PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT

for

SMITH VALLEY DAIRY DEVELOPMENT

Smith Valley, Nevada

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INTRODUCTION

Submitted herewith are the results of Lumos and Associates, Inc. (Lumos) preliminary geotechnical investigation for the proposed Smith Valley Dairy project to be located in Smith Valley, Nevada. The project site boundaries generally consist of Hunewill Lane to the west, Jessen Road 0.3 miles to the south and pasture/farm land to the north and east (Plate 1).

It is our understanding that the proposed project will consist of multiple single level buildings, storage ponds, and associated access roads. Structural loads for this project have been assumed not to exceed three to four kips per lineal foot and 15 to 18 kips for continuous-wall and isolated-column loads, respectively. We have assumed that final grades at the site will be within five feet from existing grades.

The purpose of our preliminary investigation was to characterize the site geology and soil conditions, describe the native soils and determine their engineering properties as they relate to the proposed construction. The investigation was also intended to identify possible adverse geologic, soil, and or water table conditions. However, this study did not include an environmental assessment or an evaluation for soil and/or groundwater contamination at the site.

This report concludes with preliminary recommendations for site grading, foundations, footing area preparation, slope stability, utility installation, asphalt concrete, and Portland cement concrete. In addition, information such as logs of all exploratory borings and

test pits, laboratory test data, allowable soil bearing capacities, estimated total and differential settlements based on static loads, lateral earth pressures, and International Building Code (IBC) seismic site class designation are provided in this report.

The preliminary recommendations contained herein have been prepared based on our understanding of the proposed construction, as outlined above. Re-evaluation of the recommendations presented in this report should be conducted after the final site grading and construction plans are completed, if there are any variations from the assumptions described herein. Additional field exploration, testing, and analysis may be warranted.

It is possible that subsurface discontinuities may exist between and beyond exploration points. Such discontinuities are beyond the evaluation of the Engineer at this time. No guarantee of the consistency of site geology and sub-surface conditions is implied or intended.

GEOLOGIC SETTING

Smith Valley is located in the western portion of the Great Basin geomorphic province. The Great Basin is characterized by large normal fault-bounded valleys (grabens) that are separated by large mountain ranges (horst). The Sierra Nevada province to the west is characterized by large granite masses that have been uplifted and tilted a few degrees toward the west. Overlying the granites are older oceanic meta-sedimentary rocks.

The geologic evolution of the region involves uplift, volcanism, extension, and sedimentation. All these factors have contributed to the current "Basin and Range" physiographic.

Specifically, Smith Valley is located in a faulted sub-basin bounded by the Singatse Range to the northeast and the Pine Nut Mountains to the west. The basin is located at the southern terminus of the Pine Nut Mountains. The valley is primarily filled with valley fill and Pleistocene Lake beds from the ancestral Walker River. According to the Geologic map of Lyon County, Nevada compiled by James G. Moore, the site is underlain by alluvium. Specifically, it is mapped as Qp, with fine sand, silt, and clay of river flood plains, and playa clay and sand. According to the Soil Survey of Lyon County Area, Nevada, sheet 26, compiled by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies, the site has three distinct features: the Obanion sandy loam, drained and saline-alkali units, and the Wedertz-Wellington-Saralegui complex.

The Obanion drained and saline-alkali units are very deep, very poorly drained soil on alluvial fans and flats. They typically have a gray brown sandy loam underlain by 60 inches or more of mottled, stratified sandy loam to sandy clay loam, and have a high potential for frost heave. Local roads and streets may require a special base to avoid frost heave damage. They can also have a moderate shrink-swell potential, and both are subject to have excess salt/sodium content and therefore have a high corrosive potential. The Wedertz-Wellington-Saralegui complex is on alluvial fans and lake terraces. Generally speaking, it is well drained and can have a cemented layer 60 inches or more with moderate potential for frost heave.

SEISMIC CONSIDERATIONS

Smith Valley, similar to many areas in Nevada, is located near active faults that are capable of producing significant earthquakes. This area can be described as an area that may experience major damage due to earthquakes having intensities of VII or more when evaluated using the Modified Mercalli Intensity Scale of 1931 (Plate 3).

The Smith Valley area is located near the intersection of the Sierra Nevada-Great Basin seismic belt and the central Nevada Seismic Belt and at least 5 major earthquakes with assigned magnitudes greater than 6.0 (Plate 4) have occurred historically (less than 200 years) within 50 miles of the site (Dohrewend, 1982). Fault mapping shows a major range-front fault about 15 miles southwest of the site (Plate 5). Based on our investigation, no Holocene (<12000 years) age faulting is known to cross the site, nor has any direct evidence of on-site faulting been observed in the field or found in any explorations conducted for this project.

According to the USGS Earthquake Hazards program, the Peak Ground Acceleration corresponding to a ten percent (10%) probability of exceedance in 50 years is 0.30g and the Peak Ground Acceleration corresponding to a two percent (2%) probability of exceedance in 50 years is 0.57g.

Liquefaction is the phenomena where loose saturated granular soils lose their shear strength when subjected to strong vibration or cyclic loading, and become unstable. Large earthquakes as described above may provide that type of cyclic loading. Loose, saturated sands and silty sands are the most susceptible to this phenomenon. A site-specific liquefaction evaluation of subsurface soils was not conducted for this project. However, liquefaction of subsurface soils at the site is not considered likely to occur; due to the fact that standard penetration testing on sands below the groundwater table indicates the site sands are dense to very dense. The majority of any structural damage to buildings at this site is most likely to be the result of strong seismic shaking rather than subsurface soil liquefaction.

2006 IBC Design: The mapped maximum considered earthquake spectral response acceleration at short periods (S_S) is 1.39g corresponding to a 0.2 second spectral response acceleration at five percent (5%) of critical damping and for a Site Class B (IBC Figure 1615(3)). The mapped maximum considered earthquake spectral response acceleration at a 1-second period (S_1) is 0.54g corresponding to a 1.0 second spectral response acceleration at five percent (5%) of critical damping and for a Site Class B (IBC Figure 1615(4). The site may be considered a stiff soil profile, corresponding to a Site Class D (IBC Table 1615.1.1). Therefore, the spectral response accelerations must be adjusted for site class effects. The site coefficient for spectral response accelerations adjustment at short periods (F_a) is 1.00 (IBC Table 1615.1.2(1)). The site class effect for spectral response acceleration adjustment at 1-second periods (F_V) is 1.50 (IBC Table 1615.1.2(2)) the maximum considered earthquake spectral response acceleration parameter for short period (S_{MS}) is 1.39g and for 1-second period (S_{M1}) is 0.81g. This corresponds to design spectral response acceleration parameters of 0.93g for short period (S_{DS}) and of 0.54g for 1-second period (S_{D1}). A peak ground acceleration of 0.37g ($S_{DS}/2.5$) may be used for design.

It is emphasized that the above values are the minimum requirements intended to maintain public safety during strong ground shaking. These minimum requirements are meant to safeguard against loss of life and major structural failures. However, they are not intended to prevent damage or insure the functionality of the structure during and/or after a large seismic event.

In conclusion, seismic concerns for this site are not unlike other sites in Smith Valley area. No evidence of active faulting was found on the site. However, due to the proximity of the site to a number of faults that are considered active, as noted above, strong seismic shaking should be anticipated during the life of the proposed structures.

SITE CONDITIONS AND FIELD EXPLORATION

At the time of our investigation, a portion of the site had been previously graded for a corral area, but mostly the site is relatively flat and relatively undisturbed. The vegetation generally consists of grasses, sagebrush, and occasional trees.

Field exploration included a site reconnaissance and subsurface soil-exploration. During the site reconnaissance, surface conditions were noted and the locations of the exploratory borings and test pits were determined. They were located using existing features and a conceptual plan available to Lumos as a guide. Locations and elevations of the exploratory borings and test pits should be considered accurate only to the degree implied by the method used.

Four exploratory borings and seven exploratory test pits were excavated to a maximum depth of 21.5 feet below-ground-surface (bgs). The approximate locations of the exploratory borings and test pits within the site are shown on Plate 2. The subsurface soils were continuously logged and visually classified in the field by our Geotechnical Intern in accordance with the Unified Soil Classification System. Penetration testing utilizing a Standard split spoon (SPT) and California Modified split spoon samplers were collected at five foot intervals within the exploratory borings. Representative bulk soil samples were collected at each material change within each of the exploratory test pits. Auger cuttings were also collected within the upper seven feet from the exploratory borings. All the samples, subsequently, were transported to our Carson City geotechnical laboratory for testing and analysis.

The native subsurface soils consisted generally of lean clays, silty sands (cemented), clayey sands, and sands to a depth of about 21.5 feet bgs.

Groundwater was encountered at the time of our field investigation in all the borings and test pits 1 and 4 ranging in depth from 15 feet to 18 feet bgs. "Mottling", which indicates previous groundwater presence, was observed in several of the test pits and borings at depths of between 5 and 14 feet. Therefore, seasonal groundwater (water table) fluctuations should be anticipated at the site.

FIELD AND LABORATORY TEST DATA

Field and laboratory data was developed from samples taken and tests conducted during the field exploration and laboratory phases of this project. The test pits were excavated by a John Deere 690 ELC backhoe. Representative bulk soil samples were collected from each stratum of material encountered. The borings were advanced by a truck mounted CME 55 Truck Mounted Drill Rig. Representative samples were collected from the borings at five foot intervals using a 1.4-inch inside diameter Standard Penetration Testing (SPT) and California Modified split spoon samplers. A 140-pound safety hammer powered by a rope / cathead pulley system, free falling 30 inches, drove the sampler.

Laboratory tests performed on representative samples included sieve analysis, Atterberg Limits, modified proctor, R-value, direct shear, hydrocollapse, consolidation, soluble sulfates, pH value, and resistivity. Much of this data is displayed on the "logs" of the exploratory borings and test pits to facilitate correlation. Field descriptions presented on the logs have been modified, where appropriate, to reflect laboratory test results. The logs of the exploratory borings and test pits are included in Appendix A of this report as Plates A-1 through A-11. Plate A-12 describes the various symbols and nomenclature shown on the logs.

Individual laboratory test results are presented in Appendix B as Plates B-1 through B-7. Laboratory testing was performed per ASTM standards, except when test procedures are briefly described and no ASTM standard is specifically referenced in the report. Atterberg limits were determined using the dry method of preparation (Plate B-2). Special testing conducted for this project is described below.

Analytical Testing: Silver State Analytical Laboratories, Reno, Nevada, conducted this testing. The testing included pH value, resistivity and soluble sulfates. Test results are included (on Silver State letterhead) in Plate B-7.

The soil samples obtained during this investigation will be held in our laboratory for 30 days from the date of this report. The samples may be retained longer at an additional cost to the client or obtained from this office upon request.

DISCUSSION AND RECOMMENDATIONS

General

From a geotechnical viewpoint, the site is considered suitable for the proposed improvements when prepared as recommended herein.

The site fine grained soils (clays) are not considered adequate to support any of the proposed improvements due to the fact they are relatively weak and susceptible to volume change. For the purposes of this report, fine grained soils are defined as soils with greater than 50% passing the #200 sieve. Additionally, the site coarse grained soils hydrocollapse potential is moderately severe. Therefore, they are not suitable to provide direct support for the proposed improvements, in their current condition. All unsuitable material, and any soils with organics, and previously placed fill soils should be excavated and removed off site, or set aside. Any loose/soft, or otherwise disturbed soils in the proposed building footprint and associated structures should be over excavated and re-compacted prior to receiving any properly compacted fill.

The following preliminary recommendations are based upon the construction and our understanding of this project, as outlined in the introduction of this report. If changes in the construction are proposed, they should be presented to the Lumos Geotechnical Department, so that these recommendations can be reviewed and modified in writing, as necessary. As a minimum, final construction drawings should be submitted to the Lumos Geotechnical Department for review prior to actual construction and verification that our geotechnical design recommendations have been implemented. Additional field exploration, testing, and analysis may be warranted.

General Site Grading

Prior to placement of fill, the areas to receive fill shall be cleared and grubbed. Clearing and grubbing is anticipated to be as much as six inches or more where thicker vegetation/trees are present.

The onsite clays (CL) soils are also unsuitable to provide direct structural support due to their volume change potential and weak bearing capacity. If onsite clays (CL) are encountered within three (3) feet of bottom of footing we recommend a minimum of three (3) feet of separation between all building foundations and slabs, and the clays, if conventional spread foundation and/or concrete slabs on grade are utilized. Additionally, we recommend a minimum of 1.5 feet of separation between exterior concrete improvements and asphalt pavement sections and the clays. Unless required otherwise, removals should extend horizontally beyond the perimeter of the proposed foundation and slab a distance of at least three (3) feet if conventional spread foundations are utilized, or as required by the design, whichever is greater. Removals shall extend horizontally beyond the edge of exterior concrete improvements and asphalt pavement sections a minimum of 1.5 feet. We highly recommend potholing be done during construction to insure these minimum separation requirements are met.

Due to the "moderately severe" collapse potential of the on-site sands (coarse grained soils), we recommend the site sands (SM, and SW-SM) are removed vertically to a depth of three (3) feet below bottom of footing and three (3) feet horizontally from the outside edge of any structure foundation. Additionally, we recommend a minimum of 1.5 feet depth of overexcavation below, and laterally beyond, the edge of exterior concrete improvements and asphalt pavement sections. These coarse grained soils may be reused as structural fill, provided they are moisture conditioned and recompacted as required.

Root- or organic-laden soils encountered during excavations, should be stockpiled in a designated area on site for later use in landscaping, or removed off site as directed by the owner. Excavated soils free from any organics, debris or otherwise unsuitable material and with particles no larger than three (3) inches in maximum dimension may be stockpiled and moisture conditioned for later use as compacted fill provided it meets the criteria for acceptable fill soils.

All Surfaces should be observed and approved by a Lumos representative prior to placement of fill or improvements. The surfaces to receive fill, footings, or improvements shall be scarified to a minimum of twelve (12) inches, moisture conditioned to within two

percent (2%) of optimum, and re-compacted to at least ninety percent (90%) of the ASTM D1557 standard. Fill material should not be placed, spread or compacted while the ground is frozen or during unfavorable weather conditions. When site grading is interrupted by heavy rain or snow, grading or fill operations should not resume until a Lumos representative approves the moisture content and density conditions of the subgrade or previously placed fill.

Unstable conditions due to yielding and/or pumping soils may be encountered on site. Native soils may yield or pump under heavy equipment loads or where vibratory equipment draws up water. If yielding or pumping conditions are encountered, the soils should be scarified in place, allowed to dry as necessary and re-compacted, where applicable. Alternatively, the unsuitable or saturated soil should be removed, the exposed surface leveled and compacted/tamped as much as practical without causing further pumping, and covered (including the sides) with geotextile stabilizing fabric (Mirafi HP370 or other equivalent). The fabric should then be covered with at least 12 inches of 4- to 12-inch **angular rock fill** with enough fines to fill the inter-rock pore spaces. Placement should be by end dumping. No traffic or other action should be allowed over the fabric, which may cause it to deflect/deform prior to cobble placement. Test sections should be used to determine the minimum thickness and/or number of layers required for stabilization.

Stabilization should be evaluated by proof-rolling standards commensurate with the equipment used, and approved by a Lumos representative. The placement of the stabilizing rock-fill may require additional over-excavation to maintain appropriate grading elevations. A filter fabric (Mirafi 180N or equal) should also be placed over the cobble rock fill to prevent piping of fines from covering soils into the stabilizing rock matrix.

Acceptable structural fill soils to be used for this project should consist of non-expansive material (LL less than 35 and/or a PI less than 12, and/or an Expansion Index less than 20), and should be free of contaminants, organics (less than two percent (2%)), rubble, or natural rock larger than three (3) inches in largest dimension. The soluble sulfate content shall be less than 0.1% and the R-Value shall be a minimum of 45. Any import

soils should be tested and approved prior to being placed or delivered on-site (seven (7) day advanced notice). Structural fill soils shall also meet the following gradation requirements (Table 1):

TABLE 1
STRUCTURAL FILL GRADATION

Sieve Size	% Passing
3"	100
3/4"	70 - 100
#40	15 - 65
#200	10 - 25

The site coarse grained soils (sands) are suitable for re-use as structural fill. Compacted fill should be placed only on compacted sub-grade or on compacted fill in lifts not exceeding eight (8) inches in loose thickness, moisture conditioned to within two percent (2%) of optimum, and compacted to at least ninety-five percent (95%) relative compaction, as determined by the ASTM D1557 standard.

Landscaped areas should be cleared of all organic and objectionable material such as wood, root stumps, etc., if any. In cut areas, no other work is necessary except grading to proper elevation and drainage conditions. In landscape fill areas, fill should be placed in loose lifts not exceeding eight (8) inches, and compacted to at least ninety percent (90%) relative compaction to prevent erosion.

A representative of Lumos should be present during all site clearing, excavation removals, and grading operations to ensure that any unforeseen or concealed conditions within the site are identified and properly mitigated, and to test and observe earthwork construction. This testing and observation is an integral part of our services as acceptance of earthwork construction and is dependent upon compaction and stability of the subgrade soils. The soils engineer may reject any material that does not meet acceptable fill, compaction, and stability requirements. Further, recommendations in this report are provided upon the assumption that earthwork construction will conform to recommendations set forth in this section of the report.

FOUNDATION DESIGN CRITERIA

Conventional spread footings founded on a minimum of three (3) feet of properly compacted structural fill as recommended previously, may be used to support the proposed building within the project site.

Spread footings: Footings should have a minimum embedment of 18 inches below lowest adjacent grade for frost protection. Footings founded on properly compacted structural fill or native cut suitable subgrade may be designed for a net allowable bearing pressure of 2,000 pounds-per-square-foot (psf).

Footing Settlements: The maximum anticipated settlements, caused by static loading, for continuous or isolated footings bearing on properly compacted structural fill or native cut suitable subgrade and designed for a 2,000 psf bearing pressure is estimated at one (1) inch or less. Differential settlements are generally expected to be half of the total settlements. Settlements in granular soils are primarily expected to occur shortly after dead and sustained live loads are applied.

Lateral Loading: Resistance to lateral loads can be provided by friction acting at the base of foundations and by lateral earth resistance. A coefficient of friction of 0.40 may be assumed at the base of footings. An allowable passive earth resistance of 250 psf per foot of depth starting six inches below lowest adjacent grade may be used for the sides of footings poured against properly compacted structural fill. Passive resistance should not exceed 2,000 psf. The at-rest lateral pressure can be calculated utilizing an equivalent fluid pressure of 35 pcf.

Dynamic Factors: Vertical and lateral bearing values indicated above are for total dead-load and frequently applied live loads. If normal code requirements are applied for design, the above vertical bearing values may be increased by thirty-three percent (33%) for short duration loading due to wind or seismic forces. The additional Dynamic Lateral earth pressure can be calculated utilizing the following equation.

Dynamic Lateral Force = $16.5H^2$

H = height of wall

This force should be assumed to act at a height of 0.6H above the bottom of the wall.

RETAINING WALLS

Retaining structures over three feet in height, if used, will require local code compliance and engineered based on parameters described in this section of the report. Retaining structures should be designed to resist the appropriate lateral earth pressures. Cantilevered walls, which are able to deflect at least 0.01 radians, can be designed using an equivalent fluid (backfill) unit weight of 35 pounds-per-cubic-foot (pcf). However, if the wall is fixed against rotation, the wall should be designed using an equivalent fluid (backfill) unit weight of 55 pcf. These design parameters are based upon the assumption that walls will retain only level backfill and no hydrostatic pressure will be present. Any other surcharge pressures should be added to the above recommended lateral earth pressures. Retaining walls should be backfilled with free draining granular material that extends vertically to the bottom of the stem and laterally at least six inches beyond the face of the stem (wall) and wrapped with a Mirafi 180 N or equivalent non-woven filter fabric. Weep holes should be provided on the walls at regular intervals, or a slotted drainpipe placed at the bottom of the wall (bottom of granular material) to relieve any possible build-up of hydrostatic pressure. Backfill material within two feet of the wall should be compacted with hand-held equipment only, and to at least 90% of the maximum ASTM D1557 standard.

PAVEMENT DESIGN

Areas to be paved and/or receive aggregate base shall be underlain by at least 18 inches of properly compacted structural fill material, as recommended previously in this report. Pavement structural section for the asphalt concrete utilizing a calculated R-value of 69 is provided in Table 2, "Recommended Asphalt Pavement Sections". A Traffic Index (TI) value of 7.5 was utilized for design due to the potential high volume of truck traffic. Aggregate base should consist of Type 2, Class B material and meet the requirements of the Standard Specifications for Public Works Construction (SPPWC). Aggregate base material should be compacted to at least ninety-five percent (95%) of the laboratory maximum density, and moisture conditioned to within two percent (2%) of optimum as determined by the ASTM D1557 standard.

TABLE 2
RECOMMENDED ASPHALT PAVEMENT SECTIONS

Pavement Area	Minimum Asphalt Pavement	Minimum Aggregate Base	Properly Compacted Structural Fill
T.I. = 7.5	3"	4"	18"
	or 0"	9" *	18"

* Underlain by geotextile stabilization fabric (Mirafi Bx1200 or equivalent).

In all areas of the project, asphalt concrete should consist of PG64-28NV, and Type 3 asphalt aggregate per the "Orange Book" standards. We recommend a 50-blow Marshall mix that targets three percent (3%) air voids. Asphalt concrete, in any case, should be compacted to between ninety-two percent (92%) and ninety-seven percent (97%) of the Rice theoretical maximum density.

All mix designs for asphalt concrete should be submitted to the Geotechnical Engineer for review and approval a minimum of seven (7) days prior to paving.

CORROSION AND CHEMICAL ATTACK

On-site soils have a negligible water soluble sulfate content of less than 0.10% (0.00% or less). No specific type of cement is required for concrete in direct contact with on-site soils, as required by the International Building Code. However, Type II cement (meeting ASTM C150) is recommended for concrete in direct contact with on-site soils.

All exterior concrete should have between 4.5 and 7.5 percent entrained air, a maximum water-cement ratio of 0.45, and comply with all other ACI recommendations for concrete placed in areas subject to freezing. A minimum compression strength of 4,000 psi is recommended for all external concrete. All interior concrete should also be placed pursuant to ACI recommendations.

Native soils have a pH 8.61 and have a resistivity of 1,290 ohm-cm under saturated conditions. This indicates a highly corrosive potential for ferrous metals in contact with these soils. Corrosion mitigation measures, such as protective coatings, wrappings, and cathodic protection are therefore recommended. If protective coatings are used, the type and quantity will depend on the kind of steel and specific construction application. Steel and wire concrete reinforcement cover of at least three (3) inches where cast against soil, unformed, is recommended.

SLOPE STABILITY AND EROSION CONTROL

The results of our exploration and testing confirm that 2:1 (H:V) maximum slopes will be stable for on-site materials both in cut and fill. Slopes less than 10 feet in height may be constructed to a maximum of 1.5:1 (H:V) both in cut and fill. Fill slope materials shall be placed, moisture conditioned, and compacted per the requirements of structural fill provided earlier in this report. All slopes shall incorporate a brow ditch to direct surface drainage away from the slope face.

The potential for dust generation is high at this project. Dust control will be mandatory on this project in order to comply with air quality standards. The contractor shall be responsible for submitting a dust control plan and securing any required permits.

Stabilization of all slopes and areas disturbed by construction will be required to prevent erosion and to control dust. Stabilization may consist of rip-rap, revegetation, or dust pallative, depending on the inclination of the slope.

In order to minimize storm water discharge from this site, best management practices should be implemented.

UTILITY EXCAVATIONS

On-site soils are anticipated to be excavatable with conventional construction equipment. Compliance with OSHA regulations should be enforced for Type C soils. Excavated coarse grained soils may be suitable for backfill of utility trenches after screening any oversize material and debris provided they meet the requirements of Class E backfill. However, on-site soils do not meet the minimum requirements for Class A bedding and should be imported, where required.

MOISTURE PROTECTION, EROSION AND DRAINAGE

The finish surfaces around all structures should slope away from the building and toward appropriate drop inlets or other surface drainage devices. It is recommended that within 10 feet of the buildings a minimum slope of five percent (5%) be used for soil subgrades and one percent (1%) be used for pavements. These grades should be maintained for the life of the structures.

Landscaping and downspouts should be planned to prevent discharge adjacent to buildings. Instead, water flow should be conveyed and re-routed to discharge areas away from any improvements.

Backfill adjacent to the proposed building perimeters should be properly compacted to minimize water infiltration into the foundation soils.

CONSTRUCTION SPECIFICATIONS

All work on-site shall be governed by the latest edition of the International Building Code (IBC) as accepted by Lyon County, except where modified herein.

LIMITATIONS

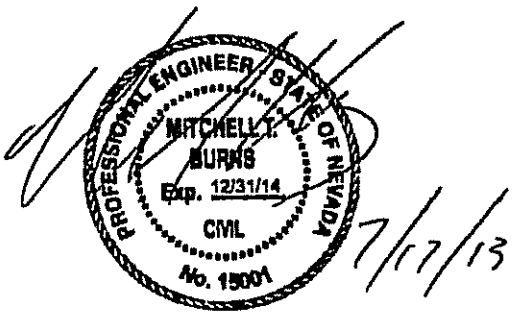
This report has been prepared in accordance with the currently accepted engineering practices in Northern Nevada and Northern California. The analysis and recommendations in this report are based upon exploration performed at the locations shown on the site plan, the proposed improvements as described in the Introduction section of this report and upon the property in its condition as of the date of this report. Lumos makes no guarantee as to the continuity of conditions as subsurface variations may occur between or beyond exploration points and over time. Any subsurface variations encountered during construction should be immediately reported to Lumos so that, if necessary, Lumos' recommendations may be modified.

This report has been prepared for and provided directly to AGPROfessionals, LLC ("The Client"), and any and all use of this report is expressly limited to the exclusive use of the Client. The Client is responsible for determining who, if anyone, shall be provided this report, including any designers and subcontractors whose work is related to this project. Should the Client decide to provide this report to any other individual or entity, Lumos shall not be held liable for any use by those individuals or entities to whom this report is provided. The Client agrees to indemnify, defend and hold harmless Lumos, its agents and employees from any claims resulting from unauthorized users.

If this report is utilized in the preparation of an Engineer's Estimate of Probable Construction Costs, then the preparer of the estimate acknowledges that the report recommendations are based on the subsurface conditions found at the specific locations investigated on site; that subsurface conditions may vary outside these locations; and that no guaranty or warranty, express or implied, is made that the conditions encountered are representative of the entire site. The preparer of the estimate agrees to indemnify, defend and hold harmless Lumos & Associates, its agents and employees from any and all claims, causes of action or liability arising from any claims resulting from the use of the report in the preparation of an Engineer's Cost Estimate.

This report is not intended for, nor should be utilized for, bidding purposes. If it is utilized for bidding purposes, Client acknowledges that the report recommendations are based on the subsurface conditions found at the specific locations investigated on site; that subsurface conditions may vary outside these locations; and that no guaranty or warranty, express or implied, is made that the conditions encountered are representative of the entire site. The Client agrees to indemnify, defend and hold harmless Lumos & Associates, its agents and employees from any and all claims, causes or action or liability arising from any claims resulting from the use of the report for bidding purposes.

As explained above, subsurface variations may exist and as such, beyond the express findings located in this report, no warranties express, or implied, are made by this report. No affirmation of fact, including but not limited to statements regarding suitability for use of performance shall be deemed to be a warranty or guaranty for any purpose.



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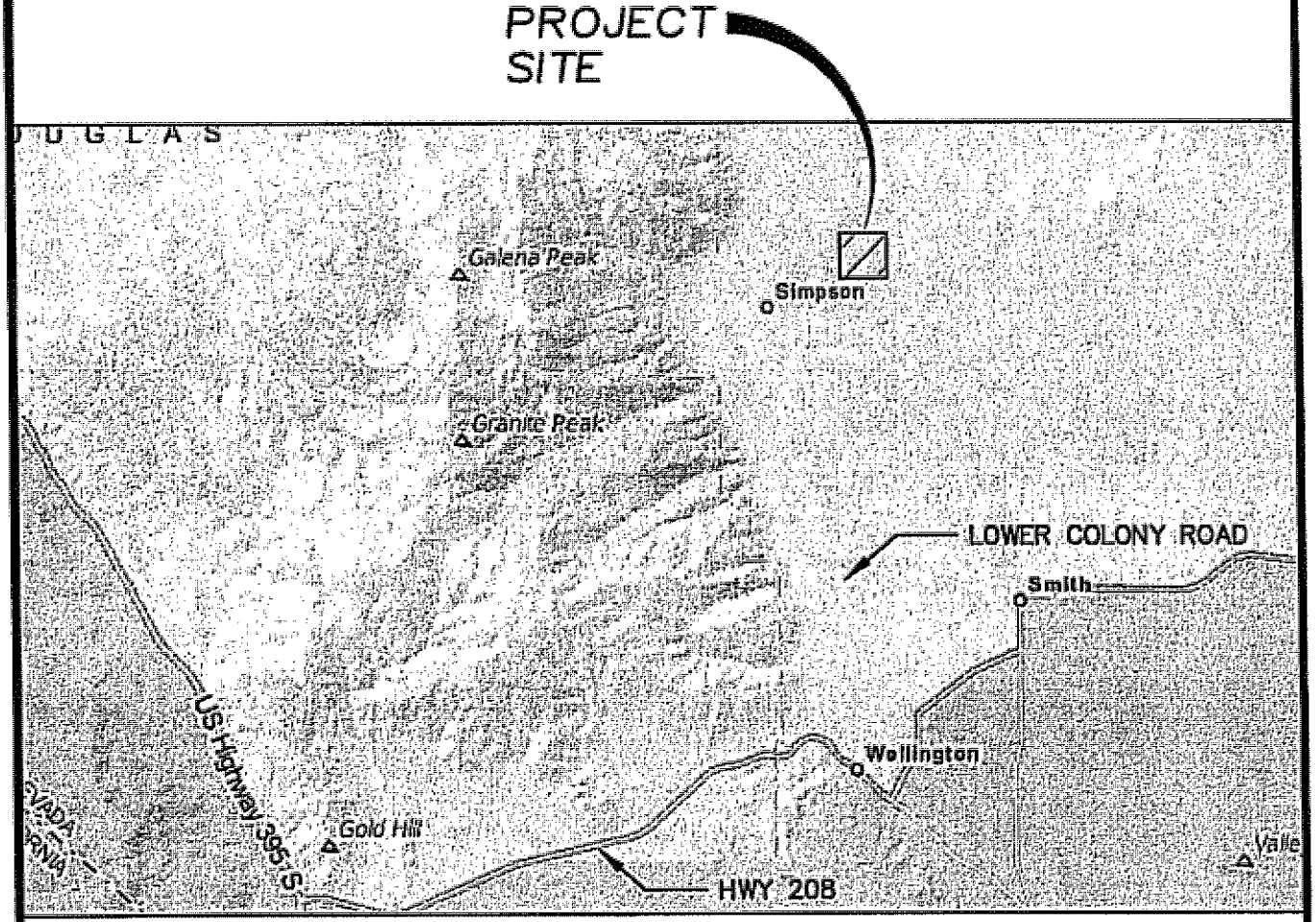

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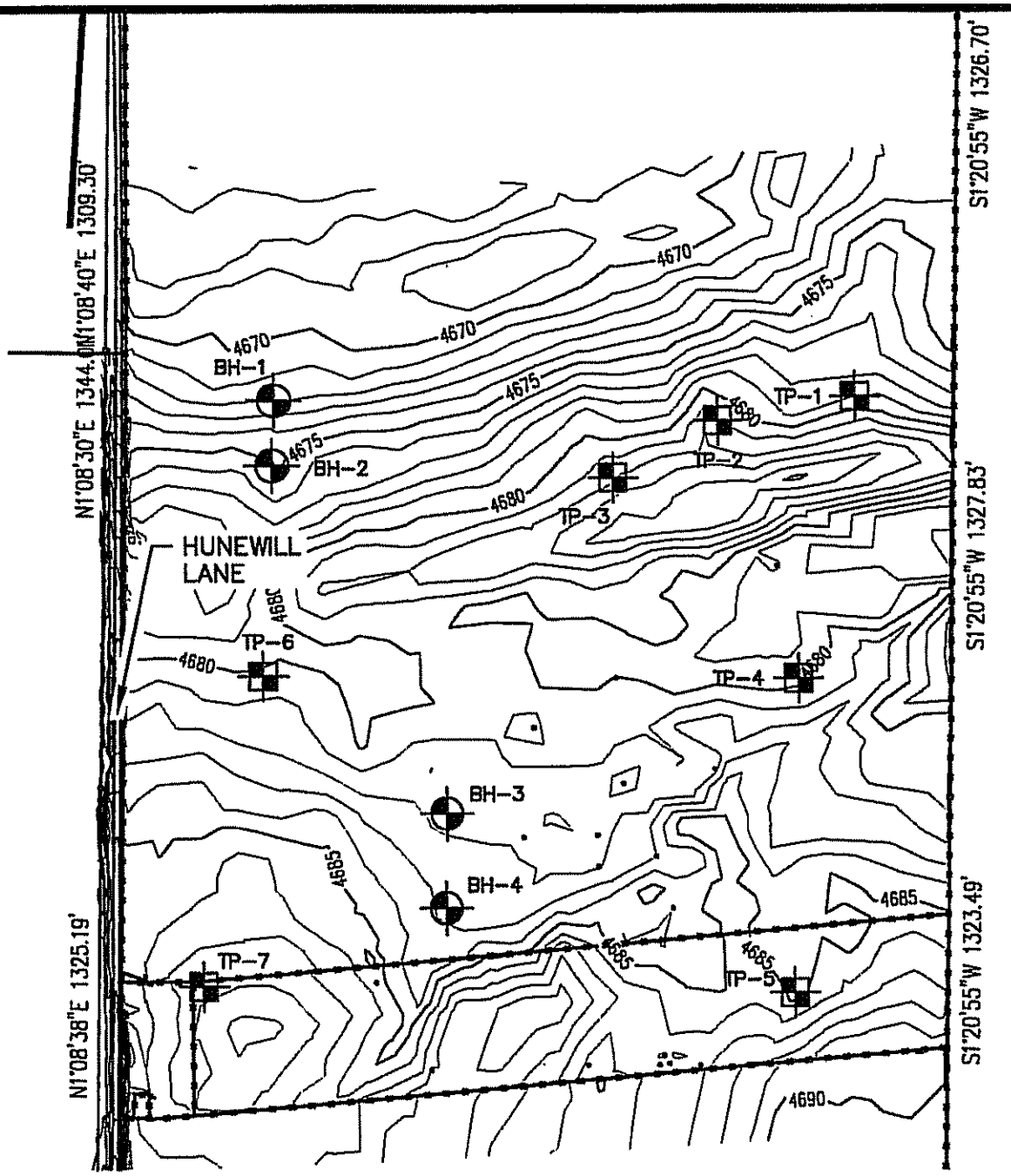
SMITH VALLEY DAIRY DEVELOPMENT

VICINITY MAP

LYON COUNTY NEVADA

Date:	JULY 2013
Scale:	N.T.S.
Job No:	8403.000
PLATE	1



LEGEND

TP- = APPROXIMATE EXPLORATORY TEST PIT LOCATION

BH- = APPROXIMATE EXPLORATORY BORING LOCATION

LUMOS & ASSOCIATES
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SMITH VALLEY DAIRY DEVELOPMENT

SITE MAP

LYON COUNTY NEVADA

Date:	JULY 2013
Scale:	N.T.S.
Job No:	8403.000
PLATE	2

MODIFIED MERCALLI INTENSITY SCALE

INTENSITY	EFFECTS
I	Not felt except by a very few under especially favorable circumstances.
II	Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
III	Felt quite noticeable indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration like passing of truck. Duration estimated.
IV	During the day felt indoors by many, outdoors by few. At night some awaken. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building; standing motor cars rock noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbance of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.
VI	Felt by all; many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.
VII	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well- built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Disturbs persons driving motor cars.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.
X	Some well-built wooden structures destroyed; most masonry and frame structures with foundations destroyed; ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed (sloped) over banks.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipe lines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.
XII	Damage total. Waves seen on ground surfaces. Lines of sight and level distorted. Objects thrown upward into the air.

From Wood and Newman, 1931, by U.S. Geological Survey, 1974, Earthquake Information Bulletin, v. 6, no. 5, p. 28

Richter Magnitude	Intensity (maximum expected Modified Mercalli)
3.0 - 3.9	II - III
4.0 - 4.9	IV - V
5.0 - 5.9	VI - VII
6.0 - 6.9	VII - VIII
7.0 - 7.9	IX - X
8.0 - 8.9	XI - XII

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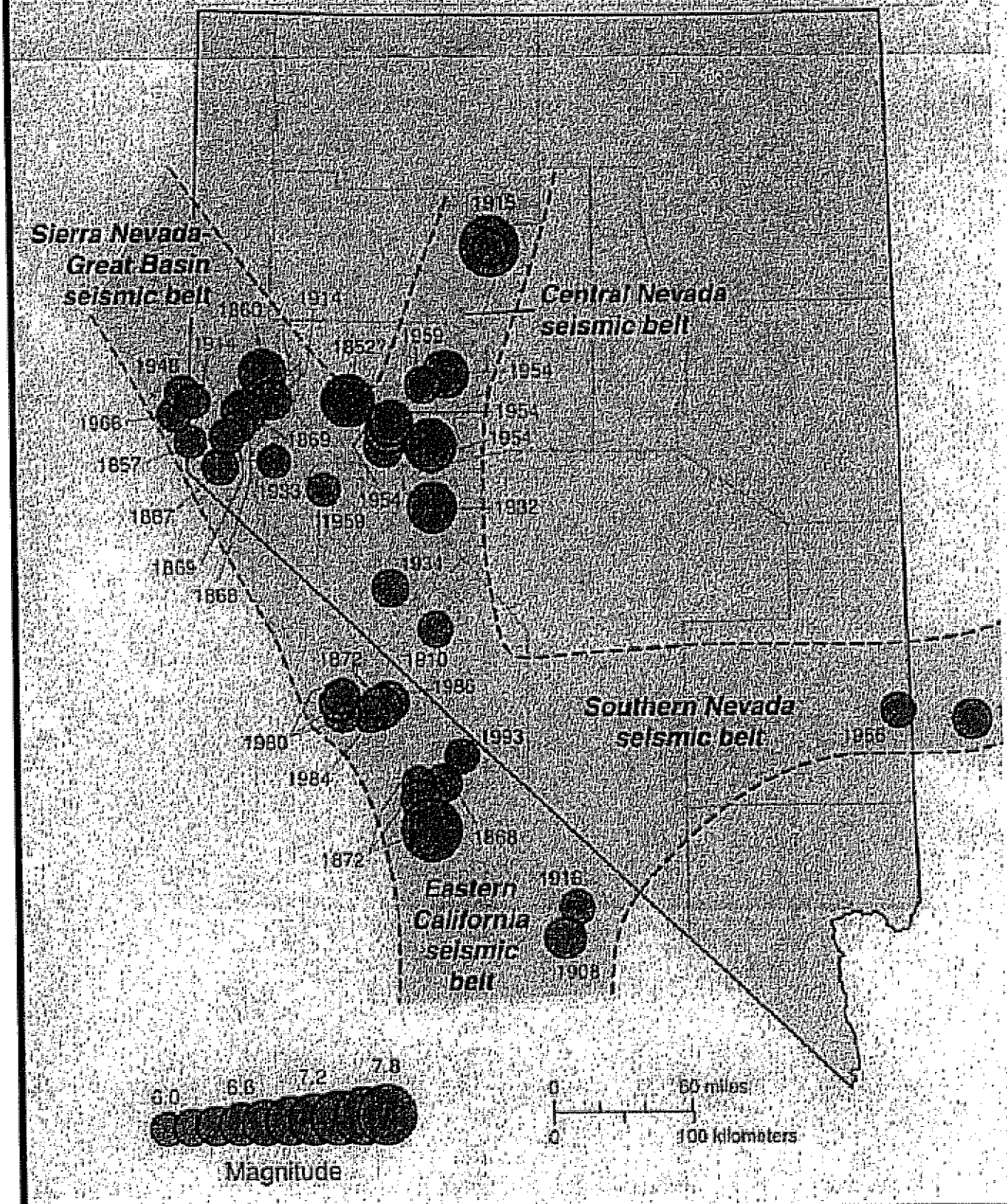
SMITH VALLEY DAIRY DEVELOPMENT

MODIFIED MERCALLI SCALE

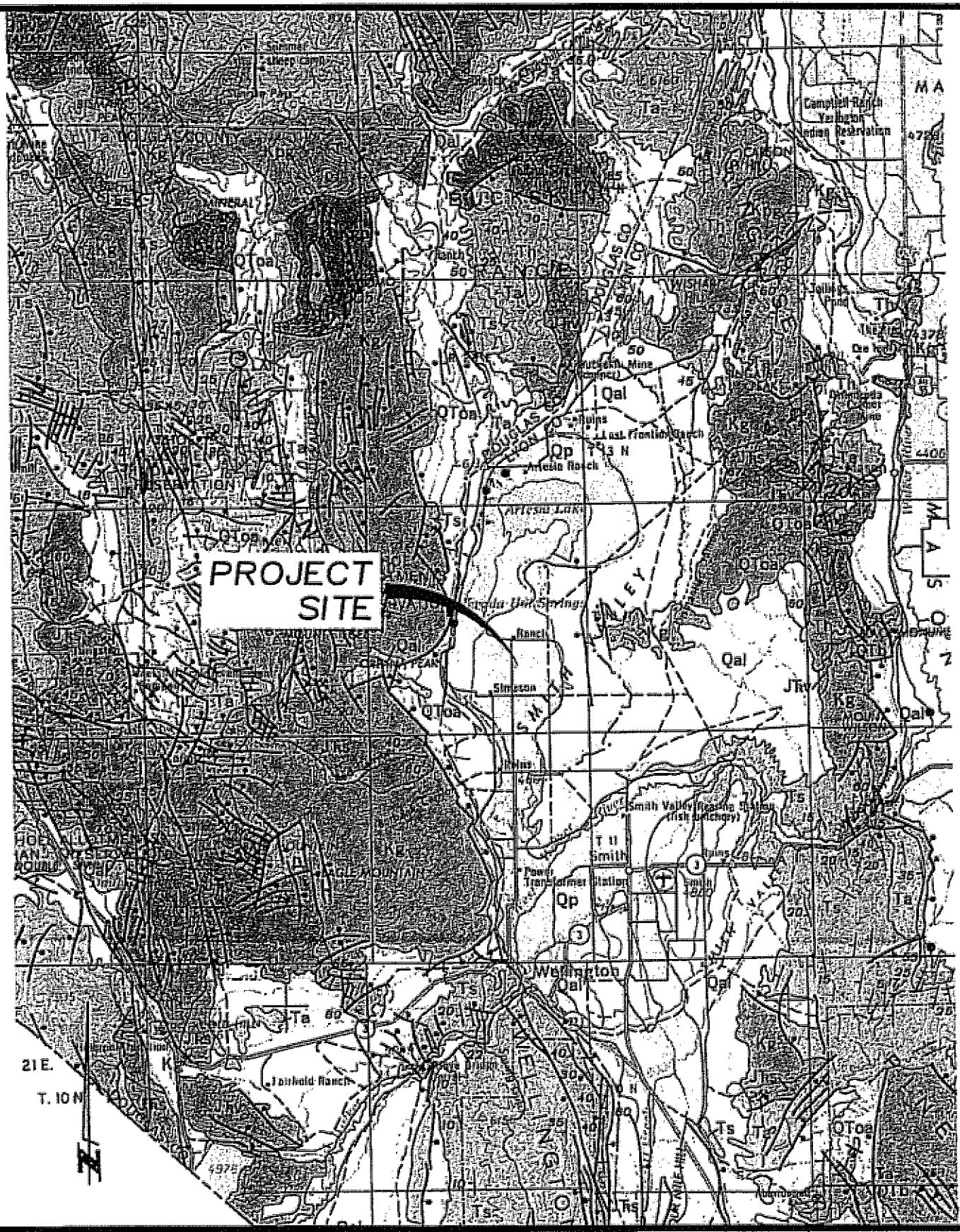
LYON COUNTY NEVADA

Date: JULY 2013
Scale: N.T.S.
Job No: 8403.000
PLATE 3

MAJOR EARTHQUAKES AND SEISMIC BELTS



LUMOS & ASSOCIATES 850 E. COLLEGE PARKWAY CARSON CITY, NEVADA 89706 PH. (775) 883-7877 FAX (775) 883-7114	SMITH VALLEY DAIRY DEVELOPMENT **MAJOR EARTHQUAKES/ SEISMIC BELTS** LYON COUNTY — NEVADA	Date: JULY 2013 Scale: N.T.S. Job No: 8403.000 PLATE 4



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SMITH VALLEY DAIRY DEVELOPMENT

FAULT MAP

LYON COUNTY NEVADA

Date:	JULY 2013
Scale:	N.T.S.
Job No:	8403.000
PLATE	5

APPENDIX A

LUMOS & ASSOCIATES

Sheet 1 of 1

BORING No. B-1

Logged By: B. Sexton
Date Logged: 6-27-2013
Drill Type: CME 55 Truck Mounted Drill Rig

Total Depth: 21.5 feet
Water Depth: 15 feet ±
Ground Elev.: 4671.9 feet ±

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Direct Shear	Expansion Index
		B	**Light Brown Silty SAND (SM)**, Dry, Medium Dense, Moderately Cemented. Estimated 80% Coarse to Fine Sand and 20% Non-Plastic Silt.										
			4.0										
5		B	**Medium Brown Clayey SAND (SC)**, Slightly Moist, Dense.	* 68			23	10	2.2	66.6	31.1		
10			at 10' Color Change to Reddish Brown and Evidence of Mottling	* 100 +									
15			▼ at 15' Groundwater Encountered										
			15.0										
			Grayish Brown Poorly Graded SAND with Silt (SP-SM), Very Moist, Medium Dense. Estimated 90% Coarse to Fine Sand and 10% Non-Plastic Silt.	28									
			16.0										
			Gray Brown Clayey SAND (SC), Very Moist, Medium Dense. Estimated 70% Coarse to Fine Sand and 30% Moderately Plastic Clay.										
			20.0										
20			**Medium Brown Poorly Graded SAND (SP)**, Very Moist, Dense. Estimated 95% Coarse to Fine Sand and 5% Non-Plastic Silt. With 1/4" Lenses ø1.5 Clayey Sand (SC) Which is Estimated to have 70% Coarse to Fine Sand and 30% Moderately Plastic Clay.	36									

* Blows/Foot - Modified California Sampler
Boring Terminated at 21.5 feet.
Boring Backfilled with Excavated Soils and Tamped at the Surface.

BERT BORING LOG 8403 SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/18/13

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Carson City, Nevada 89706
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Smith Valley Dairy Development

LOG OF EXPLORATORY BORING

Job Number: 8403.000
Date: July 2013

PLATE
A-1

Sheet 1 of 1

BORING No. B-2

Logged By: B. Sexton
Date Logged: 6-27-2013
Drill Type: CME 55 Truck Mounted Drill Rig

Total Depth: 21.5 feet
Water Depth: 18 feet ±
Ground Elev.: 4675.2 feet ±

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Direct Shear	Expansion Index
		B	**Light Brown Silty SAND (SM)**, Dry, Medium Dense, Moderately Cemented. Estimated 80% Coarse to Fine Sand and 20% Non-Plastic Silt.	* 19									
			4.0										
5		B	**Medium Brown Poorly Graded SAND (SP)**, Slightly Moist, Medium Dense.	* 25									
			10.0										
10			**Medium to Reddish Brown Silty SAND (SM)**, Moist, Very Dense. Estimated 80% Coarse to Fine Sand and 20% Non-Plastic Silt. Evidence of Mottling.	* 100+									
15			16.0	32									
			Medium Brown Sandy Lean CLAY (CL), Moist to Very Moist, Stiff. Estimated 35% Medium to Fine Sand and 65% Moderately Plastic Clay.										
			▼ at 18' Groundwater Encountered										
20			20.0										
			Medium Brown Well-Graded SAND with Silt (SW-SM), Very Moist, Very Dense.				NP	NP	2.8	91.8	5.5		
			21.5										

* Blows/Foot - Modified California Sampler
Boring Terminated at 21.5 feet.
Boring Backfilled with Excavated Soils and Tamped at the Surface.

BERT BORING LOG 8403 SMITH VALLEY DAIRY.GPJ US_LAB.GDT 7/18/13

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Smith Valley Dairy Development

LOG OF EXPLORATORY BORING

Job Number: 8403.000
Date: July 2013

PLATE
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Sheet 1 of 1

BORING No. B-3

Logged By: B. Sexton
Date Logged: 6-27-2013
Drill Type: CME 55 Truck Mounted Drill Rig

Total Depth: 21.5 feet
Water Depth: 18 feet ±
Ground Elev.: 4681.6 feet ±

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Direct Shear	Expansion Index
			Light to Medium Brown Silty SAND (SM), Dry, Loose, Top Soil. Estimated 80% Coarse to Fine Sand and 20% Non-Plastic Silt. 1.0										
		B	**Light Brown Clayey SAND (SC)**, Dry, Dense.				21	8	0.7	69.9	29.4	36.7	
5			5.0										
			Brown Silty SAND (SM), Slightly Moist, Dense. Estimated 80% Coarse to Fine Sand and 20% Non-Plastic Silt.	* 37									
10			10.5	* 38									
			Light Brown Poorly Graded SAND (SP), Moist, Dense. Estimated 95% Coarse to Fine Sand and 5% Non-Plastic Silt. 11.0				44	31	0.7	34.2	65.1		
			Brown Sandy Lean CLAY (CL), Moist, Stiff.										
15			15.0										
			Medium Brown Poorly Graded SAND (SP), Moist to Very Moist, Dense. Estimated 95% Coarse to Fine Sand and 5% Non-Plastic Silt.	52									
			▼ at 18' Groundwater Encountered										
20				62									
			21.5										

* Blows/Foot - Modified California Sampler
Boring Terminated at 21.5 feet.
Boring Backfilled with Excavated Soils and Tamped at the Surface.

BERT BORING LOG 8403 SMITH VALLEY DAIRY.GPJ US_LAB.GDT 7/18/13

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LOG OF EXPLORATORY BORING

Job Number: 8403.000
Date: July 2013

PLATE
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Sheet 1 of 1

BORING No. B-4

Logged By: B. Sexton
Date Logged: 6-27-2013
Drill Type: CME 55 Truck Mounted Drill Rig

Total Depth: 21.5 feet
Water Depth: 17 feet ±
Ground Elev.: 4682.7 feet ±

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Direct Shear	Expansion Index
		B	**Light Brown Clayey SAND (SC)**, Dry, Dense. Estimated 70% Coarse to Fine Sand and 30% Moderately Plastic Clay. 5.0										
5			**Light to Medium Brown Well-Graded SAND with Silt (SW-SM)**, Dry to Slightly Moist, Medium Dense, and Evidence of Mottling. Estimated 90% Coarse to Fine Sand and 10% Non-Plastic Silt. 10.0	* 25									
10			**Brown Sandy Lean CLAY (CL)**, Slightly Moist to Moist, Stiff. Estimated 35% Medium to Fine Sand and 65% Moderately Plastic Clay. 11.5	* 34									
			Brown Well-Graded SAND with Silt (SW-SM), Moist to Very Moist, Dense. Estimated 90% Coarse to Fine Sand and 10% Non-Plastic Silt. 15.5	42									
15			**Brown Poorly Graded SAND (SP)**, Very Moist, Dense. Estimated 95% Coarse to Fine Sand and 5% Non-Plastic Silt. ▼ at 17' Groundwater Encountered 20.0										
20			**Brown Sandy Lean CLAY (CL)**, Very Moist, Stiff 20.5 Estimated 35% Medium to Fine Sand and 65% Moderately Plastic Clay. 21.5	33									
			Brown Poorly Graded SAND (SP), Very Moist, Dense. Estimated 95% Coarse to Fine Sand and 5% Non-Plastic Silt.										

* Blows/Foot - Modified California Sampler
Boring Terminated at 21.5 feet.
Boring Backfilled with Excavated Soils and Tamped at the Surface.

BERT BORING LOG 8403 SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/16/13

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LOG OF EXPLORATORY BORING

Job Number: 8403.000
Date: July 2013

PLATE A-4

Sheet 1 of 1

BORING No. TP-1

Logged By: B. Sexton
Date Logged: 6-28-2013
Drill Type: John Deere 690 ELC Backhoe

Total Depth: 20 feet
Water Depth: 18 feet ±
Ground Elev.: 4678.9 feet ±

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Direct Shear	Expansion Index
			Medium Brown Silty SAND (SM), Dry, Loose, Top Soil. Estimated 80% Coarse to Fine Sand and 20% Non-Plastic Silt. 1.0										
			Light Brown Silty SAND (SM) , Dry to Slightly Moist, Medium Dense, Moderately Cemented.										
			at 2.5' Nuclear Field Density Test Taken										
		B	at 3.5' Nuclear Field Density Test Taken				NP	NP	1.0	82.0	16.9	34.2	
5			8.0										
			Medium Brown Poorly Graded SAND (SP) , Moist, Medium Dense. Estimated 95% Coarse to Fine Sand and 5% Non-Plastic Silt. 10.5										
10			**Medium Brown Well-Graded SAND with Silt (SP-SM)** , Moist, Medium Dense. Estiamted 90% Coarse to Fine Sand and 10% Non-Plastic Silt.										
		Z	Below 14' Evidence of Mottling.										
15			at 18' Groundwater Encountered 18.0										
		Z	**Reddish Brown Poorly Graded SAND (SP)** , Very Moist, Medium Dense. Estimated 95% Coarse to Fine Sand and 5% Non-Plastic Silt. 20.0										
20			* Blows/Foot - Modified California Sampler Boring Terminated at 20 feet. Boring Backfilled with Excavated Soils and Tamped at the Surface.										

8ERT BORING LOG 8403 SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/18/13

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LOG OF EXPLORATORY BORING

Job Number: 8403.000
Date: July 2013

PLATE A-5

Sheet 1 of 1

BORING No. TP-2

Logged By: B. Sexton
Date Logged: 6-28-2013
Drill Type: John Deere 690 ELC Backhoe

Total Depth: 20 feet
Water Depth: No groundwater encountered
Ground Elev.: 4680.9 feet ±

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Direct Shear	Expansion Index
0		B	**Brown Silty SAND (SM)**, Moist, Medium Dense. Estimated 70% Coarse to Fine Sand and 30% Non-Plastic Silt.										
5		B	at 4' Color Change to Light Brown and Dry to Slightly Moist										
10		B	at 7' Color Change to Brown										
			11.0										
15		B	**Alternating Mix of Brown Silty SAND (SM) and Poorly Graded SAND (SP)**, Moist, Medium Dense. With Evidence of Very Small Roots and Slighlty Cemented within the Silty Sand Layers.										
			16.0										
20		Z	**Reddish Brown Poorly Graded SAND (SP)**, Moist, Medium Dense. Estimated 95% Coarse to Fine Sand and 5% Non-Plastic Silt.										
			20.0										

* Blows/Foot - Modified California Sampler
Boring Terminated at 20 feet.
Boring Backfilled with Excavated Soils and Tamped at the Surface.

BERT BORING LOG 8403 SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/18/13

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Smith Valley Dairy Development

LOG OF EXPLORATORY BORING

Job Number: 8403.000
Date: July 2013

PLATE
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Sheet 1 of 1

BORING No. TP-3

Logged By: B. Sexton
Date Logged: 6-28-2013
Drill Type: John Deere 690 ELC Backhoe

Total Depth: 20 feet
Water Depth: No groundwater encountered
Ground Elev.: 4681.7 feet ±

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Direct Shear	Expansion Index
0			**Medium Brown Silty SAND (SM)**, Dry, Loose, Top Soil. Estimated 80% Coarse to Fine Sand and 20% Non-Plastic Silt.										
1.0			**Light Brown Silty SAND (SM)** , Dry, Medium Dense, Moderately Cemented. Estimated 80% Coarse to Fine Sand and 20% Non-Plastic Silt. at 2' Nuclear Field Density Test Taken										
		B	at 3.5' Nuclear Field Density Test Taken										
5													
5.5			**Light Brown Silty SAND (SM)** , Dry to Slightly Moist, Medium Dense. Estimated 80% Coarse to Fine Sand and 20% Non-Plastic Silt.										
		B											
			at 9.5' Color Change to Reddish Brown and Evidence of Mottling										
10													
13.0			**Brown Sandy Lean CLAY (CL)** , Moist, Medium Stiff. Estimated 35% Medium to Fine Sand and 65% Moderately Plastic Clay.										
		B											
15													
19.0			**Reddish Brown Poorly Graded SAND (SP)** , Moist, Medium Dense. Estimated 95% Coarse to Fine Sand and 5% Non-Plastic Silt.										
20			Boring Terminated at 20 feet.										
20.0			Boring Backfilled with Excavated Soils and Tamped at the Surface.										

Blows/Foot - Modified California Sampler

BERT BORING LOG 8403 SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/16/13

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Smith Valley Dairy Development

LOG OF EXPLORATORY BORING

Job Number: 8403.000
Date: July 2013

PLATE
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Sheet 1 of 1

BORING No. TP-4

Logged By: B. Sexton
Date Logged: 6-28-2013
Drill Type: John Deere 690 ELC Backhoe

Total Depth: 20 feet
Water Depth: 18 feet ±
Ground Elev.: 4679.7 feet ±

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth In Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Direct Shear	Expansion Index
			Medium Brown Silty SAND (SM), Dry, Loose, Top Soil. Estimated 80% Coarse to Fine Sand and 20% Non-Plastic Silt. 1.0										
			Light Brown Silty SAND (SM) , Dry, Medium Dense, Moderately Cemented.				NP	NP	0.6	83.1	16.3		
5		B											
			8.0										
			Reddish Brown Poorly Graded SAND (SP) , Moist, Medium Dense. Estimated 95% Coarse to Fine Sand and 5% Non-Plastic Silt. 10.0										
10			**Medium Brown Well-Graded SAND with Silt (SW-SM)** , Moist, Medium Dense. Estimated 90% Coarse to Fine Sand and 10% Non-Plastic Silt.										
15		B											
			18.0										
			Reddish Brown Poorly Graded SAND (SP) , Very Moist, Medium Dense. Estimated 95% Coarse to Fine Sand and 5% Non-Plastic Silt. 19.0										
		Z	19.5										
20			**Brown Sandy Lean CLAY (CL)** , Very Moist, Medium Stiff. Estimated 35% Medium to Fine Sand and 65% Moderately Plastic Clay. 20.0										
			Reddish Brown Poorly Graded SAND (SP) , Very Moist, Medium Dense. Estimated 95% Coarse to Fine Sand and 5% Non-Plastic Silt.										
			Boring Terminated at 20 feet.										
			Boring Backfilled with Excavated Soils and Tamped at the Surface.										

BERT BORING LOG 8403 SMITH VALLEY DAIRY.GPJ US_LAB.GDT 7/18/13

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Smith Valley Dairy Development

LOG OF EXPLORATORY BORING

Job Number: 8403.000 Date: July 2013

PLATE A-8

Sheet 1 of 1

BORING No. TP-5

Logged By: B. Sexton
Date Logged: 6-28-2013
Drill Type: John Deere 690 ELC Backhoe

Total Depth: 14 feet
Water Depth: No groundwater encountered
Ground Elev.: 4684.6 feet ±

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Direct Shear	Expansion Index
0			**Medium Brown Silty SAND (SM)**, Dry, Loose, Top Soil. Estimated 80% Coarse to Fine Sand and 20% Non-Plastic Silt. 1.0										
1			**Medium Brown Silty SAND (SM)** , Dry, Medium Dense, Moderately Cemented.										
2			at 2' Nuclear Field Density Test Taken										
3		B	at 3' Nuclear Field Density Test Taken				NP	NP	1.1	56.8	42.2	34	
4			4.5										
5			**Medium Brown Well-Graded SAND with Silt (SW-SM)** , Moist, Loose to Medium Dense. Estimated 90% Coarse to Fine Sand and 10% Non-Plastic Silt.										
6		B											
7													
8													
9													
10													
11													
12													
13			Test Pit Terminated Due to Caving.										
14			14.0										

* Blows/Foot - Modified California Sampler
Boring Terminated at 14 feet.
Boring Backfilled with Excavated Soils and Tamped at the Surface.

BERT BORING LOG 8403 SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/18/13

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LOG OF EXPLORATORY BORING

Job Number: 8403.000
Date: July 2013

PLATE
A-9

Sheet 1 of 1

BORING No. TP-6

Logged By: B. Sexton
Date Logged: 6-28-2013
Drill Type: John Deere 690 ELC Backhoe

Total Depth: 20 feet
Water Depth: No groundwater encountered
Ground Elev.: 4680.2 feet ±

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Direct Shear	Expansion Index
0			**Medium Brown Silty SAND (SM)**, Dry, Loose, Top Soil. Estimated 80% Coarse to Fine Sand and 20% Non-Plastic Silt. 1.0										
		Z	**Light Brown Silty SAND (SM)** , Dry, Medium Dense, Moderately Cemented. Estimated 80% Coarse to Fine Sand and 20% Non-Plastic Silt. at 2' Nuclear Field Density Test Taken at 3' Nuclear Field Density Test Taken										
5			6.0										
		Z	**Reddish Brown Poorly Graded SAND (SP)** , Slightly Moist to Moist, Medium Dense.				NP	NP	0.2	99.1	0.8		
			The Soil Alternates Red in Color to Brown in Color at Approximate 3" Layers.										
10													
15		Z	Color Change to Gray from 17' to 18'. Back to Alternating Red and Brown from 18' to 20'.										
20			20.0										

* Blows/Foot - Modified California Sampler
Boring Terminated at 20 feet.
Boring Backfilled with Excavated Soils and Tamped at the Surface.

BERT BORING LOG 8403 SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/16/13

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LOG OF EXPLORATORY BORING

Job Number: 8403.000
Date: July 2013

PLATE
A-10

Sheet 1 of 1

BORING No. TP-7

Logged By: B. Sexton
Date Logged: 6-28-2013
Drill Type: John Deere 690 ELC Backhoe

Total Depth: 20 feet
Water Depth: No groundwater encountered
Ground Elev.: 4687.6 feet ±

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Direct Shear	Expansion Index
			Medium Brown Silty SAND (SM), Dry, Loose, Top Soil. Estimated 80% Coarse to Fine Sand and 20% Non-Plastic Silt. 1.0										
		B	**Medium Brown Silty SAND (SM)** , Dry, Medium Dense, Moderately Cemented. Estimated 60% Coarse to Fine Sand and 40% Non-Plastic Silt. 6.0										
5		B	**Medium Brown Lean CLAY with Sand (CL)** , Moist, Medium Stiff. 9.0				41	25	0.0	20.6	79.4		
			Reddish Brown Poorly Graded SAND (SP) , Moist, Medium Dense. Estimated 95% Coarse to Fine Sand and 5% Non-Plastic Silt. 10.0										
10		Z	**Gray Red Brown Well-Graded SAND with Silt (SW-SM)** , Moist, Medium Dense. Estimated 90% Coarse to Fine Sand and 10% Non-Plastic Silt.										
15													
20			20.0										

* Blows/Foot - Modified California Sampler
Boring Terminated at 20 feet.
Boring Backfilled with Excavated Soils and Tamped at the Surface.

BERT BORING LOG 8403 SMITH VALLEY DAIRY.GPJ US_LAB.GDT 7/19/13

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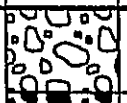
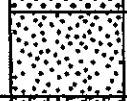
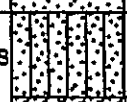
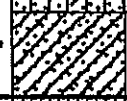
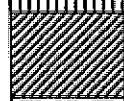
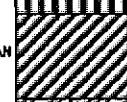
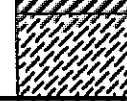
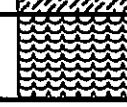
LOG OF EXPLORATORY BORING

Job Number: 8403.000
Date: July 2013

PLATE
A-11

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

Other Tests	
AN	ANALYTICAL TEST (pH, Soluble Sulfate, and Resistivity)
C	CONSOLIDATION TEST
DS	DIRECT SHEAR TEST
MD	MOISTURE DENSITY CURVE

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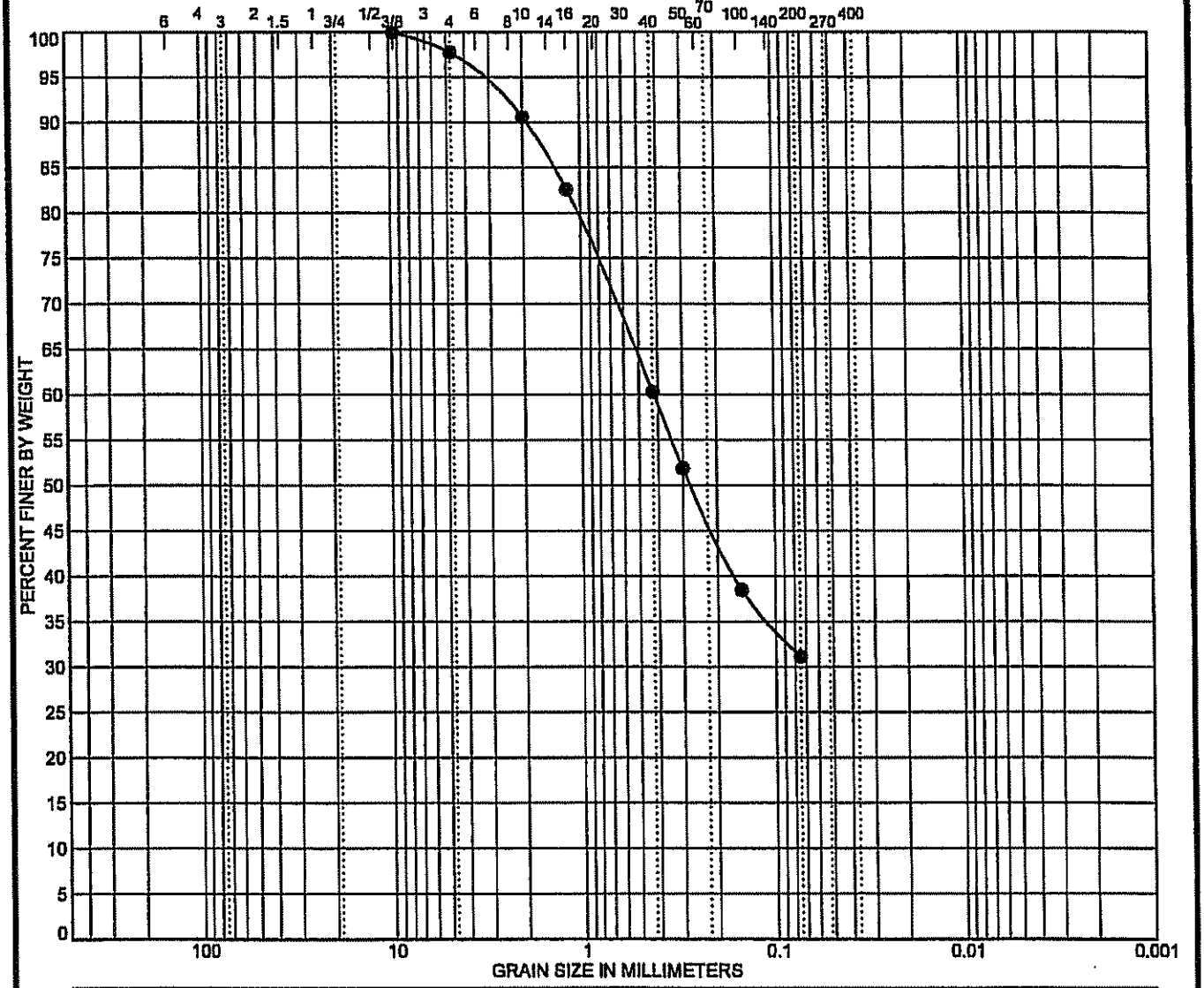
Job Number: 8403.000 Date: July 2013

PLATE A-12

LUMOS LEGEND 8403 SMITH VALLEY DAIRY.GPJ 10-23-06.GDT 7/16/13

APPENDIX B

LUMOS & ASSOCIATES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Date: 7-8-2013				
● B-1	Classification	LL	PL	PI	Cc	Cu
Depth: 4	Light Brown Clayey Sand (SC)	23	13	10		
Sample Location	Boring 1 from 4' - 7'					
USCS	SC					
AASHTO						

Specimen Identification								
● B-1	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
Depth: 4	9.5	0.42			2.2	66.6	31.1	
Natural Moisture	%		S.E.		Absorption %			
R-Value			Durability Index		Soundness			
Perctage of Wear (500 rev)	%		Specific Gravity		Direct Shear			

LUMOS GRAIN SIZE 8403 SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/18/13

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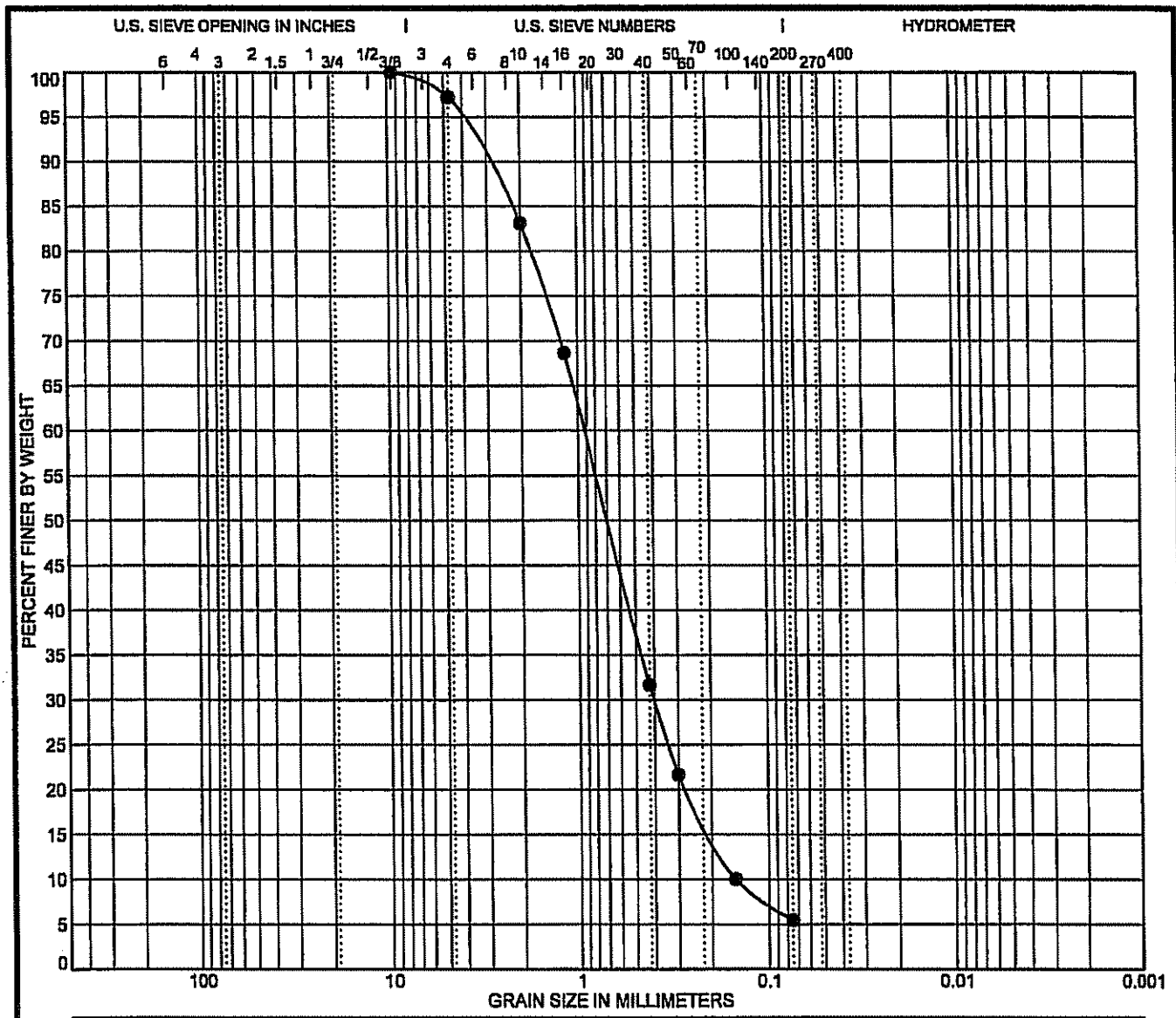
PLATE
B-1.1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Date: 7-5-2013						
● B-2	Classification	LL	PL	PI	Cc	Cu
Depth: 20	Brown Well-Graded SAND w/Silt (SW-SM)	NP	NP	NP	1.2	6.3
Sample Location	Boring 2 from 20' - 21.5'					
USCS	SW-SM					
AASHTO						

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-2 Depth: 20	9.5	0.929	0.4	0.149	2.8	91.8	5.5	

Natural Moisture	%		S.E.		Absorption %	
R-Value			Durability Index		Soundness	
Perctage of Wear (500 rev)	%		Specific Gravity		Direct Shear	

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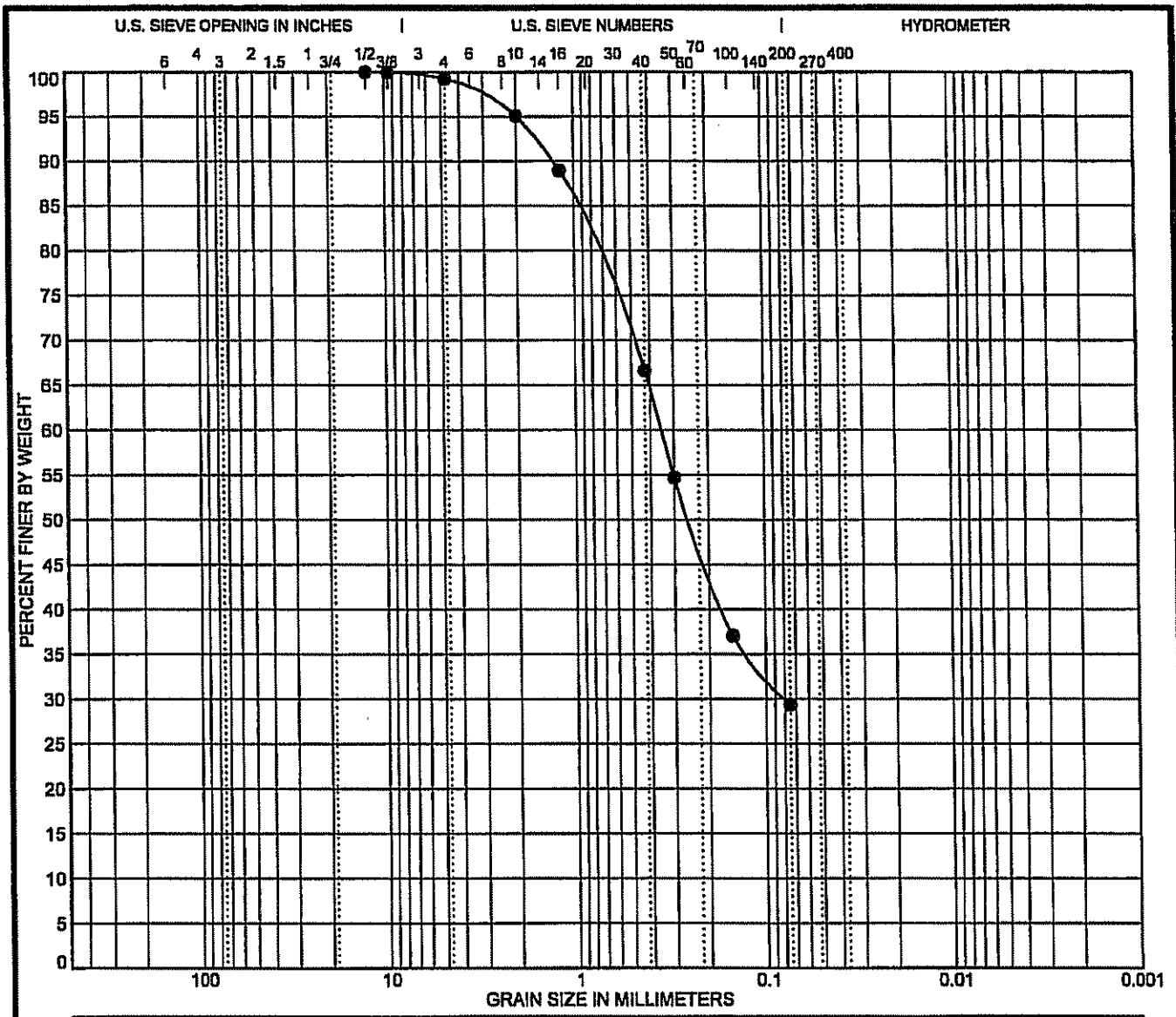
PLATE B-1.2

LUMOS GRAIN SIZE 8403 SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/18/13



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Date: 7-5-2013	LL	PL	PI	Cc	Cu
● B-3	Classification					
Depth: 1	Light Brown Clayey SAND (SC)	21	13	8		
Sample Location	Combined Boring 3 & 4 from 1' - 4'					
USCS	SC					
AASHTO						

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-3								
Depth: 1	12.5	0.35	0.079		0.7	69.9	29.4	
Natural Moisture	%		S.E.		Absorption %			
R-Value			Durability Index		Soundness			
Perctage of Wear (500 rev)	%		Specific Gravity		Direct Shear	36.7		

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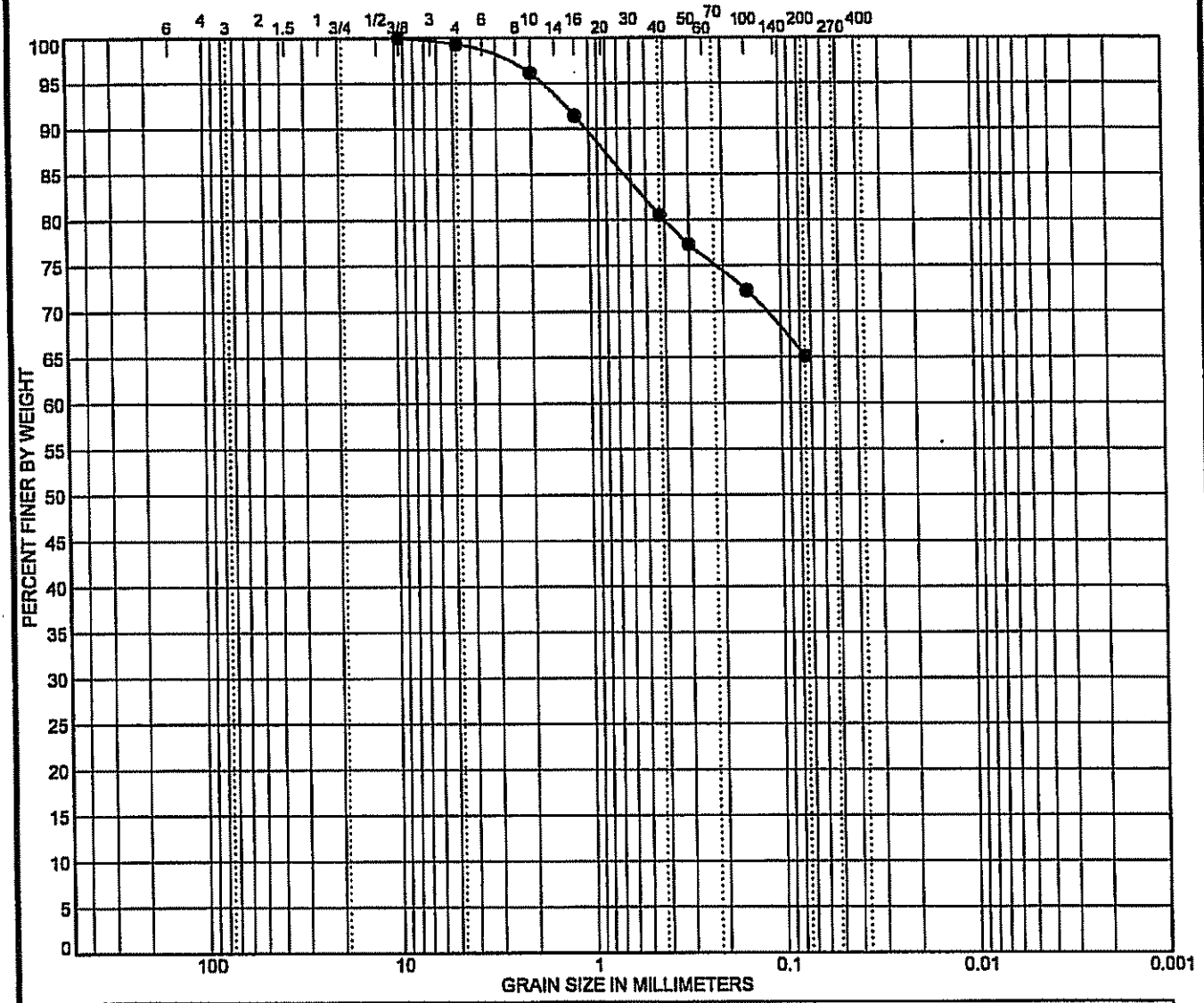
PLATE B-1.3

LUMOS GRAIN SIZE 8403 SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/18/13



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Date: 7-5-2013								
● B-3	Classification					LL	PL	PI	Cc	Cu
Depth: 11	Brown Sandy Lean CLAY (CL)					44	13	31		
Sample Location	Boring 3 from 11' -11.5'									
USCS	CL									
AASHTO										

Specimen Identification								
● B-3	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
Depth: 11	9.5				0.7	34.2	65.1	
Natural Moisture	%		S.E.		Absorption %			
R-Value			Durability Index		Soundness			
Perctage of Wear (500 rev)	%		Specific Gravity		Direct Shear			

LUMOS GRAIN SIZE 8403 SMITH VALLEY DAIRY.GPJ US_LAB.GDT 7/16/13

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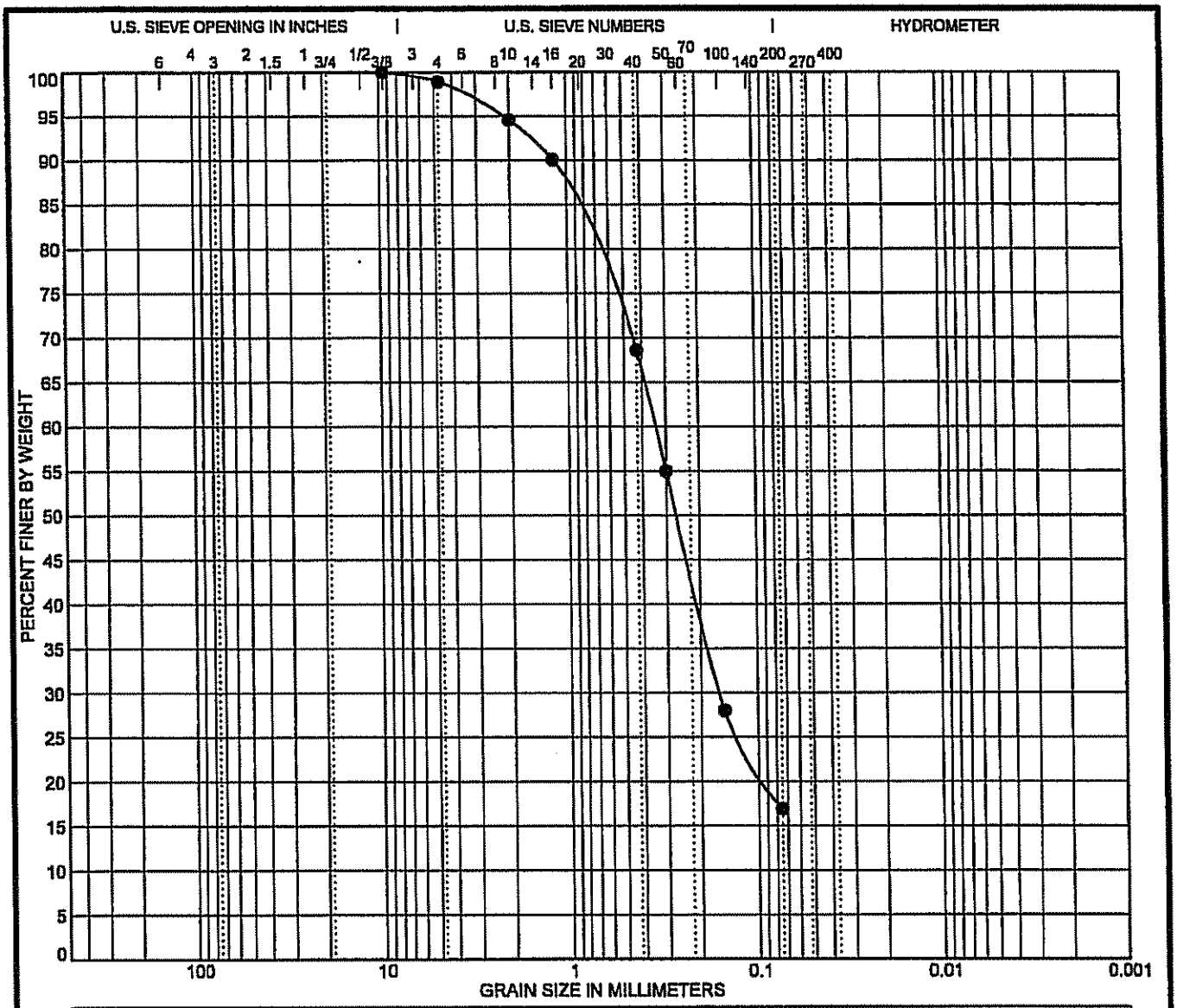
PLATE
B-1.4



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Date: 7-3-2013								
● TP-1	Classification					LL	PL	PI	Cc	Cu
Depth: 3	Light Brown Silty SAND (SM)					NP	NP	NP		
Sample Location	Test Pit 1 from 3' - 4'									
USCS	SM									
AASHTO										

Specimen Identification								
● TP-1	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
Depth: 3	9.5	0.341	0.158		1.0	82.0	16.9	
Natural Moisture	%		S.E.		Absorption %			
R-Value			Durability Index		Soundness			
Perctage of Wear (500 rev)	%		Specific Gravity		Direct Shear	34.2		

LUMOS GRAIN SIZE 8403 SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/16/13

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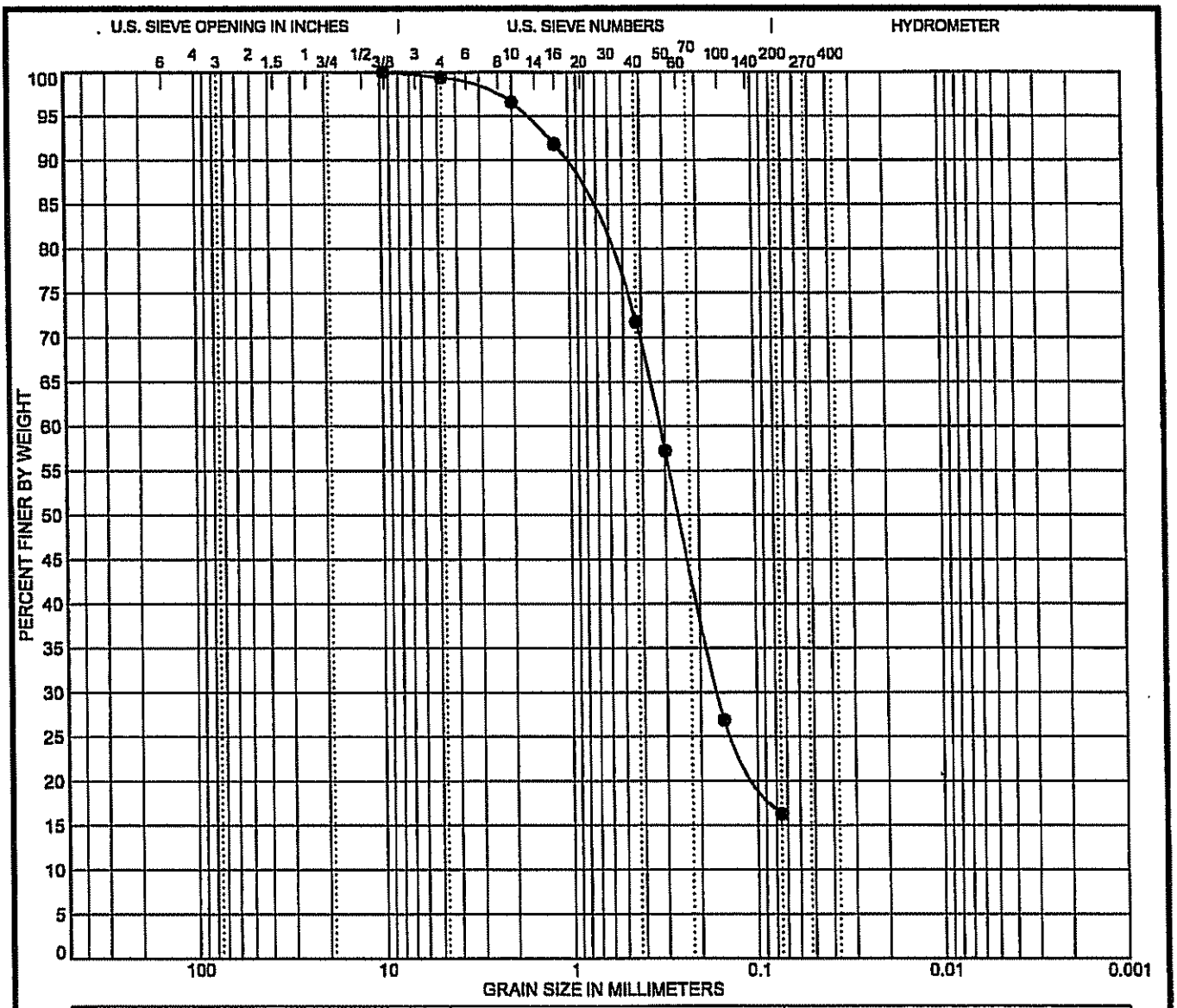
PLATE

B-1.5



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Date: 7-8-2013							
●	TP-4	Classification				LL	PL	PI	Cc	Cu
	Depth: 3	Light Brown Silty SAND (SM)				NP	NP	NP		
	Sample Location	Test Pit 4 from 3' - 4'								
	USCS	SM								
	AASHTO									

	Specimen Identification								
●	TP-4	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
	Depth: 3	9.5	0.321	0.161		0.6	83.1	16.3	
	Natural Moisture	%		S.E.		Absorption %			
	R-Value	69		Durability Index		Soundness			
	Perctage of Wear (500 rev)	%		Specific Gravity		Direct Shear			

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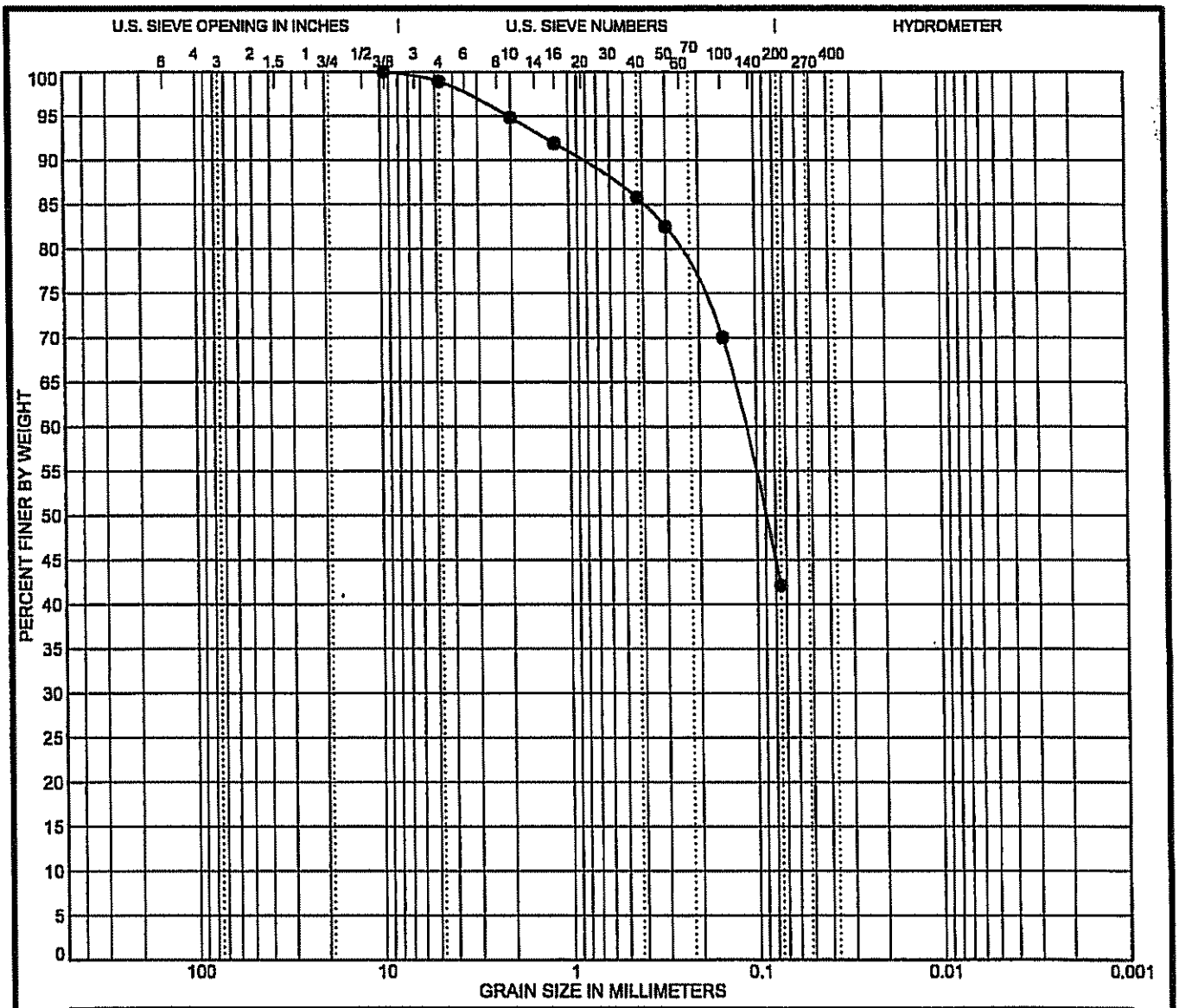
PLATE

B-1.6



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Date: 7-5-2013	LL	PL	PI	Cc	Cu
●	TP-5	Classification					
	Depth: 2.5	Medium Brown Silty SAND (SM)	NP	NP	NP		
	Sample Location	Test Pit 5 from 2.5' - 3.5'					
	USCS	SM					
	AASHTO						

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP-5								
	Depth: 2.5	9.5	0.117			1.1	56.8	42.2	
	Natural Moisture	%		S.E.		Absorption %			
	R-Value			Durability Index		Soundness			
	Percage of Wear (500 rev)	%		Specific Gravity		Direct Shear	34		

LUMOS GRAIN SIZE 8403 SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/18/13

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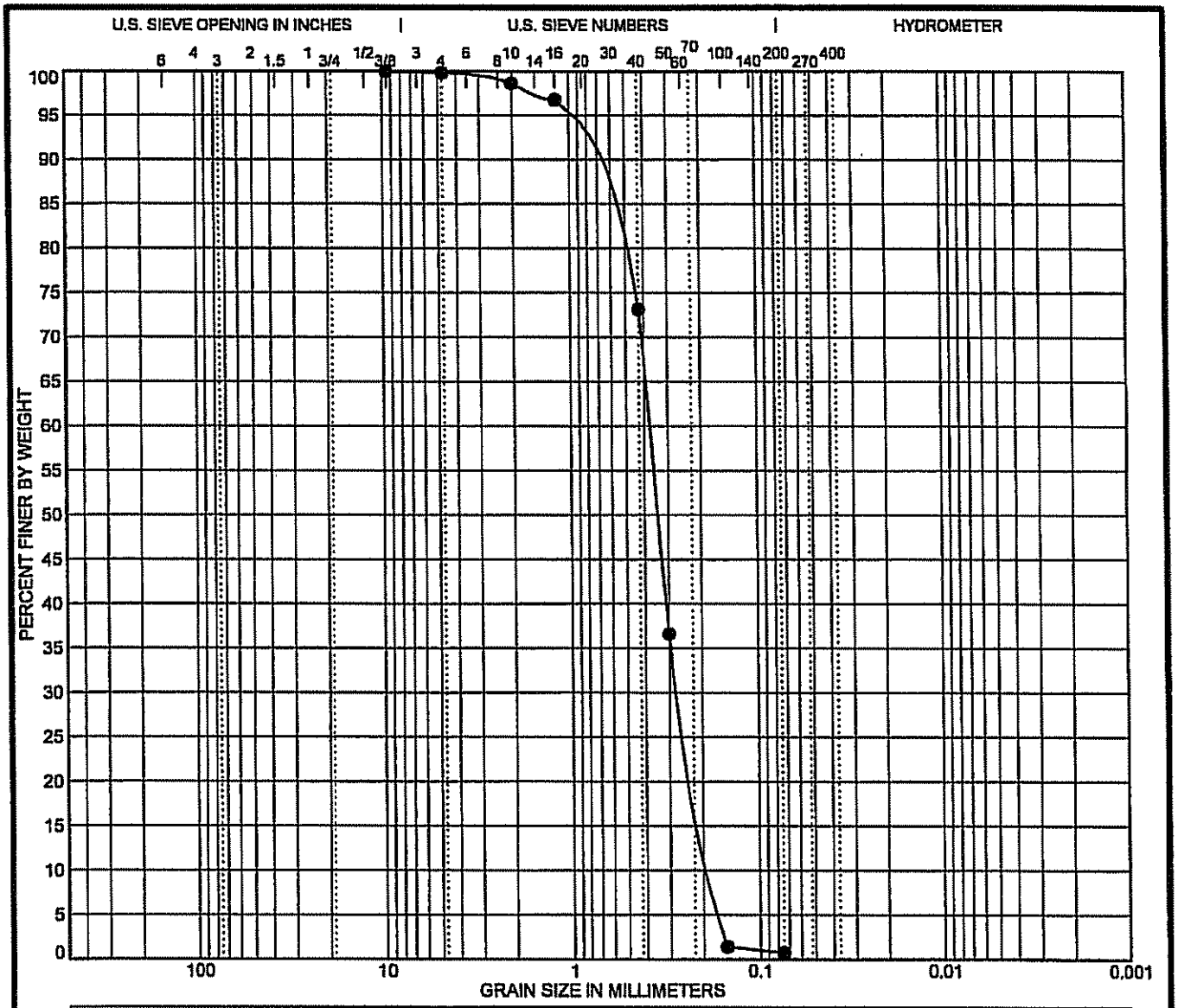
PLATE

B-1.7



Specimen Identification	Date: 7-5-2013								
● TP-6	Classification				LL	PL	PI	Cc	Cu
Depth: 7	Light Red Brown Poorly Graded SAND (SP)				NP	NP	NP	1.0	2.1
Sample Location	Test Pit 6 from 7' - 7.5'								
USCS	SP								
AASHTO									

Specimen Identification								
● TP-6	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
Depth: 7	9.5	0.375	0.263	0.178	0.2	99.1	0.8	
Natural Moisture	%		S.E.		Absorption %			
R-Value			Durability Index		Soundness			
Perctage of Wear (500 rev)	%		Specific Gravity		Direct Shear			

LUMOS GRAIN SIZE 8403 SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/18/13

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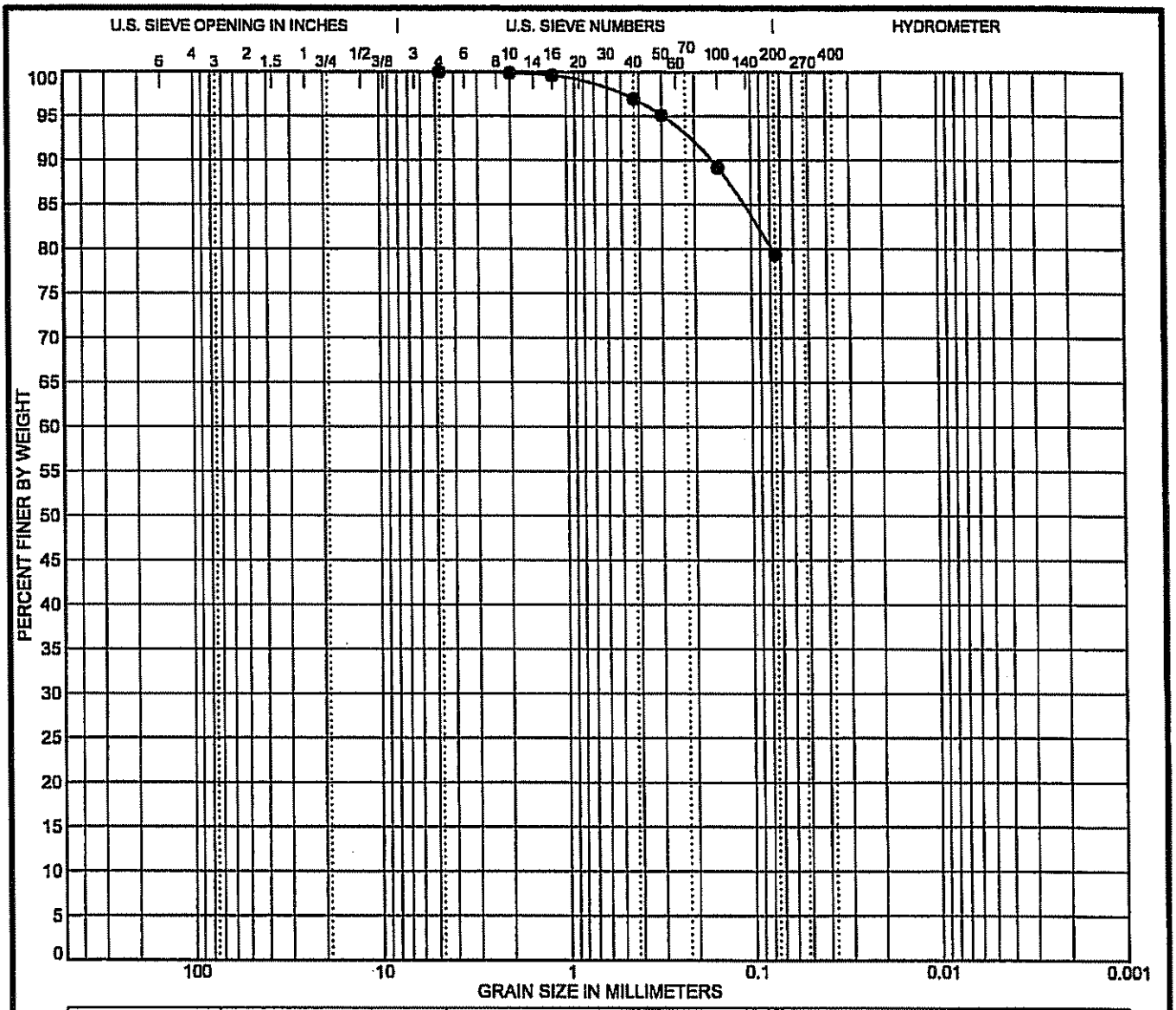
PLATE

B-1.8



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Date: 7-5-2013					
● TP-7	Classification	LL	PL	PI	Cc	Cu
Depth: 7	Brown Lean CLAY w/ Sand (CL)	41	16	25		
Sample Location	Test Pit 7 from 7' - 8'					
USCS	CL					
AASHTO						

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● TP-7								
Depth: 7	4.75				0.0	20.6	79.4	
Natural Moisture	%		S.E.		Absorption %			
R-Value			Durability Index		Soundness			
Perctage of Wear (500 rev)	%		Specific Gravity		Direct Shear			

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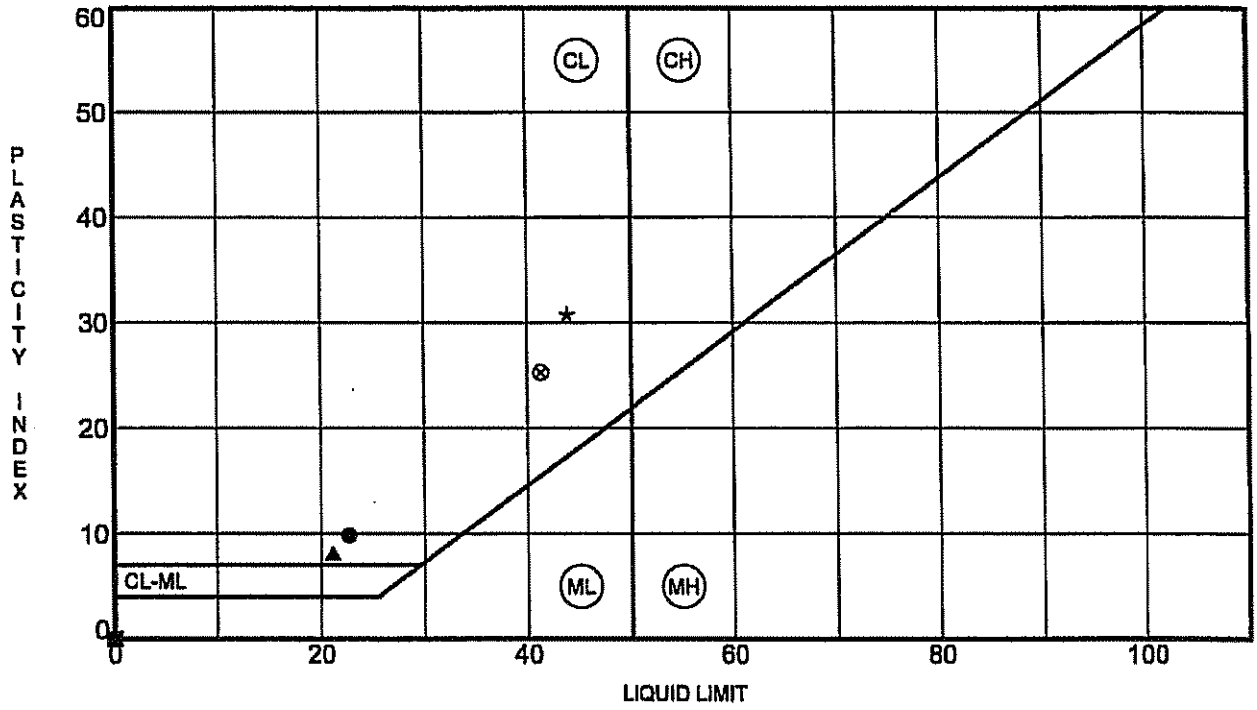
PLATE
B-1.9



	Specimen Identification		LL	PL	PI	Fines	Classification
●	B-1	4.0	23	13	10	31	Light Brown Clayey Sand (SC)
⊠	B-2	20.0	NP	NP	NP	5	Brown Well-Graded SAND w/Silt (SW-SM)
▲	B-3	1.0	21	13	8	29	Light Brown Clayey SAND (SC)
★	B-3	11.0	44	13	31	65	Brown Sandy Lean CLAY (CL)
⊙	TP-1	3.0	NP	NP	NP	17	Light Brown Silty SAND (SM)
◈	TP-4	3.0	NP	NP	NP	16	Light Brown Silty SAND (SM)
○	TP-5	2.5	NP	NP	NP	42	Medium Brown Silty SAND (SM)
△	TP-6	7.0	NP	NP	NP	1	Light Red Brown Poorly Graded SAND (SP)
⊗	TP-7	7.0	41	16	25	79	Brown Lean CLAY w/ Sand (CL)

LUMOS ATTERBERG LIMITS 8403 SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/16/13

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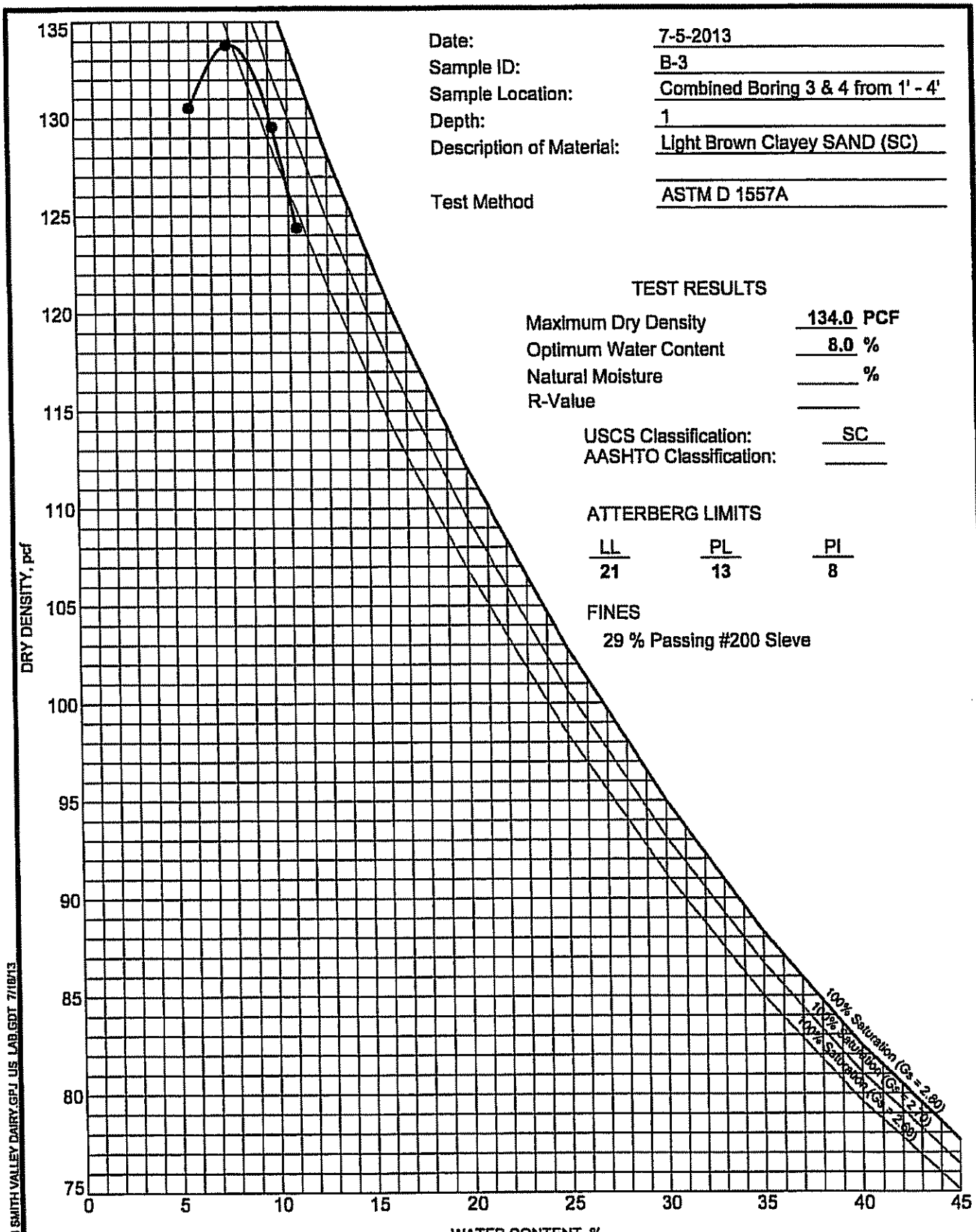
Smith Valley Dairy Development

ATTERBERG LIMITS' RESULTS

Job Number: 8403.000 Date: July 2013

PLATE B-2



Date: 7-5-2013
Sample ID: B-3
Sample Location: Combined Boring 3 & 4 from 1' - 4'
Depth: 1
Description of Material: Light Brown Clayey SAND (SC)

Test Method: ASTM D 1557A

TEST RESULTS

Maximum Dry Density	134.0 PCF
Optimum Water Content	8.0 %
Natural Moisture	%
R-Value	

USCS Classification: SC
AASHTO Classification:

ATTERBERG LIMITS

LL	PL	PI
21	13	8

FINES
29 % Passing #200 Sieve

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Lumos & Associates, Inc
800 E. College Parkway
Carson City, Nevada 89706
775-883-7077
Fax: 775-883-7114

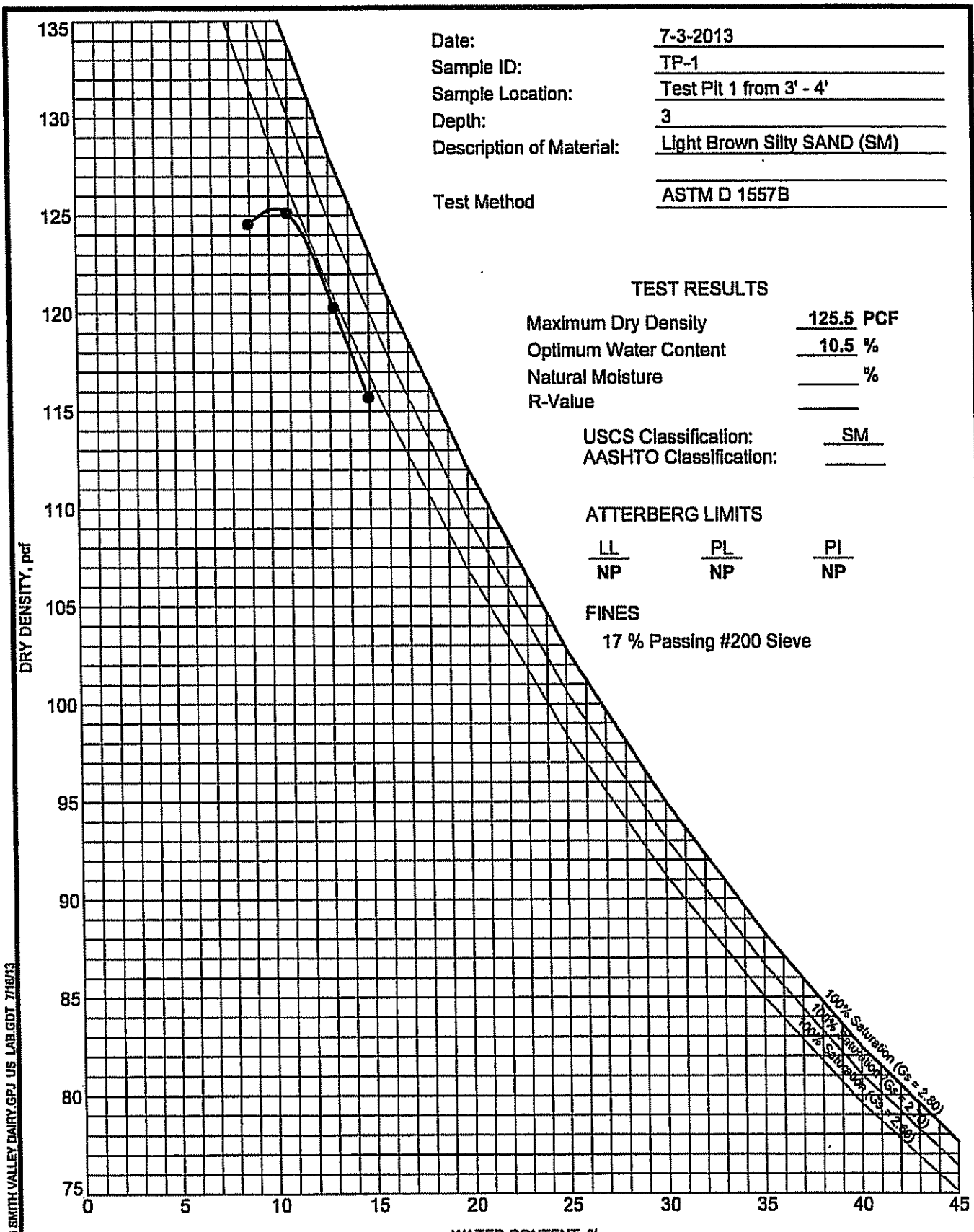
Smith Valley Dairy Development

MOISTURE-DENSITY CURVE

Job Number: 8403.000 Date: July 2013

PLATE
B-3.1

LUMOS COMPACTION 8403 SMITH VALLEY DAIRY.GPJ US_LAB.GDT 7/18/13



Date: 7-3-2013
Sample ID: TP-1
Sample Location: Test Pit 1 from 3' - 4'
Depth: 3
Description of Material: Light Brown Silty SAND (SM)

Test Method: ASTM D 1557B

TEST RESULTS

Maximum Dry Density	125.5 PCF
Optimum Water Content	10.5 %
Natural Moisture	%
R-Value	

USCS Classification: SM
AASHTO Classification:

ATTERBERG LIMITS

LL	PL	PI
NP	NP	NP

FINES
17 % Passing #200 Sieve

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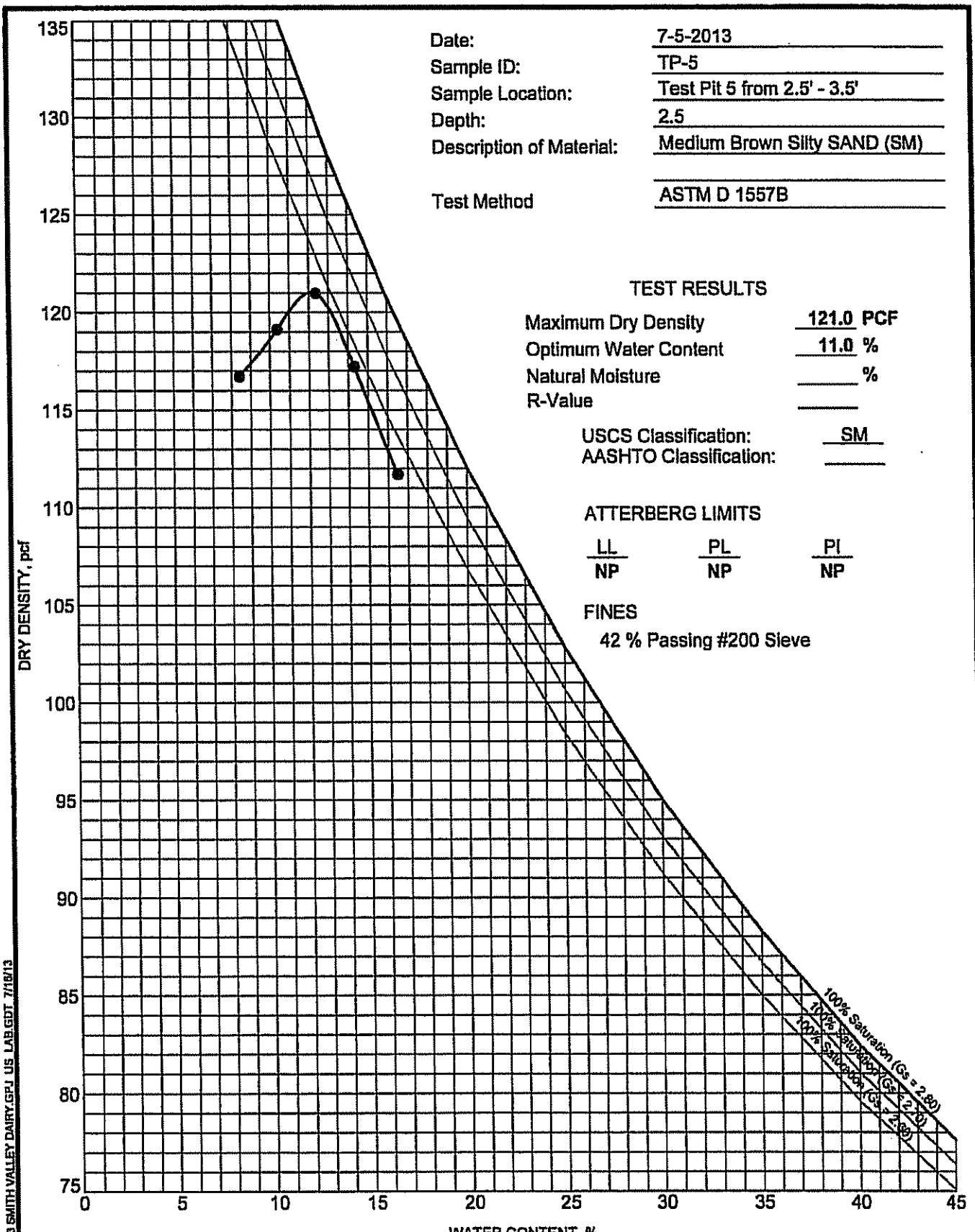
Smith Valley Dairy Development

MOISTURE-DENSITY CURVE

Job Number: 8403.000 Date: July 2013

PLATE B-3.2

LUMOS COMPACTION 8403 SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/16/13



Date: 7-5-2013
Sample ID: TP-5
Sample Location: Test Pit 5 from 2.5' - 3.5'
Depth: 2.5
Description of Material: Medium Brown Silty SAND (SM)

Test Method: ASTM D 1557B

TEST RESULTS

Maximum Dry Density	121.0 PCF
Optimum Water Content	11.0 %
Natural Moisture	%
R-Value	

USCS Classification: SM
AASHTO Classification:

ATTERBERG LIMITS

LL	PL	PI
NP	NP	NP

FINES
42 % Passing #200 Sieve

LUMOS COMPACTION 8403 SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/18/13

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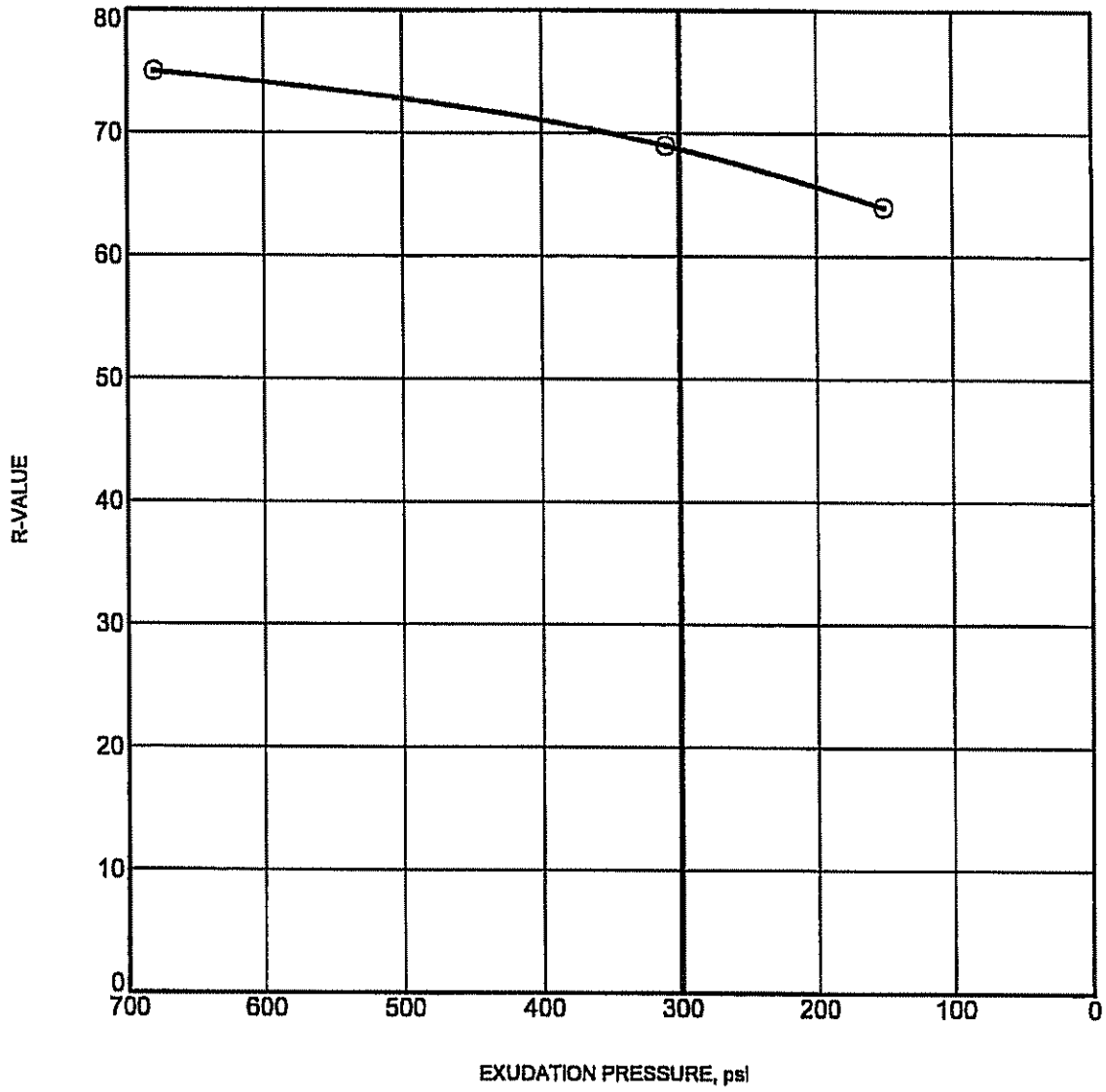
Fax: 775-883-7114

Smith Valley Dairy Development

MOISTURE-DENSITY CURVE

Job Number: 8403.000 Date: July 2013

PLATE B-3.3



Test Data

Specimen No.	Water Content (%)	Dry Density (pcf)	Expansion (psf)	Exudation (psi)	Test R-Value*
1	11.2	117.3	0.0	150.0	64.0
2	10.9	119.9	0.0	310.0	69.0
3	9.8	122.4	0.0	680.0	75.0

* Reported values have been corrected for sample height, where required.

Test Result

Specimen Identification		Classification	R-Value
TP-4	3.0	Light Brown Silty SAND (SM)	69

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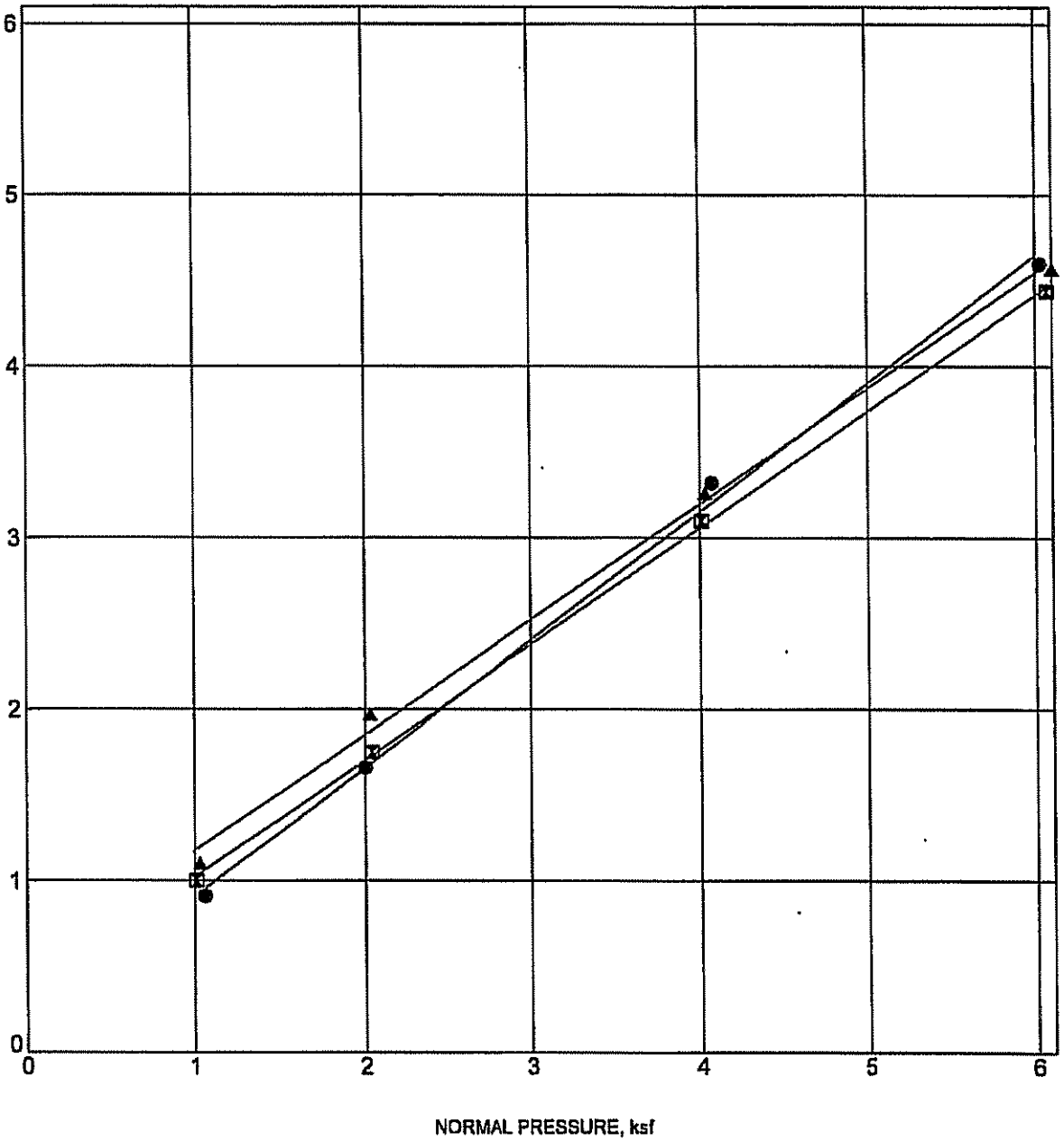
Smith Valley Dairy Development

RESISTANCE VALUE TEST

Job Number: 8403.000 Date: July 2013

PLATE B-4

R VALUE 8403 SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/18/13



Specimen Identification			Classification	γ_d	MC%	c	ϕ
●	B-3	1.0	Light Brown Clayey SAND (SC)	134	8	0.16	36.8
⊠	TP-1	3.0	Light Brown Silty SAND (SM)	126	11	0.34	34.2
▲	TP-5	2.5	Medium Brown Silty SAND (SM)	121	11	0.50	34.0

LUMOS DIRECT SHEAR 8403.SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/18/13

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Smith Valley Dairy Development

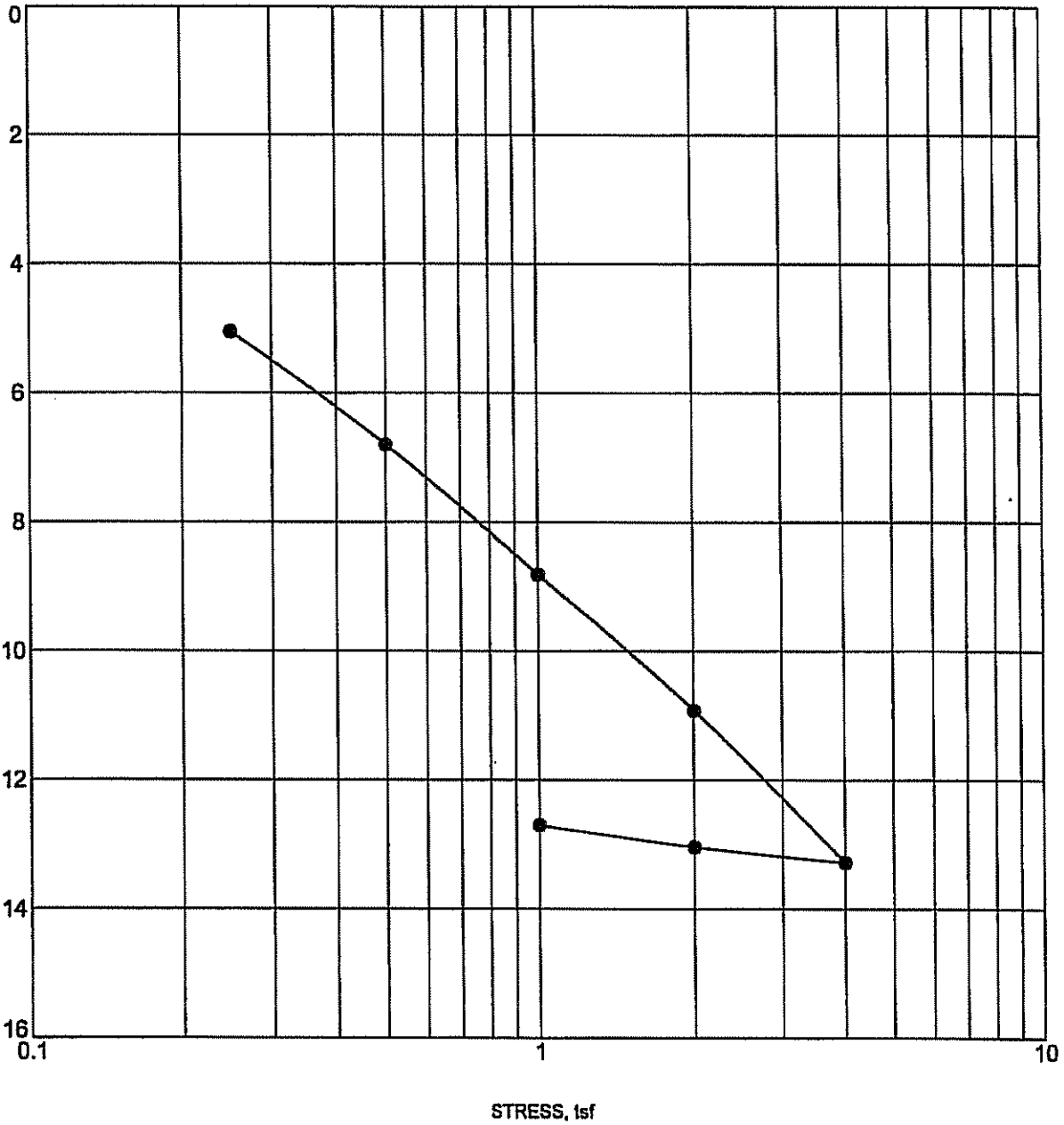
DIRECT SHEAR TEST

Job Number: 8403.000

Date: July 2013

PLATE

B-5



⊙ Field Moisture

● Soaked

Specimen Identification		Classification	γ_d	MC%
● B-4	10.5	Brown Sandy Lean CLAY (CL)	89	22
■				
▲				
★				
⊙				
✿				

LUMOS CONSOL_STRAIN 8403.SMITH VALLEY DAIRY.GPJ US_LAB.GDT 7/16/13

LUMOS & ASSOCIATES
Lumos & Associates, Inc
800 E. College Parkway
Carson City, Nevada 89706
775-883-7077
Fax: 775-883-7114

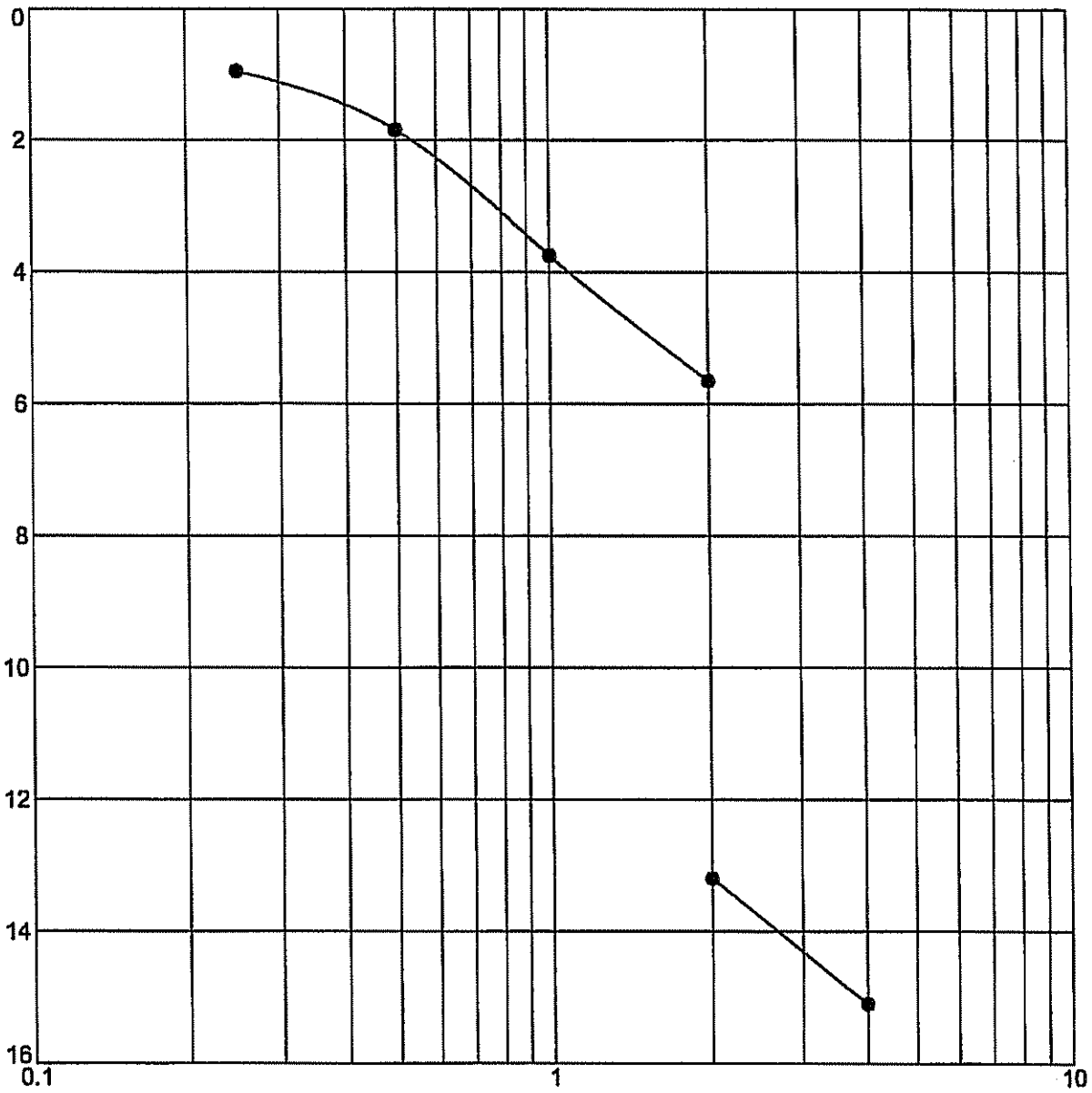
Smith Valley Dairy Development

CONSOLIDATION TEST

Job Number: 8403.000 Date: July 2013

PLATE

B-6.1



⊙ Field Moisture

● Soaked

Specimen Identification		Classification	γ_d	MC%
● TP-4	2.5	Light Brown Silty SAND (SM)	103	4
⊠				
▲				
★				
⊙				
✿				

LUMOS CONSOL_STRAIN 8403 SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/16/13

LUMOS & ASSOCIATES

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Smith Valley Dairy Development

CONSOLIDATION TEST

Job Number: 8403.000 Date: July 2013

PLATE

B-6.2

SilverState
Analytical Laboratories

LABORATORY REPORT

DATE: July 09, 2013

REPORT NUMBER: R13-0172

CLIENT: Lumos and Associates
800 E. College Pkwy
Carson City, NV 89706

PAGE: 1

CLIENT PROJECT: 8403.000

PO# 8403.000/ MTB

Sampled By: Client
Date Sampled: –
Time Sampled: –

Date Received: 07/01/13
Time Received: 1715

Report Attention: Mitch B.

Sample ID: TP-4 @ 3' - 4'

Test	Result	Unit	Method
Sodium	0.03	%	ASTM 3500Na-B
Sulfate	0.00	%	SM4500E
Sodium Sulfate	0.00	%	Calculation
pH	8.61	S.U.	SM9045C
Soluble Soil Chlorides	50.8	mg/kg	SM4500C
Resistivity	1290	Ω•cm	AASHTOT288

Note: The results for each constituent denote the percentage (%) for that particular element which is soluble in a 1:5 (soil to water) extraction ratio and corrected for dilution.

REVIEWED BY:

Adam Moore, Ph.D.
Laboratory Manager

3636 E. Sunset Road, Suite 100, Las Vegas, NV 89120 - Tel: 702-873-4478 Fax: 702-873-7967
4587 Longley Lane, No. 2, Reno, NV 89502 - Tel: 775-825-1127 Fax: 775-825-1167
www.ssalabs.com or www.envirotechonline.com

SOLUBLE SULFATE 8403 SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/19/13

LUMOS & ASSOCIATES

Lumos & Associates, Inc
800 E. College Parkway
Carson City, Nevada 89706
775-883-7077
Fax: 775-883-7114

Smith Valley Dairy Development

SOLUBLE SULFATE

Job Number: 8403.000 Date: July 2013

PLATE

B-7

APPENDIX C

LUMOS & ASSOCIATES

Conterminous 48 States
2002 Data
Uniform Hazard Spectrum (UHS) for 2 % PE in 50 years

Latitude = 38.8763
Longitude = -119.3822
B/C Boundary
Data are based on a 0.05 deg grid spacing

Period (sec)	Sa (g)	Sd (inches)
0.000	0.574	0.000
0.100	1.202	0.117
0.200	1.390	0.543
0.300	1.244	1.094
0.500	0.943	2.302
1.000	0.542	5.291
2.000	0.259	10.138

Conterminous 48 States
2002 Data
Uniform Hazard Spectrum (UHS) for 10 % PE in 50 years

Latitude = 38.8763
Longitude = -119.3822
B/C Boundary
Data are based on a 0.05 deg grid spacing

Period (sec)	Sa (g)	Sd (inches)
0.000	0.300	0.000
0.100	0.631	0.062
0.200	0.728	0.285
0.300	0.641	0.564
0.500	0.463	1.132
1.000	0.258	2.518
2.000	0.129	5.038

PROBABILISTIC UNIFORM HAZARD RESPONSE 8403 SMITH VALLEY DAIRY.GPJ US LAB.GDT 7/19/13

LUMOS & ASSOCIATES
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800 E. College Parkway
Carson City, Nevada 89706
775-883-7077
Fax: 775-883-7114

Smith Valley Dairy Development

PROBABILISTIC UNIFORM HAZARD RESPONSE

Job Number: 8403.000 Date: July 2013

PLATE C-1

Conterminous 48 States
2009 International Building Code
Latitude = 38.8763
Longitude = -119.3822
Spectral Response Accelerations Ss and S1
Ss and S1 = Mapped Spectral Acceleration Values
Site Class B - Fa = 1.0 ,Fv = 1.0
Data are based on a 0.01 deg grid spacing

Period (sec)	Sa (g)
0.2	1.390 (Ss, Site Class B)
1.0	0.542 (S1, Site Class B)

Conterminous 48 States
2009 International Building Code
Latitude = 38.8763
Longitude = -119.3822
Spectral Response Accelerations SMs and SM1
SMs = Fa x Ss and SM1 = Fv x S1
Site Class D - Fa = 1.0 ,Fv = 1.5

Period (sec)	Sa (g)
0.2	1.390 (SMs, Site Class D)
1.0	0.812 (SM1, Site Class D)

Conterminous 48 States
2009 International Building Code
Latitude = 38.8763
Longitude = -119.3822
Design Spectral Response Accelerations SDs and SD1
SDs = 2/3 x SMs and SD1 = 2/3 x SM1
Site Class D - Fa = 1.0 ,Fv = 1.5

Period (sec)	Sa (g)
0.2	0.927 (SDs, Site Class D)
1.0	0.542 (SD1, Site Class D)

MAXIMUM CONSIDERED EARTHQUAKE GROUND MOTION 8403 SMITH VALLEY DAIRY.GPJ US_LAB.GDT 7/16/13

LUMOS & ASSOCIATES
Lumos & Associates, Inc
800 E. College Parkway
Carson City, Nevada 89706
775-883-7077
Fax: 775-883-7114

Smith Valley Dairy Development

MAXIMUM CONSIDERED EARTHQUAKE GROUND MOTION

Job Number: 8403.000 Date: July 2013

PLATE C-2

APPENDIX D

LUMOS & ASSOCIATES

Job # 8403.000
Client: AGPROfessionals, LLC
Description: Pavement Calculations
By: B. Sexton

R-Value for existing (SM) = 69
R-Value for Gravel (Type II, Class B) = 70

T.I. = 7.5
G_f = 2.01
GE = 0.0032(TI)(100-R)
t_{layer} = GE/G_f

GE_{AC}= 0.0032(7.5)(100-70) = 0.72′
t_{AC}= .72/(2.01)*(12″) = 4.3″ => **use 3″ asphalt**
$t_{AC(actual)}$= (3)(2.01)/12″ = .50′

GE_{AB}= 0.0032(7.5)(100-69) = 0.74′
t_{AB}= (0.74-.50)(12″)/1.1 = 2.6″ => **use 4″ aggregate base**

(ALTERNATIVELY) GE_{AB}= 0.0032(7.5)(100-69) = 0.74′
t_{AB}= (0.74)(12″)/1.1 = 8.1″ =>**use 9″ aggregate base and Mirafi BX 1200 or equivalent**

Therefore, use 3″ of Asphalt Concrete (AC) underlain by a minimum of 4″ of Aggregate Base, Alternatively if only Aggregate Base is used then use 9″ Aggregate Base, underlain by a geotextile stabilization fabric (Mirafi BX1200 or equivalent).

PAVEMENT DESIGN 8403 SMITH VALLEY DAIRY.GPJ US_LAB.GDT 7/10/13

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Lumos & Associates, Inc
800 E. College Parkway
Carson City, Nevada 89706
775-883-7077
Fax: 775-883-7114

Smith Valley Dairy Development

PAVEMENT DESIGN

Job Number: 8403.000 Date: July 2013

PLATE D-1

APPENDIX E

LUMOS & ASSOCIATES

XSTABL File: SVDAIRYD 7-12-** 12:39

```
*******************************************
*              X S T A B L                *
*                                         *
*        Slope Stability Analysis         *
*              using the                  *
*           Method of Slices              *
*                                         *
*        Copyright (C) 1992 Ä 97          *
*   Interactive Software Designs, Inc.    *
*        Moscow, ID 83843, U.S.A.         *
*                                         *
*          All Rights Reserved            *
*                                         *
*  Ver. 5.202                96 Ä 1599    *
*******************************************
```

Problem Description : svdairy

SEGMENT BOUNDARY COORDINATES

---

3 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	10.0	10.0	20.0	10.0	1
2	20.0	10.0	35.0	20.0	1
3	35.0	20.0	45.0	20.0	1

ISOTROPIC Soil Parameters

---

1 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	120.0	60.0	160.0	34.00	.000	.0	0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

```
***********************************
        PHREATIC SURFACE,
***********************************
```

Point No.	x-water (ft)	y-water (ft)
1	10.00	20.00
2	45.00	20.00

-- WARNING ----------
Water surface number 1 has been defined but is not used by any soil unit. The analysis will IGNORE water surface # 1. Please make sure that this assumption is consistent with your subsurface model.

A horizontal earthquake loading coefficient of .150 has been assigned

A vertical earthquake loading coefficient of .000 has been assigned

---
BOUNDARY LOADS
---

1 load(s) specified

Load No.	x-left (ft)	x-right (ft)	Intensity (psf)	Direction (deg)
1	35.0	45.0	200.0	.0

NOTE - Intensity is specified as a uniformly distributed force acting on a HORIZONTALLY projected surface.

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 surfaces initiate from each of 10 points equally spaced along the ground surface between x = 15.0 ft
and x = 25.0 ft

Each surface terminates between x = 30.0 ft
and x = 40.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

2.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

****
-- WARNING -- WARNING -- WARNING -- WARNING -- (# 48)
****
Negative effective stresses were calculated at the base of a slice. This warning is usually reported for cases where slices have low self weight and a relatively high "c" shear strength parameter. In such cases, this effect can only be eliminated by reducing the "c" value.
****

USER SELECTED option to maintain strength greater than zero

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 12 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	20.56	10.37
2	22.56	10.40
3	24.54	10.63
4	26.50	11.04
5	28.41	11.64
6	30.25	12.43
7	32.00	13.38
8	33.66	14.50
9	35.20	15.78
10	36.61	17.20
11	37.88	18.75
12	38.72	20.00

**** Simplified BISHOP FOS = 1.783 ****

The following is a summary of the TEN most critical surfaces

Problem Description : svdairy

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	1.783	21.22	31.09	20.73	20.56	38.72	1.607E+05
2.	1.813	22.34	27.66	18.11	18.33	38.73	1.742E+05
3.	1.821	23.49	27.33	18.08	18.33	40.02	2.075E+05
4.	1.826	22.37	28.95	19.63	17.22	39.82	2.167E+05
5.	1.836	17.25	40.25	30.06	20.56	39.45	2.198E+05
6.	1.838	24.72	28.19	17.35	21.67	40.00	1.566E+05
7.	1.839	24.39	25.57	16.34	19.44	39.72	1.867E+05
8.	1.848	21.83	29.90	20.71	16.11	40.02	2.364E+05
9.	1.867	15.31	45.26	35.28	20.56	39.94	2.605E+05
10.	1.880	22.24	25.44	15.93	18.33	37.18	1.359E+05

* * * END OF FILE * * *

XSTABL File: SVDAIRY 7-12-** 12:36

```
*****************************************
*              X S T A B L              *
*                                       *
*        Slope Stability Analysis       *
*              using the                *
*           Method of Slices            *
*                                       *
*        Copyright (C) 1992 Ä 97        *
*   Interactive Software Designs, Inc.  *
*        Moscow, ID 83843, U.S.A.       *
*                                       *
*          All Rights Reserved          *
*                                       *
*  Ver. 5.202                96 Ä 1599  *
*****************************************
```

Problem Description : svdairy

SEGMENT BOUNDARY COORDINATES

---

3 SURFACE boundary segments

Segment No.	x-left (ft)	y-left (ft)	x-right (ft)	y-right (ft)	Soil Unit Below Segment
1	10.0	10.0	20.0	10.0	1
2	20.0	10.0	35.0	20.0	1
3	35.0	20.0	45.0	20.0	1

ISOTROPIC Soil Parameters

---

1 Soil unit(s) specified

Soil Unit No.	Unit Weight Moist (pcf)	Unit Weight Sat. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Parameter Ru	Pore Pressure Constant (psf)	Water Surface No.
1	120.0	60.0	160.0	34.00	.000	.0	1

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

```
************************************
        PHREATIC SURFACE,
************************************
```

Point No.	x-water (ft)	y-water (ft)
1	10.00	20.00
2	45.00	20.00

A horizontal earthquake loading coefficient
of .150 has been assigned

A vertical earthquake loading coefficient
of .000 has been assigned

BOUNDARY LOADS

---

1 load(s) specified

Load No.	x-left (ft)	x-right (ft)	Intensity (psf)	Direction (deg)
1	35.0	45.0	200.0	.0

NOTE - Intensity is specified as a uniformly distributed force acting on a HORIZONTALLY projected surface.

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

100 trial surfaces will be generated and analyzed.

10 Surfaces initiate from each of 10 points equally spaced
along the ground surface between x = 15.0 ft
and x = 25.0 ft

Each surface terminates between x = 30.0 ft
and x = 40.0 ft

Unless further limitations were imposed, the minimum elevation
at which a surface extends is y = .0 ft

* * * * * DEFAULT SEGMENT LENGTH SELECTED BY XSTABL * * * * *

2.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined
within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := (slope angle - 5.0) degrees

****
-- WARNING -- WARNING -- WARNING -- WARNING -- (# 50)
****
This warning is usually reported for cases where slices near the toe
of the slide mass have steep, negative base angles. Generally, this
error condition can be avoided by "raising" the lower angular limit
boundary to prevent generation of such deep failure surfaces.
****

Surface No: 2 Slice No: 1 m_alpha = -.089585
Alpha = -9.35 deg Phi = 34.00 deg FOS = .102

****
** Factor of safety calculation for surface # 2 **
** failed to converge within FIFTY iterations **
**
** The last calculated value of the FOS was 17.7746 **
** This will be ignored for final summary of results **
****

Circular surface (FOS= 17.7746) is defined by: xcenter = 18.44
ycenter = 24.72 Init. Pt. = 15.00 Seg. Length = 2.00

****
-- WARNING -- WARNING -- WARNING -- WARNING -- (# 50)
****
This warning is usually reported for cases where slices near the toe
of the slide mass have steep, negative base angles. Generally, this
error condition can be avoided by "raising" the lower angular limit
boundary to prevent generation of such deep failure surfaces.
****

Surface No: 4 Slice No: 1 m_alpha = -.056876
Alpha = -13.91 deg Phi = 34.00 deg FOS = .158

****
** Factor of safety calculation for surface # 4 **
** failed to converge within FIFTY iterations **
**
** The last calculated value of the FOS was 15.0312 **
** This will be ignored for final summary of results **
****

Circular surface (FOS= 15.0312) is defined by: xcenter = 19.28
ycenter = 23.11 Init. Pt. = 15.00 Seg. Length = 2.00

****
-- WARNING -- WARNING -- WARNING -- WARNING -- (# 50)
****
This warning is usually reported for cases where slices near the toe of the slide mass have steep, negative base angles. Generally, this error condition can be avoided by "raising" the lower angular limit boundary to prevent generation of such deep failure surfaces.
****

Surface No: 5 Slice No: 1 m_alpha = -.057089
Alpha = -13.86 deg Phi = 34.00 deg FOS = .157

****
** Factor of safety calculation for surface # 5 **
** failed to converge within FIFTY iterations **
**
** The last calculated value of the FOS was 14.5177 **
** This will be ignored for final summary of results **
****

Circular surface (FOS= 14.5177) is defined by: xcenter = 19.33
ycenter = 23.36 Init. Pt. = 15.00 Seg. Length = 2.00

****
-- WARNING -- WARNING -- WARNING -- WARNING -- (# 50)
****
This warning is usually reported for cases where slices near the toe of the slide mass have steep, negative base angles. Generally, this error condition can be avoided by "raising" the lower angular limit boundary to prevent generation of such deep failure surfaces.
****

Surface No: 12 Slice No: 1 m_alpha = -.097910
Alpha = -8.65 deg Phi = 34.00 deg FOS = .093

****
** Factor of safety calculation for surface # 12 **
** failed to converge within FIFTY iterations **
**
** The last calculated value of the FOS was 18.0723 **
** This will be ignored for final summary of results **
****

Circular surface (FOS= 18.0723) is defined by: xcenter = 19.05
ycenter = 22.70 Init. Pt. = 16.11 Seg. Length = 2.00

****
-- WARNING -- WARNING -- WARNING -- WARNING -- (# 50)
****
This warning is usually reported for cases where slices near the toe of the slide mass have steep, negative base angles. Generally, this error condition can be avoided by "raising" the lower angular limit boundary to prevent generation of such deep failure surfaces.
****

Surface No: 13 Slice No: 1 m_alpha = -.122049
Alpha = -7.13 deg Phi = 34.00 deg FOS = .075

****
** Factor of safety calculation for surface # 13 **
** failed to converge within FIFTY iterations **
** **
** The last calculated value of the FOS was 16.7681 **
** This will be ignored for final summary of results **
****

Circular surface (FOS= 16.7681) is defined by: xcenter = 18.89
ycenter = 24.17 Init. Pt. = 16.11 Seg. Length = 2.00

****
-- WARNING -- WARNING -- WARNING -- WARNING -- (# 50)
****
This warning is usually reported for cases where slices near the toe of the slide mass have steep, negative base angles. Generally, this error condition can be avoided by "raising" the lower angular limit boundary to prevent generation of such deep failure surfaces.
****

Surface No: 24 Slice No: 1 m_alpha = -.073422
Alpha = -11.13 deg Phi = 34.00 deg FOS = .124

****
** Factor of safety calculation for surface # 24 **
** failed to converge within FIFTY iterations **
** **
** The last calculated value of the FOS was 13.1411 **
** This will be ignored for final summary of results **
****

Circular surface (FOS= 13.1411) is defined by: xcenter = 20.54
ycenter = 21.66 Init. Pt. = 17.22 Seg. Length = 2.00

****
-- WARNING -- WARNING -- WARNING -- WARNING -- (# 50)
****
This warning is usually reported for cases where slices near the toe of the slide mass have steep, negative base angles. Generally, this

error condition can be avoided by "raising" the lower angular limit boundary to prevent generation of such deep failure surfaces.
****

Surface No: 30 Slice No: 1 m_alpha = -.012032
Alpha = -19.30 deg Phi = 34.00 deg FOS = .233

****
** Factor of safety calculation for surface # 30 **
** failed to converge within FIFTY iterations **
** **
** The last calculated value of the FOS was 15.1785 **
** This will be ignored for final summary of results **
****

Circular surface (FOS= 15.1785) is defined by: xcenter = 21.29
ycenter = 18.59 Init. Pt. = 17.22 Seg. Length = 2.00

****
-- WARNING -- WARNING -- WARNING -- WARNING -- (# 50)
****
This warning is usually reported for cases where slices near the toe of the slide mass have steep, negative base angles. Generally, this error condition can be avoided by "raising" the lower angular limit boundary to prevent generation of such deep failure surfaces.
****

Surface No: 35 Slice No: 1 m_alpha = -.066645
Alpha = -12.12 deg Phi = 34.00 deg FOS = .136

****
** Factor of safety calculation for surface # 35 **
** failed to converge within FIFTY iterations **
** **
** The last calculated value of the FOS was 8.9730 **
** This will be ignored for final summary of results **
****

Circular surface (FOS= 8.9730) is defined by: xcenter = 22.04
ycenter = 22.51 Init. Pt. = 18.33 Seg. Length = 2.00

****
-- WARNING -- WARNING -- WARNING -- WARNING -- (# 50)
****
This warning is usually reported for cases where slices near the toe of the slide mass have steep, negative base angles. Generally, this error condition can be avoided by "raising" the lower angular limit boundary to prevent generation of such deep failure surfaces.
****

Surface No: 41 Slice No: 1 m_alpha = -.099303
Alpha = -8.54 deg Phi = 34.00 deg FOS = .092

```
**********************************************************
**     Factor of safety calculation for surface #    41   **
**     failed to converge within FIFTY iterations         **
**                                                        **
**    The last calculated value of the FOS was  12.1517   **
**    This will be ignored for final summary of results   **
**********************************************************
```

Circular surface (FOS= 12.1517) is defined by: xcenter = 21.82
ycenter = 19.08 Init. Pt. = 19.44 Seg. Length = 2.00

```
**************************************************************************
   -- WARNING -- WARNING -- WARNING -- WARNING -- (# 50)
**************************************************************************
This warning is usually reported for cases where slices near the toe
of the slide mass have steep, negative base angles.  Generally, this
error condition can be avoided by "raising" the lower angular limit
boundary to prevent generation of such deep failure surfaces.
**************************************************************************
```

Surface No: 44 Slice No: 1 m_alpha = -.144942
Alpha = -6.15 deg Phi = 34.00 deg FOS = .063

```
**********************************************************
**     Factor of safety calculation for surface #    44   **
**     failed to converge within FIFTY iterations         **
**                                                        **
**    The last calculated value of the FOS was  12.8909   **
**    This will be ignored for final summary of results   **
**********************************************************
```

Circular surface (FOS= 12.8909) is defined by: xcenter = 21.39
ycenter = 18.75 Init. Pt. = 19.44 Seg. Length = 2.00

```
**************************************************************************
   -- WARNING -- WARNING -- WARNING -- WARNING -- (# 50)
**************************************************************************
This warning is usually reported for cases where slices near the toe
of the slide mass have steep, negative base angles.  Generally, this
error condition can be avoided by "raising" the lower angular limit
boundary to prevent generation of such deep failure surfaces.
**************************************************************************
```

Surface No: 45 Slice No: 1 m_alpha = -.099022
Alpha = -8.56 deg Phi = 34.00 deg FOS = .092

```
**********************************************************
**     Factor of safety calculation for surface #    45    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was   9.6812    **
**    This will be ignored for final summary of results    **
**********************************************************

Circular surface (FOS=  9.6812) is defined by: xcenter =     22.07
ycenter =     20.72   Init. Pt. =     19.44   Seg. Length =   2.00
----------------------------------------------------------------

**************************************************************************
    --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 50)
**************************************************************************
This warning is usually reported for cases where slices near the toe
of the slide mass have steep, negative base angles.  Generally, this
error condition can be avoided by "raising" the lower angular limit
boundary to prevent generation of such deep failure surfaces.
**************************************************************************

Surface No:    49       Slice No:  1        m_alpha =  -.063021
Alpha =  -12.72 deg     Phi =  34.00 deg        FOS =   .143

**********************************************************
**     Factor of safety calculation for surface #    49    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  10.3329    **
**    This will be ignored for final summary of results    **
**********************************************************

Circular surface (FOS= 10.3329) is defined by: xcenter =     22.58
ycenter =     19.34   Init. Pt. =     19.44   Seg. Length =   2.00
----------------------------------------------------------------

**************************************************************************
    --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 50)
**************************************************************************
This warning is usually reported for cases where slices near the toe
of the slide mass have steep, negative base angles.  Generally, this
error condition can be avoided by "raising" the lower angular limit
boundary to prevent generation of such deep failure surfaces.
**************************************************************************

Surface No:    50       Slice No:  1        m_alpha =  -.122093
Alpha =   -7.13 deg     Phi =  34.00 deg        FOS =   .075

**********************************************************
**     Factor of safety calculation for surface #    50    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was   9.0840    **
```

```
**    This will be ignored for final summary of results    **
**********************************************************

Circular surface (FOS=  9.0840) is defined by: xcenter =     21.92
ycenter =     21.76   Init. Pt. =     19.44   Seg. Length =   2.00
-------------------------------------------------------------------

**********************************************************************
    --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 50)
**********************************************************************
This warning is usually reported for cases where slices near the toe
of the slide mass have steep, negative base angles.  Generally, this
error condition can be avoided by "raising" the lower angular limit
boundary to prevent generation of such deep failure surfaces.
**********************************************************************

    Surface No:    51       Slice No:  1        m_alpha =  -.087205
    Alpha =   -9.57 deg     Phi =  34.00 deg        FOS =   .105

    ************************************************************
    **     Factor of safety calculation for surface #    51    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was   8.0894    **
    **    This will be ignored for final summary of results    **
    ************************************************************

Circular surface (FOS=  8.0894) is defined by: xcenter =     23.47
ycenter =     21.64   Init. Pt. =     20.56   Seg. Length =   2.00
-------------------------------------------------------------------

**********************************************************************
    --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 50)
**********************************************************************
This warning is usually reported for cases where slices near the toe
of the slide mass have steep, negative base angles.  Generally, this
error condition can be avoided by "raising" the lower angular limit
boundary to prevent generation of such deep failure surfaces.
**********************************************************************

    Surface No:    58       Slice No:  1        m_alpha =  -.106921
    Alpha =   -8.00 deg     Phi =  34.00 deg        FOS =   .086

    ************************************************************
    **     Factor of safety calculation for surface #    58    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  14.7396    **
    **    This will be ignored for final summary of results    **
    ************************************************************

Circular surface (FOS= 14.7396) is defined by: xcenter =     22.61
```

ycenter = 17.82 Init. Pt. = 20.56 Seg. Length = 2.00

****
** Factor of safety calculation for surface # 59 **
** failed to converge within FIFTY iterations **
** **
** The last calculated value of the FOS was 26.4401 **
** This will be ignored for final summary of results **
****

Circular surface (FOS= 26.4401) is defined by: xcenter = 19.42
ycenter = 23.88 Init. Pt. = 20.56 Seg. Length = 2.00

****
** Factor of safety calculation for surface # 64 **
** failed to converge within FIFTY iterations **
** **
** The last calculated value of the FOS was .0044 **
** This will be ignored for final summary of results **
****

Circular surface (FOS= .0044) is defined by: xcenter = 15.41
ycenter = 30.02 Init. Pt. = 21.67 Seg. Length = 2.00

****
** Factor of safety calculation for surface # 66 **
** failed to converge within FIFTY iterations **
** **
** The last calculated value of the FOS was 25.7724 **
** This will be ignored for final summary of results **
****

Circular surface (FOS= 25.7724) is defined by: xcenter = 21.67
ycenter = 22.18 Init. Pt. = 21.67 Seg. Length = 2.00

****
-- WARNING -- WARNING -- WARNING -- WARNING -- (# 50)
****
This warning is usually reported for cases where slices near the toe of the slide mass have steep, negative base angles. Generally, this error condition can be avoided by "raising" the lower angular limit boundary to prevent generation of such deep failure surfaces.
****

Surface No: 68 Slice No: 1 m_alpha = -.139788
Alpha = -6.34 deg Phi = 34.00 deg FOS = .066

****
** Factor of safety calculation for surface # 68 **

```
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was   8.9377    **
**    This will be ignored for final summary of results    **
*************************************************************

Circular surface (FOS=  8.9377) is defined by: xcenter =     23.88
ycenter =     21.96   Init. Pt. =     21.67   Seg. Length =   2.00
-------------------------------------------------------------------

*************************************************************
**     Factor of safety calculation for surface #    69     **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was    .0038    **
**    This will be ignored for final summary of results    **
*************************************************************

Circular surface (FOS=   .0038) is defined by: xcenter =     17.80
ycenter =     26.39   Init. Pt. =     21.67   Seg. Length =   2.00
-------------------------------------------------------------------

*************************************************************************
    --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 50)
*************************************************************************
This warning is usually reported for cases where slices near the toe
of the slide mass have steep, negative base angles.  Generally, this
error condition can be avoided by "raising" the lower angular limit
boundary to prevent generation of such deep failure surfaces.
*************************************************************************

Surface No:    70       Slice No:  1        m_alpha =  -.207980
Alpha =   -4.54 deg     Phi =  34.00 deg        FOS =   .044

*************************************************************
**     Factor of safety calculation for surface #    70     **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was   9.5069    **
**    This will be ignored for final summary of results    **
*************************************************************

Circular surface (FOS=  9.5069) is defined by: xcenter =     23.51
ycenter =     21.70   Init. Pt. =     21.67   Seg. Length =   2.00
-------------------------------------------------------------------

*************************************************************
**     Factor of safety calculation for surface #    71     **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was    .0047    **
**    This will be ignored for final summary of results    **
*************************************************************
```

Circular surface (FOS= .0047) is defined by: xcenter = 12.05
ycenter = 40.95 Init. Pt. = 22.78 Seg. Length = 2.00

Factor of safety calculation for surface # 72 failed to converge within FIFTY iterations
The last calculated value of the FOS was .0050
This will be ignored for final summary of results

Circular surface (FOS= .0050) is defined by: xcenter = 23.73
ycenter = 18.69 Init. Pt. = 22.78 Seg. Length = 2.00

Factor of safety calculation for surface # 77 failed to converge within FIFTY iterations
The last calculated value of the FOS was .0036
This will be ignored for final summary of results

Circular surface (FOS= .0036) is defined by: xcenter = 19.50
ycenter = 26.32 Init. Pt. = 22.78 Seg. Length = 2.00

-- WARNING -- WARNING -- WARNING -- WARNING -- (# 50)

This warning is usually reported for cases where slices near the toe of the slide mass have steep, negative base angles. Generally, this error condition can be avoided by "raising" the lower angular limit boundary to prevent generation of such deep failure surfaces.

Surface No: 82 Slice No: 1 m_alpha = -.072205
Alpha = -15.83 deg Phi = 34.00 deg FOS = .178

Factor of safety calculation for surface # 82 failed to converge within FIFTY iterations
The last calculated value of the FOS was 12.5195
This will be ignored for final summary of results

Circular surface (FOS= 12.5195) is defined by: xcenter = 26.92
ycenter = 19.62 Init. Pt. = 23.89 Seg. Length = 2.00

```
**********************************************************
**     Factor of safety calculation for surface #    83    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was  24.6734    **
**    This will be ignored for final summary of results    **
**********************************************************

Circular surface (FOS= 24.6734) is defined by: xcenter =     24.89
ycenter =     21.20   Init. Pt. =     23.89   Seg. Length =   2.00
----------------------------------------------------------------

**********************************************************
**     Factor of safety calculation for surface #    84    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was    .0018    **
**    This will be ignored for final summary of results    **
**********************************************************

Circular surface (FOS=   .0018) is defined by: xcenter =     24.60
ycenter =     18.26   Init. Pt. =     23.89   Seg. Length =   2.00
----------------------------------------------------------------

**********************************************************
**     Factor of safety calculation for surface #    85    **
**     failed to converge within FIFTY iterations          **
**                                                         **
**    The last calculated value of the FOS was    .0041    **
**    This will be ignored for final summary of results    **
**********************************************************

Circular surface (FOS=   .0041) is defined by: xcenter =     11.79
ycenter =     39.47   Init. Pt. =     23.89   Seg. Length =   2.00
----------------------------------------------------------------

**************************************************************************
   --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 50)
**************************************************************************
This warning is usually reported for cases where slices near the toe
of the slide mass have steep, negative base angles.  Generally, this
error condition can be avoided by "raising" the lower angular limit
boundary to prevent generation of such deep failure surfaces.
**************************************************************************

    Surface No:    86       Slice No:  1        m_alpha =  -.073201
    Alpha =  -11.16 deg     Phi =  34.00 deg        FOS =   .124

    **********************************************************
    **     Factor of safety calculation for surface #    86    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was  13.1187    **
    **    This will be ignored for final summary of results    **
```

```
**************************************************************

Circular surface (FOS= 13.1187) is defined by: xcenter =     26.30
ycenter =     19.64   Init. Pt. =     23.89   Seg. Length =   2.00
--------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    87    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was    .0045   **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS=   .0045) is defined by: xcenter =     24.19
ycenter =     19.30   Init. Pt. =     23.89   Seg. Length =   2.00
--------------------------------------------------------------------


**************************************************************************
    --  WARNING  --  WARNING  --  WARNING  --  WARNING  --  (# 50)
**************************************************************************
This warning is usually reported for cases where slices near the toe
of the slide mass have steep, negative base angles.  Generally, this
error condition can be avoided by "raising" the lower angular limit
boundary to prevent generation of such deep failure surfaces.
**************************************************************************


    Surface No:    95       Slice No:  1        m_alpha =  -.093577
    Alpha =   -9.00 deg     Phi =  34.00 deg        FOS =   .098


    ************************************************************
    **     Factor of safety calculation for surface #    95    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was   9.3379    **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS=  9.3379) is defined by: xcenter =     27.23
ycenter =     21.04   Init. Pt. =     25.00   Seg. Length =   2.00
--------------------------------------------------------------------


    ************************************************************
    **     Factor of safety calculation for surface #    96    **
    **     failed to converge within FIFTY iterations          **
    **                                                         **
    **    The last calculated value of the FOS was    .0030   **
    **    This will be ignored for final summary of results    **
    ************************************************************


Circular surface (FOS=   .0030) is defined by: xcenter =     15.11
ycenter =     37.93   Init. Pt. =     25.00   Seg. Length =   2.00
--------------------------------------------------------------------
```

****
-- WARNING -- WARNING -- WARNING -- WARNING -- (# 50)
****
This warning is usually reported for cases where slices near the toe of the slide mass have steep, negative base angles. Generally, this error condition can be avoided by "raising" the lower angular limit boundary to prevent generation of such deep failure surfaces.
****

Surface No: 100 Slice No: 1 m_alpha = -.357794
Alpha = -2.97 deg Phi = 34.00 deg FOS = .026

****
** Factor of safety calculation for surface # 100 **
** failed to converge within FIFTY iterations **
** **
** The last calculated value of the FOS was 32.7726 **
** This will be ignored for final summary of results **
****

Circular surface (FOS= 32.7726) is defined by: xcenter = 26.27
ycenter = 18.47 Init. Pt. = 25.00 Seg. Length = 2.00

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 11 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	25.00	13.33
2	26.92	12.76
3	28.90	12.53
4	30.90	12.64
5	32.85	13.10
6	34.68	13.89
7	36.36	14.98
8	37.82	16.35
9	39.02	17.95
10	39.92	19.73
11	40.00	20.00

**** Simplified BISHOP FOS = 3.353 ****

****
** **

```
**  Out of the    100 surfaces generated and analyzed by XSTABL,  **
**       33 surfaces were found to have MISLEADING FOS values.    **
**                                                                **
********************************************************************
```

The following is a summary of the TEN most critical surfaces

Problem Description : svdairy

	FOS (BISHOP)	Circle Center x-coord (ft)	Circle Center y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)	Resisting Moment (ft-lb)
1.	3.353	29.25	24.03	11.51	25.00	40.00	3.912E+04
2.	3.362	25.24	24.27	15.40	19.44	40.02	6.843E+04
3.	3.369	26.63	21.41	13.49	19.44	40.01	6.215E+04
4.	3.392	27.30	22.62	12.82	21.67	39.82	5.208E+04
5.	3.408	29.99	22.27	10.24	25.00	39.93	3.571E+04
6.	3.414	26.12	22.20	13.90	19.44	39.82	6.265E+04
7.	3.431	26.91	21.67	12.96	20.56	39.73	5.571E+04
8.	3.433	26.86	21.74	13.00	20.56	39.71	5.578E+04
9.	3.441	24.72	28.19	17.35	21.67	40.00	6.727E+04
10.	3.478	24.96	24.07	15.55	18.33	39.93	7.242E+04

* * * END OF FILE * * *

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Client: _____ Sheet ____ of ____

Description: _____

_____ Job No. _____

By: _____ Date: _____

Checked By: _____ Date: _____