	0.0000	1.855	1.809
38	329.000	1224.000	125.680	1	0.0000	1.802	1.859
38	329.000	1224.000	125.680	4	0.0000	1.860	1.803
39	329.000	1224.000	127.406	1	0.0000	1.805	1.873
39	329.000	1224.000	127.406	4	0.0000	1.873	1.805
40	340.333	1224.333	127.798	1	0.0000	1.807	1.851
40	340.333	1224.333	127.798	4	0.0000	1.852	1.808
41	340.333	1224.333	129.502	1	0.0000	1.800	1.855
41	340.333	1224.333	129.502	4	0.0000	1.855	1.801
42	340.333	1224.333	131.203	1	0.0000	1.802	1.868
42	340.333	1224.333	131.203	4	0.0000	1.868	1.803
43	351.667	1224.667	131.646	1	0.0000	1.806	1.848
43	351.667	1224.667	131.646	4	0.0000	1.849	1.807
44	351.667	1224.667	133.324	1	0.0000	1.798	1.851
44	351.667	1224.667	133.324	4	0.0000	1.851	1.799
45	351.667	1224.667	134.999	1	0.0000	1.800	1.863
45	351.667	1224.667	134.999	4	0.0000	1.863	1.801
46	363.000	1225.000	135.493	1	0.0000	1.806	1.846
46	363.000	1225.000	135.493	4	0.0000	1.847	1.807
47	363.000	1225.000	137.146	1	0.0000	1.797	1.847
47	363.000	1225.000	137.146	4	0.0000	1.848	1.798
48	363.000	1225.000	138.796	1	0.0000	1.798	1.858
48	363.000	1225.000	138.796	4	0.0000	1.858	1.798

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    363.0000=X-COOR.   1225.0000=Y-COOR.   137.1456=RADIUS      1.797=F.S.    47=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    363.0000=X-COOR.   1225.0000=Y-COOR.   135.4934=RADIUS      1.847=F.S.    46=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    363.0000=X-COOR.   1225.0000=Y-COOR.   137.1456=RADIUS      1.798=F.S.    47=SLIP#
```

NORMAL TERMINATION OF SLOPE


1.589
1.587
1.581
1.582
1.598
1.595
1.592
1.589
1.609
1.605
1.601
1.598
1.624
1.618
1.613
1.609
Section 2-2 5' Filter Drainage/Bedding with Seismic Loading
Elevation (ft) (x 1000)
1.24
1.23
1.22
1.21
1.20
1.19
1.18
1.17
1.16
1.15
1.14
1.13
1.12
1.11
1.10
1.09
1.08
1.07
200
250
300
350
400
450
Distance (ft)

```
FILEINFO
SLOPEW 4.22
TITLE


04/04/2000
3:19:04 PM
ANALYSIS
    1     2     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL           3
    1 +1.3000e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Filter Drainage
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION      0
AFUNCTION      0
POINT         15
    1 +2.0000e+002 +1.1360e+003
    2 +2.2300e+002 +1.1360e+003
    3 +4.2000e+002 +1.0700e+003
    4 +2.0020e+002 +1.1310e+003
    5 +2.2200e+002 +1.1310e+003
    6 +3.8400e+002 +1.0770e+003
    7 +2.0050e+002 +1.0900e+003
    8 +2.9500e+002 +1.0900e+003
    9 +2.8800e+002 +1.1070e+003
   10 +3.4900e+002 +1.0870e+003
   11 +3.4800e+002 +1.0840e+003
   12 +2.8600e+002 +1.1040e+003
   13 +3.2900e+002 +1.2240e+003
   14 +3.0800e+002 +1.1930e+003
   15 +3.4200e+002 +1.1940e+003
LINE           3
    1     3
    1
    2
    3
    2     5
    1
    4
```

```
    5
    6
    3
    3     6
    1
    4
    7
    8
    6
    3
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000     0
GRID
   14    15    13     3     3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
    9    10    12    11     2    12    10
AXIS
    0
LIMIT
0 +2.0000e+002 +4.2000e+002
SLIP           0
BLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
PORU           3 +0.0000e+000
    1 +0.0000e+000     0
    2 +0.0000e+000     0
    3 +0.0000e+000     0
PIEZ           3 +0.0000e+000
    1     0     0
    2     0     0
    3     0     0
PCON           0 +0.0000e+000
POGH           0 +0.0000e+000
POGP           0 +0.0000e+000
POGR           0 +0.0000e+000
PORA           3
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
LOAD           0
ANCHOR         0
PBOUNDARY      0
SEISMIC
+5.0000e-002 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE           0
ELEMENT        0
MATLCOLOR      3
    1   255   255   128
    2   191   255   128
    3   128   255   128
```

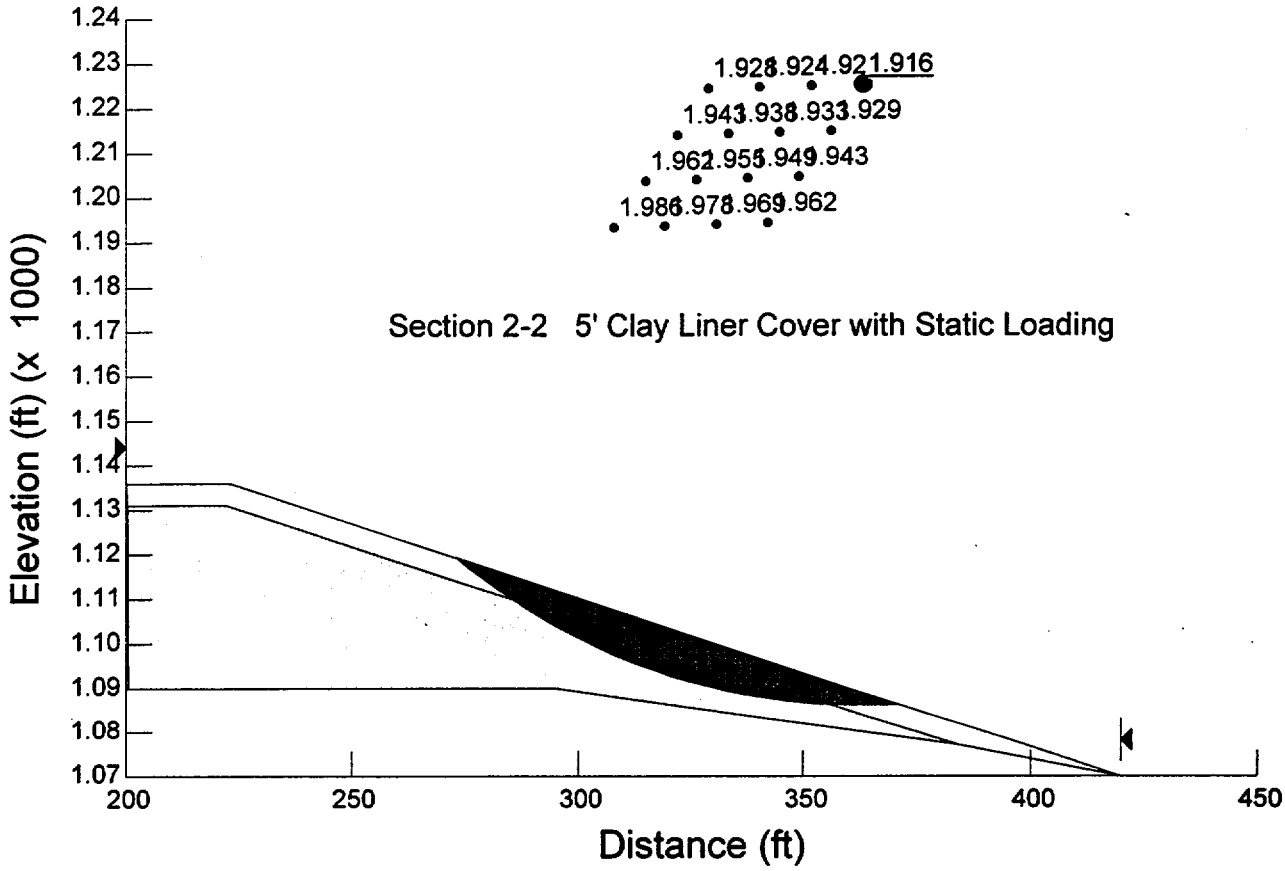
04/04/2000
3:19:04 PM
1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	308.000	1193.000	87.951	1	0.0000	1.564	1.607
1	308.000	1193.000	87.951	4	0.0000	1.624	1.566
2	308.000	1193.000	89.705	1	0.0000	1.563	1.616
2	308.000	1193.000	89.705	4	0.0000	1.637	1.564
3	308.000	1193.000	91.456	1	0.0000	1.570	1.633
3	308.000	1193.000	91.456	4	0.0000	1.657	1.570
4	319.333	1193.333	91.798	1	0.0000	1.562	1.602
4	319.333	1193.333	91.798	4	0.0000	1.618	1.563
5	319.333	1193.333	93.527	1	0.0000	1.560	1.610
5	319.333	1193.333	93.527	4	0.0000	1.629	1.561
6	319.333	1193.333	95.253	1	0.0000	1.566	1.625
6	319.333	1193.333	95.253	4	0.0000	1.648	1.566
7	330.667	1193.667	95.646	1	0.0000	1.560	1.598
7	330.667	1193.667	95.646	4	0.0000	1.613	1.561
8	330.667	1193.667	97.349	1	0.0000	1.557	1.604
8	330.667	1193.667	97.349	4	0.0000	1.623	1.558
9	330.667	1193.667	99.049	1	0.0000	1.562	1.618
9	330.667	1193.667	99.049	4	0.0000	1.640	1.563
10	342.000	1194.000	99.494	1	0.0000	1.558	1.594
10	342.000	1194.000	99.494	4	0.0000	1.609	1.559
11	342.000	1194.000	101.171	1	0.0000	1.554	1.599
11	342.000	1194.000	101.171	4	0.0000	1.617	1.555
12	342.000	1194.000	102.846	1	0.0000	1.558	1.612
12	342.000	1194.000	102.846	4	0.0000	1.632	1.559
13	315.000	1203.333	99.951	1	0.0000	1.557	1.594
13	315.000	1203.333	99.951	4	0.0000	1.609	1.559
14	315.000	1203.333	101.697	1	0.0000	1.555	1.601
14	315.000	1203.333	101.697	4	0.0000	1.619	1.556
15	315.000	1203.333	103.440	1	0.0000	1.560	1.615
15	315.000	1203.333	103.440	4	0.0000	1.636	1.560
16	326.333	1203.667	103.798	1	0.0000	1.555	1.590
16	326.333	1203.667	103.798	4	0.0000	1.605	1.557
17	326.333	1203.667	105.519	1	0.0000	1.552	1.596
17	326.333	1203.667	105.519	4	0.0000	1.613	1.553
18	326.333	1203.667	107.236	1	0.0000	1.556	1.608
18	326.333	1203.667	107.236	4	0.0000	1.628	1.557
19	337.667	1204.000	107.646	1	0.0000	1.554	1.587
19	337.667	1204.000	107.646	4	0.0000	1.601	1.555
20	337.667	1204.000	109.340	1	0.0000	1.550	1.591
20	337.667	1204.000	109.340	4	0.0000	1.608	1.551
21	337.667	1204.000	111.033	1	0.0000	1.553	1.603
21	337.667	1204.000	111.033	4	0.0000	1.622	1.554
22	349.000	1204.333	111.494	1	0.0000	1.553	1.584
22	349.000	1204.333	111.494	4	0.0000	1.598	1.554
23	349.000	1204.333	113.162	1	0.0000	1.548	1.587
23	349.000	1204.333	113.162	4	0.0000	1.603	1.549
24	349.000	1204.333	114.829	1	0.0000	1.550	1.598
24	349.000	1204.333	114.829	4	0.0000	1.616	1.551
25	322.000	1213.667	111.951	1	0.0000	1.552	1.584

25	322.000	1213.667	111.951	4	0.0000	1.598	1.553
26	322.000	1213.667	113.688	1	0.0000	1.548	1.589
26	322.000	1213.667	113.688	4	0.0000	1.605	1.549
27	322.000	1213.667	115.423	1	0.0000	1.552	1.600
27	322.000	1213.667	115.423	4	0.0000	1.619	1.552
28	333.333	1214.000	115.798	1	0.0000	1.551	1.582
28	333.333	1214.000	115.798	4	0.0000	1.595	1.552
29	333.333	1214.000	117.510	1	0.0000	1.546	1.585
29	333.333	1214.000	117.510	4	0.0000	1.600	1.547
30	333.333	1214.000	119.219	1	0.0000	1.549	1.595
30	333.333	1214.000	119.219	4	0.0000	1.613	1.550
31	344.667	1214.333	119.646	1	0.0000	1.550	1.579
31	344.667	1214.333	119.646	4	0.0000	1.592	1.551
32	344.667	1214.333	121.332	1	0.0000	1.544	1.581
32	344.667	1214.333	121.332	4	0.0000	1.596	1.545
33	344.667	1214.333	123.016	1	0.0000	1.546	1.591
33	344.667	1214.333	123.016	4	0.0000	1.608	1.547
34	356.000	1214.667	123.493	1	0.0000	1.549	1.577
34	356.000	1214.667	123.493	4	0.0000	1.589	1.550
35	356.000	1214.667	125.154	1	0.0000	1.542	1.578
35	356.000	1214.667	125.154	4	0.0000	1.592	1.543
36	356.000	1214.667	126.813	1	0.0000	1.544	1.586
36	356.000	1214.667	126.813	4	0.0000	1.603	1.545
37	329.000	1224.000	123.950	1	0.0000	1.548	1.577
37	329.000	1224.000	123.950	4	0.0000	1.589	1.549
38	329.000	1224.000	125.680	1	0.0000	1.542	1.579
38	329.000	1224.000	125.680	4	0.0000	1.593	1.544
39	329.000	1224.000	127.406	1	0.0000	1.545	1.589
39	329.000	1224.000	127.406	4	0.0000	1.605	1.546
40	340.333	1224.333	127.798	1	0.0000	1.547	1.575
40	340.333	1224.333	127.798	4	0.0000	1.587	1.548
41	340.333	1224.333	129.502	1	0.0000	1.541	1.576
41	340.333	1224.333	129.502	4	0.0000	1.590	1.542
42	340.333	1224.333	131.203	1	0.0000	1.543	1.585
42	340.333	1224.333	131.203	4	0.0000	1.601	1.544
43	351.667	1224.667	131.646	1	0.0000	1.546	1.573
43	351.667	1224.667	131.646	4	0.0000	1.584	1.547
44	351.667	1224.667	133.324	1	0.0000	1.539	1.573
44	351.667	1224.667	133.324	4	0.0000	1.586	1.540
45	351.667	1224.667	134.999	1	0.0000	1.541	1.581
45	351.667	1224.667	134.999	4	0.0000	1.596	1.542
46	363.000	1225.000	135.493	1	0.0000	1.545	1.571
46	363.000	1225.000	135.493	4	0.0000	1.582	1.546
47	363.000	1225.000	137.146	1	0.0000	1.538	1.570
47	363.000	1225.000	137.146	4	0.0000	1.583	1.539
48	363.000	1225.000	138.796	1	0.0000	1.539	1.577
48	363.000	1225.000	138.796	4	0.0000	1.592	1.540

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    363.0000=X-COOR.   1225.0000=Y-COOR.    137.1456=RADIUS      1.538=F.S.    47=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    363.0000=X-COOR.   1225.0000=Y-COOR.    135.4934=RADIUS      1.582=F.S.    46=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    363.0000=X-COOR.   1225.0000=Y-COOR.    137.1456=RADIUS      1.539=F.S.    47=SLIP#
```

NORMAL TERMINATION OF SLOPE


1.928
.924
.921
.916
1.943
.938
.933
.929
1.962
.955
.949
.943
1.986
.978
.969
.962
Section 2-2 5' Clay Liner Cover with Static Loading
Elevation (ft) (x 1000)
1.24
1.23
1.22
1.21
1.20
1.19
1.18
1.17
1.16
1.15
1.14
1.13
1.12
1.11
1.10
1.09
1.08
1.07
200
250
300
350
400
450
Distance (ft)

ATTACHMENT # B
CALC 43

```
FILEINFO
SLOPEW 4.22
TITLE


03/29/2000
2:40:09 PM
ANALYSIS
    1     2     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            3
    1 +1.3000e+002 +1.0000e+002 +2.5000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Clay Liner
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          15
    1 +2.0000e+002 +1.1360e+003
    2 +2.2300e+002 +1.1360e+003
    3 +4.2000e+002 +1.0700e+003
    4 +2.0020e+002 +1.1310e+003
    5 +2.2200e+002 +1.1310e+003
    6 +3.8400e+002 +1.0770e+003
    7 +2.0050e+002 +1.0900e+003
    8 +2.9500e+002 +1.0900e+003
    9 +2.8800e+002 +1.1070e+003
   10 +3.4900e+002 +1.0870e+003
   11 +3.4800e+002 +1.0840e+003
   12 +2.8600e+002 +1.1040e+003
   13 +3.2900e+002 +1.2240e+003
   14 +3.0800e+002 +1.1930e+003
   15 +3.4200e+002 +1.1940e+003
LINE            3
    1     3
    1
    2
    3
    2     5
    1
    4
```

```
    5
    6
    3
    3     6
    1
    4
    7
    8
    6
    3
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000     0
GRID
   14    15    13     3     3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
    9    10    12    11     2    12    10
AXIS
    0
LIMIT
0 +2.0000e+002 +4.2000e+002
SLIP           0
BLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
PORU           3 +0.0000e+000
    1 +0.0000e+000     0
    2 +0.0000e+000     0
    3 +0.0000e+000     0
PIEZ           3 +0.0000e+000
    1     0     0
    2     0     0
    3     0     0
PCON           0 +0.0000e+000
POGH           0 +0.0000e+000
POGP           0 +0.0000e+000
POGR           0 +0.0000e+000
PORA           3
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
LOAD           0
ANCHOR         0
PBOUNDARY      0
SEISMIC
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE           0
ELEMENT        0
MATLCOLOR      3
    1   255   255   128
    2   191   255   128
    3   128   255   128
```

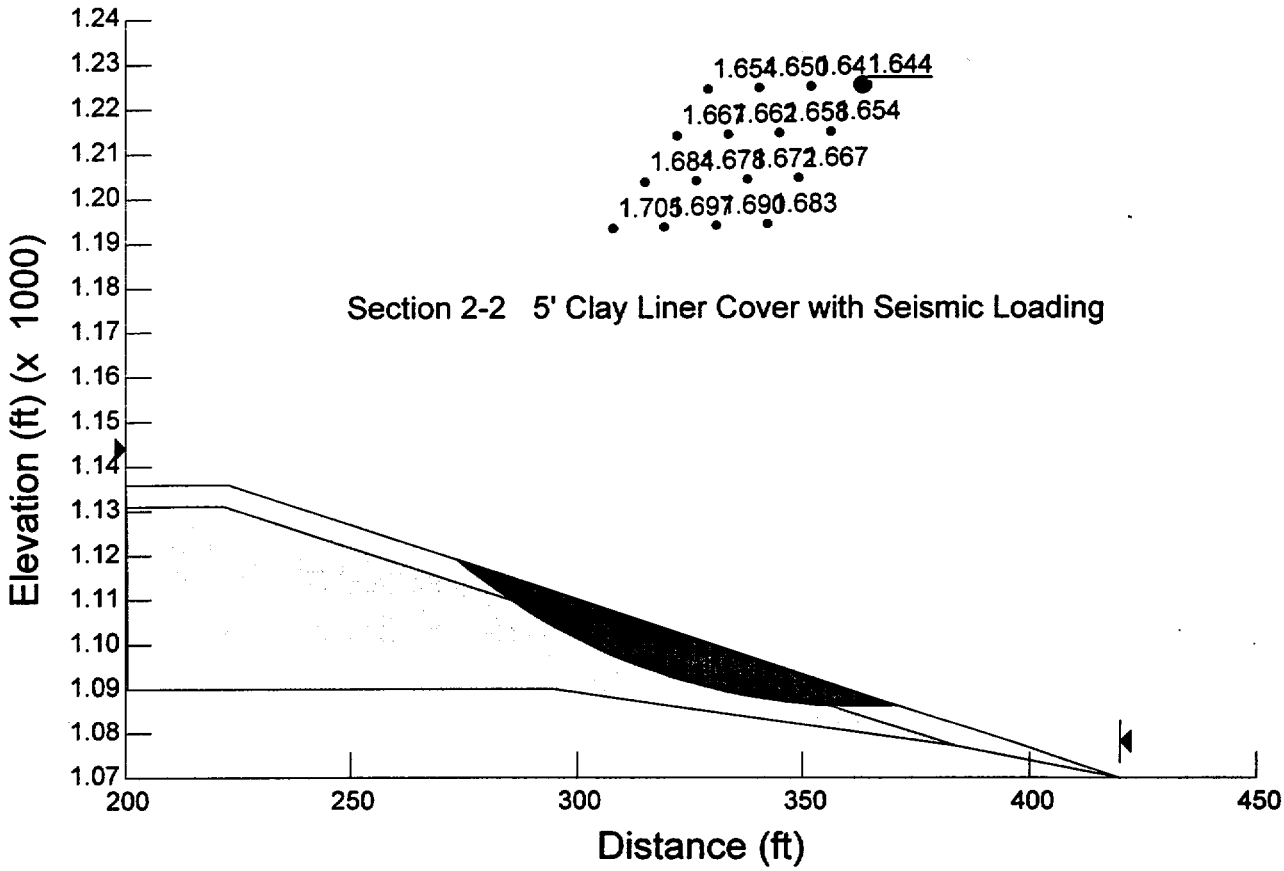
03/29/2000
2:40:09 PM
1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	308.000	1193.000	87.951	1	0.0000	1.963	2.026
1	308.000	1193.000	87.951	4	0.0000	2.020	1.959
2	308.000	1193.000	89.705	1	0.0000	1.914	1.993
2	308.000	1193.000	89.705	4	0.0000	1.988	1.909
3	308.000	1193.000	91.456	1	0.0000	1.896	1.992
3	308.000	1193.000	91.456	4	0.0000	1.986	1.891
4	319.333	1193.333	91.798	1	0.0000	1.962	2.021
4	319.333	1193.333	91.798	4	0.0000	2.016	1.958
5	319.333	1193.333	93.527	1	0.0000	1.912	1.986
5	319.333	1193.333	93.527	4	0.0000	1.981	1.907
6	319.333	1193.333	95.253	1	0.0000	1.893	1.983
6	319.333	1193.333	95.253	4	0.0000	1.978	1.888
7	330.667	1193.667	95.646	1	0.0000	1.962	2.017
7	330.667	1193.667	95.646	4	0.0000	2.013	1.958
8	330.667	1193.667	97.349	1	0.0000	1.909	1.980
8	330.667	1193.667	97.349	4	0.0000	1.975	1.905
9	330.667	1193.667	99.049	1	0.0000	1.889	1.974
9	330.667	1193.667	99.049	4	0.0000	1.969	1.885
10	342.000	1194.000	99.494	1	0.0000	1.962	2.015
10	342.000	1194.000	99.494	4	0.0000	2.011	1.958
11	342.000	1194.000	101.171	1	0.0000	1.907	1.974
11	342.000	1194.000	101.171	4	0.0000	1.970	1.904
12	342.000	1194.000	102.846	1	0.0000	1.886	1.966
12	342.000	1194.000	102.846	4	0.0000	1.962	1.882
13	315.000	1203.333	99.951	1	0.0000	1.954	2.008
13	315.000	1203.333	99.951	4	0.0000	2.004	1.950
14	315.000	1203.333	101.697	1	0.0000	1.903	1.971
14	315.000	1203.333	101.697	4	0.0000	1.967	1.899
15	315.000	1203.333	103.440	1	0.0000	1.884	1.967
15	315.000	1203.333	103.440	4	0.0000	1.962	1.880
16	326.333	1203.667	103.798	1	0.0000	1.954	2.005
16	326.333	1203.667	103.798	4	0.0000	2.001	1.950
17	326.333	1203.667	105.519	1	0.0000	1.901	1.966
17	326.333	1203.667	105.519	4	0.0000	1.962	1.898
18	326.333	1203.667	107.236	1	0.0000	1.880	1.959
18	326.333	1203.667	107.236	4	0.0000	1.955	1.877
19	337.667	1204.000	107.646	1	0.0000	1.954	2.003
19	337.667	1204.000	107.646	4	0.0000	2.000	1.951
20	337.667	1204.000	109.340	1	0.0000	1.900	1.962
20	337.667	1204.000	109.340	4	0.0000	1.958	1.896
21	337.667	1204.000	111.033	1	0.0000	1.878	1.953
21	337.667	1204.000	111.033	4	0.0000	1.949	1.875
22	349.000	1204.333	111.494	1	0.0000	1.955	2.002
22	349.000	1204.333	111.494	4	0.0000	1.998	1.952
23	349.000	1204.333	113.162	1	0.0000	1.899	1.958
23	349.000	1204.333	113.162	4	0.0000	1.954	1.896
24	349.000	1204.333	114.829	1	0.0000	1.875	1.947
24	349.000	1204.333	114.829	4	0.0000	1.943	1.872
25	322.000	1213.667	111.951	1	0.0000	1.947	1.994

25	322.000	1213.667	111.951	4	0.0000	1.991	1.943
26	322.000	1213.667	113.688	1	0.0000	1.894	1.955
26	322.000	1213.667	113.688	4	0.0000	1.951	1.891
27	322.000	1213.667	115.423	1	0.0000	1.873	1.947
27	322.000	1213.667	115.423	4	0.0000	1.943	1.870
28	333.333	1214.000	115.798	1	0.0000	1.948	1.993
28	333.333	1214.000	115.798	4	0.0000	1.990	1.945
29	333.333	1214.000	117.510	1	0.0000	1.893	1.951
29	333.333	1214.000	117.510	4	0.0000	1.948	1.890
30	333.333	1214.000	119.219	1	0.0000	1.871	1.941
30	333.333	1214.000	119.219	4	0.0000	1.938	1.868
31	344.667	1214.333	119.646	1	0.0000	1.949	1.992
31	344.667	1214.333	119.646	4	0.0000	1.989	1.946
32	344.667	1214.333	121.332	1	0.0000	1.892	1.947
32	344.667	1214.333	121.332	4	0.0000	1.945	1.890
33	344.667	1214.333	123.016	1	0.0000	1.869	1.936
33	344.667	1214.333	123.016	4	0.0000	1.933	1.866
34	356.000	1214.667	123.493	1	0.0000	1.950	1.991
34	356.000	1214.667	123.493	4	0.0000	1.989	1.947
35	356.000	1214.667	125.154	1	0.0000	1.892	1.945
35	356.000	1214.667	125.154	4	0.0000	1.942	1.889
36	356.000	1214.667	126.813	1	0.0000	1.868	1.931
36	356.000	1214.667	126.813	4	0.0000	1.929	1.865
37	329.000	1224.000	123.950	1	0.0000	1.941	1.984
37	329.000	1224.000	123.950	4	0.0000	1.981	1.938
38	329.000	1224.000	125.680	1	0.0000	1.887	1.941
38	329.000	1224.000	125.680	4	0.0000	1.939	1.885
39	329.000	1224.000	127.406	1	0.0000	1.865	1.931
39	329.000	1224.000	127.406	4	0.0000	1.928	1.862
40	340.333	1224.333	127.798	1	0.0000	1.943	1.983
40	340.333	1224.333	127.798	4	0.0000	1.981	1.940
41	340.333	1224.333	129.502	1	0.0000	1.887	1.939
41	340.333	1224.333	129.502	4	0.0000	1.936	1.884
42	340.333	1224.333	131.203	1	0.0000	1.863	1.926
42	340.333	1224.333	131.203	4	0.0000	1.924	1.861
43	351.667	1224.667	131.646	1	0.0000	1.944	1.983
43	351.667	1224.667	131.646	4	0.0000	1.981	1.942
44	351.667	1224.667	133.324	1	0.0000	1.886	1.936
44	351.667	1224.667	133.324	4	0.0000	1.934	1.884
45	351.667	1224.667	134.999	1	0.0000	1.862	1.922
45	351.667	1224.667	134.999	4	0.0000	1.920	1.860
46	363.000	1225.000	135.493	1	0.0000	1.946	1.983
46	363.000	1225.000	135.493	4	0.0000	1.981	1.943
47	363.000	1225.000	137.146	1	0.0000	1.887	1.934
47	363.000	1225.000	137.146	4	0.0000	1.932	1.884
48	363.000	1225.000	138.796	1	0.0000	1.861	1.919
48	363.000	1225.000	138.796	4	0.0000	1.916	1.859

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    363.0000=X-COOR.   1225.0000=Y-COOR.    138.7960=RADIUS      1.861=F.S.    48=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    363.0000=X-COOR.   1225.0000=Y-COOR.    138.7960=RADIUS      1.916=F.S.    48=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    363.0000=X-COOR.   1225.0000=Y-COOR.    138.7960=RADIUS      1.859=F.S.    48=SLIP#
```

NORMAL TERMINATION OF SLOPE


Section 2-2 5' Clay Liner Cover with Seismic Loading
1.654
1.650
1.641
1.644
1.667
1.662
1.658
1.654
1.684
1.678
1.672
1.667
1.705
1.697
1.690
1.683
Elevation (ft) (x 1000)
1.24
1.23
1.22
1.21
1.20
1.19
1.18
1.17
1.16
1.15
1.14
1.13
1.12
1.11
1.10
1.09
1.08
1.07
200
250
300
350
400
450
Distance (ft)

```
FILEINFO
SLOPEW 4.22
TITLE


03/29/2000
2:50:24 PM
ANALYSIS
    1     2     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL          3
    1 +1.3000e+002 +1.0000e+002 +2.5000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Clay Liner
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION      0
AFUNCTION      0
POINT         15
    1 +2.0000e+002 +1.1360e+003
    2 +2.2300e+002 +1.1360e+003
    3 +4.2000e+002 +1.0700e+003
    4 +2.0020e+002 +1.1310e+003
    5 +2.2200e+002 +1.1310e+003
    6 +3.8400e+002 +1.0770e+003
    7 +2.0050e+002 +1.0900e+003
    8 +2.9500e+002 +1.0900e+003
    9 +2.8800e+002 +1.1070e+003
   10 +3.4900e+002 +1.0870e+003
   11 +3.4800e+002 +1.0840e+003
   12 +2.8600e+002 +1.1040e+003
   13 +3.2900e+002 +1.2240e+003
   14 +3.0800e+002 +1.1930e+003
   15 +3.4200e+002 +1.1940e+003
LINE          3
    1     3
    1
    2
    3
    2     5
    1
    4
```

```
    5
    6
    3
    3     6
    1
    4
    7
    8
    6
    3
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000     0
GRID
   14    15    13     3     3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
    9    10    12    11     2    12    10
AXIS
    0
LIMIT
0 +2.0000e+002 +4.2000e+002
SLIP           0
BLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
PORU           3 +0.0000e+000
    1 +0.0000e+000     0
    2 +0.0000e+000     0
    3 +0.0000e+000     0
PIEZ           3 +0.0000e+000
    1     0     0
    2     0     0
    3     0     0
PCON           0 +0.0000e+000
POGH           0 +0.0000e+000
POGP           0 +0.0000e+000
POGR           0 +0.0000e+000
PORA           3
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
LOAD           0
ANCHOR         0
PBOUNDARY      0
SEISMIC
+5.0000e-002 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE           0
ELEMENT        0
MATLCOLOR      3
    1   255   255   128
    2   191   255   128
    3   128   255   128
```

ATTACHMENT # B
CALC
51

03/29/2000
2:50:24 PM
1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	308.000	1193.000	87.951	1	0.0000	1.685	1.722
1	308.000	1193.000	87.951	4	0.0000	1.735	1.681
2	308.000	1193.000	89.705	1	0.0000	1.641	1.689
2	308.000	1193.000	89.705	4	0.0000	1.706	1.637
3	308.000	1193.000	91.456	1	0.0000	1.625	1.684
3	308.000	1193.000	91.456	4	0.0000	1.705	1.621
4	319.333	1193.333	91.798	1	0.0000	1.684	1.719
4	319.333	1193.333	91.798	4	0.0000	1.732	1.680
5	319.333	1193.333	93.527	1	0.0000	1.639	1.684
5	319.333	1193.333	93.527	4	0.0000	1.701	1.636
6	319.333	1193.333	95.253	1	0.0000	1.622	1.677
6	319.333	1193.333	95.253	4	0.0000	1.697	1.619
7	330.667	1193.667	95.646	1	0.0000	1.683	1.717
7	330.667	1193.667	95.646	4	0.0000	1.729	1.680
8	330.667	1193.667	97.349	1	0.0000	1.637	1.680
8	330.667	1193.667	97.349	4	0.0000	1.695	1.634
9	330.667	1193.667	99.049	1	0.0000	1.619	1.671
9	330.667	1193.667	99.049	4	0.0000	1.690	1.616
10	342.000	1194.000	99.494	1	0.0000	1.684	1.715
10	342.000	1194.000	99.494	4	0.0000	1.727	1.680
11	342.000	1194.000	101.171	1	0.0000	1.635	1.676
11	342.000	1194.000	101.171	4	0.0000	1.691	1.632
12	342.000	1194.000	102.846	1	0.0000	1.616	1.666
12	342.000	1194.000	102.846	4	0.0000	1.683	1.613
13	315.000	1203.333	99.951	1	0.0000	1.676	1.709
13	315.000	1203.333	99.951	4	0.0000	1.721	1.673
14	315.000	1203.333	101.697	1	0.0000	1.631	1.673
14	315.000	1203.333	101.697	4	0.0000	1.688	1.628
15	315.000	1203.333	103.440	1	0.0000	1.614	1.665
15	315.000	1203.333	103.440	4	0.0000	1.684	1.611
16	326.333	1203.667	103.798	1	0.0000	1.676	1.707
16	326.333	1203.667	103.798	4	0.0000	1.718	1.673
17	326.333	1203.667	105.519	1	0.0000	1.630	1.669
17	326.333	1203.667	105.519	4	0.0000	1.684	1.627
18	326.333	1203.667	107.236	1	0.0000	1.611	1.660
18	326.333	1203.667	107.236	4	0.0000	1.678	1.609
19	337.667	1204.000	107.646	1	0.0000	1.677	1.706
19	337.667	1204.000	107.646	4	0.0000	1.717	1.674
20	337.667	1204.000	109.340	1	0.0000	1.628	1.666
20	337.667	1204.000	109.340	4	0.0000	1.680	1.626
21	337.667	1204.000	111.033	1	0.0000	1.609	1.655
21	337.667	1204.000	111.033	4	0.0000	1.672	1.607
22	349.000	1204.333	111.494	1	0.0000	1.677	1.705
22	349.000	1204.333	111.494	4	0.0000	1.716	1.675
23	349.000	1204.333	113.162	1	0.0000	1.628	1.664
23	349.000	1204.333	113.162	4	0.0000	1.677	1.625
24	349.000	1204.333	114.829	1	0.0000	1.607	1.651
24	349.000	1204.333	114.829	4	0.0000	1.667	1.605
25	322.000	1213.667	111.951	1	0.0000	1.670	1.699

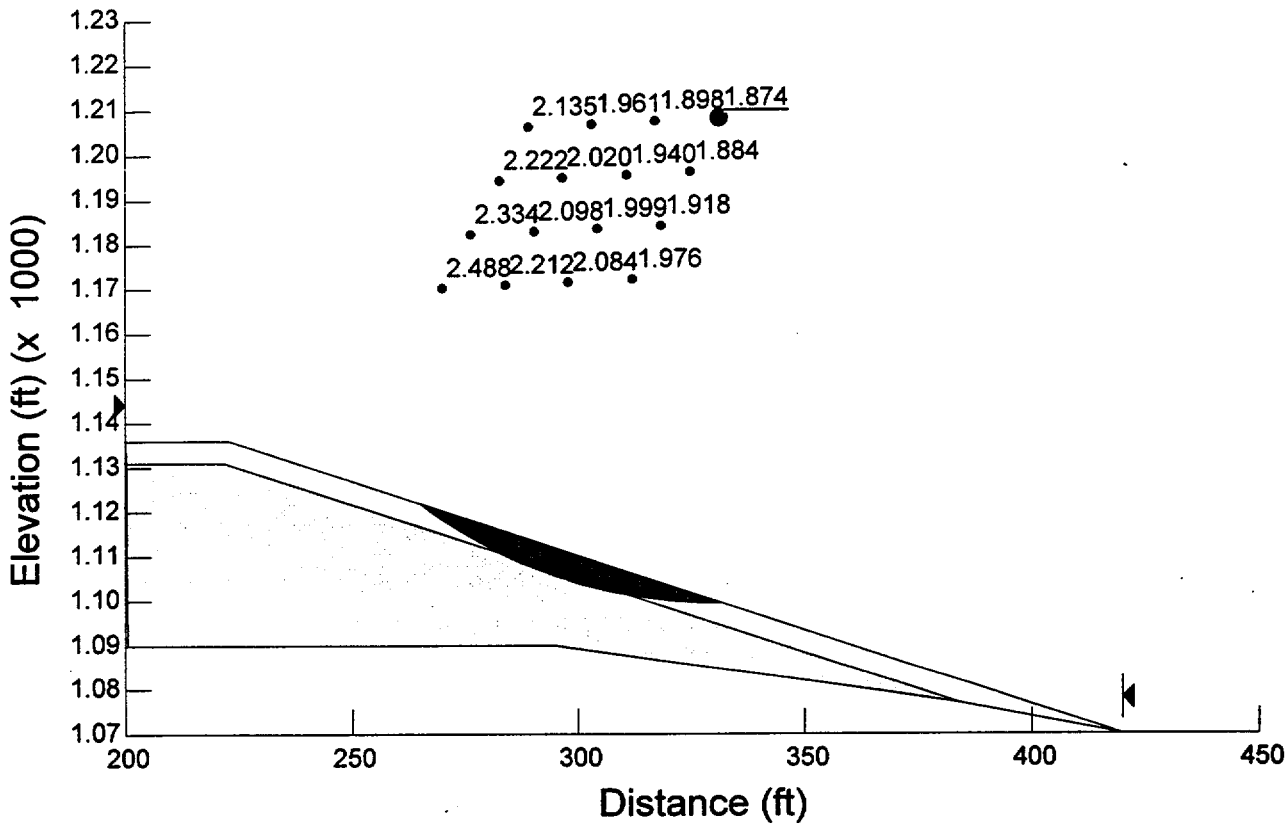
25	322.000	1213.667	111.951	4	0.0000	1.710	1.667
26	322.000	1213.667	113.688	1	0.0000	1.624	1.661
26	322.000	1213.667	113.688	4	0.0000	1.675	1.621
27	322.000	1213.667	115.423	1	0.0000	1.605	1.651
27	322.000	1213.667	115.423	4	0.0000	1.667	1.603
28	333.333	1214.000	115.798	1	0.0000	1.671	1.698
28	333.333	1214.000	115.798	4	0.0000	1.709	1.668
29	333.333	1214.000	117.510	1	0.0000	1.623	1.658
29	333.333	1214.000	117.510	4	0.0000	1.671	1.621
30	333.333	1214.000	119.219	1	0.0000	1.603	1.647
30	333.333	1214.000	119.219	4	0.0000	1.662	1.601
31	344.667	1214.333	119.646	1	0.0000	1.672	1.698
31	344.667	1214.333	119.646	4	0.0000	1.708	1.670
32	344.667	1214.333	121.332	1	0.0000	1.622	1.656
32	344.667	1214.333	121.332	4	0.0000	1.669	1.620
33	344.667	1214.333	123.016	1	0.0000	1.602	1.643
33	344.667	1214.333	123.016	4	0.0000	1.658	1.600
34	356.000	1214.667	123.493	1	0.0000	1.673	1.698
34	356.000	1214.667	123.493	4	0.0000	1.708	1.671
35	356.000	1214.667	125.154	1	0.0000	1.622	1.654
35	356.000	1214.667	125.154	4	0.0000	1.666	1.620
36	356.000	1214.667	126.813	1	0.0000	1.600	1.640
36	356.000	1214.667	126.813	4	0.0000	1.654	1.598
37	329.000	1224.000	123.950	1	0.0000	1.665	1.691
37	329.000	1224.000	123.950	4	0.0000	1.701	1.663
38	329.000	1224.000	125.680	1	0.0000	1.618	1.651
38	329.000	1224.000	125.680	4	0.0000	1.663	1.616
39	329.000	1224.000	127.406	1	0.0000	1.598	1.639
39	329.000	1224.000	127.406	4	0.0000	1.654	1.596
40	340.333	1224.333	127.798	1	0.0000	1.666	1.691
40	340.333	1224.333	127.798	4	0.0000	1.701	1.665
41	340.333	1224.333	129.502	1	0.0000	1.617	1.649
41	340.333	1224.333	129.502	4	0.0000	1.661	1.616
42	340.333	1224.333	131.203	1	0.0000	1.597	1.636
42	340.333	1224.333	131.203	4	0.0000	1.650	1.595
43	351.667	1224.667	131.646	1	0.0000	1.668	1.691
43	351.667	1224.667	131.646	4	0.0000	1.701	1.666
44	351.667	1224.667	133.324	1	0.0000	1.617	1.648
44	351.667	1224.667	133.324	4	0.0000	1.659	1.615
45	351.667	1224.667	134.999	1	0.0000	1.596	1.633
45	351.667	1224.667	134.999	4	0.0000	1.647	1.594
46	363.000	1225.000	135.493	1	0.0000	1.669	1.692
46	363.000	1225.000	135.493	4	0.0000	1.701	1.668
47	363.000	1225.000	137.146	1	0.0000	1.617	1.646
47	363.000	1225.000	137.146	4	0.0000	1.658	1.616
48	363.000	1225.000	138.796	1	0.0000	1.595	1.631
48	363.000	1225.000	138.796	4	0.0000	1.644	1.593

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    363.0000=X-COOR.   1225.0000=Y-COOR.   138.7960=RADIUS      1.595=F.S.    48=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    363.0000=X-COOR.   1225.0000=Y-COOR.   138.7960=RADIUS      1.644=F.S.    48=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    363.0000=X-COOR.   1225.0000=Y-COOR.   138.7960=RADIUS      1.593=F.S.    48=SLIP#
```

NORMAL TERMINATION OF SLOPE

ATTACHMENT # B
CALC 1003401-G(B)-06
PAGE 54

Section 2-2 5' Filter Drainage/Bedding Cover with Static Loading



```
FILEINFO
SLOPEW 4.22
TITLE


04/04/2000
4:02:09 PM
ANALYSIS
    1     2     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL           3
    1 +1.3000e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Soil Granual
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION      0
AFUNCTION      0
POINT         15
    1 +2.0000e+002 +1.1360e+003
    2 +2.2300e+002 +1.1360e+003
    3 +4.2000e+002 +1.0700e+003
    4 +2.0020e+002 +1.1310e+003
    5 +2.2200e+002 +1.1310e+003
    6 +3.8400e+002 +1.0770e+003
    7 +2.0050e+002 +1.0900e+003
    8 +2.9500e+002 +1.0900e+003
    9 +2.1300e+002 +1.1010e+003
   10 +2.9200e+002 +1.1000e+003
   11 +2.9200e+002 +1.0930e+003
   12 +2.1300e+002 +1.0940e+003
   13 +2.8900e+002 +1.2060e+003
   14 +2.7000e+002 +1.1700e+003
   15 +3.1200e+002 +1.1720e+003
LINE           3
    1     3
    1
    2
    3
    2     5
    1
    4
```

```
    5
    6
    3
    3     6
    1
    4
    7
    8
    6
    3
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000     0
GRID
   14    15    13     3     3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
    9    10    12    11     2     9    10
AXIS
    0
LIMIT
0 +2.0000e+002 +4.2000e+002
SLIP           0
BLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
PORU           3 +0.0000e+000
    1 +0.0000e+000     0
    2 +0.0000e+000     0
    3 +0.0000e+000     0
PIEZ           3 +0.0000e+000
    1     0     0
    2     0     0
    3     0     0
PCON           0 +0.0000e+000
POGH           0 +0.0000e+000
POGP           0 +0.0000e+000
POGR           0 +0.0000e+000
PORA           3
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
LOAD           0
ANCHOR         0
PBOUNDARY      0
SEISMIC
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE           0
ELEMENT        0
MATLCOLOR      3
    1   255   255   128
    2   191   255   128
    3   128   255   128
```

04/04/2000
4:02:09 PM
1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

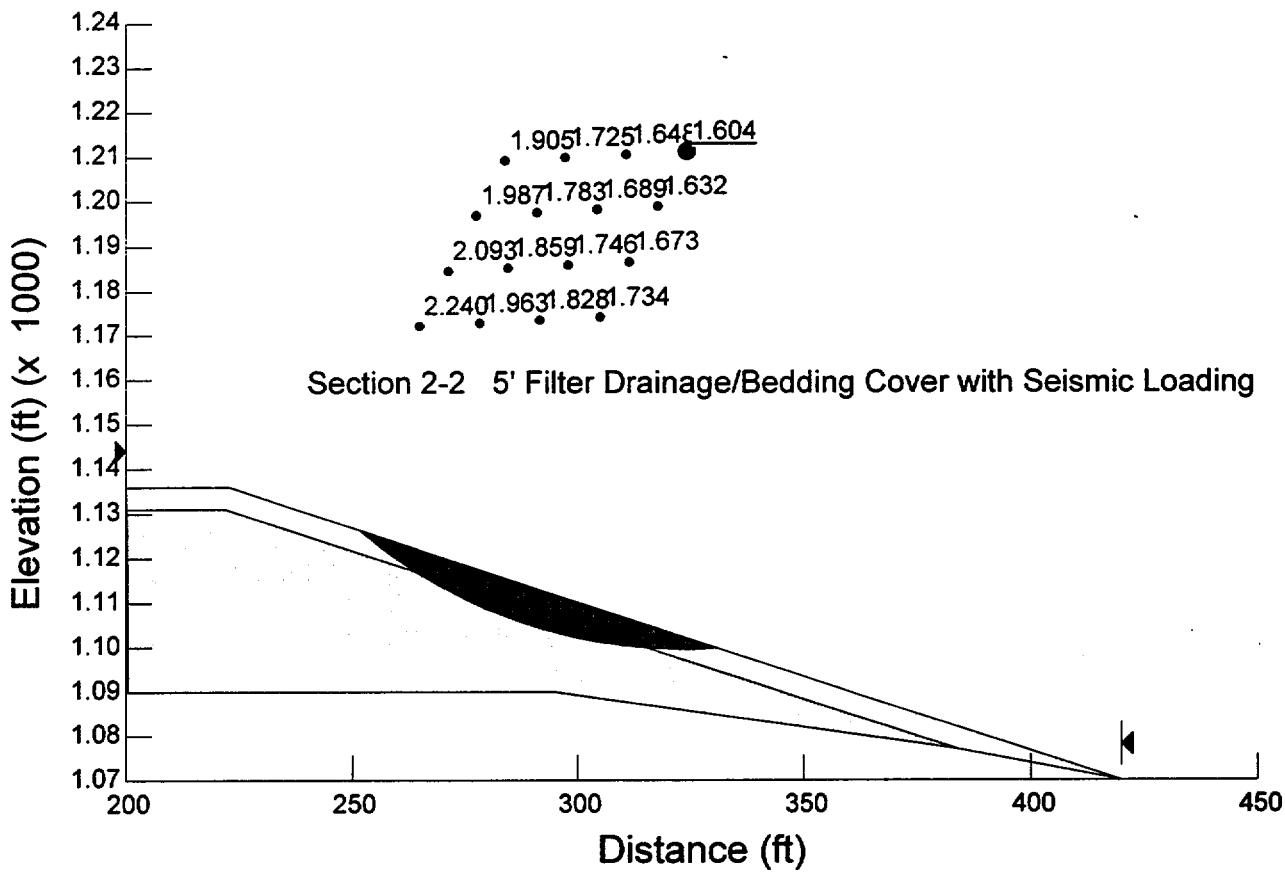
SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	270.000	1170.000	69.716	1	0.0000	2.185	2.505
1	270.000	1170.000	69.716	5	0.0000	2.488	2.180
2	270.000	1170.000	73.216	1	0.0000	2.279	2.638
2	270.000	1170.000	73.216	5	0.0000	2.618	2.274
3	270.000	1170.000	76.715	1	0.0000	2.371	2.769
3	270.000	1170.000	76.715	5	0.0000	2.747	2.366
4	284.000	1170.667	70.560	1	0.0000	1.970	2.230
4	284.000	1170.667	70.560	4	0.0000	2.212	1.959
5	284.000	1170.667	74.059	1	0.0000	2.024	2.324
5	284.000	1170.667	74.059	5	0.0000	2.301	2.012
6	284.000	1170.667	77.559	1	0.0000	2.089	2.425
6	284.000	1170.667	77.559	5	0.0000	2.400	2.078
7	298.000	1171.333	71.404	1	0.0000	1.906	2.093
7	298.000	1171.333	71.404	4	0.0000	2.084	1.902
8	298.000	1171.333	74.903	1	0.0000	1.943	2.172
8	298.000	1171.333	74.903	4	0.0000	2.158	1.935
9	298.000	1171.333	78.403	1	0.0000	1.978	2.250
9	298.000	1171.333	78.403	4	0.0000	2.229	1.966
10	312.000	1172.000	72.247	1	0.0000	1.856	1.978
10	312.000	1172.000	72.247	4	0.0000	1.976	1.856
11	312.000	1172.000	75.747	1	0.0000	1.886	2.050
11	312.000	1172.000	75.747	4	0.0000	2.043	1.883
12	312.000	1172.000	79.247	1	0.0000	1.920	2.123
12	312.000	1172.000	79.247	4	0.0000	2.112	1.914
13	276.333	1182.000	81.795	1	0.0000	2.104	2.344
13	276.333	1182.000	81.795	4	0.0000	2.334	2.101
14	276.333	1182.000	85.295	1	0.0000	2.188	2.461
14	276.333	1182.000	85.295	4	0.0000	2.450	2.186
15	276.333	1182.000	88.795	1	0.0000	2.271	2.575
15	276.333	1182.000	88.795	5	0.0000	2.563	2.269
16	290.333	1182.667	82.639	1	0.0000	1.913	2.109
16	290.333	1182.667	82.639	4	0.0000	2.098	1.907
17	290.333	1182.667	86.139	1	0.0000	1.963	2.192
17	290.333	1182.667	86.139	4	0.0000	2.178	1.956
18	290.333	1182.667	89.638	1	0.0000	2.024	2.283
18	290.333	1182.667	89.638	4	0.0000	2.267	2.016
19	304.333	1183.333	83.483	1	0.0000	1.865	2.003
19	304.333	1183.333	83.483	4	0.0000	1.999	1.863
20	304.333	1183.333	86.983	1	0.0000	1.894	2.069
20	304.333	1183.333	86.983	4	0.0000	2.061	1.890
21	304.333	1183.333	90.482	1	0.0000	1.923	2.134
21	304.333	1183.333	90.482	4	0.0000	2.121	1.916
22	318.333	1184.000	84.327	1	0.0000	1.831	1.918
22	318.333	1184.000	84.327	4	0.0000	1.918	1.832
23	318.333	1184.000	87.826	1	0.0000	1.851	1.973
23	318.333	1184.000	87.826	4	0.0000	1.970	1.850
24	318.333	1184.000	91.326	1	0.0000	1.878	2.034
24	318.333	1184.000	91.326	4	0.0000	2.028	1.874
25	282.667	1194.000	93.874	1	0.0000	2.040	2.227

25	282.667	1194.000	93.874	4	0.0000	2.222	2.040
26	282.667	1194.000	97.374	1	0.0000	2.118	2.333
26	282.667	1194.000	97.374	4	0.0000	2.326	2.118
27	282.667	1194.000	100.874	1	0.0000	2.195	2.436
27	282.667	1194.000	100.874	4	0.0000	2.429	2.194
28	296.667	1194.667	94.718	1	0.0000	1.874	2.026
28	296.667	1194.667	94.718	4	0.0000	2.020	1.871
29	296.667	1194.667	98.218	1	0.0000	1.918	2.098
29	296.667	1194.667	98.218	4	0.0000	2.090	1.913
30	296.667	1194.667	101.718	1	0.0000	1.973	2.180
30	296.667	1194.667	101.718	4	0.0000	2.170	1.968
31	310.667	1195.333	95.562	1	0.0000	1.836	1.942
31	310.667	1195.333	95.562	4	0.0000	1.940	1.836
32	310.667	1195.333	99.062	1	0.0000	1.860	1.996
32	310.667	1195.333	99.062	4	0.0000	1.991	1.858
33	310.667	1195.333	102.561	1	0.0000	1.886	2.053
33	310.667	1195.333	102.561	4	0.0000	2.045	1.882
34	324.667	1196.000	96.406	1	0.0000	1.820	1.883
34	324.667	1196.000	96.406	4	0.0000	1.884	1.821
35	324.667	1196.000	99.905	1	0.0000	1.827	1.920
35	324.667	1196.000	99.905	4	0.0000	1.919	1.827
36	324.667	1196.000	103.405	1	0.0000	1.848	1.971
36	324.667	1196.000	103.405	4	0.0000	1.967	1.846
37	289.000	1206.000	105.954	1	0.0000	1.988	2.138
37	289.000	1206.000	105.954	4	0.0000	2.135	1.988
38	289.000	1206.000	109.453	1	0.0000	2.061	2.234
38	289.000	1206.000	109.453	4	0.0000	2.230	2.061
39	289.000	1206.000	112.953	1	0.0000	2.132	2.328
39	289.000	1206.000	112.953	4	0.0000	2.324	2.132
40	303.000	1206.667	106.797	1	0.0000	1.845	1.965
40	303.000	1206.667	106.797	4	0.0000	1.961	1.844
41	303.000	1206.667	110.297	1	0.0000	1.881	2.027
41	303.000	1206.667	110.297	4	0.0000	2.022	1.879
42	303.000	1206.667	113.797	1	0.0000	1.933	2.102
42	303.000	1206.667	113.797	4	0.0000	2.095	1.930
43	317.000	1207.333	107.641	1	0.0000	1.817	1.898
43	317.000	1207.333	107.641	4	0.0000	1.898	1.818
44	317.000	1207.333	111.141	1	0.0000	1.835	1.943
44	317.000	1207.333	111.141	4	0.0000	1.940	1.834
45	317.000	1207.333	114.641	1	0.0000	1.857	1.992
45	317.000	1207.333	114.641	4	0.0000	1.987	1.854
46	331.000	1208.000	108.485	1	0.0000	1.828	1.873
46	331.000	1208.000	108.485	4	0.0000	1.874	1.829
47	331.000	1208.000	111.985	1	0.0000	1.811	1.882
47	331.000	1208.000	111.985	4	0.0000	1.882	1.812
48	331.000	1208.000	115.484	1	0.0000	1.826	1.924
48	331.000	1208.000	115.484	4	0.0000	1.922	1.826

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    331.0000=X-COOR.   1208.0000=Y-COOR.    111.9847=RADIUS      1.811=F.S.    47=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    331.0000=X-COOR.   1208.0000=Y-COOR.    108.4850=RADIUS      1.874=F.S.    46=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    331.0000=X-COOR.   1208.0000=Y-COOR.    111.9847=RADIUS      1.812=F.S.    47=SLIP#
```

NORMAL TERMINATION OF SLOPE

ATTACHMENT # B
CALC 100340/-G(B)-06
PAGE 60



ATTACHMENT # B
CALC 100340-G(B)-06
6

```
FILEINFO
SLOPEW 4.22
TITLE


04/04/2000
3:55:52 PM
ANALYSIS
    1     2     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL          3
    1 +1.3000e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Soil Granual
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION      0
AFUNCTION      0
POINT         15
    1 +2.0000e+002 +1.1360e+003
    2 +2.2300e+002 +1.1360e+003
    3 +4.2000e+002 +1.0700e+003
    4 +2.0020e+002 +1.1310e+003
    5 +2.2200e+002 +1.1310e+003
    6 +3.8400e+002 +1.0770e+003
    7 +2.0050e+002 +1.0900e+003
    8 +2.9500e+002 +1.0900e+003
    9 +2.1300e+002 +1.1010e+003
   10 +2.9200e+002 +1.1000e+003
   11 +2.9200e+002 +1.0930e+003
   12 +2.1300e+002 +1.0940e+003
   13 +2.8400e+002 +1.2090e+003
   14 +2.6500e+002 +1.1720e+003
   15 +3.0500e+002 +1.1740e+003
LINE          3
    1     3
    1
    2
    3
    2     5
    1
    4
```

ATTACHMENT # B
CALC 100340I-G1(B)-06
62

```
    5
    6
    3
    3     6
    1
    4
    7
    8
    6
    3
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000     0
GRID
   14    15    13     3     3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
    9    10    12    11     2     9    10
AXIS
    0
LIMIT
0 +2.0000e+002 +4.2000e+002
SLIP           0
BLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
PORU           3 +0.0000e+000
    1 +0.0000e+000     0
    2 +0.0000e+000     0
    3 +0.0000e+000     0
PIEZ           3 +0.0000e+000
    1     0     0
    2     0     0
    3     0     0
PCON           0 +0.0000e+000
POGH           0 +0.0000e+000
POGP           0 +0.0000e+000
POGR           0 +0.0000e+000
PORA           3
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
LOAD           0
ANCHOR         0
PBOUNDARY      0
SEISMIC
+5.0000e-002 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE           0
ELEMENT        0
MATLCOLOR      3
    1   255   255   128
    2   191   255   128
    3   128   255   128
```

ATTACHMENT # B
CALC 100340-1-G(B)-06
63

04/04/2000
3:55:52 PM
1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	265.000	1172.000	71.652	1	0.0000	1.966	2.138
1	265.000	1172.000	71.652	4	0.0000	2.240	1.955
2	265.000	1172.000	75.152	0	0.0000	998.000	998.000
2	265.000	1172.000	75.152	0	0.0000	998.000	998.000
3	265.000	1172.000	78.652	0	0.0000	998.000	998.000
3	265.000	1172.000	78.652	0	0.0000	998.000	998.000
4	278.333	1172.667	72.488	1	0.0000	1.737	1.899
4	278.333	1172.667	72.488	4	0.0000	1.963	1.729
5	278.333	1172.667	75.988	1	0.0000	1.800	1.977
5	278.333	1172.667	75.988	4	0.0000	2.055	1.790
6	278.333	1172.667	79.487	1	0.0000	1.864	2.055
6	278.333	1172.667	79.487	4	0.0000	2.146	1.852
7	291.667	1173.333	73.323	1	0.0000	1.652	1.782
7	291.667	1173.333	73.323	4	0.0000	1.828	1.647
8	291.667	1173.333	76.823	1	0.0000	1.683	1.837
8	291.667	1173.333	76.823	4	0.0000	1.891	1.674
9	291.667	1173.333	80.323	1	0.0000	1.717	1.893
9	291.667	1173.333	80.323	4	0.0000	1.956	1.707
10	305.000	1174.000	74.159	1	0.0000	1.606	1.700
10	305.000	1174.000	74.159	4	0.0000	1.734	1.606
11	305.000	1174.000	77.658	1	0.0000	1.635	1.752
11	305.000	1174.000	77.658	4	0.0000	1.794	1.631
12	305.000	1174.000	81.158	1	0.0000	1.664	1.804
12	305.000	1174.000	81.158	4	0.0000	1.854	1.657
13	271.333	1184.333	84.065	1	0.0000	1.885	2.017
13	271.333	1184.333	84.065	4	0.0000	2.093	1.878
14	271.333	1184.333	87.565	0	0.0000	998.000	998.000
14	271.333	1184.333	87.565	0	0.0000	998.000	998.000
15	271.333	1184.333	91.064	0	0.0000	998.000	998.000
15	271.333	1184.333	91.064	0	0.0000	998.000	998.000
16	284.667	1185.000	84.900	1	0.0000	1.685	1.809
16	284.667	1185.000	84.900	4	0.0000	1.859	1.681
17	284.667	1185.000	88.400	1	0.0000	1.743	1.881
17	284.667	1185.000	88.400	4	0.0000	1.941	1.737
18	284.667	1185.000	91.900	1	0.0000	1.801	1.951
18	284.667	1185.000	91.900	4	0.0000	2.023	1.794
19	298.000	1185.667	85.736	1	0.0000	1.611	1.711
19	298.000	1185.667	85.736	4	0.0000	1.746	1.609
20	298.000	1185.667	89.236	1	0.0000	1.638	1.758
20	298.000	1185.667	89.236	4	0.0000	1.800	1.634
21	298.000	1185.667	92.735	1	0.0000	1.669	1.807
21	298.000	1185.667	92.735	4	0.0000	1.857	1.662
22	311.333	1186.333	86.571	1	0.0000	1.578	1.647
22	311.333	1186.333	86.571	4	0.0000	1.673	1.578
23	311.333	1186.333	90.071	1	0.0000	1.600	1.690
23	311.333	1186.333	90.071	4	0.0000	1.723	1.598
24	311.333	1186.333	93.571	1	0.0000	1.625	1.735
24	311.333	1186.333	93.571	4	0.0000	1.774	1.621
25	277.667	1196.667	96.477	1	0.0000	1.822	1.928

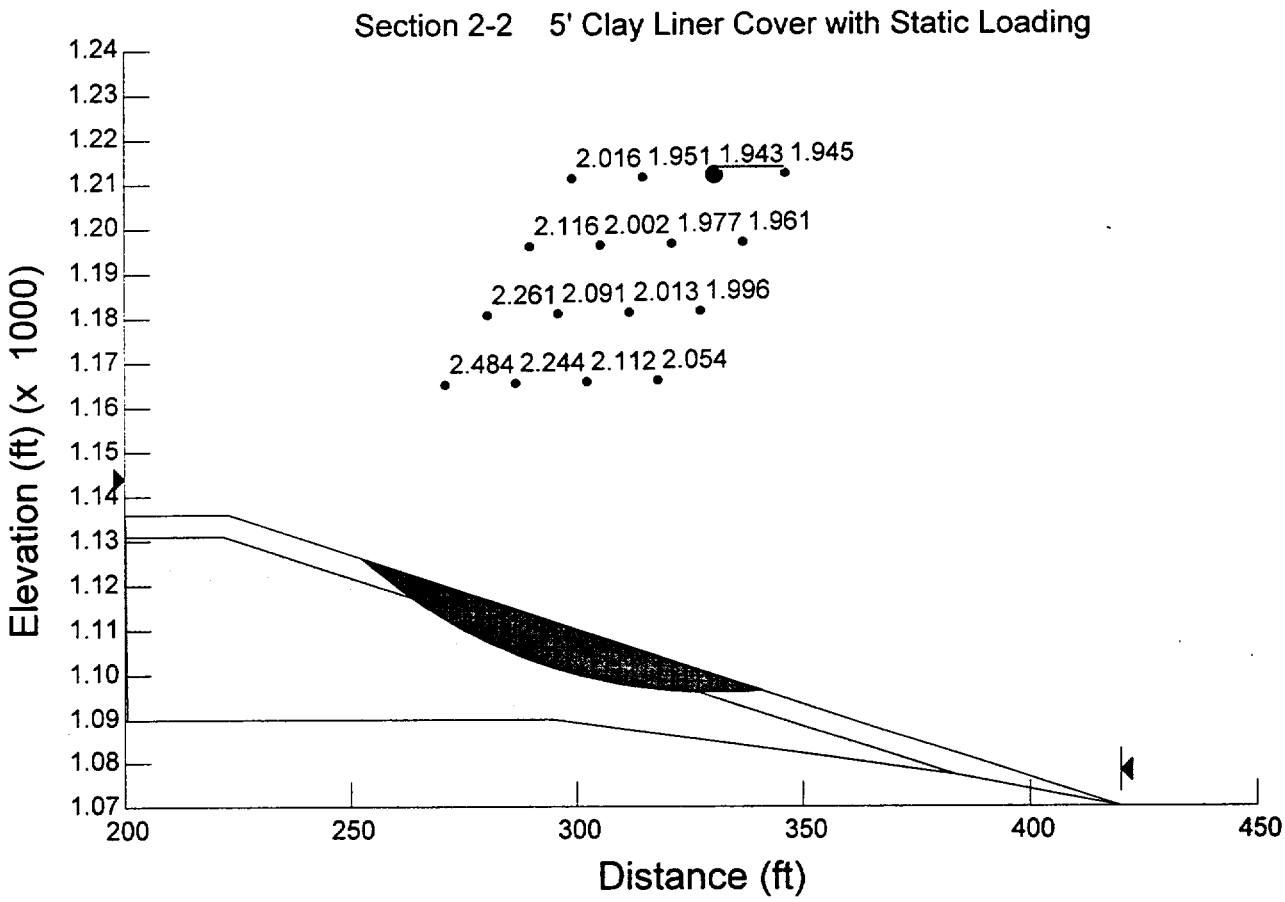
25	277.667	1196.667	96.477	4	0.0000	1.987	1.818
26	277.667	1196.667	99.977	0	0.0000	998.000	998.000
26	277.667	1196.667	99.977	0	0.0000	998.000	998.000
27	277.667	1196.667	103.477	0	0.0000	998.000	998.000
27	277.667	1196.667	103.477	0	0.0000	998.000	998.000
28	291.000	1197.333	97.313	1	0.0000	1.646	1.744
28	291.000	1197.333	97.313	4	0.0000	1.783	1.644
29	291.000	1197.333	100.813	1	0.0000	1.699	1.809
29	291.000	1197.333	100.813	4	0.0000	1.857	1.696
30	291.000	1197.333	104.312	1	0.0000	1.753	1.875
30	291.000	1197.333	104.312	4	0.0000	1.932	1.748
31	304.333	1198.000	98.148	1	0.0000	1.583	1.661
31	304.333	1198.000	98.148	4	0.0000	1.689	1.583
32	304.333	1198.000	101.648	1	0.0000	1.605	1.701
32	304.333	1198.000	101.648	4	0.0000	1.735	1.603
33	304.333	1198.000	105.148	1	0.0000	1.633	1.745
33	304.333	1198.000	105.148	4	0.0000	1.786	1.630
34	317.667	1198.667	98.984	1	0.0000	1.559	1.611
34	317.667	1198.667	98.984	4	0.0000	1.632	1.560
35	317.667	1198.667	102.483	1	0.0000	1.575	1.646
35	317.667	1198.667	102.483	4	0.0000	1.672	1.575
36	317.667	1198.667	105.983	1	0.0000	1.596	1.684
36	317.667	1198.667	105.983	4	0.0000	1.715	1.594
37	284.000	1209.000	108.890	1	0.0000	1.771	1.858
37	284.000	1209.000	108.890	4	0.0000	1.905	1.769
38	284.000	1209.000	112.390	0	0.0000	998.000	998.000
38	284.000	1209.000	112.390	0	0.0000	998.000	998.000
39	284.000	1209.000	115.889	0	0.0000	998.000	998.000
39	284.000	1209.000	115.889	0	0.0000	998.000	998.000
40	297.333	1209.667	109.725	1	0.0000	1.614	1.694
40	297.333	1209.667	109.725	4	0.0000	1.725	1.613
41	297.333	1209.667	113.225	1	0.0000	1.663	1.754
41	297.333	1209.667	113.225	4	0.0000	1.793	1.662
42	297.333	1209.667	116.725	1	0.0000	1.714	1.815
42	297.333	1209.667	116.725	4	0.0000	1.862	1.711
43	310.667	1210.333	110.561	1	0.0000	1.564	1.625
43	310.667	1210.333	110.561	4	0.0000	1.648	1.564
44	310.667	1210.333	114.061	1	0.0000	1.581	1.659
44	310.667	1210.333	114.061	4	0.0000	1.687	1.580
45	310.667	1210.333	117.560	1	0.0000	1.606	1.698
45	310.667	1210.333	117.560	4	0.0000	1.731	1.604
46	324.000	1211.000	111.396	1	0.0000	1.549	1.588
46	324.000	1211.000	111.396	4	0.0000	1.604	1.550
47	324.000	1211.000	114.896	1	0.0000	1.558	1.613
47	324.000	1211.000	114.896	4	0.0000	1.635	1.558
48	324.000	1211.000	118.396	1	0.0000	1.574	1.646
48	324.000	1211.000	118.396	4	0.0000	1.672	1.573

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    324.0000=X-COOR.   1211.0000=Y-COOR.    111.3961=RADIUS      1.549=F.S.    46=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    324.0000=X-COOR.   1211.0000=Y-COOR.    111.3961=RADIUS      1.604=F.S.    46=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    324.0000=X-COOR.   1211.0000=Y-COOR.    111.3961=RADIUS      1.550=F.S.    46=SLIP#
```

ATTACHMENT # B
100340I-G(13)-06
65

NORMAL TERMINATION OF SLOPE

ATTACHMENT # B
CALC 100340I-G(B)06
66



ATTACHMENT # B
CALC 100340 1-G(B)-01
67

```
FILEINFO
SLOPEW 4.22
TITLE


04/04/2000
3:30:18 PM
ANALYSIS
    1     2     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL           3
    1 +1.3000e+002 +1.0000e+002 +2.5000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Clay Liner
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION      0
AFUNCTION      0
POINT         15
    1 +2.0000e+002 +1.1360e+003
    2 +2.2300e+002 +1.1360e+003
    3 +4.2000e+002 +1.0700e+003
    4 +2.0020e+002 +1.1310e+003
    5 +2.2200e+002 +1.1310e+003
    6 +3.8400e+002 +1.0770e+003
    7 +2.0050e+002 +1.0900e+003
    8 +2.9500e+002 +1.0900e+003
    9 +2.1300e+002 +1.1010e+003
   10 +2.9200e+002 +1.1000e+003
   11 +2.9200e+002 +1.0930e+003
   12 +2.1300e+002 +1.0940e+003
   13 +2.9900e+002 +1.2110e+003
   14 +2.7100e+002 +1.1650e+003
   15 +3.1800e+002 +1.1660e+003
LINE           3
    1     3
    1
    2
    3
    2     5
    1
    4
```

```
    5
    6
    3
    3     6
    1
    4
    7
    8
    6
    3
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000     0
GRID
   14    15    13     3     3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
    9    10    12    11     2     9    10
AXIS
    0
LIMIT
0 +2.0000e+002 +4.2000e+002
SLIP           0
BLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
PORU           3 +0.0000e+000
    1 +0.0000e+000     0
    2 +0.0000e+000     0
    3 +0.0000e+000     0
PIEZ           3 +0.0000e+000
    1     0     0
    2     0     0
    3     0     0
PCON           0 +0.0000e+000
POGH           0 +0.0000e+000
POGP           0 +0.0000e+000
POGR           0 +0.0000e+000
PORA           3
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
LOAD           0
ANCHOR         0
PBOUNDARY      0
SEISMIC
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE           0
ELEMENT        0
MATLCOLOR      3
    1   255   255   128
    2   191   255   128
    3   128   255   128
```

ATTACHMENT # B
CALC 100340-FG(B)-06
69

04/04/2000
3:30:18 PM

1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

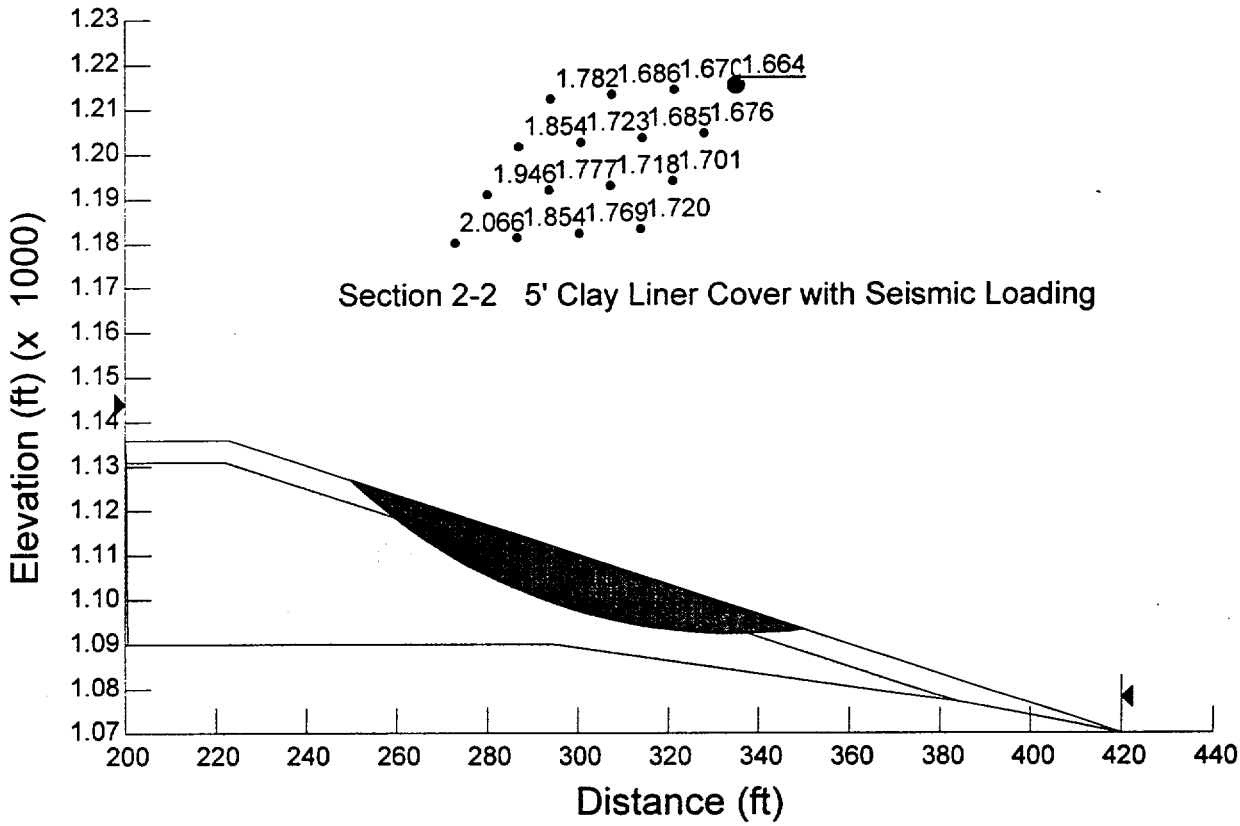
SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	271.000	1165.000	64.729	1	0.0000	2.166	2.512
1	271.000	1165.000	64.729	5	0.0000	2.484	2.152
2	271.000	1165.000	68.229	1	0.0000	2.253	2.640
2	271.000	1165.000	68.229	5	0.0000	2.610	2.240
3	271.000	1165.000	71.728	1	0.0000	2.341	2.768
3	271.000	1165.000	71.728	5	0.0000	2.736	2.329
4	286.667	1165.333	65.261	1	0.0000	2.007	2.268
4	286.667	1165.333	65.261	4	0.0000	2.244	1.992
5	286.667	1165.333	68.760	1	0.0000	2.039	2.350
5	286.667	1165.333	68.760	5	0.0000	2.320	2.021
6	286.667	1165.333	72.260	1	0.0000	2.078	2.433
6	286.667	1165.333	72.260	5	0.0000	2.398	2.057
7	302.333	1165.667	65.792	1	0.0000	1.953	2.125
7	302.333	1165.667	65.792	4	0.0000	2.112	1.943
8	302.333	1165.667	69.292	1	0.0000	1.974	2.194
8	302.333	1165.667	69.292	4	0.0000	2.176	1.961
9	302.333	1165.667	72.792	1	0.0000	2.001	2.268
9	302.333	1165.667	72.792	4	0.0000	2.244	1.985
10	318.000	1166.000	66.324	1	0.0000	1.967	2.063
10	318.000	1166.000	66.324	4	0.0000	2.054	1.959
11	318.000	1166.000	69.824	1	0.0000	1.935	2.076
11	318.000	1166.000	69.824	4	0.0000	2.066	1.927
12	318.000	1166.000	73.323	1	0.0000	1.947	2.133
12	318.000	1166.000	73.323	4	0.0000	2.119	1.937
13	280.333	1180.333	80.179	1	0.0000	2.043	2.275
13	280.333	1180.333	80.179	4	0.0000	2.261	2.035
14	280.333	1180.333	83.679	1	0.0000	2.117	2.382
14	280.333	1180.333	83.679	4	0.0000	2.366	2.109
15	280.333	1180.333	87.179	1	0.0000	2.192	2.489
15	280.333	1180.333	87.179	5	0.0000	2.472	2.186
16	296.000	1180.667	80.711	1	0.0000	1.931	2.103
16	296.000	1180.667	80.711	4	0.0000	2.091	1.922
17	296.000	1180.667	84.211	1	0.0000	1.952	2.163
17	296.000	1180.667	84.211	4	0.0000	2.147	1.940
18	296.000	1180.667	87.710	1	0.0000	1.981	2.229
18	296.000	1180.667	87.710	4	0.0000	2.209	1.969
19	311.667	1181.000	81.242	1	0.0000	1.911	2.021
19	311.667	1181.000	81.242	4	0.0000	2.013	1.905
20	311.667	1181.000	84.742	1	0.0000	1.913	2.060
20	311.667	1181.000	84.742	4	0.0000	2.050	1.906
21	311.667	1181.000	88.242	1	0.0000	1.930	2.113
21	311.667	1181.000	88.242	4	0.0000	2.101	1.922
22	327.333	1181.333	81.774	1	0.0000	2.057	2.111
22	327.333	1181.333	81.774	4	0.0000	2.104	2.050
23	327.333	1181.333	85.274	1	0.0000	1.913	2.002
23	327.333	1181.333	85.274	4	0.0000	1.996	1.908
24	327.333	1181.333	88.774	1	0.0000	1.900	2.024
24	327.333	1181.333	88.774	4	0.0000	2.017	1.895
25	289.667	1195.667	95.629	1	0.0000	1.959	2.125

25	289.667	1195.667	95.629	4	0.0000	2.116	1.954
26	289.667	1195.667	99.129	1	0.0000	2.022	2.215
26	289.667	1195.667	99.129	4	0.0000	2.205	2.018
27	289.667	1195.667	102.629	1	0.0000	2.088	2.306
27	289.667	1195.667	102.629	4	0.0000	2.296	2.084
28	305.333	1196.000	96.161	1	0.0000	1.891	2.009
28	305.333	1196.000	96.161	4	0.0000	2.002	1.885
29	305.333	1196.000	99.661	1	0.0000	1.901	2.051
29	305.333	1196.000	99.661	4	0.0000	2.042	1.895
30	305.333	1196.000	103.161	1	0.0000	1.920	2.101
30	305.333	1196.000	103.161	4	0.0000	2.089	1.913
31	321.000	1196.333	96.693	1	0.0000	1.912	1.982
31	321.000	1196.333	96.693	4	0.0000	1.977	1.908
32	321.000	1196.333	100.192	1	0.0000	1.883	1.984
32	321.000	1196.333	100.192	4	0.0000	1.978	1.879
33	321.000	1196.333	103.692	1	0.0000	1.888	2.019
33	321.000	1196.333	103.692	4	0.0000	2.011	1.883
34	336.667	1196.667	97.224	1	0.0000	2.458	2.490
34	336.667	1196.667	97.224	4	0.0000	2.480	2.448
35	336.667	1196.667	100.724	1	0.0000	1.944	1.999
35	336.667	1196.667	100.724	4	0.0000	1.995	1.940
36	336.667	1196.667	104.224	1	0.0000	1.881	1.966
36	336.667	1196.667	104.224	4	0.0000	1.961	1.877
37	299.000	1211.000	111.080	1	0.0000	1.898	2.022
37	299.000	1211.000	111.080	4	0.0000	2.016	1.895
38	299.000	1211.000	114.579	1	0.0000	1.952	2.097
38	299.000	1211.000	114.579	4	0.0000	2.091	1.949
39	299.000	1211.000	118.079	1	0.0000	2.010	2.177
39	299.000	1211.000	118.079	4	0.0000	2.170	2.007
40	314.667	1211.333	111.611	1	0.0000	1.873	1.955
40	314.667	1211.333	111.611	4	0.0000	1.951	1.869
41	314.667	1211.333	115.111	1	0.0000	1.870	1.980
41	314.667	1211.333	115.111	4	0.0000	1.974	1.866
42	314.667	1211.333	118.611	1	0.0000	1.882	2.017
42	314.667	1211.333	118.611	4	0.0000	2.010	1.877
43	330.333	1211.667	112.143	1	0.0000	1.978	2.021
43	330.333	1211.667	112.143	4	0.0000	2.018	1.974
44	330.333	1211.667	115.643	1	0.0000	1.877	1.946
44	330.333	1211.667	115.643	4	0.0000	1.943	1.874
45	330.333	1211.667	119.142	1	0.0000	1.864	1.959
45	330.333	1211.667	119.142	4	0.0000	1.954	1.861
46	346.000	1212.000	112.675	1	0.0000	3.788	3.804
46	346.000	1212.000	112.675	4	0.0000	3.796	3.781
47	346.000	1212.000	116.174	1	0.0000	2.131	2.165
47	346.000	1212.000	116.174	4	0.0000	2.159	2.125
48	346.000	1212.000	119.674	1	0.0000	1.891	1.948
48	346.000	1212.000	119.674	4	0.0000	1.945	1.888

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    330.3333=X-COOR.   1211.6666=Y-COOR.   119.1423=RADIUS      1.864=F.S.    45=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    330.3333=X-COOR.   1211.6666=Y-COOR.   115.6426=RADIUS      1.943=F.S.    44=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    330.3333=X-COOR.   1211.6666=Y-COOR.   119.1423=RADIUS      1.861=F.S.    45=SLIP#
```

NORMAL TERMINATION OF SLOPE

ATTACHMENT # B
CALC 100340 1-GQ(B3)-06
PAGE 72



ATTACHMENT # B
CALC 1003401-G(13)-06
73

```
FILEINFO
SLOPEW 4.22
TITLE


04/04/2000
2:58:38 PM
ANALYSIS
    1     2     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            3
    1 +1.3000e+002 +1.0000e+002 +2.5000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Clay Liner
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          15
    1 +2.0000e+002 +1.1360e+003
    2 +2.2300e+002 +1.1360e+003
    3 +4.2000e+002 +1.0700e+003
    4 +2.0020e+002 +1.1310e+003
    5 +2.2200e+002 +1.1310e+003
    6 +3.8400e+002 +1.0770e+003
    7 +2.0050e+002 +1.0900e+003
    8 +2.9500e+002 +1.0900e+003
    9 +2.1300e+002 +1.1010e+003
   10 +2.9200e+002 +1.1000e+003
   11 +2.9200e+002 +1.0930e+003
   12 +2.1300e+002 +1.0940e+003
   13 +2.9400e+002 +1.2120e+003
   14 +2.7300e+002 +1.1800e+003
   15 +3.1400e+002 +1.1830e+003
LINE            3
    1     3
    1
    2
    3
    2     5
    1
    4
```

ATTACHMENT # B
CALC 100340I-G(B)-06
74

```
    5
    6
    3
    3     6
    1
    4
    7
    8
    6
    3
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000     0
GRID
   14    15    13     3     3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
    9    10    12    11     2     9    10
AXIS
    0
LIMIT
0 +2.0000e+002 +4.2000e+002
SLIP           0
BLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
PORU           3 +0.0000e+000
    1 +0.0000e+000     0
    2 +0.0000e+000     0
    3 +0.0000e+000     0
PIEZ           3 +0.0000e+000
    1     0     0
    2     0     0
    3     0     0
PCON           0 +0.0000e+000
POGH           0 +0.0000e+000
POGP           0 +0.0000e+000
POGR           0 +0.0000e+000
PORA           3
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
LOAD           0
ANCHOR         0
PBOUNDARY      0
SEISMIC
+5.0000e-002 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE           0
ELEMENT        0
MATLCOLOR      3
    1   255   255   128
    2   191   255   128
    3   128   255   128
```

ATTACHMENT # B
CALC 100340I-G(B)-06
75

04/04/2000
2:58:38 PM
1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	273.000	1180.000	79.753	1	0.0000	1.854	1.994
1	273.000	1180.000	79.753	4	0.0000	2.066	1.844
2	273.000	1180.000	83.253	1	0.0000	1.921	2.074
2	273.000	1180.000	83.253	4	0.0000	2.160	1.909
3	273.000	1180.000	86.753	0	0.0000	998.000	998.000
3	273.000	1180.000	86.753	0	0.0000	998.000	998.000
4	286.667	1181.000	80.926	1	0.0000	1.682	1.809
4	286.667	1181.000	80.926	4	0.0000	1.854	1.673
5	286.667	1181.000	84.426	1	0.0000	1.727	1.871
5	286.667	1181.000	84.426	4	0.0000	1.927	1.718
6	286.667	1181.000	87.925	1	0.0000	1.779	1.937
6	286.667	1181.000	87.925	4	0.0000	2.004	1.769
7	300.333	1182.000	82.099	1	0.0000	1.644	1.737
7	300.333	1182.000	82.099	4	0.0000	1.769	1.638
8	300.333	1182.000	85.599	1	0.0000	1.660	1.776
8	300.333	1182.000	85.599	4	0.0000	1.816	1.653
9	300.333	1182.000	89.098	1	0.0000	1.680	1.817
9	300.333	1182.000	89.098	4	0.0000	1.864	1.671
10	314.000	1183.000	83.272	1	0.0000	1.638	1.698
10	314.000	1183.000	83.272	4	0.0000	1.720	1.634
11	314.000	1183.000	86.772	1	0.0000	1.633	1.716
11	314.000	1183.000	86.772	4	0.0000	1.745	1.628
12	314.000	1183.000	90.271	1	0.0000	1.646	1.750
12	314.000	1183.000	90.271	4	0.0000	1.786	1.640
13	280.000	1190.667	90.507	1	0.0000	1.778	1.892
13	280.000	1190.667	90.507	4	0.0000	1.946	1.772
14	280.000	1190.667	94.007	1	0.0000	1.839	1.965
14	280.000	1190.667	94.007	4	0.0000	2.030	1.831
15	280.000	1190.667	97.507	0	0.0000	998.000	998.000
15	280.000	1190.667	97.507	0	0.0000	998.000	998.000
16	293.667	1191.667	91.680	1	0.0000	1.642	1.742
16	293.667	1191.667	91.680	4	0.0000	1.777	1.636
17	293.667	1191.667	95.180	1	0.0000	1.677	1.793
17	293.667	1191.667	95.180	4	0.0000	1.837	1.671
18	293.667	1191.667	98.680	1	0.0000	1.723	1.852
18	293.667	1191.667	98.680	4	0.0000	1.905	1.716
19	307.333	1192.667	92.853	1	0.0000	1.622	1.693
19	307.333	1192.667	92.853	4	0.0000	1.718	1.618
20	307.333	1192.667	96.353	1	0.0000	1.630	1.721
20	307.333	1192.667	96.353	4	0.0000	1.752	1.625
21	307.333	1192.667	99.853	1	0.0000	1.645	1.755
21	307.333	1192.667	99.853	4	0.0000	1.793	1.638
22	321.000	1193.667	94.026	1	0.0000	1.644	1.687
22	321.000	1193.667	94.026	4	0.0000	1.702	1.641
23	321.000	1193.667	97.526	1	0.0000	1.616	1.679
23	321.000	1193.667	97.526	4	0.0000	1.701	1.613
24	321.000	1193.667	101.026	1	0.0000	1.620	1.702
24	321.000	1193.667	101.026	4	0.0000	1.731	1.616
25	287.000	1201.333	101.262	1	0.0000	1.719	1.812

ATTACHMENT # B
CALC 1003K01-G(D)-06
76

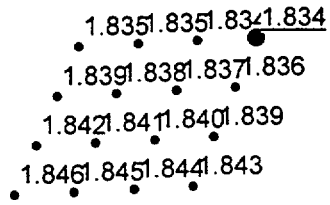
25	287.000	1201.333	101.262	4	0.0000	1.854	1.714
26	287.000	1201.333	104.762	1	0.0000	1.774	1.878
26	287.000	1201.333	104.762	4	0.0000	1.930	1.768
27	287.000	1201.333	108.261	1	0.0000	1.828	1.944
27	287.000	1201.333	108.261	4	0.0000	2.005	1.822
28	300.667	1202.333	102.435	1	0.0000	1.617	1.696
28	300.667	1202.333	102.435	4	0.0000	1.723	1.613
29	300.667	1202.333	105.935	1	0.0000	1.638	1.733
29	300.667	1202.333	105.935	4	0.0000	1.768	1.633
30	300.667	1202.333	109.434	1	0.0000	1.677	1.785
30	300.667	1202.333	109.434	4	0.0000	1.827	1.672
31	314.333	1203.333	103.608	1	0.0000	1.612	1.666
31	314.333	1203.333	103.608	4	0.0000	1.685	1.609
32	314.333	1203.333	107.107	1	0.0000	1.610	1.681
32	314.333	1203.333	107.107	4	0.0000	1.706	1.606
33	314.333	1203.333	110.607	1	0.0000	1.620	1.709
33	314.333	1203.333	110.607	4	0.0000	1.740	1.616
34	328.000	1204.333	104.781	1	0.0000	1.684	1.713
34	328.000	1204.333	104.781	4	0.0000	1.724	1.681
35	328.000	1204.333	108.280	1	0.0000	1.611	1.659
35	328.000	1204.333	108.280	4	0.0000	1.676	1.609
36	328.000	1204.333	111.780	1	0.0000	1.603	1.668
36	328.000	1204.333	111.780	4	0.0000	1.691	1.600
37	294.000	1212.000	112.016	1	0.0000	1.671	1.749
37	294.000	1212.000	112.016	4	0.0000	1.782	1.668
38	294.000	1212.000	115.516	1	0.0000	1.721	1.809
38	294.000	1212.000	115.516	4	0.0000	1.850	1.717
39	294.000	1212.000	119.016	1	0.0000	1.771	1.869
39	294.000	1212.000	119.016	4	0.0000	1.918	1.766
40	307.667	1213.000	113.189	1	0.0000	1.602	1.664
40	307.667	1213.000	113.189	4	0.0000	1.686	1.599
41	307.667	1213.000	116.689	1	0.0000	1.610	1.688
41	307.667	1213.000	116.689	4	0.0000	1.716	1.607
42	307.667	1213.000	120.189	1	0.0000	1.640	1.731
42	307.667	1213.000	120.189	4	0.0000	1.765	1.636
43	321.333	1214.000	114.362	1	0.0000	1.615	1.655
43	321.333	1214.000	114.362	4	0.0000	1.670	1.613
44	321.333	1214.000	117.862	1	0.0000	1.597	1.654
44	321.333	1214.000	117.862	4	0.0000	1.674	1.595
45	321.333	1214.000	121.362	1	0.0000	1.601	1.673
45	321.333	1214.000	121.362	4	0.0000	1.699	1.598
46	335.000	1215.000	115.535	1	0.0000	1.833	1.853
46	335.000	1215.000	115.535	4	0.0000	1.858	1.828
47	335.000	1215.000	119.035	1	0.0000	1.621	1.656
47	335.000	1215.000	119.035	4	0.0000	1.669	1.619
48	335.000	1215.000	122.534	1	0.0000	1.594	1.645
48	335.000	1215.000	122.534	4	0.0000	1.664	1.592

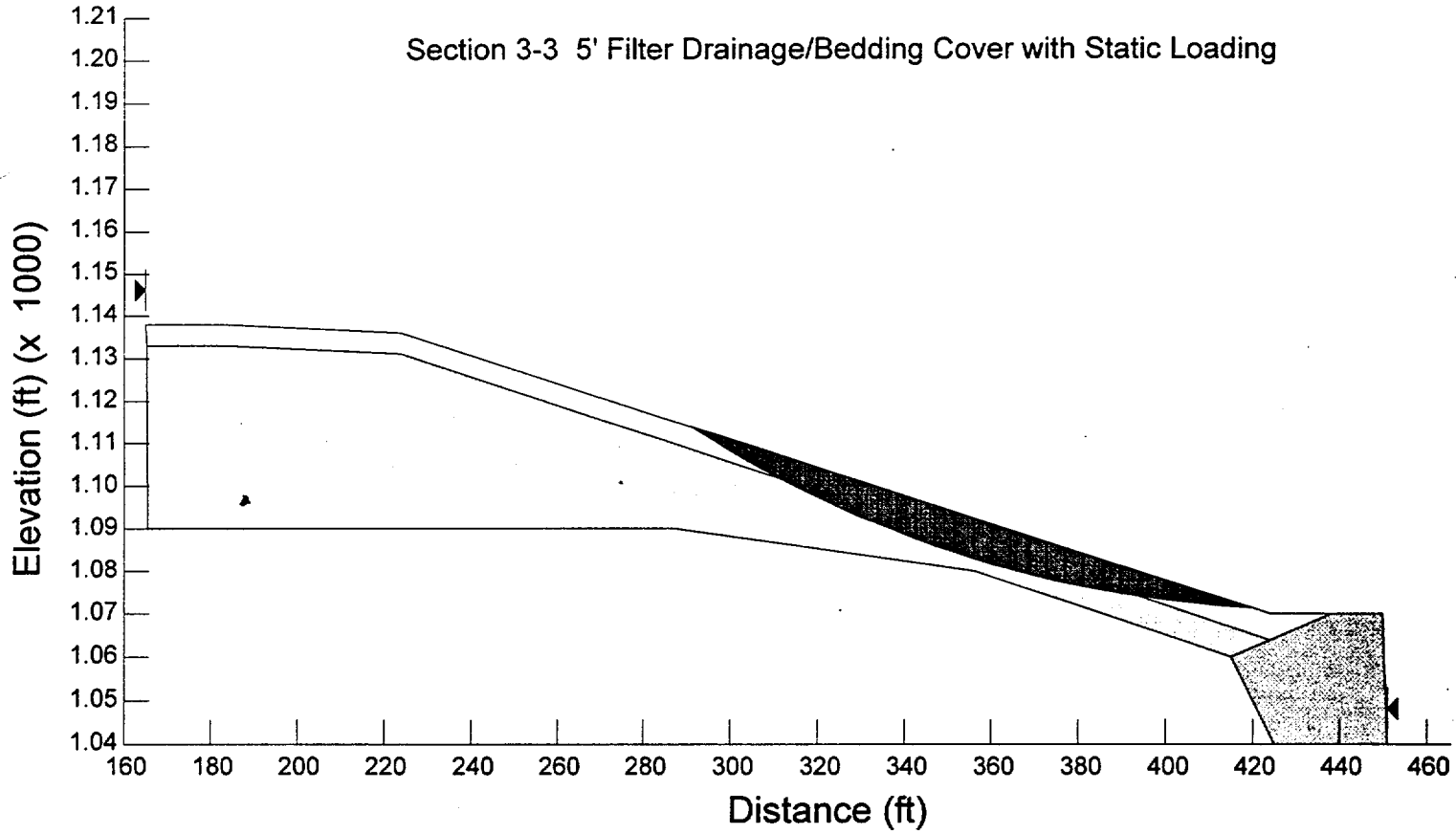
```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    335.0000=X-COOR.   1215.0000=Y-COOR.    122.5345=RADIUS      1.594=F.S.    48=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    335.0000=X-COOR.   1215.0000=Y-COOR.    122.5345=RADIUS      1.664=F.S.    48=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    335.0000=X-COOR.   1215.0000=Y-COOR.    122.5345=RADIUS      1.592=F.S.    48=SLIP#
```

ATTACHMENT # B
CALC 100340 1-G(13)-06
77

NORMAL TERMINATION OF SLOPE

ATTACHMENT # B
CALC 1003401-GRB-06
PAGE 78





```
'ILEINFO
SLOPEW 4.22
TITLE
Stability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
9:17:36 AM
ANALYSIS
    1     0     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            4
    1 +1.3000e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Soil
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          23
    1 +1.6500e+002 +1.1380e+003
    2 +1.8400e+002 +1.1380e+003
    3 +2.2400e+002 +1.1360e+003
    4 +4.2400e+002 +1.0700e+003
    5 +4.5000e+002 +1.0700e+003
    6 +4.5100e+002 +1.0400e+003
    7 +1.6520e+002 +1.1330e+003
    8 +1.8400e+002 +1.1330e+003
    9 +2.2400e+002 +1.1310e+003
   10 +4.2400e+002 +1.0640e+003
   11 +4.3800e+002 +1.0700e+003
   12 +1.6540e+002 +1.0900e+003
   13 +2.8700e+002 +1.0900e+003
   14 +3.5600e+002 +1.0800e+003
   15 +4.1500e+002 +1.0600e+003
   16 +4.2500e+002 +1.0400e+003
   17 +3.0600e+002 +1.0990e+003
   18 +4.1200e+002 +1.0650e+003
```

```
   19 +4.1100e+002 +1.0630e+003
   20 +3.0600e+002 +1.0960e+003
   21 +3.9500e+002 +1.3290e+003
   22 +3.8100e+002 +1.2960e+003
   23 +4.2000e+002 +1.2980e+003
LINE            4
    1      7
    1
    2
    3
    4
   11
    5
    6
    2      8
    1
    7
    8
    9
   10
   11
    5
    6
    3     10
    1
    7
   12
   13
   14
   15
   10
   11
    5
    6
    4      8
    1
    7
   12
   13
   14
   15
   16
    6
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000      0
GRID
   22     23     21      3      3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
   17     18     20     19      2     17     18
AXIS
    0
LIMIT
0 +1.6500e+002 +4.5100e+002
SLIP            0
BLOCK
    0      0      0      0      0 +1.3500e+002 +1.3500e+002 0 0
    0      0      0      0      0 +4.5000e+001 +4.5000e+001 0 0
```

```
PORU            4 +0.0000e+000
    1 +0.0000e+000      0
    2 +0.0000e+000      0
    3 +0.0000e+000      0
    4 +0.0000e+000      0
PIEZ            4 +0.0000e+000
    1      0      0
    2      0      0
    3      0      0
    4      0      0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

-ability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
9:17:36 AM

1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

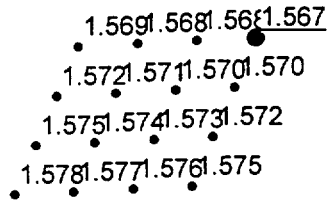
SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	381.000	1296.000	210.493	1	0.0000	1.809	1.846
1	381.000	1296.000	210.493	4	0.0000	1.846	1.809
2	381.000	1296.000	211.889	1	0.0000	1.808	1.851
2	381.000	1296.000	211.889	4	0.0000	1.851	1.809
3	381.000	1296.000	213.286	1	0.0000	1.810	1.858
3	381.000	1296.000	213.286	4	0.0000	1.858	1.810
4	394.000	1296.667	215.099	1	0.0000	1.808	1.844
4	394.000	1296.667	215.099	4	0.0000	1.845	1.809
5	394.000	1296.667	216.459	1	0.0000	1.808	1.849
5	394.000	1296.667	216.459	4	0.0000	1.849	1.808
6	394.000	1296.667	217.819	1	0.0000	1.809	1.855
6	394.000	1296.667	217.819	4	0.0000	1.855	1.809
7	407.000	1297.333	219.704	1	0.0000	1.808	1.843
7	407.000	1297.333	219.704	4	0.0000	1.844	1.809
8	407.000	1297.333	221.029	1	0.0000	1.807	1.847
8	407.000	1297.333	221.029	4	0.0000	1.847	1.807
9	407.000	1297.333	222.353	1	0.0000	1.808	1.853
9	407.000	1297.333	222.353	4	0.0000	1.853	1.809
10	420.000	1298.000	224.310	1	0.0000	1.809	1.842
10	420.000	1298.000	224.310	4	0.0000	1.843	1.809
11	420.000	1298.000	225.599	1	0.0000	1.807	1.845
11	420.000	1298.000	225.599	4	0.0000	1.845	1.807
12	420.000	1298.000	226.887	1	0.0000	1.808	1.850
12	420.000	1298.000	226.887	4	0.0000	1.851	1.808
13	385.667	1307.000	222.393	1	0.0000	1.807	1.842
13	385.667	1307.000	222.393	4	0.0000	1.842	1.807
14	385.667	1307.000	223.786	1	0.0000	1.806	1.846
14	385.667	1307.000	223.786	4	0.0000	1.847	1.807
15	385.667	1307.000	225.179	1	0.0000	1.808	1.853
15	385.667	1307.000	225.179	4	0.0000	1.853	1.808
16	398.667	1307.667	226.999	1	0.0000	1.807	1.840
16	398.667	1307.667	226.999	4	0.0000	1.841	1.807
17	398.667	1307.667	228.356	1	0.0000	1.806	1.844
17	398.667	1307.667	228.356	4	0.0000	1.845	1.806
18	398.667	1307.667	229.713	1	0.0000	1.807	1.850
18	398.667	1307.667	229.713	4	0.0000	1.850	1.807
19	411.667	1308.333	231.604	1	0.0000	1.807	1.840
19	411.667	1308.333	231.604	4	0.0000	1.840	1.807
20	411.667	1308.333	232.925	1	0.0000	1.805	1.842
20	411.667	1308.333	232.925	4	0.0000	1.843	1.805
21	411.667	1308.333	234.246	1	0.0000	1.806	1.848
21	411.667	1308.333	234.246	4	0.0000	1.848	1.806
22	424.667	1309.000	236.209	1	0.0000	1.807	1.839
22	424.667	1309.000	236.209	4	0.0000	1.839	1.808
23	424.667	1309.000	237.495	1	0.0000	1.805	1.841
23	424.667	1309.000	237.495	4	0.0000	1.842	1.805
24	424.667	1309.000	238.780	1	0.0000	1.805	1.846
24	424.667	1309.000	238.780	4	0.0000	1.846	1.806
25	390.333	1318.000	234.293	1	0.0000	1.805	1.838

25	390.333	1318.000	234.293	4	0.0000	1.839	1.805
26	390.333	1318.000	235.682	1	0.0000	1.804	1.842
26	390.333	1318.000	235.682	4	0.0000	1.842	1.805
27	390.333	1318.000	237.072	1	0.0000	1.805	1.848
27	390.333	1318.000	237.072	4	0.0000	1.848	1.806
28	403.333	1318.667	238.898	1	0.0000	1.805	1.837
28	403.333	1318.667	238.898	4	0.0000	1.838	1.806
29	403.333	1318.667	240.252	1	0.0000	1.804	1.840
29	403.333	1318.667	240.252	4	0.0000	1.841	1.804
30	403.333	1318.667	241.606	1	0.0000	1.804	1.846
30	403.333	1318.667	241.606	4	0.0000	1.846	1.805
31	416.333	1319.333	243.504	1	0.0000	1.805	1.836
31	416.333	1319.333	243.504	4	0.0000	1.837	1.806
32	416.333	1319.333	244.822	1	0.0000	1.803	1.839
32	416.333	1319.333	244.822	4	0.0000	1.839	1.804
33	416.333	1319.333	246.140	1	0.0000	1.804	1.844
33	416.333	1319.333	246.140	4	0.0000	1.844	1.804
34	429.333	1320.000	248.109	1	0.0000	1.806	1.836
34	429.333	1320.000	248.109	4	0.0000	1.836	1.806
35	429.333	1320.000	249.392	1	0.0000	1.803	1.838
35	429.333	1320.000	249.392	4	0.0000	1.838	1.804
36	429.333	1320.000	250.673	1	0.0000	1.825	1.865
36	429.333	1320.000	250.673	4	0.0000	1.866	1.825
37	395.000	1329.000	246.193	1	0.0000	1.803	1.835
37	395.000	1329.000	246.193	4	0.0000	1.835	1.804
38	395.000	1329.000	247.579	1	0.0000	1.802	1.838
38	395.000	1329.000	247.579	4	0.0000	1.839	1.803
39	395.000	1329.000	248.965	1	0.0000	1.803	1.844
39	395.000	1329.000	248.965	4	0.0000	1.844	1.803
40	408.000	1329.667	250.798	1	0.0000	1.804	1.834
40	408.000	1329.667	250.798	4	0.0000	1.835	1.804
41	408.000	1329.667	252.149	1	0.0000	1.802	1.837
41	408.000	1329.667	252.149	4	0.0000	1.837	1.802
42	408.000	1329.667	253.499	1	0.0000	1.803	1.842
42	408.000	1329.667	253.499	4	0.0000	1.842	1.803
43	421.000	1330.333	255.403	1	0.0000	1.804	1.834
43	421.000	1330.333	255.403	4	0.0000	1.834	1.804
44	421.000	1330.333	256.718	1	0.0000	1.802	1.836
44	421.000	1330.333	256.718	4	0.0000	1.836	1.802
45	421.000	1330.333	258.033	1	0.0000	1.802	1.840
45	421.000	1330.333	258.033	4	0.0000	1.840	1.802
46	434.000	1331.000	260.009	1	0.0000	1.804	1.833
46	434.000	1331.000	260.009	4	0.0000	1.834	1.805
47	434.000	1331.000	261.288	1	0.0000	1.811	1.845
47	434.000	1331.000	261.288	4	0.0000	1.846	1.812
48	434.000	1331.000	262.566	1	0.0000	1.864	1.906
48	434.000	1331.000	262.566	4	0.0000	1.908	1.866

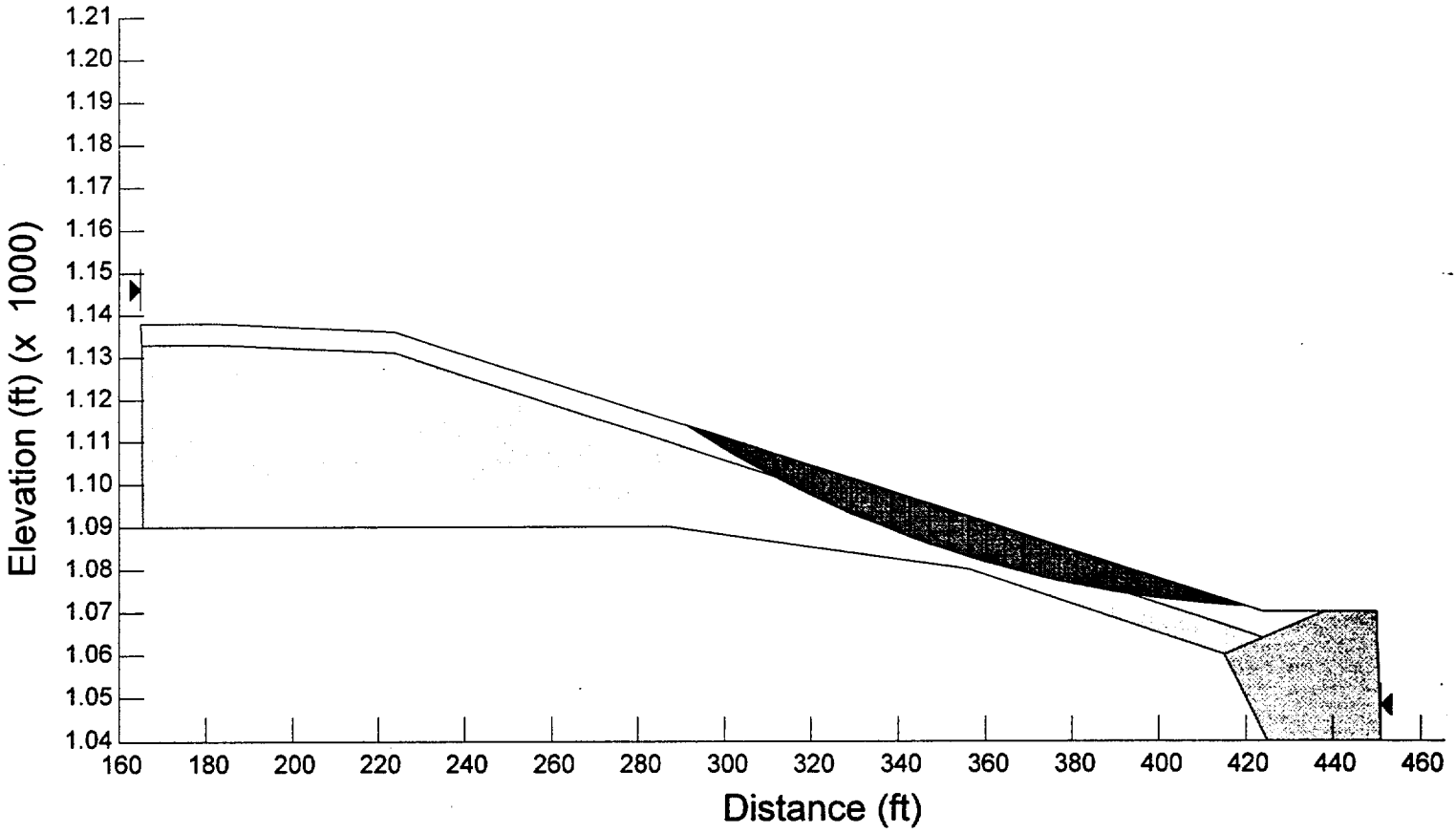
```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    421.0000=X-COOR.   1330.3334=Y-COOR.   258.0326=RADIUS      1.802=F.S.    45=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    434.0000=X-COOR.   1331.0000=Y-COOR.   260.0087=RADIUS      1.834=F.S.    46=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    421.0000=X-COOR.   1330.3334=Y-COOR.   258.0326=RADIUS      1.802=F.S.    45=SLIP#
```

NORMAL TERMINATION OF SLOPE

ATTACHMENT # B
CALC 100340-G(B)-06
PAGE 85



Section 3-3 5' Filter Drainage/Bedding Cover with Seismic Loading



ATTACHMENT # B
CALC 1003X01-G(3)-06
PAGE 86

```
FILEINFO
SLOPEW 4.22
TITLE
Stability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
9:15:16 AM
ANALYSIS
    1     0     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            4
    1 +1.3000e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Soil
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          23
    1 +1.6500e+002 +1.1380e+003
    2 +1.8400e+002 +1.1380e+003
    3 +2.2400e+002 +1.1360e+003
    4 +4.2400e+002 +1.0700e+003
    5 +4.5000e+002 +1.0700e+003
    6 +4.5100e+002 +1.0400e+003
    7 +1.6520e+002 +1.1330e+003
    8 +1.8400e+002 +1.1330e+003
    9 +2.2400e+002 +1.1310e+003
   10 +4.2400e+002 +1.0640e+003
   11 +4.3800e+002 +1.0700e+003
   12 +1.6540e+002 +1.0900e+003
   13 +2.8700e+002 +1.0900e+003
   14 +3.5600e+002 +1.0800e+003
   15 +4.1500e+002 +1.0600e+003
   16 +4.2500e+002 +1.0400e+003
   17 +3.0600e+002 +1.0990e+003
   18 +4.1200e+002 +1.0650e+003
```

ATTACHMENT # B
CALC 1003401-G(B)-06
8

```
   19 +4.1100e+002 +1.0630e+003
   20 +3.0600e+002 +1.0960e+003
   21 +3.9500e+002 +1.3290e+003
   22 +3.8100e+002 +1.2960e+003
   23 +4.2000e+002 +1.2980e+003
LINE            4
    1      7
    1
    2
    3
    4
   11
    5
    6
    2      8
    1
    7
    8
    9
   10
   11
    5
    6
    3     10
    1
    7
   12
   13
   14
   15
   10
   11
    5
    6
    4      8
    1
    7
   12
   13
   14
   15
   16
    6
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000      0
GRID
   22     23     21      3      3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
   17     18     20     19      2     17     18
AXIS
    0
LIMIT
0 +1.6500e+002 +4.5100e+002
SLIP            0
BLOCK
    0      0      0      0      0 +1.3500e+002 +1.3500e+002 0 0
    0      0      0      0      0 +4.5000e+001 +4.5000e+001 0 0
```

ATTACHMENT # B
CALC 100340/-G(3)-06
PAGE 88

```
PORU            4 +0.0000e+000
    1 +0.0000e+000      0
    2 +0.0000e+000      0
    3 +0.0000e+000      0
    4 +0.0000e+000      0
PIEZ            4 +0.0000e+000
    1      0      0
    2      0      0
    3      0      0
    4      0      0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+5.0000e-002 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

ATTACHMENT # B
CMO 1003401-G(B)-06
89

tability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
9:15:16 AM

1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	381.000	1296.000	210.493	1	0.0000	1.545	1.569
1	381.000	1296.000	210.493	4	0.0000	1.578	1.546
2	381.000	1296.000	211.889	1	0.0000	1.545	1.572
2	381.000	1296.000	211.889	4	0.0000	1.583	1.546
3	381.000	1296.000	213.286	1	0.0000	1.547	1.577
3	381.000	1296.000	213.286	4	0.0000	1.589	1.547
4	394.000	1296.667	215.099	1	0.0000	1.545	1.568
4	394.000	1296.667	215.099	4	0.0000	1.577	1.546
5	394.000	1296.667	216.459	1	0.0000	1.544	1.571
5	394.000	1296.667	216.459	4	0.0000	1.581	1.545
6	394.000	1296.667	217.819	1	0.0000	1.545	1.575
6	394.000	1296.667	217.819	4	0.0000	1.586	1.546
7	407.000	1297.333	219.704	1	0.0000	1.545	1.567
7	407.000	1297.333	219.704	4	0.0000	1.576	1.545
8	407.000	1297.333	221.029	1	0.0000	1.544	1.569
8	407.000	1297.333	221.029	4	0.0000	1.579	1.544
9	407.000	1297.333	222.353	1	0.0000	1.545	1.573
9	407.000	1297.333	222.353	4	0.0000	1.584	1.545
10	420.000	1298.000	224.310	1	0.0000	1.545	1.567
10	420.000	1298.000	224.310	4	0.0000	1.575	1.546
11	420.000	1298.000	225.599	1	0.0000	1.544	1.568
11	420.000	1298.000	225.599	4	0.0000	1.578	1.544
12	420.000	1298.000	226.887	1	0.0000	1.544	1.572
12	420.000	1298.000	226.887	4	0.0000	1.582	1.545
13	385.667	1307.000	222.393	1	0.0000	1.543	1.566
13	385.667	1307.000	222.393	4	0.0000	1.575	1.544
14	385.667	1307.000	223.786	1	0.0000	1.543	1.569
14	385.667	1307.000	223.786	4	0.0000	1.579	1.544
15	385.667	1307.000	225.179	1	0.0000	1.544	1.573
15	385.667	1307.000	225.179	4	0.0000	1.584	1.545
16	398.667	1307.667	226.999	1	0.0000	1.543	1.565
16	398.667	1307.667	226.999	4	0.0000	1.574	1.544
17	398.667	1307.667	228.356	1	0.0000	1.543	1.567
17	398.667	1307.667	228.356	4	0.0000	1.577	1.543
18	398.667	1307.667	229.713	1	0.0000	1.543	1.571
18	398.667	1307.667	229.713	4	0.0000	1.582	1.544
19	411.667	1308.333	231.604	1	0.0000	1.544	1.565
19	411.667	1308.333	231.604	4	0.0000	1.573	1.544
20	411.667	1308.333	232.925	1	0.0000	1.542	1.566
20	411.667	1308.333	232.925	4	0.0000	1.575	1.543
21	411.667	1308.333	234.246	1	0.0000	1.543	1.570
21	411.667	1308.333	234.246	4	0.0000	1.580	1.543
22	424.667	1309.000	236.209	1	0.0000	1.544	1.564
22	424.667	1309.000	236.209	4	0.0000	1.572	1.544
23	424.667	1309.000	237.495	1	0.0000	1.542	1.565
23	424.667	1309.000	237.495	4	0.0000	1.574	1.543
24	424.667	1309.000	238.780	1	0.0000	1.542	1.568
24	424.667	1309.000	238.780	4	0.0000	1.578	1.543
25	390.333	1318.000	234.293	1	0.0000	1.542	1.563

ATTACHMENT # B
CALC 100340 1-GTB06
90

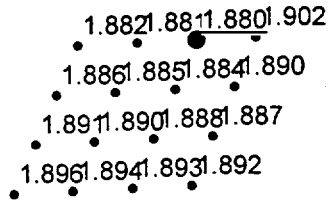
25	390.333	1318.000	234.293	4	0.0000	1.572	1.542
26	390.333	1318.000	235.682	1	0.0000	1.541	1.566
26	390.333	1318.000	235.682	4	0.0000	1.575	1.542
27	390.333	1318.000	237.072	1	0.0000	1.542	1.570
27	390.333	1318.000	237.072	4	0.0000	1.580	1.543
28	403.333	1318.667	238.898	1	0.0000	1.542	1.563
28	403.333	1318.667	238.898	4	0.0000	1.571	1.543
29	403.333	1318.667	240.252	1	0.0000	1.541	1.564
29	403.333	1318.667	240.252	4	0.0000	1.574	1.541
30	403.333	1318.667	241.606	1	0.0000	1.541	1.568
30	403.333	1318.667	241.606	4	0.0000	1.578	1.542
31	416.333	1319.333	243.504	1	0.0000	1.542	1.562
31	416.333	1319.333	243.504	4	0.0000	1.570	1.543
32	416.333	1319.333	244.822	1	0.0000	1.541	1.563
32	416.333	1319.333	244.822	4	0.0000	1.572	1.541
33	416.333	1319.333	246.140	1	0.0000	1.541	1.567
33	416.333	1319.333	246.140	4	0.0000	1.577	1.541
34	429.333	1320.000	248.109	1	0.0000	1.543	1.562
34	429.333	1320.000	248.109	4	0.0000	1.570	1.543
35	429.333	1320.000	249.392	1	0.0000	1.540	1.562
35	429.333	1320.000	249.392	4	0.0000	1.571	1.541
36	429.333	1320.000	250.673	1	0.0000	1.557	1.582
36	429.333	1320.000	250.673	4	0.0000	1.593	1.558
37	395.000	1329.000	246.193	1	0.0000	1.541	1.561
37	395.000	1329.000	246.193	4	0.0000	1.569	1.541
38	395.000	1329.000	247.579	1	0.0000	1.540	1.563
38	395.000	1329.000	247.579	4	0.0000	1.572	1.540
39	395.000	1329.000	248.965	1	0.0000	1.540	1.566
39	395.000	1329.000	248.965	4	0.0000	1.577	1.541
40	408.000	1329.667	250.798	1	0.0000	1.541	1.560
40	408.000	1329.667	250.798	4	0.0000	1.568	1.541
41	408.000	1329.667	252.149	1	0.0000	1.539	1.562
41	408.000	1329.667	252.149	4	0.0000	1.571	1.540
42	408.000	1329.667	253.499	1	0.0000	1.540	1.565
42	408.000	1329.667	253.499	4	0.0000	1.575	1.540
43	421.000	1330.333	255.403	1	0.0000	1.541	1.560
43	421.000	1330.333	255.403	4	0.0000	1.568	1.542
44	421.000	1330.333	256.718	1	0.0000	1.539	1.561
44	421.000	1330.333	256.718	4	0.0000	1.570	1.540
45	421.000	1330.333	258.033	1	0.0000	1.539	1.564
45	421.000	1330.333	258.033	4	0.0000	1.573	1.540
46	434.000	1331.000	260.009	1	0.0000	1.541	1.560
46	434.000	1331.000	260.009	4	0.0000	1.567	1.542
47	434.000	1331.000	261.288	1	0.0000	1.547	1.568
47	434.000	1331.000	261.288	4	0.0000	1.577	1.547
48	434.000	1331.000	262.566	1	0.0000	1.586	1.613
48	434.000	1331.000	262.566	4	0.0000	1.625	1.589

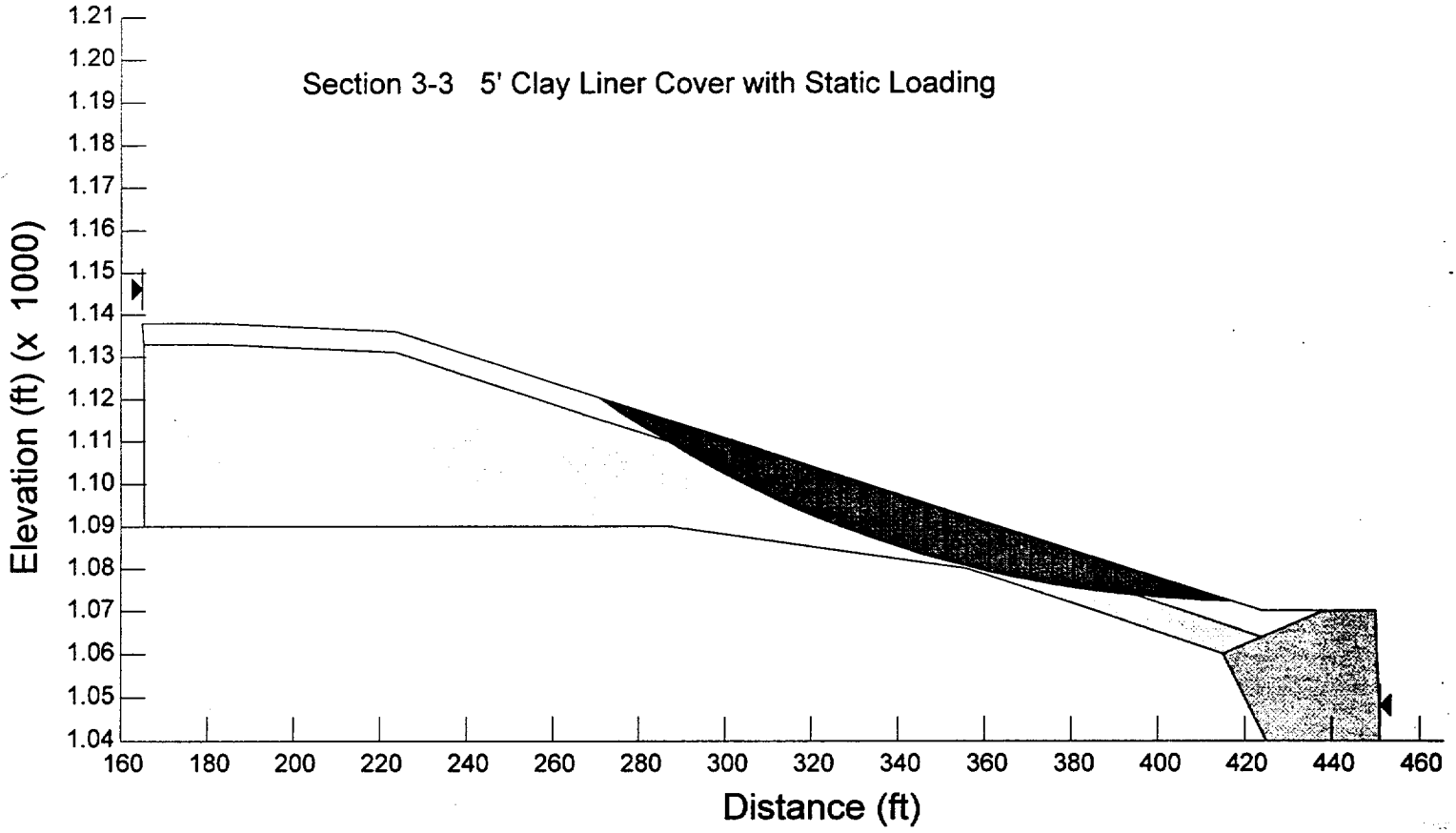
```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    421.0000=X-COOR.   1330.3334=Y-COOR.    256.7184=RADIUS      1.539=F.S.    44=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    434.0000=X-COOR.   1331.0000=Y-COOR.    260.0087=RADIUS      1.567=F.S.    46=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    421.0000=X-COOR.   1330.3334=Y-COOR.    258.0326=RADIUS      1.540=F.S.    45=SLIP#
```

ATTACHMENT # B
CALC 1003401-G/9/B-06

NORMAL TERMINATION OF SLOPE

ATTACHMENT # B
CALC 1003401-G(B)-06
PAGE 92





ATTACHMENT # B
CALC 100340(-0)(B)-06
PAGE 93

```
FILEINFO
SLOPEW 4.22
TITLE
Stability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
9:21:22 AM
ANALYSIS
    1     0     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            4
    1 +1.3000e+002 +1.0000e+002 +2.5000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Clay Liner
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          23
    1 +1.6500e+002 +1.1380e+003
    2 +1.8400e+002 +1.1380e+003
    3 +2.2400e+002 +1.1360e+003
    4 +4.2400e+002 +1.0700e+003
    5 +4.5000e+002 +1.0700e+003
    6 +4.5100e+002 +1.0400e+003
    7 +1.6520e+002 +1.1330e+003
    8 +1.8400e+002 +1.1330e+003
    9 +2.2400e+002 +1.1310e+003
   10 +4.2400e+002 +1.0640e+003
   11 +4.3800e+002 +1.0700e+003
   12 +1.6540e+002 +1.0900e+003
   13 +2.8700e+002 +1.0900e+003
   14 +3.5600e+002 +1.0800e+003
   15 +4.1500e+002 +1.0600e+003
   16 +4.2500e+002 +1.0400e+003
   17 +3.0600e+002 +1.0990e+003
   18 +4.1200e+002 +1.0650e+003
```

ATTACHMENT # B
CALC 100340-G(B)-06
PAGE 94

```
   19 +4.1100e+002 +1.0630e+003
   20 +3.0600e+002 +1.0960e+003
   21 +3.9500e+002 +1.3290e+003
   22 +3.8100e+002 +1.2960e+003
   23 +4.2000e+002 +1.2980e+003
LINE            4
    1      7
    1
    2
    3
    4
   11
    5
    6
    2      8
    1
    7
    8
    9
   10
   11
    5
    6
    3     10
    1
    7
   12
   13
   14
   15
   10
   11
    5
    6
    4      8
    1
    7
   12
   13
   14
   15
   16
    6
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000      0
GRID
   22     23     21      3      3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
   17     18     20     19      2     17     18
AXIS
    0
LIMIT
0 +1.6500e+002 +4.5100e+002
SLIP            0
BLOCK
    0      0      0      0      0 +1.3500e+002 +1.3500e+002 0 0
    0      0      0      0      0 +4.5000e+001 +4.5000e+001 0 0
```

```
ORU             4 +0.0000e+000
    1 +0.0000e+000      0
    2 +0.0000e+000      0
    3 +0.0000e+000      0
    4 +0.0000e+000      0
PIEZ            4 +0.0000e+000
    1      0      0
    2      0      0
    3      0      0
    4      0      0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

ATTACHMENT # B
CALC 1063401-G1(3)-06
PAGE 96

tability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
9:21:22 AM

1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	381.000	1296.000	210.493	1	0.0000	1.876	1.912
1	381.000	1296.000	210.493	4	0.0000	1.911	1.875
2	381.000	1296.000	211.889	1	0.0000	1.860	1.901
2	381.000	1296.000	211.889	4	0.0000	1.900	1.859
3	381.000	1296.000	213.286	1	0.0000	1.851	1.897
3	381.000	1296.000	213.286	4	0.0000	1.896	1.850
4	394.000	1296.667	215.099	1	0.0000	1.877	1.912
4	394.000	1296.667	215.099	4	0.0000	1.911	1.877
5	394.000	1296.667	216.459	1	0.0000	1.860	1.900
5	394.000	1296.667	216.459	4	0.0000	1.899	1.859
6	394.000	1296.667	217.819	1	0.0000	1.851	1.895
6	394.000	1296.667	217.819	4	0.0000	1.894	1.850
7	407.000	1297.333	219.704	1	0.0000	1.879	1.912
7	407.000	1297.333	219.704	4	0.0000	1.911	1.878
8	407.000	1297.333	221.029	1	0.0000	1.861	1.899
8	407.000	1297.333	221.029	4	0.0000	1.898	1.860
9	407.000	1297.333	222.353	1	0.0000	1.851	1.894
9	407.000	1297.333	222.353	4	0.0000	1.893	1.850
10	420.000	1298.000	224.310	1	0.0000	1.880	1.912
10	420.000	1298.000	224.310	4	0.0000	1.912	1.880
11	420.000	1298.000	225.599	1	0.0000	1.862	1.899
11	420.000	1298.000	225.599	4	0.0000	1.898	1.861
12	420.000	1298.000	226.887	1	0.0000	1.851	1.893
12	420.000	1298.000	226.887	4	0.0000	1.892	1.850
13	385.667	1307.000	222.393	1	0.0000	1.874	1.907
13	385.667	1307.000	222.393	4	0.0000	1.907	1.873
14	385.667	1307.000	223.786	1	0.0000	1.857	1.896
14	385.667	1307.000	223.786	4	0.0000	1.895	1.857
15	385.667	1307.000	225.179	1	0.0000	1.848	1.892
15	385.667	1307.000	225.179	4	0.0000	1.891	1.847
16	398.667	1307.667	226.999	1	0.0000	1.875	1.908
16	398.667	1307.667	226.999	4	0.0000	1.907	1.875
17	398.667	1307.667	228.356	1	0.0000	1.858	1.895
17	398.667	1307.667	228.356	4	0.0000	1.895	1.857
18	398.667	1307.667	229.713	1	0.0000	1.848	1.890
18	398.667	1307.667	229.713	4	0.0000	1.890	1.847
19	411.667	1308.333	231.604	1	0.0000	1.877	1.908
19	411.667	1308.333	231.604	4	0.0000	1.908	1.876
20	411.667	1308.333	232.925	1	0.0000	1.859	1.895
20	411.667	1308.333	232.925	4	0.0000	1.894	1.858
21	411.667	1308.333	234.246	1	0.0000	1.848	1.889
21	411.667	1308.333	234.246	4	0.0000	1.888	1.848
22	424.667	1309.000	236.209	1	0.0000	1.879	1.909
22	424.667	1309.000	236.209	4	0.0000	1.908	1.878
23	424.667	1309.000	237.495	1	0.0000	1.860	1.895
23	424.667	1309.000	237.495	4	0.0000	1.894	1.859
24	424.667	1309.000	238.780	1	0.0000	1.849	1.888
24	424.667	1309.000	238.780	4	0.0000	1.887	1.848
25	390.333	1318.000	234.293	1	0.0000	1.872	1.904

ATTACHMENT # V
CALC 100340 1-5/13/-06
97

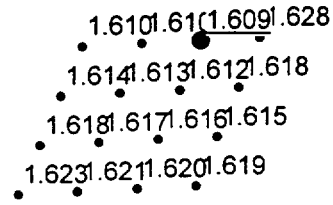
25	390.333	1318.000	234.293	4	0.0000	1.903	1.872
26	390.333	1318.000	235.682	1	0.0000	1.855	1.892
26	390.333	1318.000	235.682	4	0.0000	1.891	1.855
27	390.333	1318.000	237.072	1	0.0000	1.846	1.887
27	390.333	1318.000	237.072	4	0.0000	1.886	1.845
28	403.333	1318.667	238.898	1	0.0000	1.874	1.904
28	403.333	1318.667	238.898	4	0.0000	1.904	1.873
29	403.333	1318.667	240.252	1	0.0000	1.856	1.891
29	403.333	1318.667	240.252	4	0.0000	1.891	1.855
30	403.333	1318.667	241.606	1	0.0000	1.846	1.886
30	403.333	1318.667	241.606	4	0.0000	1.885	1.845
31	416.333	1319.333	243.504	1	0.0000	1.875	1.905
31	416.333	1319.333	243.504	4	0.0000	1.905	1.875
32	416.333	1319.333	244.822	1	0.0000	1.857	1.891
32	416.333	1319.333	244.822	4	0.0000	1.891	1.856
33	416.333	1319.333	246.140	1	0.0000	1.846	1.885
33	416.333	1319.333	246.140	4	0.0000	1.884	1.845
34	429.333	1320.000	248.109	1	0.0000	1.877	1.906
34	429.333	1320.000	248.109	4	0.0000	1.905	1.876
35	429.333	1320.000	249.392	1	0.0000	1.858	1.891
35	429.333	1320.000	249.392	4	0.0000	1.890	1.857
36	429.333	1320.000	250.673	1	0.0000	1.889	1.929
36	429.333	1320.000	250.673	4	0.0000	1.930	1.889
37	395.000	1329.000	246.193	1	0.0000	1.870	1.900
37	395.000	1329.000	246.193	4	0.0000	1.900	1.870
38	395.000	1329.000	247.579	1	0.0000	1.853	1.888
38	395.000	1329.000	247.579	4	0.0000	1.888	1.853
39	395.000	1329.000	248.965	1	0.0000	1.843	1.883
39	395.000	1329.000	248.965	4	0.0000	1.882	1.843
40	408.000	1329.667	250.798	1	0.0000	1.872	1.901
40	408.000	1329.667	250.798	4	0.0000	1.901	1.871
41	408.000	1329.667	252.149	1	0.0000	1.854	1.888
41	408.000	1329.667	252.149	4	0.0000	1.887	1.854
42	408.000	1329.667	253.499	1	0.0000	1.844	1.882
42	408.000	1329.667	253.499	4	0.0000	1.881	1.843
43	421.000	1330.333	255.403	1	0.0000	1.874	1.902
43	421.000	1330.333	255.403	4	0.0000	1.902	1.873
44	421.000	1330.333	256.718	1	0.0000	1.855	1.888
44	421.000	1330.333	256.718	4	0.0000	1.887	1.855
45	421.000	1330.333	258.033	1	0.0000	1.844	1.881
45	421.000	1330.333	258.033	4	0.0000	1.880	1.844
46	434.000	1331.000	260.009	1	0.0000	1.875	1.903
46	434.000	1331.000	260.009	4	0.0000	1.902	1.875
47	434.000	1331.000	261.288	1	0.0000	1.898	1.933
47	434.000	1331.000	261.288	4	0.0000	1.933	1.898
48	434.000	1331.000	262.566	1	0.0000	1.915	1.956
48	434.000	1331.000	262.566	4	0.0000	1.957	1.915

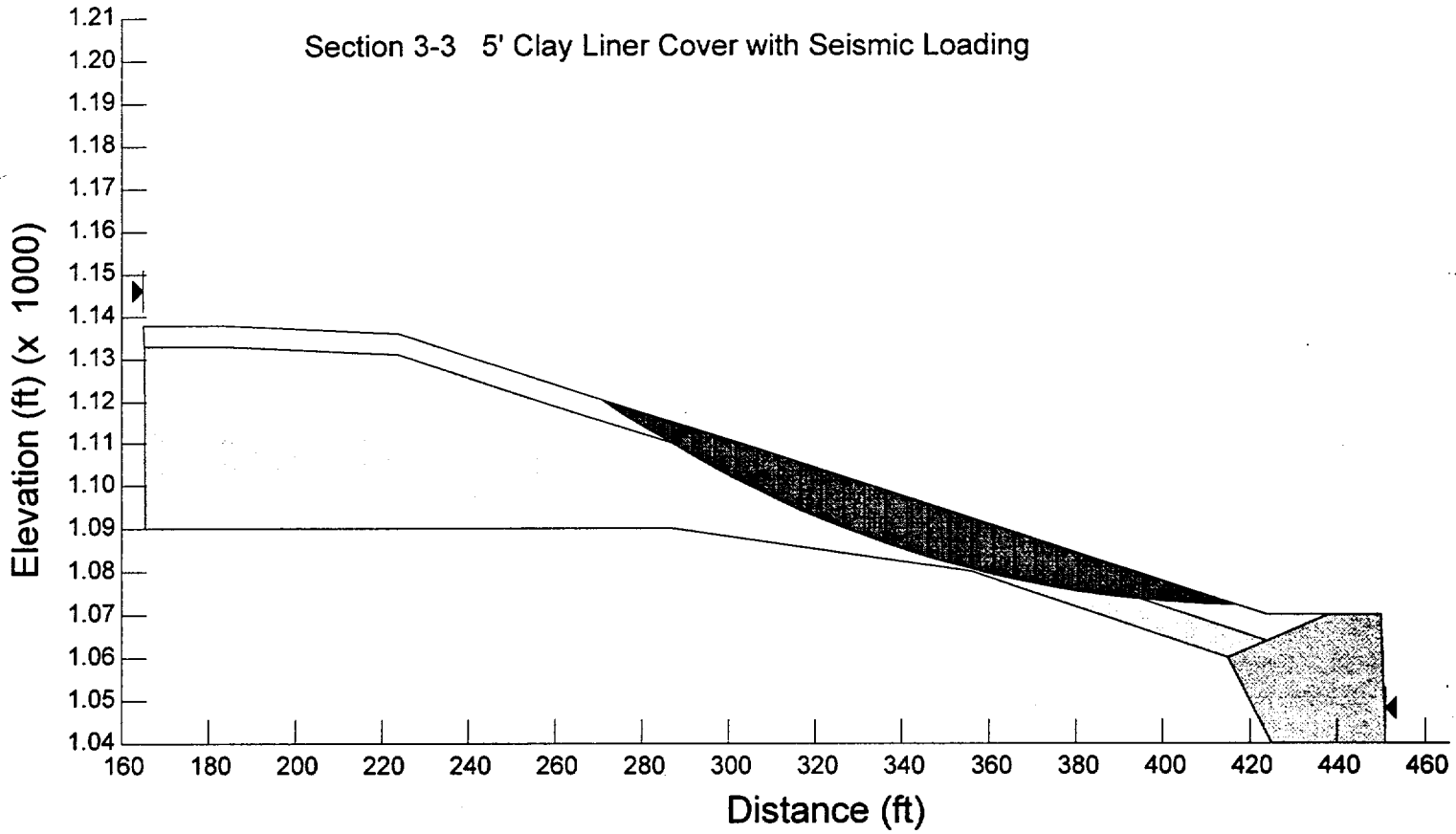
```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    395.0000=X-COOR.   1329.0000=Y-COOR.    248.9651=RADIUS      1.843=F.S.    39=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    421.0000=X-COOR.   1330.3334=Y-COOR.    258.0326=RADIUS      1.880=F.S.    45=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    395.0000=X-COOR.   1329.0000=Y-COOR.    248.9651=RADIUS      1.843=F.S.    39=SLIP#
```

ATTACHMENT # B
CALC 100340I-G(03)-06
98

NORMAL TERMINATION OF SLOPE

ATTACHMENT # B
CALC 100340 1-6 06
99





ATTACHMENT # B
CALC / 003401-G(B)-06
100

```
FILEINFO
SLOPEW 4.22
TITLE
Stability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
9:25:57 AM
ANALYSIS
    1     0     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            4
    1 +1.3000e+002 +1.0000e+002 +2.5000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Clay Liner
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          23
    1 +1.6500e+002 +1.1380e+003
    2 +1.8400e+002 +1.1380e+003
    3 +2.2400e+002 +1.1360e+003
    4 +4.2400e+002 +1.0700e+003
    5 +4.5000e+002 +1.0700e+003
    6 +4.5100e+002 +1.0400e+003
    7 +1.6520e+002 +1.1330e+003
    8 +1.8400e+002 +1.1330e+003
    9 +2.2400e+002 +1.1310e+003
   10 +4.2400e+002 +1.0640e+003
   11 +4.3800e+002 +1.0700e+003
   12 +1.6540e+002 +1.0900e+003
   13 +2.8700e+002 +1.0900e+003
   14 +3.5600e+002 +1.0800e+003
   15 +4.1500e+002 +1.0600e+003
   16 +4.2500e+002 +1.0400e+003
   17 +3.0600e+002 +1.0990e+003
   18 +4.1200e+002 +1.0650e+003
```

ATTACHMENT # B
CALC 100340-G(2)-06 10

```
   19 +4.1100e+002 +1.0630e+003
   20 +3.0600e+002 +1.0960e+003
   21 +3.9500e+002 +1.3290e+003
   22 +3.8100e+002 +1.2960e+003
   23 +4.2000e+002 +1.2980e+003
LINE            4
    1     7
    1
    2
    3
    4
   11
    5
    6
    2     8
    1
    7
    8
    9
   10
   11
    5
    6
    3    10
    1
    7
   12
   13
   14
   15
   10
   11
    5
    6
    4     8
    1
    7
   12
   13
   14
   15
   16
    6
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000     0
GRID
   22    23    21     3     3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
   17    18    20    19     2    17    18
AXIS
    0
LIMIT
0 +1.6500e+002 +4.5100e+002
SLIP            0
BLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
```

```
PORU            4 +0.0000e+000
    1 +0.0000e+000      0
    2 +0.0000e+000      0
    3 +0.0000e+000      0
    4 +0.0000e+000      0
PIEZ            4 +0.0000e+000
    1      0      0
    2      0      0
    3      0      0
    4      0      0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+5.0000e-002 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

ATTACHMENT # B
CALC 1003401-G(B)-06
PAGE 103

Stability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
9:25:57 AM

1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

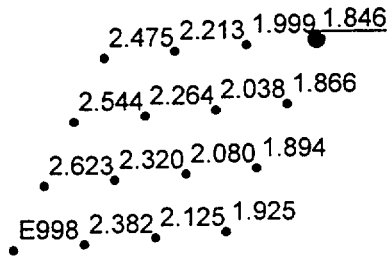
SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	381.000	1296.000	210.493	1	0.0000	1.605	1.627
1	381.000	1296.000	210.493	4	0.0000	1.636	1.604
2	381.000	1296.000	211.889	1	0.0000	1.590	1.616
2	381.000	1296.000	211.889	4	0.0000	1.626	1.590
3	381.000	1296.000	213.286	1	0.0000	1.582	1.611
3	381.000	1296.000	213.286	4	0.0000	1.623	1.582
4	394.000	1296.667	215.099	1	0.0000	1.606	1.627
4	394.000	1296.667	215.099	4	0.0000	1.636	1.605
5	394.000	1296.667	216.459	1	0.0000	1.591	1.615
5	394.000	1296.667	216.459	4	0.0000	1.625	1.590
6	394.000	1296.667	217.819	1	0.0000	1.582	1.610
6	394.000	1296.667	217.819	4	0.0000	1.621	1.582
7	407.000	1297.333	219.704	1	0.0000	1.607	1.627
7	407.000	1297.333	219.704	4	0.0000	1.636	1.607
8	407.000	1297.333	221.029	1	0.0000	1.591	1.615
8	407.000	1297.333	221.029	4	0.0000	1.624	1.591
9	407.000	1297.333	222.353	1	0.0000	1.582	1.609
9	407.000	1297.333	222.353	4	0.0000	1.620	1.582
10	420.000	1298.000	224.310	1	0.0000	1.608	1.628
10	420.000	1298.000	224.310	4	0.0000	1.636	1.608
11	420.000	1298.000	225.599	1	0.0000	1.592	1.615
11	420.000	1298.000	225.599	4	0.0000	1.624	1.592
12	420.000	1298.000	226.887	1	0.0000	1.583	1.609
12	420.000	1298.000	226.887	4	0.0000	1.619	1.582
13	385.667	1307.000	222.393	1	0.0000	1.603	1.624
13	385.667	1307.000	222.393	4	0.0000	1.632	1.603
14	385.667	1307.000	223.786	1	0.0000	1.588	1.612
14	385.667	1307.000	223.786	4	0.0000	1.622	1.588
15	385.667	1307.000	225.179	1	0.0000	1.580	1.607
15	385.667	1307.000	225.179	4	0.0000	1.618	1.579
16	398.667	1307.667	226.999	1	0.0000	1.604	1.624
16	398.667	1307.667	226.999	4	0.0000	1.632	1.604
17	398.667	1307.667	228.356	1	0.0000	1.589	1.612
17	398.667	1307.667	228.356	4	0.0000	1.621	1.588
18	398.667	1307.667	229.713	1	0.0000	1.580	1.606
18	398.667	1307.667	229.713	4	0.0000	1.617	1.579
19	411.667	1308.333	231.604	1	0.0000	1.605	1.625
19	411.667	1308.333	231.604	4	0.0000	1.633	1.605
20	411.667	1308.333	232.925	1	0.0000	1.589	1.612
20	411.667	1308.333	232.925	4	0.0000	1.621	1.589
21	411.667	1308.333	234.246	1	0.0000	1.580	1.606
21	411.667	1308.333	234.246	4	0.0000	1.616	1.580
22	424.667	1309.000	236.209	1	0.0000	1.607	1.626
22	424.667	1309.000	236.209	4	0.0000	1.633	1.607
23	424.667	1309.000	237.495	1	0.0000	1.590	1.612
23	424.667	1309.000	237.495	4	0.0000	1.621	1.590
24	424.667	1309.000	238.780	1	0.0000	1.581	1.605
24	424.667	1309.000	238.780	4	0.0000	1.615	1.580
25	390.333	1318.000	234.293	1	0.0000	1.601	1.621

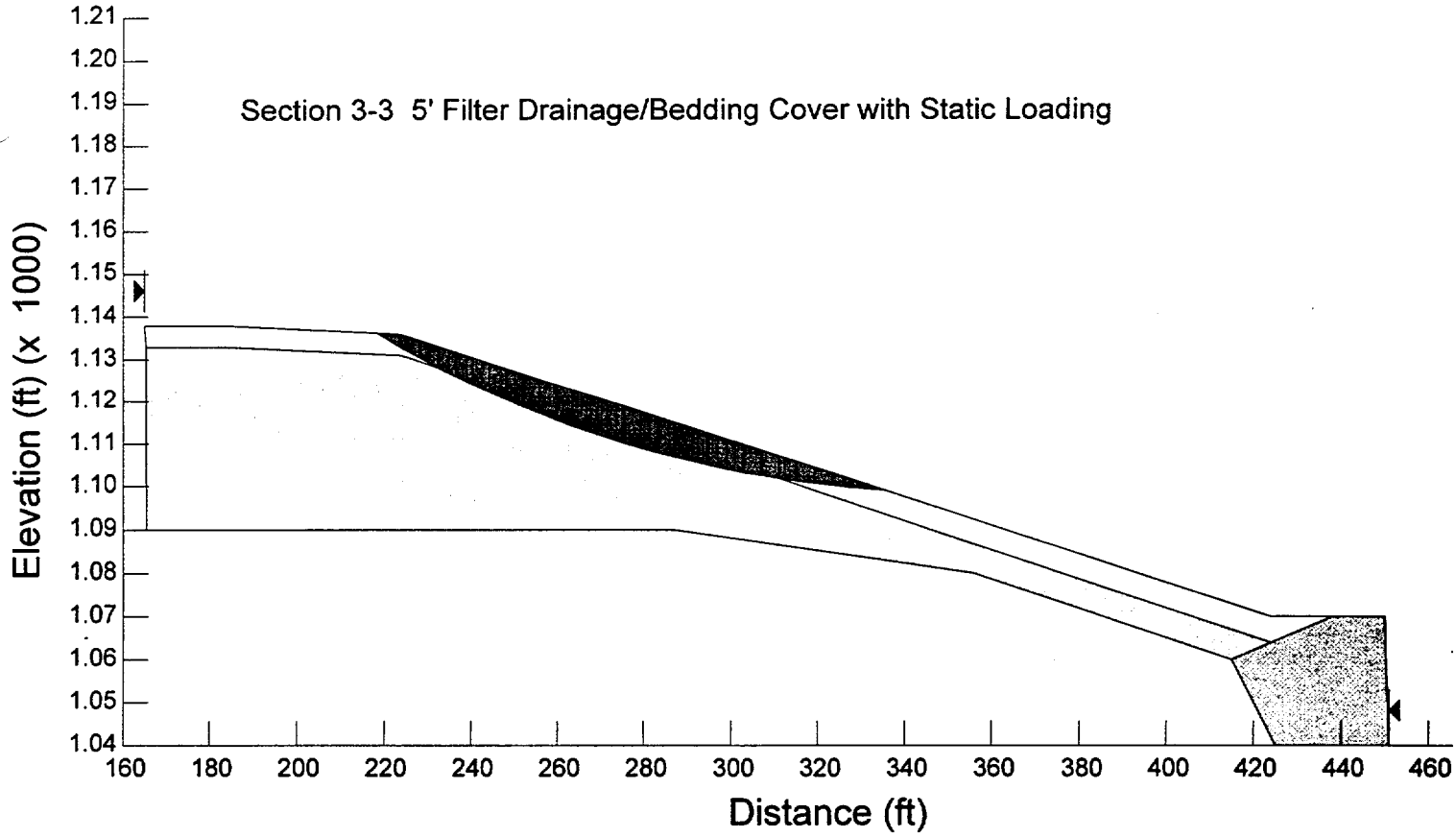
ATTACHMENT # 12
CALC 1003401-GB(B)-06
104

25	390.333	1318.000	234.293	4	0.0000	1.629	1.601
26	390.333	1318.000	235.682	1	0.0000	1.586	1.609
26	390.333	1318.000	235.682	4	0.0000	1.618	1.586
27	390.333	1318.000	237.072	1	0.0000	1.578	1.604
27	390.333	1318.000	237.072	4	0.0000	1.614	1.577
28	403.333	1318.667	238.898	1	0.0000	1.602	1.621
28	403.333	1318.667	238.898	4	0.0000	1.629	1.602
29	403.333	1318.667	240.252	1	0.0000	1.587	1.609
29	403.333	1318.667	240.252	4	0.0000	1.618	1.587
30	403.333	1318.667	241.606	1	0.0000	1.578	1.603
30	403.333	1318.667	241.606	4	0.0000	1.613	1.578
31	416.333	1319.333	243.504	1	0.0000	1.604	1.622
31	416.333	1319.333	243.504	4	0.0000	1.630	1.604
32	416.333	1319.333	244.822	1	0.0000	1.588	1.609
32	416.333	1319.333	244.822	4	0.0000	1.618	1.588
33	416.333	1319.333	246.140	1	0.0000	1.578	1.603
33	416.333	1319.333	246.140	4	0.0000	1.612	1.578
34	429.333	1320.000	248.109	1	0.0000	1.605	1.623
34	429.333	1320.000	248.109	4	0.0000	1.631	1.605
35	429.333	1320.000	249.392	1	0.0000	1.589	1.609
35	429.333	1320.000	249.392	4	0.0000	1.618	1.589
36	429.333	1320.000	250.673	1	0.0000	1.613	1.639
36	429.333	1320.000	250.673	4	0.0000	1.649	1.614
37	395.000	1329.000	246.193	1	0.0000	1.600	1.618
37	395.000	1329.000	246.193	4	0.0000	1.626	1.600
38	395.000	1329.000	247.579	1	0.0000	1.585	1.606
38	395.000	1329.000	247.579	4	0.0000	1.615	1.585
39	395.000	1329.000	248.965	1	0.0000	1.576	1.601
39	395.000	1329.000	248.965	4	0.0000	1.610	1.576
40	408.000	1329.667	250.798	1	0.0000	1.601	1.619
40	408.000	1329.667	250.798	4	0.0000	1.627	1.601
41	408.000	1329.667	252.149	1	0.0000	1.585	1.606
41	408.000	1329.667	252.149	4	0.0000	1.615	1.585
42	408.000	1329.667	253.499	1	0.0000	1.576	1.600
42	408.000	1329.667	253.499	4	0.0000	1.610	1.576
43	421.000	1330.333	255.403	1	0.0000	1.603	1.620
43	421.000	1330.333	255.403	4	0.0000	1.628	1.603
44	421.000	1330.333	256.718	1	0.0000	1.586	1.607
44	421.000	1330.333	256.718	4	0.0000	1.615	1.586
45	421.000	1330.333	258.033	1	0.0000	1.577	1.600
45	421.000	1330.333	258.033	4	0.0000	1.609	1.576
46	434.000	1331.000	260.009	1	0.0000	1.604	1.621
46	434.000	1331.000	260.009	4	0.0000	1.628	1.604
47	434.000	1331.000	261.288	1	0.0000	1.623	1.645
47	434.000	1331.000	261.288	4	0.0000	1.654	1.624
48	434.000	1331.000	262.566	1	0.0000	1.631	1.657
48	434.000	1331.000	262.566	4	0.0000	1.668	1.632

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    395.0000=X-COOR.   1329.0000=Y-COOR.    248.9651=RADIUS      1.576=F.S.    39=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    421.0000=X-COOR.   1330.3334=Y-COOR.    258.0326=RADIUS      1.609=F.S.    45=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    395.0000=X-COOR.   1329.0000=Y-COOR.    248.9651=RADIUS      1.576=F.S.    39=SLIP#
```

.ORMAL TERMINATION OF SLOPE


2.475
2.213
1.999
1.846
2.544
2.264
2.038
1.866
2.623
2.320
2.080
1.894
E998
2.382
2.125
1.925


Section 3-3 5' Filter Drainage/Bedding Cover with Static Loading
Elevation (ft) (x 1000)
1.21
1.20
1.19
1.18
1.17
1.16
1.15
1.14
1.13
1.12
1.11
1.10
1.09
1.08
1.07
1.06
1.05
1.04
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
Distance (ft)

```
TILEINFO
SLOPEW 4.22
TITLE
Stability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
8:18:08 AM
ANALYSIS
    1     0     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            4
    1 +1.3000e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Soil
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          23
    1 +1.6500e+002 +1.1380e+003
    2 +1.8400e+002 +1.1380e+003
    3 +2.2400e+002 +1.1360e+003
    4 +4.2400e+002 +1.0700e+003
    5 +4.5000e+002 +1.0700e+003
    6 +4.5100e+002 +1.0400e+003
    7 +1.6520e+002 +1.1330e+003
    8 +1.8400e+002 +1.1330e+003
    9 +2.2400e+002 +1.1310e+003
   10 +4.2400e+002 +1.0640e+003
   11 +4.3800e+002 +1.0700e+003
   12 +1.6540e+002 +1.0900e+003
   13 +2.8700e+002 +1.0900e+003
   14 +3.5600e+002 +1.0800e+003
   15 +4.1500e+002 +1.0600e+003
   16 +4.2500e+002 +1.0400e+003
   17 +1.7700e+002 +1.1000e+003
   18 +3.0500e+002 +1.0990e+003
```

```
   19 +3.0500e+002 +1.0930e+003
   20 +1.7700e+002 +1.0940e+003
   21 +3.0400e+002 +1.3470e+003
   22 +2.8400e+002 +1.3040e+003
   23 +3.3100e+002 +1.3080e+003
LINE            4
    1     7
    1
    2
    3
    4
   11
    5
    6
    2     8
    1
    7
    8
    9
   10
   11
    5
    6
    3    10
    1
    7
   12
   13
   14
   15
   10
   11
    5
    6
    4     8
    1
    7
   12
   13
   14
   15
   16
    6
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000     0
GRID
   22    23    21     3     3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
   17    18    20    19     2    17    18
AXIS
    0
LIMIT
0 +1.6500e+002 +4.5100e+002
SLIP            0
BLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
```

ATTACHMENT # B
CALC 100340I-GT(D)-06
PAGE 109

```
PORU            4 +0.0000e+000
    1 +0.0000e+000      0
    2 +0.0000e+000      0
    3 +0.0000e+000      0
    4 +0.0000e+000      0
PIEZ            4 +0.0000e+000
    1     0     0
    2     0     0
    3     0     0
    4     0     0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

ability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
8:18:08 AM

1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

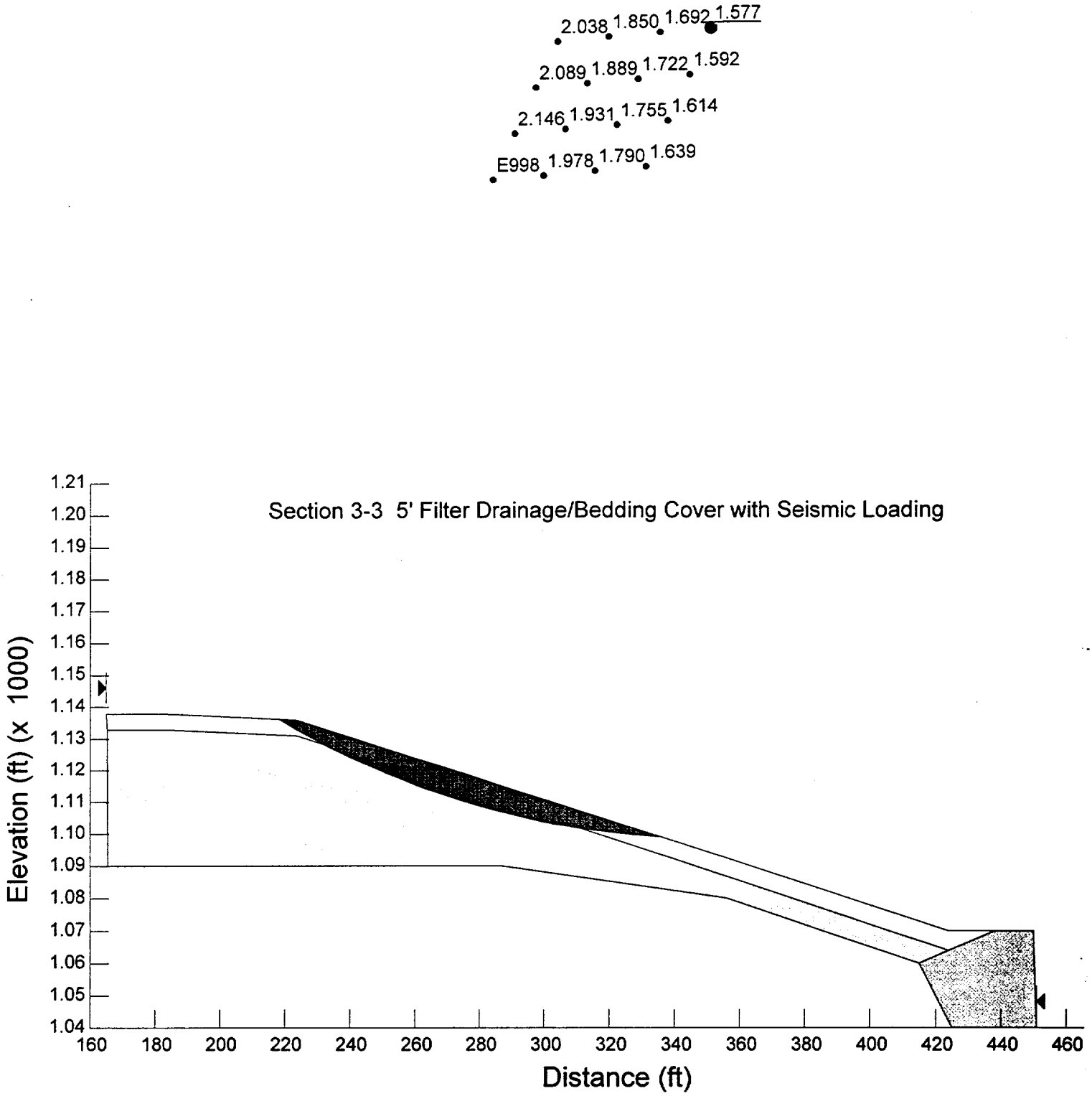
SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	(FORCE)
1	284.000	1304.000	204.830	0	0.0000	998.000	998.000
1	284.000	1304.000	204.830	0	0.0000	998.000	998.000
2	284.000	1304.000	207.830	0	0.0000	998.000	998.000
2	284.000	1304.000	207.830	0	0.0000	998.000	998.000
3	284.000	1304.000	210.829	0	0.0000	998.000	998.000
3	284.000	1304.000	210.829	0	0.0000	998.000	998.000
4	299.667	1305.333	206.285	1	0.0000	2.308	2.381
4	299.667	1305.333	206.285	4	0.0000	2.382	2.310
5	299.667	1305.333	209.285	1	0.0000	2.356	2.439
5	299.667	1305.333	209.285	4	0.0000	2.440	2.358
6	299.667	1305.333	212.285	1	0.0000	2.401	2.495
6	299.667	1305.333	212.285	4	0.0000	2.496	2.403
7	315.333	1306.667	207.741	1	0.0000	2.067	2.124
7	315.333	1306.667	207.741	4	0.0000	2.125	2.068
8	315.333	1306.667	210.741	1	0.0000	2.114	2.181
8	315.333	1306.667	210.741	4	0.0000	2.183	2.116
9	315.333	1306.667	213.741	1	0.0000	2.160	2.237
9	315.333	1306.667	213.741	4	0.0000	2.238	2.161
10	331.000	1308.000	209.197	1	0.0000	1.879	1.925
10	331.000	1308.000	209.197	4	0.0000	1.925	1.880
11	331.000	1308.000	212.197	1	0.0000	1.925	1.980
11	331.000	1308.000	212.197	4	0.0000	1.980	1.926
12	331.000	1308.000	215.197	1	0.0000	1.969	2.033
12	331.000	1308.000	215.197	4	0.0000	2.034	1.971
13	290.667	1318.333	219.215	1	0.0000	2.543	2.621
13	290.667	1318.333	219.215	4	0.0000	2.623	2.545
14	290.667	1318.333	222.215	0	0.0000	998.000	998.000
14	290.667	1318.333	222.215	0	0.0000	998.000	998.000
15	290.667	1318.333	225.215	0	0.0000	998.000	998.000
15	290.667	1318.333	225.215	0	0.0000	998.000	998.000
16	306.333	1319.667	220.670	1	0.0000	2.257	2.319
16	306.333	1319.667	220.670	4	0.0000	2.320	2.258
17	306.333	1319.667	223.670	1	0.0000	2.303	2.375
17	306.333	1319.667	223.670	4	0.0000	2.376	2.305
18	306.333	1319.667	226.670	1	0.0000	2.348	2.430
18	306.333	1319.667	226.670	4	0.0000	2.431	2.350
19	322.000	1321.000	222.126	1	0.0000	2.030	2.079
19	322.000	1321.000	222.126	4	0.0000	2.080	2.031
20	322.000	1321.000	225.126	1	0.0000	2.078	2.136
20	322.000	1321.000	225.126	4	0.0000	2.137	2.079
21	322.000	1321.000	228.126	1	0.0000	2.122	2.189
21	322.000	1321.000	228.126	4	0.0000	2.191	2.124
22	337.667	1322.333	223.582	1	0.0000	1.855	1.893
22	337.667	1322.333	223.582	4	0.0000	1.894	1.856
23	337.667	1322.333	226.582	1	0.0000	1.899	1.946
23	337.667	1322.333	226.582	4	0.0000	1.946	1.900
24	337.667	1322.333	229.582	1	0.0000	1.943	1.998
24	337.667	1322.333	229.582	4	0.0000	1.999	1.944
25	297.333	1332.667	233.600	1	0.0000	2.476	2.543

25	297.333	1332.667	233.600	4	0.0000	2.544	2.477
26	297.333	1332.667	236.600	0	0.0000	998.000	998.000
26	297.333	1332.667	236.600	0	0.0000	998.000	998.000
27	297.333	1332.667	239.599	0	0.0000	998.000	998.000
27	297.333	1332.667	239.599	0	0.0000	998.000	998.000
28	313.000	1334.000	235.055	1	0.0000	2.210	2.263
28	313.000	1334.000	235.055	4	0.0000	2.264	2.211
29	313.000	1334.000	238.055	1	0.0000	2.256	2.318
29	313.000	1334.000	238.055	4	0.0000	2.319	2.257
30	313.000	1334.000	241.055	1	0.0000	2.300	2.371
30	313.000	1334.000	241.055	4	0.0000	2.372	2.302
31	328.667	1335.333	236.511	1	0.0000	1.995	2.037
31	328.667	1335.333	236.511	4	0.0000	2.038	1.996
32	328.667	1335.333	239.511	1	0.0000	2.043	2.093
32	328.667	1335.333	239.511	4	0.0000	2.094	2.044
33	328.667	1335.333	242.511	1	0.0000	2.087	2.145
33	328.667	1335.333	242.511	4	0.0000	2.147	2.088
34	344.333	1336.667	237.967	1	0.0000	1.834	1.866
34	344.333	1336.667	237.967	4	0.0000	1.866	1.834
35	344.333	1336.667	240.967	1	0.0000	1.875	1.915
35	344.333	1336.667	240.967	4	0.0000	1.915	1.875
36	344.333	1336.667	243.966	1	0.0000	1.917	1.965
36	344.333	1336.667	243.966	4	0.0000	1.966	1.918
37	304.000	1347.000	247.985	1	0.0000	2.416	2.474
37	304.000	1347.000	247.985	4	0.0000	2.475	2.417
38	304.000	1347.000	250.985	1	0.0000	2.460	2.527
38	304.000	1347.000	250.985	4	0.0000	2.528	2.462
39	304.000	1347.000	253.984	0	0.0000	998.000	998.000
39	304.000	1347.000	253.984	0	0.0000	998.000	998.000
40	319.667	1348.333	249.440	1	0.0000	2.166	2.212
40	319.667	1348.333	249.440	4	0.0000	2.213	2.167
41	319.667	1348.333	252.440	1	0.0000	2.211	2.265
41	319.667	1348.333	252.440	4	0.0000	2.267	2.213
42	319.667	1348.333	255.440	1	0.0000	2.255	2.317
42	319.667	1348.333	255.440	4	0.0000	2.319	2.257
43	335.333	1349.667	250.896	1	0.0000	1.962	1.998
43	335.333	1349.667	250.896	4	0.0000	1.999	1.963
44	335.333	1349.667	253.896	1	0.0000	2.010	2.054
44	335.333	1349.667	253.896	4	0.0000	2.055	2.011
45	335.333	1349.667	256.896	1	0.0000	2.055	2.106
45	335.333	1349.667	256.896	4	0.0000	2.107	2.056
46	351.000	1351.000	252.352	1	0.0000	1.819	1.846
46	351.000	1351.000	252.352	4	0.0000	1.846	1.820
47	351.000	1351.000	255.352	1	0.0000	1.852	1.886
47	351.000	1351.000	255.352	4	0.0000	1.886	1.852
48	351.000	1351.000	258.352	1	0.0000	1.893	1.935
48	351.000	1351.000	258.352	4	0.0000	1.935	1.894

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    351.0000=X-COOR.   1351.0000=Y-COOR.    252.3517=RADIUS      1.819=F.S.    46=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    351.0000=X-COOR.   1351.0000=Y-COOR.    252.3517=RADIUS      1.846=F.S.    46=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    351.0000=X-COOR.   1351.0000=Y-COOR.    252.3517=RADIUS      1.820=F.S.    46=SLIP#
```

NORMAL TERMINATION OF SLOPE

ATTACHMENT # 15
CALC 100340 1-GT(B)-06
PAGE 113



ATTACHMENT # B
OAC 100340-G(B)06
114

```
FILEINFO
SLOPEW 4.22
TITLE
Stability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
8:55:44 AM
ANALYSIS
    1     0     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            4
    1 +1.3000e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Soil
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          23
    1 +1.6500e+002 +1.1380e+003
    2 +1.8400e+002 +1.1380e+003
    3 +2.2400e+002 +1.1360e+003
    4 +4.2400e+002 +1.0700e+003
    5 +4.5000e+002 +1.0700e+003
    6 +4.5100e+002 +1.0400e+003
    7 +1.6520e+002 +1.1330e+003
    8 +1.8400e+002 +1.1330e+003
    9 +2.2400e+002 +1.1310e+003
   10 +4.2400e+002 +1.0640e+003
   11 +4.3800e+002 +1.0700e+003
   12 +1.6540e+002 +1.0900e+003
   13 +2.8700e+002 +1.0900e+003
   14 +3.5600e+002 +1.0800e+003
   15 +4.1500e+002 +1.0600e+003
   16 +4.2500e+002 +1.0400e+003
   17 +1.7700e+002 +1.1000e+003
   18 +3.0500e+002 +1.0990e+003
```

ATTACHMENT # B
CALC 1003401-GTB-06
115

```
    19 +3.0500e+002 +1.0930e+003
    20 +1.7700e+002 +1.0940e+003
    21 +3.0400e+002 +1.3470e+003
    22 +2.8400e+002 +1.3040e+003
    23 +3.3100e+002 +1.3080e+003
LINE            4
     1      7
     1
     2
     3
     4
    11
     5
     6
     2      8
     1
     7
     8
     9
    10
    11
     5
     6
     3     10
     1
     7
    12
    13
    14
    15
    10
    11
     5
     6
     4      8
     1
     7
    12
    13
    14
    15
    16
     6
TENSION
     0 +9.8070e+000 +0.0000e+000 +0.0000e+000      0
GRID
    22     23     21      3      3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
    17     18     20     19      2     17     18
AXIS
     0
LIMIT
0 +1.6500e+002 +4.5100e+002
SLIP            0
BLOCK
     0      0      0      0      0 +1.3500e+002 +1.3500e+002 0 0
     0      0      0      0      0 +4.5000e+001 +4.5000e+001 0 0
```

```
PORU            4 +0.0000e+000
    1 +0.0000e+000      0
    2 +0.0000e+000      0
    3 +0.0000e+000      0
    4 +0.0000e+000      0
PIEZ            4 +0.0000e+000
    1      0      0
    2      0      0
    3      0      0
    4      0      0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+5.0000e-002 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

ATTACHMENT # B
CALC 1003401-G(B)-06
117

'tability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
8:55:44 AM

1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

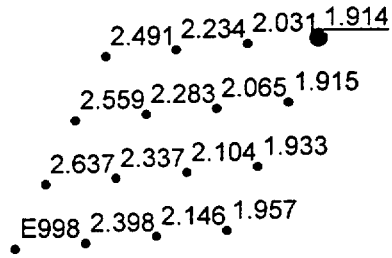
SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	284.000	1304.000	204.830	0	0.0000	998.000	998.000
1	284.000	1304.000	204.830	0	0.0000	998.000	998.000
2	284.000	1304.000	207.830	0	0.0000	998.000	998.000
2	284.000	1304.000	207.830	0	0.0000	998.000	998.000
3	284.000	1304.000	210.829	0	0.0000	998.000	998.000
3	284.000	1304.000	210.829	0	0.0000	998.000	998.000
4	299.667	1305.333	206.285	1	0.0000	1.915	1.950
4	299.667	1305.333	206.285	4	0.0000	1.978	1.912
5	299.667	1305.333	209.285	1	0.0000	1.950	1.990
5	299.667	1305.333	209.285	4	0.0000	2.022	1.946
6	299.667	1305.333	212.285	1	0.0000	1.984	2.028
6	299.667	1305.333	212.285	4	0.0000	2.065	1.979
7	315.333	1306.667	207.741	1	0.0000	1.739	1.770
7	315.333	1306.667	207.741	4	0.0000	1.790	1.738
8	315.333	1306.667	210.741	1	0.0000	1.775	1.811
8	315.333	1306.667	210.741	4	0.0000	1.834	1.773
9	315.333	1306.667	213.741	1	0.0000	1.809	1.850
9	315.333	1306.667	213.741	4	0.0000	1.877	1.807
10	331.000	1308.000	209.197	1	0.0000	1.599	1.626
10	331.000	1308.000	209.197	4	0.0000	1.639	1.599
11	331.000	1308.000	212.197	1	0.0000	1.634	1.666
11	331.000	1308.000	212.197	4	0.0000	1.682	1.634
12	331.000	1308.000	215.197	1	0.0000	1.668	1.705
12	331.000	1308.000	215.197	4	0.0000	1.724	1.667
13	290.667	1318.333	219.215	1	0.0000	2.079	2.113
13	290.667	1318.333	219.215	4	0.0000	2.146	2.074
14	290.667	1318.333	222.215	0	0.0000	998.000	998.000
14	290.667	1318.333	222.215	0	0.0000	998.000	998.000
15	290.667	1318.333	225.215	0	0.0000	998.000	998.000
15	290.667	1318.333	225.215	0	0.0000	998.000	998.000
16	306.333	1319.667	220.670	1	0.0000	1.877	1.908
16	306.333	1319.667	220.670	4	0.0000	1.931	1.874
17	306.333	1319.667	223.670	1	0.0000	1.911	1.946
17	306.333	1319.667	223.670	4	0.0000	1.974	1.908
18	306.333	1319.667	226.670	1	0.0000	1.945	1.984
18	306.333	1319.667	226.670	4	0.0000	2.015	1.941
19	322.000	1321.000	222.126	1	0.0000	1.711	1.738
19	322.000	1321.000	222.126	4	0.0000	1.755	1.710
20	322.000	1321.000	225.126	1	0.0000	1.747	1.779
20	322.000	1321.000	225.126	4	0.0000	1.798	1.746
21	322.000	1321.000	228.126	1	0.0000	1.781	1.817
21	322.000	1321.000	228.126	4	0.0000	1.840	1.779
22	337.667	1322.333	223.582	1	0.0000	1.580	1.603
22	337.667	1322.333	223.582	4	0.0000	1.614	1.580
23	337.667	1322.333	226.582	1	0.0000	1.614	1.642
23	337.667	1322.333	226.582	4	0.0000	1.655	1.613
24	337.667	1322.333	229.582	1	0.0000	1.647	1.679
24	337.667	1322.333	229.582	4	0.0000	1.696	1.647
25	297.333	1332.667	233.600	1	0.0000	2.031	2.061

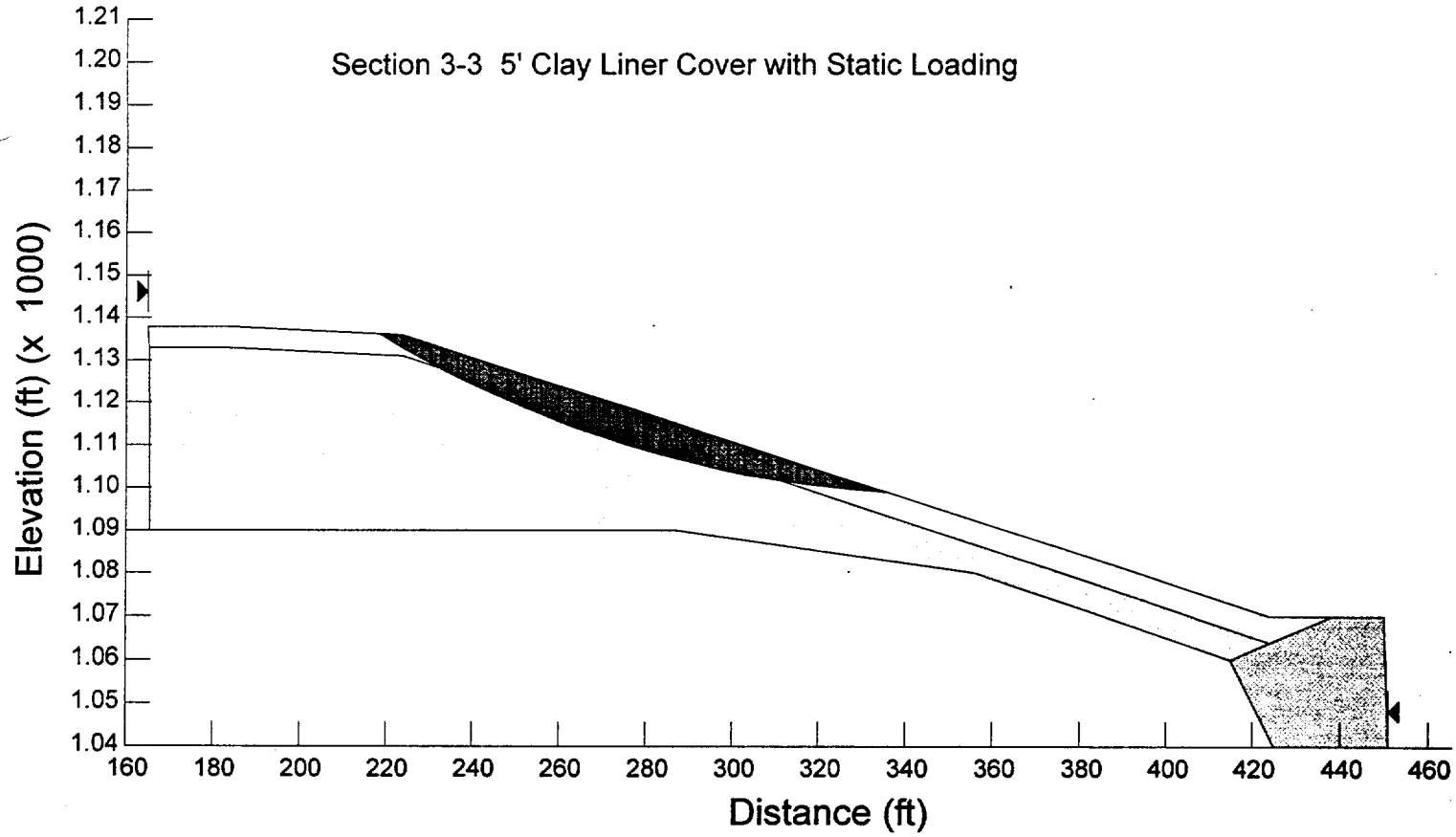
25	297.333	1332.667	233.600	4	0.0000	2.089	2.027
26	297.333	1332.667	236.600	0	0.0000	998.000	998.000
26	297.333	1332.667	236.600	0	0.0000	998.000	998.000
27	297.333	1332.667	239.599	0	0.0000	998.000	998.000
27	297.333	1332.667	239.599	0	0.0000	998.000	998.000
28	313.000	1334.000	235.055	1	0.0000	1.842	1.869
28	313.000	1334.000	235.055	4	0.0000	1.889	1.840
29	313.000	1334.000	238.055	1	0.0000	1.876	1.907
29	313.000	1334.000	238.055	4	0.0000	1.930	1.873
30	313.000	1334.000	241.055	1	0.0000	1.909	1.943
30	313.000	1334.000	241.055	4	0.0000	1.971	1.906
31	328.667	1335.333	236.511	1	0.0000	1.684	1.708
31	328.667	1335.333	236.511	4	0.0000	1.722	1.684
32	328.667	1335.333	239.511	1	0.0000	1.720	1.748
32	328.667	1335.333	239.511	4	0.0000	1.765	1.719
33	328.667	1335.333	242.511	1	0.0000	1.754	1.786
33	328.667	1335.333	242.511	4	0.0000	1.806	1.752
34	344.333	1336.667	237.967	1	0.0000	1.563	1.583
34	344.333	1336.667	237.967	4	0.0000	1.592	1.563
35	344.333	1336.667	240.967	1	0.0000	1.594	1.619
35	344.333	1336.667	240.967	4	0.0000	1.630	1.594
36	344.333	1336.667	243.966	1	0.0000	1.627	1.656
36	344.333	1336.667	243.966	4	0.0000	1.670	1.627
37	304.000	1347.000	247.985	1	0.0000	1.988	2.014
37	304.000	1347.000	247.985	4	0.0000	2.038	1.984
38	304.000	1347.000	250.985	1	0.0000	2.020	2.050
38	304.000	1347.000	250.985	4	0.0000	2.078	2.016
39	304.000	1347.000	253.984	0	0.0000	998.000	998.000
39	304.000	1347.000	253.984	0	0.0000	998.000	998.000
40	319.667	1348.333	249.440	1	0.0000	1.809	1.833
40	319.667	1348.333	249.440	4	0.0000	1.850	1.808
41	319.667	1348.333	252.440	1	0.0000	1.843	1.870
41	319.667	1348.333	252.440	4	0.0000	1.891	1.841
42	319.667	1348.333	255.440	1	0.0000	1.875	1.906
42	319.667	1348.333	255.440	4	0.0000	1.930	1.873
43	335.333	1349.667	250.896	1	0.0000	1.659	1.680
43	335.333	1349.667	250.896	4	0.0000	1.692	1.659
44	335.333	1349.667	253.896	1	0.0000	1.696	1.720
44	335.333	1349.667	253.896	4	0.0000	1.734	1.695
45	335.333	1349.667	256.896	1	0.0000	1.729	1.757
45	335.333	1349.667	256.896	4	0.0000	1.775	1.728
46	351.000	1351.000	252.352	1	0.0000	1.553	1.569
46	351.000	1351.000	252.352	4	0.0000	1.577	1.553
47	351.000	1351.000	255.352	1	0.0000	1.577	1.598
47	351.000	1351.000	255.352	4	0.0000	1.607	1.577
48	351.000	1351.000	258.352	1	0.0000	1.608	1.633
48	351.000	1351.000	258.352	4	0.0000	1.645	1.608

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    351.0000=X-COOR.   1351.0000=Y-COOR.    252.3517=RADIUS      1.553=F.S.    46=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    351.0000=X-COOR.   1351.0000=Y-COOR.    252.3517=RADIUS      1.577=F.S.    46=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    351.0000=X-COOR.   1351.0000=Y-COOR.    252.3517=RADIUS      1.553=F.S.    46=SLIP#
```

NORMAL TERMINATION OF SLOPE

ATTACHMENT # 13
CLC 1003401-G(B)-06
PAGE 120





ATTACHMENT # B
CALC 100340I-G(B)-06
12

```
FILEINFO
SLOPEW 4.22
TITLE
Stability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
8:27:34 AM
ANALYSIS
    1     0     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            4
    1 +1.3000e+002 +1.0000e+002 +2.5000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Clay Liner
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          23
    1 +1.6500e+002 +1.1380e+003
    2 +1.8400e+002 +1.1380e+003
    3 +2.2400e+002 +1.1360e+003
    4 +4.2400e+002 +1.0700e+003
    5 +4.5000e+002 +1.0700e+003
    6 +4.5100e+002 +1.0400e+003
    7 +1.6520e+002 +1.1330e+003
    8 +1.8400e+002 +1.1330e+003
    9 +2.2400e+002 +1.1310e+003
   10 +4.2400e+002 +1.0640e+003
   11 +4.3800e+002 +1.0700e+003
   12 +1.6540e+002 +1.0900e+003
   13 +2.8700e+002 +1.0900e+003
   14 +3.5600e+002 +1.0800e+003
   15 +4.1500e+002 +1.0600e+003
   16 +4.2500e+002 +1.0400e+003
   17 +1.7700e+002 +1.1000e+003
   18 +3.0500e+002 +1.0990e+003
```

```
   19 +3.0500e+002 +1.0930e+003
   20 +1.7700e+002 +1.0940e+003
   21 +3.0400e+002 +1.3470e+003
   22 +2.8400e+002 +1.3040e+003
   23 +3.3100e+002 +1.3080e+003
LINE            4
    1     7
    1
    2
    3
    4
   11
    5
    6
    2     8
    1
    7
    8
    9
   10
   11
    5
    6
    3    10
    1
    7
   12
   13
   14
   15
   10
   11
    5
    6
    4     8
    1
    7
   12
   13
   14
   15
   16
    6
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000     0
GRID
   22    23    21     3     3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
   17    18    20    19     2    17    18
AXIS
    0
LIMIT
0 +1.6500e+002 +4.5100e+002
SLIP            0
BLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
```

ATTACHMENT # 15
CALC 100340I-G(10)-06
123

```
PORU            4 +0.0000e+000
    1 +0.0000e+000     0
    2 +0.0000e+000     0
    3 +0.0000e+000     0
    4 +0.0000e+000     0
PIEZ            4 +0.0000e+000
    1     0     0
    2     0     0
    3     0     0
    4     0     0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

ATTACHMENT # B
CALC 100340-1-G(B)-06
PAGE 124

'tability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
8:27:34 AM

1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	284.000	1304.000	204.830	0	0.0000	998.000	998.000
1	284.000	1304.000	204.830	0	0.0000	998.000	998.000
2	284.000	1304.000	207.830	0	0.0000	998.000	998.000
2	284.000	1304.000	207.830	0	0.0000	998.000	998.000
3	284.000	1304.000	210.829	0	0.0000	998.000	998.000
3	284.000	1304.000	210.829	0	0.0000	998.000	998.000
4	299.667	1305.333	206.285	1	0.0000	2.326	2.397
4	299.667	1305.333	206.285	4	0.0000	2.398	2.326
5	299.667	1305.333	209.285	1	0.0000	2.369	2.452
5	299.667	1305.333	209.285	4	0.0000	2.452	2.370
6	299.667	1305.333	212.285	1	0.0000	2.413	2.506
6	299.667	1305.333	212.285	4	0.0000	2.506	2.413
7	315.333	1306.667	207.741	1	0.0000	2.089	2.146
7	315.333	1306.667	207.741	4	0.0000	2.146	2.089
8	315.333	1306.667	210.741	1	0.0000	2.131	2.198
8	315.333	1306.667	210.741	4	0.0000	2.198	2.132
9	315.333	1306.667	213.741	1	0.0000	2.173	2.250
9	315.333	1306.667	213.741	4	0.0000	2.251	2.174
10	331.000	1308.000	209.197	1	0.0000	1.912	1.957
10	331.000	1308.000	209.197	4	0.0000	1.957	1.912
11	331.000	1308.000	212.197	1	0.0000	1.949	2.003
11	331.000	1308.000	212.197	4	0.0000	2.003	1.949
12	331.000	1308.000	215.197	1	0.0000	1.987	2.050
12	331.000	1308.000	215.197	4	0.0000	2.050	1.987
13	290.667	1318.333	219.215	1	0.0000	2.559	2.636
13	290.667	1318.333	219.215	4	0.0000	2.637	2.560
14	290.667	1318.333	222.215	0	0.0000	998.000	998.000
14	290.667	1318.333	222.215	0	0.0000	998.000	998.000
15	290.667	1318.333	225.215	0	0.0000	998.000	998.000
15	290.667	1318.333	225.215	0	0.0000	998.000	998.000
16	306.333	1319.667	220.670	1	0.0000	2.275	2.337
16	306.333	1319.667	220.670	4	0.0000	2.337	2.276
17	306.333	1319.667	223.670	1	0.0000	2.318	2.389
17	306.333	1319.667	223.670	4	0.0000	2.390	2.319
18	306.333	1319.667	226.670	1	0.0000	2.360	2.441
18	306.333	1319.667	226.670	4	0.0000	2.442	2.361
19	322.000	1321.000	222.126	1	0.0000	2.054	2.103
19	322.000	1321.000	222.126	4	0.0000	2.104	2.055
20	322.000	1321.000	225.126	1	0.0000	2.096	2.154
20	322.000	1321.000	225.126	4	0.0000	2.154	2.097
21	322.000	1321.000	228.126	1	0.0000	2.137	2.204
21	322.000	1321.000	228.126	4	0.0000	2.204	2.138
22	337.667	1322.333	223.582	1	0.0000	1.894	1.932
22	337.667	1322.333	223.582	4	0.0000	1.933	1.894
23	337.667	1322.333	226.582	1	0.0000	1.926	1.972
23	337.667	1322.333	226.582	4	0.0000	1.972	1.926
24	337.667	1322.333	229.582	1	0.0000	1.962	2.017
24	337.667	1322.333	229.582	4	0.0000	2.017	1.963
25	297.333	1332.667	233.600	1	0.0000	2.492	2.559

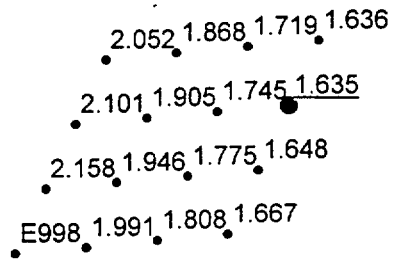
25	297.333	1332.667	233.600	4	0.0000	2.559	2.493
26	297.333	1332.667	236.600	0	0.0000	998.000	998.000
26	297.333	1332.667	236.600	0	0.0000	998.000	998.000
27	297.333	1332.667	239.599	0	0.0000	998.000	998.000
27	297.333	1332.667	239.599	0	0.0000	998.000	998.000
28	313.000	1334.000	235.055	1	0.0000	2.230	2.283
28	313.000	1334.000	235.055	4	0.0000	2.283	2.231
29	313.000	1334.000	238.055	1	0.0000	2.271	2.333
29	313.000	1334.000	238.055	4	0.0000	2.334	2.272
30	313.000	1334.000	241.055	1	0.0000	2.312	2.383
30	313.000	1334.000	241.055	4	0.0000	2.384	2.313
31	328.667	1335.333	236.511	1	0.0000	2.023	2.064
31	328.667	1335.333	236.511	4	0.0000	2.065	2.023
32	328.667	1335.333	239.511	1	0.0000	2.063	2.113
32	328.667	1335.333	239.511	4	0.0000	2.114	2.064
33	328.667	1335.333	242.511	1	0.0000	2.103	2.161
33	328.667	1335.333	242.511	4	0.0000	2.162	2.104
34	344.333	1336.667	237.967	1	0.0000	1.882	1.915
34	344.333	1336.667	237.967	4	0.0000	1.915	1.883
35	344.333	1336.667	240.967	1	0.0000	1.905	1.945
35	344.333	1336.667	240.967	4	0.0000	1.945	1.905
36	344.333	1336.667	243.966	1	0.0000	1.939	1.987
36	344.333	1336.667	243.966	4	0.0000	1.987	1.939
37	304.000	1347.000	247.985	1	0.0000	2.433	2.491
37	304.000	1347.000	247.985	4	0.0000	2.491	2.434
38	304.000	1347.000	250.985	1	0.0000	2.474	2.540
38	304.000	1347.000	250.985	4	0.0000	2.541	2.475
39	304.000	1347.000	253.984	0	0.0000	998.000	998.000
39	304.000	1347.000	253.984	0	0.0000	998.000	998.000
40	319.667	1348.333	249.440	1	0.0000	2.188	2.234
40	319.667	1348.333	249.440	4	0.0000	2.234	2.189
41	319.667	1348.333	252.440	1	0.0000	2.228	2.282
41	319.667	1348.333	252.440	4	0.0000	2.282	2.229
42	319.667	1348.333	255.440	1	0.0000	2.268	2.330
42	319.667	1348.333	255.440	4	0.0000	2.331	2.269
43	335.333	1349.667	250.896	1	0.0000	1.994	2.030
43	335.333	1349.667	250.896	4	0.0000	2.031	1.995
44	335.333	1349.667	253.896	1	0.0000	2.033	2.076
44	335.333	1349.667	253.896	4	0.0000	2.077	2.034
45	335.333	1349.667	256.896	1	0.0000	2.072	2.123
45	335.333	1349.667	256.896	4	0.0000	2.123	2.073
46	351.000	1351.000	252.352	1	0.0000	1.887	1.914
46	351.000	1351.000	252.352	4	0.0000	1.914	1.887
47	351.000	1351.000	255.352	1	0.0000	1.888	1.922
47	351.000	1351.000	255.352	4	0.0000	1.923	1.888
48	351.000	1351.000	258.352	1	0.0000	1.918	1.959
48	351.000	1351.000	258.352	4	0.0000	1.959	1.918

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    344.3333=X-COOR.   1336.6666=Y-COOR.    237.9667=RADIUS      1.882=F.S.    34=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    351.0000=X-COOR.   1351.0000=Y-COOR.    252.3517=RADIUS      1.914=F.S.    46=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    344.3333=X-COOR.   1336.6666=Y-COOR.    237.9667=RADIUS      1.883=F.S.    34=SLIP#
```

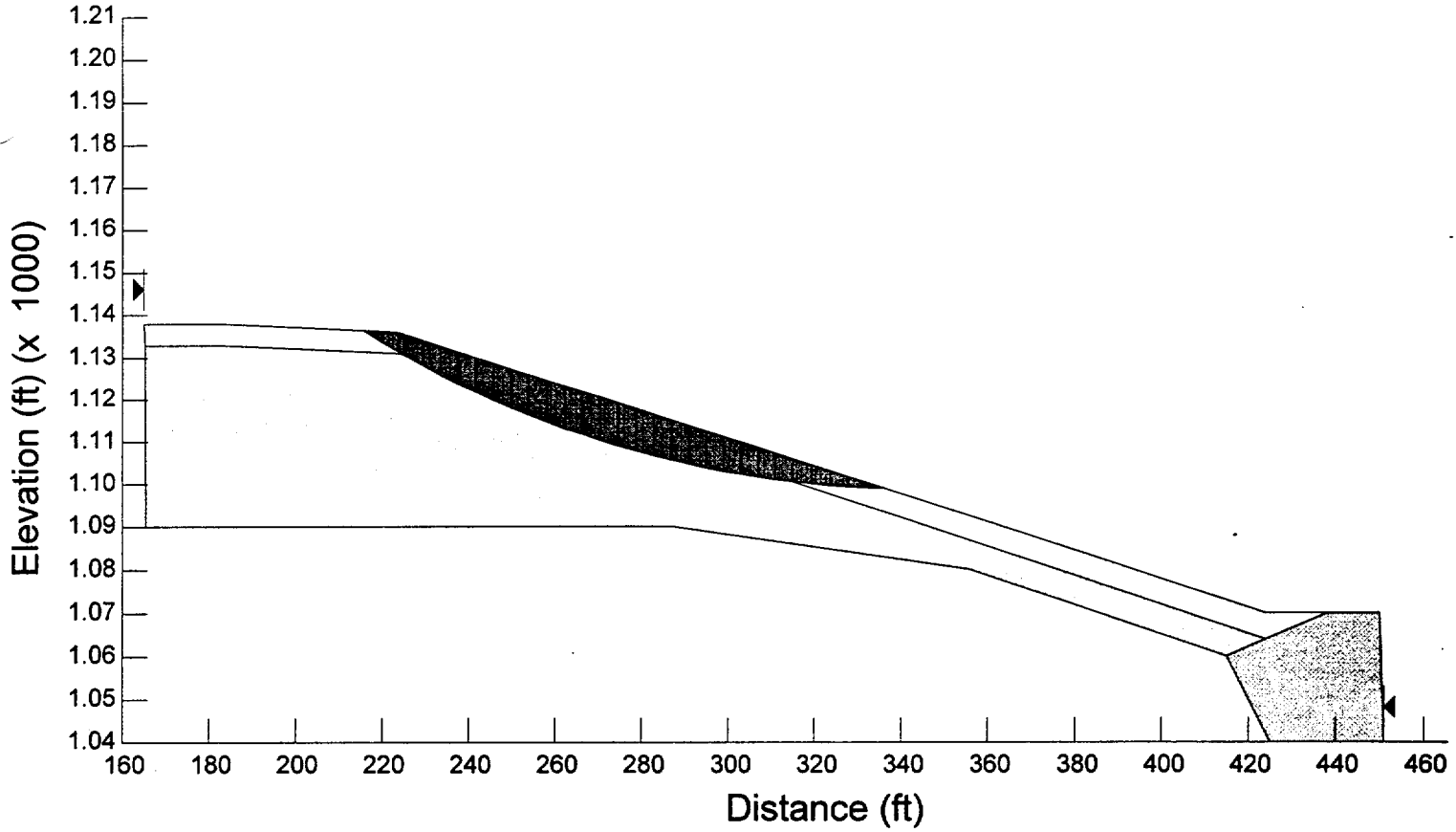
ATTACHMENT # B
CALC 100340T-G(B)-06
126

NORMAL TERMINATION OF SLOPE

ATTACHMENT # B
CALC 1003401-G(B)-01
PAGE 127



Section 3-3 5' Clay Liner Cover with Seismic Loading



```
FILEINFO
SLOPEW 4.22
TITLE
Stability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
8:53:11 AM
ANALYSIS
    1     0     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL           4
    1 +1.3000e+002 +1.0000e+002 +2.5000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Clay Liner
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION      0
AFUNCTION      0
POINT         23
    1 +1.6500e+002 +1.1380e+003
    2 +1.8400e+002 +1.1380e+003
    3 +2.2400e+002 +1.1360e+003
    4 +4.2400e+002 +1.0700e+003
    5 +4.5000e+002 +1.0700e+003
    6 +4.5100e+002 +1.0400e+003
    7 +1.6520e+002 +1.1330e+003
    8 +1.8400e+002 +1.1330e+003
    9 +2.2400e+002 +1.1310e+003
   10 +4.2400e+002 +1.0640e+003
   11 +4.3800e+002 +1.0700e+003
   12 +1.6540e+002 +1.0900e+003
   13 +2.8700e+002 +1.0900e+003
   14 +3.5600e+002 +1.0800e+003
   15 +4.1500e+002 +1.0600e+003
   16 +4.2500e+002 +1.0400e+003
   17 +1.7700e+002 +1.1000e+003
   18 +3.0500e+002 +1.0990e+003
```

ATTACHMENT # B
CALC 100340I-G(B)-06
129

```
    19 +3.0500e+002 +1.0930e+003
    20 +1.7700e+002 +1.0940e+003
    21 +3.0400e+002 +1.3470e+003
    22 +2.8400e+002 +1.3040e+003
    23 +3.3100e+002 +1.3080e+003
LINE            4
     1      7
     1
     2
     3
     4
    11
     5
     6
     2      8
     1
     7
     8
     9
    10
    11
     5
     6
     3     10
     1
     7
    12
    13
    14
    15
    10
    11
     5
     6
     4      8
     1
     7
    12
    13
    14
    15
    16
     6
TENSION
     0 +9.8070e+000 +0.0000e+000 +0.0000e+000      0
GRID
    22     23     21      3      3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
    17     18     20     19      2     17     18
AXIS
     0
LIMIT
0 +1.6500e+002 +4.5100e+002
SLIP            0
BLOCK
     0      0      0      0      0 +1.3500e+002 +1.3500e+002 0 0
     0      0      0      0      0 +4.5000e+001 +4.5000e+001 0 0
```

ATTACHMENT # B
CALC 100340-G(B)-06
130

```
PORU            4 +0.0000e+000
    1 +0.0000e+000      0
    2 +0.0000e+000      0
    3 +0.0000e+000      0
    4 +0.0000e+000      0
PIEZ            4 +0.0000e+000
    1     0      0
    2     0      0
    3     0      0
    4     0      0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+5.0000e-002 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

ATTACHMENT # B
1003401-G1(B)06
13

Stability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
8:53:11 AM
1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	284.000	1304.000	204.830	0	0.0000	998.000	998.000
1	284.000	1304.000	204.830	0	0.0000	998.000	998.000
2	284.000	1304.000	207.830	0	0.0000	998.000	998.000
2	284.000	1304.000	207.830	0	0.0000	998.000	998.000
3	284.000	1304.000	210.829	0	0.0000	998.000	998.000
3	284.000	1304.000	210.829	0	0.0000	998.000	998.000
4	299.667	1305.333	206.285	1	0.0000	1.929	1.964
4	299.667	1305.333	206.285	4	0.0000	1.991	1.925
5	299.667	1305.333	209.285	1	0.0000	1.962	2.001
5	299.667	1305.333	209.285	4	0.0000	2.032	1.957
6	299.667	1305.333	212.285	1	0.0000	1.993	2.037
6	299.667	1305.333	212.285	4	0.0000	2.073	1.988
7	315.333	1306.667	207.741	1	0.0000	1.758	1.789
7	315.333	1306.667	207.741	4	0.0000	1.808	1.756
8	315.333	1306.667	210.741	1	0.0000	1.789	1.825
8	315.333	1306.667	210.741	4	0.0000	1.848	1.787
9	315.333	1306.667	213.741	1	0.0000	1.821	1.861
9	315.333	1306.667	213.741	4	0.0000	1.888	1.818
10	331.000	1308.000	209.197	1	0.0000	1.627	1.654
10	331.000	1308.000	209.197	4	0.0000	1.667	1.627
11	331.000	1308.000	212.197	1	0.0000	1.654	1.686
11	331.000	1308.000	212.197	4	0.0000	1.702	1.653
12	331.000	1308.000	215.197	1	0.0000	1.683	1.720
12	331.000	1308.000	215.197	4	0.0000	1.738	1.682
13	290.667	1318.333	219.215	1	0.0000	2.092	2.126
13	290.667	1318.333	219.215	4	0.0000	2.158	2.086
14	290.667	1318.333	222.215	0	0.0000	998.000	998.000
14	290.667	1318.333	222.215	0	0.0000	998.000	998.000
15	290.667	1318.333	225.215	0	0.0000	998.000	998.000
15	290.667	1318.333	225.215	0	0.0000	998.000	998.000
16	306.333	1319.667	220.670	1	0.0000	1.892	1.923
16	306.333	1319.667	220.670	4	0.0000	1.946	1.889
17	306.333	1319.667	223.670	1	0.0000	1.923	1.958
17	306.333	1319.667	223.670	4	0.0000	1.985	1.920
18	306.333	1319.667	226.670	1	0.0000	1.955	1.994
18	306.333	1319.667	226.670	4	0.0000	2.024	1.950
19	322.000	1321.000	222.126	1	0.0000	1.732	1.759
19	322.000	1321.000	222.126	4	0.0000	1.775	1.731
20	322.000	1321.000	225.126	1	0.0000	1.763	1.794
20	322.000	1321.000	225.126	4	0.0000	1.814	1.761
21	322.000	1321.000	228.126	1	0.0000	1.793	1.829
21	322.000	1321.000	228.126	4	0.0000	1.852	1.791
22	337.667	1322.333	223.582	1	0.0000	1.614	1.637
22	337.667	1322.333	223.582	4	0.0000	1.648	1.614
23	337.667	1322.333	226.582	1	0.0000	1.636	1.664
23	337.667	1322.333	226.582	4	0.0000	1.677	1.636
24	337.667	1322.333	229.582	1	0.0000	1.664	1.696
24	337.667	1322.333	229.582	4	0.0000	1.712	1.663
25	297.333	1332.667	233.600	1	0.0000	2.045	2.074

ATTACHMENT # B
CALC 100340-FG(D)-06
132

25	297.333	1332.667	233.600	4	0.0000	2.101	2.039
26	297.333	1332.667	236.600	0	0.0000	998.000	998.000
26	297.333	1332.667	236.600	0	0.0000	998.000	998.000
27	297.333	1332.667	239.599	0	0.0000	998.000	998.000
27	297.333	1332.667	239.599	0	0.0000	998.000	998.000
28	313.000	1334.000	235.055	1	0.0000	1.859	1.885
28	313.000	1334.000	235.055	4	0.0000	1.905	1.856
29	313.000	1334.000	238.055	1	0.0000	1.889	1.920
29	313.000	1334.000	238.055	4	0.0000	1.943	1.886
30	313.000	1334.000	241.055	1	0.0000	1.919	1.954
30	313.000	1334.000	241.055	4	0.0000	1.980	1.916
31	328.667	1335.333	236.511	1	0.0000	1.708	1.732
31	328.667	1335.333	236.511	4	0.0000	1.745	1.707
32	328.667	1335.333	239.511	1	0.0000	1.738	1.765
32	328.667	1335.333	239.511	4	0.0000	1.782	1.737
33	328.667	1335.333	242.511	1	0.0000	1.767	1.799
33	328.667	1335.333	242.511	4	0.0000	1.818	1.765
34	344.333	1336.667	237.967	1	0.0000	1.606	1.626
34	344.333	1336.667	237.967	4	0.0000	1.635	1.606
35	344.333	1336.667	240.967	1	0.0000	1.621	1.645
35	344.333	1336.667	240.967	4	0.0000	1.656	1.621
36	344.333	1336.667	243.966	1	0.0000	1.646	1.674
36	344.333	1336.667	243.966	4	0.0000	1.688	1.645
37	304.000	1347.000	247.985	1	0.0000	2.002	2.028
37	304.000	1347.000	247.985	4	0.0000	2.052	1.998
38	304.000	1347.000	250.985	1	0.0000	2.032	2.061
38	304.000	1347.000	250.985	4	0.0000	2.088	2.027
39	304.000	1347.000	253.984	0	0.0000	998.000	998.000
39	304.000	1347.000	253.984	0	0.0000	998.000	998.000
40	319.667	1348.333	249.440	1	0.0000	1.828	1.851
40	319.667	1348.333	249.440	4	0.0000	1.868	1.826
41	319.667	1348.333	252.440	1	0.0000	1.857	1.884
41	319.667	1348.333	252.440	4	0.0000	1.904	1.855
42	319.667	1348.333	255.440	1	0.0000	1.887	1.917
42	319.667	1348.333	255.440	4	0.0000	1.941	1.883
43	335.333	1349.667	250.896	1	0.0000	1.687	1.707
43	335.333	1349.667	250.896	4	0.0000	1.719	1.686
44	335.333	1349.667	253.896	1	0.0000	1.715	1.739
44	335.333	1349.667	253.896	4	0.0000	1.754	1.714
45	335.333	1349.667	256.896	1	0.0000	1.744	1.772
45	335.333	1349.667	256.896	4	0.0000	1.789	1.742
46	351.000	1351.000	252.352	1	0.0000	1.612	1.629
46	351.000	1351.000	252.352	4	0.0000	1.636	1.613
47	351.000	1351.000	255.352	1	0.0000	1.608	1.629
47	351.000	1351.000	255.352	4	0.0000	1.639	1.608
48	351.000	1351.000	258.352	1	0.0000	1.630	1.654
48	351.000	1351.000	258.352	4	0.0000	1.666	1.629

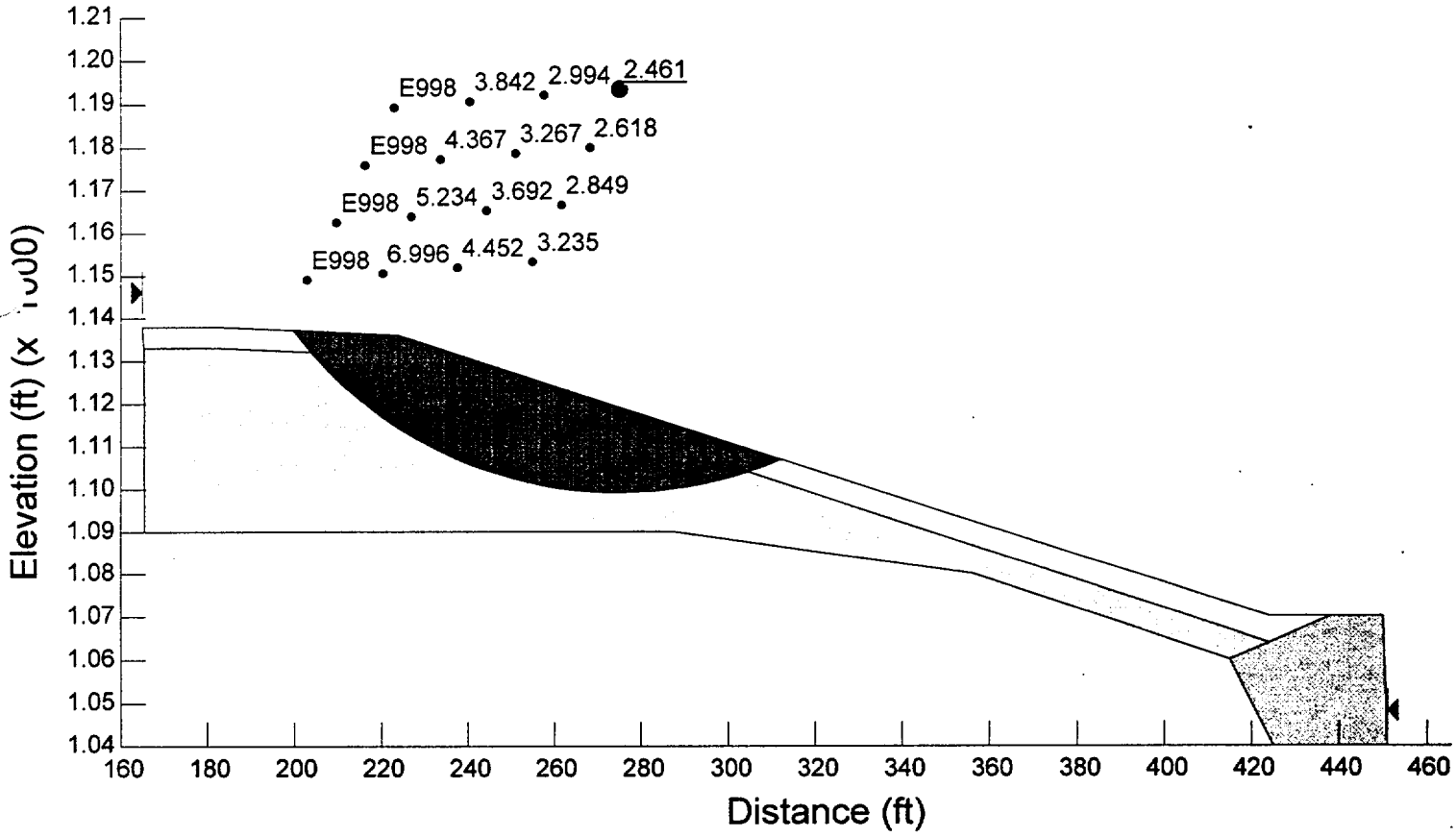
```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    344.3333=X-COOR.   1336.6666=Y-COOR.    237.9667=RADIUS      1.606=F.S.    34=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    344.3333=X-COOR.   1336.6666=Y-COOR.    237.9667=RADIUS      1.635=F.S.    34=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    344.3333=X-COOR.   1336.6666=Y-COOR.    237.9667=RADIUS      1.606=F.S.    34=SLIP#
```

ATTACHMENT # B
CALO 100340 1-67(B)-06
133

NORMAL TERMINATION OF SLOPE

ATTACHMENT # 13
CALC 1003401-G(B)-06
PAGE 134

Section 3-3 5' Filter Drainage/Bedding Cover with Static Loading



```
TILEINFO
LOPEW 4.22
TITLE
Stability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
9:46:42 AM
ANALYSIS
    1     0     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL          4
    1 +1.3000e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Soil
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          23
    1 +1.6500e+002 +1.1380e+003
    2 +1.8400e+002 +1.1380e+003
    3 +2.2400e+002 +1.1360e+003
    4 +4.2400e+002 +1.0700e+003
    5 +4.5000e+002 +1.0700e+003
    6 +4.5100e+002 +1.0400e+003
    7 +1.6520e+002 +1.1330e+003
    8 +1.8400e+002 +1.1330e+003
    9 +2.2400e+002 +1.1310e+003
   10 +4.2400e+002 +1.0640e+003
   11 +4.3800e+002 +1.0700e+003
   12 +1.6540e+002 +1.0900e+003
   13 +2.8700e+002 +1.0900e+003
   14 +3.5600e+002 +1.0800e+003
   15 +4.1500e+002 +1.0600e+003
   16 +4.2500e+002 +1.0400e+003
   17 +1.7700e+002 +1.1000e+003
   18 +3.0500e+002 +1.0990e+003
```

```
    19 +3.0500e+002 +1.0930e+003
    20 +1.7700e+002 +1.0940e+003
    21 +2.2300e+002 +1.1890e+003
    22 +2.0300e+002 +1.1490e+003
    23 +2.5500e+002 +1.1530e+003
LINE            4
     1      7
     1
     2
     3
     4
    11
     5
     6
     2      8
     1
     7
     8
     9
    10
    11
     5
     6
     3     10
     1
     7
    12
    13
    14
    15
    10
    11
     5
     6
     4      8
     1
     7
    12
    13
    14
    15
    16
     6
TENSION
     0 +9.8070e+000 +0.0000e+000 +0.0000e+000      0
GRID
    22     23     21      3      3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
    17     18     20     19      2     17     18
AXIS
     0
LIMIT
0 +1.6500e+002 +4.5100e+002
SLIP            0
BLOCK
     0      0      0      0      0 +1.3500e+002 +1.3500e+002 0 0
     0      0      0      0      0 +4.5000e+001 +4.5000e+001 0 0
```

```
ORU            4 +0.0000e+000
    1 +0.0000e+000      0
    2 +0.0000e+000      0
    3 +0.0000e+000      0
    4 +0.0000e+000      0
PIEZ           4 +0.0000e+000
    1      0      0
    2      0      0
    3      0      0
    4      0      0
PCON           0 +0.0000e+000
POGH           0 +0.0000e+000
POGP           0 +0.0000e+000
POGR           0 +0.0000e+000
PORA           4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD           0
ANCHOR         0
PBOUNDARY      0
SEISMIC
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE           0
ELEMENT        0
MATLCOLOR      4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

ATTACHMENT # 13
CALC 100340I-G(13)-06
PAGE 138

ability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
9:46:42 AM

1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	203.000	1149.000	49.202	0	0.0000	998.000	998.000
1	203.000	1149.000	49.202	0	0.0000	998.000	998.000
2	203.000	1149.000	52.202	0	0.0000	998.000	998.000
2	203.000	1149.000	52.202	0	0.0000	998.000	998.000
3	203.000	1149.000	55.201	0	0.0000	998.000	998.000
3	203.000	1149.000	55.201	0	0.0000	998.000	998.000
4	220.333	1150.333	50.670	1	0.0000	5.470	7.381
4	220.333	1150.333	50.670	8	0.0000	6.996	5.215
5	220.333	1150.333	53.670	1	0.0000	5.503	7.472
5	220.333	1150.333	53.670	8	0.0000	7.074	5.231
6	220.333	1150.333	56.670	1	0.0000	5.550	7.565
6	220.333	1150.333	56.670	8	0.0000	7.162	5.278
7	237.667	1151.667	52.139	1	0.0000	3.575	4.565
7	237.667	1151.667	52.139	7	0.0000	4.452	3.505
8	237.667	1151.667	55.139	1	0.0000	3.663	4.717
8	237.667	1151.667	55.139	7	0.0000	4.591	3.582
9	237.667	1151.667	58.139	1	0.0000	3.750	4.862
9	237.667	1151.667	58.139	7	0.0000	4.726	3.664
10	255.000	1153.000	53.608	1	0.0000	2.653	3.289
10	255.000	1153.000	53.608	6	0.0000	3.235	2.627
11	255.000	1153.000	56.608	1	0.0000	2.750	3.435
11	255.000	1153.000	56.608	6	0.0000	3.377	2.721
12	255.000	1153.000	59.608	1	0.0000	2.838	3.571
12	255.000	1153.000	59.608	6	0.0000	3.508	2.803
13	209.667	1162.333	62.587	0	0.0000	998.000	998.000
13	209.667	1162.333	62.587	0	0.0000	998.000	998.000
14	209.667	1162.333	65.587	0	0.0000	998.000	998.000
14	209.667	1162.333	65.587	0	0.0000	998.000	998.000
15	209.667	1162.333	68.586	0	0.0000	998.000	998.000
15	209.667	1162.333	68.586	0	0.0000	998.000	998.000
16	227.000	1163.667	64.055	1	0.0000	4.363	5.383
16	227.000	1163.667	64.055	6	0.0000	5.234	4.269
17	227.000	1163.667	67.055	1	0.0000	4.426	5.507
17	227.000	1163.667	67.055	6	0.0000	5.345	4.322
18	227.000	1163.667	70.055	0	0.0000	998.000	998.000
18	227.000	1163.667	70.055	0	0.0000	998.000	998.000
19	244.333	1165.000	65.524	1	0.0000	3.132	3.743
19	244.333	1165.000	65.524	5	0.0000	3.692	3.106
20	244.333	1165.000	68.524	1	0.0000	3.210	3.873
20	244.333	1165.000	68.524	5	0.0000	3.812	3.178
21	244.333	1165.000	71.524	1	0.0000	3.289	3.999
21	244.333	1165.000	71.524	6	0.0000	3.932	3.250
22	261.667	1166.333	66.993	1	0.0000	2.454	2.875
22	261.667	1166.333	66.993	5	0.0000	2.849	2.445
23	261.667	1166.333	69.993	1	0.0000	2.535	2.996
23	261.667	1166.333	69.993	5	0.0000	2.966	2.524
24	261.667	1166.333	72.993	1	0.0000	2.612	3.113
24	261.667	1166.333	72.993	5	0.0000	3.079	2.600
25	216.333	1175.667	75.972	0	0.0000	998.000	998.000

ATTACHMENT # B
OLD 1003401-G1(B)-06
139

25	216.333	1175.667	75.972	0	0.0000	998.000	998.000
26	216.333	1175.667	78.972	0	0.0000	998.000	998.000
26	216.333	1175.667	78.972	0	0.0000	998.000	998.000
27	216.333	1175.667	81.971	0	0.0000	998.000	998.000
27	216.333	1175.667	81.971	0	0.0000	998.000	998.000
28	233.667	1177.000	77.440	1	0.0000	3.790	4.434
28	233.667	1177.000	77.440	5	0.0000	4.367	3.751
29	233.667	1177.000	80.440	0	0.0000	998.000	998.000
29	233.667	1177.000	80.440	0	0.0000	998.000	998.000
30	233.667	1177.000	83.440	0	0.0000	998.000	998.000
30	233.667	1177.000	83.440	0	0.0000	998.000	998.000
31	251.000	1178.333	78.909	1	0.0000	2.872	3.292
31	251.000	1178.333	78.909	5	0.0000	3.267	2.862
32	251.000	1178.333	81.909	1	0.0000	2.947	3.407
32	251.000	1178.333	81.909	5	0.0000	3.378	2.934
33	251.000	1178.333	84.909	1	0.0000	3.017	3.516
33	251.000	1178.333	84.909	5	0.0000	3.481	3.000
34	268.333	1179.667	80.378	1	0.0000	2.328	2.631
34	268.333	1179.667	80.378	4	0.0000	2.618	2.324
35	268.333	1179.667	83.378	1	0.0000	2.400	2.735
35	268.333	1179.667	83.378	5	0.0000	2.720	2.396
36	268.333	1179.667	86.378	1	0.0000	2.470	2.837
36	268.333	1179.667	86.378	5	0.0000	2.819	2.465
37	223.000	1189.000	89.357	0	0.0000	998.000	998.000
37	223.000	1189.000	89.357	0	0.0000	998.000	998.000
38	223.000	1189.000	92.357	0	0.0000	998.000	998.000
38	223.000	1189.000	92.357	0	0.0000	998.000	998.000
39	223.000	1189.000	95.356	0	0.0000	998.000	998.000
39	223.000	1189.000	95.356	0	0.0000	998.000	998.000
40	240.333	1190.333	90.825	1	0.0000	3.428	3.877
40	240.333	1190.333	90.825	5	0.0000	3.842	3.408
41	240.333	1190.333	93.825	0	0.0000	998.000	998.000
41	240.333	1190.333	93.825	0	0.0000	998.000	998.000
42	240.333	1190.333	96.825	0	0.0000	998.000	998.000
42	240.333	1190.333	96.825	0	0.0000	998.000	998.000
43	257.667	1191.667	92.294	1	0.0000	2.698	3.006
43	257.667	1191.667	92.294	4	0.0000	2.994	2.693
44	257.667	1191.667	95.294	1	0.0000	2.765	3.105
44	257.667	1191.667	95.294	5	0.0000	3.090	2.760
45	257.667	1191.667	98.294	1	0.0000	2.829	3.201
45	257.667	1191.667	98.294	5	0.0000	3.183	2.822
46	275.000	1193.000	93.763	1	0.0000	2.238	2.467
46	275.000	1193.000	93.763	4	0.0000	2.461	2.237
47	275.000	1193.000	96.763	1	0.0000	2.304	2.559
47	275.000	1193.000	96.763	4	0.0000	2.551	2.302
48	275.000	1193.000	99.763	1	0.0000	2.367	2.649
48	275.000	1193.000	99.763	4	0.0000	2.639	2.364

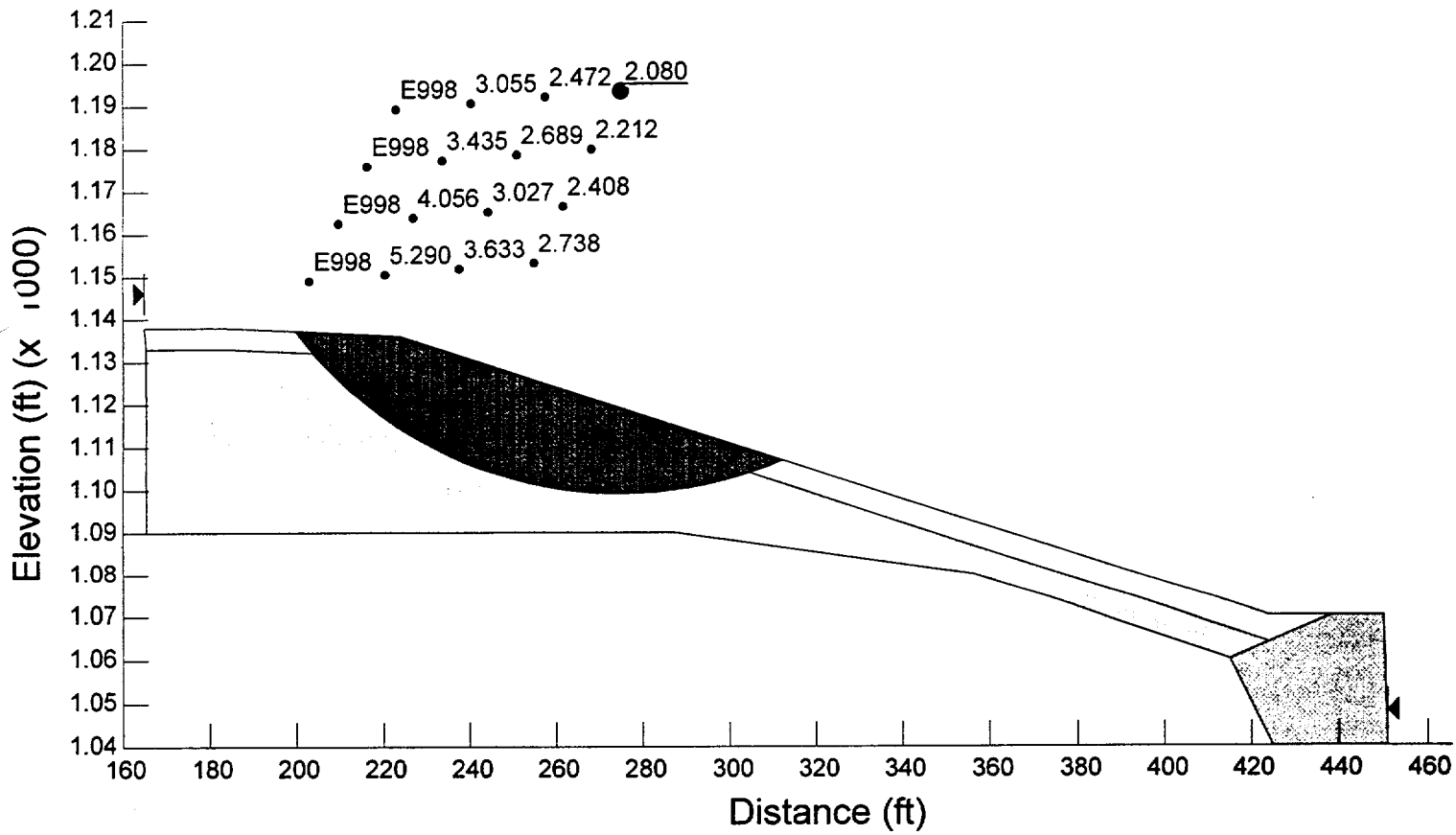
```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    275.0000=X-COOR.   1193.0000=Y-COOR.     93.7628=RADIUS      2.238=F.S.    46=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    275.0000=X-COOR.   1193.0000=Y-COOR.     93.7628=RADIUS      2.461=F.S.    46=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    275.0000=X-COOR.   1193.0000=Y-COOR.     93.7628=RADIUS      2.237=F.S.    46=SLIP#
```

ATTACHMENT # D
CALC 1003401-G(B)-06
140

NORMAL TERMINATION OF SLOPE

ATTACHMENT # B
CALC 1003401-G(B)-06
141

Section 3-3 5' Filter Drainage/Bedding Cover with Seismic Loading



```
TILEINFO
SLOPEW 4.22
TITLE
Stability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
9:43:19 AM
ANALYSIS
    1     0     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            4
    1 +1.3000e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Soil
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          23
    1 +1.6500e+002 +1.1380e+003
    2 +1.8400e+002 +1.1380e+003
    3 +2.2400e+002 +1.1360e+003
    4 +4.2400e+002 +1.0700e+003
    5 +4.5000e+002 +1.0700e+003
    6 +4.5100e+002 +1.0400e+003
    7 +1.6520e+002 +1.1330e+003
    8 +1.8400e+002 +1.1330e+003
    9 +2.2400e+002 +1.1310e+003
   10 +4.2400e+002 +1.0640e+003
   11 +4.3800e+002 +1.0700e+003
   12 +1.6540e+002 +1.0900e+003
   13 +2.8700e+002 +1.0900e+003
   14 +3.5600e+002 +1.0800e+003
   15 +4.1500e+002 +1.0600e+003
   16 +4.2500e+002 +1.0400e+003
   17 +1.7700e+002 +1.1000e+003
   18 +3.0500e+002 +1.0990e+003
```

```
   19 +3.0500e+002 +1.0930e+003
   20 +1.7700e+002 +1.0940e+003
   21 +2.2300e+002 +1.1890e+003
   22 +2.0300e+002 +1.1490e+003
   23 +2.5500e+002 +1.1530e+003
LINE            4
    1      7
    1
    2
    3
    4
   11
    5
    6
    2      8
    1
    7
    8
    9
   10
   11
    5
    6
    3     10
    1
    7
   12
   13
   14
   15
   10
   11
    5
    6
    4      8
    1
    7
   12
   13
   14
   15
   16
    6
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000      0
GRID
   22    23    21     3     3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
   17    18    20    19     2    17    18
AXIS
    0
LIMIT
0 +1.6500e+002 +4.5100e+002
SLIP            0
BLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
```

```
ORU             4 +0.0000e+000
    1 +0.0000e+000      0
    2 +0.0000e+000      0
    3 +0.0000e+000      0
    4 +0.0000e+000      0
PIEZ            4 +0.0000e+000
    1      0      0
    2      0      0
    3      0      0
    4      0      0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+5.0000e-002 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

ATTACHMENT # 13
CALC 1003401-G(B)-06
145

ability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
9:43:19 AM
1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	203.000	1149.000	49.202	0	0.0000	998.000	998.000
1	203.000	1149.000	49.202	0	0.0000	998.000	998.000
2	203.000	1149.000	52.202	0	0.0000	998.000	998.000
2	203.000	1149.000	52.202	0	0.0000	998.000	998.000
3	203.000	1149.000	55.201	0	0.0000	998.000	998.000
3	203.000	1149.000	55.201	0	0.0000	998.000	998.000
4	220.333	1150.333	50.670	1	0.0000	4.129	4.486
4	220.333	1150.333	50.670	7	0.0000	5.290	3.890
5	220.333	1150.333	53.670	1	0.0000	4.159	4.519
5	220.333	1150.333	53.670	7	0.0000	5.356	3.908
6	220.333	1150.333	56.670	1	0.0000	4.197	4.553
6	220.333	1150.333	56.670	7	0.0000	5.426	3.941
7	237.667	1151.667	52.139	1	0.0000	2.909	3.251
7	237.667	1151.667	52.139	6	0.0000	3.633	2.817
8	237.667	1151.667	55.139	1	0.0000	2.975	3.329
8	237.667	1151.667	55.139	6	0.0000	3.740	2.873
9	237.667	1151.667	58.139	1	0.0000	3.041	3.401
9	237.667	1151.667	58.139	6	0.0000	3.843	2.930
10	255.000	1153.000	53.608	1	0.0000	2.238	2.537
10	255.000	1153.000	53.608	5	0.0000	2.738	2.203
11	255.000	1153.000	56.608	1	0.0000	2.314	2.625
11	255.000	1153.000	56.608	6	0.0000	2.851	2.273
12	255.000	1153.000	59.608	1	0.0000	2.382	2.706
12	255.000	1153.000	59.608	6	0.0000	2.955	2.334
13	209.667	1162.333	62.587	0	0.0000	998.000	998.000
13	209.667	1162.333	62.587	0	0.0000	998.000	998.000
14	209.667	1162.333	65.587	0	0.0000	998.000	998.000
14	209.667	1162.333	65.587	0	0.0000	998.000	998.000
15	209.667	1162.333	68.586	0	0.0000	998.000	998.000
15	209.667	1162.333	68.586	0	0.0000	998.000	998.000
16	227.000	1163.667	64.055	1	0.0000	3.373	3.652
16	227.000	1163.667	64.055	5	0.0000	4.056	3.265
17	227.000	1163.667	67.055	1	0.0000	3.421	3.709
17	227.000	1163.667	67.055	6	0.0000	4.140	3.301
18	227.000	1163.667	70.055	0	0.0000	998.000	998.000
18	227.000	1163.667	70.055	0	0.0000	998.000	998.000
19	244.333	1165.000	65.524	1	0.0000	2.560	2.805
19	244.333	1165.000	65.524	5	0.0000	3.027	2.516
20	244.333	1165.000	68.524	1	0.0000	2.620	2.879
20	244.333	1165.000	68.524	5	0.0000	3.120	2.569
21	244.333	1165.000	71.524	1	0.0000	2.679	2.949
21	244.333	1165.000	71.524	5	0.0000	3.212	2.623
22	261.667	1166.333	66.993	1	0.0000	2.067	2.279
22	261.667	1166.333	66.993	5	0.0000	2.408	2.050
23	261.667	1166.333	69.993	1	0.0000	2.131	2.356
23	261.667	1166.333	69.993	5	0.0000	2.501	2.109
24	261.667	1166.333	72.993	1	0.0000	2.191	2.430
24	261.667	1166.333	72.993	5	0.0000	2.592	2.166
25	216.333	1175.667	75.972	0	0.0000	998.000	998.000

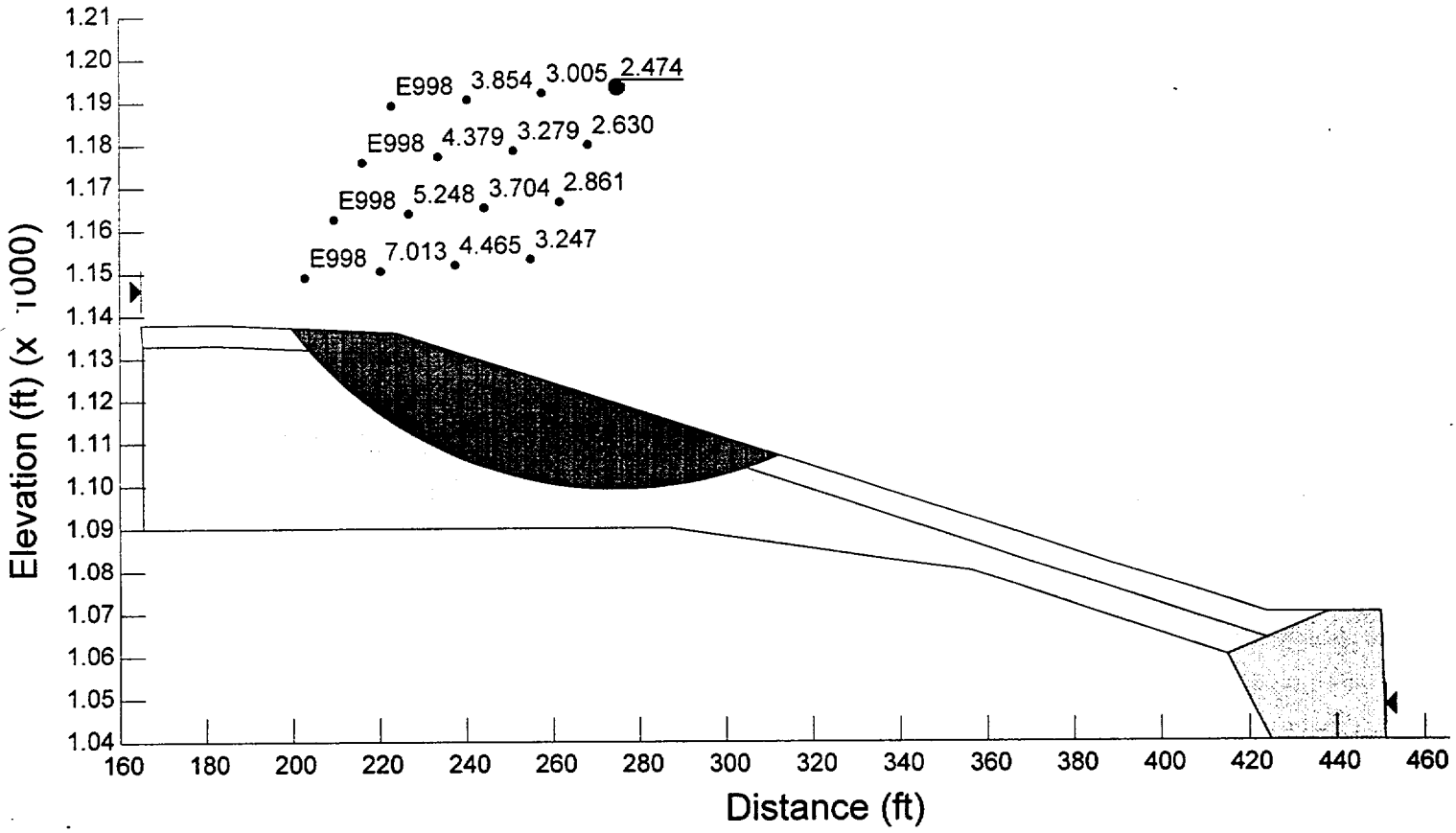
25	216.333	1175.667	75.972	0	0.0000	998.000	998.000
26	216.333	1175.667	78.972	0	0.0000	998.000	998.000
26	216.333	1175.667	78.972	0	0.0000	998.000	998.000
27	216.333	1175.667	81.971	0	0.0000	998.000	998.000
27	216.333	1175.667	81.971	0	0.0000	998.000	998.000
28	233.667	1177.000	77.440	1	0.0000	2.974	3.183
28	233.667	1177.000	77.440	5	0.0000	3.435	2.914
29	233.667	1177.000	80.440	0	0.0000	998.000	998.000
29	233.667	1177.000	80.440	0	0.0000	998.000	998.000
30	233.667	1177.000	83.440	0	0.0000	998.000	998.000
30	233.667	1177.000	83.440	0	0.0000	998.000	998.000
31	251.000	1178.333	78.909	1	0.0000	2.358	2.540
31	251.000	1178.333	78.909	4	0.0000	2.689	2.331
32	251.000	1178.333	81.909	1	0.0000	2.414	2.609
32	251.000	1178.333	81.909	5	0.0000	2.774	2.385
33	251.000	1178.333	84.909	1	0.0000	2.467	2.673
33	251.000	1178.333	84.909	5	0.0000	2.854	2.433
34	268.333	1179.667	80.378	1	0.0000	1.961	2.120
34	268.333	1179.667	80.378	4	0.0000	2.212	1.951
35	268.333	1179.667	83.378	1	0.0000	2.017	2.188
35	268.333	1179.667	83.378	4	0.0000	2.293	2.004
36	268.333	1179.667	86.378	1	0.0000	2.072	2.255
36	268.333	1179.667	86.378	4	0.0000	2.372	2.056
37	223.000	1189.000	89.357	0	0.0000	998.000	998.000
37	223.000	1189.000	89.357	0	0.0000	998.000	998.000
38	223.000	1189.000	92.357	0	0.0000	998.000	998.000
38	223.000	1189.000	92.357	0	0.0000	998.000	998.000
39	223.000	1189.000	95.356	0	0.0000	998.000	998.000
39	223.000	1189.000	95.356	0	0.0000	998.000	998.000
40	240.333	1190.333	90.825	1	0.0000	2.720	2.881
40	240.333	1190.333	90.825	4	0.0000	3.055	2.680
41	240.333	1190.333	93.825	0	0.0000	998.000	998.000
41	240.333	1190.333	93.825	0	0.0000	998.000	998.000
42	240.333	1190.333	96.825	0	0.0000	998.000	998.000
42	240.333	1190.333	96.825	0	0.0000	998.000	998.000
43	257.667	1191.667	92.294	1	0.0000	2.222	2.363
43	257.667	1191.667	92.294	4	0.0000	2.472	2.206
44	257.667	1191.667	95.294	1	0.0000	2.273	2.425
44	257.667	1191.667	95.294	4	0.0000	2.547	2.254
45	257.667	1191.667	98.294	1	0.0000	2.322	2.484
45	257.667	1191.667	98.294	4	0.0000	2.618	2.299
46	275.000	1193.000	93.763	1	0.0000	1.886	2.010
46	275.000	1193.000	93.763	4	0.0000	2.080	1.880
47	275.000	1193.000	96.763	1	0.0000	1.937	2.072
47	275.000	1193.000	96.763	4	0.0000	2.151	1.929
48	275.000	1193.000	99.763	1	0.0000	1.987	2.132
48	275.000	1193.000	99.763	4	0.0000	2.221	1.976

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    275.0000=X-COOR.   1193.0000=Y-COOR.     93.7628=RADIUS      1.886=F.S.    46=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    275.0000=X-COOR.   1193.0000=Y-COOR.     93.7628=RADIUS      2.080=F.S.    46=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    275.0000=X-COOR.   1193.0000=Y-COOR.     93.7628=RADIUS      1.880=F.S.    46=SLIP#
```

.ORMAL TERMINATION OF SLOPE

ATTACHMENT # 13
CALC 100340-G1(B)-01
148

Section 3-3 5' Clay Liner Cover with Static Loading



```
'ILEINFO
LOPEW 4.22
TITLE
Stability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
9:49:55 AM
ANALYSIS
    1     0     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            4
    1 +1.3000e+002 +1.0000e+002 +2.5000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Clay Liner
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          23
    1 +1.6500e+002 +1.1380e+003
    2 +1.8400e+002 +1.1380e+003
    3 +2.2400e+002 +1.1360e+003
    4 +4.2400e+002 +1.0700e+003
    5 +4.5000e+002 +1.0700e+003
    6 +4.5100e+002 +1.0400e+003
    7 +1.6520e+002 +1.1330e+003
    8 +1.8400e+002 +1.1330e+003
    9 +2.2400e+002 +1.1310e+003
   10 +4.2400e+002 +1.0640e+003
   11 +4.3800e+002 +1.0700e+003
   12 +1.6540e+002 +1.0900e+003
   13 +2.8700e+002 +1.0900e+003
   14 +3.5600e+002 +1.0800e+003
   15 +4.1500e+002 +1.0600e+003
   16 +4.2500e+002 +1.0400e+003
   17 +1.7700e+002 +1.1000e+003
   18 +3.0500e+002 +1.0990e+003
```

```
   19 +3.0500e+002 +1.0930e+003
   20 +1.7700e+002 +1.0940e+003
   21 +2.2300e+002 +1.1890e+003
   22 +2.0300e+002 +1.1490e+003
   23 +2.5500e+002 +1.1530e+003
LINE            4
    1      7
    1
    2
    3
    4
   11
    5
    6
    2      8
    1
    7
    8
    9
   10
   11
    5
    6
    3     10
    1
    7
   12
   13
   14
   15
   10
   11
    5
    6
    4      8
    1
    7
   12
   13
   14
   15
   16
    6
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000      0
GRID
   22     23     21      3      3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
   17     18     20     19      2     17     18
AXIS
    0
LIMIT
0 +1.6500e+002 +4.5100e+002
SLIP            0
BLOCK
    0      0      0      0      0 +1.3500e+002 +1.3500e+002 0 0
    0      0      0      0      0 +4.5000e+001 +4.5000e+001 0 0
```

ATTACHMENT # 12
CALC 100340I-G(B)-06
151

```
ORU             4 +0.0000e+000
    1 +0.0000e+000      0
    2 +0.0000e+000      0
    3 +0.0000e+000      0
    4 +0.0000e+000      0
PIEZ            4 +0.0000e+000
    1      0      0
    2      0      0
    3      0      0
    4      0      0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

ATTACHMENT # B
CALC 100340I-G(B)-06
PAGE 152

tability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
9:49:55 AM

1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	203.000	1149.000	49.202	0	0.0000	998.000	998.000
1	203.000	1149.000	49.202	0	0.0000	998.000	998.000
2	203.000	1149.000	52.202	0	0.0000	998.000	998.000
2	203.000	1149.000	52.202	0	0.0000	998.000	998.000
3	203.000	1149.000	55.201	0	0.0000	998.000	998.000
3	203.000	1149.000	55.201	0	0.0000	998.000	998.000
4	220.333	1150.333	50.670	1	0.0000	5.505	7.403
4	220.333	1150.333	50.670	8	0.0000	7.013	5.243
5	220.333	1150.333	53.670	1	0.0000	5.534	7.491
5	220.333	1150.333	53.670	8	0.0000	7.089	5.256
6	220.333	1150.333	56.670	1	0.0000	5.577	7.581
6	220.333	1150.333	56.670	8	0.0000	7.175	5.301
7	237.667	1151.667	52.139	1	0.0000	3.600	4.582
7	237.667	1151.667	52.139	7	0.0000	4.465	3.526
8	237.667	1151.667	55.139	1	0.0000	3.685	4.732
8	237.667	1151.667	55.139	7	0.0000	4.603	3.601
9	237.667	1151.667	58.139	1	0.0000	3.770	4.874
9	237.667	1151.667	58.139	7	0.0000	4.736	3.681
10	255.000	1153.000	53.608	1	0.0000	2.675	3.304
10	255.000	1153.000	53.608	6	0.0000	3.247	2.645
11	255.000	1153.000	56.608	1	0.0000	2.769	3.448
11	255.000	1153.000	56.608	6	0.0000	3.387	2.737
12	255.000	1153.000	59.608	1	0.0000	2.855	3.583
12	255.000	1153.000	59.608	6	0.0000	3.516	2.817
13	209.667	1162.333	62.587	0	0.0000	998.000	998.000
13	209.667	1162.333	62.587	0	0.0000	998.000	998.000
14	209.667	1162.333	65.587	0	0.0000	998.000	998.000
14	209.667	1162.333	65.587	0	0.0000	998.000	998.000
15	209.667	1162.333	68.586	0	0.0000	998.000	998.000
15	209.667	1162.333	68.586	0	0.0000	998.000	998.000
16	227.000	1163.667	64.055	1	0.0000	4.387	5.402
16	227.000	1163.667	64.055	6	0.0000	5.248	4.287
17	227.000	1163.667	67.055	1	0.0000	4.447	5.523
17	227.000	1163.667	67.055	6	0.0000	5.357	4.339
18	227.000	1163.667	70.055	0	0.0000	998.000	998.000
18	227.000	1163.667	70.055	0	0.0000	998.000	998.000
19	244.333	1165.000	65.524	1	0.0000	3.152	3.759
19	244.333	1165.000	65.524	5	0.0000	3.704	3.122
20	244.333	1165.000	68.524	1	0.0000	3.228	3.886
20	244.333	1165.000	68.524	6	0.0000	3.822	3.190
21	244.333	1165.000	71.524	1	0.0000	3.304	4.011
21	244.333	1165.000	71.524	6	0.0000	3.941	3.262
22	261.667	1166.333	66.993	1	0.0000	2.472	2.890
22	261.667	1166.333	66.993	5	0.0000	2.861	2.460
23	261.667	1166.333	69.993	1	0.0000	2.551	3.009
23	261.667	1166.333	69.993	5	0.0000	2.976	2.537
24	261.667	1166.333	72.993	1	0.0000	2.627	3.125
24	261.667	1166.333	72.993	5	0.0000	3.088	2.611
25	216.333	1175.667	75.972	0	0.0000	998.000	998.000

25	216.333	1175.667	75.972	0	0.0000	998.000	998.000
26	216.333	1175.667	78.972	0	0.0000	998.000	998.000
26	216.333	1175.667	78.972	0	0.0000	998.000	998.000
27	216.333	1175.667	81.971	0	0.0000	998.000	998.000
27	216.333	1175.667	81.971	0	0.0000	998.000	998.000
28	233.667	1177.000	77.440	1	0.0000	3.810	4.450
28	233.667	1177.000	77.440	5	0.0000	4.379	3.766
29	233.667	1177.000	80.440	0	0.0000	998.000	998.000
29	233.667	1177.000	80.440	0	0.0000	998.000	998.000
30	233.667	1177.000	83.440	0	0.0000	998.000	998.000
30	233.667	1177.000	83.440	0	0.0000	998.000	998.000
31	251.000	1178.333	78.909	1	0.0000	2.890	3.307
31	251.000	1178.333	78.909	5	0.0000	3.279	2.876
32	251.000	1178.333	81.909	1	0.0000	2.962	3.419
32	251.000	1178.333	81.909	5	0.0000	3.387	2.946
33	251.000	1178.333	84.909	1	0.0000	3.030	3.527
33	251.000	1178.333	84.909	5	0.0000	3.489	3.011
34	268.333	1179.667	80.378	1	0.0000	2.346	2.646
34	268.333	1179.667	80.378	5	0.0000	2.630	2.340
35	268.333	1179.667	83.378	1	0.0000	2.415	2.748
35	268.333	1179.667	83.378	5	0.0000	2.730	2.408
36	268.333	1179.667	86.378	1	0.0000	2.483	2.848
36	268.333	1179.667	86.378	5	0.0000	2.827	2.475
37	223.000	1189.000	89.357	0	0.0000	998.000	998.000
37	223.000	1189.000	89.357	0	0.0000	998.000	998.000
38	223.000	1189.000	92.357	0	0.0000	998.000	998.000
38	223.000	1189.000	92.357	0	0.0000	998.000	998.000
39	223.000	1189.000	95.356	0	0.0000	998.000	998.000
39	223.000	1189.000	95.356	0	0.0000	998.000	998.000
40	240.333	1190.333	90.825	1	0.0000	3.445	3.891
40	240.333	1190.333	90.825	5	0.0000	3.854	3.422
41	240.333	1190.333	93.825	0	0.0000	998.000	998.000
41	240.333	1190.333	93.825	0	0.0000	998.000	998.000
42	240.333	1190.333	96.825	0	0.0000	998.000	998.000
42	240.333	1190.333	96.825	0	0.0000	998.000	998.000
43	257.667	1191.667	92.294	1	0.0000	2.714	3.020
43	257.667	1191.667	92.294	4	0.0000	3.005	2.706
44	257.667	1191.667	95.294	1	0.0000	2.779	3.117
44	257.667	1191.667	95.294	5	0.0000	3.100	2.771
45	257.667	1191.667	98.294	1	0.0000	2.842	3.212
45	257.667	1191.667	98.294	5	0.0000	3.191	2.832
46	275.000	1193.000	93.763	1	0.0000	2.255	2.483
46	275.000	1193.000	93.763	4	0.0000	2.474	2.252
47	275.000	1193.000	96.763	1	0.0000	2.318	2.572
47	275.000	1193.000	96.763	4	0.0000	2.562	2.314
48	275.000	1193.000	99.763	1	0.0000	2.379	2.660
48	275.000	1193.000	99.763	4	0.0000	2.647	2.374

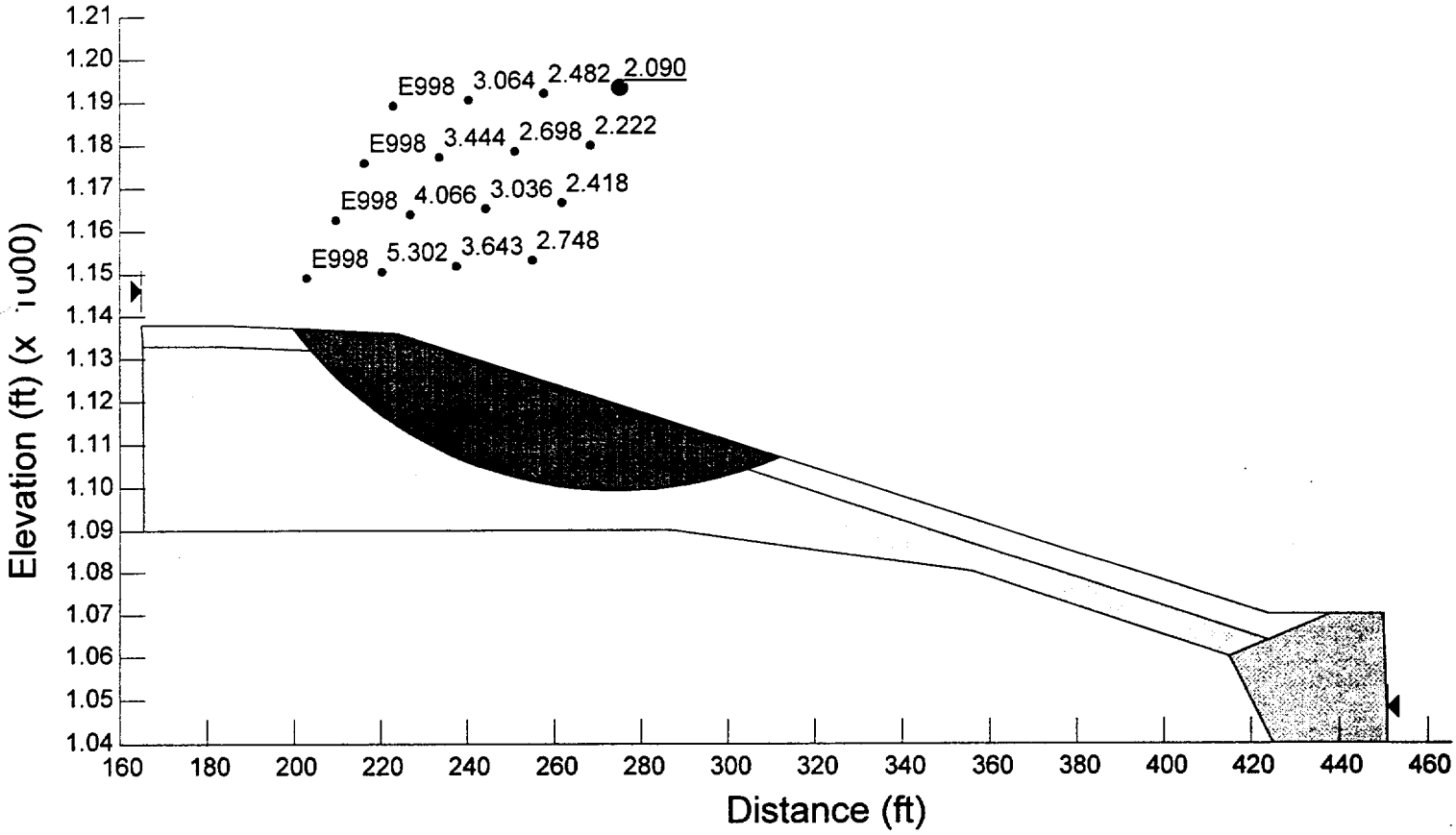
```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    275.0000=X-COOR.   1193.0000=Y-COOR.     93.7628=RADIUS      2.255=F.S.    46=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    275.0000=X-COOR.   1193.0000=Y-COOR.     93.7628=RADIUS      2.474=F.S.    46=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    275.0000=X-COOR.   1193.0000=Y-COOR.     93.7628=RADIUS      2.252=F.S.    46=SLIP#
```

ATTACHMENT # B
CALC 1003401-G1B1-06
154

NORMAL TERMINATION OF SLOPE

ATTACHMENT # B
CALC 100340-G(B)-06
155

Section 3-3 5' Clay Liner Cover with Seismic Loading



ATTACHMENT # 12
CALC 1003K-1-6(13)-06
156

```
FILEINFO
SLOPEW 4.22
TITLE
Stability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
9:52:37 AM
ANALYSIS
    1     0     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL           4
    1 +1.3000e+002 +1.0000e+002 +2.5000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Clay Liner
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION      0
AFUNCTION      0
POINT         23
    1 +1.6500e+002 +1.1380e+003
    2 +1.8400e+002 +1.1380e+003
    3 +2.2400e+002 +1.1360e+003
    4 +4.2400e+002 +1.0700e+003
    5 +4.5000e+002 +1.0700e+003
    6 +4.5100e+002 +1.0400e+003
    7 +1.6520e+002 +1.1330e+003
    8 +1.8400e+002 +1.1330e+003
    9 +2.2400e+002 +1.1310e+003
   10 +4.2400e+002 +1.0640e+003
   11 +4.3800e+002 +1.0700e+003
   12 +1.6540e+002 +1.0900e+003
   13 +2.8700e+002 +1.0900e+003
   14 +3.5600e+002 +1.0800e+003
   15 +4.1500e+002 +1.0600e+003
   16 +4.2500e+002 +1.0400e+003
   17 +1.7700e+002 +1.1000e+003
   18 +3.0500e+002 +1.0990e+003
```

ATTACHMENT # B
CALC 160340I-G7(B)-06
157

```
   19 +3.0500e+002 +1.0930e+003
   20 +1.7700e+002 +1.0940e+003
   21 +2.2300e+002 +1.1890e+003
   22 +2.0300e+002 +1.1490e+003
   23 +2.5500e+002 +1.1530e+003
LINE            4
    1      7
    1
    2
    3
    4
   11
    5
    6
    2      8
    1
    7
    8
    9
   10
   11
    5
    6
    3     10
    1
    7
   12
   13
   14
   15
   10
   11
    5
    6
    4      8
    1
    7
   12
   13
   14
   15
   16
    6
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000      0
GRID
   22     23     21      3      3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
   17     18     20     19      2     17     18
AXIS
    0
LIMIT
0 +1.6500e+002 +4.5100e+002
SLIP            0
BLOCK
    0      0      0      0      0 +1.3500e+002 +1.3500e+002 0 0
    0      0      0      0      0 +4.5000e+001 +4.5000e+001 0 0
```

ATTACHMENT # V
CALC 100340-S(B)-06
158

```
PORU            4 +0.0000e+000
    1 +0.0000e+000      0
    2 +0.0000e+000      0
    3 +0.0000e+000      0
    4 +0.0000e+000      0
PIEZ            4 +0.0000e+000
    1      0      0
    2      0      0
    3      0      0
    4      0      0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+5.0000e-002 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

ATTACHMENT # B
CALC 100340I-G(B)06
159

tability Analysis -Unocal Moly Corp Sec 3-3

04/05/2000
9:52:37 AM

1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	(FORCE)
1	203.000	1149.000	49.202	0	0.0000	998.000	998.000
1	203.000	1149.000	49.202	0	0.0000	998.000	998.000
2	203.000	1149.000	52.202	0	0.0000	998.000	998.000
2	203.000	1149.000	52.202	0	0.0000	998.000	998.000
3	203.000	1149.000	55.201	0	0.0000	998.000	998.000
3	203.000	1149.000	55.201	0	0.0000	998.000	998.000
4	220.333	1150.333	50.670	1	0.0000	4.155	4.499
4	220.333	1150.333	50.670	7	0.0000	5.302	3.911
5	220.333	1150.333	53.670	1	0.0000	4.183	4.530
5	220.333	1150.333	53.670	7	0.0000	5.367	3.926
6	220.333	1150.333	56.670	1	0.0000	4.218	4.563
6	220.333	1150.333	56.670	7	0.0000	5.436	3.958
7	237.667	1151.667	52.139	1	0.0000	2.930	3.263
7	237.667	1151.667	52.139	6	0.0000	3.643	2.833
8	237.667	1151.667	55.139	1	0.0000	2.994	3.339
8	237.667	1151.667	55.139	6	0.0000	3.749	2.887
9	237.667	1151.667	58.139	1	0.0000	3.057	3.410
9	237.667	1151.667	58.139	6	0.0000	3.851	2.943
10	255.000	1153.000	53.608	1	0.0000	2.256	2.550
10	255.000	1153.000	53.608	5	0.0000	2.748	2.218
11	255.000	1153.000	56.608	1	0.0000	2.330	2.635
11	255.000	1153.000	56.608	6	0.0000	2.860	2.285
12	255.000	1153.000	59.608	1	0.0000	2.397	2.715
12	255.000	1153.000	59.608	6	0.0000	2.962	2.345
13	209.667	1162.333	62.587	0	0.0000	998.000	998.000
13	209.667	1162.333	62.587	0	0.0000	998.000	998.000
14	209.667	1162.333	65.587	0	0.0000	998.000	998.000
14	209.667	1162.333	65.587	0	0.0000	998.000	998.000
15	209.667	1162.333	68.586	0	0.0000	998.000	998.000
15	209.667	1162.333	68.586	0	0.0000	998.000	998.000
16	227.000	1163.667	64.055	1	0.0000	3.392	3.665
16	227.000	1163.667	64.055	5	0.0000	4.066	3.279
17	227.000	1163.667	67.055	1	0.0000	3.438	3.720
17	227.000	1163.667	67.055	6	0.0000	4.149	3.314
18	227.000	1163.667	70.055	0	0.0000	998.000	998.000
18	227.000	1163.667	70.055	0	0.0000	998.000	998.000
19	244.333	1165.000	65.524	1	0.0000	2.577	2.817
19	244.333	1165.000	65.524	5	0.0000	3.036	2.529
20	244.333	1165.000	68.524	1	0.0000	2.634	2.889
20	244.333	1165.000	68.524	5	0.0000	3.128	2.580
21	244.333	1165.000	71.524	1	0.0000	2.692	2.958
21	244.333	1165.000	71.524	5	0.0000	3.219	2.632
22	261.667	1166.333	66.993	1	0.0000	2.083	2.291
22	261.667	1166.333	66.993	5	0.0000	2.418	2.062
23	261.667	1166.333	69.993	1	0.0000	2.145	2.367
23	261.667	1166.333	69.993	5	0.0000	2.510	2.120
24	261.667	1166.333	72.993	1	0.0000	2.203	2.438
24	261.667	1166.333	72.993	5	0.0000	2.599	2.176
25	216.333	1175.667	75.972	0	0.0000	998.000	998.000

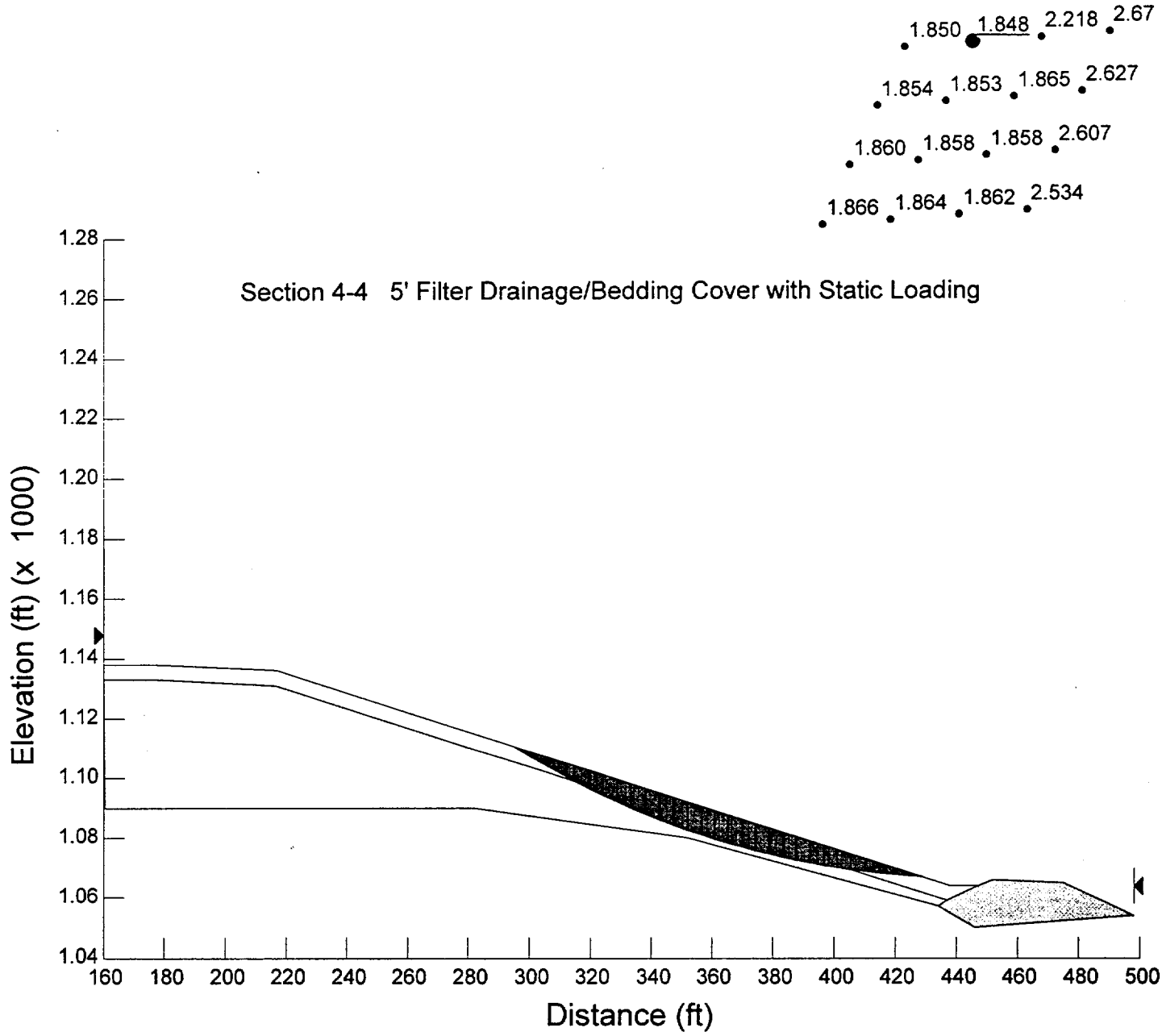
ATTACHMENT # 15
CALC 100340I-G(B)-06
160

25	216.333	1175.667	75.972	0	0.0000	998.000	998.000
26	216.333	1175.667	78.972	0	0.0000	998.000	998.000
26	216.333	1175.667	78.972	0	0.0000	998.000	998.000
27	216.333	1175.667	81.971	0	0.0000	998.000	998.000
27	216.333	1175.667	81.971	0	0.0000	998.000	998.000
28	233.667	1177.000	77.440	1	0.0000	2.990	3.195
28	233.667	1177.000	77.440	5	0.0000	3.444	2.926
29	233.667	1177.000	80.440	0	0.0000	998.000	998.000
29	233.667	1177.000	80.440	0	0.0000	998.000	998.000
30	233.667	1177.000	83.440	0	0.0000	998.000	998.000
30	233.667	1177.000	83.440	0	0.0000	998.000	998.000
31	251.000	1178.333	78.909	1	0.0000	2.372	2.551
31	251.000	1178.333	78.909	5	0.0000	2.698	2.343
32	251.000	1178.333	81.909	1	0.0000	2.427	2.618
32	251.000	1178.333	81.909	5	0.0000	2.782	2.395
33	251.000	1178.333	84.909	1	0.0000	2.478	2.682
33	251.000	1178.333	84.909	5	0.0000	2.861	2.442
34	268.333	1179.667	80.378	1	0.0000	1.976	2.132
34	268.333	1179.667	80.378	4	0.0000	2.222	1.963
35	268.333	1179.667	83.378	1	0.0000	2.030	2.199
35	268.333	1179.667	83.378	4	0.0000	2.301	2.014
36	268.333	1179.667	86.378	1	0.0000	2.083	2.263
36	268.333	1179.667	86.378	4	0.0000	2.379	2.065
37	223.000	1189.000	89.357	0	0.0000	998.000	998.000
37	223.000	1189.000	89.357	0	0.0000	998.000	998.000
38	223.000	1189.000	92.357	0	0.0000	998.000	998.000
38	223.000	1189.000	92.357	0	0.0000	998.000	998.000
39	223.000	1189.000	95.356	0	0.0000	998.000	998.000
39	223.000	1189.000	95.356	0	0.0000	998.000	998.000
40	240.333	1190.333	90.825	1	0.0000	2.733	2.892
40	240.333	1190.333	90.825	4	0.0000	3.064	2.691
41	240.333	1190.333	93.825	0	0.0000	998.000	998.000
41	240.333	1190.333	93.825	0	0.0000	998.000	998.000
42	240.333	1190.333	96.825	0	0.0000	998.000	998.000
42	240.333	1190.333	96.825	0	0.0000	998.000	998.000
43	257.667	1191.667	92.294	1	0.0000	2.236	2.374
43	257.667	1191.667	92.294	4	0.0000	2.482	2.216
44	257.667	1191.667	95.294	1	0.0000	2.285	2.434
44	257.667	1191.667	95.294	4	0.0000	2.555	2.263
45	257.667	1191.667	98.294	1	0.0000	2.332	2.492
45	257.667	1191.667	98.294	4	0.0000	2.625	2.307
46	275.000	1193.000	93.763	1	0.0000	1.901	2.022
46	275.000	1193.000	93.763	4	0.0000	2.090	1.892
47	275.000	1193.000	96.763	1	0.0000	1.950	2.082
47	275.000	1193.000	96.763	4	0.0000	2.160	1.939
48	275.000	1193.000	99.763	1	0.0000	1.997	2.140
48	275.000	1193.000	99.763	4	0.0000	2.228	1.985

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    275.0000=X-COOR.   1193.0000=Y-COOR.     93.7628=RADIUS      1.901=F.S.    46=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    275.0000=X-COOR.   1193.0000=Y-COOR.     93.7628=RADIUS      2.090=F.S.    46=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    275.0000=X-COOR.   1193.0000=Y-COOR.     93.7628=RADIUS      1.892=F.S.    46=SLIP#
```

.ORMAL TERMINATION OF SLOPE

ATTACHMENT # 13
CALC 1003401-G(B)-06
PAGE 162



```
FILEINFO
SLOPEW 4.22
TITLE


04/05/2000
11:03:39 AM
ANALYSIS
    1     2     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            4
    1 +1.3000e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Filter Drainage
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          24
    1 +1.6000e+002 +1.1380e+003
    2 +1.7800e+002 +1.1380e+003
    3 +2.1700e+002 +1.1360e+003
    4 +4.3800e+002 +1.0640e+003
    5 +4.4700e+002 +1.0640e+003
    6 +4.5200e+002 +1.0660e+003
    7 +4.7500e+002 +1.0650e+003
    8 +4.9800e+002 +1.0540e+003
    9 +1.6010e+002 +1.1330e+003
   10 +1.7800e+002 +1.1330e+003
   11 +2.1700e+002 +1.1310e+003
   12 +4.3700e+002 +1.0590e+003
   13 +1.6050e+002 +1.0900e+003
   14 +2.8200e+002 +1.0900e+003
   15 +3.5200e+002 +1.0800e+003
   16 +4.3400e+002 +1.0570e+003
   17 +4.4600e+002 +1.0500e+003
   18 +3.4000e+002 +1.0890e+003
```

```
   19 +4.3100e+002 +1.0600e+003
   20 +4.3000e+002 +1.0590e+003
   21 +3.3900e+002 +1.0860e+003
   22 +4.2300e+002 +1.3430e+003
   23 +3.9600e+002 +1.2840e+003
   24 +4.6300e+002 +1.2890e+003
LINE            4
    1     8
    1
    2
    3
    4
    5
    6
    7
    8
    2     9
    1
    9
   10
   11
   12
    5
    6
    7
    8
    3    11
    1
    9
   13
   14
   15
   16
   12
    5
    6
    7
    8
    4     8
    1
    9
   13
   14
   15
   16
   17
    8
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000     0
GRID
   23    24    22     3     3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
   18    19    21    20     2    21    19
AXIS
    0
LIMIT
0 +1.6000e+002 +4.9800e+002
```

```
SLIP            0
BLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
PORU            4 +0.0000e+000
    1 +0.0000e+000     0
    2 +0.0000e+000     0
    3 +0.0000e+000     0
    4 +0.0000e+000     0
PIEZ            4 +0.0000e+000
    1     0     0
    2     0     0
    3     0     0
    4     0     0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

04/05/2000
11:03:39 AM

1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	396.000	1284.000	202.797	1	0.0000	1.844	1.871
1	396.000	1284.000	202.797	4	0.0000	1.872	1.844
2	396.000	1284.000	204.426	1	0.0000	1.832	1.865
2	396.000	1284.000	204.426	4	0.0000	1.866	1.832
3	396.000	1284.000	206.034	1	0.0000	1.829	1.870
3	396.000	1284.000	206.034	4	0.0000	1.870	1.830
4	418.333	1285.667	211.166	1	0.0000	1.845	1.871
4	418.333	1285.667	211.166	4	0.0000	1.872	1.846
5	418.333	1285.667	212.587	1	0.0000	1.832	1.863
5	418.333	1285.667	212.587	4	0.0000	1.864	1.833
6	418.333	1285.667	213.985	1	0.0000	1.828	1.865
6	418.333	1285.667	213.985	4	0.0000	1.865	1.829
7	440.667	1287.333	219.536	1	0.0000	1.847	1.871
7	440.667	1287.333	219.536	4	0.0000	1.872	1.848
8	440.667	1287.333	220.748	1	0.0000	1.833	1.862
8	440.667	1287.333	220.748	4	0.0000	1.863	1.834
9	440.667	1287.333	221.935	1	0.0000	1.828	1.861
9	440.667	1287.333	221.935	4	0.0000	1.862	1.829
10	463.000	1289.000	227.905	1	0.0000	2.465	2.529
10	463.000	1289.000	227.905	4	0.0000	2.534	2.472
11	463.000	1289.000	228.909	1	0.0000	2.467	2.536
11	463.000	1289.000	228.909	4	0.0000	2.540	2.471
12	463.000	1289.000	229.886	1	0.0000	2.463	2.539
12	463.000	1289.000	229.886	4	0.0000	2.542	2.467
13	405.000	1303.667	224.268	1	0.0000	1.841	1.866
13	405.000	1303.667	224.268	4	0.0000	1.867	1.842
14	405.000	1303.667	225.870	1	0.0000	1.829	1.859
14	405.000	1303.667	225.870	4	0.0000	1.860	1.829
15	405.000	1303.667	227.449	1	0.0000	1.826	1.862
15	405.000	1303.667	227.449	4	0.0000	1.862	1.826
16	427.333	1305.333	232.637	1	0.0000	1.843	1.866
16	427.333	1305.333	232.637	4	0.0000	1.867	1.844
17	427.333	1305.333	234.031	1	0.0000	1.829	1.857
17	427.333	1305.333	234.031	4	0.0000	1.858	1.830
18	427.333	1305.333	235.399	1	0.0000	1.825	1.858
18	427.333	1305.333	235.399	4	0.0000	1.858	1.826
19	449.667	1307.000	241.007	1	0.0000	1.846	1.867
19	449.667	1307.000	241.007	4	0.0000	1.868	1.846
20	449.667	1307.000	242.192	1	0.0000	1.831	1.857
20	449.667	1307.000	242.192	4	0.0000	1.858	1.832
21	449.667	1307.000	243.350	1	0.0000	1.947	1.986
21	449.667	1307.000	243.350	4	0.0000	1.991	1.952
22	472.000	1308.667	249.376	1	0.0000	2.605	2.671
22	472.000	1308.667	249.376	4	0.0000	2.672	2.606
23	472.000	1308.667	250.353	1	0.0000	2.564	2.635
23	472.000	1308.667	250.353	4	0.0000	2.634	2.565
24	472.000	1308.667	251.300	1	0.0000	2.534	2.608
24	472.000	1308.667	251.300	4	0.0000	2.607	2.534
25	414.000	1323.333	245.739	1	0.0000	1.840	1.862

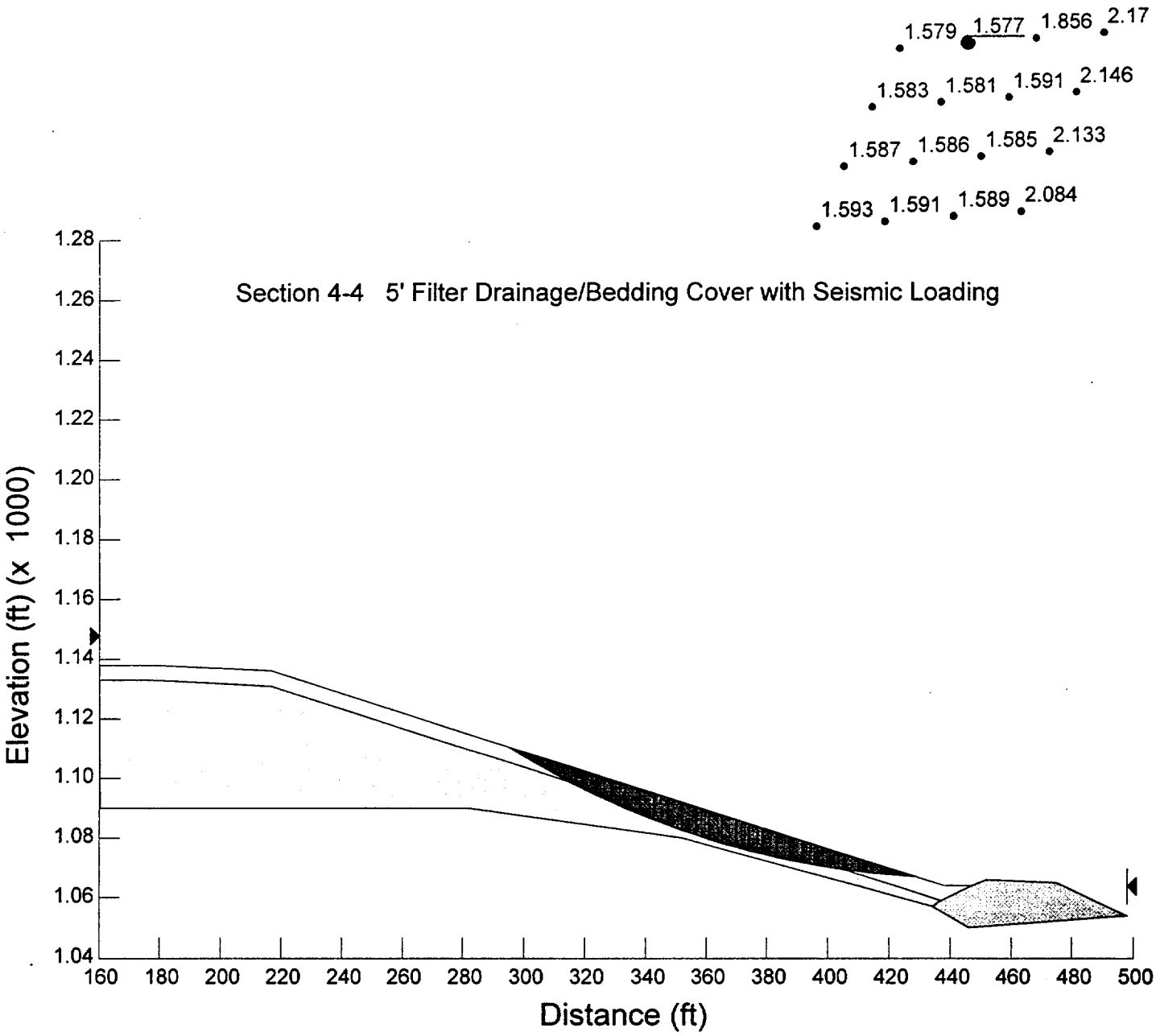
ATTACHMENT # 6
CALC 10034-01-G(B)-06
167

25	414.000	1323.333	245.739	4	0.0000	1.863	1.840
26	414.000	1323.333	247.314	1	0.0000	1.826	1.854
26	414.000	1323.333	247.314	4	0.0000	1.854	1.827
27	414.000	1323.333	248.863	1	0.0000	1.823	1.855
27	414.000	1323.333	248.863	4	0.0000	1.856	1.823
28	436.333	1325.000	254.108	1	0.0000	1.842	1.863
28	436.333	1325.000	254.108	4	0.0000	1.863	1.842
29	436.333	1325.000	255.475	1	0.0000	1.827	1.853
29	436.333	1325.000	255.475	4	0.0000	1.853	1.828
30	436.333	1325.000	256.814	1	0.0000	1.822	1.852
30	436.333	1325.000	256.814	4	0.0000	1.853	1.823
31	458.667	1326.667	262.478	1	0.0000	1.844	1.864
31	458.667	1326.667	262.478	4	0.0000	1.865	1.845
32	458.667	1326.667	263.636	1	0.0000	2.056	2.095
32	458.667	1326.667	263.636	4	0.0000	2.102	2.062
33	458.667	1326.667	264.764	1	0.0000	2.124	2.173
33	458.667	1326.667	264.764	4	0.0000	2.179	2.130
34	481.000	1328.333	270.847	1	0.0000	2.668	2.732
34	481.000	1328.333	270.847	4	0.0000	2.729	2.666
35	481.000	1328.333	271.797	1	0.0000	2.608	2.674
35	481.000	1328.333	271.797	4	0.0000	2.671	2.606
36	481.000	1328.333	272.714	1	0.0000	2.562	2.631
36	481.000	1328.333	272.714	4	0.0000	2.627	2.559
37	423.000	1343.000	267.210	1	0.0000	1.838	1.859
37	423.000	1343.000	267.210	4	0.0000	1.859	1.839
38	423.000	1343.000	268.758	1	0.0000	1.824	1.849
38	423.000	1343.000	268.758	4	0.0000	1.850	1.825
39	423.000	1343.000	270.277	1	0.0000	1.820	1.850
39	423.000	1343.000	270.277	4	0.0000	1.850	1.820
40	445.333	1344.667	275.579	1	0.0000	1.841	1.860
40	445.333	1344.667	275.579	4	0.0000	1.860	1.841
41	445.333	1344.667	276.919	1	0.0000	1.826	1.849
41	445.333	1344.667	276.919	4	0.0000	1.850	1.826
42	445.333	1344.667	278.228	1	0.0000	1.820	1.848
42	445.333	1344.667	278.228	4	0.0000	1.848	1.821
43	467.667	1346.333	283.948	1	0.0000	2.173	2.212
43	467.667	1346.333	283.948	4	0.0000	2.218	2.179
44	467.667	1346.333	285.079	1	0.0000	2.219	2.266
44	467.667	1346.333	285.079	4	0.0000	2.271	2.224
45	467.667	1346.333	286.178	1	0.0000	2.244	2.297
45	467.667	1346.333	286.178	4	0.0000	2.301	2.249
46	490.000	1348.000	292.318	1	0.0000	2.685	2.744
46	490.000	1348.000	292.318	4	0.0000	2.739	2.681
47	490.000	1348.000	293.240	1	0.0000	2.616	2.677
47	490.000	1348.000	293.240	4	0.0000	2.672	2.612
48	490.000	1348.000	294.129	0	0.0000	998.000	998.000
48	490.000	1348.000	294.129	0	0.0000	998.000	998.000

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    423.0000=X-COOR.   1343.0000=Y-COOR.    270.2773=RADIUS      1.820=F.S.    39=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    445.3333=X-COOR.   1344.6666=Y-COOR.    278.2278=RADIUS      1.848=F.S.    42=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    423.0000=X-COOR.   1343.0000=Y-COOR.    270.2773=RADIUS      1.820=F.S.    39=SLIP#
```

NORMAL TERMINATION OF SLOPE

ATTACHMENT # B
CALC 1003401-G1(B)06
PAGE 169



```
TILEINFO
SLOPEW 4.22
TITLE


04/05/2000
11:01:43 AM
ANALYSIS
    1     2     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            4
    1 +1.3000e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Filter Drainage
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          24
    1 +1.6000e+002 +1.1380e+003
    2 +1.7800e+002 +1.1380e+003
    3 +2.1700e+002 +1.1360e+003
    4 +4.3800e+002 +1.0640e+003
    5 +4.4700e+002 +1.0640e+003
    6 +4.5200e+002 +1.0660e+003
    7 +4.7500e+002 +1.0650e+003
    8 +4.9800e+002 +1.0540e+003
    9 +1.6010e+002 +1.1330e+003
   10 +1.7800e+002 +1.1330e+003
   11 +2.1700e+002 +1.1310e+003
   12 +4.3700e+002 +1.0590e+003
   13 +1.6050e+002 +1.0900e+003
   14 +2.8200e+002 +1.0900e+003
   15 +3.5200e+002 +1.0800e+003
   16 +4.3400e+002 +1.0570e+003
   17 +4.4600e+002 +1.0500e+003
   18 +3.4000e+002 +1.0890e+003
```

```
    19 +4.3100e+002 +1.0600e+003
    20 +4.3000e+002 +1.0590e+003
    21 +3.3900e+002 +1.0860e+003
    22 +4.2300e+002 +1.3430e+003
    23 +3.9600e+002 +1.2840e+003
    24 +4.6300e+002 +1.2890e+003
LINE            4
     1      8
     1
     2
     3
     4
     5
     6
     7
     8
     2      9
     1
     9
    10
    11
    12
     5
     6
     7
     8
     3     11
     1
     9
    13
    14
    15
    16
    12
     5
     6
     7
     8
     4      8
     1
     9
    13
    14
    15
    16
    17
     8
TENSION
     0 +9.8070e+000 +0.0000e+000 +0.0000e+000      0
GRID
    23     24     22      3      3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
    18     19     21     20      2    21     19
AXIS
     0
LIMIT
0 +1.6000e+002 +4.9800e+002
```

```
CLIP            0
CLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
PORU            4 +0.0000e+000
    1 +0.0000e+000     0
    2 +0.0000e+000     0
    3 +0.0000e+000     0
    4 +0.0000e+000     0
PIEZ            4 +0.0000e+000
    1     0     0
    2     0     0
    3     0     0
    4     0     0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+5.0000e-002 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

ATTACHMENT # B
CALC 100340I-G(B)-06
PAGE 173

04/05/2000
11:01:43 AM

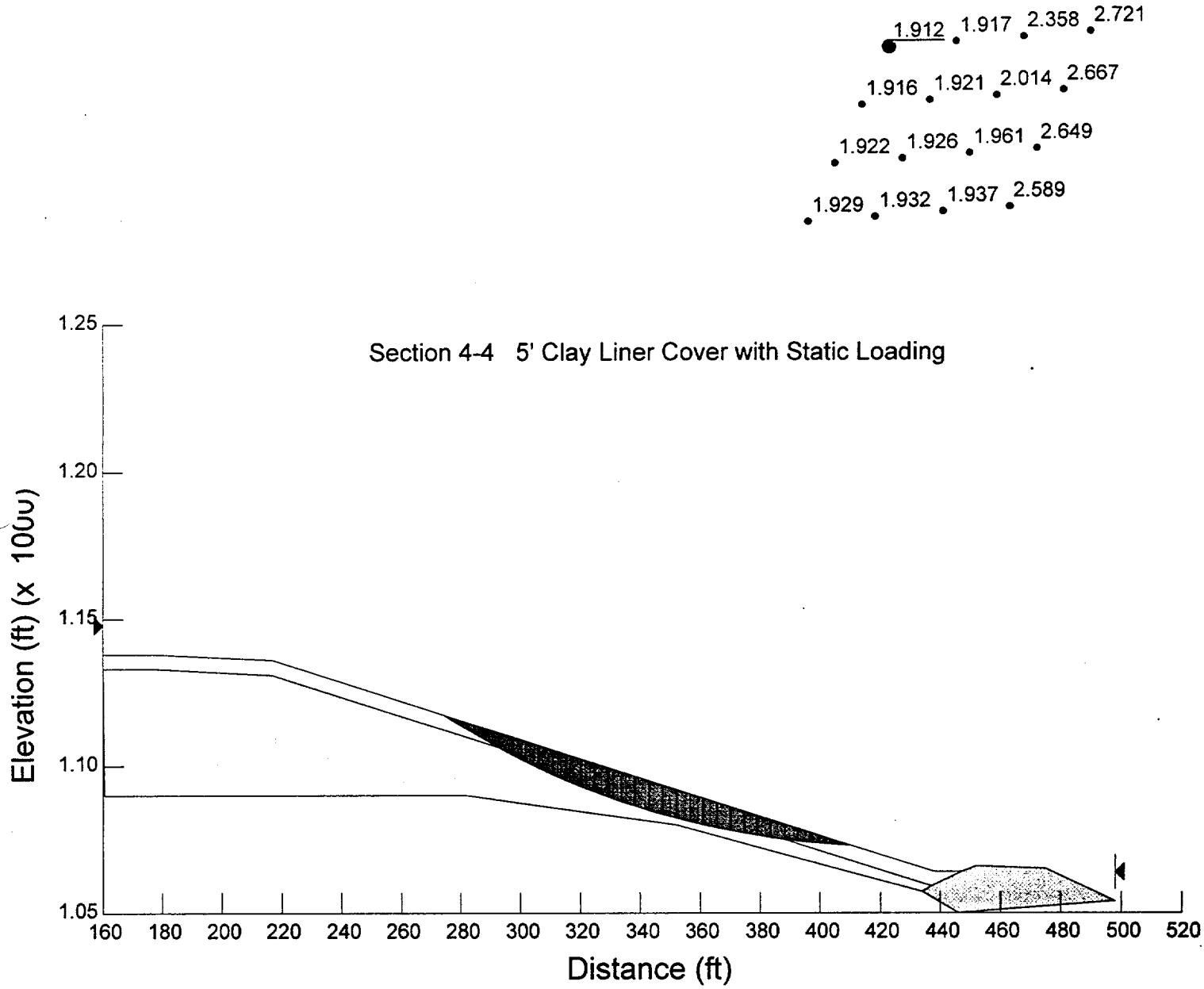
1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	396.000	1284.000	202.797	1	0.0000	1.573	1.590
1	396.000	1284.000	202.797	4	0.0000	1.597	1.573
2	396.000	1284.000	204.426	1	0.0000	1.562	1.584
2	396.000	1284.000	204.426	4	0.0000	1.593	1.563
3	396.000	1284.000	206.034	1	0.0000	1.561	1.586
3	396.000	1284.000	206.034	4	0.0000	1.597	1.561
4	418.333	1285.667	211.166	1	0.0000	1.574	1.590
4	418.333	1285.667	211.166	4	0.0000	1.597	1.575
5	418.333	1285.667	212.587	1	0.0000	1.563	1.583
5	418.333	1285.667	212.587	4	0.0000	1.591	1.563
6	418.333	1285.667	213.985	1	0.0000	1.560	1.583
6	418.333	1285.667	213.985	4	0.0000	1.592	1.560
7	440.667	1287.333	219.536	1	0.0000	1.576	1.591
7	440.667	1287.333	219.536	4	0.0000	1.598	1.576
8	440.667	1287.333	220.748	1	0.0000	1.564	1.582
8	440.667	1287.333	220.748	4	0.0000	1.590	1.564
9	440.667	1287.333	221.935	1	0.0000	1.559	1.580
9	440.667	1287.333	221.935	4	0.0000	1.589	1.560
10	463.000	1289.000	227.905	1	0.0000	2.026	2.066
10	463.000	1289.000	227.905	4	0.0000	2.084	2.036
11	463.000	1289.000	228.909	1	0.0000	2.025	2.069
11	463.000	1289.000	228.909	4	0.0000	2.087	2.034
12	463.000	1289.000	229.886	1	0.0000	2.022	2.069
12	463.000	1289.000	229.886	4	0.0000	2.088	2.031
13	405.000	1303.667	224.268	1	0.0000	1.571	1.586
13	405.000	1303.667	224.268	4	0.0000	1.593	1.571
14	405.000	1303.667	225.870	1	0.0000	1.560	1.579
14	405.000	1303.667	225.870	4	0.0000	1.587	1.561
15	405.000	1303.667	227.449	1	0.0000	1.557	1.580
15	405.000	1303.667	227.449	4	0.0000	1.590	1.558
16	427.333	1305.333	232.637	1	0.0000	1.572	1.587
16	427.333	1305.333	232.637	4	0.0000	1.593	1.573
17	427.333	1305.333	234.031	1	0.0000	1.561	1.578
17	427.333	1305.333	234.031	4	0.0000	1.586	1.561
18	427.333	1305.333	235.399	1	0.0000	1.557	1.578
18	427.333	1305.333	235.399	4	0.0000	1.586	1.557
19	449.667	1307.000	241.007	1	0.0000	1.574	1.588
19	449.667	1307.000	241.007	4	0.0000	1.594	1.575
20	449.667	1307.000	242.192	1	0.0000	1.562	1.578
20	449.667	1307.000	242.192	4	0.0000	1.585	1.563
21	449.667	1307.000	243.350	1	0.0000	1.649	1.674
21	449.667	1307.000	243.350	4	0.0000	1.687	1.654
22	472.000	1308.667	249.376	1	0.0000	2.123	2.164
22	472.000	1308.667	249.376	4	0.0000	2.179	2.129
23	472.000	1308.667	250.353	1	0.0000	2.093	2.136
23	472.000	1308.667	250.353	4	0.0000	2.152	2.099
24	472.000	1308.667	251.300	1	0.0000	2.072	2.117
24	472.000	1308.667	251.300	4	0.0000	2.133	2.077
25	414.000	1323.333	245.739	1	0.0000	1.569	1.583

25	414.000	1323.333	245.739	4	0.0000	1.589	1.570
26	414.000	1323.333	247.314	1	0.0000	1.558	1.575
26	414.000	1323.333	247.314	4	0.0000	1.583	1.558
27	414.000	1323.333	248.863	1	0.0000	1.555	1.575
27	414.000	1323.333	248.863	4	0.0000	1.584	1.555
28	436.333	1325.000	254.108	1	0.0000	1.571	1.584
28	436.333	1325.000	254.108	4	0.0000	1.590	1.571
29	436.333	1325.000	255.475	1	0.0000	1.559	1.575
29	436.333	1325.000	255.475	4	0.0000	1.582	1.559
30	436.333	1325.000	256.814	1	0.0000	1.555	1.574
30	436.333	1325.000	256.814	4	0.0000	1.581	1.555
31	458.667	1326.667	262.478	1	0.0000	1.573	1.586
31	458.667	1326.667	262.478	4	0.0000	1.591	1.574
32	458.667	1326.667	263.636	1	0.0000	1.730	1.756
32	458.667	1326.667	263.636	4	0.0000	1.769	1.737
33	458.667	1326.667	264.764	1	0.0000	1.779	1.810
33	458.667	1326.667	264.764	4	0.0000	1.826	1.787
34	481.000	1328.333	270.847	1	0.0000	2.167	2.205
34	481.000	1328.333	270.847	4	0.0000	2.218	2.170
35	481.000	1328.333	271.797	1	0.0000	2.124	2.164
35	481.000	1328.333	271.797	4	0.0000	2.177	2.127
36	481.000	1328.333	272.714	1	0.0000	2.092	2.133
36	481.000	1328.333	272.714	4	0.0000	2.146	2.094
37	423.000	1343.000	267.210	1	0.0000	1.568	1.581
37	423.000	1343.000	267.210	4	0.0000	1.587	1.568
38	423.000	1343.000	268.758	1	0.0000	1.556	1.572
38	423.000	1343.000	268.758	4	0.0000	1.579	1.557
39	423.000	1343.000	270.277	1	0.0000	1.553	1.571
39	423.000	1343.000	270.277	4	0.0000	1.579	1.553
40	445.333	1344.667	275.579	1	0.0000	1.570	1.582
40	445.333	1344.667	275.579	4	0.0000	1.588	1.570
41	445.333	1344.667	276.919	1	0.0000	1.557	1.572
41	445.333	1344.667	276.919	4	0.0000	1.578	1.558
42	445.333	1344.667	278.228	1	0.0000	1.553	1.570
42	445.333	1344.667	278.228	4	0.0000	1.577	1.553
43	467.667	1346.333	283.948	1	0.0000	1.817	1.843
43	467.667	1346.333	283.948	4	0.0000	1.856	1.825
44	467.667	1346.333	285.079	1	0.0000	1.849	1.879
44	467.667	1346.333	285.079	4	0.0000	1.893	1.856
45	467.667	1346.333	286.178	1	0.0000	1.866	1.900
45	467.667	1346.333	286.178	4	0.0000	1.915	1.873
46	490.000	1348.000	292.318	1	0.0000	2.179	2.214
46	490.000	1348.000	292.318	4	0.0000	2.224	2.180
47	490.000	1348.000	293.240	1	0.0000	2.130	2.167
47	490.000	1348.000	293.240	4	0.0000	2.177	2.131
48	490.000	1348.000	294.129	0	0.0000	998.000	998.000
48	490.000	1348.000	294.129	0	0.0000	998.000	998.000

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    423.0000=X-COOR.   1343.0000=Y-COOR.    270.2773=RADIUS      1.553=F.S.    39=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    445.3333=X-COOR.   1344.6666=Y-COOR.    278.2278=RADIUS      1.577=F.S.    42=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    423.0000=X-COOR.   1343.0000=Y-COOR.    270.2773=RADIUS      1.553=F.S.    39=SLIP#
```

.ORMAL TERMINATION OF SLOPE


1.912
1.917
2.358
2.721
1.916
1.921
2.014
2.667
1.922
1.926
1.961
2.649
1.929
1.932
1.937
2.589
Section 4-4 5' Clay Liner Cover with Static Loading
Elevation (ft) (x 1000)
1.25
1.20
1.15
1.10
1.05
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500
520
Distance (ft)

```
TILEINFO
 LOPEW 4.22
TITLE


04/05/2000
10:49:41 AM
ANALYSIS
    1     2     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            4
    1 +1.3000e+002 +1.0000e+002 +2.5000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Soil
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          24
    1 +1.6000e+002 +1.1380e+003
    2 +1.7800e+002 +1.1380e+003
    3 +2.1700e+002 +1.1360e+003
    4 +4.3800e+002 +1.0640e+003
    5 +4.4700e+002 +1.0640e+003
    6 +4.5200e+002 +1.0660e+003
    7 +4.7500e+002 +1.0650e+003
    8 +4.9800e+002 +1.0540e+003
    9 +1.6010e+002 +1.1330e+003
   10 +1.7800e+002 +1.1330e+003
   11 +2.1700e+002 +1.1310e+003
   12 +4.3700e+002 +1.0590e+003
   13 +1.6050e+002 +1.0900e+003
   14 +2.8200e+002 +1.0900e+003
   15 +3.5200e+002 +1.0800e+003
   16 +4.3400e+002 +1.0570e+003
   17 +4.4600e+002 +1.0500e+003
   18 +3.4000e+002 +1.0890e+003
```

```
   19 +4.3100e+002 +1.0600e+003
   20 +4.3000e+002 +1.0590e+003
   21 +3.3900e+002 +1.0860e+003
   22 +4.2300e+002 +1.3430e+003
   23 +3.9600e+002 +1.2840e+003
   24 +4.6300e+002 +1.2890e+003
LINE            4
    1      8
    1
    2
    3
    4
    5
    6
    7
    8
    2      9
    1
    9
   10
   11
   12
    5
    6
    7
    8
    3     11
    1
    9
   13
   14
   15
   16
   12
    5
    6
    7
    8
    4      8
    1
    9
   13
   14
   15
   16
   17
    8
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000      0
GRID
   23     24     22      3      3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
   18     19     21     20      2     21     19
AXIS
    0
LIMIT
0 +1.6000e+002 +4.9800e+002
```

```
SLIP            0
BLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
PORU            4 +0.0000e+000
    1 +0.0000e+000     0
    2 +0.0000e+000     0
    3 +0.0000e+000     0
    4 +0.0000e+000     0
PIEZ            4 +0.0000e+000
    1     0     0
    2     0     0
    3     0     0
    4     0     0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

ATTACHMENT # B
CALC 1003401-GT(B)-06
180

04/05/2000
10:49:41 AM

1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

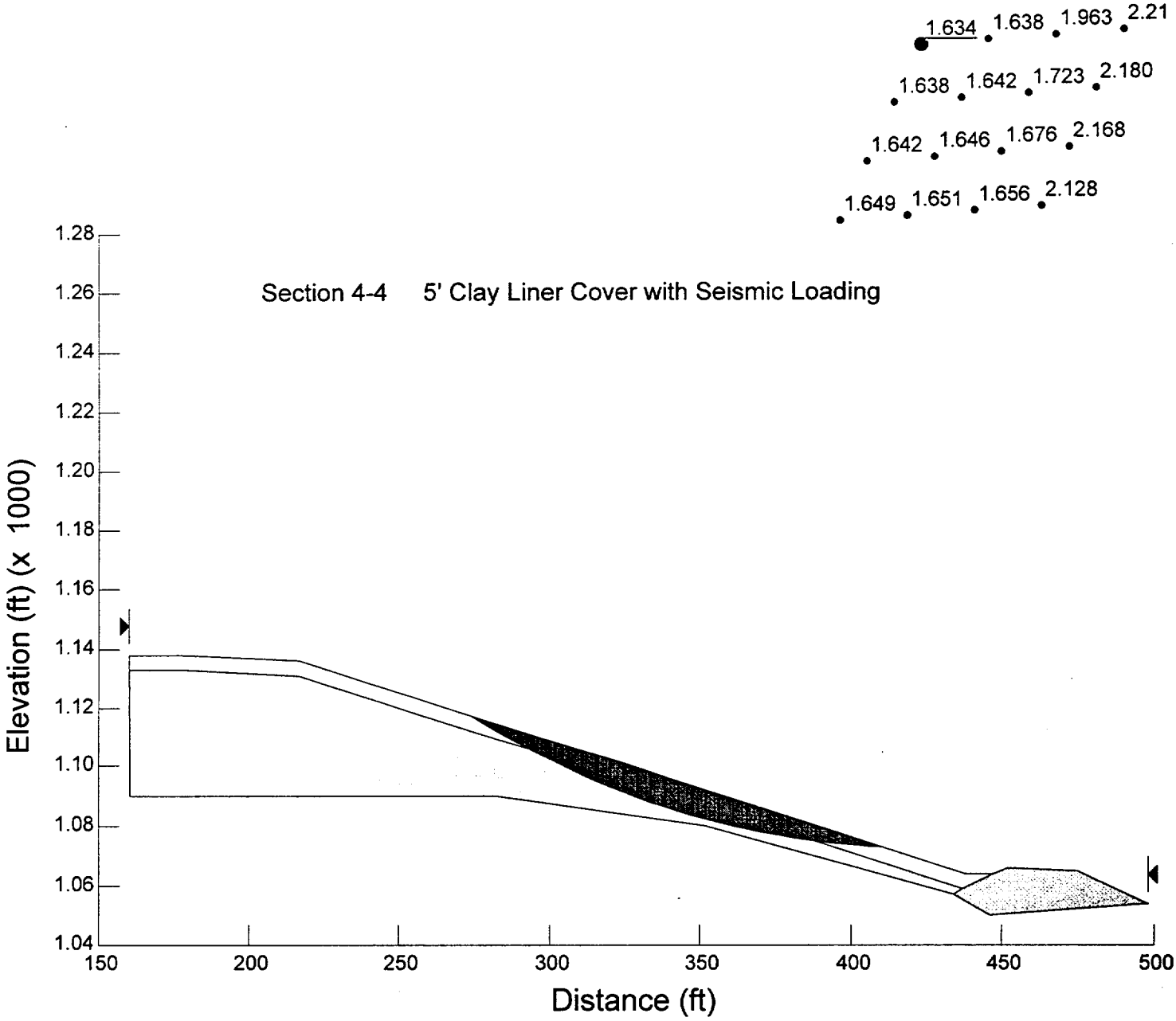
SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	396.000	1284.000	202.797	1	0.0000	1.982	2.008
1	396.000	1284.000	202.797	4	0.0000	2.007	1.982
2	396.000	1284.000	204.426	1	0.0000	1.920	1.952
2	396.000	1284.000	204.426	4	0.0000	1.951	1.919
3	396.000	1284.000	206.034	1	0.0000	1.891	1.930
3	396.000	1284.000	206.034	4	0.0000	1.929	1.891
4	418.333	1285.667	211.166	1	0.0000	1.990	2.014
4	418.333	1285.667	211.166	4	0.0000	2.013	1.989
5	418.333	1285.667	212.587	1	0.0000	1.928	1.957
5	418.333	1285.667	212.587	4	0.0000	1.957	1.927
6	418.333	1285.667	213.985	1	0.0000	1.898	1.933
6	418.333	1285.667	213.985	4	0.0000	1.932	1.897
7	440.667	1287.333	219.536	1	0.0000	1.998	2.021
7	440.667	1287.333	219.536	4	0.0000	2.020	1.997
8	440.667	1287.333	220.748	1	0.0000	1.938	1.965
8	440.667	1287.333	220.748	4	0.0000	1.965	1.937
9	440.667	1287.333	221.935	1	0.0000	1.906	1.938
9	440.667	1287.333	221.935	4	0.0000	1.937	1.906
10	463.000	1289.000	227.905	1	0.0000	2.607	2.668
10	463.000	1289.000	227.905	4	0.0000	2.666	2.606
11	463.000	1289.000	228.909	1	0.0000	2.551	2.617
11	463.000	1289.000	228.909	4	0.0000	2.616	2.550
12	463.000	1289.000	229.886	1	0.0000	2.519	2.590
12	463.000	1289.000	229.886	4	0.0000	2.589	2.518
13	405.000	1303.667	224.268	1	0.0000	1.980	2.003
13	405.000	1303.667	224.268	4	0.0000	2.003	1.980
14	405.000	1303.667	225.870	1	0.0000	1.917	1.946
14	405.000	1303.667	225.870	4	0.0000	1.946	1.917
15	405.000	1303.667	227.449	1	0.0000	1.888	1.923
15	405.000	1303.667	227.449	4	0.0000	1.922	1.887
16	427.333	1305.333	232.637	1	0.0000	1.988	2.009
16	427.333	1305.333	232.637	4	0.0000	2.009	1.987
17	427.333	1305.333	234.031	1	0.0000	1.926	1.952
17	427.333	1305.333	234.031	4	0.0000	1.952	1.925
18	427.333	1305.333	235.399	1	0.0000	1.895	1.926
18	427.333	1305.333	235.399	4	0.0000	1.926	1.894
19	449.667	1307.000	241.007	1	0.0000	1.996	2.017
19	449.667	1307.000	241.007	4	0.0000	2.017	1.996
20	449.667	1307.000	242.192	1	0.0000	1.936	1.961
20	449.667	1307.000	242.192	4	0.0000	1.961	1.936
21	449.667	1307.000	243.350	1	0.0000	2.053	2.093
21	449.667	1307.000	243.350	4	0.0000	2.096	2.056
22	472.000	1308.667	249.376	1	0.0000	2.718	2.781
22	472.000	1308.667	249.376	4	0.0000	2.774	2.712
23	472.000	1308.667	250.353	1	0.0000	2.635	2.701
23	472.000	1308.667	250.353	4	0.0000	2.696	2.630
24	472.000	1308.667	251.300	1	0.0000	2.584	2.654
24	472.000	1308.667	251.300	4	0.0000	2.649	2.579
25	414.000	1323.333	245.739	1	0.0000	1.978	1.999

25	414.000	1323.333	245.739	4	0.0000	1.999	1.978
26	414.000	1323.333	247.314	1	0.0000	1.915	1.941
26	414.000	1323.333	247.314	4	0.0000	1.941	1.915
27	414.000	1323.333	248.863	1	0.0000	1.885	1.917
27	414.000	1323.333	248.863	4	0.0000	1.916	1.885
28	436.333	1325.000	254.108	1	0.0000	1.986	2.006
28	436.333	1325.000	254.108	4	0.0000	2.006	1.986
29	436.333	1325.000	255.475	1	0.0000	1.924	1.948
29	436.333	1325.000	255.475	4	0.0000	1.948	1.924
30	436.333	1325.000	256.814	1	0.0000	1.893	1.921
30	436.333	1325.000	256.814	4	0.0000	1.921	1.893
31	458.667	1326.667	262.478	1	0.0000	1.995	2.014
31	458.667	1326.667	262.478	4	0.0000	2.014	1.995
32	458.667	1326.667	263.636	1	0.0000	2.189	2.228
32	458.667	1326.667	263.636	4	0.0000	2.232	2.192
33	458.667	1326.667	264.764	1	0.0000	2.203	2.250
33	458.667	1326.667	264.764	4	0.0000	2.253	2.206
34	481.000	1328.333	270.847	1	0.0000	2.763	2.823
34	481.000	1328.333	270.847	4	0.0000	2.814	2.755
35	481.000	1328.333	271.797	1	0.0000	2.670	2.733
35	481.000	1328.333	271.797	4	0.0000	2.725	2.663
36	481.000	1328.333	272.714	1	0.0000	2.609	2.675
36	481.000	1328.333	272.714	4	0.0000	2.667	2.603
37	423.000	1343.000	267.210	1	0.0000	1.977	1.996
37	423.000	1343.000	267.210	4	0.0000	1.996	1.977
38	423.000	1343.000	268.758	1	0.0000	1.914	1.938
38	423.000	1343.000	268.758	4	0.0000	1.938	1.914
39	423.000	1343.000	270.277	1	0.0000	1.883	1.912
39	423.000	1343.000	270.277	4	0.0000	1.912	1.883
40	445.333	1344.667	275.579	1	0.0000	1.985	2.003
40	445.333	1344.667	275.579	4	0.0000	2.004	1.985
41	445.333	1344.667	276.919	1	0.0000	1.923	1.945
41	445.333	1344.667	276.919	4	0.0000	1.945	1.923
42	445.333	1344.667	278.228	1	0.0000	1.891	1.917
42	445.333	1344.667	278.228	4	0.0000	1.917	1.891
43	467.667	1346.333	283.948	1	0.0000	2.356	2.395
43	467.667	1346.333	283.948	4	0.0000	2.396	2.356
44	467.667	1346.333	285.079	1	0.0000	2.321	2.367
44	467.667	1346.333	285.079	4	0.0000	2.368	2.323
45	467.667	1346.333	286.178	1	0.0000	2.306	2.356
45	467.667	1346.333	286.178	4	0.0000	2.358	2.307
46	490.000	1348.000	292.318	1	0.0000	2.768	2.822
46	490.000	1348.000	292.318	4	0.0000	2.812	2.758
47	490.000	1348.000	293.240	1	0.0000	2.674	2.730
47	490.000	1348.000	293.240	4	0.0000	2.721	2.665
48	490.000	1348.000	294.129	0	0.0000	998.000	998.000
48	490.000	1348.000	294.129	0	0.0000	998.000	998.000

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    423.0000=X-COOR.   1343.0000=Y-COOR.    270.2773=RADIUS      1.883=F.S.    39=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    423.0000=X-COOR.   1343.0000=Y-COOR.    270.2773=RADIUS      1.912=F.S.    39=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    423.0000=X-COOR.   1343.0000=Y-COOR.    270.2773=RADIUS      1.883=F.S.    39=SLIP#
```

NORMAL TERMINATION OF SLOPE

ATTACHMENT # B
CALC 100340-6(B)-06
PAGE 183



```
FILEINFO
SLOPEW 4.22
TITLE


04/05/2000
10:53:14 AM
ANALYSIS
    1     2     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL          4
    1 +1.3000e+002 +1.0000e+002 +2.5000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Soil
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION      0
AFUNCTION      0
POINT         24
    1 +1.6000e+002 +1.1380e+003
    2 +1.7800e+002 +1.1380e+003
    3 +2.1700e+002 +1.1360e+003
    4 +4.3800e+002 +1.0640e+003
    5 +4.4700e+002 +1.0640e+003
    6 +4.5200e+002 +1.0660e+003
    7 +4.7500e+002 +1.0650e+003
    8 +4.9800e+002 +1.0540e+003
    9 +1.6010e+002 +1.1330e+003
   10 +1.7800e+002 +1.1330e+003
   11 +2.1700e+002 +1.1310e+003
   12 +4.3700e+002 +1.0590e+003
   13 +1.6050e+002 +1.0900e+003
   14 +2.8200e+002 +1.0900e+003
   15 +3.5200e+002 +1.0800e+003
   16 +4.3400e+002 +1.0570e+003
   17 +4.4600e+002 +1.0500e+003
   18 +3.4000e+002 +1.0890e+003
```

ATTACHMENT # B
CALC 100740 1-G(B)-06
PAGE 185

```
   19 +4.3100e+002 +1.0600e+003
   20 +4.3000e+002 +1.0590e+003
   21 +3.3900e+002 +1.0860e+003
   22 +4.2300e+002 +1.3430e+003
   23 +3.9600e+002 +1.2840e+003
   24 +4.6300e+002 +1.2890e+003
LINE            4
    1      8
    1
    2
    3
    4
    5
    6
    7
    8
    2      9
    1
    9
   10
   11
   12
    5
    6
    7
    8
    3     11
    1
    9
   13
   14
   15
   16
   12
    5
    6
    7
    8
    4      8
    1
    9
   13
   14
   15
   16
   17
    8
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000      0
GRID
   23     24     22      3      3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
   18     19     21     20      2     21     19
AXIS
    0
LIMIT
0 +1.6000e+002 +4.9800e+002
```

ATTACHMENT # B
CALC 100340-G1(B)-06
186

```
CLIP            0
BLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
PORU            4 +0.0000e+000
    1 +0.0000e+000     0
    2 +0.0000e+000     0
    3 +0.0000e+000     0
    4 +0.0000e+000     0
PIEZ            4 +0.0000e+000
    1     0     0
    2     0     0
    3     0     0
    4     0     0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+5.0000e-002 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

ATTACHMENT # B
CALC 100340I-G(B)-06
PAGE 187

04/05/2000
10:53:14 AM

1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

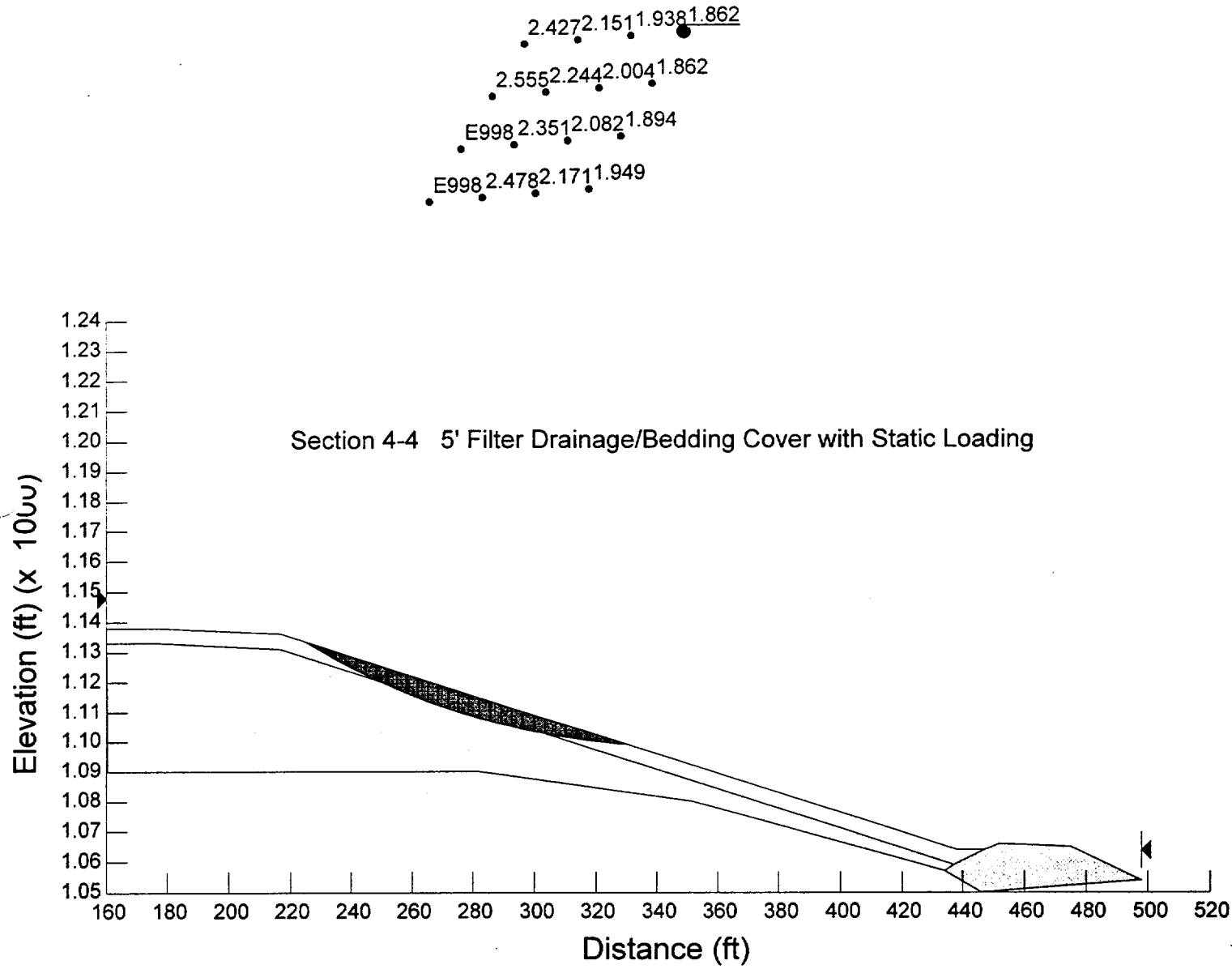
SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	396.000	1284.000	202.797	1	0.0000	1.695	1.710
1	396.000	1284.000	202.797	4	0.0000	1.717	1.695
2	396.000	1284.000	204.426	1	0.0000	1.640	1.660
2	396.000	1284.000	204.426	4	0.0000	1.668	1.640
3	396.000	1284.000	206.034	1	0.0000	1.615	1.639
3	396.000	1284.000	206.034	4	0.0000	1.649	1.615
4	418.333	1285.667	211.166	1	0.0000	1.702	1.716
4	418.333	1285.667	211.166	4	0.0000	1.722	1.701
5	418.333	1285.667	212.587	1	0.0000	1.647	1.665
5	418.333	1285.667	212.587	4	0.0000	1.673	1.647
6	418.333	1285.667	213.985	1	0.0000	1.621	1.642
6	418.333	1285.667	213.985	4	0.0000	1.651	1.620
7	440.667	1287.333	219.536	1	0.0000	1.709	1.722
7	440.667	1287.333	219.536	4	0.0000	1.729	1.709
8	440.667	1287.333	220.748	1	0.0000	1.656	1.672
8	440.667	1287.333	220.748	4	0.0000	1.680	1.656
9	440.667	1287.333	221.935	1	0.0000	1.628	1.647
9	440.667	1287.333	221.935	4	0.0000	1.656	1.628
10	463.000	1289.000	227.905	1	0.0000	2.146	2.183
10	463.000	1289.000	227.905	4	0.0000	2.196	2.150
11	463.000	1289.000	228.909	1	0.0000	2.097	2.137
11	463.000	1289.000	228.909	4	0.0000	2.152	2.102
12	463.000	1289.000	229.886	1	0.0000	2.069	2.113
12	463.000	1289.000	229.886	4	0.0000	2.128	2.074
13	405.000	1303.667	224.268	1	0.0000	1.693	1.707
13	405.000	1303.667	224.268	4	0.0000	1.713	1.693
14	405.000	1303.667	225.870	1	0.0000	1.638	1.655
14	405.000	1303.667	225.870	4	0.0000	1.663	1.638
15	405.000	1303.667	227.449	1	0.0000	1.612	1.634
15	405.000	1303.667	227.449	4	0.0000	1.642	1.612
16	427.333	1305.333	232.637	1	0.0000	1.700	1.713
16	427.333	1305.333	232.637	4	0.0000	1.719	1.700
17	427.333	1305.333	234.031	1	0.0000	1.645	1.661
17	427.333	1305.333	234.031	4	0.0000	1.669	1.645
18	427.333	1305.333	235.399	1	0.0000	1.618	1.638
18	427.333	1305.333	235.399	4	0.0000	1.646	1.618
19	449.667	1307.000	241.007	1	0.0000	1.707	1.720
19	449.667	1307.000	241.007	4	0.0000	1.726	1.707
20	449.667	1307.000	242.192	1	0.0000	1.655	1.670
20	449.667	1307.000	242.192	4	0.0000	1.676	1.655
21	449.667	1307.000	243.350	1	0.0000	1.741	1.766
21	449.667	1307.000	243.350	4	0.0000	1.779	1.745
22	472.000	1308.667	249.376	1	0.0000	2.219	2.256
22	472.000	1308.667	249.376	4	0.0000	2.265	2.219
23	472.000	1308.667	250.353	1	0.0000	2.153	2.192
23	472.000	1308.667	250.353	4	0.0000	2.204	2.154
24	472.000	1308.667	251.300	1	0.0000	2.114	2.155
24	472.000	1308.667	251.300	4	0.0000	2.168	2.115
25	414.000	1323.333	245.739	1	0.0000	1.691	1.704

25	414.000	1323.333	245.739	4	0.0000	1.710	1.692
26	414.000	1323.333	247.314	1	0.0000	1.636	1.652
26	414.000	1323.333	247.314	4	0.0000	1.659	1.636
27	414.000	1323.333	248.863	1	0.0000	1.610	1.629
27	414.000	1323.333	248.863	4	0.0000	1.638	1.610
28	436.333	1325.000	254.108	1	0.0000	1.699	1.710
28	436.333	1325.000	254.108	4	0.0000	1.716	1.699
29	436.333	1325.000	255.475	1	0.0000	1.644	1.659
29	436.333	1325.000	255.475	4	0.0000	1.666	1.644
30	436.333	1325.000	256.814	1	0.0000	1.617	1.634
30	436.333	1325.000	256.814	4	0.0000	1.642	1.617
31	458.667	1326.667	262.478	1	0.0000	1.707	1.718
31	458.667	1326.667	262.478	4	0.0000	1.723	1.707
32	458.667	1326.667	263.636	1	0.0000	1.845	1.870
32	458.667	1326.667	263.636	4	0.0000	1.882	1.850
33	458.667	1326.667	264.764	1	0.0000	1.847	1.876
33	458.667	1326.667	264.764	4	0.0000	1.890	1.853
34	481.000	1328.333	270.847	1	0.0000	2.247	2.282
34	481.000	1328.333	270.847	4	0.0000	2.288	2.245
35	481.000	1328.333	271.797	1	0.0000	2.177	2.213
35	481.000	1328.333	271.797	4	0.0000	2.222	2.175
36	481.000	1328.333	272.714	1	0.0000	2.132	2.170
36	481.000	1328.333	272.714	4	0.0000	2.180	2.130
37	423.000	1343.000	267.210	1	0.0000	1.690	1.702
37	423.000	1343.000	267.210	4	0.0000	1.708	1.691
38	423.000	1343.000	268.758	1	0.0000	1.635	1.649
38	423.000	1343.000	268.758	4	0.0000	1.656	1.635
39	423.000	1343.000	270.277	1	0.0000	1.608	1.626
39	423.000	1343.000	270.277	4	0.0000	1.634	1.608
40	445.333	1344.667	275.579	1	0.0000	1.698	1.709
40	445.333	1344.667	275.579	4	0.0000	1.714	1.698
41	445.333	1344.667	276.919	1	0.0000	1.643	1.657
41	445.333	1344.667	276.919	4	0.0000	1.663	1.643
42	445.333	1344.667	278.228	1	0.0000	1.615	1.631
42	445.333	1344.667	278.228	4	0.0000	1.638	1.615
43	467.667	1346.333	283.948	1	0.0000	1.974	1.999
43	467.667	1346.333	283.948	4	0.0000	2.009	1.978
44	467.667	1346.333	285.079	1	0.0000	1.937	1.965
44	467.667	1346.333	285.079	4	0.0000	1.977	1.941
45	467.667	1346.333	286.178	1	0.0000	1.919	1.951
45	467.667	1346.333	286.178	4	0.0000	1.963	1.924
46	490.000	1348.000	292.318	1	0.0000	2.249	2.280
46	490.000	1348.000	292.318	4	0.0000	2.285	2.245
47	490.000	1348.000	293.240	1	0.0000	2.179	2.212
47	490.000	1348.000	293.240	4	0.0000	2.218	2.176
48	490.000	1348.000	294.129	0	0.0000	998.000	998.000
48	490.000	1348.000	294.129	0	0.0000	998.000	998.000

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    423.0000=X-COOR.   1343.0000=Y-COOR.    270.2773=RADIUS      1.608=F.S.    39=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    423.0000=X-COOR.   1343.0000=Y-COOR.    270.2773=RADIUS      1.634=F.S.    39=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    423.0000=X-COOR.   1343.0000=Y-COOR.    270.2773=RADIUS      1.608=F.S.    39=SLIP#
```

ATTACHMENT # 15
CALC 100240I-GI(B)-06
189

NORMAL TERMINATION OF SLOPE


2.427
2.151
1.938
1.862
2.555
2.244
2.004
1.862
E998
2.351
2.082
1.894
E998
2.478
2.171
1.949
Section 4-4 5' Filter Drainage/Bedding Cover with Static Loading
Elevation (ft) (x 1000)
1.24
1.23
1.22
1.21
1.20
1.19
1.18
1.17
1.16
1.15
1.14
1.13
1.12
1.11
1.10
1.09
1.08
1.07
1.06
1.05
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500
520
Distance (ft)

```
TILEINFO
 LOPEW 4.22
TITLE


04/05/2000
10:35:34 AM
ANALYSIS
    1     2     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            4
    1 +1.3000e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Soil
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          24
    1 +1.6000e+002 +1.1380e+003
    2 +1.7800e+002 +1.1380e+003
    3 +2.1700e+002 +1.1360e+003
    4 +4.3800e+002 +1.0640e+003
    5 +4.4700e+002 +1.0640e+003
    6 +4.5200e+002 +1.0660e+003
    7 +4.7500e+002 +1.0650e+003
    8 +4.9800e+002 +1.0540e+003
    9 +1.6010e+002 +1.1330e+003
   10 +1.7800e+002 +1.1330e+003
   11 +2.1700e+002 +1.1310e+003
   12 +4.3700e+002 +1.0590e+003
   13 +1.6050e+002 +1.0900e+003
   14 +2.8200e+002 +1.0900e+003
   15 +3.5200e+002 +1.0800e+003
   16 +4.3400e+002 +1.0570e+003
   17 +4.4600e+002 +1.0500e+003
   18 +1.7400e+002 +1.1010e+003
```

```
   19 +3.0100e+002 +1.0990e+003
   20 +3.0000e+002 +1.0910e+003
   21 +1.7300e+002 +1.0930e+003
   22 +2.9700e+002 +1.3310e+003
   23 +2.6600e+002 +1.2790e+003
   24 +3.1800e+002 +1.2830e+003
LINE            4
    1      8
    1
    2
    3
    4
    5
    6
    7
    8
    2      9
    1
    9
   10
   11
   12
    5
    6
    7
    8
    3     11
    1
    9
   13
   14
   15
   16
   12
    5
    6
    7
    8
    4      8
    1
    9
   13
   14
   15
   16
   17
    8
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000      0
GRID
   23     24     22      3      3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
   18     19     21     20      2     21     19
AXIS
    0
LIMIT
0 +1.6000e+002 +4.9800e+002
```

```
CLIP            0
CLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
PORU            4 +0.0000e+000
    1 +0.0000e+000     0
    2 +0.0000e+000     0
    3 +0.0000e+000     0
    4 +0.0000e+000     0
PIEZ            4 +0.0000e+000
    1     0     0
    2     0     0
    3     0     0
    4     0     0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

ATTACHMENT B
CALC 1003401-G(B)-06
PAGE 194

04/05/2000
10:35:34 AM

1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	266.000	1279.000	179.427	0	0.0000	998.000	998.000
1	266.000	1279.000	179.427	0	0.0000	998.000	998.000
2	266.000	1279.000	183.434	0	0.0000	998.000	998.000
2	266.000	1279.000	183.434	0	0.0000	998.000	998.000
3	266.000	1279.000	187.441	0	0.0000	998.000	998.000
3	266.000	1279.000	187.441	0	0.0000	998.000	998.000
4	283.333	1280.333	181.033	1	0.0000	2.382	2.477
4	283.333	1280.333	181.033	4	0.0000	2.478	2.384
5	283.333	1280.333	185.040	1	0.0000	2.449	2.560
5	283.333	1280.333	185.040	4	0.0000	2.561	2.451
6	283.333	1280.333	189.047	0	0.0000	998.000	998.000
6	283.333	1280.333	189.047	0	0.0000	998.000	998.000
7	300.667	1281.667	182.639	1	0.0000	2.096	2.170
7	300.667	1281.667	182.639	4	0.0000	2.171	2.098
8	300.667	1281.667	186.646	1	0.0000	2.162	2.252
8	300.667	1281.667	186.646	4	0.0000	2.253	2.164
9	300.667	1281.667	190.653	1	0.0000	2.223	2.329
9	300.667	1281.667	190.653	4	0.0000	2.330	2.225
10	318.000	1283.000	184.245	1	0.0000	1.891	1.948
10	318.000	1283.000	184.245	4	0.0000	1.949	1.891
11	318.000	1283.000	188.252	1	0.0000	1.949	2.022
11	318.000	1283.000	188.252	4	0.0000	2.022	1.950
12	318.000	1283.000	192.260	1	0.0000	2.008	2.095
12	318.000	1283.000	192.260	4	0.0000	2.096	2.009
13	276.333	1296.333	196.921	0	0.0000	998.000	998.000
13	276.333	1296.333	196.921	0	0.0000	998.000	998.000
14	276.333	1296.333	200.928	0	0.0000	998.000	998.000
14	276.333	1296.333	200.928	0	0.0000	998.000	998.000
15	276.333	1296.333	204.935	0	0.0000	998.000	998.000
15	276.333	1296.333	204.935	0	0.0000	998.000	998.000
16	293.667	1297.667	198.527	1	0.0000	2.275	2.350
16	293.667	1297.667	198.527	4	0.0000	2.351	2.277
17	293.667	1297.667	202.534	1	0.0000	2.339	2.429
17	293.667	1297.667	202.534	4	0.0000	2.430	2.341
18	293.667	1297.667	206.541	1	0.0000	2.401	2.506
18	293.667	1297.667	206.541	4	0.0000	2.507	2.403
19	311.000	1299.000	200.133	1	0.0000	2.022	2.080
19	311.000	1299.000	200.133	4	0.0000	2.082	2.023
20	311.000	1299.000	204.140	1	0.0000	2.086	2.159
20	311.000	1299.000	204.140	4	0.0000	2.160	2.088
21	311.000	1299.000	208.147	1	0.0000	2.146	2.232
21	311.000	1299.000	208.147	4	0.0000	2.233	2.148
22	328.333	1300.333	201.739	1	0.0000	1.849	1.894
22	328.333	1300.333	201.739	4	0.0000	1.894	1.849
23	328.333	1300.333	205.746	1	0.0000	1.900	1.958
23	328.333	1300.333	205.746	4	0.0000	1.958	1.900
24	328.333	1300.333	209.754	1	0.0000	1.955	2.026
24	328.333	1300.333	209.754	4	0.0000	2.026	1.955
25	286.667	1313.667	214.414	1	0.0000	2.477	2.554

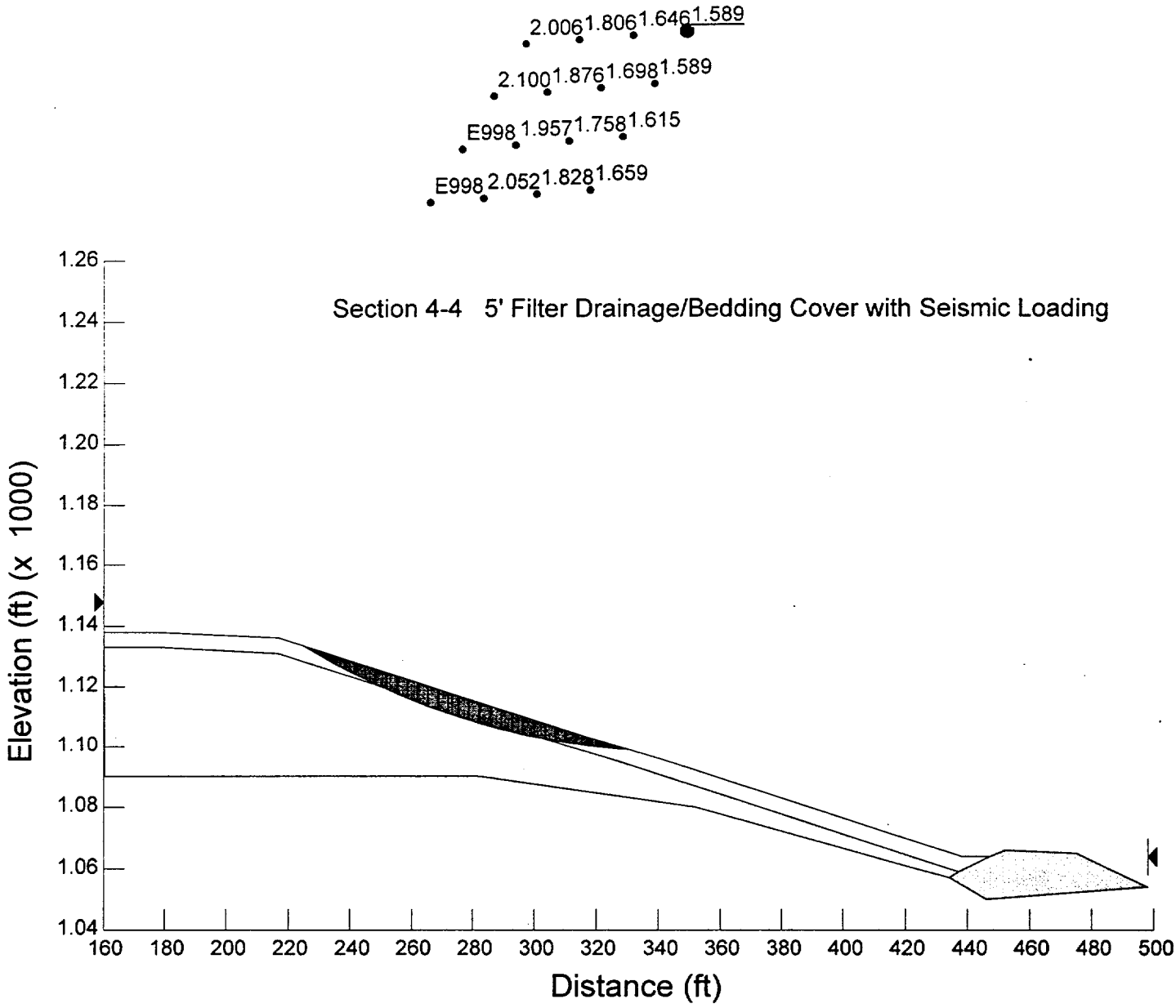
ATTACHMENT # 13
CALC 1G03401-G(B)-06
195

25	286.667	1313.667	214.414	4	0.0000	2.555	2.479
26	286.667	1313.667	218.422	0	0.0000	998.000	998.000
26	286.667	1313.667	218.422	0	0.0000	998.000	998.000
27	286.667	1313.667	222.429	0	0.0000	998.000	998.000
27	286.667	1313.667	222.429	0	0.0000	998.000	998.000
28	304.000	1315.000	216.020	1	0.0000	2.182	2.242
28	304.000	1315.000	216.020	4	0.0000	2.244	2.184
29	304.000	1315.000	220.028	1	0.0000	2.245	2.318
29	304.000	1315.000	220.028	4	0.0000	2.320	2.247
30	304.000	1315.000	224.035	1	0.0000	2.305	2.391
30	304.000	1315.000	224.035	4	0.0000	2.393	2.307
31	321.333	1316.333	217.626	1	0.0000	1.956	2.003
31	321.333	1316.333	217.626	4	0.0000	2.004	1.957
32	321.333	1316.333	221.634	1	0.0000	2.020	2.079
32	321.333	1316.333	221.634	4	0.0000	2.080	2.021
33	321.333	1316.333	225.641	1	0.0000	2.078	2.150
33	321.333	1316.333	225.641	4	0.0000	2.151	2.080
34	338.667	1317.667	219.233	1	0.0000	1.828	1.861
34	338.667	1317.667	219.233	4	0.0000	1.862	1.828
35	338.667	1317.667	223.240	1	0.0000	1.857	1.904
35	338.667	1317.667	223.240	4	0.0000	1.904	1.858
36	338.667	1317.667	227.247	1	0.0000	1.907	1.966
36	338.667	1317.667	227.247	4	0.0000	1.966	1.908
37	297.000	1331.000	231.908	1	0.0000	2.364	2.426
37	297.000	1331.000	231.908	4	0.0000	2.427	2.365
38	297.000	1331.000	235.916	1	0.0000	2.425	2.500
38	297.000	1331.000	235.916	4	0.0000	2.502	2.427
39	297.000	1331.000	239.923	0	0.0000	998.000	998.000
39	297.000	1331.000	239.923	0	0.0000	998.000	998.000
40	314.333	1332.333	233.514	1	0.0000	2.101	2.150
40	314.333	1332.333	233.514	4	0.0000	2.151	2.103
41	314.333	1332.333	237.522	1	0.0000	2.163	2.224
41	314.333	1332.333	237.522	4	0.0000	2.225	2.165
42	314.333	1332.333	241.529	1	0.0000	2.221	2.294
42	314.333	1332.333	241.529	4	0.0000	2.295	2.223
43	331.667	1333.667	235.120	1	0.0000	1.899	1.937
43	331.667	1333.667	235.120	4	0.0000	1.938	1.900
44	331.667	1333.667	239.128	1	0.0000	1.960	2.009
44	331.667	1333.667	239.128	4	0.0000	2.010	1.961
45	331.667	1333.667	243.135	1	0.0000	2.018	2.077
45	331.667	1333.667	243.135	4	0.0000	2.078	2.019
46	349.000	1335.000	236.727	1	0.0000	1.838	1.861
46	349.000	1335.000	236.727	4	0.0000	1.862	1.839
47	349.000	1335.000	240.734	1	0.0000	1.829	1.866
47	349.000	1335.000	240.734	4	0.0000	1.866	1.830
48	349.000	1335.000	244.741	1	0.0000	1.867	1.915
48	349.000	1335.000	244.741	4	0.0000	1.915	1.868

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    338.6667=X-COOR.   1317.6666=Y-COOR.    219.2326=RADIUS      1.828=F.S.    34=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    349.0000=X-COOR.   1335.0000=Y-COOR.    236.7265=RADIUS      1.862=F.S.    46=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    338.6667=X-COOR.   1317.6666=Y-COOR.    219.2326=RADIUS      1.828=F.S.    34=SLIP#
```

ATTACHMENT # D
CALC 1003401-G(B)-06
196

.ORMAL TERMINATION OF SLOPE


2.006
1.806
1.646
1.589
2.100
1.876
1.698
1.589
E998
1.957
1.758
1.615
E998
2.052
1.828
1.659
Section 4-4 5' Filter Drainage/Bedding Cover with Seismic Loading
Elevation (ft) (x 1000)
1.26
1.24
1.22
1.20
1.18
1.16
1.14
1.12
1.10
1.08
1.06
1.04
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500
Distance (ft)

ATTACHMENT # B
CALC 1003401-G(B)-C
PAGE 198

```
TILEINFO
SLOPEW 4.22
TITLE


03/29/2000
9:41:06 AM
ANALYSIS
    1     2     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            4
    1 +1.3000e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Soil
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          24
    1 +1.6000e+002 +1.1380e+003
    2 +1.7800e+002 +1.1380e+003
    3 +2.1700e+002 +1.1360e+003
    4 +4.3800e+002 +1.0640e+003
    5 +4.4700e+002 +1.0640e+003
    6 +4.5200e+002 +1.0660e+003
    7 +4.7500e+002 +1.0650e+003
    8 +4.9800e+002 +1.0540e+003
    9 +1.6010e+002 +1.1330e+003
   10 +1.7800e+002 +1.1330e+003
   11 +2.1700e+002 +1.1310e+003
   12 +4.3700e+002 +1.0590e+003
   13 +1.6050e+002 +1.0900e+003
   14 +2.8200e+002 +1.0900e+003
   15 +3.5200e+002 +1.0800e+003
   16 +4.3400e+002 +1.0570e+003
   17 +4.4600e+002 +1.0500e+003
   18 +1.7400e+002 +1.1010e+003
```

```
    19 +3.0100e+002 +1.0990e+003
    20 +3.0000e+002 +1.0910e+003
    21 +1.7300e+002 +1.0930e+003
    22 +2.9700e+002 +1.3310e+003
    23 +2.6600e+002 +1.2790e+003
    24 +3.1800e+002 +1.2830e+003
LINE            4
     1      8
     1
     2
     3
     4
     5
     6
     7
     8
     2      9
     1
     9
    10
    11
    12
     5
     6
     7
     8
     3     11
     1
     9
    13
    14
    15
    16
    12
     5
     6
     7
     8
     4      8
     1
     9
    13
    14
    15
    16
    17
     8
TENSION
     0 +9.8070e+000 +0.0000e+000 +0.0000e+000      0
GRID
    23     24     22      3      3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
    18     19     21     20      2     21     19
AXIS
     0
LIMIT
0 +1.6000e+002 +4.9800e+002
```

ATTACHMENT # 13
CALC 100340/-G(B)- 06
200

```
LIP            0
LOCK
    0      0      0      0      0 +1.3500e+002 +1.3500e+002 0 0
    0      0      0      0      0 +4.5000e+001 +4.5000e+001 0 0
PORU           4 +0.0000e+000
    1 +0.0000e+000      0
    2 +0.0000e+000      0
    3 +0.0000e+000      0
    4 +0.0000e+000      0
PIEZ           4 +0.0000e+000
    1      0      0
    2      0      0
    3      0      0
    4      0      0
PCON           0 +0.0000e+000
POGH           0 +0.0000e+000
POGP           0 +0.0000e+000
POGR           0 +0.0000e+000
PORA           4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD           0
ANCHOR         0
PBOUNDARY      0
SEISMIC
+5.0000e-002 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE           0
ELEMENT        0
MATLCOLOR      4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

03/29/2000
9:41:06 AM

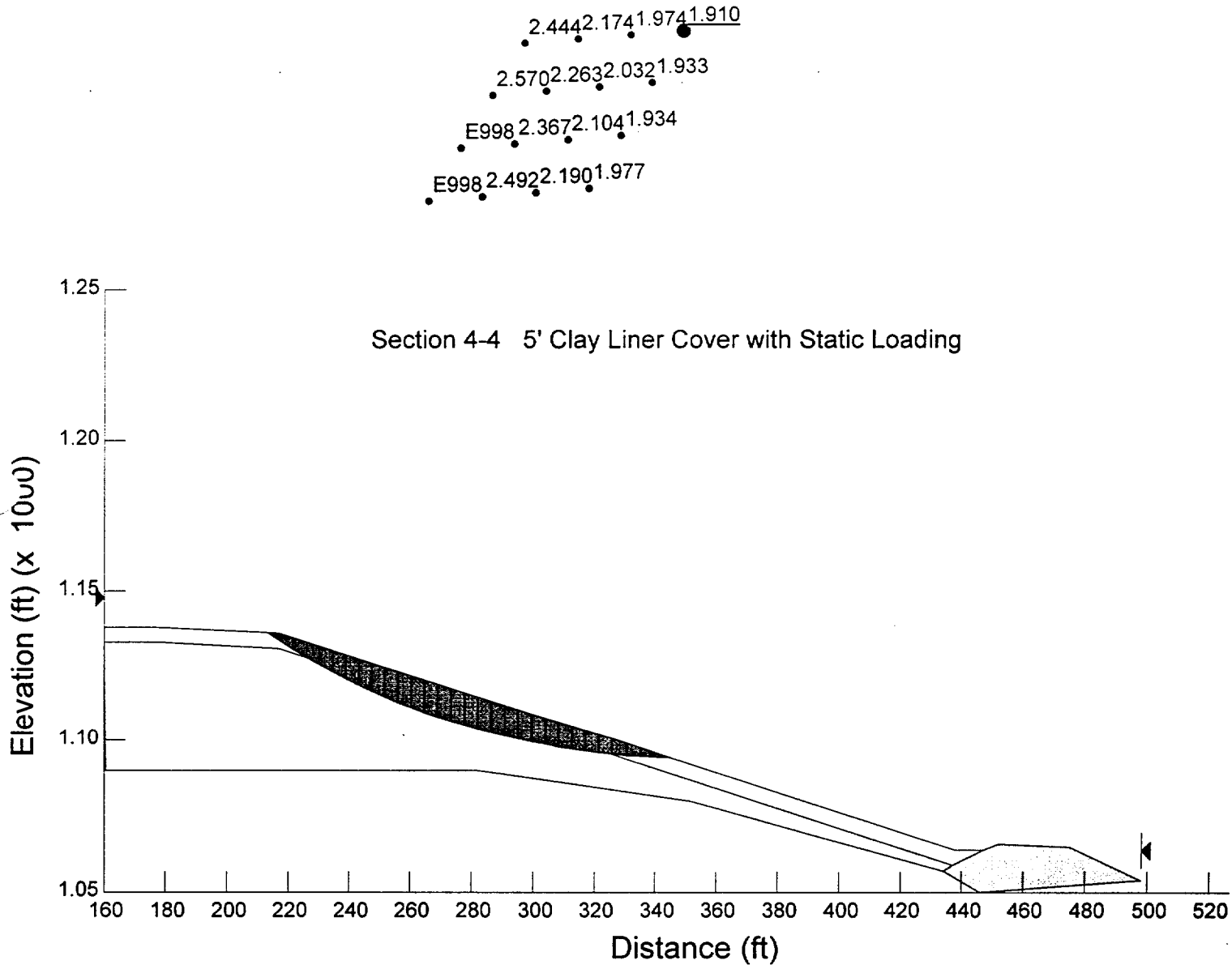
1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	266.000	1279.000	179.427	0	0.0000	998.000	998.000
1	266.000	1279.000	179.427	0	0.0000	998.000	998.000
2	266.000	1279.000	183.434	0	0.0000	998.000	998.000
2	266.000	1279.000	183.434	0	0.0000	998.000	998.000
3	266.000	1279.000	187.441	0	0.0000	998.000	998.000
3	266.000	1279.000	187.441	0	0.0000	998.000	998.000
4	283.333	1280.333	181.033	1	0.0000	1.970	2.016
4	283.333	1280.333	181.033	4	0.0000	2.052	1.966
5	283.333	1280.333	185.040	1	0.0000	2.020	2.072
5	283.333	1280.333	185.040	4	0.0000	2.115	2.015
6	283.333	1280.333	189.047	0	0.0000	998.000	998.000
6	283.333	1280.333	189.047	0	0.0000	998.000	998.000
7	300.667	1281.667	182.639	1	0.0000	1.763	1.803
7	300.667	1281.667	182.639	4	0.0000	1.828	1.761
8	300.667	1281.667	186.646	1	0.0000	1.812	1.860
8	300.667	1281.667	186.646	4	0.0000	1.891	1.811
9	300.667	1281.667	190.653	1	0.0000	1.859	1.914
9	300.667	1281.667	190.653	4	0.0000	1.950	1.856
10	318.000	1283.000	184.245	1	0.0000	1.608	1.643
10	318.000	1283.000	184.245	4	0.0000	1.659	1.608
11	318.000	1283.000	188.252	1	0.0000	1.654	1.697
11	318.000	1283.000	188.252	4	0.0000	1.717	1.653
12	318.000	1283.000	192.260	1	0.0000	1.699	1.750
12	318.000	1283.000	192.260	4	0.0000	1.775	1.698
13	276.333	1296.333	196.921	0	0.0000	998.000	998.000
13	276.333	1296.333	196.921	0	0.0000	998.000	998.000
14	276.333	1296.333	200.928	0	0.0000	998.000	998.000
14	276.333	1296.333	200.928	0	0.0000	998.000	998.000
15	276.333	1296.333	204.935	0	0.0000	998.000	998.000
15	276.333	1296.333	204.935	0	0.0000	998.000	998.000
16	293.667	1297.667	198.527	1	0.0000	1.891	1.929
16	293.667	1297.667	198.527	4	0.0000	1.957	1.889
17	293.667	1297.667	202.534	1	0.0000	1.939	1.983
17	293.667	1297.667	202.534	4	0.0000	2.017	1.935
18	293.667	1297.667	206.541	1	0.0000	1.985	2.036
18	293.667	1297.667	206.541	4	0.0000	2.075	1.980
19	311.000	1299.000	200.133	1	0.0000	1.706	1.739
19	311.000	1299.000	200.133	4	0.0000	1.758	1.705
20	311.000	1299.000	204.140	1	0.0000	1.755	1.795
20	311.000	1299.000	204.140	4	0.0000	1.819	1.754
21	311.000	1299.000	208.147	1	0.0000	1.800	1.847
21	311.000	1299.000	208.147	4	0.0000	1.876	1.798
22	328.333	1300.333	201.739	1	0.0000	1.575	1.603
22	328.333	1300.333	201.739	4	0.0000	1.615	1.576
23	328.333	1300.333	205.746	1	0.0000	1.615	1.650
23	328.333	1300.333	205.746	4	0.0000	1.666	1.615
24	328.333	1300.333	209.754	1	0.0000	1.657	1.700
24	328.333	1300.333	209.754	4	0.0000	1.720	1.657
25	286.667	1313.667	214.414	1	0.0000	2.033	2.068

25	286.667	1313.667	214.414	4	0.0000	2.100	2.029
26	286.667	1313.667	218.422	0	0.0000	998.000	998.000
26	286.667	1313.667	218.422	0	0.0000	998.000	998.000
27	286.667	1313.667	222.429	0	0.0000	998.000	998.000
27	286.667	1313.667	222.429	0	0.0000	998.000	998.000
28	304.000	1315.000	216.020	1	0.0000	1.823	1.854
28	304.000	1315.000	216.020	4	0.0000	1.876	1.821
29	304.000	1315.000	220.028	1	0.0000	1.870	1.907
29	304.000	1315.000	220.028	4	0.0000	1.934	1.867
30	304.000	1315.000	224.035	1	0.0000	1.914	1.958
30	304.000	1315.000	224.035	4	0.0000	1.990	1.911
31	321.333	1316.333	217.626	1	0.0000	1.656	1.683
31	321.333	1316.333	217.626	4	0.0000	1.698	1.656
32	321.333	1316.333	221.634	1	0.0000	1.704	1.738
32	321.333	1316.333	221.634	4	0.0000	1.757	1.703
33	321.333	1316.333	225.641	1	0.0000	1.749	1.788
33	321.333	1316.333	225.641	4	0.0000	1.812	1.748
34	338.667	1317.667	219.233	1	0.0000	1.559	1.580
34	338.667	1317.667	219.233	4	0.0000	1.589	1.560
35	338.667	1317.667	223.240	1	0.0000	1.582	1.611
35	338.667	1317.667	223.240	4	0.0000	1.623	1.582
36	338.667	1317.667	227.247	1	0.0000	1.620	1.656
36	338.667	1317.667	227.247	4	0.0000	1.672	1.620
37	297.000	1331.000	231.908	1	0.0000	1.952	1.982
37	297.000	1331.000	231.908	4	0.0000	2.006	1.949
38	297.000	1331.000	235.916	1	0.0000	1.997	2.032
38	297.000	1331.000	235.916	4	0.0000	2.062	1.993
39	297.000	1331.000	239.923	0	0.0000	998.000	998.000
39	297.000	1331.000	239.923	0	0.0000	998.000	998.000
40	314.333	1332.333	233.514	1	0.0000	1.763	1.789
40	314.333	1332.333	233.514	4	0.0000	1.806	1.762
41	314.333	1332.333	237.522	1	0.0000	1.809	1.841
41	314.333	1332.333	237.522	4	0.0000	1.862	1.807
42	314.333	1332.333	241.529	1	0.0000	1.853	1.890
42	314.333	1332.333	241.529	4	0.0000	1.916	1.850
43	331.667	1333.667	235.120	1	0.0000	1.612	1.635
43	331.667	1333.667	235.120	4	0.0000	1.646	1.613
44	331.667	1333.667	239.128	1	0.0000	1.659	1.687
44	331.667	1333.667	239.128	4	0.0000	1.702	1.659
45	331.667	1333.667	243.135	1	0.0000	1.703	1.736
45	331.667	1333.667	243.135	4	0.0000	1.755	1.702
46	349.000	1335.000	236.727	1	0.0000	1.568	1.583
46	349.000	1335.000	236.727	4	0.0000	1.589	1.568
47	349.000	1335.000	240.734	1	0.0000	1.560	1.583
47	349.000	1335.000	240.734	4	0.0000	1.592	1.560
48	349.000	1335.000	244.741	1	0.0000	1.589	1.619
48	349.000	1335.000	244.741	4	0.0000	1.632	1.589

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    338.6667=X-COOR.   1317.6666=Y-COOR.    219.2326=RADIUS      1.559=F.S.    34=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    349.0000=X-COOR.   1335.0000=Y-COOR.    236.7265=RADIUS      1.589=F.S.    46=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    338.6667=X-COOR.   1317.6666=Y-COOR.    219.2326=RADIUS      1.560=F.S.    34=SLIP#
```

NORMAL TERMINATION OF SLOPE


2.444
2.174
1.974
1.910
2.570
2.263
2.032
1.933
E998
2.367
2.104
1.934
E998
2.492
2.190
1.977
Section 4-4 5' Clay Liner Cover with Static Loading
Elevation (ft) (x 1000)
1.25
1.20
1.15
1.10
1.05
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500
520
Distance (ft)

ATTACHMENT # B
CALC 100340-1-G(B)-06
PAGE 205

```
FILEINFO
SLOPEW 4.22
TITLE


03/29/2000
10:05:45 AM
ANALYSIS
    1     2     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL          4
    1 +1.3000e+002 +1.0000e+002 +2.5000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Soil
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION      0
AFUNCTION      0
POINT         24
    1 +1.6000e+002 +1.1380e+003
    2 +1.7800e+002 +1.1380e+003
    3 +2.1700e+002 +1.1360e+003
    4 +4.3800e+002 +1.0640e+003
    5 +4.4700e+002 +1.0640e+003
    6 +4.5200e+002 +1.0660e+003
    7 +4.7500e+002 +1.0650e+003
    8 +4.9800e+002 +1.0540e+003
    9 +1.6010e+002 +1.1330e+003
   10 +1.7800e+002 +1.1330e+003
   11 +2.1700e+002 +1.1310e+003
   12 +4.3700e+002 +1.0590e+003
   13 +1.6050e+002 +1.0900e+003
   14 +2.8200e+002 +1.0900e+003
   15 +3.5200e+002 +1.0800e+003
   16 +4.3400e+002 +1.0570e+003
   17 +4.4600e+002 +1.0500e+003
   18 +1.7400e+002 +1.1010e+003
```

```
   19 +3.0100e+002 +1.0990e+003
   20 +3.0000e+002 +1.0910e+003
   21 +1.7300e+002 +1.0930e+003
   22 +2.9700e+002 +1.3310e+003
   23 +2.6600e+002 +1.2790e+003
   24 +3.1800e+002 +1.2830e+003
LINE            4
    1      8
    1
    2
    3
    4
    5
    6
    7
    8
    2      9
    1
    9
   10
   11
   12
    5
    6
    7
    8
    3     11
    1
    9
   13
   14
   15
   16
   12
    5
    6
    7
    8
    4      8
    1
    9
   13
   14
   15
   16
   17
    8
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000      0
GRID
   23     24     22      3      3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
   18     19     21     20      2     21     19
AXIS
    0
LIMIT
0 +1.6000e+002 +4.9800e+002
```

```
SLIP            0
BLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
PORU            4 +0.0000e+000
    1 +0.0000e+000     0
    2 +0.0000e+000     0
    3 +0.0000e+000     0
    4 +0.0000e+000     0
PIEZ            4 +0.0000e+000
    1     0     0
    2     0     0
    3     0     0
    4     0     0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

ATTACHMENT # B
CALC 1003401-Gr(B)-06
PAGE 208

03/29/2000
10:05:45 AM

1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	266.000	1279.000	179.427	0	0.0000	998.000	998.000
1	266.000	1279.000	179.427	0	0.0000	998.000	998.000
2	266.000	1279.000	183.434	0	0.0000	998.000	998.000
2	266.000	1279.000	183.434	0	0.0000	998.000	998.000
3	266.000	1279.000	187.441	0	0.0000	998.000	998.000
3	266.000	1279.000	187.441	0	0.0000	998.000	998.000
4	283.333	1280.333	181.033	1	0.0000	2.399	2.492
4	283.333	1280.333	181.033	4	0.0000	2.492	2.399
5	283.333	1280.333	185.040	1	0.0000	2.462	2.572
5	283.333	1280.333	185.040	4	0.0000	2.572	2.462
6	283.333	1280.333	189.047	0	0.0000	998.000	998.000
6	283.333	1280.333	189.047	0	0.0000	998.000	998.000
7	300.667	1281.667	182.639	1	0.0000	2.117	2.190
7	300.667	1281.667	182.639	4	0.0000	2.190	2.117
8	300.667	1281.667	186.646	1	0.0000	2.177	2.266
8	300.667	1281.667	186.646	4	0.0000	2.266	2.178
9	300.667	1281.667	190.653	1	0.0000	2.235	2.340
9	300.667	1281.667	190.653	4	0.0000	2.339	2.236
10	318.000	1283.000	184.245	1	0.0000	1.920	1.978
10	318.000	1283.000	184.245	4	0.0000	1.977	1.920
11	318.000	1283.000	188.252	1	0.0000	1.969	2.041
11	318.000	1283.000	188.252	4	0.0000	2.040	1.969
12	318.000	1283.000	192.260	1	0.0000	2.022	2.109
12	318.000	1283.000	192.260	4	0.0000	2.108	2.023
13	276.333	1296.333	196.921	0	0.0000	998.000	998.000
13	276.333	1296.333	196.921	0	0.0000	998.000	998.000
14	276.333	1296.333	200.928	0	0.0000	998.000	998.000
14	276.333	1296.333	200.928	0	0.0000	998.000	998.000
15	276.333	1296.333	204.935	0	0.0000	998.000	998.000
15	276.333	1296.333	204.935	0	0.0000	998.000	998.000
16	293.667	1297.667	198.527	1	0.0000	2.293	2.367
16	293.667	1297.667	198.527	4	0.0000	2.367	2.293
17	293.667	1297.667	202.534	1	0.0000	2.352	2.442
17	293.667	1297.667	202.534	4	0.0000	2.442	2.353
18	293.667	1297.667	206.541	1	0.0000	2.411	2.516
18	293.667	1297.667	206.541	4	0.0000	2.516	2.412
19	311.000	1299.000	200.133	1	0.0000	2.046	2.104
19	311.000	1299.000	200.133	4	0.0000	2.104	2.046
20	311.000	1299.000	204.140	1	0.0000	2.103	2.175
20	311.000	1299.000	204.140	4	0.0000	2.175	2.103
21	311.000	1299.000	208.147	1	0.0000	2.159	2.244
21	311.000	1299.000	208.147	4	0.0000	2.245	2.159
22	328.333	1300.333	201.739	1	0.0000	1.890	1.934
22	328.333	1300.333	201.739	4	0.0000	1.934	1.889
23	328.333	1300.333	205.746	1	0.0000	1.923	1.981
23	328.333	1300.333	205.746	4	0.0000	1.980	1.923
24	328.333	1300.333	209.754	1	0.0000	1.971	2.042
24	328.333	1300.333	209.754	4	0.0000	2.041	1.971
25	286.667	1313.667	214.414	1	0.0000	2.493	2.570

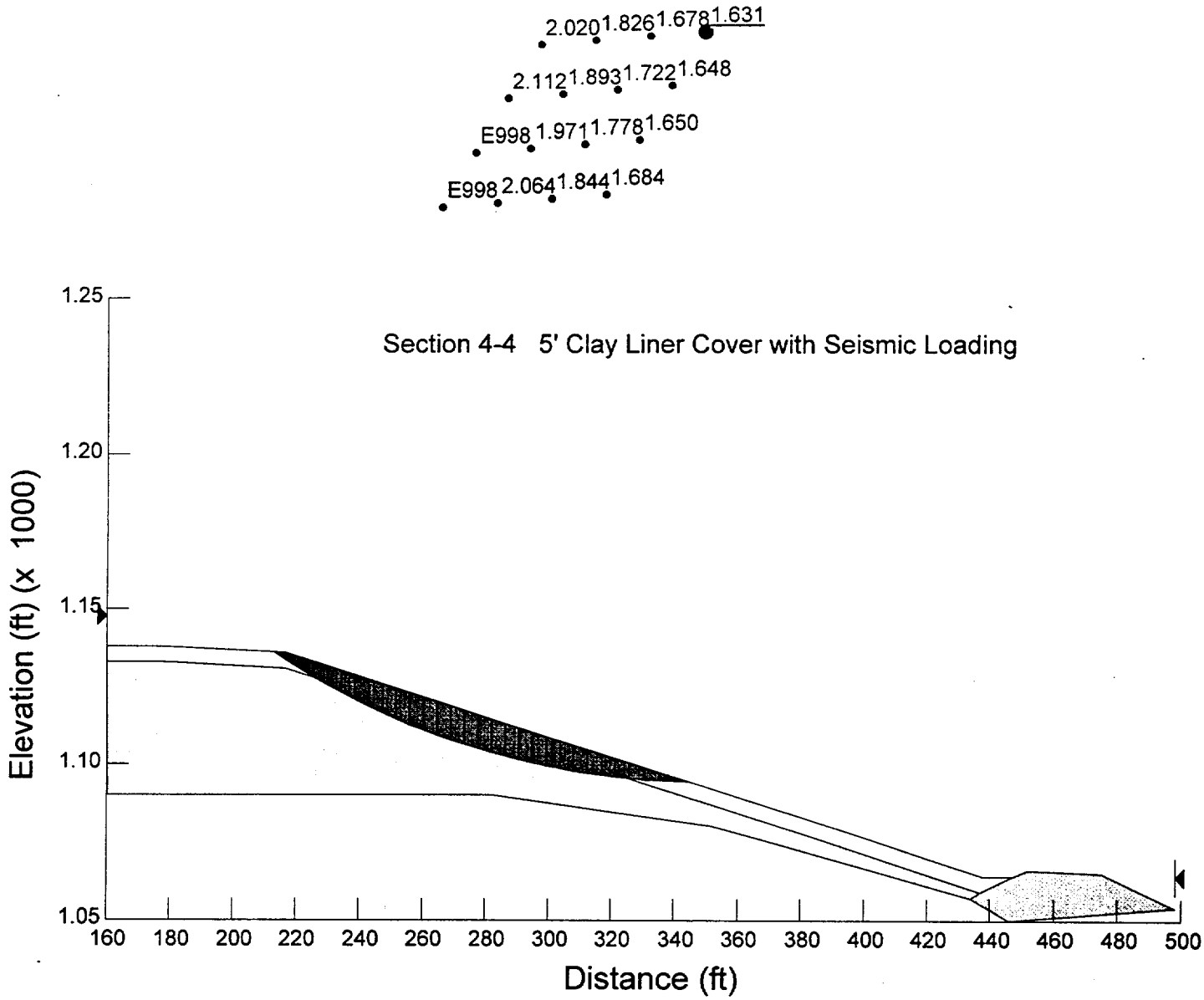
25	286.667	1313.667	214.414	4	0.0000	2.570	2.494
26	286.667	1313.667	218.422	0	0.0000	998.000	998.000
26	286.667	1313.667	218.422	0	0.0000	998.000	998.000
27	286.667	1313.667	222.429	0	0.0000	998.000	998.000
27	286.667	1313.667	222.429	0	0.0000	998.000	998.000
28	304.000	1315.000	216.020	1	0.0000	2.203	2.262
28	304.000	1315.000	216.020	4	0.0000	2.263	2.203
29	304.000	1315.000	220.028	1	0.0000	2.260	2.333
29	304.000	1315.000	220.028	4	0.0000	2.333	2.261
30	304.000	1315.000	224.035	1	0.0000	2.316	2.402
30	304.000	1315.000	224.035	4	0.0000	2.403	2.317
31	321.333	1316.333	217.626	1	0.0000	1.985	2.032
31	321.333	1316.333	217.626	4	0.0000	2.032	1.985
32	321.333	1316.333	221.634	1	0.0000	2.039	2.098
32	321.333	1316.333	221.634	4	0.0000	2.098	2.039
33	321.333	1316.333	225.641	1	0.0000	2.092	2.163
33	321.333	1316.333	225.641	4	0.0000	2.163	2.093
34	338.667	1317.667	219.233	1	0.0000	1.901	1.934
34	338.667	1317.667	219.233	4	0.0000	1.933	1.900
35	338.667	1317.667	223.240	1	0.0000	1.887	1.933
35	338.667	1317.667	223.240	4	0.0000	1.933	1.887
36	338.667	1317.667	227.247	1	0.0000	1.926	1.985
36	338.667	1317.667	227.247	4	0.0000	1.984	1.926
37	297.000	1331.000	231.908	1	0.0000	2.381	2.443
37	297.000	1331.000	231.908	4	0.0000	2.444	2.382
38	297.000	1331.000	235.916	1	0.0000	2.439	2.513
38	297.000	1331.000	235.916	4	0.0000	2.514	2.440
39	297.000	1331.000	239.923	0	0.0000	998.000	998.000
39	297.000	1331.000	239.923	0	0.0000	998.000	998.000
40	314.333	1332.333	233.514	1	0.0000	2.125	2.173
40	314.333	1332.333	233.514	4	0.0000	2.174	2.125
41	314.333	1332.333	237.522	1	0.0000	2.180	2.240
41	314.333	1332.333	237.522	4	0.0000	2.240	2.181
42	314.333	1332.333	241.529	1	0.0000	2.234	2.305
42	314.333	1332.333	241.529	4	0.0000	2.306	2.235
43	331.667	1333.667	235.120	1	0.0000	1.936	1.974
43	331.667	1333.667	235.120	4	0.0000	1.974	1.936
44	331.667	1333.667	239.128	1	0.0000	1.983	2.031
44	331.667	1333.667	239.128	4	0.0000	2.032	1.984
45	331.667	1333.667	243.135	1	0.0000	2.033	2.092
45	331.667	1333.667	243.135	4	0.0000	2.093	2.034
46	349.000	1335.000	236.727	1	0.0000	1.975	1.997
46	349.000	1335.000	236.727	4	0.0000	1.997	1.975
47	349.000	1335.000	240.734	1	0.0000	1.875	1.911
47	349.000	1335.000	240.734	4	0.0000	1.910	1.874
48	349.000	1335.000	244.741	1	0.0000	1.890	1.938
48	349.000	1335.000	244.741	4	0.0000	1.938	1.890

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    349.0000=X-COOR.   1335.0000=Y-COOR.    240.7339=RADIUS      1.875=F.S.    47=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    349.0000=X-COOR.   1335.0000=Y-COOR.    240.7339=RADIUS      1.910=F.S.    47=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    349.0000=X-COOR.   1335.0000=Y-COOR.    240.7339=RADIUS      1.874=F.S.    47=SLIP#
```

ATTACHMENT # B
CALC 100340 1-6-(B)-06
2/0

NORMAL TERMINATION OF SLOPE

ATTACHMENT # B
CALC 166340-G(B)-06
PAGE 211



ATTACHMENT # B
CALC 100340 1-G(B)-06
PAGE 2/2

```
FILEINFO
SLOPEW 4.22
TITLE


03/29/2000
9:50:15 AM
ANALYSIS
    1     2     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL           4
    1 +1.3000e+002 +1.0000e+002 +2.5000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Soil
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION      0
AFUNCTION      0
POINT         24
    1 +1.6000e+002 +1.1380e+003
    2 +1.7800e+002 +1.1380e+003
    3 +2.1700e+002 +1.1360e+003
    4 +4.3800e+002 +1.0640e+003
    5 +4.4700e+002 +1.0640e+003
    6 +4.5200e+002 +1.0660e+003
    7 +4.7500e+002 +1.0650e+003
    8 +4.9800e+002 +1.0540e+003
    9 +1.6010e+002 +1.1330e+003
   10 +1.7800e+002 +1.1330e+003
   11 +2.1700e+002 +1.1310e+003
   12 +4.3700e+002 +1.0590e+003
   13 +1.6050e+002 +1.0900e+003
   14 +2.8200e+002 +1.0900e+003
   15 +3.5200e+002 +1.0800e+003
   16 +4.3400e+002 +1.0570e+003
   17 +4.4600e+002 +1.0500e+003
   18 +1.7400e+002 +1.1010e+003
```

```
   19 +3.0100e+002 +1.0990e+003
   20 +3.0000e+002 +1.0910e+003
   21 +1.7300e+002 +1.0930e+003
   22 +2.9700e+002 +1.3310e+003
   23 +2.6600e+002 +1.2790e+003
   24 +3.1800e+002 +1.2830e+003
LINE            4
    1      8
    1
    2
    3
    4
    5
    6
    7
    8
    2      9
    1
    9
   10
   11
   12
    5
    6
    7
    8
    3     11
    1
    9
   13
   14
   15
   16
   12
    5
    6
    7
    8
    4      8
    1
    9
   13
   14
   15
   16
   17
    8
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000      0
GRID
   23     24     22      3      3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
   18     19     21     20      2     21     19
AXIS
    0
LIMIT
0 +1.6000e+002 +4.9800e+002
```

ATTACHMENT # 12
CALC 100340 1-G(B)-06
2/4

```
SLIP            0
BLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
PORU            4 +0.0000e+000
    1 +0.0000e+000     0
    2 +0.0000e+000     0
    3 +0.0000e+000     0
    4 +0.0000e+000     0
PIEZ            4 +0.0000e+000
    1     0     0
    2     0     0
    3     0     0
    4     0     0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+5.0000e-002 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

ATTACHMENT # B
CALC 100340-HS(B)-06
215

03/29/2000
9:50:15 AM

1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	266.000	1279.000	179.427	0	0.0000	998.000	998.000
1	266.000	1279.000	179.427	0	0.0000	998.000	998.000
2	266.000	1279.000	183.434	0	0.0000	998.000	998.000
2	266.000	1279.000	183.434	0	0.0000	998.000	998.000
3	266.000	1279.000	187.441	0	0.0000	998.000	998.000
3	266.000	1279.000	187.441	0	0.0000	998.000	998.000
4	283.333	1280.333	181.033	1	0.0000	1.984	2.029
4	283.333	1280.333	181.033	4	0.0000	2.064	1.979
5	283.333	1280.333	185.040	1	0.0000	2.030	2.082
5	283.333	1280.333	185.040	4	0.0000	2.124	2.024
6	283.333	1280.333	189.047	0	0.0000	998.000	998.000
6	283.333	1280.333	189.047	0	0.0000	998.000	998.000
7	300.667	1281.667	182.639	1	0.0000	1.780	1.820
7	300.667	1281.667	182.639	4	0.0000	1.844	1.778
8	300.667	1281.667	186.646	1	0.0000	1.825	1.873
8	300.667	1281.667	186.646	4	0.0000	1.902	1.822
9	300.667	1281.667	190.653	1	0.0000	1.869	1.923
9	300.667	1281.667	190.653	4	0.0000	1.959	1.865
10	318.000	1283.000	184.245	1	0.0000	1.634	1.669
10	318.000	1283.000	184.245	4	0.0000	1.684	1.633
11	318.000	1283.000	188.252	1	0.0000	1.671	1.713
11	318.000	1283.000	188.252	4	0.0000	1.733	1.669
12	318.000	1283.000	192.260	1	0.0000	1.711	1.761
12	318.000	1283.000	192.260	4	0.0000	1.786	1.710
13	276.333	1296.333	196.921	0	0.0000	998.000	998.000
13	276.333	1296.333	196.921	0	0.0000	998.000	998.000
14	276.333	1296.333	200.928	0	0.0000	998.000	998.000
14	276.333	1296.333	200.928	0	0.0000	998.000	998.000
15	276.333	1296.333	204.935	0	0.0000	998.000	998.000
15	276.333	1296.333	204.935	0	0.0000	998.000	998.000
16	293.667	1297.667	198.527	1	0.0000	1.906	1.943
16	293.667	1297.667	198.527	4	0.0000	1.971	1.903
17	293.667	1297.667	202.534	1	0.0000	1.950	1.994
17	293.667	1297.667	202.534	4	0.0000	2.027	1.946
18	293.667	1297.667	206.541	1	0.0000	1.994	2.044
18	293.667	1297.667	206.541	4	0.0000	2.083	1.989
19	311.000	1299.000	200.133	1	0.0000	1.726	1.759
19	311.000	1299.000	200.133	4	0.0000	1.778	1.725
20	311.000	1299.000	204.140	1	0.0000	1.769	1.809
20	311.000	1299.000	204.140	4	0.0000	1.832	1.767
21	311.000	1299.000	208.147	1	0.0000	1.811	1.857
21	311.000	1299.000	208.147	4	0.0000	1.886	1.808
22	328.333	1300.333	201.739	1	0.0000	1.611	1.639
22	328.333	1300.333	201.739	4	0.0000	1.650	1.611
23	328.333	1300.333	205.746	1	0.0000	1.635	1.670
23	328.333	1300.333	205.746	4	0.0000	1.686	1.634
24	328.333	1300.333	209.754	1	0.0000	1.671	1.713
24	328.333	1300.333	209.754	4	0.0000	1.733	1.670
25	286.667	1313.667	214.414	1	0.0000	2.047	2.081

ATTACHMENT # B
CALC 1003401-G(B)-06
216

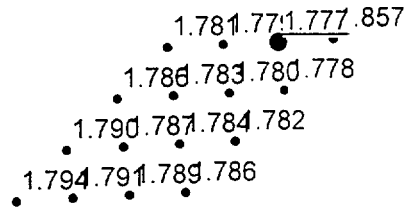
25	286.667	1313.667	214.414	4	0.0000	2.112	2.041
26	286.667	1313.667	218.422	0	0.0000	998.000	998.000
26	286.667	1313.667	218.422	0	0.0000	998.000	998.000
27	286.667	1313.667	222.429	0	0.0000	998.000	998.000
27	286.667	1313.667	222.429	0	0.0000	998.000	998.000
28	304.000	1315.000	216.020	1	0.0000	1.840	1.871
28	304.000	1315.000	216.020	4	0.0000	1.893	1.838
29	304.000	1315.000	220.028	1	0.0000	1.882	1.919
29	304.000	1315.000	220.028	4	0.0000	1.946	1.879
30	304.000	1315.000	224.035	1	0.0000	1.924	1.967
30	304.000	1315.000	224.035	4	0.0000	1.998	1.920
31	321.333	1316.333	217.626	1	0.0000	1.681	1.708
31	321.333	1316.333	217.626	4	0.0000	1.722	1.680
32	321.333	1316.333	221.634	1	0.0000	1.721	1.754
32	321.333	1316.333	221.634	4	0.0000	1.772	1.719
33	321.333	1316.333	225.641	1	0.0000	1.761	1.800
33	321.333	1316.333	225.641	4	0.0000	1.823	1.759
34	338.667	1317.667	219.233	1	0.0000	1.624	1.644
34	338.667	1317.667	219.233	4	0.0000	1.652	1.623
35	338.667	1317.667	223.240	1	0.0000	1.607	1.636
35	338.667	1317.667	223.240	4	0.0000	1.648	1.607
36	338.667	1317.667	227.247	1	0.0000	1.637	1.672
36	338.667	1317.667	227.247	4	0.0000	1.688	1.636
37	297.000	1331.000	231.908	1	0.0000	1.967	1.996
37	297.000	1331.000	231.908	4	0.0000	2.020	1.963
38	297.000	1331.000	235.916	1	0.0000	2.008	2.043
38	297.000	1331.000	235.916	4	0.0000	2.072	2.004
39	297.000	1331.000	239.923	0	0.0000	998.000	998.000
39	297.000	1331.000	239.923	0	0.0000	998.000	998.000
40	314.333	1332.333	233.514	1	0.0000	1.783	1.809
40	314.333	1332.333	233.514	4	0.0000	1.826	1.781
41	314.333	1332.333	237.522	1	0.0000	1.823	1.855
41	314.333	1332.333	237.522	4	0.0000	1.876	1.821
42	314.333	1332.333	241.529	1	0.0000	1.863	1.900
42	314.333	1332.333	241.529	4	0.0000	1.926	1.860
43	331.667	1333.667	235.120	1	0.0000	1.644	1.667
43	331.667	1333.667	235.120	4	0.0000	1.678	1.644
44	331.667	1333.667	239.128	1	0.0000	1.679	1.707
44	331.667	1333.667	239.128	4	0.0000	1.721	1.678
45	331.667	1333.667	243.135	1	0.0000	1.716	1.750
45	331.667	1333.667	243.135	4	0.0000	1.768	1.715
46	349.000	1335.000	236.727	1	0.0000	1.689	1.702
46	349.000	1335.000	236.727	4	0.0000	1.708	1.689
47	349.000	1335.000	240.734	1	0.0000	1.600	1.622
47	349.000	1335.000	240.734	4	0.0000	1.631	1.600
48	349.000	1335.000	244.741	1	0.0000	1.609	1.639
48	349.000	1335.000	244.741	4	0.0000	1.651	1.609

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    349.0000=X-COOR.   1335.0000=Y-COOR.    240.7339=RADIUS      1.600=F.S.    47=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    349.0000=X-COOR.   1335.0000=Y-COOR.    240.7339=RADIUS      1.631=F.S.    47=SLIP#
FORCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    349.0000=X-COOR.   1335.0000=Y-COOR.    240.7339=RADIUS      1.600=F.S.    47=SLIP#
```

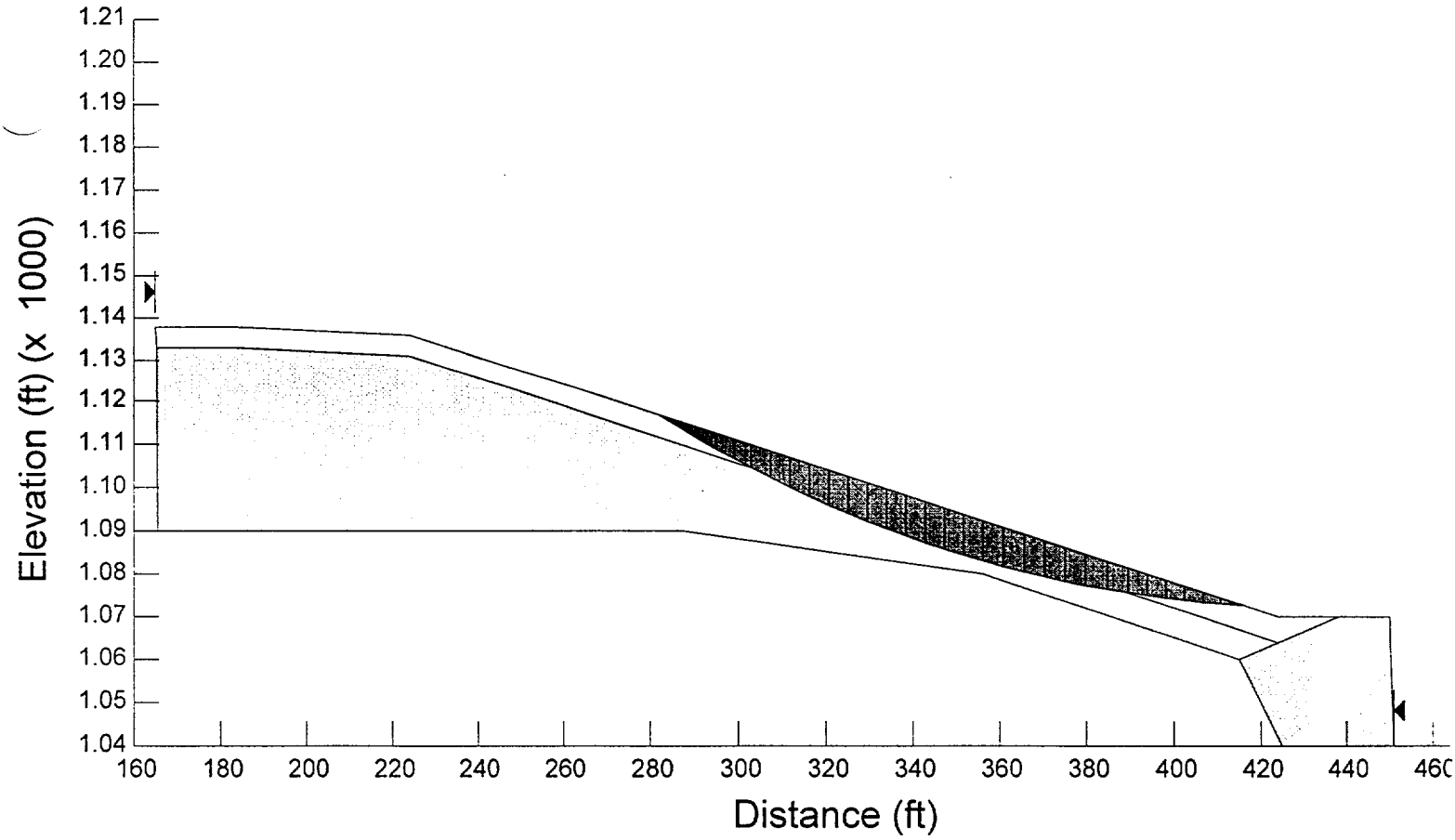
ATTACHMENT # B
CALC (00)4-1-GT(B)-06
217

NORMAL TERMINATION OF SLOPE

Attachment B
Calc 100340I-G(B)-06
Page 218



Section 3-3 5' Drainage Bedding/Topsoil & Cover Soil with Static Loading



Attachment B
Calc. 10034-01-EGE-05
Page 219

```
FILEINFO
   ?EW 4.22
TITLE
Stability Analysis -Unocal Moly Corp Sec 3-3

04/14/2000
9:30:07 AM
ANALYSIS
    1     0     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            4
    1 +1.2000e+002 +0.0000e+000 +2.8000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Upper Loamy Soil
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          23
    1 +1.6500e+002 +1.1380e+003
    2 +1.8400e+002 +1.1380e+003
    3 +2.2400e+002 +1.1360e+003
    4 +4.2400e+002 +1.0700e+003
    5 +4.5000e+002 +1.0700e+003
    6 +4.5100e+002 +1.0400e+003
    7 +1.6520e+002 +1.1330e+003
    8 +1.8400e+002 +1.1330e+003
    9 +2.2400e+002 +1.1310e+003
   10 +4.2400e+002 +1.0640e+003
   11 +4.3800e+002 +1.0700e+003
   12 +1.6540e+002 +1.0900e+003
   13 +2.8700e+002 +1.0900e+003
   14 +3.5600e+002 +1.0800e+003
   15 +4.1500e+002 +1.0600e+003
   16 +4.2500e+002 +1.0400e+003
   17 +3.0600e+002 +1.0990e+003
   18 +4.1200e+002 +1.0650e+003
```

Attachment B
Calc 100340-G(B)-06
Page 220

```
   19 +4.1100e+002 +1.0630e+003
   20 +3.0600e+002 +1.0960e+003
   21 +4.1000e+002 +1.3510e+003
   22 +3.7800e+002 +1.3180e+003
   23 +4.1400e+002 +1.3200e+003
LINE            4
    1      7
    1
    2
    3
    4
   11
    5
    6
    2      8
    1
    7
    8
    9
   10
   11
    5
    6
    3     10
    1
    7
   12
   13
   14
   15
   10
   11
    5
    6
    4      8
    1
    7
   12
   13
   14
   15
   16
    6
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000     0
GRID
   22     23     21      3      3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
   17     18     20     19      2     17     18
AXIS
    0
LIMIT
0 +1.6500e+002 +4.5100e+002
SLIP            0
BLOCK
    0      0      0      0      0 +1.3500e+002 +1.3500e+002 0 0
    0      0      0      0      0 +4.5000e+001 +4.5000e+001 0 0
```

Attachment B
Calc. 1003401-G(B)-06
Page 221

```
PORU            4 +0.0000e+000
    1 +2.5000e-001     0
    2 +2.5000e-001     0
    3 +2.5000e-001     0
    4 +0.0000e+000     0
PIEZ            4 +0.0000e+000
    1     0     0
    2     0     0
    3     0     0
    4     0     0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

Attachment B
Calc. 100340(-G(B)-06
Page 222

Stability Analysis -Unocal Moly Corp Sec 3-3

14/2000
9:30:07 AM

1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	378.000	1318.000	230.526	1	0.0000	1.763	1.796
1	378.000	1318.000	230.526	4	0.0000	1.794	1.761
2	378.000	1318.000	231.950	1	0.0000	1.773	1.811
2	378.000	1318.000	231.950	4	0.0000	1.810	1.772
3	378.000	1318.000	233.374	1	0.0000	1.781	1.824
3	378.000	1318.000	233.374	4	0.0000	1.823	1.780
4	390.000	1318.667	234.826	1	0.0000	1.761	1.793
4	390.000	1318.667	234.826	4	0.0000	1.791	1.759
5	390.000	1318.667	236.217	1	0.0000	1.771	1.808
5	390.000	1318.667	236.217	4	0.0000	1.807	1.770
6	390.000	1318.667	237.608	1	0.0000	1.780	1.821
6	390.000	1318.667	237.608	4	0.0000	1.820	1.778
7	402.000	1319.333	239.126	1	0.0000	1.759	1.790
7	402.000	1319.333	239.126	4	0.0000	1.789	1.757
8	402.000	1319.333	240.484	1	0.0000	1.769	1.805
8	402.000	1319.333	240.484	4	0.0000	1.804	1.768
9	402.000	1319.333	241.842	1	0.0000	1.778	1.818
9	402.000	1319.333	241.842	4	0.0000	1.817	1.776
10	414.000	1320.000	243.426	1	0.0000	1.757	1.787
10	414.000	1320.000	243.426	4	0.0000	1.786	1.756
11	414.000	1320.000	244.751	1	0.0000	1.767	1.802
11	414.000	1320.000	244.751	4	0.0000	1.801	1.766
12	414.000	1320.000	246.076	1	0.0000	1.776	1.815
12	414.000	1320.000	246.076	4	0.0000	1.814	1.774
13	388.667	1329.000	244.258	1	0.0000	1.760	1.791
13	388.667	1329.000	244.258	4	0.0000	1.790	1.759
14	388.667	1329.000	245.662	1	0.0000	1.770	1.806
14	388.667	1329.000	245.662	4	0.0000	1.805	1.769
15	388.667	1329.000	247.066	1	0.0000	1.778	1.819
15	388.667	1329.000	247.066	4	0.0000	1.817	1.777
16	400.667	1329.667	248.558	1	0.0000	1.758	1.788
16	400.667	1329.667	248.558	4	0.0000	1.787	1.757
17	400.667	1329.667	249.929	1	0.0000	1.768	1.803
17	400.667	1329.667	249.929	4	0.0000	1.802	1.767
18	400.667	1329.667	251.300	1	0.0000	1.777	1.815
18	400.667	1329.667	251.300	4	0.0000	1.814	1.775
19	412.667	1330.333	252.858	1	0.0000	1.756	1.785
19	412.667	1330.333	252.858	4	0.0000	1.784	1.755
20	412.667	1330.333	254.196	1	0.0000	1.767	1.800
20	412.667	1330.333	254.196	4	0.0000	1.799	1.765
21	412.667	1330.333	255.534	1	0.0000	1.775	1.812
21	412.667	1330.333	255.534	4	0.0000	1.811	1.774
22	424.667	1331.000	257.158	1	0.0000	1.754	1.783
22	424.667	1331.000	257.158	4	0.0000	1.782	1.753
23	424.667	1331.000	258.463	1	0.0000	1.765	1.797
23	424.667	1331.000	258.463	4	0.0000	1.796	1.764
24	424.667	1331.000	259.768	1	0.0000	1.773	1.810
24	424.667	1331.000	259.768	4	0.0000	1.809	1.772
25	399.333	1340.000	257.990	1	0.0000	1.758	1.786

Attachment R
Case 100401-GCG-06
Page 223

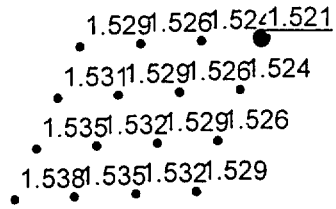
25	399.333	1340.000	257.990	4	0.0000	1.786	1.756
[illegible]	399.333	1340.000	259.374	1	0.0000	1.768	1.801
[illegible]	399.333	1340.000	259.374	4	0.0000	1.800	1.766
27	399.333	1340.000	260.758	1	0.0000	1.776	1.813
27	399.333	1340.000	260.758	4	0.0000	1.812	1.774
28	411.333	1340.667	262.290	1	0.0000	1.756	1.784
28	411.333	1340.667	262.290	4	0.0000	1.783	1.754
29	411.333	1340.667	263.642	1	0.0000	1.766	1.798
29	411.333	1340.667	263.642	4	0.0000	1.797	1.765
30	411.333	1340.667	264.992	1	0.0000	1.774	1.810
30	411.333	1340.667	264.992	4	0.0000	1.809	1.773
31	423.333	1341.333	266.590	1	0.0000	1.754	1.781
31	423.333	1341.333	266.590	4	0.0000	1.780	1.753
32	423.333	1341.333	267.909	1	0.0000	1.764	1.796
32	423.333	1341.333	267.909	4	0.0000	1.795	1.763
33	423.333	1341.333	269.226	1	0.0000	1.772	1.807
33	423.333	1341.333	269.226	4	0.0000	1.806	1.771
34	435.333	1342.000	270.890	1	0.0000	1.752	1.779
34	435.333	1342.000	270.890	4	0.0000	1.778	1.751
35	435.333	1342.000	272.176	1	0.0000	1.762	1.793
35	435.333	1342.000	272.176	4	0.0000	1.792	1.761
36	435.333	1342.000	273.460	1	0.0000	1.825	1.864
36	435.333	1342.000	273.460	4	0.0000	1.864	1.825
37	410.000	1351.000	271.723	1	0.0000	1.755	1.782
37	410.000	1351.000	271.723	4	0.0000	1.781	1.754
38	410.000	1351.000	273.087	1	0.0000	1.765	1.797
38	410.000	1351.000	273.087	4	0.0000	1.796	1.764
39	410.000	1351.000	274.450	1	0.0000	1.773	1.808
9	410.000	1351.000	274.450	4	0.0000	1.807	1.772
[illegible]	422.000	1351.667	276.023	1	0.0000	1.753	1.780
40	422.000	1351.667	276.023	4	0.0000	1.779	1.752
41	422.000	1351.667	277.354	1	0.0000	1.764	1.794
41	422.000	1351.667	277.354	4	0.0000	1.793	1.763
42	422.000	1351.667	278.684	1	0.0000	1.771	1.806
42	422.000	1351.667	278.684	4	0.0000	1.805	1.770
43	434.000	1352.333	280.323	1	0.0000	1.752	1.778
43	434.000	1352.333	280.323	4	0.0000	1.777	1.751
44	434.000	1352.333	281.621	1	0.0000	1.762	1.792
44	434.000	1352.333	281.621	4	0.0000	1.791	1.761
45	434.000	1352.333	282.918	1	0.0000	1.788	1.823
45	434.000	1352.333	282.918	4	0.0000	1.823	1.788
46	446.000	1353.000	284.623	1	0.0000	1.826	1.856
46	446.000	1353.000	284.623	4	0.0000	1.857	1.826
47	446.000	1353.000	285.888	1	0.0000	1.873	1.910
47	446.000	1353.000	285.888	4	0.0000	1.911	1.874
48	446.000	1353.000	287.152	1	0.0000	1.900	1.942
48	446.000	1353.000	287.152	4	0.0000	1.943	1.901

```
-----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
-----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    434.0000=X-COOR.   1352.3334=Y-COOR.    280.3227=RADIUS      1.752=F.S.    43=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    434.0000=X-COOR.   1352.3334=Y-COOR.    280.3227=RADIUS      1.777=F.S.    43=SLIP#
  ?CE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    434.0000=X-COOR.   1352.3334=Y-COOR.    280.3227=RADIUS      1.751=F.S.    43=SLIP#
```

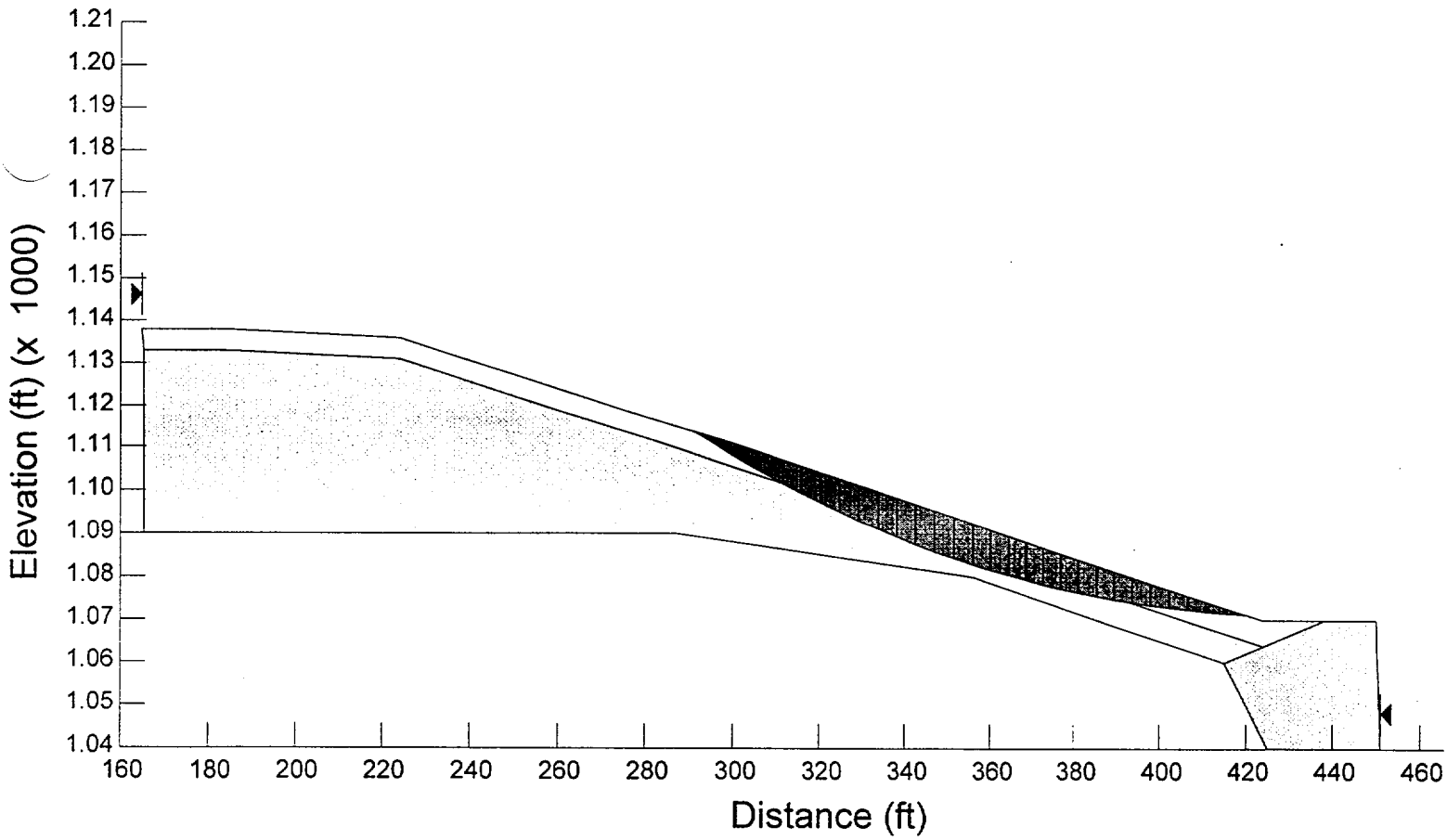
Attachment B
Calc 1003401-G(B)-06
Page 224

MAL TERMINATION OF SLOPE

Attachment B
Calc 100340(-GCG)-06
Page 225



Section 3-3 5' Drainage Bedding/Topsoil & Cover Soil with Seismic Loading



Attachment B
Calc 100401-G(B)-06
Page 226

```
FILEINFO
   PEW 4.22
TLE
Stability Analysis -Unocal Moly Corp Sec 3-3

04/14/2000
9:12:56 AM
ANALYSIS
    1     0     1 +6.2400e+001     0     0
CONVERGE
   30 +1.0000e-002  1000
SIDE
    1
LAMBDA
+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
SOIL            4
    1 +1.2000e+002 +0.0000e+000 +2.8000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Loamy Soil
    2 +1.1500e+002 +0.0000e+000 +3.0000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Lower Soil
    3 +1.2500e+002 +0.0000e+000 +3.2000e+001 +0.0000e+000 +0.0000e+000 +0.0000e+000   1  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Embankment
    4 -1.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   4  0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000   0   0
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
      +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
Bedrock
SFUNCTION       0
AFUNCTION       0
POINT          23
    1 +1.6500e+002 +1.1380e+003
    2 +1.8400e+002 +1.1380e+003
    3 +2.2400e+002 +1.1360e+003
    4 +4.2400e+002 +1.0700e+003
    5 +4.5000e+002 +1.0700e+003
    6 +4.5100e+002 +1.0400e+003
    7 +1.6520e+002 +1.1330e+003
    8 +1.8400e+002 +1.1330e+003
    9 +2.2400e+002 +1.1310e+003
   10 +4.2400e+002 +1.0640e+003
   11 +4.3800e+002 +1.0700e+003
   12 +1.6540e+002 +1.0900e+003
   13 +2.8700e+002 +1.0900e+003
   14 +3.5600e+002 +1.0800e+003
   15 +4.1500e+002 +1.0600e+003
   16 +4.2500e+002 +1.0400e+003
   17 +3.0600e+002 +1.0990e+003
   18 +4.1200e+002 +1.0650e+003
```

Attachment B
Calc 100340I-GCB-06
Page 227

```
   19 +4.1100e+002 +1.0630e+003
   20 +3.0600e+002 +1.0960e+003
   21 +3.9500e+002 +1.3290e+003
   22 +3.8100e+002 +1.2960e+003
   23 +4.2000e+002 +1.2980e+003
LINE            4
    1     7
    1
    2
    3
    4
   11
    5
    6
    2     8
    1
    7
    8
    9
   10
   11
    5
    6
    3    10
    1
    7
   12
   13
   14
   15
   10
   11
    5
    6
    4     8
    1
    7
   12
   13
   14
   15
   16
    6
TENSION
    0 +9.8070e+000 +0.0000e+000 +0.0000e+000     0
GRID
   22    23    21     3     3 0 +0.0000e+000 0 +0.0000e+000
RADIUS
   17    18    20    19     2    17    18
AXIS
    0
LIMIT
0 +1.6500e+002 +4.5100e+002
SLIP            0
BLOCK
    0     0     0     0     0 +1.3500e+002 +1.3500e+002 0 0
    0     0     0     0     0 +4.5000e+001 +4.5000e+001 0 0
```

Attachment B
Calc. 100340I-GCB-06
Page 228

```
PORU            4 +0.0000e+000
    1 +0.0000e+000      0
    2 +0.0000e+000      0
    3 +0.0000e+000      0
    4 +0.0000e+000      0
PIEZ            4 +0.0000e+000
    1      0      0
    2      0      0
    3      0      0
    4      0      0
PCON            0 +0.0000e+000
POGH            0 +0.0000e+000
POGP            0 +0.0000e+000
POGR            0 +0.0000e+000
PORA            4
    1 +0.0000e+000
    2 +0.0000e+000
    3 +0.0000e+000
    4 +0.0000e+000
LOAD            0
ANCHOR          0
PBOUNDARY       0
SEISMIC
+5.0000e-002 +0.0000e+000 +0.0000e+000 +0.0000e+000
NODE            0
ELEMENT         0
MATLCOLOR       4
    1   255   255   128
    2   191   255   128
    3   128   255   128
    4   128   255   191
```

Attachment B
Calc 100340(-GCB)-[illegible]
Page 229

Stability Analysis -Unocal Moly Corp Sec 3-3

[illegible]4/2000
9:12:56 AM

1=METHOD 48=NO. OF SLIP SURFACES 3=NO. OF RADII 1=SIDE FUNCTION TYPE

SLIP NO.	X-COORD.	Y-COORD.	RADIUS	ITERATION NO.	LAMBDA	FACTOR OF SAFETY (MOMENT)	FACTOR OF SAFETY (FORCE)
1	381.000	1296.000	210.493	1	0.0000	1.508	1.531
1	381.000	1296.000	210.493	4	0.0000	1.538	1.506
2	381.000	1296.000	211.889	1	0.0000	1.517	1.544
2	381.000	1296.000	211.889	4	0.0000	1.552	1.516
3	381.000	1296.000	213.286	1	0.0000	1.525	1.555
3	381.000	1296.000	213.286	4	0.0000	1.565	1.524
4	394.000	1296.667	215.099	1	0.0000	1.506	1.528
4	394.000	1296.667	215.099	4	0.0000	1.535	1.504
5	394.000	1296.667	216.459	1	0.0000	1.515	1.541
5	394.000	1296.667	216.459	4	0.0000	1.549	1.514
6	394.000	1296.667	217.819	1	0.0000	1.523	1.551
6	394.000	1296.667	217.819	4	0.0000	1.561	1.521
7	407.000	1297.333	219.704	1	0.0000	1.504	1.525
7	407.000	1297.333	219.704	4	0.0000	1.532	1.502
8	407.000	1297.333	221.029	1	0.0000	1.513	1.538
8	407.000	1297.333	221.029	4	0.0000	1.546	1.512
9	407.000	1297.333	222.353	1	0.0000	1.521	1.548
9	407.000	1297.333	222.353	4	0.0000	1.558	1.520
10	420.000	1298.000	224.310	1	0.0000	1.502	1.523
10	420.000	1298.000	224.310	4	0.0000	1.529	1.501
[illegible]	420.000	1298.000	225.599	1	0.0000	1.511	1.535
[illegible]	420.000	1298.000	225.599	4	0.0000	1.543	1.510
12	420.000	1298.000	226.887	1	0.0000	1.519	1.546
12	420.000	1298.000	226.887	4	0.0000	1.555	1.518
13	385.667	1307.000	222.393	1	0.0000	1.506	1.527
13	385.667	1307.000	222.393	4	0.0000	1.535	1.505
14	385.667	1307.000	223.786	1	0.0000	1.515	1.540
14	385.667	1307.000	223.786	4	0.0000	1.548	1.514
15	385.667	1307.000	225.179	1	0.0000	1.522	1.551
15	385.667	1307.000	225.179	4	0.0000	1.560	1.521
16	398.667	1307.667	226.999	1	0.0000	1.504	1.525
16	398.667	1307.667	226.999	4	0.0000	1.532	1.503
17	398.667	1307.667	228.356	1	0.0000	1.513	1.537
17	398.667	1307.667	228.356	4	0.0000	1.545	1.512
18	398.667	1307.667	229.713	1	0.0000	1.521	1.548
18	398.667	1307.667	229.713	4	0.0000	1.557	1.519
19	411.667	1308.333	231.604	1	0.0000	1.502	1.522
19	411.667	1308.333	231.604	4	0.0000	1.529	1.501
20	411.667	1308.333	232.925	1	0.0000	1.511	1.534
20	411.667	1308.333	232.925	4	0.0000	1.542	1.510
21	411.667	1308.333	234.246	1	0.0000	1.519	1.545
21	411.667	1308.333	234.246	4	0.0000	1.554	1.518
22	424.667	1309.000	236.209	1	0.0000	1.500	1.520
22	424.667	1309.000	236.209	4	0.0000	1.526	1.499
23	424.667	1309.000	237.495	1	0.0000	1.510	1.532
23	424.667	1309.000	237.495	4	0.0000	1.540	1.509
24	424.667	1309.000	238.780	1	0.0000	1.517	1.542
[illegible]	424.667	1309.000	238.780	4	0.0000	1.551	1.516
[illegible]5	390.333	1318.000	234.293	1	0.0000	1.504	1.525

25	390.333	1318.000	234.293	4	0.0000	1.531	1.503
	390.333	1318.000	235.682	1	0.0000	1.513	1.537
.o	390.333	1318.000	235.682	4	0.0000	1.545	1.512
27	390.333	1318.000	237.072	1	0.0000	1.520	1.547
27	390.333	1318.000	237.072	4	0.0000	1.556	1.519
28	403.333	1318.667	238.898	1	0.0000	1.502	1.522
28	403.333	1318.667	238.898	4	0.0000	1.529	1.501
29	403.333	1318.667	240.252	1	0.0000	1.511	1.534
29	403.333	1318.667	240.252	4	0.0000	1.542	1.510
30	403.333	1318.667	241.606	1	0.0000	1.519	1.544
30	403.333	1318.667	241.606	4	0.0000	1.553	1.518
31	416.333	1319.333	243.504	1	0.0000	1.501	1.520
31	416.333	1319.333	243.504	4	0.0000	1.526	1.500
32	416.333	1319.333	244.822	1	0.0000	1.510	1.532
32	416.333	1319.333	244.822	4	0.0000	1.539	1.509
33	416.333	1319.333	246.140	1	0.0000	1.517	1.542
33	416.333	1319.333	246.140	4	0.0000	1.550	1.516
34	429.333	1320.000	248.109	1	0.0000	1.499	1.517
34	429.333	1320.000	248.109	4	0.0000	1.524	1.498
35	429.333	1320.000	249.392	1	0.0000	1.508	1.529
35	429.333	1320.000	249.392	4	0.0000	1.536	1.507
36	429.333	1320.000	250.673	1	0.0000	1.529	1.554
36	429.333	1320.000	250.673	4	0.0000	1.563	1.529
37	395.000	1329.000	246.193	1	0.0000	1.503	1.522
37	395.000	1329.000	246.193	4	0.0000	1.529	1.502
38	395.000	1329.000	247.579	1	0.0000	1.512	1.534
38	395.000	1329.000	247.579	4	0.0000	1.542	1.511
39	395.000	1329.000	248.965	1	0.0000	1.519	1.544
9	395.000	1329.000	248.965	4	0.0000	1.553	1.518
.0	408.000	1329.667	250.798	1	0.0000	1.501	1.520
40	408.000	1329.667	250.798	4	0.0000	1.526	1.500
41	408.000	1329.667	252.149	1	0.0000	1.510	1.531
41	408.000	1329.667	252.149	4	0.0000	1.539	1.509
42	408.000	1329.667	253.499	1	0.0000	1.517	1.541
42	408.000	1329.667	253.499	4	0.0000	1.550	1.516
43	421.000	1330.333	255.403	1	0.0000	1.499	1.518
43	421.000	1330.333	255.403	4	0.0000	1.524	1.498
44	421.000	1330.333	256.718	1	0.0000	1.508	1.529
44	421.000	1330.333	256.718	4	0.0000	1.536	1.507
45	421.000	1330.333	258.033	1	0.0000	1.515	1.539
45	421.000	1330.333	258.033	4	0.0000	1.547	1.514
46	434.000	1331.000	260.009	1	0.0000	1.498	1.515
46	434.000	1331.000	260.009	4	0.0000	1.521	1.497
47	434.000	1331.000	261.288	1	0.0000	1.513	1.534
47	434.000	1331.000	261.288	4	0.0000	1.541	1.512
48	434.000	1331.000	262.566	1	0.0000	1.559	1.585
48	434.000	1331.000	262.566	4	0.0000	1.595	1.560

```
----------------------------------------
| SUMMARY OF MINIMUM FACTORS OF SAFETY |
----------------------------------------
MOMENT EQUILIBRIUM: FELLENIUS OR ORDINARY METHOD
    434.0000=X-COOR.   1331.0000=Y-COOR.    260.0087=RADIUS      1.498=F.S.    46=SLIP#
MOMENT EQUILIBRIUM: BISHOP SIMPLIFIED METHOD
    434.0000=X-COOR.   1331.0000=Y-COOR.    260.0087=RADIUS      1.521=F.S.    46=SLIP#
  RCE EQUILIBRIUM: JANBU SIMPLIFIED METHOD (NO fo FACTOR)
    434.0000=X-COOR.   1331.0000=Y-COOR.    260.0087=RADIUS      1.497=F.S.    46=SLIP#
```

Attachment B
Calc 100340(-EC(B)-06
Page 231

VAL TERMINATION OF SLOPE

ATTACHMENT 2

BORING LOGS

Taken from "Washington Facility Environmental Report, prepared for Unical/Molycorp by ICF Kaiser, April 1997.

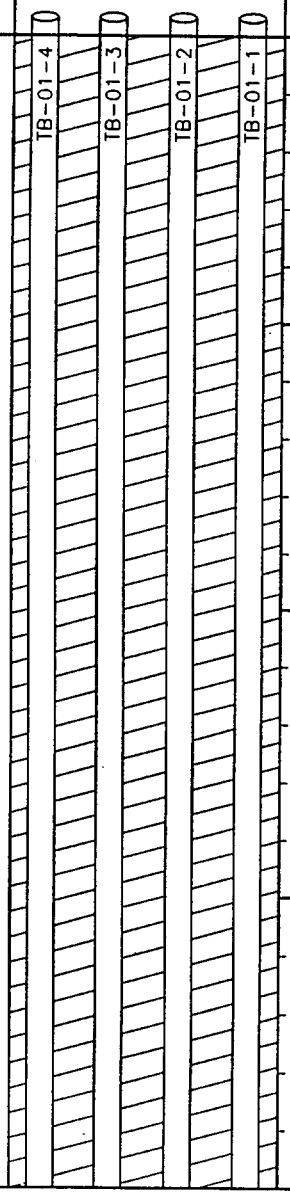
ICF KAISER ENGINEERS — BORING LOG

20152001

PROJECT NAME: Molycorp	WATER LEVELS BELOW CASING: TOC WELL LEVEL	BORING NO. TB-01
PROJECT LOCATION: Washington, Pa.	TB-01-1 = 39.11'	G.S. EL. 1121.16
DRILLING FIRM: Geo Environmental	TB-01-2 = 61.54'	TB-01-1 1121.55
DRILLING METHOD: Auger/Rock Core	TB-01-3 = 76.72'	TB-01-2 1121.23
LOGGED BY: Dave Cercone	TB-01-4 = 98.62'	TB-01-3 1121.13
	NORTHING 12,367.75	CASING EL. TB-01-4 1120.93
	EASTING 9,925.52	START DATE: 1-20-97
		FINISH DATE: 2-21-97

DEPTH	ELEVATION	RQD	RECOVERY (ft.)	CORE RUN NUMBERS	MATERIAL DESCRIPTION
					0'-11' SILT AND CLAY, Brown, Dry to Damp, Trace Rock Fragments.
5					
10					11'-14' SILT AND CLAY, Yellow Brown, Dry-Damp, Trace Rock Fragments.
15		30%	9.6'	RUN #1	14.1'-16.2' MUDSTONE, Grey, Very Soft, Slight-Moderate Weathering, Few Vertical Fractures. Very Broken-Broken.
20					

PIEZOMETER



NOTES:
1. Depths and Elevations in feet unless otherwise noted.

6786100300

ICF KAISER ENGINEERS — BORING LOG

2015200

PROJECT NAME: Molycorp

PROJECT LOCATION: Washington, Pa.

DRILLING FIRM: Geo Environmental

DRILLING METHOD: Auger/Rock Core

LOGGED BY: Dave Cercone

WATER LEVELS BELOW CASING:
TOC WELL LEVEL
TB-01-1 = 39.11'
TB-01-2 = 61.54'
TB-01-3 = 76.72'
TB-01-4 = 98.62'

NORTHING 12,367.75

EASTING 9,925.52

BORING NO. TB-01

G.S. EL. 1121.16

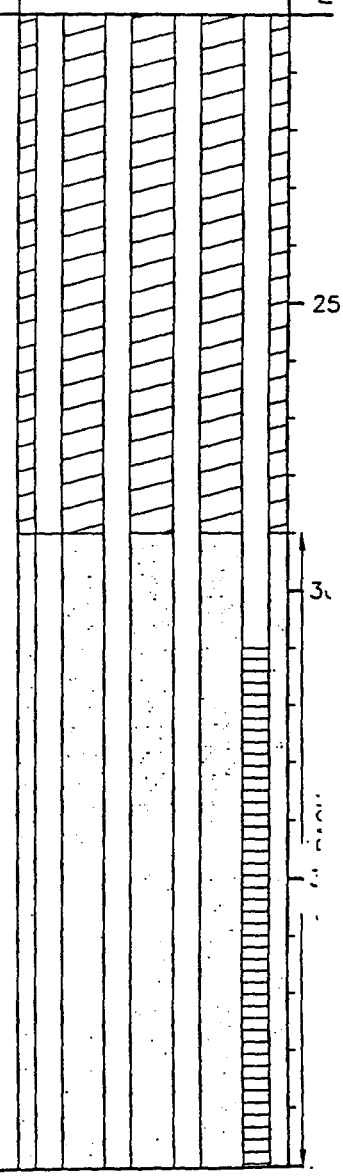
CASING EL. TB-01-1 1121.5
TB-01-2 1121.2
TB-01-3 1121.13
TB-01-4 1120.9

START DATE: 1-20-97

FINISH DATE: 2-21-97

DEPTH	ELEVATION	RQD	RECOVERY (ft.)	OVM (ppm)	CORE RUN NUMBERS	MATERIAL DESCRIPTION
						16.2'-24.3' SHALE, Dark-Grey-Black Carbonaceous, Soft, Slightly Weathered, Bedding Planes are Weak and Break Readily, Stained Vertical Fractures are Common, Abrupt Contact w/ Grey Mudstone.
25		95%	10.2	0	RUN #2	24.3'-26.7' MUDSTONE, Grey Grading into Grey Sandstone, Very Soft to Soft, Slightly Weathered, Fractured at Sandstone Interface-Oxidized.
						26.7'-34.0' SANDSTONE, Laminated, Fine Grained (Horsetail Laminations), Horizontal Fractures, Iron-Stained Zones, 7 Zones in Sandstone.
30						
35		70%	9.7	0	RUN #3	34.0'-42.1' SANDSTONE, Laminated, Same as Above.
40						

PIEZOMETER



NOTES:
1. Depths and Elevations in feet unless otherwise noted.

6786100300

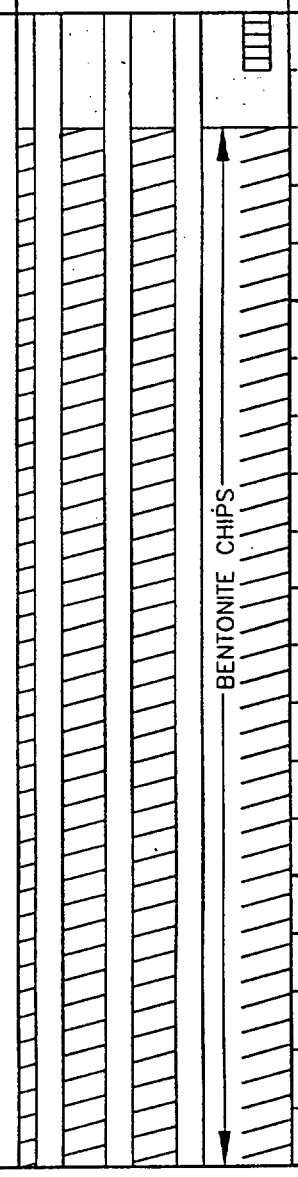
20152003

ICF KAISER ENGINEERS — BORING LOG

PROJECT NAME: Molycorp	WATER LEVELS BELOW CASING:	BORING NO. TB-01
PROJECT LOCATION: Washington, Pa.	TOC WELL LEVEL TB-01-1 = 39.11' TB-01-2 = 61.54' TB-01-3 = 76.72' TB-01-4 = 98.62'	G.S. EL. 1121.16
DRILLING FIRM: Geo Environmental		CASING EL. TB-01-1 1121.55 TB-01-2 1121.23 TB-01-3 1121.13 TB-01-4 1120.93
DRILLING METHOD: Auger/Rock Core	NORTHING 12,367.75	START DATE: 1-20-97
LOGGED BY: Dave Cercone	EASTING 9,925.52	FINISH DATE: 2-21-97

DEPTH	ELEVATION	RQD	RECOVERY (ft.)	OVM (ppm)	CORE RUN NUMBERS	MATERIAL DESCRIPTION
						42.1'-42.6' COAL, Poor Quality.
						42.6'-43.7' MUDSTONE, Grey.
		50%	10'	0	RUN #4	43.7'-46.3' SHALE, Grey Medium Hard, Slight Weathering, Stained Fractures, Broken.
45						
						46.3'-47.8' SHALE/SANDSTONE Grey, Very Fine-Fine Grained, Medium Hard-Hard, Not Weathered, No Fractures, Horsetail Laminates at Contacts w/ Overlying and Underlying Shales.
						47.8'-55.8' SHALE, Grey-Black, Fissle.
50						
		60%	1'	0	RUN #5	
		90%	10'	0	RUN #6	
55						
						55.8'-62.6' LIMESTONE, Light-Dark Grey, Hard, Micritic, Some Zones Have Laminations, No Fractures.
60						

PIEZOMETER



NOTES:
1. Depths and Elevations in feet unless otherwise noted.

6786100300

2015200

ICF KAISER ENGINEERS — BORING LOG

PROJECT NAME: Molycorp

PROJECT LOCATION: Washington, Pa.

DRILLING FIRM: Geo Environmental

DRILLING METHOD: Auger/Rock Core

LOGGED BY: Dave Cercone

WATER LEVELS BELOW CASING:
TOC WELL LEVEL
TB-01-1 = 39.11'
TB-01-2 = 61.54'
TB-01-3 = 76.72'
TB-01-4 = 98.62'

NORTHING 12,367.75

EASTING 9,925.52

BORING NO. TB-01

G.S. EL. 1121.16

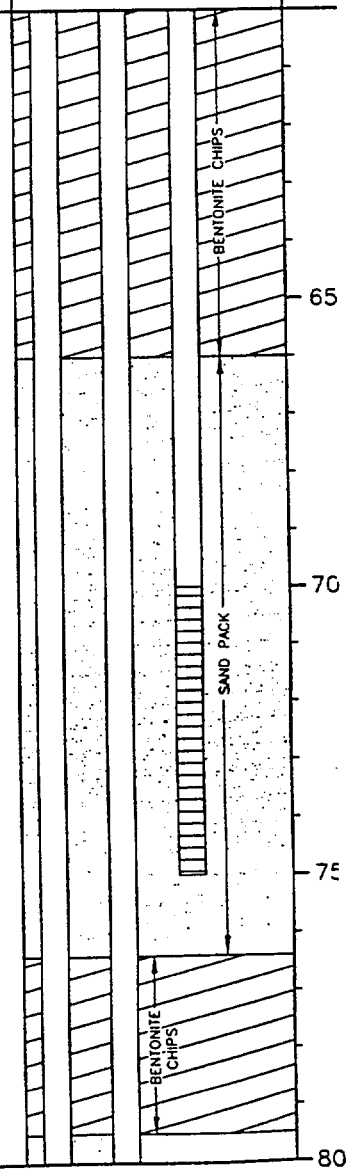
CASING EL. TB-01-1 1121.55
TB-01-2 1121.23
TB-01-3 1121.13
TB-01-4 1120.93

START DATE: 1-20-97

FINISH DATE: 2-21-97

DEPTH	ELEVATION	RQD	RECOVERY (ft.)	OVM (ppm)	CORE RUN NUMBERS	MATERIAL DESCRIPTION
						62.6'-62.9' MUDSTONE, Dark Grey, No Features.
						62.9'-64.1' LIMESTONE, Dark Grey, Soft, Fractured w/ Iron Stains.
65		100%	3.5'	0	RUN #7	64.1'-67.6' LIMESTONE, Soft, Medium-Hard.
70		95%	6.2'	0	RUN #8	67.6'-70.6' SHALE, Grey, Unfractured, Fissle, Soft-Medium Hard, Sharp Contact.
						70.6'-71.2' SHALE, Black, Carbonaceous, No Stains or Fractures.
						71.2'-73.0' SANDSTONE, Black/Grey, Hard, No Fractures, Laminated Near Bottom, Sharp Contact.
						73.0'-73.9' SHALE, Black, Carbonaceous, Fractures @ 73.4, Grades into Grey Mudstone From 73.5 to 73.9.
75		90%	9'		RUN #9	73.9'-83.9' LIMESTONE, Fractures @ 74 Ft. Thru 75 Ft. and Again @ 79.3 Ft. All Fractures are Stained, Hard.
80						

PIEZOMETER



NOTES:
1. Depths and Elevations in feet unless otherwise noted.

6786100300

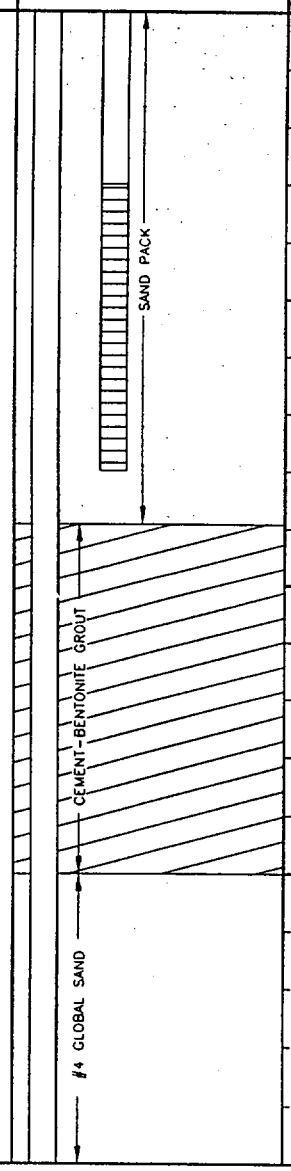
ICF KAISER ENGINEERS — BORING LOG

20152005

PROJECT NAME: Molycorp	WATER LEVELS BELOW CASING: TOC WELL LEVEL	BORING NO. TB-01
PROJECT LOCATION: Washington, Pa.	TB-01-1 = 39.11'	G.S. EL. 1121.16
DRILLING FIRM: Geo Environmental	TB-01-2 = 61.54'	TB-01-1 1121.55
	TB-01-3 = 76.72'	TB-01-2 1121.23
DRILLING METHOD: Auger/Rock Core	TB-01-4 = 98.62'	TB-01-3 1121.13
	NORTHING 12,367.75	CASING EL. TB-01-4 1120.93
LOGGED BY: Dave Cercone	EASTING 9,925.52	START DATE: 1-20-97
		FINISH DATE: 2-21-97

DEPTH	ELEVATION	RQD	RECOVERY (ft.)	OVM (ppm)	CORE RUN NUMBERS	MATERIAL DESCRIPTION
						83.9'-84.1' LIMESTONE, Carbonaceous, Gradational Contact w/ Underlying Coal/ Carb, Shale.
		90%	10'		RUN #10	84.1'-85' SHALE, Carbonaceous, Soft, Grades into Coal, Medium Hard.
85						85'-85.8' COAL, Highly Fractured, Fractures not Stained.
						85.8'-87.0' SHALE, Carbonaceous.
						87.0'-94.5' LIMESTONE, Grey, Fractures are not Open and are not Stained, a well Preserved Closed Fracture @ 91 Ft.
90						
		100%	10'		RUN #11	
95						94.5'-100.4' SHALE, Grey, Hard, Sandstone Inclusions, No Open Fractures, Mineralized.
100						

PIEZOMETER



NOTES:
1. Depths and Elevations in feet unless otherwise noted.

6786100300

2015200

ICF KAISER ENGINEERS — BORING LOG

PROJECT NAME: Molycorp

PROJECT LOCATION: Washington, Pa.

DRILLING FIRM: Geo Environmental

DRILLING METHOD: Auger/Rock Core

LOGGED BY: Dave Cercone

WATER LEVELS BELOW CASING:
TOC WELL LEVEL
TB-01-1 = 39.11'
TB-01-2 = 61.54'
TB-01-3 = 76.72'
TB-01-4 = 98.62'

NORTHING 12,367.75

EASTING 9,925.52

BORING NO. TB-01

G.S. EL. 1121.16

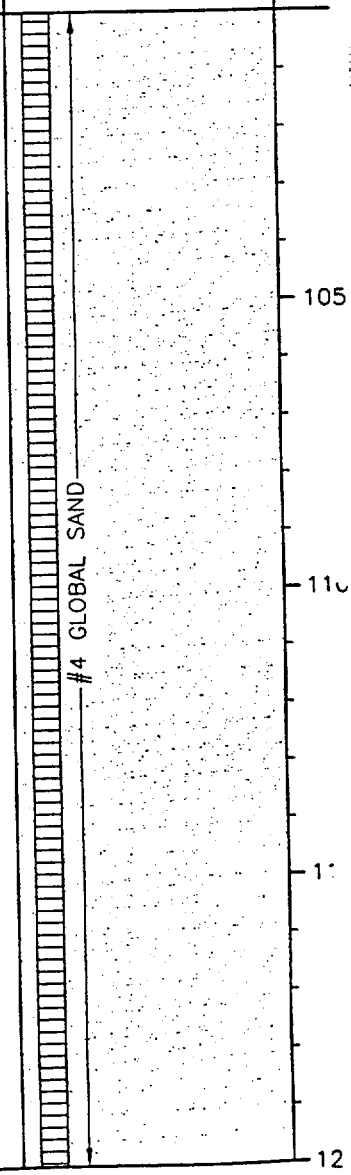
CASING EL. TB-01-1 1121.55
TB-01-2 1121.23
TB-01-3 1121.13
TB-01-4 1120.93

START DATE: 1-20-97

FINISH DATE: 2-21-97

DEPTH	ELEVATION	RQD	RECOVERY (ft.)	OVM (ppm)	CORE RUN NUMBERS	MATERIAL DESCRIPTION
						100.4'-101.1' SANDSTONE, Grey, Very Fine Grained, Hard, Lacks Fracture.
						101.1'-103.9' SHALE, Grey.
		100%	10'		RUN #12	103.9'-112.8' SHALE, Grey, No Stained Fractures or Open Fractures.
105						
110						
						112.8'-115.0' LIMESTONE, Grey to Black, No Fractures.
		100%	10'		RUN #13	115.0'-118.9' SHALE, Grey.
115						
120						Total Depth, 121 Ft.

PIEZOMETER



NOTES:
1. Depths and Elevations in feet unless otherwise noted.

6786100300

ICF KAISER ENGINEERS

BORING LOG

PROJECT NAME: Molycorp
PROJECT LOCATION: Washington, PA. facility
DRILLING FIRM: Geo Environmental
DRILLING METHOD: Auger/3" Rock Core/ 6" Hammer
LOGGED BY: Dave Cercone

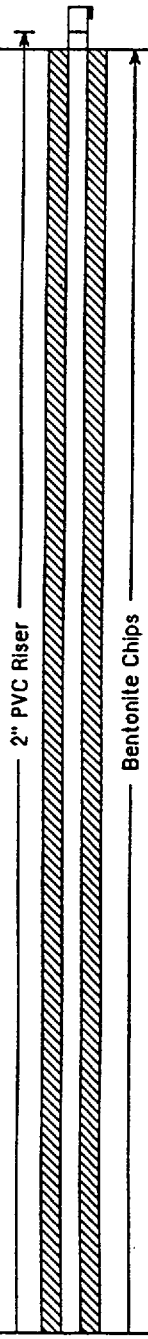
WATER LEVELS RELATIVE TO TOC
DEPTH TO WATER: 17.86
17.86

NORTHING: 9783.07
EASTING: 12655.12

BORING NO.: TB-02
G.S. ELEV.: 1077.36
CASING ELEV.: 1079.07
START DATE: 1/29/97
FINISH DATE: 1/31/97

DEPTH	RQD (%)	REC. (FT)	CORE RUN NUMBERS	MATERIAL DESCRIPTION
				Augered to 10 feet.
5				0-10 SILTY CLAY, brown to dark brown, little rock fragments, soft
10	70	1.0	Run #1	10-11 LIMESTONE, Hard. 11-12.5 Possible MUDSTONE, very soft, this zone washed out during drilling.
	90	2.0	Run #2	12.5-15.4 LIMESTONE, very hard, iron stained, no fractures.
15				

PIEZOMETER



NOTES:

1. Depths and Elevations in feet unless otherwise noted

ICF KAISER ENGINEERS

BORING LOG

PROJECT NAME: Molycorp
PROJECT LOCATION: Washington, PA. facility
DRILLING FIRM: Geo Environmental
DRILLING METHOD: Auger/3" Rock Core/ 6" Hammer
LOGGED BY: Dave Cercone

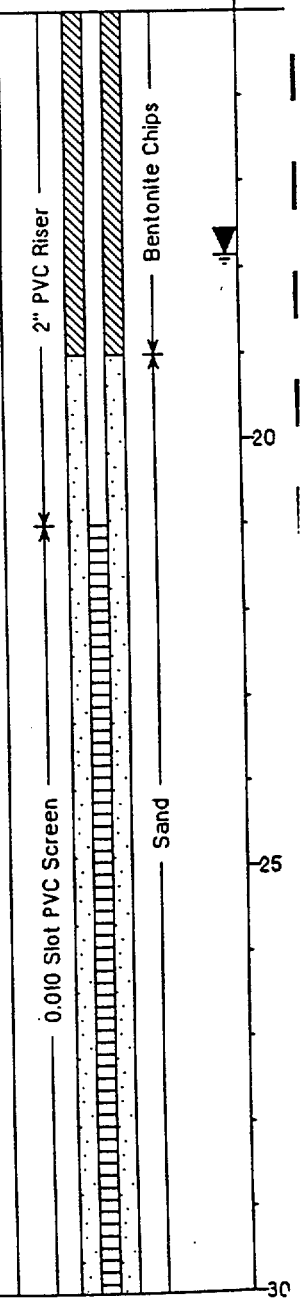
WATER LEVELS RELATIVE TO TOC
DEPTH TO WATER: 17.86
17.86

NORTHING: 9783.07
EASTING: 12655.12

BORING NO.: TB-02
G.S. ELEV.: 1077.36
CASING ELEV.: 1079.07
START DATE: 1/29/97
FINISH DATE: 1/31/97

DEPTH	RQD (%)	REC. (FT)	CORE RUN NUMBERS	MATERIAL DESCRIPTION
	100	2.5	Run #3	15.4-25 MUDSTONE, Olive grey-grey-grey brown, iron stained, horizontal and vertical fractures from 17.5-25 with iron staining, soft, friable to blocky, badly broken.
	NA	2.5	Run #4	
20	30	2.5	Run #5	
	40	2.0	Run #6	
25	80	2.3	Run #7	25-25.2 SHALE, black, friable, carbonaceous, soft, lacks iron stains. 25.2-26.1 SHALE, dark grey, calcareous. 26.1-26.7 MUDSTONE, dark grey to very dark grey, soft 26.7-27.5 LIMESTONE, shaley, dark grey, medium hard, lacks open fractures.
	15	2.0	Run #8	27.5-28 MUDSTONE, grey, medium hard, weathered, closed fractures. 28-34.5 LIMESTONE, grey, hard.
30	70	5.0	Run #9	

PIEZOMETER



NOTES:

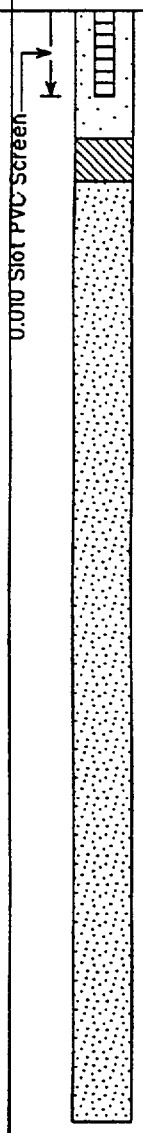
1. Depths and Elevations in feet unless otherwise noted

ICF KAISER ENGINEERS — BORING LOG

PROJECT NAME: Molycorp	WATER LEVELS RELATIVE TO TOC	BORING NO. TB-02
PROJECT LOCATION: Washington, PA. facility	DEPTH TO WATER 17.86	G.S. ELEV. 1077.36
DRILLING FIRM: Geo Environmental	17.86	CASING ELEV. 1079.07
DRILLING METHOD: Auger/3" Rock Core/ 6" Hammer	NORTHING 9783.07	START DATE 1/29/97
LOGGED BY: Dave Cercone	EASTING 12655.12	FINISH DATE 1/31/97

DEPTH	RQD (%)	REC. (FT)	CORE RUN NUMBERS	MATERIAL DESCRIPTION
	70	5.0	Run #9	LIMESTONE Same as above.
35	40	4.0	Run #10	34.5-35 MUDSTONE, soft, fissile.
				35-37.3 LIMESTONE, grey, hard, some vertical and horizontal fractures.
				37.3-38 SHALE/MUDSTONE, black, horizontal laminations, soft.
				38-39 SHALE, carbonaceous, fractured.
40	40	4.0	Run #11	39-41 SHALE AND COAL, black, medium hard, carbonaceous, fractured.
				41-43 LIMESTONE, dark grey-black, hard.
45				Total Depth, 43 ft. 3" core extended to total depth while the 6" reaming went to only 35 feet. Interval between 35 to TD filled with drill cuttings.

PIEZOMETER



NOTES:

1. Depths and Elevations in feet unless otherwise noted

ICF KAISER ENGINEERS

BORING LOG

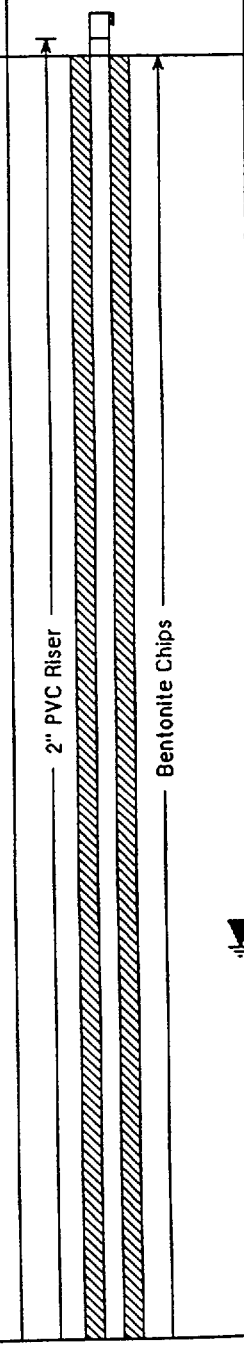
PROJECT NAME: Molycorp
PROJECT LOCATION: Washington, PA. facility
DRILLING FIRM: Geo Environmental
DRILLING METHOD: Auger/3" Rock Core/6" Hammer
LOGGED BY: Dave Cercone

WATER LEVELS RELATIVE TO TOC
DEPTH TO WATER: 10.44
NORTHING: 9871.97
EASTING: 11999.30

BORING NO.: TB-03
G.S. ELEV.: 1122.82
CASING ELEV.: 1124.63
START DATE: 1/31/97
FINISH DATE: 2/6/97

DEPTH	RQD (%)	REC. (FT)	CORE RUN NUMBERS	MATERIAL DESCRIPTION
				Augered to 7.8 feet.
				0-2 CLAY, grey/brown, mottled with coarse-fine gravels (limestone fragments), little coarse-fine sand, soft, stiff, moist.
				2-4 CLAY, yellow brown to grey, trace coarse-fine sand, trace rock fragments, moist.
5				4-7.8 CLAY, grey/dark grey, trace-some sand, carbonaceous lenses, moist.
	90	2.0	Run #1	7.8-8.3 LIMESTONE, grey/brown grey, irregular, very fractured with iron stains, hard.
				8.3-9.9 MUDSTONE, grey, soft, stained severely at contact with overlying limestone.
10	24	2.5	Run #2	9.9-12.1 LIMESTONE, grey/dark grey, iron stained, fractures.
	56	2.5	Run #3	12.1-18.5 MUDSTONE, grey, soft, friable, few iron stains at break in core, isolated fractures.
15				

PIEZOMETER



NOTES:

1. Depths and Elevations in feet unless otherwise noted

ICF KAISER ENGINEERS — BORING LOG

PROJECT NAME: Molycorp	WATER LEVELS RELATIVE TO TOC	BORING NO. TB-03
PROJECT LOCATION: Washington, PA. facility	DEPTH TO WATER 10.44	G.S. ELEV. 1122.82
DRILLING FIRM: Geo Environmental		CASING ELEV. 1124.63
DRILLING METHOD: Auger/3" Rock Core/6" Hammer	NORTHING 9871.97	START DATE 1/31/97
LOGGED BY: Dave Cercone	EASTING 11999.30	FINISH DATE 2/6/97

DEPTH	RQD (%)	REC. (FT)	CORE RUN NUMBERS	MATERIAL DESCRIPTION
	40	2.5	Run #4	MUDSTONE, grey, same as above.
	60	2.5	Run #5	18.5-19.3 LIMESTONE, grey to dark grey, very fractured, open fractures, iron stained.
20				19.3-21.2 MUDSTONE, dark grey, soft to friable.
	50	2.5	Run #6	21.2-22.8 CLAY SHALE, very dark grey to black, friable, soft, slightly carbonaceous to carbonaceous, slight iron staining on joints/partings.
	30	2.5	Run #7	22.8-23.0 COAL, broken, iron stained on joints/partings. 23.0-23.3 MUDSTONE/CLAY SHALE, dark grey to black; soft; friable; iron stained. 23.3-24.0 COAL, broken, iron stained.
25	0	2.0	Run #8	24.0-24.8 MUDSTONE, grey to dark grey, soft, friable. 24.8-28.0 SHALE, black, fissile, very fractured, stained fractures at 27 feet, other small fractures throughout core, carbonaceous. SHALE (same as above). Abrupt contact with underlying grey shale, siltstone and very fine sandstone.
	50	2.5	Run #9	28-29 SHALE, SILTSTONE and SANDSTONE, grey, very fine grained, horizontal, bedding plane fractures.
30	100	2.5	Run #10	

PIEZOMETER: 2" PVC Riser; Bentonite Chips

NOTES:

1. Depths and Elevations in feet unless otherwise noted

ICF KAISER ENGINEERS

BORING LOG

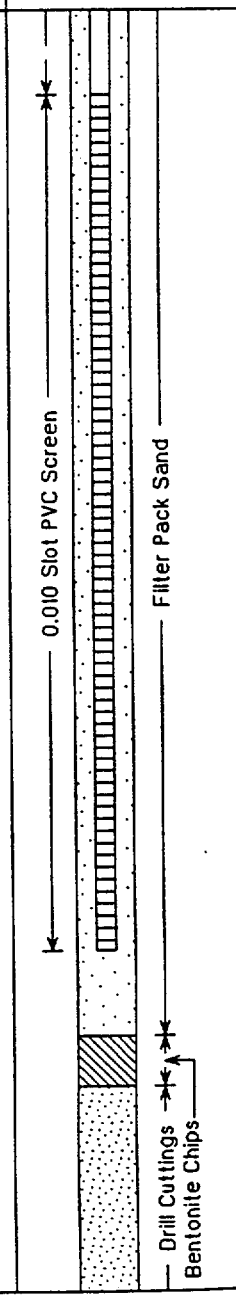
PROJECT NAME: Molycorp
PROJECT LOCATION: Washington, PA. facility
DRILLING FIRM: Geo Environmental
DRILLING METHOD: Auger/3" Rock Core/6" Hammer
LOGGED BY: Dave Cercone

WATER LEVELS RELATIVE TO TOC
DEPTH TO WATER: 10.44
NORTHING: 9871.97
EASTING: 11999.30

BORING NO.: TB-03
G.S. ELEV.: 1122.82
CASING ELEV.: 1124.63
START DATE: 1/31/97
FINISH DATE: 2/6/97

DEPTH	RQD (%)	REC. (FT)	CORE RUN NUMBERS	MATERIAL DESCRIPTION
	100	2.5	Run #10	29-30.9 SANDSTONE (same as above), numerous laminated zones, stained horizontal fractures at 29.7 feet and 30.8 feet. 30.9-32.0 SHALE/SILTSTONE, predominates below 30.9 feet.
	100	2.5	Run #11	32.0-47.5 SANDSTONE, very fine - medium grained, horsetail, laminations throughout, Stained horizontal fractures at 32.5 to 34.0, 34.5 and 44.7.
35	100	10.0	Run #12	
40				
45	100	5.0	Run #13	

PIEZOMETER



DEPTH: 35, 40, 45

NOTES:

1. Depths and Elevations in feet unless otherwise noted

ICF KAISER ENGINEERS — BORING LOG

PROJECT NAME: Molycorp	WATER LEVELS RELATIVE TO TOC	BORING NO. TB-03
PROJECT LOCATION: Washington, PA. facility	DEPTH TO WATER 10.44	G.S. ELEV. 1122.82
DRILLING FIRM: Geo Environmental		CASING ELEV. 1124.63
DRILLING METHOD: Auger/3" Rock Core/6" Hammer	NORTHING 9871.97	START DATE 1/31/97
LOGGED BY: Dave Cercone	EASTING 11999.30	FINISH DATE 2/6/97

DEPTH	RQD (%)	REC. (FT)	CORE RUN NUMBERS	MATERIAL DESCRIPTION	PIEZOMETER	DEPTH
	100	5.0	Run #13	Same as above. Grain size increased to medium grained.	Drill Cuttings / Bentonite Chips	
				47.5-48 SHALE/COAL, black, carbonaceous, iron stained.		
				48.0-49.3 MUDSTONE/SHALE, grey, vertical fracture at 49 feet, stained, abrupt contact with very soft to medium hard.		
50				49.3-49.8 SANDSTONE, grey, cross-bedded, hard.		50
				Total Depth, 49.8 feet.		
55						55
60						60

NOTES:

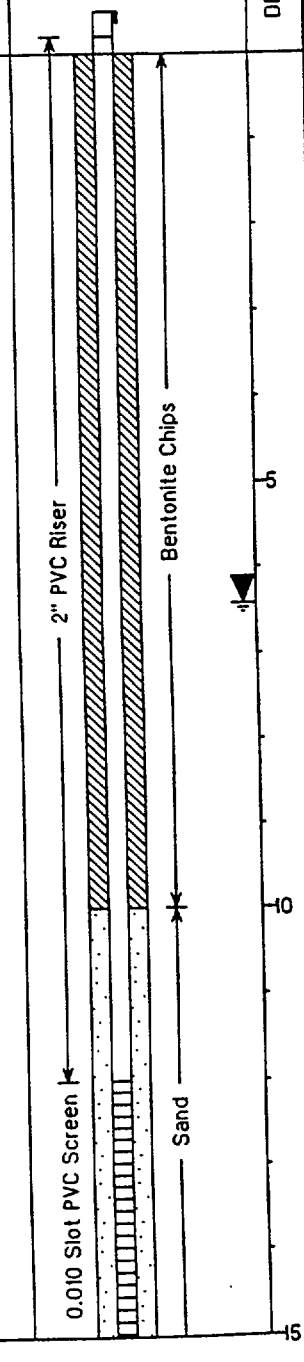
1. Depths and Elevations in feet unless otherwise noted

ICF KAISER ENGINEERS

BORING LOG

PROJECT NAME Molycorp	WATER LEVELS RELATIVE TO TOC	BORING NO. TB-04
PROJECT LOCATION Washington, PA. facility	DEPTH TO WATER 6.42	G.S. ELEV. 1047.36
DRILLING FIRM Geo Environmental		CASING ELEV. 1049.43
DRILLING METHOD Auger/3" Rock Core/6" Hammer		START DATE 2/12/97
LOGGED BY Dave Cercone	NORTHING 10214.40	FINISH DATE 2/13/97
	EASTING 12166.80	

DEPTH	RQD (%)	REC. (FT)	CORE RUN NUMBERS	MATERIAL DESCRIPTION
				Black to brown FILL, ASH, concrete fragments and crushed limestone.
5	70	5.0	Run #1	3-5.8 LIMESTONE, grey, fractures at 3.5, 4.0 and 5.5 feet.
				5.8-6.2 MUDSTONE
				6.2-8.5 LIMESTONE, grey.
10	60	5.0	Run #2	8.5-11.0 LIMESTONE, hard-medium hard, many stained fractures, muddy lenses.
				11-12.5 MUDSTONE, calcareous, grey, soft, fissile only in a small interval at 12 feet, no stained fractures.
				12.5-13 LIMESTONE, dark grey, hard.
				13-13.5 SHALE/MUDSTONE, grey/black, soft, carbonaceous, no fractures.
15	10	5.0	Run #3	13.5-15.8 SHALE/COAL, carbonaceous, broken.



NOTES:

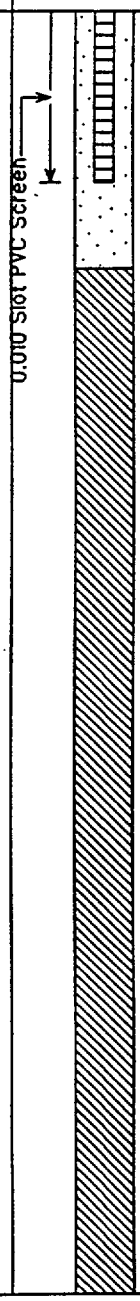
1. Depths and Elevations in feet unless otherwise noted

ICF KAISER ENGINEERS — BORING LOG

PROJECT NAME: Molycorp	WATER LEVELS RELATIVE TO TOC	BORING NO. TB-04
PROJECT LOCATION: Washington, PA. facility	DEPTH TO WATER: 6.42	G.S. ELEV. 1047.36
DRILLING FIRM: Geo Environmental		CASING ELEV. 1049.43
DRILLING METHOD: Auger/3" Rock Core/6" Hammer	NORTHING: 10214.40	START DATE: 2/12/97
LOGGED BY: Dave Cercone	EASTING: 12166.80	FINISH DATE: 2/13/97

DEPTH	RQD (%)	REC. (FT)	CORE RUN NUMBERS	MATERIAL DESCRIPTION
	10	5.0	Run #3	15.8-16.2 MUDSTONE/SHALE, grey. 16.2-17 SHALE, carbonaceous. 17-19 LIMESTONE, dark grey, hard, no fractures in entire core run.
20	100	5.0	Run #4	19-20.5 LIMESTONE, grey, medium hard, an isolated vertical stained fracture is at 19 feet. Remainder of core run is unfractured. 20.5-24.0 SHALE, calcareous.
25	90	5.0	Run #5	SHALE, light grey, medium hard to soft, clayey, siltstone lenses between 28.2 and 28.5 feet. The siltstone has an iron stained lense. 28.2-28.5 SILTSTONE
30	100	10.0	Run #6	

PIEZOMETER



NOTES:

1. Depths and Elevations in feet unless otherwise noted

ICF KAISER ENGINEERS

BORING LOG

PROJECT NAME: Molycorp
PROJECT LOCATION: Washington, PA. facility
DRILLING FIRM: Geo Environmental
DRILLING METHOD: Auger/3" Rock Core/6" Hammer
LOGGED BY: Dave Cercone

WATER LEVELS RELATIVE TO TOC
DEPTH TO WATER: 6.42

NORTHING: 10214.40
EASTING: 12166.80

BORING NO.: TB-04
G.S. ELEV.: 1047.36
CASING ELEV.: 1049.43
START DATE: 2/12/97
FINISH DATE: 2/13/97

DEPTH	RQD (%)	REC. (FT)	CORE RUN NUMBERS	MATERIAL DESCRIPTION
				28.5-32 SHALE, clayey, light grey, medium hard to soft.
				32-33.4 SILTSTONE, laminated, micaeous lens.
35	100	10.0	Run #6	33.4-40 SHALE, grey, same as above interval between 24 and 32 feet, no fractures in entire core run.
	100	1.0	Run #7	
40				Total Depth, 40 feet.
45				

PIEZOMETER: Bentonite Chips

DEPTH: 35, 40, 45

NOTES:

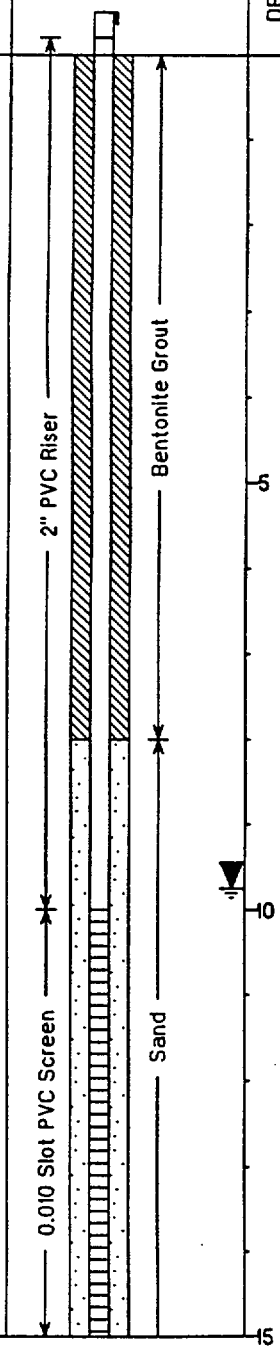
1. Depths and Elevations in feet unless otherwise noted

ICF KAISER ENGINEERS — BORING LOG

PROJECT NAME: Molycorp	WATER LEVELS RELATIVE TO TOC	BORING NO. TB-05
PROJECT LOCATION: Washington, PA. facility	DEPTH TO WATER: 9.75	G.S. ELEV. 1049.58
DRILLING FIRM: Geo Environmental		CASING ELEV. 1051.81
DRILLING METHOD: Auger/3" Rock Core/6" Hammer	NORTHING: 10139.23	START DATE: 2/17/97
LOGGED BY: George Werkman	EASTING: 11850.27	FINISH DATE: 2/18/97

DEPTH	RQD (%)	REC. (FT)	CORE RUN NUMBERS	MATERIAL DESCRIPTION
				0-2 FILL, BLACK ASH, soft.
				2-4 LIMESTONE, grey.
				4-4.9 LIMESTONE, grey, fractured, 4.6 and 4.75 feet with iron stains, medium hard.
5	24	3.0	Run #1	4.9-5.2 SHALE, grey, soft, moderately weathered, fissility.
				5.2-7 LIMESTONE, grey, fractured vertically and horizontally from 6.3 to 6.6 feet, slightly broken.
	40	2.0	Run #2	7-8 SHALE, calcareous, grey, iron stained from 7.6 to 8.0 feet, moderately hard, fractured from 7.9 to 8.1 feet.
				8-8.6 LIMESTONE, grey, hard.
				8.6-9.0 SHALE, grey, calcareous, moderately hard, fissile.
10				9.0-9.8 LIMESTONE, grey, hard, fracture 9.4 to 9.6 feet, broken.
				9.8-10.8 SHALE, grey, moderately hard, slightly broken, fissile.
	45	6.0	Run #3	10.8-12.0 SHALE, carbonaceous, moderately hard, slightly broken, fissile.
				12-13.1 COAL, hard, very broken.
				13.1-14.0 MUDSTONE, grey to dark grey, moderately hard.
				14.0-14.4 LIMESTONE, grey, hard, broken.
15				14.4-14.8 SHALE, carbonaceous, medium hard, broken.

PIEZOMETER



NOTES:

1. Depths and Elevations in feet unless otherwise noted

ICF KAISER ENGINEERS

BORING LOG

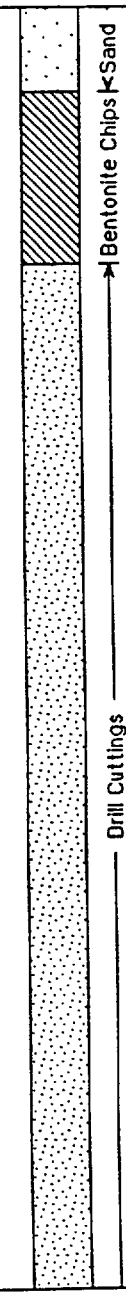
PROJECT NAME: Molycorp
PROJECT LOCATION: Washington, PA. facility
DRILLING FIRM: Geo Environmental
DRILLING METHOD: Auger/3" Rock Core/6" Hammer
LOGGED BY: George Werkman

WATER LEVELS RELATIVE TO TOC
DEPTH TO WATER: 9.75
NORTHING: 10139.23
EASTING: 11850.27

BORING NO.: TB-05
G.S. ELEV.: 1049.58
CASING ELEV.: 1051.81
START DATE: 2/17/97
FINISH DATE: 2/18/97

DEPTH	RQD (%)	REC. (FT)	CORE RUN NUMBERS	MATERIAL DESCRIPTION
	80	4.0	Run #4	14.8-15.0 MUDSTONE, grey, soft.
				15.0-15.7 LIMESTONE, grey, medium hard.
				15.7-15.8 SHALE, grey, fissile, moderately weathered.
				15.8-19.0 LIMESTONE, grey, hard, irregular stains, vertical fractures at 15.8-16.2, 16.4-16.9, 17.0-17.15, and 17.7-18.9.
				19.0-19.4 LIMESTONE, grey, broken, hard.
	74	10.0	Run #5	19.4-20.0 SHALE, grey, fissile, moderately weathered.
20				20.0-20.8 LIMESTONE, grey, hard, irregular vertical fracture from 20.3 to 20.7.
				20.8-25 MUDSTONE, clayey, grey, soft-med. hard, unlaminated.
25				25-25.3 LIMESTONE, grey, iron stained at 25.1, joint fracture at 25.15 and 25.3 feet, hard.
				25.3-25.9 CLAY/SHALE, grey, clayey, soft, fissile.
				25.9-29.0 SANDSTONE, grey to very dark grey, fine, blocky, hard, thinly laminated.
	85	10.0	Run #6	29-40 SHALE, grey, hard, fissile, no fractures or stains.
30				

PIEZOMETER



DEPTH: 20, 25, 30

NOTES:

1. Depths and Elevations in feet unless otherwise noted

ICF KAISER ENGINEERS

BORING LOG

PROJECT NAME Molycorp	WATER LEVELS RELATIVE TO TOC	BORING NO. TB-05
PROJECT LOCATION Washington, PA. facility	DEPTH TO WATER 9.75	G.S. ELEV. 1049.58
DRILLING FIRM Geo Environmental		CASING ELEV. 1051.81
DRILLING METHOD Auger/3" Rock Core/6" Hammer	NORTHING 10139.23	START DATE 2/17/97
LOGGED BY George Werkman	EASTING 11850.27	FINISH DATE 2/18/97

DEPTH		RQD (%)	REC. (FT)		CORE RUN NUMBERS	MATERIAL DESCRIPTION		PIEZOMETER	DEPTH
		85	10.0		Run #6			Drill Cuttings	
35									35
40						Total Depth, 40.0 feet. 3" core extended to total depth while the 6" reaming went to only 35 feet. Interval between 18 feet to TD filled with drill cuttings.			40
45									45

NOTES:

1. Depths and Elevations in feet unless otherwise noted

ATTACHMENT 3

SPECIFICATIONS

DIVISION 1 – GENERAL REQUIREMENTS

01010	Summary of Work	Rev. 0
01050	Field Engineering	Rev. 0
01200	Project Meetings	Rev. 0
01300	Submittals	Rev. 0
01320	Project Schedule	Rev. 0
01351	Safety, Health and Emergency Response	Rev. 0
01410	Environmental Protection	Rev. 0
01503	Maintenance & Protection of Roadway Traffic	Rev. 0
01504	Hazardous Materials Containment	Rev. 0
01505	Erosion & Sediment Control	Rev. 0
01613	Delivery, Storage & Handling	Rev. 0

DIVISION 2 – SITEWORK

02120	Loading, Transportation and Disposal of Waste Material	Rev. 0
02205	Dust Control	Rev. 0
02230	Site Clearing	Rev. 0
02300	Earthwork	Rev. 0
02377	Clay Barrier Layer	Rev. 0
02700	Drainage Control Structures	Rev. 0
02722	Aggregate Base Course	Rev. 0
02731	Aggregate Surface Course	Rev. 0
02821	Fencing	Rev. 0
02900	Topsoil & Seeding	Rev. 0

DIVISION 3 – CONCRETE

03307	Concrete For Minor Structures	Rev. 0

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 This Section describes the Project, summarizes the work required under this Contract and requirements related to the execution of the Work.

1.1.2 The Contractor's attention is called to the following work and safety regulations:

All work shall be in accordance with the requirements of OSHA.

1.2 RELATED DOCUMENTS

1.2.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2.1 The extent of the Work is detailed in the Technical Specifications and Bid Drawings.

1.3 PROJECT DESCRIPTION

1.3.1 General

The Project consists of site preparation,construction of a new storage cell for low level radioactive wastes (thorium contaminated), placement of the wastes in the storage cell, and closure of the storage cell at Molycorp's Washington, Pa site. This work will include, but not be limited to clearing and grubbing, stripping, earthworks, site grading, haul road construction, construction of drainage structures, erosion control, fencing, transportation of the waste material to the cell from the Molycorp property, placement and compaction of the waste material, cover placement, top soiling, and seeding. It also includes administrative and co-ordination activitites.

1.3.2 Site Description

Initial site characterization of the proposed storage cell site was developed in the Washington Facility Environmental Report prepared by ICF Kaiser in April 1997. Soil boring data has been extracted from this report and is an attachment to these specifications.

1.4 PROJECT CONTRACT

1.4.1 The Project will be constructed under single contract.

1.5 WORK SEQUENCE

The Work of this contract is scheduled within a sequence of engineering and erection activities appropriate to support the total project plan to place the new storage cell into service, place the waste material in the storage cell, and to close the completed storage cell.

1.6 CONTRACTORS' USE OF PREMISES

1.6.1 General

During the construction period, as approved by the Owner's Construction Manager, the Contractor shall have full use of the premises for construction operations, including use of the site. Use of the premises is limited only by the Owner's right to perform work on portions of the Project.

1.7 OCCUPANCY REQUIREMENTS

1.7.1 Full Owner Occupancy

The Owner may occupy the site during the entire construction period. Cooperate with the Owner during construction operations to minimize conflicts and facilitate Owner usage.

1.8 QUALITY CONTROL

The Contractor shall be responsible for satisfying all Quality Control requirements, and must have a Quality Control Program in place for the duration of the project.

PART 2 - TECHNICAL REQUIREMENTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01050

FIELD ENGINEERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1.1.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

1.2.1 This Section specifies administrative and procedural requirements for field-engineering services including, but not limited to land survey work and civil-engineering services.

1.3 SUBMITTALS

1.3.1 Project Record Documents: Submit a record of Work performed and record survey data as required under provisions of "Submittals" and "Project Closeout" Sections. Documents must be signed by the land surveyor or professional engineer.

1.3.2 Submit all survey field notes, sketched and records for the Project Files.

PART 2 - PRODUCTS **(Not Applicable)**

PART 3 - EXECUTION

3.1 EXAMINATION

3.1.2 The Contractor shall verify layout information shown on the Drawings, in relation to the existing benchmarks, before proceeding to layout the Work.

1. Identify any discrepancies to the Construction Manager immediately.
2. Locate and protect existing benchmarks and control points.
3. Preserve permanent reference points during construction.
4. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points or requirements to relocate reference points because of necessary changes in grades or locations.
5. Promptly replace lost or destroyed Project control points. Base replacements on the original survey control points.

3.1.3 Establish and maintain permanent benchmarks on the site, referenced to data established by survey control points.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

3.1.4 Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction.

3.2 PERFORMANCE

3.2.1 Work from lines and levels established by actual survey. Establish benchmarks and markers as needed to locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.

1. Advise entities engaged in construction activities of marked lines and levels provided for their use.
2. As construction proceeds, check every major element for line, level, and plumb.

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:

1. Pre-construction conferences.
2. Progress meetings.

1.1.2 Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.1.3 Related Sections - Documents affecting work in this section, include but are not necessarily limited to, the following sections of this Specification:

Section 01300 - Submittals

1.2 PRE-CONSTRUCTION CONFERENCE

1.2.1 The Contractor shall schedule a pre-construction conference before starting construction, at a time and location convenient to the Owner, but no later than 7 days after execution of the Agreement. Conduct the meeting to review responsibilities and personnel assignments.

1.2.2 Attendees: Authorized representatives of the Owner and their consultants; the Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

1.2.3 Agenda: Discuss items of significance that could affect progress, including but not limited to the following:

1. Construction schedule.
2. Critical work sequencing.
3. Designation of responsible personnel.
4. Procedures for processing field decisions and Change Orders.
5. Procedures for processing Applications for Payment.
6. Distribution of Contract Documents.
7. Submittal of Shop Drawings, Product Data, and Samples.
8. Preparation of record documents.

9. Use of the premises.
10. Parking availability.
11. Office, work, and storage areas.
12. Equipment deliveries and priorities.
13. Safety procedures.
14. First aid.
15. Security.
16. Housekeeping.
17. Working hours.

1.3 PROGRESS MEETINGS

1.3.1 Conduct progress meetings at the Project Site at to regular intervals. Notify the Owner of scheduled meeting dates.

1.3.2 Attendees: In addition to representatives of the Owner, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

1.3.3 Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.

A. Contractor's Construction Schedule: The Contractor shall update the Construction Schedule in preparation for each Progress Meeting. Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule activities will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time.

B. Review the present and future needs of each entity present, including the following:

a. Interface requirements.
b. Time.
c. Sequences.
d. Status of submittals.
e. Deliveries.
f. Off-site fabrication problems.
g. Access.

h. Site utilization.
i. Temporary facilities and services.
j. Hours of work.
k. Hazards and risks.
l. Housekeeping.
m. Quality and work standards.
n. Change Orders.
o. Documentation of information for payment requests.
p. Public safety and public interfaces.

1.3.4 Reporting: No later than 3 days after each meeting, the Contractor shall distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

1.3.5 Schedule Updating: The Contractor shall revise the Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 Submittals shall be in accordance with these specifications. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including the following:

1. Contractor's construction schedule.
2. Daily construction reports.
3. Shop Drawings/Product Data.
4. Safety Performance.
5. Project Record Documents

1.1.2 Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to; insurance certificates and list of subcontractors.

1.1.3 Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUBMITTAL PROCEDURES

1.2.1 Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1.2.2 Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for re-submittals.

1.2.3 Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

1. Provide a space approximately 4 by 5 inches on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.

2. Include the following information on the label for processing and recording action taken.
   a. Project name.
   b. Date.
   c. Name and address of the Contractor.
   d. Name and address of the subcontractor.
   e. Name and address of the supplier.
   f. Drawing number and detail references, as appropriate.

1.2.4 Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Owner using a transmittal form. The Owner will not accept submittals received from sources other than the Contractor.

1. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

1.3 CONTRACTOR'S CONSTRUCTION SCHEDULE

1.3.1 CPM Schedule: Prepare a fully developed, contractor's construction schedule. Submit within 7 days after the date of notice to proceed.

1.3.2 Schedule Updating: Revise the schedule after each meeting, event, or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.4 SUBMITTAL SCHEDULE

1.4.1 After development and acceptance of the Contractor's Construction Schedule, prepare a complete schedule of submittals. Submit the schedule within 7 days of the date required for submittal of the Contractor's Construction Schedule.

1. Coordinate Submittal Schedule with the list of subcontracts, and the list of products as well as the Contractor's Construction Schedule.

2. Prepare the schedule in chronological order. Provide the following information:

   a. Scheduled date for the first submittal.
   b. Related Section number.

1.5 DAILY CONSTRUCTION REPORTS

1.5.1 Prepare a daily construction report recording the following information concerning events at the site, and submit duplicate copies to the Owner at weekly intervals:

1. List of subcontractors at the site.
2. Approximate count of personnel at the site.
3. High and low temperatures, general weather conditions.
4. Accidents and unusual events.
5. Meetings and significant decisions.
6. Stoppages, delays, shortages, and losses.
7. Completions authorized.

1.6 PROJECT RECORD DOCUMENTS

1.6.1. This Section includes administrative and procedural requirements for Project Record Documents.

1.6.2. Project Record Documents required include the following:

1. Marked-up copies of Contract Drawings.
2. Marked-up copies of Shop Drawings.
3. Newly prepared drawings.
4. Marked-up copies of Specifications, addenda, and Change Orders.
5. Marked-up Product Data submittals.
6. Field records for variable and concealed conditions.

1.6.3. Markup Procedure: During construction, maintain a set of blue- or black-line white prints of Contract Drawings and Shop Drawings for Project Record Document purposes.

1. Mark these Drawings to show the actual installation where the installation varies from the installation shown originally. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later. Items required to be marked include, but are not limited to, the following:

   a. Dimensional changes to the Drawings.
   b. Revisions to details shown on the Drawings.
   c. Locations and depths of underground utilities.
   d. Revisions to routing of piping and conduits.
   e. Changes made by Construction/Change Order or Construction Change Directive.
   f. Details not on original Contract Drawings.

1.6.4 Record Product Data

1. During the construction period, maintain one copy of each Product Data submittal for Project Record Document purposes. Mark Product Data to indicate the actual product installation where the installation varies substantially from that indicated in Product Data submitted. Include significant changes in the product delivered to the site and changes in manufacturer's instructions and recommendations for installation.

1.7 OWNER'S ACTION

1.7.1

1.7.2 Action Stamp: The Owner will stamp each submittal with a uniform, action stamp. The Owner will mark the stamp appropriately to indicate the action taken, as follows:

1. Final Unrestricted Release: When the Owner marks a submittal "Approved," the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.

2. Final-But-Restricted Release: When the Owner marks a submittal "Approved as Noted," the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.

3. Returned for Resubmittal: When the Owner marks a submittal "Not Approved, Revise and Resubmit," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.

   a. Do not use, or allow others to use, submittals marked "Not Approved, Revise and Resubmit" at the Project Site or elsewhere where Work is in progress.

4. Other Action: Where a submittal is for information or record purposes or special processing or other activity, the Owner will return the submittal marked "Action Not Required."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01320

PROJECT SCHEDULE

PART 1 GENERAL

1.1 SUBMITTALS

The following shall be submitted in accordance with Section 01300 SUBMITTALS:

1.1.1 Schedules

Initial Project Schedule; Preliminary Project Schedule; Periodic Schedule Updates.

Three copies of the schedules showing codes, values, categories, numbers, items, etc., as required.

1.1.2 Qualifications

Documentation showing qualifications of personnel preparing schedule reports.

1.1.3 Reports

Narrative Report; Schedule Reports;

Three (3) copies of the reports showing numbers, descriptions, dates, float, starts, finishes, durations, sequences, etc., as required.

1.2 QUALIFICATIONS

The Contractor shall designate an authorized representative who shall be responsible for the preparation of all required project schedule reports.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 GENERAL

A Project Schedule as described below shall be prepared. The scheduling of construction shall be the responsibility of the Contractor. Contractor management personnel shall actively participate in its development. Subcontractors and suppliers working on the project may also contribute in developing and maintaining an accurate Project Schedule. The approved Project Schedule shall be used to measure the progress of the work, to aid in evaluating time extensions, and to provide the basis of all progress payments.

3.2 BASIS FOR PAYMENT

The schedule shall be the basis for measuring Contractor progress. Lack of an approved schedule or scheduling personnel shall result in an inability of the Owner to evaluate Contractor progress for the purposes of payment. Failure of the Contractor to provide all information, as specified below, shall result in the disapproval of the entire Project Schedule submission and the inability of the Owner to evaluate Contractor progress for payment purposes. In the case where Project Schedule revisions have been directed by the Owner and those revisions have not been included in the Project Schedule, then the Owner may hold retainage up to the maximum allowed by contract, each payment period, until revisions to the Project Schedule have been made.

3.3 PROJECT SCHEDULE

The computer software system utilized by the Contractor to produce the Project Schedule shall be capable of providing all requirements of this specification. Failure of the Contractor to meet the requirements of this specification shall result in the disapproval of the schedule. Manual methods used to produce any required information shall require approval by the Owner.

3.3.1 Use of the Critical Path Method

The Critical Path Method (CPM) of network calculation shall be used to generate the Project Schedule. The Contractor shall provide the Project Schedule in either the Precedence Diagram Method (PDM) or the Arrow Diagram Method (ADM).

3.3.2 Level of Detail Required

With the exception of the initial and preliminary schedule submission, the Project Schedule shall include an appropriate level of detail. Failure to develop or update the Project Schedule or provide data to the Owner at the appropriate level of detail, as specified by the Owner, shall result in the disapproval of the schedule. The Owner will use, but is not limited to, the following conditions to determine the appropriate level of detail to be used in the Project Schedule.

3.3.2.1 Activity Durations

Contractor submissions shall follow the direction of the Owner regarding reasonable activity durations. Reasonable durations are those that allow the progress of activities to be accurately determined between payment periods (usually less than 2 percent of all non-procurement activities' Original Durations shall be greater than 20 days).

3.3.2.2 Procurement Activities

Tasks related to the procurement of long lead materials or equipment shall be included as separate activities in the project schedule. Long lead materials and equipment are those materials that have a procurement cycle of over 90 days. Examples of procurement process activities include, but are not limited to submittals, approvals, procurement, fabrication, delivery, installation, start-up, and testing.

3.3.2.3 Phase of Work

All activities shall be identified in the project schedule by the phases of work in which the activity occurs. Activities shall not contain work in more than one phase of work. The project phase of each activity shall be by the unique Phase of Work Code.

3.3.3 Scheduled Project Completion

The schedule interval shall extend from notice-to-proceed to the contract completion date.

3.3.3.1 Project Start Date

The schedule shall start no earlier than the date that the Notice to Proceed (NTP) was acknowledged. The Contractor shall include as the first activity in the project schedule an activity called "Start Project". The "Start Project" activity shall have: a "ES" constraint, a constraint date equal to the date that the NTP was acknowledged, and a zero day duration.

3.3.3.2 Constraint of Last Activity

Completion of the last activity in the schedule shall be constrained by the contract completion date. Calculation on project updates shall be such that if the early finish of the last activity falls after the contract completion date, then the float calculation shall reflect a negative float on the critical path. The Contractor shall include as the last activity in the project schedule an activity call "End Project". The "End Project" activity shall have: a "LF" constraint, a constraint date equal to the completion date for the project, and a zero day duration.

3.3.3.3 Early Project Completion

In the event the project schedule shows completion of the project prior to the contract completion date, the Contractor shall identify those activities that have been accelerated and/or those activities that are scheduled in parallel to support the Contractor's "early" completion.

Contractor shall specifically address each of the activities noted at every project schedule update period to assist the Owner in evaluating the Contractor's ability to actually complete prior to the contract period.

3.3.4 Interim Completion Dates

Contractually specified interim completion dates shall also be constrained to show negative float if the early finish date of the last activity in that phase falls after the interim completion date.

3.3.4.1 Start Phase

The Contractor shall include as the first activity for a project phase an activity called "Start Phase X" where "X" refers to the phase of work. The "Start Phase X" activity shall have: a "ES" constraint, a constraint date equal to the date that the NTP was acknowledged, and a zero day duration.

3.3.4.2 End Phase

The Contractor shall include as the last activity in a project phase an activity called "End Phase X" where "X" refers to the phase of work. The "End Phase X" activity shall have: a "LF" constraint, a constraint date equal to the completion date for the project, and a zero day duration.

3.3.4.3 Phase X

The Contractor shall include a hammock type activity for each project phase called "Phase X" where "X" refers to the phase of work. The "Phase X" activity shall be logically tied to the earliest and latest activities in the phase.

3.3.5 Default Progress Data Disallowed

Actual Start and Finish dates shall not be automatically updated by default mechanisms that may be included in CPM scheduling software systems. Actual Start and Finish dates on the CPM schedule shall match those dates provided from Contractor Quality Control Reports. Failure of the Contractor to document the Actual Start and Finish dates on the Daily Quality Control report for every in-progress or completed activity and Ensure that the data contained on the Daily Quality Control reports is the sole basis for schedule updating shall result in the disapproval of the Contractor's schedule and the inability of the Owner to evaluate Contractor progress for payment purposes.

3.3.6 Out-of-Sequence Progress

Activities that have posted progress without predecessors being completed (Out-of-Sequence Progress) will be allowed only on a case-by-case approval of the Owner. The Owner may direct that changes in schedule logic be made to correct any or all out-of-sequence work.

3.3.7 Negative Lags

Lag durations contained in the project schedule shall not have a negative value.

3.4 PROJECT SCHEDULE SUBMISSIONS

The Contractor shall provide the submissions as described below. The data disk, reports, and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS.

3.4.1 Preliminary Project Schedule Submission

The Preliminary Project Schedule, defining the Contractor's planned operations for the first 60 calendar days shall be submitted for approval within 20 calendar days after Notice to Proceed is acknowledged. The approved preliminary schedule shall be used for payment purposes not to exceed 60 calendar days after Notice to Proceed.

3.4.2 Initial Project Schedule Submission

The Initial Project Schedule shall be submitted for approval within 40 calendar days after Notice to Proceed. The schedule shall provide a reasonable sequence of activities which represent work through the entire project and shall be at a reasonable level of detail.

3.4.3 Periodic Schedule Updates

Based on the result of progress meetings, specified in "Periodic Progress Meetings," the Contractor shall submit periodic schedule updates. These submissions shall enable the Owner or to assess Contractor's progress. If the Contractor fails or refuses to furnish the information and project schedule data, which in the judgement of the Owner or authorized representative, is necessary for verifying the contractor's progress, the Contractor shall be deemed not to have provided an estimate upon which progress payment may be made.

3.5 SUBMISSION REQUIREMENTS

The following items shall be submitted by the Contractor for the initial submission, and every periodic project schedule update throughout the life of the project:

3.5.1 Data Disks

Three data disks containing the project schedule shall be provided. Data on the disks shall be in the format specified by the contracting office.

3.5.1.1 File Medium

Required data shall be submitted on 3.5 disks, formatted to hold 1.44MB of data, under the MS-DOS Version 5.0 operating system.

3.5.1.2 Disk Label

A permanent exterior label shall be affixed to each disk submitted. The label shall indicate the type of schedule (Initial, Update, or Change), full contract number, project name, project location, data date, name and telephone number or person responsible for the schedule, and the MS-DOS version used to format the disk.

3.5.2 Narrative Report

A Narrative Report shall be provided with each update of the project schedule. This report shall be provided as the basis of the Contractor's progress payment request. The Narrative Report shall include: a description of activities along the 4 most critical paths, a description of current and anticipated problem areas or delaying factors and their impact, and an explanation of corrective actions taken.

3.5.3 Approved Changes Verification

Only project schedule changes that have been previously approved by the Owner shall be included in the schedule submission. The Narrative Report shall specifically reference, on an activity by activity basis, all changes made since the previous period and relate each change to documented, approved schedule changes.

3.5.4 Schedule Reports

The format for each activity for the schedule reports listed below shall contain: Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date, Total Float. Actual Start and Actual Finish Dates shall be printed for those activities in progress or completed.

3.5.4.1 Activity Report

A list of all activities sorted according to activity number and then sorted according to Early Start Date. For completed activities the Actual Start Date shall be used as the secondary sort.

3.5.4.2 Logic Report

A list of Preceding and Succeeding activities for every activity in ascending order by activity number and then sorted according to Early Start Date. For completed activities the Actual Start Date shall be used as the secondary sort.

3.5.4.3 Total Float Report

A list of all activities sorted in ascending order of total float. Activities which have the same amount of total float shall be listed in ascending order of Early Start Dates.

3.5.4.4 Earnings Report

A compilation of the Contractor's Total Earnings on the project from the Notice to Proceed until the most recent Monthly Progress Meeting. This report shall reflect the Earnings of specific activities based on the agreements made in the field and approved between the Contractor and Owner at the most recent Monthly Progress Meeting. Provided that the Contractor has provided a complete schedule update, this report shall serve as the basis of determining Contractor Payment. Activities shall be grouped by bid item and sorted by activity numbers. This report shall: sum all activities in a bid item and provide a bid item percent; and complete and sum all bid items to provide a total project percent complete. The printed report shall contain, for each activity: Activity Number Activity Description, Original Budgeted Amount, Total Quantity, Quantity to Date, Percent Complete (based on cost), Earnings to Date.

3.5.5 Network Diagram

The network diagram shall be required on the initial schedule submission. The network diagram shall depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The Owner will use, but is not limited to, the following conditions to review compliance with this paragraph:

3.5.5.1 Continuous Flow

Diagrams shall show a continuous flow from left to right with no arrows from right to left. The activity or event number, description, duration, and estimated earned value shall be shown on the diagram.

3.5.5.2 Project Milestone Dates

Dates shall be shown on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

3.5.5.3 Critical Path

The critical path shall be clearly shown.

3.6 PERIODIC PROGRESS MEETINGS

Progress meetings to discuss payment shall include a monthly onsite meeting or other regular intervals mutually agreed to at the preconstruction conference. During this meeting the Contractor shall describe, on an activity by activity basis, all proposed revisions and adjustments to the project schedule required to reflect the current status of the project. The Owner will approve activity progress, proposed revisions, and adjustments as appropriate.

3.6.1 Meeting Attendance

The Contractor's Project Manager and Scheduler shall attend the regular progress meeting.

3.6.2 Update Submission Following Progress Meeting

A complete update of the project schedule containing all approved progress, revisions, and adjustments, based on the regular progress meeting, shall be submitted not later than 4 working days after the monthly progress meeting.

3.6.3 Progress Meeting Contents

Update information, including Actual Start Dates, Actual Finish Dates, Remaining Durations, and Cost-to-Date shall be subject to the approval of the Owner. The following minimum set of items which the Contractor shall address, on an activity by activity basis, during each progress meeting.

3.6.3.1 Start and Finish Dates

The Actual Start and Actual Finish dates for each activity currently in-progress or completed activities.

3.6.3.2 Time Completion

The estimated Remaining Duration for each activity in-progress. Time-based progress calculations must be based on Remaining Duration for each activity.

3.6.3.3 Cost Completion

The earnings for each activity started. Payment will be based on earnings for each in-progress or completed activity. Payment for individual activities will not be made for work that contains quality defects. A portion of the overall project amount may be retained based on delays of activities.

3.6.3.4 Logic Changes

All logic changes pertaining to Notice to Proceed on change orders, change orders to be incorporated into the schedule, contractor proposed changes in work sequence, corrections to schedule logic for out-of-sequence progress and other changes that have been made pursuant to contract provisions shall be specifically identified and discussed.

3.6.3.5 Other Changes

Other changes required due to delays in completion of any activity or group of activities include: 1) delays beyond the Contractor's control, such as strikes and unusual weather. 2) delays encountered due to submittals, Owner Activities, deliveries or work stoppages which make re-planning the work necessary, and 3) a schedule which does not represent the actual prosecution and progress of the work.

3.7 REQUESTS FOR TIME EXTENSIONS

In the event the Contractor requests an extension of the contract completion date, he shall furnish such justification, project schedule data and supporting evidence as the Owner may deem necessary for a determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract. Submission of proof of delay, based on revised activity logic, duration, and costs (updated to the specific date that the delay occurred) is obligatory to any approvals.

3.7.1 Justification of Delay

The project schedule shall clearly display that the Contractor has used, in full, all the float time available for the work involved with this request. The Owner's determination as to the number of allowable days of contract extension shall be based upon the project schedule updates in effect for the time period in question, and other factual information. Actual delays that are found to be caused by the Contractor's own actions, which result in the extension of the schedule, will not be a cause for a time extension to the contract completion date.

3.7.2 Submission Requirements

The Contractor shall submit a justification for each request for a change in the contract completion date of under 2 weeks based upon the most recent schedule update at the time of the Notice to Proceed or constructive direction issued for the change. Such a request shall be in accordance with the requirements of other appropriate Contract Clauses and shall include, as a minimum:

a. A list of affected activities, with their associated project schedule activity number.

b. A brief explanation of the causes of the change.

c. An analysis of the overall impact of the changes proposed.

d. A sub-network of the affected area.

Activities impacted in each justification for change shall be identified by a unique activity code contained in the required data file.

3.7.3 Additional Submission Requirements

For any requested time extension of over 2 weeks, the Owner may request an interim update with revised activities for a specific change request. The Contractor shall provide this disk within 4 days of the Owner's request.

3.8 DIRECTED CHANGES

If Notice to Proceed (NTP) is issued for changes prior to settlement of price and/or time, the Contractor shall submit proposed schedule revisions to the Owner within 2 weeks of the NTP being issued. The proposed revisions to the schedule will be approved by the Owner prior to inclusion of those changes within the project schedule. If the Contractor fails to submit the proposed revisions, the Owner may furnish the Contractor suggested revisions to the project schedule. The Contractor shall include these revisions in the project schedule until revisions are submitted, and final changes and impacts have been negotiated. If the Contractor has any objections to the revisions furnished by the Owner, the Contractor shall advise the Owner within 2 weeks of receipt of the revisions. Regardless of the objections, the Contractor shall continue to update the schedule with the Owner's revisions until a mutual agreement in the revisions is reached. If the Contractor fails to submit alternative revisions within 2 weeks of receipt of the Owner's proposed revisions, the Contractor will be deemed to have concurred with the Owner's proposed revisions. The proposed revisions will then be the basis for an equitable adjustment for performance of the work.

3.9 OWNERSHIP OF FLOAT

Float available in the schedule, at any time, shall not be considered for the exclusive use of either the Owner or the Contractor.

SECTION 01351

SAFETY, HEALTH, AND EMERGENCY RESPONSE

PART 1 – GENERAL

1.1 DESCRIPTION

This section outlines minimum Safety, Health and Environmental requirements and provides information which must be submitted as a part of the Contractor's Proposal for evaluation.

1.2 SUBMITTALS

1.2.1 Proposal Submittal Requirements

The Contractor shall submit with their Proposal the attached Contractor's Safety and Loss Control Evaluation Form. The form shall be completed and all requested information provided. Incomplete forms may render the Contractor's Proposal to be considered as non-responsive and eliminated from consideration.

The Contractor shall submit the name and qualifications of the individual to be assigned the responsibilities described in Section 1,3.

1.2.2 Post Award Submittal Requirements

A minimum of 10 days prior to commencing work at the jobsite, Contractors must file with the Stone & Webster Site Manager all required documents, such as: A copy of the ***Contractor's Project Specific Safety and Health Plan*** and copies of employee training certificates, insurance certificates, construction permits, blasting permits, crane certifications and operator licenses, Steam Boiler Certifications, Elevator Certifications and any approved "OSHA Variances," or other approvals as required to safely and legally perform the Contractor's Scope of Work.

1.3 Minimum Safety and Health Requirements

The general principles underlying all safety and health practices and procedures shall be understood by all Contractors in order to meet the requirements for maintaining, at all times, in all areas under their respective control, a safe place for their employees and for others who are present. Contractors selected to perform work are responsible for the following:

1.3.1 Responsible Individual -The Contractor shall provide a responsible individual, competent through experience and training, to be able to identify hazards associated with the Contractor's Scope of Work and has overall responsibility for the safety and health performance of contractor's activities, including lower tier subcontractors. The person shall be present on-site during all contractor activities and shall ensure the provisions of this Appendix and the requirements of the Project Specific Safety and Health Plan are fully implemented. This person shall also:

1. Attend pre-work conferences and site safety and health orientations and briefings. The Contractor is expected to supplement the site orientation with information related to the Contractor's scope of work.

2. Document weekly tool box safety meetings for the Contractor's employees onsite.

3. Submit weekly safety and health inspection reports of the construction site as it relates to the Contractor's scope of work. Record hazards identified and corrective actions taken. The weekly inspection report shall be provided to the Stone & Webster Site Manager.

4. Perform site accident and incident investigations associated with the Contractor's scope of work and fully cooperate with any other accident or incident investigations which may be required.

5. Maintain safety and health statistical information and provide monthly reports to the Stone & Webster Site Manager. Reports shall include, employee hours worked, the number of first aid and doctor cases, number of recordable injuries and illnesses, the number of restricted and lost workday cases as defined by the US Occupational Health and Safety Administration. These reports shall include statistical information related to all of the Contractor's activities and the activities of lower tier subcontractors.

6. Provide Stone & Webster with the immediate notification of any regulatory inspection and a copy of all resulting citations or notice of deficiencies.

1.3.2 Documentation - The ***Contractor's Project Specific Safety and Health Plan*** shall as a minimum include the following:

1. Letter of corporate commitment to Safety and Health signed by CEO or President of the contractor's organization.

2. Brief description of the contractor's scope of work.

3. Project safety and health organization, responsibilities and accountability procedures.

4. Project safety and health goals and objectives.

5. Project hazard communication and safety training. (This section shall include a minimum requirement for a site hazard communication program and weekly safety meetings.)

6. Activity hazard analyses covering activities within the contractor's scope of work describing the steps of each principle activity, the hazards associated with each activity and procedures to be used to eliminate or control the hazards.

7. Personal protective equipment.(Note: Minimum site PPE requirements shall include hard hats, safety glasses with side shields and sturdy work boots, See Section II.C.7 of this Appendix.)

8. Specialized medical surveillance and/or air monitoring procedures, if required.

9. Safe work procedures. These may be incorporated by reference to the Contractor's Corporate Safety and Health Program.

10. Safety inspections and audits.

11. Project emergency response and preparedness procedures including provisions for providing first aid and notification of emergency services.

12. The Contractor (and any of its subcontractors), must submit, a Hazardous Waste Management Plan that addresses the handling, labeling, transpiration and disposal of hazardous waste . The Contractor shall be held solely responsible for compliance with the provisions of all applicable regulations associated with hazardous waste generated as a consequence of the Contractor's activities.

1.3.3 Rules and Regulations - The Contractor is responsible for awareness, knowledge and full compliance with all applicable rules, regulations, laws and practices applicable to the Contractor's Scope of Work, including lower tier subcontractors, prescribed by the site owner, Stone & Webster, and any other government or agency governing the safety and health of employees, other site personnel, the general public and protection of the environment. Within the United States and its Territories these include, but are not limited to regulations promulgated by the following :

1. Occupational Safety and Health Administration (OSHA)

2. Environmental Protection Agency (EPA)

3. Department of Transportation (DOT)

4. Department of Energy, Nuclear Regulatory Commission (NRC)

5. Mine Safety and Health Administraion (MSHA)

Additional rules required by this section include:

6. Each Contractor has the responsibility for instructing its employees in safe practices for the operation of tools and equipment and for the maintenance of safe conditions.

7. Contractors shall furnish for their employees personal safety equipment such as, ANSI Z89.1 approved hard hats, ANSI Z87.1 approved eye protection with fixed side shields, ear protection, foot protection, NIOSH approved respiratory protection, fall protection and other equipment as required for safe performance of their particular work assignment. All personnel on the job site shall be required at a minimum to wear hard hats, safety glasses with side shields and proper and sturdy footwear.

8. Danger tags and locks shall be utilized to prevent personal injury and equipment damage in accordance with project electrical and mechanical tagging procedures.

9. Scaffolding and other structures utilized for elevated work platforms shall have the required decking, handrails, midrails, toeboards, proper access, and nets or screens.

10. Catwalks shall conform to a two-plank width minimum and, if elevated, shall have handrails and toeboards.

11. Areas in which "overhead" work is to be performed shall be blocked, decked, barricaded, netted, posted, or evacuated as instructed by project supervision.

12. Pits, trenches, and other excavations shall be shored/shielded or sloped to the proper angle of repose, barricaded, and provided with proper access.

13. When not is use, blades of bulldozers and buckets of front end loaders shall be lowered to the ground. Also, beds of dumptrucks shall be lowered when traveling or not in use. Project parking and traffic regulations shall be complied with.

14. Crane booms shall be lowered at the end of single shifts or secured against movement by attaching the hoist line to a fixed structure.

15. Specific air sampling shall be performed to determine the presence of toxic materials or dusts, flammable atmosphere and adequate oxygen content, in accordance with project procedures. Respirators, safety harnesses, lifelines, standby personnel, and permits shall be used when appropriate.

16. Personnel involved in activities which require the use of an Air Purifying Respirator (APR) shall not have facial hair which interferes with the respirator's face seal.

17. The Contractor shall provide to the Stone & Webster Site Manager a copy of MSDSs for all hazardous materials prior to their use at the site.

18. Back-up alarms shall be provided on all construction vehicles and equipment and shall alarm continuously while the vehicle or equipment is in reverse motion. For equipment not equipped with a back-up alarm, a spotter shall be used.

19. All portable generators shall have frames externally grounded or other means to ensure there is no potential for circuit to frame conductivity.

20. All electrical services used in conjunction with field activities shall be equipped with Ground Fault Circuit Interrupters (GFCI).

21. Compliance with the following fire prevention measures is mandatory:

    a. Smoking is permitted only in specific areas as designated in project rules and procedures.

    b. Open fires are prohibited. Temporary gas-fired heaters shall not be used in enclosed areas. Only UL and NFPA approved petroleum and/or electrically fired heating devices will be authorized for use.

    c. Hot work permits shall be required in potentially hazardous areas to control generation of all flame and spark producing work tasks.

    d. Debris, scrap, and refuse shall be segregated and controlled in metal containers and removed at appropriate intervals. Any potential fire hazard shall be controlled.

    e. Each Contractor is responsible for maintaining and cleaning their work area. All walkways shall be kept clean an free of obstructions. Broken/spilled, scrap or other waste materials shall be placed in appropriate containers or waste areas as soon as practical after they are generated.

    f. Flammable liquids shall be kept in UL approved safety containers and properly labeled as to contents.

    g. Flammable and combustible materials shall be stored in designated locations that meet Federal, State and local regulations.

    h. All equipment such as cranes, trucks, bulldozers, graders, loaders and backhoes shall be equipped with proper fire extinguishers.

    i. The use of heavy equipment with internal combustion engines is prohibited within enclosed areas.

22. Only the number of persons provided with proper seats shall ride in a vehicle. No one shall ride on running boards, stand on moving equipment or ride on a vehicle other than in a proper seated position.

23. The swing radius of all heavy equipment such as cranes, back hoes, etc. shall be clearly barricaded.

24. The contractor shall provide 100% fall protection for fall exposures greater than 6 ft(2 meters) in accordance with project procedures.

1.3.4 General Conditions - Listed below are general conditions related to Safety and Health which the Contractor is required to comply with.

1. Should a specific interpretation be required concerning special and/or unusual safety, fire protection, or environmental concerns not covered by the Stone & Webster Safety, Health and Environmental Manual, the National Fire Protection Association Codes, and current OSHA/EPA or other local regulations the contractor shall contact the Site Safety and Health Representative or Stone & Webster Corporate Safety and Health for guidance.

2. The practices, procedures, and requirements set forth in this Appendix shall apply equally to all Contractors, and it is mandatory that each Contractor inform and enforce the provisions of this Appendix in all contracts with its Subcontractors.

3. Stone & Webster shall have the right to direct the removal from the jobsite any Contractor or Contractor personnel for violation of safety, health, fire protection, or environmental rules and regulations.

4. Fighting or horseplay is strictly prohibited and shall be considered grounds for removal from the project.

5. The illegal use, possession, purchase, sale or diversion of a drug or controlled substance is prohibited. The use or possession of alcoholic beverages at the jobsite is prohibited.

6. Stone & Webster shall have the right to direct the removal from the jobsite any defective tools and equipment, the use of which may create a hazardous situation.

7. Stone & Webster reserves the right to delete, modify, or supplement these procedures at any time without prior notice, but in such event, will notify all contractors affected by such change in procedures.

8. Stone & Webster reserves the right to evaluate the Contractor's, and any of its subcontractor's, overall safety performance, compliance with these procedures, and any established supplements, at intervals Stone & Webster deems appropriate.

9. Prior to starting work in any jobsite area, each Contractor must first obtain permission and instructions from Stone & Webster's Site Mananger, or designee.

1. List your firm's Interstate Experience Modification Rate (EMR) for the past four years and the current year. Use your intrastate EMR if not interstate rated.

   19____ _____ 19____ _____ 19____ _____ 19____ _____ 19____ _____

2. Using your OSHA Logs for the past three years and year-to-date data, provide the injury and illness information requested by completing the chart below:

INJURIES AND ILLNESSES DATA	YEAR____		YEAR____		YEAR____		YEAR TO DATE	
Number of Employee Hours Worked								
	NO.	RATE	NO.	RATE	NO	RATE	NO	RATE
Fatalities								
Lost Workday Cases								
Restricted Workday Cases								
Medical Treatment Only Cases								
Total Recordable Cases								
Number of Lost Workdays (including days of restricted duty)								

Rate = [No. of each type of case x 200,000]/ Employee Hours Worked

3. Has your organization been cited by OSHA in the last three years?
   Yes____ No____

   If yes, describe (on a separate page if necessary) the citations. Were the citations contested/vacated? What corrective actions were taken?

4. Will a full-time or part-time professional safety representative be utilized on this project? (A safety and health professional other than the senior site supervisor or superintendent).
   Yes____ No____
   If yes, provide copy of resume. Will they be ?

   Full Time _____ Part Time _____ If part time, describe the level of involvement and provide

   estimated hours per month.

7. Are you self-insured? Yes____ No____ If not, name your insurance carrier(s) and provide copies of certificates of insurance.

   _____

   _____

8. Training

   a. Is each employee instructed in known or anticipated physical and health hazards related to his/her job?
      Yes____ No____

   b. Do you have a safety and health orientation program for new hires?
      Yes____ No_____

   c. Do you have periodic toolbox/tailgate meetings to discuss safety issues?
      Yes____ No_____
      If yes describe frequency and duration of meeting

   d. Describe your employee safety training program, the frequency and length of training, how they receive such training and method(s) used to document training and verify comprehension.

e. Do managers, supervisors or formen receive the same safety training as employees?
Yes____ No____

f. Do managers, supervisors or formen receive additional or other safety training?
Yes____ No____
If yes, provide outline or description of additional training provided.

9. Safety and Health Audits

a. Do you have a home office or corporate safety representative who will audit the job?
Yes____ No_____

If yes, Name: _____ Title
_____

b. How frequently will the representative visit the project? _____

c. Does the representative have the authority to make corrections?
Yes____ No____

d. To whom does the representative report?

_____ _____
Name Title

10. Written Safety and Health Program

a. Does your company have written safety and health program?
Yes____ No____
If yes, provide a copy for review.

If yes,

b. Does the program include a commitment to safety and health from senior management?
Yes____ No____

c. Does the program include procedures for compiance with the
OSHA Hazard Communication Standard?
Yes____ No____

d. Does the program include procedures for waste management and disposal?
Yes____ No____

e. Does the program include accident/incident investigation procedures?
Yes____ No____

f. List additional policies and procedures addressed in the program

11. The undersigned warrants and represents the data provided in this document is accurate.

Name of Firm: _____

Date: _____

Preparer

_____

Name Signature

Title: _____

SECTION 01410

ENVIRONMENT PROTECTION

1.1 GENERAL REQUIREMENTS

The Contractor shall perform the work minimizing environmental pollution and damage as the result of construction operations. Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the utility of the environment for aesthetic, cultural and/or historical purposes. The control of environmental pollution and damage requires consideration of land, water, and air, and includes management of visual aesthetics, noise, solid waste, as well as other pollutants. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this contract.

1.1.1 Subcontractors

The Contractor shall ensure compliance with this section by subcontractors.

1.1.2 Environmental Protection Plan

The Contractor shall submit an environmental protection plan within 15 days after receipt of the notice to proceed. Approval of the Contractor's plan will not relieve the Contractor of responsibility for adequate and continuing control of pollutants and other environmental protection measures. The environmental protection plan shall include, but shall not be limited to, the following:

a. A list of Federal, State, and local laws, regulations, and permits concerning environmental protection, pollution control and abatement that are applicable to the Contractor's proposed operations and the requirements imposed by those laws, regulations, and permits.

b. Methods for protection of features to be preserved within authorized work areas like trees, shrubs, vines, grasses and ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, archaeological, and cultural resources.

c. Procedures to be implemented to provide the required environmental protection, to comply with the applicable laws and regulations, and to correct pollution due to accident, natural causes, or failure to follow the procedures of the environmental protection plan.

d. Location of the solid waste disposal area. Generated from on site activities.

e. Drawings showing locations of any proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials.

f. Environmental monitoring plans for the job site, including land, water, air, and noise monitoring.

g. Traffic control plan including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather, and the amount of mud transported onto paved public roads by vehicles or runoff.

h. Methods of protecting surface and ground water during construction activities.

i. Plan showing the proposed activity in each portion of the work area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas.

1.1.3 Permits

The Contractor shall obtain all needed permits or licenses. The Owner will not obtain any permits for this project. The Contractor shall be responsible for implementing the terms and requirements of the appropriate permits as needed and for payment of all fees.

1.1.4 Preconstruction Survey

Prior to starting any onsite construction activities, the Contractor and the Owner shall make a joint condition survey after which the Contractor shall prepare a brief report indicating on a layout plan the condition of trees, shrubs and grassed areas immediately adjacent to work sites and adjacent to the assigned storage area and access routes as applicable. This report will be signed by both the Owner and the Contractor upon mutual agreement as to its accuracy and completeness.

1.1.5 Meetings

The Contractor shall meet with representatives of the Owner to alter the environmental protection plan as needed for compliance with the environmental pollution control program.

1.1.6 Notification

The Owner will notify the Contractor in writing of any observed noncompliance with the previously mentioned Federal, State or local laws or regulations, permits, and other elements of the Contractor's environmental protection plan. The Contractor shall, after receipt of such notice, inform the Owner of proposed corrective action and take such action when approved. If the Contractor fails to comply promptly, the Owner may issue an order stopping all or part of the

work until satisfactory corrective action has been taken. No time extensions shall be granted or costs or damages allowed to the Contractor for any such suspensions.

1.1.7 Litigation

If work is suspended, delayed, or interrupted due to a court order of competent jurisdiction, the Owner will determine whether the order is due in any part to the acts or omissions of the Contractor, or subcontractors at any tier, not required by the terms of the contract. If it is determined that the order is not due to Contractor's failing, such suspension, delay, or interruption shall be considered as ordered by the Owner in the administration of the contract.

1.1.8 Previously Used Equipment

The Contractor shall thoroughly clean all construction equipment previously used at other sites before it is brought into the work areas, ensuring that soil residuals are removed and that egg deposits from plant pests are not present; the Contractor shall consult with the USDA jurisdictional office for additional cleaning requirements.

1.1.9 Payment

No separate payment will be made for work covered under this section; all costs associated with this section shall be included in the contract unit and/or lump sum prices in the Bidding Schedule.

1.2 LAND RESOURCES

The Contractor shall confine all activities to areas defined by the drawings and specifications. Prior to the beginning of any construction, the Contractor shall identify the land resources to be preserved within the work area. Except in areas indicated on the drawings or specified to be cleared, the Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without permission. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. Where such emergency use is permitted, the Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Stone, earth or other material displaced into uncleared areas shall be removed.

1.2.1 Work Area Limits

Prior to any construction, the Contractor shall mark the areas that need not be disturbed under this contract. Isolated areas within the general work area which are to be saved and protected shall also be marked or fenced. Monuments and markers shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, the markers shall be visible. The Contractor's personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.

1.2.2 Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques.

1.2.3 Unprotected Erodible Soils

Earthwork brought to final grade shall be finished as indicated. Side slopes and back slopes shall be protected as soon as practicable upon completion of rough grading. All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils. Except in cases where the constructed feature obscures borrow areas, quarries, and waste material areas, these areas shall not initially be totally cleared. Clearing of such areas shall progress in reasonably sized increments as needed to use the developed areas as approved by the Owner.

1.2.4 Disturbed Areas

The Contractor shall effectively prevent erosion and control sedimentation through approved methods including, but not limited to, the following:

a. Retardation and control of runoff. Runoff from the construction site or from storms shall be controlled, retarded, and diverted to protected drainage courses by means of diversion ditches, benches, berms, and by any measures required by area wide plans under the Clean Water Act.

b. Erosion and sedimentation control devices. The Contractor shall construct or install temporary and permanent erosion and sedimentation control features as indicated on the drawings. Berms, dikes, drains, sedimentation basins, grassing, and mulching shall be maintained until permanent drainage and erosion control facilities are completed and operative.

c. Sediment basins. Sediment from construction areas shall be trapped in temporary or permanent sediment basins in accordance with the drawings. The basins shall accommodate the runoff of a local 100 year storm. After each storm, the basins shall be pumped dry and accumulated sediment shall be removed to maintain basin effectiveness. Overflow shall be controlled by paved weirs or by vertical overflow pipes. The collected topsoil sediment shall be reused for fill on the construction site, and/or stockpiled for use at another site. The Contractor shall institute effluent quality monitoring programs as required by State and local environmental agencies.

1.2.5 Contractor Facilities and Work Areas

The Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated on the drawings or as directed by the Owner. Temporary movement or relocation of Contractor facilities shall be made only when approved. Borrow areas shall be managed to minimize erosion and to prevent sediment from entering nearby waters. Spoil areas

shall be managed and controlled to limit spoil intrusion into areas designated on the drawings and to prevent erosion of soil or sediment from entering nearby waters. Spoil areas shall be developed in accordance with the grading plan indicated on the drawings. Temporary excavation and embankments for plant and/or work areas shall be controlled to protect adjacent areas from despoilment.

1.3 WATER RESOURCES

The Contractor shall keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters. Toxic or hazardous chemicals shall not be applied to soil or vegetation when such application may cause contamination of the fresh water reserve. Monitoring of water areas affected by construction shall be the Contractor's responsibility. All water areas affected by construction activities shall be monitored by the Contractor.

1.3.1 Washing and Curing Water

Waste waters directly derived from construction activities shall not be allowed to enter water areas. Waste waters shall be collected and placed in retention ponds where suspended material can be settled out or the water evaporates to separate pollutants from the water. Analysis shall be performed and results reviewed and approved before water in retention ponds is discharged.

1.3.2 Cofferdam and Diversion Operations

Construction operations for dewatering, removal of cofferdams, tailrace excavation, and tunnel closure shall be controlled at all times to limit the impact of water turbidity on the habitat for wildlife and on water quality for downstream use.

1.3.3 Stream Crossings

Stream crossings shall allow movement of materials or equipment without violating water pollution control standards of the Federal, State or local government.

1.3.4 Fish and Wildlife

The Contractor shall minimize interference with, disturbance to, and damage of fish and wildlife. Species that require specific attention along with measures for their protection shall be listed by the Contractor prior to beginning of construction operations.

1.4 AIR RESOURCES

Equipment operation and activities or processes performed by the Contractor in accomplishing the specified construction shall be in accordance with the State's rules and all Federal emission and performance laws and standards. Ambient Air Quality Standards set by the Environmental Protection Agency shall be maintained. Monitoring of air quality shall be the Contractor's responsibility. All air areas affected by the construction activities shall be monitored by the

Contractor. Monitoring results will be periodically reviewed by the Owner to ensure compliance.

1.4.1 Particulates

Dust particles; aerosols and gaseous by-products from construction activities; shall be controlled at all times, including weekends, holidays and hours when work is not in progress. Dust Control shall be in accordance with specification section 02205, Dust Control. The Contractor shall maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates which would cause the air pollution standards to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. The Contractor must have sufficient, competent equipment available to accomplish these tasks. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs.

1.4.2 Hydrocarbons and Carbon Monoxide

Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal and State allowable limits at all times.

1.4.3 Odors

Odors shall be controlled at all times for all construction activities, processing and preparation of materials.

1.4.4 Sound Intrusions

The Contractor shall keep construction activities under surveillance and control to minimize environment damage by noise.

1.5 WASTE DISPOSAL

Disposal of wastes shall be as specified below.

1.5.1 Solid Wastes

Solid wastes (excluding clearing debris) shall be placed in containers which are emptied on a regular schedule. Handling and disposal shall be conducted to prevent contamination. Segregation measures shall be employed so that no hazardous or toxic waste will become co-mingled with solid waste. The Contractor shall transport solid waste off Owner property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. The Contractor shall comply with Federal, State, and local laws and regulations pertaining to the use of landfill areas.

1.5.2 Chemical Wastes

Chemicals shall be dispensed ensuring no spillage to ground or water. Periodic inspections of dispensing areas to identify leakage and initiate corrective action shall be performed and documented. This documentation will be periodically reviewed by the Owner. Chemical waste shall be collected in corrosion resistant, compatible containers. Collection drums shall be monitored and removed to a staging or storage area when contents are within 6 inches of the top. Wastes shall be disposed of in accordance with Federal and local laws and regulations.

1.5.3 Hazardous Wastes

The Contractor shall take sufficient measures to prevent spillage of hazardous and toxic materials during dispensing and shall collect waste in suitable containers observing compatibility. The Contractor shall transport hazardous waste off Owner property and dispose of it in compliance with Federal and local laws and regulations. Spills of hazardous or toxic materials shall be immediately reported to the Owner. Cleanup and cleanup costs due to spills shall be the Contractor's responsibility.

1.5.4 Burning

No burning will be allowed.

1.7 POST CONSTRUCTION CLEANUP

The Contractor shall clean up all areas used for construction.

1.8 RESTORATION OF LANDSCAPE DAMAGE

The Contractor shall restore landscape features damaged or destroyed during construction operations outside the limits of the approved work areas.

1.9 MAINTENANCE OF POLLUTION FACILITIES

The Contractor shall maintain permanent and temporary pollution control facilities and devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

1.10 TRAINING OF CONTRACTOR PERSONNEL

The Contractor's personnel shall be trained in all phases of environmental protection. The training shall include methods of detecting and avoiding pollution, familiarization with pollution standards, both statutory and contractual, and installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental pollution control.

SECTION 01503
MAINTENANCE & PROTECTION OF ROADWAY TRAFFIC

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 This item shall govern for providing, installing, moving, replacing, maintaining, cleaning, and removing upon completion of all work, all barricades, signs, cones, lights, arrow panels, markings, and other types of devices and of handling traffic as indicated on the plans or as directed by the Owner. Flagpersons and temporary police details may be required depending on the type of traffic control, the roadway volume and posted speed. The Summary of Work for this contract is presented in Section 01010.

1.1.2 Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.1.3 Related Sections - Documents affecting work in this section, include but are not necessarily limited to, the following sections of this Specification:

Section 01300 - Submittals
Section 01505 - Erosion and Sediment Control
Section 02300 - Earthwork
Section 02700 - Drainage Control Structures

1.2 SUBMITTALS

1.2.1 The Contractor shall submit to the Owner for review and approval a "Traffic Control Plan (TCP) and Suggested Work Sequence" for each phase of construction. The contractor shall develop his own TCP. All barricades, signs, and other devices listed above shall conform to the details on the plans and be responsive to the:

a. Pennsylvania Department of Transportation, Standard Specifications for Construction, (Dated, 1994,) Sec. 900.

PART 2 - TECHNICAL REQUIREMENTS

2.1 All materials for signs, barricades, drums, lights, arrow panels, markings, and other types of devices shall conform to the Pennsylvania Department of Transportation, Standard Specifications for Construction.

PART 3 - EXECUTION

3.1 The Contractor shall erect all traffic control devices at times of off-peak traffic flow. Any changes in traffic control, due to implementing the next work phase, shall also be scheduled for off-peak periods. The safe travel of motorists, pedestrians and work crews is of utmost importance.

Temporary approaches, encroachments, or crossings of roadways shall be provided in a safe and passable condition by the contractor at his expense. Any streets, roadways, structures, or traffic control devices damaged by the contractor's operations shall be repaired by the contractor at his expense.

END OF SECTION

SECTION 01504

HAZARDOUS MATERIALS CONTAINMENT

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 This Section contains provisions for the storage and handling of hazardous and petroleum products used onsite during the work.

1.1.2 All storage and handling of petroleum products, and if necessary, petroleum product spill collection, containment and disposal, shall be in accordance with and conform to all applicable local, state and federal regulations.

1.2 METHODS

1.2.1 Spill containment and control measures shall be provided at stationary facilities that contain petroleum products. Such measures shall include, but not necessarily be limited to, providing lined spill containment berms around tanks and other similar storage facilities, and storing shovels, absorbent pads, plastic bags, buckets, and other similar material at the locations of stationary facilities for use in containing any minor spills that may occur. In addition, procedures to prevent spills from occurring (drip pans, formal refueling procedures, worker training, etc.) shall be developed and implemented.

1.2.2 Spill containment berms shall be constructed around Contractor supplied temporary fuel tanks, drums of oil, drums of fluid, etc. The berms shall be sized to contain 110% of the volume of petroleum product contained in the enclosed tank or equipment. The berms shall be periodically inspected for functionality.

1.2.3 Contaminated precipitation, leaves and other similar materials that may collect within spill containment berms, all waste oil, waste fluids, oily rags, etc. and any petroleum product spills that occur shall be immediately contained and collected for disposal offsite. Free liquids shall be collected with buckets and/or with absorbent materials. All petroleum-product-contaminated soils shall be excavated and placed in barrels, bags or other appropriate containers.

1.2.4 Contractor shall notify Owner any other regulatory authorities immediately of any product spills.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01505

EROSION & SEDIMENT CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 This Section identifies the Contractor's responsibility to conform to and maintain stormwater pollution prevention and comply with Pennsylvania Department of Transportation, Standard Specifications for Construction , Section 800.

PART 2 - PRODUCTS

2.1 Contractor shall supply vendor literature to show that silt curtain and hay bales are in compliance with the requirements as shown on the drawings.

PART 3 - EXECUTION

3.1 GENERAL

3.1.1. Contractor's Responsibility - Contractors working onsite are required to abide by all applicable provisions and practices noted in the Pennsylvania Department of Transportation Standard Construction Specification. This requirement ensures that the proper information is readily and immediately available to the Construction Manager in the event of a material spill or release by an onsite Contractor. A signed certification statement of the Contractor's understanding of these requirements must be provided by each Contractor and Subcontractor prior to participating in the project.

The Contractor is required to ensure that all employees onsite under his supervision are instructed to immediately contact the Construction Manager in the event of an emergency situation that may result in stormwater pollution.

3.1.2 Inspection Program - The Contractor shall designate inspectors who are required to conduct and document regular inspections of areas under his responsibility for erosion, sedimentation, and structural control condition. Any existing or imminent conditions that could cause or lead to release of pollutants in stormwater must be immediately reported to the Construction Manager. Inspectors must be trained in the inspection and maintenance practices necessary for keeping the erosion and sediment controls used onsite in good working order. Inspections must be

conducted weekly and within 24 hours after each rainfall event totaling 0.5 inch or more.

Where an inspection indicates a finding of deficiency, the inspector must specifically document the situation on an inspection form. A maintenance report is required to be generated which requires the signature of the Maintenance Foreman upon completion of the repair. The repair is required to be completed within 24 hours of the inspection. The Contractor is required to submit both the inspection form and maintenance report to the Owner's Construction Manager on a weekly basis. If the repair requires a change in erosion control methodology, i.e. change from silt fence to a rock filter dam, the Stormwater Pollution Prevention drawings must reflect this change. It is the responsibility of the Contractor that all Pennsylvania Department of Transportation Standard Construction Specifications covering Stormwater Pollution Prevention are followed.

3.1.3 Installation/Maintenance of Controls - The Contractor is responsible for the acquisition of materials, installation, and maintenance of structural controls under his responsibility.

3..2 STORMWATER EROSION AND SEDIMENT CONTROL SUMMARY

3.2.1 It is anticipated that Contractor installed temporary and/or permanent stormwater control measures may be required at locations noted in the following sections. This list should not be construed as a final required or recommended list of sediment and erosion controls. Specific requirements must be addressed by the Contractor and must be in compliance with the Pennsylvania Department of Transportation Standard Construction Specifications on stormwater control.

1. Silt Fences: Downslope sides of disturbed right-of-way and roadbed areas.

2. Sediment Traps:
   a. Along existing or constructed drainage routes discharging to detention ponds or receiving streams.
   b. At detention pond discharge points to receiving streams.

3. Stabilized Vehicle Entrances:
   a. Temporary access roads.
   b. Borrow area entrance(s) and exit(s).
   c. Any other entrance or exit from disturbed areas where vehicles may track sediment to roads or into receiving waters.

4. Slope Stabilization:
   a. Temporary stabilization on filled or otherwise disturbed slopes.
   b. Final stabilization at completion of construction on sloped areas where surface has been disturbed.

5. Dikes/Drainage Swales: Downslope of disturbed areas where runoff must be diverted to detention ponds or otherwise directed.

6. Temporary Stream Crossings: At any location where vehicle movement across stream bed may disturb stream banks and contribute to sediment runoff.

END OF SECTION

SECTION 01613

DELIVERY, STORAGE AND HANDLING

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 Specific requirements for the receiving, storage and handling of materials are found in the relevant sections of this specification and as outlined herein.

As a minimum, materials shall be so stored as to insure the preservation of quality and fitness of the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the Work. When considered necessary by the Owner and directed by these specifications, the materials shall be placed on wooden platforms or hard, clean surfaces and not on the ground. The materials shall be placed under cover when so directed by these specifications, the Owner, or recommended by the Supplier. Stored materials shall be so located as to facilitate prompt inspection.

1.1.2 Contractor supplied materials shall be progressively delivered at the site so that there will be neither a delay in the progress of the work nor an accumulation of materials that is not to be used within a reasonable time.

1.1.3 Contractor shall accept, in a timely manner, all materials furnished to the jobsite by the Owner. The Contractor shall store these materials in accordance with the provisions of these specification and as recommended by the supplier.

1.1.4 The Contractor shall ensure the security of all stored materials and be responsible for and bear the cost of any necessary corrective action as a result of improper storage and/or security.

1.1.5 Approved portions of the right-of-way and temporary easements obtained by the Owner may be used by the Contractor for storage purposes but any additional space required must be provided by the Contractor.

Private property shall not be used for storage purposes without written permission of the landowner and if requested by the Owner, copies of such written permission shall be furnished.

All storage sites not affected by the Work shall be restored to their original condition.

PART 2 - TECHNICAL REQUIREMENTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 02120

LOADING, TRANSPORTATION AND DISPOSAL OF WASTE MATERIAL

PART 1 GENERAL

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

CODE OF FEDERAL REGULATIONS (CFR)

40 CFR 300 National Oil and Hazardous Substances Pollution Contingency Plan

49 CFR 173 Shippers - General Requirements for Shipments and Packaging

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01300 SUBMITTALS:

1.2.1 Waste Management/

Prior to start of work, a plan detailing the manner in which waste shall be loaded, managed, and hauled to the storage cell.

1.2.2 Spill Response

In the event of a spill or release of a waste material (as designated, or pollutant or contaminant, or oil (as governed by the Oil Pollution Act (OPA), 33 U.S.C. 2701 et seq.), the Contractor shall notify the Owner immediately. If the spill exceeds a reporting threshold, the Contractor shall follow the pre-established procedures for immediate reporting to the Owner.

1.2.3 Notices of Non-Compliance and Notices of Violation

Notices of non-compliance or notices of violation by a Federal, state, or local regulatory agency issued to the Contractor in relation to any work performed under this contract. The Contractor shall immediately provide copies of such notices to the Owner. The Contractor shall also furnish all relevant documents regarding the incident and any information requested by the Owner, and shall coordinate its response to the notice with the Owner or his designated representative prior to submission to the notifying authority. The Contractor shall also furnish a copy to the Owner of all documents submitted to the regulatory authority, including the final reply to the notice, and all other materials, until the matter is resolved.

1.2.4 Scale Facility

Contractor shall provide intended scale to weigh waste material for payment purposes. Scale shall be certified to be accurate to the nearest 0.1 tons.

1.3 QUALIFICATIONS

1.3.1 Transportation and Disposal Coordinator

The Contractor shall designate, by position and title, one person to act as the Transportation and Disposal Coordinator (TDC) for this contract. The TDC shall serve as the single point of contact for all environmental regulatory matters and shall have overall responsibility for total environmental compliance at the site including but not limited to accurate record keeping of daily waste haul loads from each waste material site.

1.4 LAWS AND REGULATIONS REQUIREMENTS

Work shall meet or exceed the minimum requirements established by Federal, state, and local laws and regulations, which are applicable. These requirements are amended frequently and the Contractor shall be responsible for complying with amendments as they become effective. In the event that compliance exceeds the scope of work or conflicts with specific requirements of the contract, the Contractor shall notify the Owner immediately.

1.5 DISPOSAL

Contractor is haul waste material from areas identified by the Owner within the Molycorp property to the storage cell after acceptance by the Owner.

PART 2 PRODUCTS

2.1 MATERIALS

The Contractor shall provide all of the materials required for the transportation and packaging of loaded waste material in conformance with Department of Transportation standards. Details in this specification shall not be construed as establishing the limits of the Contractor's responsibility.

2.1.1 Spill Response Materials

The Contractor shall provide spill response materials including, but not limited to, containers, adsorbent, shovels, and personal protective equipment. Spill response materials shall be available at all times in which wastes are being handled or transported.

2.2 EQUIPMENT AND TOOLS

The Contractor shall provide miscellaneous equipment and tools necessary to handle waste material in a safe and environmentally sound manner.

PART 3 EXECUTION

3.1 ON-SITE WASTE MATERIAL MANAGEMENT

These paragraphs apply to Owner owned waste only. Contractors are prohibited from storing contractor owned waste on site for any length of time. The Contractor shall be responsible for ensuring compliance with all Federal, state, and local waste laws and regulations and shall verify those requirements when preparing reports, waste shipment records, or other documents. The Contractor shall only use trucks in good condition and compatible with state transportation regulations for hauling. The Contractor shall be responsible for ensuring trucks are covered except when adding or removing waste. The Contractor shall be responsible for inspecting roadways for signs of deterioration and shall be responsible for any spills or damage from hauling. The Contractor shall inspect all haul roadways daily and shall provide written documentation of the inspection. Inspection logs will contain date and time of inspection, name of individual conducting the inspection, problems noted, and corrective actions taken.

3.1.2 Management Plan

The Contractor shall prepare a plan detailing the manner in which waste material shall be managed. The plan shall identify the method of hauling and placement of waste material.

3.2 LOADING AND WASTE MATERIAL DISPOSAL

Contractor shall haul waste material from disposal areas that have been stockpiled by the Owner. Loading of the Contractor's trucks shall be by the Owner. Contractor shall provide a schedule indicating anticipated loading rates and schedule for completion of removal of waste material. A minimum 1000 cubic yards of waste material will be available for the contractor to haul on a daily basis.

3.3 SPILL RESPONSE

The Contractor shall respond to any spill of waste material which is in the custody or care of the Contractor pursuant to this contract. Any direction from the Owner concerning a spill or release shall not be considered a change under the contract. The Contractor shall comply with all applicable requirements of Federal, state, or local laws or regulations regarding any spill incident.

3.4 WASTE MATERIAL PLACEMENT

Contractor shall grade the waste material to promote runoff off from the storage cell. Ponding of runoff in the waste material placed in the storage cell will not be permitted.

Contractor shall submit his operational filling and access plan to the Owner for approval for all disposal activities. Waste material placed in the consolidation landfill shall be spread and compacted with sheepsfoot roller waste compaction equipment a minimum of 4 passes. Lift thickness shall not exceed 2-ft.

SECTION 02205

DUST CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 This work shall consist of furnishing and applying approved dust control material (water, calcium chloride or other approved method as approved by the Construction Manager) to the surface of the subgrade or elsewhere as required to control dust or as directed by the Construction Manager in accordance with these specifications.

1.1.2 Materials except for water used for dust control will be furnished by the Contractor (i.e., Owner will provide a source of water for the Contractor's use).

PART 2 - TECHNICAL REQUIREMENTS

2.1 GENERAL

2.1.1 Water: Water obtained for dust control shall not contain compounds which may be harmful to the environment and must be from sources approved by the Construction Manager.

2.1.2 Calcium Chloride: Shall conform to the requirements of AASHTO M 144, Type I or Type II.

PART 3 - EXECUTION

3.1 GENERAL

3.1.1 The required material shall be properly applied where directed by the Construction Manager and distributed uniformly at a rate required to control dust. The means of distribution shall depend upon the kind of material used, and the method and equipment used shall be satisfactory to the Construction Manager. The number and frequency of applications shall be as necessary to control the dust.

3.1.2 Water shall be applied at locations at such times, and in the amount required to control dust. Watering equipment shall consist of pipelines, tanks, tank trucks, or other approved devices capable of applying a uniform spread of water over the surface. A suitable device for a positive shut-off and for regulating the flow of water shall be located so as to permit positive operator control.

3.1.3 Calcium chloride shall be uniformly applied at the rate of 2.0 lbs/square yard or at any other rate as required to control dust by means of a mechanical spreader, or other approved methods.

Calcium chloride dust control methods shall not be used within 1000' of any concrete road surfaces, foundations and/or structures.

3.2 DUST CONTROL OF WASTE PLACEMENT

3.2.1 The release of visible dust from construction activities must be controlled. Contaminated dust is a concern relating to exposure of workers and the public to airborne radioactive contaminates. Airborne dust emissions will be monitored and controlled at all times, including weekends, holidays, and hours when work is not in progress.

3.2.2 Operational controls will include:

- Spraying of waste placement with water
- Using geotextile fabric or geomembrane as covers
- Using a sprayed-on, biodegradable surface-covering material
- Minimizing free fall of material
- The use of truck washing stations at truck loading areas and at the storage cell
- The use of covers on trucks when transporting the waste material

3.2.3 Administrative controls will include:

- Training of personnel
- Enforcing speed limits
- Limiting hours of operations
- Maintaining dust monitoring at key downwind positions

3.2.4 In general, on-site dust control will primarily be accomplished by using water spray from a dedicated water wagon or truck. Placed waste will be wetted with the water tuck. The landfill cover will be constructed as soon as practical to retain moisture and to minimize dispersion of dust by wind.

3.2.5 Uncontaminated water or contaminated water may be used for dust control on contaminated areas. Only uncontaminated water will be used for dust control on the Haul Road.

END OF SECTION

SECTION 02230

SITE CLEARING

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 Work items included for this specification section are to clear, grub and strip work and borrow areas.

1.1.2 Related Work Described Elsewhere

02205	Dust Control
02300	Earthwork

1.2 SUBMITTALS

Not applicable.

1.3 QUALITY ASSURANCE

1.3.1 Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

1.4 PRODUCT HANDLING

1.4.1 Provisions for Delivery, Storage, and Handling - see Division 1, Section 01613.

PART 2 - TECHNICAL REQUIREMENTS (Not Applicable)

PART 3 - EXECUTION

3.1 CLEARING AND GRUBBING

3.1.1 General

1. This section covers clearing, grubbing and the disposal of all trees, shrubs, logs, stumps, brush, roots, vegetation, debris and other obstructions and objectionable materials within the clearing limits unless designated for preservation by the Owner. The work also includes the removal and disposal of fences, utilities, equipment, etc. that are not to be retained for use by the Owner.

2. Survey monuments, landmarks and other facilities and structures within the work area designated for preservation by the Construction Site Manager shall be clearly flagged or marked by the Contractor in the field prior to commencing work. Contractor shall protect those designated items from abuse, marring, or damage during the work. Such protection shall include prohibiting parking or servicing equipment over, under, or near those items.

3. Limits of clearing and grubbing shall not extend beyond the limits of the right of way and shall be held to the minimum requirements for the Contractor to perform the work.

3.1.2 Clearing

1. Clearing shall consist of the removal (flush with the ground surface) and disposal of all trees, brush, stumps, and other growth. Clearing shall include the removal and disposal of vegetation.

2. Clearing shall include the removal and disposal of slabs, concrete rubble, etc.; rubbish, fence posts, wire gates, water gaps, pull structures, road culverts, abandoned aboveground utilities, abandoned underground utilities, or parts thereof.

3.1.3 Grubbing

1. Grubbing shall consist of the removal (to a maximum depth of six inches below natural ground) and disposal of all stumps, roots larger than two (2) inches in diameter, and all matted roots.

2. Stumps and roots within the borrow and excavation areas shall be grubbed as described above to the complete extent possible to prevent such objectionable matter from becoming mixed with the material to be used in construction.

3.1.4 Disposal of Material

1. Waste material shall not be thrown into or left in waterways or other low areas. Disposal of material shall closely follow the clearing or clearing and grubbing process so that in case of high water, the cleared material will not be washed into waterways.

2. Any downed timber and wood pieces from the clearing or grubbing process that is solid and larger than two (2) inches in diameter at the butt end and longer than four (4) feet in length shall be disposed of off-site. Such disposal shall conform to all applicable local, state and federal regulations.

3. All trees, fences, poles, building materials, pipes, etc., removed during the clearing or clearing and grubbing operation shall become the property of Contractor unless those materials can be reused as part of the specified work. Any profit realized from the salvage of those items shall be passed on to the Owner through a reduction in price for clearing.

3.2 STRIPPING

3.2.1 General

This section covers the excavation of topsoil from all work areas.

3.2.2 Methods

1. After the completion of clearing and grubbing work, near-surface organic soils (topsoil), including grasses and weeds growing in those soils, shall be excavated (stripped) a minimum depth of six inches from excavation and fill areas and areas to be used for stockpiles or construction staging areas, prior to beginning further construction in those areas. If, in the opinion of the Owner, stripping topsoil, grasses and weeds from some fill areas would result in softening of the subgrade, the Owner may direct the Contractor to not strip those areas.

2. Topsoil stripped from work areas shall be hauled and stored at areas as designated by the Owner.

END OF SECTION

SECTION 02300

EARTHWORK

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 Work included for this specification section:

1. Excavate and place fill per the lines and grades indicated on the plans.

2. Furnish and install culvert bedding and backfill.

3. Construct roads as detailed on the drawings.

4. Furnish and Install Rip Rap per lines and grades indicated on the plans.

1.1.2 Related Work Described Elsewhere

02205	Dust Control
02230	Site Clearing
02377	Clay Barrier Layer
02700	Drainage Control Structures
02722	Aggregate Base Course
02731	Aggregate Surface Course
02821	Fencing
02900	Topsoil & Seeding

1.2 SUBMITTALS

Submittals will be in accordance with Section 01300; Submittals and as specified in this section.

1.2.1 Product Data

The Contractor shall submit product data for geotextile material.

1.2.2 Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.

2. Laboratory compaction curves according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.

3. Laboratory compaction curve according to ASTM D 1557 for each on-site or borrow soil material proposed for fill and backfill.

1.2.3 Shop drawings: After the contract is placed, the Contractor shall prepare shop detail and erection drawings for all items he supplies and shall submit two good quality sepias of each made from the Contractor's original drawings, to the Engineer for approval with such promptness as to cause no delay in the contract schedule.

1.3 QUALITY ASSURANCE

1.3.1 Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

1.4 PRODUCT HANDLING

1.4.1 Provisions for Delivery, Storage, and Handling - see Division 1, Section 01613.

PART 2 - TECHNICAL REQUIREMENTS

2.1 FILLS

2.1.1 General

1. This section details requirements for constructing fills within the work area. Work includes, but is not necessarily limited to:

   a. Preparing subgrades for the placement of fill.
   b. Placing fill, pipe bedding, riprap, and topsoil.

2. The requirements for constructing fills are contained herein and include:

   - material types
   - compaction requirements
   - lift thicknesses
   - construction methods
   - design standards

3. Materials testing will be performed by "Others" to evaluate whether the work conforms to specification requirements. Contractor shall provide access to the work and reasonable assistance so the tests can be made.

4. The results of tests performed by "Others" shall not be the sole basis the Owner will use to evaluate Contractor compliance with specification

3. The test results shall not relieve the Contractor of the sole responsibility of performing all work to conform to specification requirements.

2.1.2 Fill Material Sources

1. Contractor shall be responsible for providing all fill materials that cannot be obtained from required excavations and Owner-provided borrow areas. Contractor shall also be responsible for determining the nature and quantity of materials and for the excavation, hauling, blending and processing of these materials, as required, to meet the requirements of this specification.

2. In general, fill and topsoil requirements shall be obtained from the site excavations.
   Contractor shall provide fill and topsoil material shortages from offsite Sources.

3. Only unfrozen fill and backfill shall be used.

2.1.3 Fill Material

1. Fill shall be free of frozen material, vegetation, sod, roots and other debris.

2. Pipe Bedding shall consist of sands and gravels, classified in accordance with ASTM D 2487, conforming to the following:

U.S. Standard Sieve Size	Percent Finer (by weight)
3/4 inch	100
No. 4	50 to 100
No. 30	15 to 60
No. 200	0 to 10

Plasticity Index (ASTM 4318A) Less than 6

3. Riprap shall consist of well-graded, hard, sound, durable, angular, rock material conforming to the following:

Maximum Size	30 inches
Median Size	20 inches
Minimum Size (Spalls)	1 inches
Specific Gravity	Greater than 2.40

The length to width ratio of riprap pieces shall not exceed 2.

4. Cover Filter Drainage/Bedding Layer shall consist of well graded crushed non-carbonate bearing stone

U.S. Standard Sieve Size	Percent Finer (by weight)
1 inch	100
3/8 inch	75 to 100
No. 4	45 to 95
No. 8	15 to 75
No.15	5 to 50
No. 40	0 to 15
No. 70	0 to 5
No. 100	0

5. Topsoil shall consist of near-surface organic soils (topsoil), including grasses and weeds growing in those soils, stripped from excavation and fill areas.

6. Culvert Backfill

Culvert backfill around and over the structure shall conform to details shown on the construction drawing's.

Backfill shall be placed and compacted to not less than 95 per cent density per ASTM D 698.

2.1.4 Compaction Equipment

1. Compaction of the natural soil subgrade and each lift of fill shall be with suitable, large, self-propelled, compaction equipment. Hand equipment shall be used, as needed, for compaction in areas too small for the effective operation of large, self-propelled, compaction equipment.

PART 3 - EXECUTION

3.1 EXCAVATION

3.1.1 General

1. Excavation shall consist of excavating, loading, transporting, and dumping of soils, and if necessary, the stockpiling and re-handling of stockpiled soils, and the disposal of excavated unsuitable soils.

2. All trees, brush, trash, rubbish, existing structures; debris and topsoil shall be cleared, grubbed and stripped from the excavation areas prior to starting excavations.

3.1.2 Methods

1. Excavation shall be with suitable equipment and methods, which shall be subject to review and approval by the Owner.

2. Required excavations shall be at the locations and to the lines and grades shown on the drawings.

3. Borrow area excavations shall be planned and executed to minimize the area disturbed and to provide the necessary fill materials. Borrow area excavations shall be at the locations and generally to the lines and grades shown on the drawings. As much as possible, the excavations shall be in segments, with each segment completed prior to opening additional areas of the borrow area.

4. If loose or unsuitable soils are found in excavation bottoms or slopes, excavations shall be deepened or widened to remove the loose or unsuitable material.

5. Should Contractor excavate below the planned permanent lines and grades indicated on the drawings, or below depths specified by the Owner, the Owner shall be notified immediately. In the event of over-excavation, work in the area in question shall be suspended until further notice.

6. Contractor is responsible for all costs associated with over-excavation. Fill to return over-excavation to the lines and grades indicated on the construction plans shall be embankment fill, or as determined by Owner.

7. The approximate locations of the known utilities are shown on the drawings. Contractor shall plan excavations to avoid damaging all underground utilities and shall be fully responsible to the Owner in the event of damage or removal of any existing utility.

8. Temporary excavations to prepare areas to receive fill or for culverts shall be to at least the depths shown on the drawings. Contractor shall shore, brace or otherwise support such excavations, flatten excavation slopes and/or increase excavation dimensions as necessary to provide for worker safety. Such shoring, bracing, supports, and increased excavation dimensions shall be provided by Contractor and shall be in accordance with applicable local, state and federal laws and regulations.

9. Excavations will be by hand equipment, if required.

10. The Owner immediately prior to any subsequent construction shall inspect the bottom of all excavations for acceptance.

3.1.3 Use of Excavated Materials

1. Earth materials from excavations that conform to fill material specification requirements shall be used for fill materials.

2. Earth materials from required excavations that, in the opinion of Owner, cannot be used as fill materials shall be hauled and disposed of off -site.

3. Excess topsoil not used in dressing slopes or spread over designated excavated areas as indicated on the plans shall be disposed of as directed by the Owner.

3.2 FILL SUBGRADE PREPARATION

1. Areas to receive fill shall be graded to remove surface irregularities and to permit drainage of surface water. Areas to receive fill shall be free of debris, mud, loose soil, frozen ground and other deleterious material. All areas to receive fill shall be maintained free of snow and ice.

2. Areas to receive fill shall be inspected for acceptance by the Owner immediately prior to placing fill.

3. The top 8 inches of natural soils to be covered by fill shall be scarified, conditioned to within ± 2 percent of the optimum moisture content for compaction, and shall be compacted to at least 95 percent maximum dry density (ASTM D 698) prior to fill placement.

4. The surfaces of existing fill materials to be overlain by additional fill shall be reconditioned, as required, (moistened and/or dried) to within ± 2 percent of the optimum moisture content for compaction by discing, scarifying or other industry-accepted methods. After moisture reconditioning, the fill materials shall be compacted to the maximum dry density specified for that particular fill prior to placing additional materials. The reconditioning shall extend into existing fill materials that are still near the optimum moisture content for compaction and still compacted to specified dry densities (i.e., not loosened by weather or other activities). Excavating some existing fill materials may be necessary.

3.3 FILL PLACEMENT

1. No frozen soils, snow or ice shall be allowed in any fill material, nor shall any fill be placed over frozen materials, snow or ice.

2. Adjacent to structures, fill shall be placed in a manner that will prevent damage to the structures and will allow the structures to assume the loads from the fill gradually and uniformly.

3. Each layer of fill shall extend the entire length and width of the area being filled, when practicable.

4. Where fills are constructed at different levels, the slope of the bonding surface of fill in-place shall not exceed 3 horizontal to 1 vertical.

5. When fill is placed against sloping subgrade or fill surfaces, the surface shall be bladed or notched to tie in each layer, and the tie-in of fill with the subgrade or fill shall be compacted.

6. Fill shall be placed in horizontal loose lifts of 8 to 10 inches in thickness. Prior to compaction, the moisture content of the fill shall be within ± 2 percent of the optimum moisture content for compaction. Each lift of fill shall be compacted to at least 95 percent of the maximum density based on ASTM D 698.

7. Pipe Bedding shall be placed by methods that prevent segregation and contamination by foreign material. The uncompacted lift thickness of bedding shall not exceed 8 inches. Compaction shall be at least to 90 percent relative density (ASTM D 4253 and ASTM D 4254).

8. Riprap shall be placed in a manner that produces a stable riprap section. The riprap shall be placed over the bedding layer and at the locations and to the lines and grades shown on the drawings beginning at the bottom of the section and in such a manner as to produce a well graded riprap section with maximum interlocking and minimum voids with no overhanging "floaters."

9. Topsoil, where indicated on the drawings, shall be spread to a minimum depth of 4 Inches over completed fill and excavation slopes, and areas disturbed by construction. Excavation, fill and ground surfaces to receive topsoil shall be graded to their final configuration prior to spreading the topsoil. After the topsoil has been placed and spread to a uniform thickness, the topsoil shall be moistened and rolled if required.

3.4 FINAL GRADING

After all construction work has been completed, all ground surface areas disturbed by this construction shall be graded. The grading shall be finished to the matching contours and elevations of the original undisturbed adjacent ground surface. The final grading shall provide a smooth, uniform surface and positive drainage of the area. No ponding of water shall be allowed.

END OF SECTION

SECTION 02377

CLAY BARRIER LAYER

PART 1 GENERAL

1.1 DESCRIPTION

1.1.1 Work included for this specification section includes furnish, deliver and install the clay barrier layer as indicated on the plans.

1.1.2 Related Work Described Elsewhere:

02205 Dust Control
02300 Earthwork
02900 Topsoil & Seeding

1.2 EQUIPMENT

Equipment used to place the clay barrier layer shall not brake suddenly, turn sharply, or be operated at speeds exceeding 5.0 miles per hour.

1.2.1 Compaction Equipment

Compaction equipment shall consist of tamping foot rollers which have a minimum weight of 40,000 pounds . At least one tamping foot shall be provided for each 110 square inches of drum surface. The length of each tamping foot, from the outside surface of the drum, shall be equal to or greater than the loose lift thickness. During compaction operations, the spaces between the tamping feet shall be maintained clear of materials which would impair the effectiveness of the tamping foot rollers.

1.2.2 Scarification Equipment

Disks, rotor tillers, or other approved means shall be provided to scarify the surface of each lift of clay prior to placement of the next lift. The scarification equipment shall be capable of uniformly disturbing the upper 1 inch of the clay surface to provide good bonding between lifts.

1.2.3 Steel Wheeled Rollers

A smooth, non-vibratory steel wheeled roller shall be used to produce a smooth compacted surface on the clay barrier layer. Steel wheeled rollers shall weigh a minimum of 20,000 pounds.

1.2.4 Hand Operated Tampers

Hand operated tampers shall consist of rammers or other impact type equipment. Vibratory type equipment will not be allowed.

1.3 SUBMITTALS

Submittals will be in accordance with Section 01300; Submittals and as specified in this section.

1.3.1 Materials Handling Plan describing the following: processing and placement of the clay; type, model number, weight and critical dimensions of equipment to be used for soil processing, compaction, scarification, and smooth rolling; method of protecting clay from contamination, changes in moisture content, and freezing prior to and after placement.

1.3.2 Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Moisture Content and Density Test

2. Hydraulic Conductivity Tests

3. Borrow Source Report at least 15 days prior to clay placement. No clay shall be placed until the Borrow Source Report is approved. The report shall include the following: location of each borrow source; laboratory test results; moisture-density curves showing the "Acceptable Zone" of moisture contents and densities which achieve the required hydraulic conductivity for each principal type of material or combination of materials. A zero air voids curve shall be included on each moisture-density curve

PART 2 PRODUCTS

2.1 CLAY

2.1.1 Clay shall be free of roots, debris, organic or frozen material, and shall have a maximum clod size of 2 inches at the time of compaction. Clay material shall comply with the criteria listed in Table 1.

TABLE 1
REQUIRED PHYSICAL PROPERTIES OF CLAY

Property	Test Value	Test Method
Max. particle size (inches)	1	ASTM D 422
Min. percent passing No. 4 sieve	80	ASTM D 422
Min. percent passing No. 200 sieve	50	ASTM D 1140
Min. liquid limit	35	ASTM D 4318
Min. plasticity index	10	ASTM D 4318
Max. plasticity index	40	ASTM D 4318

PART 3 EXECUTION

3.1 BORROW SOURCE REPORT

3.1.1 Borrow source Report tests shall be performed on each principal type or combination of materials proposed for use in the clay barrier layer to assure compliance with specified requirements and to develop compaction requirements for placement. A minimum of one set of borrow Report tests shall be performed for each borrow source proposed. A set of borrow source Report tests shall consist of classification testing, moisture-density (compaction) testing, and hydraulic conductivity testing.

3.1.2 Classification Testing; Borings placed in a grid pattern shall be used to characterize each proposed borrow source. The borings shall extend to the full depth of the proposed borrow source. Visual classification as described in ASTM D 2488 shall be performed over the full depth of each boring by a registered geologist or geotechnical engineer. Soils shall be grouped into "principal types" based on visual classification. Classification testing shall be performed on representative samples of each principal type or combination of materials. At a minimum, one set of classification tests shall be performed per 500 cubic yards of proposed borrow. Classification testing shall consist of liquid and plastic limits in accordance with ASTM D 4318 and particle size analysis in accordance with ASTM D 422. Moisture content testing of proposed borrow shall be performed at a frequency of once per 500 cubic yards in accordance with ASTM D 2216.

3.1.3 Compaction Testing; A representative sample from each principal type or combination of borrow materials shall be tested to establish compaction curves using ASTM D 698 and ASTM D 1557. A minimum of one set of compaction curves shall be developed per 1,000 cubic yards of each proposed borrow material. A minimum of 5 points shall be used to develop each compaction curve. The compaction curves for each principal type or combination of borrow materials shall be plotted on a single graph of dry density versus moisture content

3.1.4 Hydraulic Conductivity Testing; A set of hydraulic conductivity tests shall be performed on representative samples of each principal type or combination of borrow materials. A minimum of one set of tests shall be performed per 6,500 cubic yards of proposed borrow material. A set of tests shall consist of one hydraulic conductivity test run on a representative sample corresponding to each point from each compaction curve at or above ASTM D 1557 optimum moisture content. Hydraulic conductivity testing referenced in this section shall be conducted in accordance with ASTM D 5084. In addition, the following procedures shall be adhered to when performing the testing:

a. Saturation of test specimens shall be verified by determination of the B coefficient. The B coefficient must be at least 0.95. The B coefficient is defined as the change in pore water pressure divided by the change in confining pressure

b. .During consolidation of the test specimens, outflow volumes versus time shall be recorded on a semi-log graph to confirm primary consolidation has been completed prior to permeation of the specimens.

c. The permeant used for back pressure saturation and permeation shall be 0.005 N calcium sulfate as specified in ASTM D 5084.

d. The average effective confining pressure shall be 4 psi.

3.1.5 Acceptable Zone Development; An "Acceptable Zone" of moisture contents and densities shall be developed and displayed with the compaction curve graphs for each principal type of borrow material or combination of borrow materials. The "Acceptable Zone" shall consist of moisture-density values that meet the following requirements:

a. Maximum Allowable Hydraulic Conductivity = 1×10^{-7} cm/second.

b. The minimum allowable moisture content shall be no less than optimum moisture content based on ASTM D 1557.

c. The minimum allowable dry density shall be no less than 95 percent of maximum dry density based on ASTM D 698

3.2 INSTALLATION

3.2.1 Clay Placement; Clay shall be placed to the lines and grades shown on the drawings. The clay shall be placed in loose lifts not to exceed 8 inches in thickness. In areas where hand operated tampers must be used, the loose lift thickness shall not exceed 4 inches. If grade stakes are driven into the clay layer to control lift thickness, they shall be numbered and accounted for at the end of each shift. When

removing grade stakes, no broken portion of the grade stakes shall be left in the clay layer. Holes left by grade stakes shall be backfilled and compacted.

3.2.2 Moisture Control; Clay shall be placed and compacted within the "Acceptable Zone" moisture content range in the approved Borrow Source Report Report. The moisture content shall be maintained uniform throughout each lift. Moisture added shall be thoroughly incorporated into the clay to ensure uniformity of moisture content prior to compaction.

3.2.3 Compaction; Clay shall be compacted to meet the density requirements in the approved Borrow Source Report and by at least 5 passes of the approved compaction equipment over all areas of each lift. For self-propelled compactors, one pass is defined as one pass of the entire vehicle. For towed rollers, one pass of the drum constitutes a pass. Hand operated tampers shall be used in areas where standard compaction equipment cannot be operated.

3.2.4 Scarification; Scarification shall be performed on all areas of the upper surface of each clay lift prior to placement of the next lift. Scarification shall be accomplished with approved equipment. The final lift of clay shall not be scarified. The final lift shall be smooth rolled with at least 3 passes of the approved smooth steel wheeled roller to provide a smooth surface with no ridges or depressions.

3.2.5 Repair of Voids; Voids created in the clay barrier layer during construction (including, but not limited to, penetrations for test samples, grade stakes, and other penetrations necessary for construction) shall be repaired by removing sand or other non-clay material, placing clay backfill in lifts no thicker than 3 inches and tamping each lift with a steel rod. Each lift shall be tamped a minimum of 25 times altering the location of the rod within the void for each blow. Other ruts and depressions in the surface of the lifts shall be scarified, filled, and then compacted to grade.

3.3 CONSTRUCTION TOLERANCES

3.3.1 The top surface of the clay barrier layer shall be no greater than 3 inches above the lines and grades shown on the drawings. No minus tolerance will be permitted .

3.4 CONSTRUCTION TESTS

3.4.1 Clay Material Tests; During construction of the clay barrier layer, representative samples shall be taken for testing at the frequencies listed in Table 2 from the borrow source. Where test results indicate material does not meet specifications of Table 1, additional testing shall be performed as described in paragraph BORROW SOURCE REPORT.

TABLE 2
CLAY MATERIAL PROPERTIES

Property	Frequency	Test Method
Percent passing No. 4 sieve (Note 1)	500 cubic yards	ASTM D 422
Percent passing No. 200 sieve (Note 1)	500 cubic yards	ASTM D 1140
Liquid and plastic limits (Note 1)	500 cubic yards	ASTM D 4318
Compaction	500 cubic yards	ASTM D 698

Note 1: At least one test shall be performed each day that soil is placed.

3.4.2 Moisture Content and Density Tests of In-Place Clay; Moisture content and density tests shall be performed in a grid pattern. The grid pattern shall be staggered for successive lifts so that sampling points are not at the same location in each lift. Moisture content and density tests shall be performed in accordance with Table 3.

TABLE 3
MOISTURE CONTENT AND DENSITY TESTS OF IN-PLACE CLAY

Property	Frequency Per Lift	Test Method
Rapid Moisture Content	1,000 square feet	ASTM D 3017
Standard Moisture Content (Note 1)	1 for every 10 rapid tests	ASTM D 2216
Rapid Density	1,000 square feet	ASTM D 2922
Standard Density (Note 1)	1 for every 20 rapid tests	ASTM D 1556 ASTM D 2167

Note 1: The standard moisture content test is defined as ASTM D 2216. Standard density tests are defined as either ASTM D 1556 or ASTM D 2167.

3.4.2.1 Rapid Tests; Each day that clay is compacted, a minimum of one set of moisture content and density tests shall be performed using standard procedures. Rapid tests shall be checked at the frequencies shown in Table 3. Standard tests shall

be performed at locations which are as close as possible to the location of the rapid tests being checked.

3.4.2.2 Nuclear Density and Moisture Content Tests; Nuclear density readings shall be taken in the direct transmission mode. Nuclear density and moisture calibration curves shall be checked and adjusted in accordance with the procedures described in ASTM D 2922 and ASTM D 3017. The nuclear gauge calibration checks shall be made at the beginning of a job, on each different type of material to be placed, and at intervals as directed. Nuclear density and moisture content gauges shall also be standardized daily in accordance with ASTM D 2922 and ASTM D 3017.

3.4.2.3 Test Results; The field moisture content and density test results shall be plotted on the "Acceptable Zone" plot that corresponds to the appropriate material type being tested. If test results are not within the "Acceptable Zone" for moisture content or density, 3 additional tests shall be performed near the location of the failed parameter. If all retests pass, no additional action shall be taken. If any of the retests fail, the lift of soil shall be repaired out to the limits defined by passing tests for that parameter. The area shall then be retested as directed. Repairs to the clay layer shall be documented including location and volume of soil affected, corrective action taken, and results of retests.

3.4.3 Hydraulic Conductivity Tests of In-Place Clay; Undisturbed samples shall be taken for hydraulic conductivity testing at a frequency of once per 40,000 square feet for each lift of clay placed. Samples shall be cut from the lift in accordance with ASTM D 1587 and transported in the vertical position in accordance with ASTM D 4220, Group C. Each undisturbed sample shall be tested for hydraulic conductivity in accordance with ASTM D 5084, moisture content in accordance with ASTM D 2216, particle size analysis in accordance with ASTM D 422, and liquid and plastic limits in accordance with ASTM D 4318. Hydraulic conductivity testing shall be conducted in accordance with the requirements in paragraph Hydraulic Conductivity Testing. If any test result is greater than the "Maximum Allowable Hydraulic Conductivity", modifications shall be proposed and approved for the placement of additional clay of that type. If the hydraulic conductivity of any test is more than one-half of one order of magnitude greater than the "Maximum Allowable Hydraulic Conductivity",3 additional tests shall be performed near the location of the original failed test. If all retests pass, no additional action shall be taken. If any of the retests fail, the area shall be repaired out to the limits defined by passing hydraulic conductivity tests. The area shall then be retested as directed. Repairs to the clay layer shall be documented including location and volume of soil affected, corrective action taken, and results of retests.

3.5 PROTECTION

3.5.1 Moisture Content; After placement, moisture content shall be maintained or adjusted to meet the acceptable zone criteria.

3.5.2 Erosion; Erosion that occurs in the clay layer shall be repaired and grades re-established.

3.5.3 Freezing and Desiccation; Freezing and desiccation of the clay layer shall be prevented. If freezing or desiccation occurs, the affected soil shall be removed or reconditioned as directed.

3.5.4 Retests; Areas that have required repair shall be retested as directed. Repairs to the clay layer shall be documented including location and volume of soil affected, corrective action taken, and results of retests.

END OF SECTION

SECTION 02700

DRAINAGE CONTROL STRUCTURES

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 Work Included

Furnish, fabricate, deliver and install the culverts and appurtenances as shown on the contract drawings and as specified herein including but not necessarily limited to:

- Corrugated metal pipe culverts

Prepare and furnish applicable shop drawings and appurtenant materials necessary to satisfy the design requirements as specified herein and shown on the Engineer's drawings.

Furnish and install all culverts and appurtenant materials including, but not limited to, end treatments, anchor bolts, embedments, and stiffeners.

1.1.2 Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.1.3 Related Sections - Documents affecting work in this section, include but are not necessarily limited to, the following sections of this Specification:

Section 01300 - Submittals

Section 02300 – Earthwork

Section 03307 – Concrete for Minor Structures

1.2 SUBMITTALS

1.2.1. General

All Contractor's drawings and submittals shall be in conformance with Section 01300. During the course of approving shop detail drawings, the Engineer may indicate that revisions are required to incorporate a change on the Engineers' design drawing. Changes to the shop detail drawings made as a result of the Engineer's written instructions are reimbursable to the Contractor. Changes to the shop detail

drawings required to correct the design of the detail are not reimbursable to the Contractor. In order to determine the responsibility for back charges for additional drafting room work, all Contractor requests for additional compensation due to changes shall be designated as an Engineers' Design Change (EDC) and be indicated on the Contractor's shop detail drawing when reissued along with verified man-hours. Upon approval by the Engineer, additional compensation at the established all- inclusive hourly rate will be paid for this category.

1.2.2 Product Data

Submit producer's or manufacturer's details, specifications and installation instructions. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1.3 QUALITY ASSURANCE

1.3.1 Codes and Standards

Contractor shall comply with the provisions of the following, except as otherwise indicated:

AASHTO - Division I - Section 12 - Soil-Corrugated Metal Structure Interaction Systems

AASHTO - Division II - Section 26 - Metal Culverts

American Society for Testing and Materials (ASTM)

1.4 PRODUCT HANDLING

1.4.1 Provisions for Storage

Items shall be handled in a manner consistent with safe and sound material handling practice.

Items shall be stored outdoors in an area designated by the Owner. The area shall be well drained and reasonably removed from the actual construction area and traffic so that damage from construction equipment is minimized. All items shall be stored on cribbing or equivalent to avoid trapping water and to allow air circulation. Bolts, nuts and washers, if packaged to exclude moisture, may be stored outdoors on cribbing.

1.4.2 Shipping Requirements

For all items, packaging shall be adequate to prevent contamination, mechanical damage or deterioration during the field storage period. Bolts, nuts and washers shall be shipped in closed containers.

PART 2 - TECHNICAL REQUIREMENTS

2.1 GENERAL

2.1.1 Materials

All materials shall be new and shall be certified to be in accordance with the applicable specification of the serial designation herein. Evidence of certification shall be on file in the Contractor's office and furnished to the Engineer as specified in Part 1. Certificates of Conformance in lieu of material test reports may be submitted as documentation of the above requirements, only upon the written approval of the Owner.

2.2 REQUIREMENTS

Materials and fabrication shall be in accordance with the design requirements of the Pennsylvania, Department of Transportation, Standard Specifications for Construction except as specified or approved in writing by the Engineers. All materials shall conform to the current requirements of the following ASTM specifications:

Corrugated galvanized steel	AASHTO M 218
Corrugated aluminized steel	AASHTO M 274
Coupling bands	AASHTO M 36
Bolts and nuts	ASTM A449 and ASTM A563, Class C, respectively
Washers, steel, hardened	ASTM F436
Anchor bolts	ASTM A307, Grade A
Galvanizing	ASTM A153 and ASTM A123

PART 3 - EXECUTION

3.1 GENERAL

The station, flow information, size, type, quantity, length, and foundation type (where required) for the various culverts required are shown on the engineer's drawing.

3.1.1 Erection

All culverts shall be furnished, fabricated and installed in strict accordance with the manufacturer's instructions. Provisions not covered in PA. DOT Spec. shall be as specified in AASHTO, Division II, Section 26. Bedding and backfill material are specified in Section 02300 - Earthwork.

3.2 GALVANIZING

The zinc (hot galvanized) coatings applied to the fabricated products shall be in accordance with ASTM A123 or ASTM A153 and all of the incorporated specifications and recommended practices of the ASTM referenced therein, except as otherwise required or permitted herein. Additionally, hot-dip galvanizing and fabrication of items for hot-dip galvanizing should conform to the standards and guidelines set forth in AHDGA/ZI Manual.

3.3 ALUMINIZING

The aluminum coatings applied to the fabricated products shall be in accordance with AASHTO M 274 and all of the incorporated specifications and recommended practices of the ASTM referenced therein.

3.4 INSPECTIONS AND TESTS

The Contractor shall be responsible for performing all tests and inspections necessary to ensure that the products specified herein meet the requirements of this specification. At a minimum, testing shall comply with the inspection procedures outlined in the PA. DOT Spec. Complete records of the testing and inspection shall be maintained. All products will be subject to inspection by the Owner's designee, at delivery, for conformance with this specification. The inspection at delivery will include, but not be limited to, visual inspection and measurements to verify that all products meet the requirements of this specification.

In addition, the Contractor shall perform and require his subcontractors and vendors to perform sufficient testing and inspections to ensure that the products supplied satisfy specifications. Records of any and all tests and inspections shall be maintained in the Contractor's files and be submitted to the Engineer as specified in Part 1 of this specification.

All tests required by this specification shall be performed and paid for by the Contractor.

3.5 SHIPPING REQUIREMENTS

Delivery shall be in accordance with Section 01643.

END OF SECTION

SECTION 02722

AGGREGATE BASE COURSE

PART 1 GENERAL

1.1 DESCRIPTION

1.1.1 Work included for this specification section:

1. Furnish, deliver and install Aggregate Base Course as indicated on the plans.

1.1.2 Related Work Described Elsewhere

02300 Earthwork
02731 Aggregate Surface Course

1.2 DEFINITIONS

For the purposes of this specification, the following definitions apply.

1.2.1 Aggregate Base Course; Aggregate base course (ABC) is well graded, durable aggregate uniformly moistened and mechanically stabilized by compaction strength and stability

1.2.2 Degree of Compaction; Degree of compaction shall be expressed as a percentage of the maximum dry density obtained by the test procedure presented in ASTM D 1557.

1.3 SUBMITTALS

1.3.1 Calibration curves and related test results prior to using the device or equipment being calibrated. Copies of field test results within 24 hours after the tests are performed. Certified copies of test results for approval not less than 15 days before material is required for the work.

1.3.2 Waybills and Delivery Tickets; Copies of waybills and delivery tickets during the progress of the work. Before the final statement is allowed, the Contractor shall file certified waybills and certified delivery tickets for all aggregates actually used.

1.4 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by a qualified testing agency.

1.4.1 Sampling; Samples for laboratory testing shall be taken in conformance with ASTM D 75. When deemed necessary, the sampling will be observed by the Contracting Officer.

1.4.2 Tests; The following tests shall be performed in conformance with the applicable standards listed.

1.4.2.1 Sieve Analysis; Sieve analysis shall be made in conformance with ASTM C 117 and ASTM D 422. Sieves shall conform to ASTM E 11.

1.4.2.2 Liquid Limit and Plasticity Index; Liquid limit and plasticity index shall be determined in accordance with ASTM D 4318.

1.4.2.3 Moisture-Density Determinations; The maximum density and optimum moisture content shall be determined in accordance with ASTM D1557, Method D.

1.4.2.4 Field Density Tests; Density shall be field measured in accordance with ASTM D 2922. For the method presented in ASTM D 2922 the calibration curves shall be checked and adjusted if necessary using only the sand cone method as described in paragraph Calibration, of the ASTM publication. Tests performed in accordance with ASTM D 2922 result in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made by the prepared containers of material method, as described in paragraph Calibration of ASTM D 2922, on each different type of material being tested at the beginning of a job and at intervals as directed.

1.4.2.5 Wear Test; Wear tests shall be made on ABC course material in conformance with ASTM C 131.

1.4.3 Testing Frequency

1.4.3.1 Initial Tests; One of each of the following tests shall be performed on the proposed material prior to commencing construction to demonstrate that the proposed material meets all specified requirements when furnished. If materials from more than one source are going to be utilized, this testing shall be completed for each source.

a. Sieve Analysis
b. Liquid limit and plasticity index moisture-density relationship.
c. Moisture-density relationship.
d. Wear

1.4.3.2 In Place Tests; One of each of the following tests shall be performed on samples taken from the placed and compacted ABC. Samples shall be taken and tested at the rates indicated.

a. Density tests shall be performed on every lift of material placed and at a frequency of one set of tests for every 250 square yards, or portion thereof, of completed area.

b. Sieve Analysis No. 635 size material shall be performed for every 500 tons, or portion thereof, of material placed.

c. Liquid limit and plasticity index tests shall be performed at the same frequency as the sieve analysis.

1.4.4 Approval of Material; The source of the material shall be selected 15 days prior to the time the material will be required in the work. Tentative approval of material will be based on initial test results. Final approval of the materials will be based on sieve analysis, liquid limit, and plasticity index tests performed on samples taken from the completed and fully compacted ABC.

1.5 WEATHER LIMITATIONS

Construction shall be done when the atmospheric temperature is above 35 degrees F. When the temperature falls below 35 degrees F, the Contractor shall protect all completed areas by approved methods against detrimental effects of freezing. Completed areas damaged by freezing, rainfall, or other weather conditions shall be corrected to meet specified requirements.

1.6 PLANT, EQUIPMENT, AND TOOLS

All plant, equipment, and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall be adequate and shall have the capability of producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

PART 2 PRODUCTS

2.1 AGGREGATES

The ABC shall consist of clean, sound, durable particles of crushed stone, crushed slag, crushed gravel, crushed recycled concrete, angular sand, or other approved material. ABC shall be free of lumps of clay, organic matter, and other objectionable materials or coatings. The portion retained on the No. 4 sieve shall be known as coarse aggregate; that portion passing the No. 4 sieve shall be known as fine aggregate.

2.1.1 Coarse Aggregate; Coarse aggregates shall be angular particles of uniform density. When the coarse aggregate is supplied from more than one source, aggregate from each source shall meet the specified requirements and shall be stockpiled separately.

a. Crushed Gravel: Crushed gravel shall be manufactured by crushing gravels, and shall meet all the requirements specified below.

b. Crushed Stone: Crushed stone shall consist of freshly mined quarry rock, and shall meet all the requirements specified below.

c. Crushed Recycled Concrete: Crushed recycled concrete shall consist of previously hardened portland cement concrete or other concrete containing pozzolanic binder material. The recycled material shall be free of all reinforcing steel, bituminous concrete surfacing, and any other foreign material and shall be crushed and processed to meet the required gradations for coarse aggregate. Crushed recycled concrete shall meet all other applicable requirements specified below.

d. Crushed Slag: Crushed slag shall be an air-cooled blast-furnace product having an air dry unit weight of not less than 65 pcf as determined by ASTM C 29/C 29M, and shall meet all the requirements specified below.

2.1.1.1 Aggregate Base Course; ABC coarse aggregate shall not show more than 50 percent loss when subjected to the Los Angeles abrasion test in accordance with ASTM C 131. The amount of flat and elongated particles shall not exceed 30 percent. A flat particle is one having a ratio of width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than 3. In the portion retained on each sieve specified, the crushed aggregates shall contain at least 50 percent by weight of crushed pieces having two or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest midsectional area of the piece. When two fractures are contiguous, the angle between planes of the fractures must be at least 30 degrees in order to count as two fractured faces. Crushed gravel shall be manufactured from gravel particles 50 percent of which, by weight, are retained on the maximum size sieve listed in TABLE 1.

2.1.2 Fine Aggregate; Fine aggregates shall be angular particles of uniform density. When the fine aggregate is supplied from more than one source, aggregate from each source shall meet the specified requirements.

2.1.2.1.1 Aggregate Base Course; ABC fine aggregate shall consist of screenings, angular sand, crushed recycled concrete fines, or other finely divided mineral matter processed or naturally combined with the coarse aggregate.

2.1.3 Gradation Requirements; The specified gradation requirements shall apply to the completed base course. The aggregates shall have a maximum size of 2 inches and

shall be continuously well graded within the limits specified in TABLE 1. Sieves shall conform to ASTM E 11.

TABLE 1. GRADATION OF AGGREGATES

Percentage by Weight Passing Square-Mesh Sieve

Sieve Designation	No. 1	No. 2	No. 3
2 inch	100	----	----
1-1/2 inch	70-100	100	----
1 inch	45-80	60-100	100
1/2 inch	30-60	30-65	40-70
No. 4	20-50	20-50	20-50
No. 10	15-40	15-40	15-40
No. 40	5-25	5-25	5-25
No. 200	0-10	0-10	0-10

NOTE 1: Particles having diameters less than 0.0008 inch shall not be in excess of 3 percent by weight of the total sample tested.

NOTE 2: The values are based on aggregates of uniform specific gravity. If materials from different sources are used for the coarse and fine aggregates, they shall be tested in accordance with ASTM C 127 and ASTM C 128 to determine their specific gravities. If the specific gravities vary by more than 10 percent, the percentages passing the various sieves shall be corrected as directed by the Contracting Officer.

2.1.4 Liquid Limit and Plasticity Index; Liquid limit and plasticity index requirements shall apply to the completed course and shall also apply to any component that is blended to meet the required gradation. The portion of any component or of the completed course passing the No. 40 sieve shall be either nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 5.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

When the ABC is constructed in more than one layer, the previously constructed layer shall be cleaned of loose and foreign matter by sweeping with power sweepers or power brooms, except that hand brooms may be used in areas where power cleaning is not practicable. Adequate drainage shall be provided during the entire period of construction to prevent water from collecting or standing on the working area. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction and suitably spaced for string lining.

3.2 OPERATION OF AGGREGATE SOURCES

Aggregates shall be obtained from offsite sources..

3.3 STOCKPILING MATERIAL

Prior to stockpiling of material, storage sites shall be cleared and leveled by the Contractor. All materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at the locations designated. Aggregates shall be stockpiled on the cleared and leveled areas designated by the Construction Manager to prevent segregation. Materials obtained from different sources shall be stockpiled separately.

3.4 PREPARATION OF UNDERLYING COURSE

Prior to constructing the ABC, the underlying course or subgrade shall be cleaned of all foreign substances. At the time of construction of the ABC, the underlying course shall contain no frozen material. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances. Ruts or soft yielding spots in the underlying courses, areas having inadequate compaction, and deviations of the surface from the requirements set forth herein shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless underlying courses containing sands or gravels, as defined in ASTM D 2487, the surface shall be stabilized prior to placement of the ABC . Stabilization shall be accomplished by mixing ABC into the underlying course and compacting by approved methods. The stabilized material shall be considered as part of the underlying course and shall meet all requirements of the underlying course. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the ABC is placed.

3.5 INSTALLATION

3.5.1 Mixing the Materials; The coarse and fine aggregates shall be mixed in a stationary plant, or in a traveling plant or bucket loader on an approved paved working area. The Contractor shall make adjustments in mixing procedures or in equipment as directed to obtain true grades, to minimize segregation or degradation, to obtain the required water content, and to insure a satisfactory ABC meeting all requirements of this specification.

3.5.2 Placing; The mixed material shall be placed on the prepared subgrade or subbase in layers of uniform thickness with an approved spreader. When a compacted layer 6 inches or less in thickness is required, the material shall be placed in a single layer. When a compacted layer in excess of 6 inches is required, the material shall be placed in layers of equal thickness. No layer shall exceed 6 inches or less than 3 inches when compacted. The layers shall be so placed that when compacted they will be true to the grades or levels required with the least possible surface disturbance. Where the ABC is placed in more than one layer, the previously constructed layers shall be cleaned of loose and foreign matter by sweeping with

power sweepers, power brooms, or hand brooms, as directed. Such adjustments in placing procedures or equipment shall be made as may be directed to obtain true grades, to minimize segregation and degradation, to adjust the water content, and to insure an acceptable ABC.

3.5.3 Grade Control; The finished and completed ABC shall conform to the lines, grades, and cross sections shown. Underlying material shall be excavated and prepared at sufficient depth for the required ABC thickness so that the finished ABC with the subsequent surface course will meet the designated grades.

3.5.4 Compaction; Each layer of the ABC shall be compacted as specified with approved compaction equipment. Water content shall be maintained during the compaction procedure to within plus or minus 3 percent of the optimum water content determined from laboratory tests as specified in paragraph SAMPLING AND TESTING. Rolling shall begin at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Alternate trips of the roller shall be slightly different lengths. Speed of the roller shall be such that displacement of the aggregate does not occur. In all places not accessible to the rollers, the mixture shall be compacted with hand-operated power tampers. Compaction shall continue until each layer has a degree of compaction that is at least 90 percent of laboratory maximum dry density through the full depth of the layer. The Contractor shall make such adjustments in compacting or finishing procedures as may be directed to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to ensure a satisfactory ABC. Any materials that are found to be unsatisfactory shall be removed and replaced with satisfactory material or reworked, as directed, to meet the requirements of this specification.

3.5.5 Thickness; Compacted thickness of the aggregate course shall be as indicated. No individual layer shall exceed 8 inches nor be less than 3 inches in compacted thickness. The total compacted thickness of the ABC course shall be within 1/2 inch of the thickness indicated. Where the measured thickness is more than 1/2 inch deficient, such areas shall be corrected by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness is more than 1/2 inch thicker than indicated, the course shall be considered as conforming to the specified thickness requirements. The total thickness of the ABC course shall be measured at intervals in such a manner as to ensure one measurement for each 500 square yards of base course. Measurements shall be made in 3 inch diameter test holes penetrating the base course.

3.5.6 Proof Rolling; Proof rolling of the areas indicated shall be in addition to the compaction specified and shall consist of the application of 30 coverages with a heavy pneumatic-tired roller having four or more tires, each loaded to a minimum of 30,000 pounds and inflated to a minimum of 150 psi. In areas designated, proof rolling shall be applied to the top of the underlying material on which ABC is laid and to each layer of ABC. Water content of the underlying material shall be

maintained at optimum or at the percentage directed from start of compaction to completion of proof rolling of that layer. Water content of each layer of the ABC shall be maintained at the optimum percentage directed from start of compaction to completion of proof rolling. Any ABC materials or any underlying materials that produce unsatisfactory results by proof rolling shall be removed and replaced with satisfactory materials, recompacted and proof rolled to meet these specifications.

3.5.7 Finishing; The surface of the top layer of ABC shall be finished after final compaction by cutting any overbuild to grade and rolling with a steel-wheeled roller. Thin layers of material shall not be added to the top layer of base course to meet grade. If the elevation of the top layer of ABC 1/2 inch or more below grade, then the top layer should be scarified to a depth of at least 3 inches and new material shall be blended in and compacted, to bring to grade. Adjustments to rolling and finishing procedures shall be made as directed to minimize segregation and degradation, obtain grades, maintain moisture content, and insure an acceptable base course. Should the surface become rough, corrugated, uneven in texture, or traffic marked prior to completion, the unsatisfactory portion shall be scarified, reworked and recompacted or it shall be replaced as directed.

3.6 TRAFFIC

Completed portions of the ABC course may be opened to limited traffic, provided there is no marring or distorting of the surface by the traffic. Heavy equipment shall not be permitted except when necessary to construction, and then the area shall be protected against marring or damage to the completed work.

3.7 MAINTENANCE

The ABC shall be maintained in a satisfactory condition until the full surface section is completed and accepted. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact.

3.8 DISPOSAL OF UNSATISFACTORY MATERIALS

Any unsuitable materials that must be removed shall be disposed of as directed. No additional payments will be made for materials that must be replaced.

END OF SECTION

SECTION 02731

AGGREGATE SURFACE COURSE

PART 1 GENERAL

1.1 DESCRIPTION

1.1.1 Work included for this specification section:

1. Furnish, deliver and install Aggregate Surface Course as indicated on the plans.

1.1.2 Related Work Described Elsewhere

02300 EARTHWORK
02722 AGGREGATE BASE COURSE

1.2 DEFINITIONS

For the purposes of this specification, the following definitions apply.

1.2.1 Aggregate Surface Course; Aggregate surface course is aggregate consisting of clean, sound, durable particles of natural gravel, crushed gravel, crushed stone, sand, slag, soil, or other approved materials processed and blended or naturally combined.

1.2.2 Degree of Compaction; Degree of compaction shall be expressed as a percentage of the maximum dry density obtained by the test procedure presented in ASTM D 1557.

1.3 SUBMITTALS

1.3.1 Calibration curves and related test results prior to using the device or equipment being calibrated. Copies of field test results within 24 hours after the tests are performed. Test results from samples, not less than 15 days before material is required for the work. Results of laboratory tests for quality control purposes, for approval, prior to using the material.

1.3.2 Waybills and Delivery Tickets; Copies of waybills and delivery tickets during the progress of the work. Before the final statement is allowed, the Contractor shall file certified waybills and certified delivery tickets for all aggregate actually used.

1.4 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by an approved qualified testing agency.

1.4.1 Sampling; Sampling for material gradation, liquid limit, and plastic limit tests shall be taken in conformance with ASTM D 75. When deemed necessary, the sampling will be observed by the Contracting Officer.

1.4.2 Testing

1.4.2.1 Gradation; Aggregate gradation shall be made in conformance with ASTM C 117, ASTM C 136, and ASTM D 422. Sieves shall conform to ASTM E 11.

1.4.2.2 Liquid Limit and Plasticity Index; Liquid limit and plasticity index shall be determined in accordance with ASTM D 4318.

1.4.3 Approval of Materials; The source of the material to be used for producing aggregates shall be selected 15 days prior to the time the material will be required in the work. Tentative approval of materials will be based on appropriate test results on the aggregate source. Final approval of the materials will be based on tests for gradation, liquid limit, and plasticity index performed on samples taken from the completed and compacted surface course.

1.5 WEATHER LIMITATIONS

Aggregate surface courses shall not be constructed when the ambient temperatures is below 35 degrees F and on subgrades that are frozen or contain frost. It shall be the responsibility of the Contractor to protect, by approved method or methods, all areas of surfacing that have not been accepted by the Owner. Surfaces damaged by freeze, rainfall, or other weather conditions shall be brought to a satisfactory condition by the Contractor

PART 2 PRODUCTS

2.1 AGGREGATES

Aggregates shall consist of clean, sound, durable particles of natural gravel, crushed gravel, crushed stone, sand, slag, soil, or other approved materials processed and blended or naturally combined. Aggregates shall be free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign materials. The Contractor shall be responsible for obtaining materials that meet the specification and can be used to meet the grade and smoothness requirements specified herein after all compaction and proof rolling operations have been completed

2.1.1 Coarse Aggregates; The material retained on the No. 4 sieve shall be known as coarse aggregate. Coarse aggregates shall be reasonably uniform in density and

quality. The coarse aggregate shall have a percentage of wear not to exceed 50 percent after 500 revolutions as determined by ASTM C 131. The amount of flat and/or elongated particles shall not exceed 20 percent. A flat particle is one having a ratio of width to thickness greater than three; an elongated particle is one having a ratio of length to width greater than three. When the coarse aggregate is supplied from more than one source, aggregate from each source shall meet the requirements set forth herein.

2.1.2 Fine Aggregates; The material passing the No. 4 sieve shall be known as fine aggregate. Fine aggregate shall consist of screenings, sand, soil, or other finely divided mineral matter that is processed or naturally combined with the coarse aggregate.

2.1.3 Gradation Requirements; Gradation requirements specified in TABLE I shall apply to the completed aggregate surface. It shall be the responsibility of the Contractor to obtain materials that will meet the gradation requirements after mixing, placing, compacting, and other operations. TABLE I shows permissible gradings for granular material used in aggregate surface roads. Sieves shall conform to ASTM E 11.

TABLE I.

GRADATION FOR AGGREGATE SURFACE COURSES

Sieve Designation	No. 1	No. 2	No. 3	No. 4
1 in.	100	100	100	100
3/8 in.	50-85	60-100	--	--
No. 4	35-65	50-85	55-100	70-100
No. 10	25-50	40-70	40-100	5-100
No. 40	15-30	24-45	20-50	30-70
No. 200	8-15	8-15	8-15	8-15

2.1 LIQUID LIMIT AND PLASTICITY INDEX REQUIREMENTS

The portion of the completed aggregate surface course passing the No. 40 sieve shall have a maximum liquid limit of 35 and a plasticity index of 4 to 9.

PART 3 EXECUTION

3.1 STOCKPILING MATERIALS

Prior to stockpiling the material, the storage sites shall be cleared and leveled by the Contractor. All materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at the locations designated. Aggregates shall

be stockpiled in such a manner that will prevent segregation. Aggregates and binders obtained from different sources shall be stockpiled separately

3.2 PREPARATION OF UNDERLYING COURSE

The underlying course, including shoulders, shall be cleaned of all foreign substances. At the time of surface course construction, the underlying course shall contain no frozen material. Ruts or soft yielding spots in the underlying course areas having inadequate compaction and deviations of the surface from the requirements set forth herein shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade and recompacting to density requirements specified in Section 02722 AGGREGATE BASE COURSE. The completed underlying course shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the surface course is placed.

3.3 GRADE CONTROL

During construction, the lines and grades including crown and cross slope indicated for the aggregate surface course shall be maintained by means of line and grade stakes placed by the Contractor.

3.4 MIXING AND PLACING MATERIALS

The materials shall be mixed and placed to obtain uniformity of the material and a uniform optimum water content for compaction. The Contractor shall make adjustments in mixing, placing procedures, or in equipment to obtain the true grades, to minimize segregation and degradation, to obtain the desired water content, and to ensure a satisfactory surface course.

3.5 LAYER THICKNESS

The aggregate material shall be placed on the underlying course in layers of uniform thickness. When a compacted layer of 6 inches or less is specified, the material may be placed in a single layer; when a compacted thickness of more than 6 inches is required, no layer shall exceed 6 inches nor be less than 3 inches when compacted.

3.6 COMPACTION

Each layer of the aggregate surface course shall be compacted with approval compaction equipment. The water content during the compaction procedure shall be maintained at optimum or at the percentage specified by the Owner. In locations not accessible to the rollers, the mixture shall be compacted with mechanical tampers. Compaction shall continue until each layer through the full depth is compacted to at least 95 percent of laboratory maximum dry density. Any materials that are found to be unsatisfactory shall be removed and replaced with satisfactory material or reworked to produce a satisfactory material.

3.7 EDGES OF AGGREGATE-SURFACED ROAD

Approved material shall be placed along the edges of the aggregate surface course in such quantity as to compact to the thickness of the course being constructed. When the course is being constructed in two or more layers, at least 1 foot of shoulder width shall be rolled and compacted simultaneously with the rolling and compacting of each layer of the surface course.

3.8 SMOOTHNESS TEST

The surface of each layer shall not show any deviations in excess of 3/8 inch when tested with a 10 foot straightedge applied both parallel with and at right angles to the centerline of the road. Deviations exceeding this amount shall be corrected by the Contractor by removing material, replacing with new material, or reworking existing material and compacting, as directed.

3.9 THICKNESS CONTROL

The completed thickness of the aggregate surface course shall be within 1/2 inch, plus or minus, of the thickness indicated on plans. The thickness of the aggregate surface course shall be measured at intervals in such manner that there will be a thickness measurement for at least each 500 square yards of the aggregate surface course. The thickness measurement shall be made by test holes at least 3 inches in diameter through the aggregate surface course. When the measured thickness of the aggregate surface course is more than 1/2 inch deficient in thickness, the Contractor, at no additional expense, shall correct such areas by scarifying, adding mixture of proper gradation, reblading, and recompacting, as directed. Where the measured thickness of the aggregate surface course is more than 1/2 inch thicker than that indicated, it shall be considered as conforming with the specified thickness requirements plus 1/2 inch.

3.10 DENSITY TESTS

Density shall be measured in the field in accordance with ASTM D 2922. For the method presented in ASTM D 2922 the calibration curves shall be checked and adjusted, if necessary, using only the sand cone method as described in paragraph Calibration of the ASTM publication. Tests performed in accordance with ASTM D 2922 result in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made by the prepared containers of material method, as described in paragraph Calibration of ASTM D 2922, on each different type of material being tested at the beginning of a job and at intervals, as directed.

3.11 WEAR TEST

Wear tests shall be made in conformance with ASTM C 131.

3.12 MAINTENANCE

The aggregate surface course shall be maintained in a condition that will meet all specification requirements until accepted.

END OF SECTION

SECTION 02821

FENCING

PART 1 GENERAL

1.1 DESCRIPTION

1.1.1 Work included for this specification section:

Furnish, deliver and install Fencing as indicated on the plans.

PART 2 PRODUCTS

2.1 FENCE FABRIC

2.1.1 Chain Link Fence Fabric

ASTM A 392, Class 2, zinc-coated steel wire with minimum coating weight of 2.0 ounces of zinc per square foot of coated surface. Fabric shall be fabricated of 9 gauge wire woven in 2 inch mesh. Fabric height shall be as shown. Fabric shall be twisted and barbed on the top selvage and knuckled on the bottom selvage.

2.1 GATES

2.2.1 Gates shall be designed and manufactured in accordance with ASTM F 900 and the gate manufacturer's standard practice. Gate shall be the type and swing shown on the plans. Gate frames shall be fully welded (watertight) and braced to prevent sagging or twisting. Gate fabric shall be attached to the gate frame by method standard with the manufacturer except that welding will not be permitted. Latches, hinges, stops, keepers, rollers, and other hardware items shall be furnished as required for the operation of the gate. Latches shall be arranged for padlocking so that the padlock will be accessible from both sides of the gate. Stops shall be provided for holding the gates in the open position. Each end member of gate frames shall be extended sufficiently above the top member to carry three strands of barbed wire in horizontal alignment with barbed wire strands on the fence.

2.1 POSTS

2.3.1 Metal Posts for Chain Link Fence;

ASTM F 1083, zinc-coated. Group IA, with external coating Type A steel pipe. Group IC steel pipe, zinc-coated with external coating Type A or Type B and Group II , formed steel sections, shall meet the strength and coating requirements of ASTM F 1043. Group III, ASTM F 1043 steel H-section may be used for line posts in lieu of line post shapes specified for the other classes. Sizes shall be as shown on the

drawings. Line posts and terminal (corner, gate, and pull) posts selected shall be of the same designation throughout the fence. Gate post shall be for the gate type specified subject to the limitation specified in ASTM F 900 and/or ASTM F 1184.

2.4 BRACES AND RAILS

2.4.1 ASTM F 1083, zinc-coated, Group IA, steel pipe, size NPS 1-1/4. Group IC steel pipe, zinc-coated, shall meet the strength and coating requirements of ASTM F 1043. Group II , formed steel sections, size 1-21/32 inch, conforming to ASTM F 1043, may be used as braces and rails if Group II line posts are furnished.

2.5 WIRE

2.5.1 Tension Wire

Tension wire shall be Type I or Type II, Class 2 coating, in accordance with ASTM A 824.

2.6 ACCESSORIES

ASTM F 626. Ferrous accessories shall be zinc or aluminum coated. Truss rods shall be furnished for each terminal post. Truss rods shall be provided with turnbuckles or other equivalent provisions for adjustment. Barbed wire shall be 2 strand, 12-1/2 gauge wire, zinc-coated, Class 3 in accordance with ASTM A 121 or aluminum coated Type I in accordance with ASTM A 585. Barbed wire shall be four-point barbed type steel wire. Barbed wire support arms shall be the single arm type and of the design required for the post furnished. Tie wire for attaching fabric to rails, braces, and posts shall be 9 gauge steel wire and match the coating of the fence fabric. Miscellaneous hardware coatings shall conform to ASTM A 153/A 153M unless modified.

2.6 BARBED TAPE

Reinforced barbed tape, single coil, for fence toppings shall be fabricated from 430 series stainless steel with a hardness range of Rockwell (30N) 37-45 conforming to the requirements of ASTM A 176. The stainless steel strip shall be 0.025 inch thick by 1 inch wide before fabrication. Each barb shall be a minimum of 1.2 inch in length, in groups of 4, spaced on 4 inch centers. The stainless steel core wire shall have a 0.098 inch diameter with a minimum tensile strength of 140 psi and shall be in accordance with Reinforced barbed tape, single coil, for ground application shall meet the above requirements. Sixteen gauge stainless steel twistable wire ties shall be used for attaching the barbed tape to the barbed wire and to the fence for ground application.

2.7 CONCRETE

ASTM C 94, using 3/4 inch maximum size aggregate, and having minimum compressive strength of 3000 psi at 28 days. Grout shall consist of one part portland cement to three parts clean, well-graded sand and the minimum amount of water to produce a workable mix.

PART 3 EXECUTION

3.1 INSTALLATION

Fence shall be installed to the lines and grades indicated. The area on either side of the fence line shall be cleared to the extent indicated. Line posts shall be spaced equidistant at intervals not exceeding 10 feet. Terminal (corner, gate, and pull) posts shall be set at abrupt changes in vertical and horizontal alignment. Fabric shall be continuous between terminal posts; however, runs between terminal posts shall not exceed 500 feet. Any damage to galvanized surfaces, including welding, shall be repaired with paint containing zinc dust in accordance with ASTM A 780.

3.2 EXCAVATION

Post holes shall be cleared of loose material. Waste material shall be spread where directed. The ground surface irregularities along the fence line shall be eliminated to the extent necessary to maintain a 2 inch clearance between the bottom of the fabric and finish grade.

3.3 POST INSTALLATION

3.3.1 Chain Link Fence

Posts shall be set plumb and in alignment. Except where solid rock is encountered, posts shall be set in concrete to the depth indicated on the drawings. Where solid rock is encountered with no overburden, posts shall be set to a minimum depth of 18 inches in rock. Where solid rock is covered with an overburden of soil or loose rock, posts shall be set to the minimum depth indicated on the drawing unless a penetration of 18 inches in solid rock is achieved before reaching the indicated depth, in which case depth of penetration shall terminate. All portions of posts set in rock shall be grouted. Portions of posts not set in rock shall be set in concrete from the rock to ground level. Posts set in concrete shall be set in holes not less than the diameter shown on the drawings. Diameters of holes in solid rock shall be at least 1 inch greater than the largest cross section of the post. Concrete and grout shall be thoroughly consolidated around each post, shall be free of voids and finished to form a dome. Concrete and grout shall be allowed to cure for 72 hours prior to attachment of any item to the posts. Group II line posts may be mechanically driven, for temporary fence construction only, if rock is not encountered. Driven posts shall be set to a minimum depth of 3 feet and shall be protected with drive caps when being set. Fence post rigidity shall be tested by applying a 50 pound force on the post, perpendicular to the fabric, at 5 feet above ground; post movement measured at the point where the force is applied shall be less than or equal to 3/4 inch from the relaxed position; every tenth post shall be tested for rigidity; when a post fails this test, further tests on the next four posts on either side of the failed post shall be made; all failed posts shall be removed, replaced, and retested at the Contractor's expense.

3.4 BRACES AND TRUSS RODS

Braces and truss rods shall be installed as indicated and in conformance with the standard practice for the fence furnished. Horizontal (compression) braces and diagonal truss (tension) rods shall be installed on fences over 6 feet in height. A center brace or 2 diagonal truss rods shall be installed on 12 foot fences. Braces and truss rods shall extend from terminal posts to line posts. Diagonal braces shall form an angle of approximately 40 to 50 degrees with the horizontal. No bracing is required on fences 6 feet high or less if a top rail is installed.

3.5 TENSION WIRES

Tension wires shall be installed along the top and bottom of the fence line and attached to the terminal posts of each stretch of the fence. Top tension wires shall be installed within the top 4 inches of the installed fabric. Bottom tension wire shall be installed within the bottom 6 inches of the installed fabric. Tension wire shall be pulled taut and shall be free of sag.

3.6 CHAIN LINK FABRIC

Chain link fabric shall be installed on the side of the post indicated. Fabric shall be attached to terminal posts with stretcher bars and tension bands. Bands shall be spaced at approximately 15 inch intervals. The fabric shall be installed and pulled taut to provide a smooth and uniform appearance free from sag, without permanently distorting the fabric diamond or reducing the fabric height. Fabric shall be fastened to line posts at approximately 15 inch intervals and fastened to all rails and tension wires at approximately 12 inch intervals. Fabric shall be cut by untwisting and removing pickets. Splicing shall be accomplished by weaving a single picket into the ends of the rolls to be joined. The bottom of the installed fabric shall be 2 plus or minus 1/2 inch above the ground After the fabric installation is complete, the fabric shall be exercised by applying a 50 pound push-pull force at the center of the fabric between posts; the use of a 30 pound pull at the center of the panel shall cause fabric deflection of not more than 2-1/2 inches when pulling fabric from the post side of the fence; every second fence panel shall meet this requirement; all failed panels shall be resecured and retested at the Contractor's expense

3.7 BARBED WIRE SUPPORTING ARMS AND BARBED WIRE

Barbed wire supporting arms and barbed wire shall be installed as indicated and as recommended by the manufacturer. Supporting arms shall be anchored to the posts in a manner to prevent easy removal with hand tools with 3/8 inch diameter plain pin rivets or, at the Contractor's option, with studs driven by low-velocity explosive-actuated tools for steel, wrought iron, ductile iron, or malleable iron. Studs driven by an explosive-actuated tool shall not be used with gray iron or other material that can be fractured. A minimum of two studs per support arm shall be used. Barbed wire shall be pulled taut and attached to the arms with clips or other means that will prevent easy removal.

3.8 GATE INSTALLATION

Gates shall be installed at the locations shown. Hinged gates shall be mounted to swing as indicated. Latches, stops, and keepers shall be installed as required. Slide or Lift gates shall be installed as recommended by the manufacturer. Padlocks shall be attached to gates or gate posts with chains. Hinge pins, and hardware shall be welded or otherwise secured to prevent removal

3.9 BARBED TAPE INSTALLATION

Stainless steel reinforced barbed tape shall be installed as detailed on the drawings. Barbed tape shall be stretched out to its manufacturer's recommended length, set on top of the barbed wire and "V" shaped support arms, and then secured to the barbed wire. The barbed tape shall be secured to the barbed wire at the two points and at every spiral turn of both coils as shown on the drawings. Stainless steel reinforced barbed tape for ground applications shall be installed per manufacturer's recommendations.

3.10 GROUNDING

Fences shall be grounded on each side of all gates, at each corner, at the closest approach to each building located within 50 feet of the fence, and where the fence alignment changes more than 15 degrees. Grounding locations shall not exceed 650 feet. Each gate panel shall be bonded with a flexible bond strap to its gate post. Fences crossed by powerlines of 600 volts or more shall be grounded at or near the point of crossing and at distances not exceeding 150 feet on each side of crossing. Ground conductor shall consist of No. 8 AWG solid copper wire. Grounding electrodes shall be 3/4 inch by 10 foot long copper-clad steel rod. Electrodes shall be driven into the earth so that the top of the electrode is at least 6 inches below the grade. Where driving is impracticable, electrodes shall be buried a minimum of 12 inches deep and radially from the fence. The top of the electrode shall be not less than 2 feet or more than 8 feet from the fence. Ground conductor shall be clamped to the fence and electrodes with bronze grounding clamps to create electrical continuity between fence posts, fence fabric, and ground rods. After installation the total resistance of fence to ground shall not be greater than 25 ohms.

END OF SECTION

SECTION 02900

TOPSOIL AND SEEDING

PART 1 - GENERAL

1.1 DESCRIPTION

1.1.1 This Section includes the following:

1. Seeding of new cut and fill slopes for erosion control.
2. Topsoil placement.
3. Use of fertilizers and mulches.

1.1.2 Related Sections: The following Sections contain requirements that relate to this Section:

02205	Dust Control
02230	Site Clearing
02300	Earthwork

1.2 SUBMITTALS

1.2.1 General: Submit each item in this Section according to the Conditions of the Contract and Division 1 Specification Sections.

1.2.2 Product certificates signed by manufacturers certifying that their products comply with specified requirements.

1. Manufacturer's certified analysis for standard products.
2. Analysis for other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
3. Label data substantiating that planting materials comply with specified requirements.

1.2.3 Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and address of architects and owners, and other information specified.

1.2.4 Maintenance instructions recommending procedures to be established by Construction Manager for maintenance of seeded areas during an entire year. Submit before expiration of required maintenance periods.

1.3 QUALITY ASSURANCE

1.3.1 Installer Qualifications: Engage an experienced Installer who has completed seeding work similar in material, design, and extent to that indicated for this Project and with a record of successful seed establishment.

Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that seeding is in progress.

1.3.2 Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to the Construction Manager's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

Selection of trees and shrubs purchased under allowances will be made by Architect, who will tag stock at their place of growth before they are prepared for transplanting.

1.3.3 Certified test results must be submitted for each variety of seed.

1.4 PRODUCT HANDLING

1.4.1 Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.

1.4.2 Seed: Deliver seed in original sealed, labeled, and undamaged containers.

Each variety of seed shall be furnished and delivered in separate bags or containers.

1.5 WARRANTIES AND GUARANTEES

1.5.1 General Warranty: The special warranty specified in this Article shall not deprive the Construction Manager of other rights the Construction Manager may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

1.5.2 Special Warranty: Warrant the following living planting materials for a period of one year after date of Substantial Completion, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Construction Manager, abnormal weather

conditions unusual for warranty period, or incidents that are beyond Contractor's control.

PART 2 - TECHNICAL REQUIREMENTS

2.1 SEEDING

2.1.1 All seed must meet the requirements of the Pennsylvania Department of Transportation, Standard Specification for Construction. (PA. DOT Spec.) Sec. 804.

2.2 MATERIALS

2.2.1 Seed: The species and varieties of seed shall be from among the types specified in Sec. 804 of the PA. DOT Spec.

2.2.2 Fertilizer: Fertilizer shall conform to the requirements of Sec. 804 of the PA. DOT Spec. and spread at a uniform rate, dependent on the topsoil analysis; for optimum seed germination and growth.

2.2.3 Soil Supplements: Shall conform to the requirements of Sec. 804 of the PA. DOT Spec.

2.2.4 Topsoil: The topsoil shall be fertile soil, be easily cultivated, be free from objectionable material, have a relatively high erosion resistance and be readily able to support the growth of planting, seeding or sodding.

2.2.5 Sources of Topsoil must be approved by the Construction Manager.

1. The topsoil may be obtained from the site at areas of proposed excavation or embankment. The topsoil may also be obtained from approved sources which are outside of the right of way and have been secured by the Contractor.

2. Contractor-Obtained Sources. The Contractor shall notify the Construction Manager sufficiently in advance of the opening of any material source to permit inspection of the site and to prepare for any necessary testing and approval by the Construction Manager.

PART 3 - EXECUTION

3.1 PREPARATION

3.1.1 Topsoil Construction Methods: Any trash, wood, brush, stumps or other objectionable materials encountered at the source shall be removed and disposed of as approved by the Construction Manager prior to beginning of work. The source and stockpile areas shall be kept drained, insofar as practicable, during the period of topsoil removal. The source and stockpile areas shall be left in a neat and presentable condition upon completion of the removal of all material required.

The placement of the topsoil shall be undertaken as soon as the grading operations have been completed or at such time as specified by the Construction Manager. The topsoil shall be spread so as to form a cover of uniform thickness (loose) as shown on the plans. After the topsoil has been placed and shaped, it shall be sprinkled and/or rolled if directed by the Construction Manager. Rolling shall be performed with a light corrugated drum roller of the type approved by the Construction Manager.

3.1.2 Seedbed Construction Methods. After designated areas have been completed to the lines, grades and cross sections shown on the plans and as provided for in other items of this contract, seeding shall be performed in accordance with the requirements hereinafter described. Unless otherwise approved by the Construction Manager, all areas to be seeded shall be cultivated to a depth of at least 4 inches, except where seeding is to be done using a seed drill suitable for seeding into untilled soil. The seedbeds shall be cultivated sufficiently to reduce the soil to a state of good tilth when the soil particles on the surface are small enough and lie closely enough together to prevent the seed from being covered too deeply for optimum germination.

3.2 SEEDING

3.2.1 Cultivation of the seedbed will not be required in loose sand where depth of sand is 4 inches or more.

Broadcast Seeding. The seed or seed mixture, in the quantity specified, shall be uniformly distributed over the areas shown on the plans or where directed by the Construction Manager. If the sowing of seed is by hand, rather than by mechanical methods, the seed shall be sown in two directions at right angles to each other. If mechanical equipment is used, all varieties of seed as well as fertilizer, may be distributed simultaneously provided that each component is uniformly applied at the specified rate. When seed and fertilizer are to be distributed as a water slurry, the mixture shall be applied to the area to be seeded within 30 minutes after components are placed in the equipment. After planting, the planted area shall be rolled with a light corrugated drum roller or another type of roller approved by the Construction Manager. All rolling of the sloped areas shall be along the contour of the slopes.

Straw or Hay Mulch Seeding. The seed or seed mixture, in the quantity specified, shall be uniformly distributed over the areas shown on the plans or where directed by the Construction Manager. If the sowing of seed is by hand, rather than by mechanical methods, the seed shall be sown in two directions at right angles to each other. If mechanical equipment is used, all varieties of seed, as well as fertilizer, may be distributed simultaneously provided that each component is uniformly applied at the specified rate. When seed and fertilizer are to be distributed as a water slurry, the mixture shall be applied to the area to be seeded within 30 minutes after all components are placed in the equipment.

Immediately upon completion of planting of the seed, straw or hay mulch shall be spread uniformly over the seeded area at the rate of approximately 1.8 to 2.4 tons of hay mulch or 2.4 to 3.0 tons of straw mulch per acre. When a mulching machine is used it must be approved by the Construction Manager and may be equipped to inject a tacking agent into the straw or hay mulch uniformly as it leaves the equipment at a rate of 8.5 to 17.0 oz. of tacking agent per square yard of mulched area. When the tacking agent is placed by hand, then the rate of application for the tacking agent shall be approximately 24.0 oz. per square yard.

Cellulose Fiber Mulch Seeding. The seed or seed mixture, in the quantity specified, shall be uniformly distributed over the areas shown on the plans or where directed by the Construction Manager. If the sowing of seed is by hand, rather than by mechanical methods, the seed shall be sown in two directions at right angles to each other. If mechanical equipment is used all varieties of seed, as well as fertilizer, may be distributed simultaneously, provided that each component is uniformly applied at the specified rate. When seed and fertilizer are to be distributed as a water slurry, the mixture shall be applied to that area to be seeded within 30 minutes after all components are placed in the equipment.

Immediately upon completion of planting of the seed, cellulose fiber mulch shall be spread uniformly over the seeded area at the following rates:

Sandy soils with 1:3 slope or less - min. 1.2 T/ac
Sandy soils with greater than 1:3 slope - min. 1.4 T/ac
Clay soils with 1:3 slope or less - min. 1.5 T/ac
Clay soils with greater than 1:3 slope - min. 1.8 T/ac

Cellulose fiber mulch rates are based on dry mass of mulch per hectare. When used, a mulching machine, approved by the Construction Manager, shall be equipped to eject the thoroughly wet mulch material at a uniform rate to provide the mulch coverage specified.

Drill Seeding. The seed or seed mixture, in the quantity specified, shall be uniformly distributed over the areas shown on the plans or where directed by the Construction Manager. All varieties of seed, as well as fertilizer, may be distributed simultaneously provided that each component is uniformly applied at the specified

rate. Seed shall be drilled at a depth of from .2 to .4 inches utilizing a pasture or rangeland type drill. All drilling shall be along the contour of the slope. After planting, the area shall be rolled with a roller integral to the seed drill, or a light corrugated drum roller or with another type of roller approved by the Construction Manager. All rolling of sloped areas shall be on the contour of the slopes.

3.3 ESTABLISHMENT & MAINTENANCE OF SEEDED AREAS

3.3.1 Contractor shall be responsible for continued proper care of the seeded areas during the period when the grass is becoming established. The period of maintenance for seeding shall extend for as long as necessary to establish over the entire area a uniformly close stand of grasses as specified, free of weeds and undesirable grasses. A stabilized stand of grass is defined as a grassed area having 70% vegetative cover of perennial. Contractor shall be responsible for maintenance of seeded areas until acceptance by the Construction Manager.

3.3.2 Areas needing re-fertilization will be designated by Construction Manager's Representative. The fertilizer shall be distributed on the seeded area during a period when the grass is dry. Physical condition, packaging and marking of the fertilizer shall be as specified for original seeding.

3.3.3 Areas that require reseeding will be designated by the Construction Manager. Reseeding shall be as specified for original seeding and shall be distributed at a rate of 4 pounds per 10,000 sq. ft. in a manner that will cause a minimum of disturbance to the existing stand of grass.

3.3.4 Seeded areas shall be protected against damage, including erosion and washouts. Damaged areas shall be promptly repaired, reworked as required, and replanted and eroded areas shall be filled and reseeded.

3.4 DISPOSAL OF SURPLUS AND WASTE MATERIALS

3.4.1 Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it in areas approved by the Construction Manager.

END OF SECTION

SECTION 03307

CONCRETE FOR MINOR STRUCTURES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 308 (1992) Standard Practice for Curing Concrete

ACI 318/318R (1992) Building Code Requirements for Reinforced Concrete

ACI 347R (1994) Formwork for Concrete

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 185 (1994) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement

ASTM A 615/A 615M (1995a) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

ASTM C 31 (1991) Making and Curing Concrete Test Specimens in the Field

ASTM C 33 (1993) Concrete Aggregate

ASTM C 39 (1993) Compressive Strength of Cylindrical Concrete Specimens

ASTM C 94 (1994) Ready-Mixed Concrete

ASTM C 143 (1990a) Slump of Hydraulic Cement Concrete

ASTM C 150 (1995) Portland Cement

ASTM C 171 (1992) Sheet Materials for Curing Concrete

ASTM C 172 (1990) Sampling Freshly Mixed Concrete

ASTM C 231 (1991b) Air Content of Freshly Mixed Concrete by the Pressure Method

ASTM C 260 (1994) Air-Entraining Admixtures for Concrete

ASTM C 309 (1994) Liquid Membrane-Forming Compounds for Curing Concrete

ASTM C 685 (1994) Concrete Made by Volumetric Batching and Continuous Mixing

ASTM D 75 (1987; R 1992) Sampling Aggregates

ASTM E 96 (1995) Water Vapor Transmission of Materials

1.2 DESIGN AND PERFORMANCE REQUIREMENTS

The Owner will maintain the option to sample and test joint sealer, joint filler material, waterstop, aggregates and concrete to determine compliance with the specifications. The Contractor shall provide facilities and labor as may be necessary to assist the Owner in procurement of representative test samples. Samples of aggregates will be obtained at the point of batching in accordance with ASTM D 75. Concrete will be sampled in accordance with ASTM C 172. Slump and air content will be determined in accordance with ASTM C 143 and ASTM C 231, respectively, when cylinders are molded. Compression test specimens will be made, cured, and transported in accordance with ASTM C 31. Compression test specimens will be tested in accordance with ASTM C 39. Samples for strength tests will be taken not less than once each shift in which concrete is produced [from each class of concrete required]. A minimum of three specimens will be made from each sample; two will be tested at 28 days for acceptance, and one will be tested at 7 days for information.

1.2.1 Strength

Acceptance test results will be the average strengths of two specimens tested at 28 days. The strength of the concrete will be considered satisfactory so long as the average of three consecutive acceptance test results equal or exceed the specified compressive strength, f'c, and no individual acceptance test result falls below f'c by more than 500 psi.

1.2.2 Construction Tolerances

A Class "C" finish shall apply to all surfaces except those specified to receive a Class "D" finish. A Class "D" finish shall apply to all surfaces which will be permanently concealed after construction. The surface requirements for the classes of finish required shall be as specified in ACI 347R.

1.2.3 Concrete Mixture Proportions

Concrete mixture proportions shall be the responsibility of the Contractor. Mixture proportions shall include the dry weights of cementitious material(s); the nominal maximum size of the coarse aggregate; the specific gravities, absorptions, and saturated surface-dry weights of fine and coarse aggregates; the quantities, types, and names of admixtures; and quantity of water per cubic yard of concrete. All materials included in the mixture proportions shall be of the same

type and from the same source as will be used on the project. Specified compressive strength f'c shall be 3,000 psi at 28 days . The maximum nominal size coarse aggregate shall be 3/4 inch, in accordance with ACI 318/318R. The air content shall be between 4.5 and 7.5 percent. The slump shall be between 2 and 5 inches. The maximum water cement ratio shall be 0.50.

1.3 SUBMITTALS

The following shall be submitted in accordance with Section 01300 SUBMITTALS.

1.3.1 Air-Entraining Admixture; Accelerating Admixture; Water-Reducing or Retarding Admixture; Curing Materials; Reinforcing Steel; Expansion Joint Filler Strips, Premolded; Joint Sealants - Field Molded Sealants; Waterstops.

1.3.2 Manufacturer's literature is available from suppliers which demonstrates compliance with applicable specifications for the above materials.

1.3.3 Batching and Mixing Equipment.

Batching and mixing equipment will be accepted on the basis of manufacturer's data which demonstrates compliance with the applicable specifications.

1.3.4 Conveying and Placing Concrete.

The methods and equipment for transporting, handling, depositing, and consolidating the concrete shall be submitted prior to the first concrete placement.

1.3.5 Formwork.

Formwork design shall be submitted prior to the first concrete placement.

1.3.6 Aggregates.

Aggregates will be accepted on the basis of certificates of compliance and test reports that show the material(s) meets the quality and grading requirements of the specifications under which it is furnished.

1.3.7 Concrete Mixture Proportions.

Ten days prior to placement of concrete, the contractor shall submit the mixture proportions that will produce concrete of the quality required. Applicable test reports shall be submitted to verify that the concrete mixture proportions selected will produce concrete of the quality specified.

1.3.8 Cementitious Materials.

Certificates of compliance attesting that the concrete materials meet the requirements of the specifications shall be submitted. Cementitious material will be accepted on the basis of a manufacturer's certificate of compliance, accompanied by mill test reports that the material(s) meet the requirements of the specification under which it is furnished.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Cementitious Materials

Cementitious materials shall conform to the appropriate specifications listed:

2.1.1.1 Portland Cement

ASTM C 150, Use type II

2.1.2 Aggregates

Aggregates shall meet the quality and grading requirements of ASTM C 33-Nos. 57 or 67

2.1.3 Admixtures- Not used unless specified

Admixtures to be used, when required or approved, shall comply with the appropriate specification listed.

2.1.3.1 Air-Entraining Admixture

Air-entraining admixture shall meet the requirements of ASTM C 260.

2.1.4 Water

Water for mixing and curing shall be fresh, clean, potable, and free from injurious amounts of oil, acid, salt, or alkali.

2.1.5 Reinforcing Steel

Reinforcing steel bar shall conform to the requirements of ASTM A 615/A 615M, Grade 60. # 5 Bar-12 o/c Welded steel wire fabric shall conform to the requirements of ASTM A 185.

2.1.9 Formwork-ACI 347

The design and engineering of the formwork as well as its construction, shall be the responsibility of the Contractor.

2.1.10 Form Coatings

Forms for exposed surfaces shall be coated with a non-staining form oil, which shall be applied shortly before concrete is placed.

2.1.11 Vapor Barrier

Vapor barrier shall be polyethylene sheeting with a minimum thickness of 6 mils or other equivalent material having a vapor permeance rating not exceeding 0.5 perms as determined in accordance with ASTM E 96.

2.1.12 Curing Materials

Curing materials shall conform to the following requirements.

2.1.12.1 Impervious Sheet Materials

Impervious sheet materials, ASTM C 171, type optional, except polyethylene film, if used, shall be white opaque.

2.1.12.2 Membrane-Forming Curing Compound

ASTM C 309, Type 1-D or 2, Class A.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 General

Construction joints shall be prepared to expose coarse aggregate, and the surface shall be clean, damp, and free of laitance. Snow, ice, standing or flowing water, loose particles, debris, and foreign matter shall have been removed. Earth foundations shall be satisfactorily compacted. The entire preparation shall be accepted by the Owner prior to placing.

3.1.2 Embedded Items

Reinforcement shall be secured in place; joints, anchors, and other embedded items shall have been positioned. Internal ties shall be arranged so that when the forms are removed all metal will be not less than 2 inches from concrete surfaces permanently exposed to view or exposed to water on the finished structures. Embedded items shall be free of oil and other foreign matters such as loose coatings or rust, paint, and scale. All equipment needed to place, consolidate, protect, and cure the concrete shall be at the placement site and in good operating condition.

3.1.3 Formwork Installation

Forms shall be properly aligned, adequately supported, and mortar-tight. The form surfaces shall be smooth and free from irregularities, dents, sags, or holes when used for permanently exposed faces. All exposed joints and edges shall be chamfered, unless otherwise indicated, complying with ACI 347

3.1.4 Vapor Barrier Installation

Vapor barriers shall be applied over gravel fill. Edges shall be lapped not less than 6 inches. All joints shall be sealed with pressure-sensitive adhesive not less than 2 inches wide. The vapor barrier shall be protected at all times to prevent injury or displacement prior to and during concrete placement.

3.1.5 Production of Concrete

3.1.5.1 Ready-Mixed Concrete

Ready-mixed concrete shall conform to ASTM C 94

3.1.5.2 Concrete made by volumetric batching and continuous mixing

Concrete made by volumetric batching and continuous mixing shall conform to ASTM C 685.

3.1.5.3 Batching and Mixing Equipment

The contractor shall have the option of using an on-site batching and mixing facility. The facility shall provide sufficient batching and mixing equipment capacity to prevent cold joints. The method of measuring materials, batching operation, and mixer shall be submitted for review.

3.2 CONVEYING AND PLACING CONCRETE

Conveying and placing concrete shall conform to the following requirements.

3.2.1 General

Concrete placement shall not be permitted when weather conditions prevent proper placement and consolidation without approval. When concrete is mixed and/or transported by a truck mixer, the concrete shall be delivered to the site of the work and discharge shall be completed within 1-1/2 hours or 45 minutes when the placing temperature is 85 degrees F or greater unless a retarding admixture is used. Concrete shall be conveyed from the mixer to the forms as rapidly as practicable by methods which prevent segregation or loss of ingredients. Concrete shall be in place and consolidated within 15 minutes after discharge from the mixer. Concrete shall be deposited as close as possible to its final position in the forms and be so regulated that it may be effectively consolidated in horizontal layers 18 inches or less in thickness with a minimum of

lateral movement. The placement shall be carried on at such a rate that the formation of cold joints will be prevented.

3.2.2 Consolidation

Each layer of concrete shall be consolidated by rodding, or mechanical vibrating equipment. Internal vibration shall be systematically accomplished by inserting the vibrator through the fresh concrete in the layer below at a uniform spacing over the entire area of placement. The distance between insertions shall be approximately 1.5 times the radius of action of the vibrator and overlay the adjacent, just-vibrated area by a few inches. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the layer below, if such a layer exists. It shall be held stationary until the concrete is consolidated and then withdrawn slowly at the rate of about 3 inches per second.

3.2.3 Cold-Weather Requirements

No concrete placement shall be made when the ambient temperature is below 35 degrees F or if the ambient temperature is below 40 degrees F and falling. Suitable covering and other means as approved shall be provided for maintaining the concrete at a temperature of at least 50 degrees F for not less than 72 hours after placing and at a temperature above freezing for the remainder of the curing period. Salt, chemicals, or other foreign materials shall not be mixed with the concrete to prevent freezing. Any concrete damaged by freezing shall be removed and replaced at the expense of the contractor.

3.2.4 Hot-Weather Requirements

When the rate of evaporation of surface moisture, as determined by use of Figure 1 of ACI 308, is expected to exceed 0.2 pound per square foot per hour, provisions for windbreaks, shading, fog spraying, or covering with a light-colored material shall be made in advance of placement, and such protective measures shall be taken as quickly as finishing operations will allow.

3.3 FORM REMOVAL

Forms shall not be removed before the expiration of 24 hours after concrete placement except where otherwise specifically authorized. Supporting forms and shoring shall not be removed until the concrete has cured for at least 5 days. When conditions on the work are such as to justify the requirement, forms will be required to remain in place for longer periods.

3.4 FINISHING

3.4.1 General

No finishing or repair will be done when either the concrete or the ambient temperature is below 50 degrees F.

3.4.2 Finishing Formed Surfaces

All fins and loose materials shall be removed, and surface defects including tie holes shall be filled. All honeycomb areas and other defects shall be repaired. All unsound concrete shall be removed from areas to be repaired. Surface defects greater than 1/2 inch in diameter and holes left by removal of tie rods in all surfaces not to receive additional concrete shall be reamed or chipped and filled with dry-pack mortar. The prepared area shall be brush-coated with an approved epoxy resin or latex bonding compound or with a neat cement grout after dampening and filled with mortar or concrete. The cement used in mortar or concrete for repairs to all surfaces permanently exposed to view shall be a blend of portland cement and white cement so that the final color when cured will be the same as adjacent concrete.

3.4.3 Finishing Unformed Surfaces

All unformed surfaces that are not to be covered by additional concrete or backfill shall be float finished to elevations shown, unless otherwise specified. Surfaces to receive additional concrete or backfill shall be brought to the elevations shown and left as a true and regular surface. Exterior surfaces shall be sloped for drainage unless otherwise shown. Joints shall be carefully made with a jointing tool. Unformed surfaces shall be finished to a tolerance of 3/8 inch for a float finish and 5/16 inch for a trowel finish as determined by a 10 foot straightedge placed on surfaces shown on the plans to be level or having a constant slope. Finishing shall not be performed while there is excess moisture or bleeding water on the surface. No water or cement shall be added to the surface during finishing.

3.4.3.1 Float Finish

Surfaces to be float finished shall be screeded and darbied or bullfloated to eliminate the ridges and to fill in the voids left by the screed. In addition, the darby or bullfloat shall fill all surface voids and only slightly embed the coarse aggregate below the surface of the fresh concrete. When the water sheen disappears and the concrete will support a person's weight without deep imprint, floating should be completed. Floating should embed large aggregates just beneath the surface, remove slight imperfections, humps, and voids to produce a plane surface, compact the concrete, and consolidate mortar at the surface.

3.5 CURING AND PROTECTION

Beginning immediately after placement and continuing for at least 7 days, all concrete shall be cured and protected from premature drying, extremes in temperature, rapid temperature change, freezing, mechanical damage, and exposure to rain or flowing water. All materials and equipment needed for adequate curing and protection shall be available and at the site of the placement prior to the start of concrete placement. Preservation of moisture for concrete surfaces not in contact with forms shall be accomplished by one of the following methods:

a. Continuous sprinkling or ponding.

b. Application of absorptive mats or fabrics kept continuously wet.

c. Application of sand kept continuously wet.

d. Application of impervious sheet material conforming to ASTM C 171.

e. Application of membrane-forming curing compound conforming to ASTM C 309, Type 1-D, on surfaces permanently exposed to view and Type 2 on other surfaces shall be accomplished in accordance with manufacturer's instructions.

The preservation of moisture for concrete surfaces placed against wooden forms shall be accomplished by keeping the forms continuously wet for 7 days If forms are removed prior to end of the required curing period, other curing methods shall be used for the balance of the curing period. During the period of protection removal, the temperature of the air in contact with the concrete shall not be allowed to drop more than 25 degrees F within a 24 hour period.

3.6 TESTS AND INSPECTIONS

3.6.1 General

The individuals who sample and test concrete as required in this specification shall have demonstrated a knowledge and ability to perform the necessary test procedures equivalent to the ACI minimum guidelines for certification of Concrete Field Testing Technicians, Grade I.

3.6.2 Inspection Details and Frequency of Testing

3.6.2.1 Preparations for Placing

Foundation or construction joints, forms, and embedded items shall be inspected in sufficient time prior to each concrete placement by the Contractor to certify that it is ready to receive concrete.

3.6.2.2 Air Content

Air content shall be checked during each shift that concrete is. Samples shall be obtained in accordance with ASTM C 172 and tested in accordance with ASTM C 231.

3.6.2.3 Slump

Slump shall be checked during each shift that concrete is produced Samples shall be obtained in accordance with ASTM C 172 and tested in accordance with ASTM C 143.

3.6.2.4 Consolidation and Protection

The Contractor shall ensure that the concrete is properly consolidated, finished, protected, and cured.

3.6.3 Action Required

3.6.3.1 Placing

The placing foreman shall not permit placing to begin until he has verified that an adequate number of acceptable vibrators, which are in working order and have competent operators, are available. Placing shall not be continued if any pile is inadequately consolidated.

3.6.3.2 Air Content

Whenever a test result is outside the specification limits, the concrete shall not be delivered to the forms and an adjustment shall be made to the dosage of the air-entrainment admixture.

3.6.3.3 Slump

Whenever a test result is outside the specification limits, the concrete shall not be delivered to the forms and an adjustment should be made in the batch weights of water and fine aggregate. The adjustments are to be made so that the water-cement ratio does not exceed that specified in the submitted concrete mixture proportion.

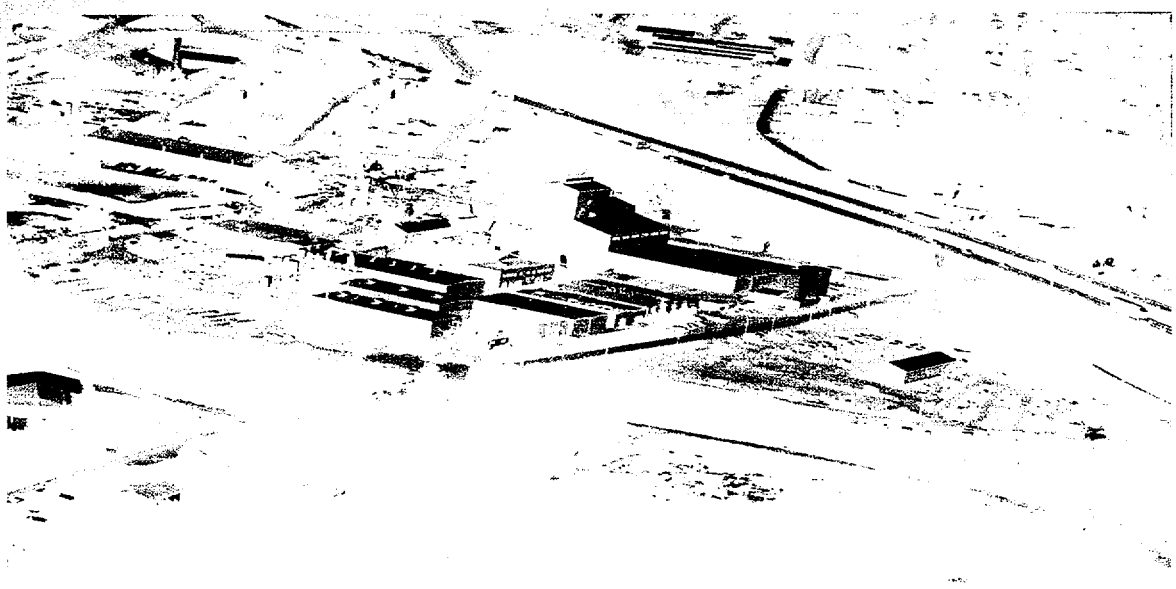
3.6.4 Reports

The results of all tests and inspections conducted at the project site shall be reported informally at the end of each shift and in writing weekly and shall be delivered within 3 days after the end of each weekly reporting period.

ATTACHMENT 4

DRAWINGS

Molycorp



Washington, PA Facility
Decommissioning Plan
Part 2 Revision

July 14, 2000

RSI

RADIOLOGICAL SERVICES

DESIGN ANALYSIS

60% STORAGE CELL DESIGN

MOLYCORP, INC
WASHINGTON, PA

Prepared for:
Radiological Services, Inc

June 2000

VOLUME 2

Stone & Webster Engineering Corporation
Boston, Massachusetts

TABLE OF CONTENTS

VOLUME 1

1.0	**INTRODUCTION**	**1**
1.1	**PROJECT SCOPE**	**1**
1.2	**SITE HISTORY**	**1**
1.3	**SITE CONDITIONS**	**2**
1.4	**GEOLOGY AND HYDROLOGY**	**2**
2.0	**EXISTING INFORMATION SURVEY**	**5**
2.1	**DOCUMENT REVIEW**	**5**
2.2	**STORAGE CELL SITE GEOLOGY/HYDROGEOLOGY**	**6**
2.3	**GROUND WATER**	**7**
2.4	**SURFACE WATER**	**7**
3.0	**STORAGE CELL DESIGN**	**8**
3.1	**SCOPE AND PURPOSE**	**8**
3.2	**APPLICABLE REGULATIONS**	**8**
3.3	**WASTE CHARACTERISTICS**	**8**
3.4	**SITE LAYOUT**	**8**
3.5	**CELL CAPACITY**	**9**
3.6	**CELL LINER**	**9**
3.7	**GROUND WATER MONITORING**	**9**
3.8	**STORM WATER MANAGEMENT**	**10**
3.9	**EROSION AND SEDIMENT CONTROL**	**10**
3.10	**STRUCTURAL STABILITY ANALYSES**	**11**
3.11	**STORAGE CELL CONSTRUCTION**	**12**
4.0	**WASTE PLACEMENT**	**14**
4.1	**WASTE PLACEMENT**	**14**
4.2	**OPERATING REQUIREMENTS**	**14**
4.2.1	TRUCK MANAGEMENT	14
4.2.2	DUST CONTROL	14
4.2.3	STORM WATER MAINTENANCE	15

5.0 STORAGE CELL FINAL COVER **16**

5.1 FINAL COVER GRADING **16**
5.2 CAPPING SYSTEM COMPONENTS **16**
5.3 FINAL DRAINAGE **16**

ATTACHMENTS

1. Calculations
2. Boring Logs
3. Specifications

VOLUME 2

ATTACHMENTS (Cont)

4. Drawings

ATTACHMENT 4

DRAWINGS

Drawing No.	Title / Description
10034.01-EY-1A	Title Sheet
10034.01-EY-2A	Site Plan
10034.01-EY-3A	Existing Topography
10034.01-EY-4A	Erosion Control Plan
10034.01-EY-5A	Site Preparation Plan
10034.01-EY-6A	Final Finished Grading Plan
10034.01-EY-6B	Final Surface Treatment Plan
10034.01-EY-7A	Cross Sections Sh. 1
10034.01-EY-7B	Cross Sections Sh. 2
10034.01-EY-7C	Cross Sections Sh. 3
10034.01-EY-7D	Cross Sections Sh. 4
10034.01-EY-7E	Cross Sections Sh. 5
10034.01-EY-8A	Storm Water Retention Pond - Construction Phase
10034.01-EY-8B	Storm Water Retention Pond - Final Phase
10034.01-EY-9A	Haul Road – Plan
10034.01-EY-9B	Haul Road – Profile
10034.01-EY-10A	Civil Details Sh. 1
10034.01-EY-10B	Civil Details Sh. 2
10034.01-EY-10C	Civil Details Sh. 3

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED:

DWG. NO. 10034.01-EY-1A-1 TITLE SHEET

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DOCUMENT/REPORT NUMBER: 10034.01-EY-1A-1

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED: DWG. NO. 10034.01-EY-2A-1 SITE PLAN STORAGE CELL DESIGN

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DOCUMENT/REPORT NUMBER: 10034.01-EY-2A-1

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED: DWG. NO. 10034.01-EY-3A-1 EXISTING TOPOGRAPHY STORAGE CELL DESIGN

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DOCUMENT/REPORT NUMBER: 10034.01-EY-3A-1

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED: DWG. NO. 10034.01-EY-4A-1 EROSION CONTROL PLAN STORAGE CELL DESIGN

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DOCUMENT/REPORT NUMBER: 10034.01-EY-4A-1

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED: DWG. NO. 10034.01-EY-5A-1 SITE PREPARATION PLAN STORAGE CELL DESIGN

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DOCUMENT/REPORT NUMBER: 10034.01-EY-5A-1

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED: DWG. NO. 10034.01-EY-6A-1 FINAL FINISHED GRADING PLAN STORAGE CELL DESIGN

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DOCUMENT/REPORT NUMBER: 10034.01-EY-6A-1

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED:

DWG. NO. 10034.01-EY-6B-1 FINAL SURFACE TREATMENT PLAN STORAGE CELL DESIGN

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DOCUMENT/REPORT NUMBER: 10034.01-EY-6B-1

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED:

DWG. NO. 10034.01-EY-7A-1
CROSS SECTIONS, SH.1 OF 5
STORAGE CELL DESIGN

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DOCUMENT/REPORT NUMBER: 10034.01-EY-7A-1

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED: 10034.01-EY-7B-1: CROSS SECTIONS, SH.2 OF 5 STORAGE CELL DESIGN

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DRAWING NUMBER: 10034.01-EY-7B-1

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED:

DWG. NO. 10034.01-EY-7C-1
CROSS SECTIONS, SH. 3 OF 5
STORAGE CELL DESIGN

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DOCUMENT/REPORT NUMBER: 10034.01-EY-7C-1

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED:

DWG. NO. 10034.01-EY-7D-1
CROSS SECTIONS, SH. 4 OF 5
STORAGE CELL DESIGN

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DOCUMENT/REPORT NUMBER: 10034.01-EY-7D-1

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED:

DWG. NO. 10034.01-EY-7E-1
CROSS SECTIONS, SH. 5 OF 5
STORAGE CELL DESIGN

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DOCUMENT/REPORT NUMBER: 10034.01-EY-7E-1

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED: DWG. NO. 10034.01-EY-8A-1 STORM WATER RETENTION POND CONSTRUCTION PHASE STORAGE CELL DESIGN

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DOCUMENT/REPORT NUMBER: 10034.01-EY-8A-1

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED: DWG. NO. 10034.01-EY-8B-1 STORM WATER RETENTION POND FINAL PHASE STORAGE CELL DESIGN

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DOCUMENT/REPORT NUMBER: 10034.01-EY-8B-1

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED:

DWG. NO. 10034.01-EY-9A-1 HAUL ROAD - PLAN STORAGE CELL DESIGN

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DOCUMENT/REPORT NUMBER: 10034.01-EY-9A-1

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED:

DWG. NO. 10034.01-EY-9B-1
HAUL ROAD - PROFILE
STORAGE CELL DESIGN

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DOCUMENT/REPORT NUMBER: 10034.01-EY-9B-1

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED:

DWG. NO. 10034.01-EY-10A-1
CIVIL DETAILS SH. 1
STORAGE CELL DESIGN

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DOCUMENT/REPORT NUMBER: 10034.01-EY-10A-1

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED:

DWG. NO. 10034.01-EY-10B-1
CIVIL DETAILS SH. 2
STORAGE CELL DESIGN

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DOCUMENT/REPORT NUMBER: 10034.01-EY-10B-1

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

THIS PAGE IS AN OVERSIZED DRAWING OR FIGURE,

THAT CAN BE VIEWED AT THE RECORD TITLED:

DWG. NO. 10034.01-EY-10C-1
CIVIL DETAILS SH. 3
STORAGE CELL DESIGN

WITHIN THIS PACKAGE...OR, BY SEARCHING USING THE DOCUMENT/REPORT NUMBER: 10034.01-EY-10C-1

NOTE: Because of this page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.