Appendix B-10

Landfill Report for Trench 12 Supplement

Appendix B
January 8, 2010 US Ecology
TSCA Renewal Application

SUPPLEMENT
LANDFILL REPORT FOR TRENCH 12

USEcology Nevada

an *American Ecology* company

Hazardous Waste Management Facility
Beatty, Nevada
Nevada Hazardous Waste Treatment, Storage and Disposal Permit
NEV HW0019, USEPA ID #NVT330010000

Prepared by:

AquAeTer
7340 East Caley Avenue
Centennial, CO 80111

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SUPPLEMENT

LANDFILL REPORT FOR TRENCH 12

US Ecology Nevada, Inc.

Hazardous Waste Management Facility

Beatty, Nevada

Nevada Hazardous Waste Treatment, Storage and Disposal Permit

NEV HW0019, USEPA ID #NVT330010000

October 8, 2007

CERTIFICATION

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

US Ecology Nevada Representative: R L Marchand **Date:** 10/10/07

Printed name: Robert Marchand

Title: General Manager

Nevada Professional Engineer STEPHEN L. WAMPLER **Date:** 8 OCT 2007

PROFESSIONAL ENGINEER - STATE OF NEVADA
STEPHEN L. WAMPLER
CIVIL
No 13641

10/8/07

EXPIRES: 6/30/08

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- LCRS Flow Capacity and Pump Sizing
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1. PURPOSE OF THIS SUPPLEMENT

This Supplement to the Trench 12 Landfill Report (Supplement) and attachments present the Final Design for the Trench 12 landfill at the US Ecology Nevada, Inc. (USEN) hazardous waste management facility located near Beatty, Nevada (see Figure 1). This is a supplement to the 1994 "Section IV.D, Landfill Report, US Ecology, Inc., Beatty, Nevada" (Landfill Report) (USE, 1994) that was provided to the Nevada Division of Environmental Protection (NDEP). Another component of the previous Landfill Report was the March 1996 "Cell 12 Design Report" (TRC Environmental Solutions, 1996), as specifically cited in the 2005 RCRA Permit. The 1996 Design Report was provided in response to an NDEP letter dated September 22, 1995 (NDEP, 1995) that requested certain additional information with regard to the Trench 12 design. The 1994 Landfill Report, 1996 Design Report, and the resolution of Nevada Division of Environmental Protection (NDEP) design-related comments and questions (as cited in the 2005 RCRA Permit) comprise the 1996 Trench 12 Design (1996 Design) referenced in this Supplement.

The 1996 Design was given conditional approval by NDEP in the 1998 RCRA Permit and the renewed 2005 RCRA Permit. That approval was subject to satisfactory completion of the design-related conditions contained in Section 7.12 of the RCRA Permit. In general, the conditions under which approval was granted include finalization of certain design drawings and plans, completion of certain materials tests, and completion of a geophysical survey of the Trench 12 location.

USEN has completed the Final Design for disposal Trench 12 and presents the final design in this Supplement, which includes the attached "Construction Quality Assurance Plan for Trench 12" (CQA Plan). This Final Design differs from the conditionally approved 1996 Design as needed to satisfy the design-related conditions contained in the RCRA Permit and to accommodate minor changes in the USEN plan for the relationship between disposal Trenches 11 and 12. Also, during 2007, USEN renewed its lease agreement with the State of Nevada for the property that is occupied by the Beatty facility, including the location of Trench 12. The Trench 12 site area is referred to as Area C in the lease agreement. The terms of the renewed lease allow USEN to more effectively utilize the portion of its leased property

between the southern limit of waste disposal in new Trench 12 and the northern limit of the adjoining closed low-level radioactive waste (LLRW) disposal area.

This Supplement consists of the following components:

- Supplement – Trench 12 Landfill Report;
- Attachment 1 - Trench 12 Soil Testing Results;
- Attachment 2 - Results of Geophysical Survey of Trench 12 Area;
- Attachment 3 - Supplemental Engineering Calculations;
- Attachment 4 – Construction Quality Assurance Plan for Trench 12.

Attachment 4, the CQA Plan, also includes the following appendices:

- Appendix A - Above-Grade Facility Design Drawings;
- Appendix B -Construction Materials Specifications; and
- Appendix C - Construction Methods Specifications.

The Supplement and its various attachments present the Final Design for Trench 12 and address in detail the differences between the conditionally approved 1996 Design and the Final Design. The specific types of design refinements made are:

- The Final Design incorporates additional design refinements developed through the process of review and comment by NDEP;
- The Final Design addresses the specific conditions of NDEP approval of the 1996 Design (as presented in Section 7.12 of the RCRA Permit); and
- The Final Design accommodates changes in USEN planning to make more effective use the its leased property for development of Trench 12 and to facilitate the waste disposal transition from Trench 11 to Trench 12.

The Supplement is organized to address these areas of design refinement and to present appropriate supporting documentation. Aspects of Trench 12 design that are not modified in the Final Design remain in the Design Drawings (CQA Plan Appendix A), Construction Materials Specifications (CQA Appendix B), and Construction Methods Specifications (CQA Plan Appendix C). These unchanged design aspects are not specifically addressed in this

Supplement, and the supporting documentation (including calculations) provided in the 1996 Design, as previously reviewed and approved by NDEP, are not included in the Supplement.

Design details that either are clarified or changed between the 1996 Design and Final Design, and the location where the additional information is provided in this Supplement, are summarized below.

Changed Design Details		How Addressed	Information Location
Design details developed in compliance with RCRA Permit conditions			
7.12.2	Subgrade hydraulic conductivity requirement	Laboratory testing for site soil materials.	Section 5.2.2, and Attachment 1 Additional test results to be provided as indicated herein.
7.12.3	Stress-strain testing for liner materials	On June 28, 2007, NDEP confirmed that this requirement would be satisfactorily addressed by providing the manufacture's quality control results for liner materials used.	Section 5.2.1, CQA Plan, Appendix B, and Attachment 3
7.12.4	Submit complete set of final design drawings	The final design, including drawings and specifications, is provided in the CQA Plan.	CQA Plan, Appendix A
7.12.5	Submit QA/QC Plan for Trench 12 construction	QA/QC requirements for Trench 12 construction are provided in the CQA Plan.	Section 5.1, and CQA Plan, Appendices A, B and C
7.12.7	Demonstrate capacity to store runoff from design storm	On June 28, 2007, NDEP confirmed that this requirement would be satisfactorily addressed by Response Action Plan (RAP) language.	(RAP to be provided separately)

Changed Design Details		How Addressed	Information Location
7.12.8	Sump gravel hydraulic conductivity requirement	Laboratory testing for site soil materials.	Section 5.2.3, Attachment 1, and Attachment 3 Additional test results to be provided as indicated herein.
7.12.11	Magnetic survey of Trench 12 area	A geophysical survey of the Trench 12 area was conducted during July 2007.	Section 9.1, and Attachment 2
Other design changes			
Trench 11 – 12 relationship		The 1996 Design merged the disposed waste footprints and final covers of the two trenches; the Final Design merges a small portion of the final covers, but not the waste footprints.	Section 4, and CQA Plan, Appendix A
Separation between Trench 12 waste disposal and cover footprints and the closed LLRW area		The 2007 lease agreement with Nevada allows Trench 12 to more closely approach the closed LLRW area in the Final Design.	Section 4, and CQA Plan, Appendix A
Trench 12 LCRS and LDS areas		The Final Design provides a larger total trench area, and increases the leachate volume to be managed by the LCRS/LDS. The Final Design accommodates the leachate volume increase.	Section 6, Attachment 3, and CQA Plan, Appendix A

Note: Compliance schedule items 7.12.1, 7.12.6, 7.12.9, 7.12.10, and 7.12.12 in the RCRA Permit either require no design-related response or will be addressed in later submittals to NDEP.

In addition to these areas of design refinement, this Supplement also addresses questions related to landfill design and operations posed by the Nevada State Health Division, the agency responsible for long-term custodial care of the closed LLRW disposal facility that adjoins leased Area C and Trench 12. These questions pertain to the following topics.

- Excavation stability –Trench 12 excavation stability, as an influence on the long-term stability of the closed LLRW disposal cells. (Section 7)

- Surface-water management - Management of surface-water originating within Area C from the presence of operating or closed Trench 12, as an influence on the long-term stability of the closed LLRW disposal cells. (Section 8)

- Health and safety – Health and safety issues for Trench 12 construction and operations personnel as related to the presence the closed LLRW disposal cells, including known and unknown disposed materials. (Section 9)

- Accessibility – Access to the closed LLRW facility for inspection and custodial care, as affected by Trench 12 construction, disposal operations, and post-closure configuration. (Section 10)

2. FACILITY INFORMATION

The USEN Beatty, Nevada Hazardous Waste Management Facility is located approximately 100 miles northwest of Las Vegas in a remote and arid desert region. The facility is operated by USEN under Hazardous Waste Management Permit NEV HW0019 (2005 RCRA Permit) and is permitted to manage wastes regulated under the Resource Conservation and Recovery Act (RCRA) and Toxic Substances Control Act (TSCA). At the time of preparation of this Supplement to the Landfill Report, the active waste disposal trench is Trench 11. Trench 12 is planned as the next waste disposal trench on the property leased by USEN from the State of Nevada. The adjacent low-level radioactive waste (LLRW) management units, south of the Trench 12 location (as shown in Drawing NV12-07-002, CQA Plan Appendix A) has closed. The closed LLRW facility is owned and managed by the State of Nevada. Post-closure care for the LLRW facility is provided by the State.

The lease agreement between USEN and the State of Nevada (land owner) for the property occupied by the Beatty hazardous waste disposal facility was modified in April 2007 with regard to the requirements for waste disposal in the 12.6-acre (approximately) area identified as Area C. Area C is the location of new Trench 12. The lease agreement modification identifies the entire 12.6-acre Area C as "for the disposal of hazardous waste" and references the RCRA Permit as the document that establishes the requirements for waste disposal dimensions, design, construction, and operation. In accordance with the provisions of the 2007 lease agreement and the 2005 RCRA Permit, USEN has developed the necessary Final Design and supporting documentation for Trench 12 in order that this information may be included in a RCRA Permit modification.

The Trench 12 areal footprint is approximately 11.2 acres. The disposal trench will be approximately 1,350 feet long with a width that varies between approximately 225 and 430 feet. The trench will extend 75 feet below the original ground surface at 0.5:1.0 (Horizontal:Vertical) slopes, and upon completion will rise 75 feet above the original ground surface. Trench 12 will have a bottom and sidewall liner system that incorporates primary and secondary liner and leachate collection and recovery systems. The trench, including below-grade and above-grade

volumes will have an ultimate disposal capacity of approximately 1.65 million cubic yards of waste material.

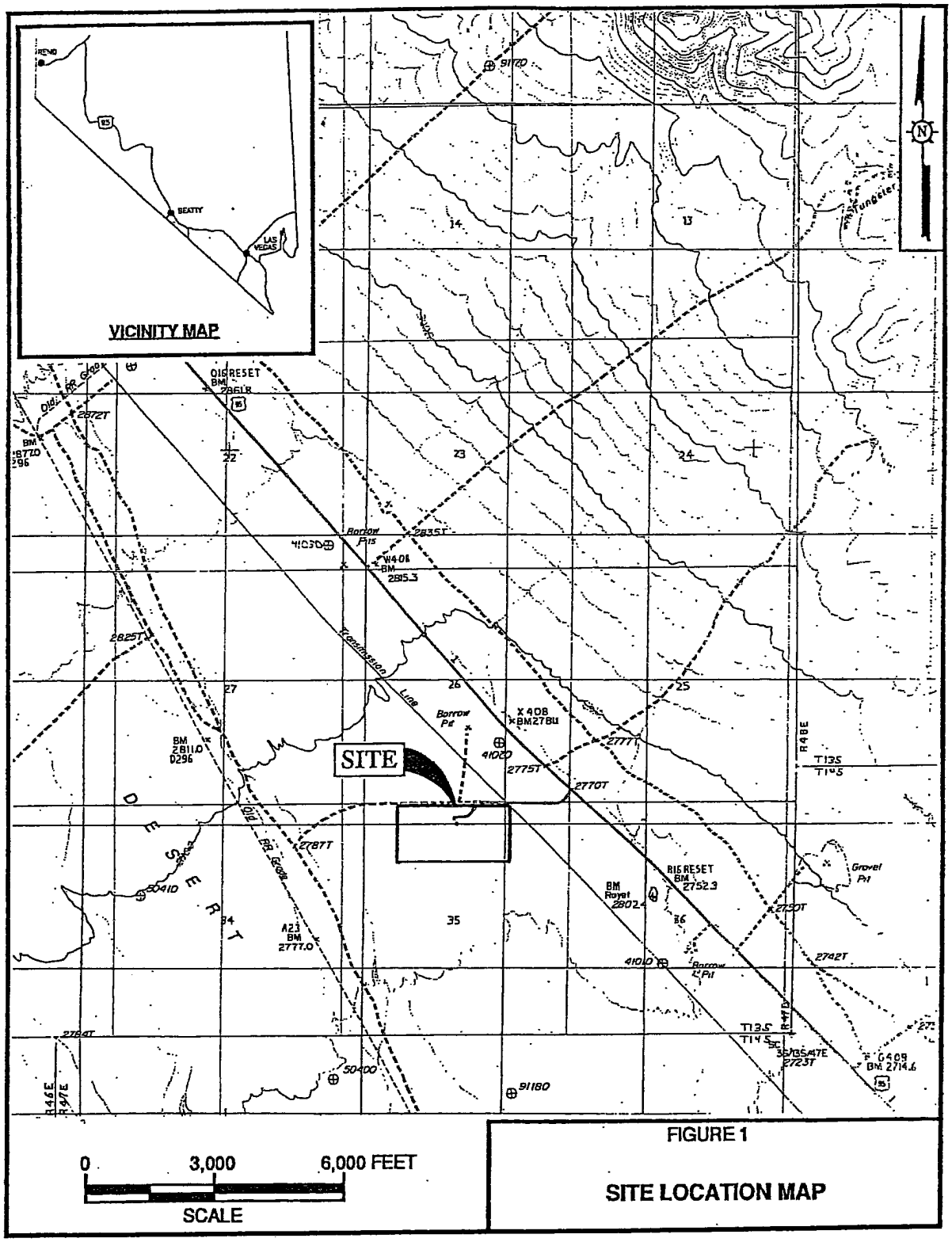


FIGURE 1

SITE LOCATION MAP

3. AREAS OF DESIGN REFINEMENT

Table 1, Correlation Between 1996 Design Documents and 2007 Final Design Documents, identifies design aspects and documentation that are modified in the Final Design, and identifies the locations within the Supplement and its attachments where the design refinement is discussed and documented. Table 1 also identifies the specific types of engineering calculations that were provided in support of the 1996 Design and which of those calculations has been revised to support the design refinements contained in the Final Design. The specific calculations revised in support of the Final Design are listed below and are included in Attachment 3.

- Slope Stability Evaluation with Surface Soil Improvement
- Liner Stresses (sidewall liner materials)
- Anchor Trench Stresses
- LCRS Infiltration Rate
- LCRS Flow Capacity and Pump Sizing
- LDS Flow Capacity and Pump Sizing
- LCRS Gravel Hydraulic Conductivity

Table 1
Correlation Between 1996 Design Documents and 2007 Final Design Documents

1994 Landfill Report Chapter or Appendix		Included in 1994 Landfill Report	Revised in 1996 Design Report	Revised in 2007 Final Design	Information Location in Final Design Documents
1.0	List of Hazardous Waste	•			NA
2.0	Landfill Operating Procedures	•			NA
3.0	Wind Dispersal Control	•			NA
4.0	Run-On/Run-Off Control Systems	•	•		NA
5.0	Liner System Description	•		•	Section 5 and Attachment 4 (CQA Plan)
6.0	Above Grade Design	•		•	(to be provided with final cover design)
7.0	Inspection	•			NA
8.0	Closure	•		•	(to be provided with final cover design)
A	Landfill Cell Design Plans	•		•	Attachment 4 - CQA Plan (Appendix A)
B	Waste Location Map and Grid System	•			NA
C	Drainage Diversion Ditches Drawings	•			NA
D	Drainage Diversion Ditches Design Calculatio	•			NA
E	MTR Equivalency Demonstration	•	•		NA
F	Method 9090 Compatibility Data	•			NA
G	Retrofilleted Sump Riser Diagrams	•			NA
H	Leachate Monitoring and Recording Log	•			NA
I	Response Action Plan	•		•	(to be provided in separate document)
J	Leachate Removal Pump Specification	•		•	Section 6 and Attachment 3
K	Design Calculation for Loads	•			NA
L	Converse Consultants Foundation Soils Report	•			NA
M	Infiltration Test Method	•			NA
N	Permeability Test Method	•			NA
O	Factor of Safety Calculations for Side Slopes Using Law Engineering Strength Parameters	•			NA
P	Cell Specifications	•		•	Attachment 4 - CQA Plan (Appendices B & C)
Q	Slope Stability Analysis for Cell Above Grade Embankment	•		•	Attachment 3
R	Cell 12 Design Calculations				
	- Slope Stability Final Configuration	•	•		NA
	- Slope Stability Interim Configuration	•	•		NA
	- Surficial Soil Improvement	•	•	•	Attachment 3
	- Settlement	•	•		NA
	- Liner Stresses	•	•	•	Attachment 3
	- Anchor Trench	•	•	•	Attachment 3
	- Sump and Riser Design	•	•		NA
	- LCRS Flow Capacity and Pump Sizing	•	•	•	Attachment 3
	- LDS Flow Capacity and Pump Sizing	•	•	•	Attachment 3
	- Surface Water Management	•	•	•	(to be provided with final cover design)
	- Erosion Control	•	•	•	(to be provided with final cover design)
S	Geotechnical Investigation for Cell 12	•			NA
T	Cell 11 Intermediate Cap	•			NA

4. TRENCH 12 LOCATION WITHIN LEASED PROPERTY

During 2007, USEN renewed its lease agreement with the State of Nevada for the property occupied by the Beatty facility, including the 12.6-acre Area C (location of new Trench 12). The terms of the new lease allow USEN to consider technically appropriate ways to effectively utilize the portion of its leased property between the southern limit of hazardous waste disposal in new Trench 12 and the northern limit of the adjoining closed LLRW disposal area.

In the 1996 Design, a "horizontal control line" defined the limit of excavation at ground surface. The horizontal control line, or HCL, also defined the horizontal limit of hazardous waste disposal in Trench 12. In that design, the HCL on the south side of Trench 12 was at least 150 feet from the horizontal limit of the closed LLRW disposal cells on the adjoining State property. This separation between Trench 12 and the closed LLRW cells was consistent with the terms of the Area C lease agreement at the time the 1996 Design was developed. The area of the Trench 12 footprint at ground level (i.e., the area inside the HCL) was about 8.2 acres.

The 2007 lease agreement did not include a specific restriction (offset) on hazardous waste disposal along the boundary with the LLRW disposal cells. Instead, the 2007 lease agreement identifies the entire 12.6-acre Area C as "for the disposal of hazardous waste" and references the RCRA Permit (rather than the lease agreement) as the document that establishes the requirements for waste disposal dimensions, design, construction, and operation. The Final Design includes an HCL that is as near as 50 feet from the horizontal limit of waste disposal in the LLRW cells. The area inside this larger Trench 12 HCL, marking the excavation footprint at ground level, is about 11.0 acres. The larger HCL allows placement of a larger waste volume in Trench 12, while providing the necessary geotechnical stability and worker protections during construction, disposal operations, and after closure.

The 1996 Design also included some above-grade (i.e., above natural ground level) waste disposal in the narrow area between Trenches 11 and 12. The 1996 design included constructing a double-liner system approximately at ground level to join the Trench 11 and 12 subgrade liner systems. The Final Design maintains the approximately 50-feet wide separation between the Trenches 11 and 12 and does not include hazardous waste disposal within the above-grade area

between the two trenches. For convenience of construction and to maintain stable final cover slopes, the final covers of the two trenches will merge in the area between the trenches, but only clean cover soil will occupy the 50-feet wide area between the trenches.

In accordance with the lease agreement, this Supplement and attachments (subsequent to NDEP approval) will establish the requirements for waste disposal dimensions, design, construction, and operation and will be referenced in a RCRA Permit modification.

5. CONSTRUCTION QUALITY ASSURANCE

5.1 CONSTRUCTION QUALITY ASSURANCE PLAN

The quality assurance/quality control (QA/QC) plan required by Compliance Schedule item 7.12.5 of the RCRA Permit is provided as the CQA Plan in Attachment 4 to this Supplement. The CQA Plan provides a description of the primarily administrative aspects of quality assurance (e.g., project position descriptions and responsibilities, meetings, and reporting). Appendices B and C to the CQA Plan provide construction materials and construction methods specifications, respectively.

5.2 CONSTRUCTION MATERIALS PROPERTIES

Compliance schedule items 7.12.2, 7.12.3, and 7.13.8 contain specific testing requirements for construction materials. The results of materials testing are summarized below and the actual laboratory testing results are included in Attachment 1. Also, some material testing is underway at the time this Supplement was being prepared for submittal to NDEP. The results of those additional tests will be provided separately to NDEP on a schedule consistent with RCRA Permit requirements.

5.2.1 Liner System Materials

Compliance schedule item 7.12.3 requires that the results of "stress-strain tests on the liner materials" be submitted to NDEP. On June 28, 2007, NDEP confirmed that this requirement will be satisfactorily addressed by including the liner material manufacturer's quality control results for the various liner system components in the project design and construction documents. Appendix B to the CQA Plan (Attachment 4) includes specifications for liner materials based upon the materials properties of the following specific materials.

Geosynthetic clay liner	CETCO Bentomat DN
Geomembrane	GSE HD Textured and Single-Side Textured HDPE FML
Geocomposite	GSE FabriNet and Fabrinet UF
Geotextile	GSE NW8, NW10, and NW12
Geonet	GSE Hypernet

The updated liner strength calculations included in Attachment 3 to this Supplement were made using the properties of these specific materials. By these calculations, it was determined that the liner system (and its individual members) will perform satisfactorily under the conditions considered by the calculations (and as demonstrated and accepted by calculations contained in the 1996 Design). If alternative materials are proposed by the contractors retained by USEN to construct Trench 12, the Project Engineer (or other qualified person retained by USEN) will verify that the alternative materials have physical properties that are at least equivalent to those specified.

The formal results of physical properties testing by the manufacturer(s) of materials used for Trench 12 liner construction will be included in the project construction documents to be submitted to NDEP.

5.2.2 Liner Subgrade

The hydraulic conductivity requirement for the liner subgrade (per Section 7.12.2 of the RCRA Permit) is a maximum value of 1×10^{-5} centimeters per second (cm/sec). USEN arranged for hydraulic conductivity testing of natural soil materials excavated from the Trench 12 area that can be used for liner subgrade material. Recompacted natural materials were determined to have hydraulic conductivities (see Attachment 1) between 2.6×10^{-4} and 3.9×10^{-7} cm/sec, with the difference appearing to relate directly to the amount of fine-grained materials (silt and clay) in the material. In general, it appears that natural materials can achieve the required hydraulic conductivity if the fine-grained fraction comprises at least 10 percent of the material. Since the gradation of the material that actually will be available for construction of the subgrade material is not certain, USEN is testing mixtures of natural materials and imported fine-grained materials (primarily from a local natural clay source) that will achieve the specification. The final specification for subgrade materials will be determined upon completion of this testing. USEN will provide testing results and the resulting material specification to NDEP in accordance with Section 7.12.2 of the RCRA Permit.

5.2.3 Sump Gravel

The RCRA Permit at Section 7.12.8 asks that USEN specify the gravel to be used in leachate sumps to obtain a "transmissivity" of 10 cm/sec. A calculation identifying the gravel

"permeability" as 10 cm/sec was accepted previously by NDEP. That gravel permeability is a conservative, mid-range textbook value considered typical for coarse-grained gravel and was used as a typical value in calculations for the 1996 Design. Recent materials tests by USEN have determined that a permeability between 1.0 and 2.0 cm/sec can be achieved using screened gravel from the Trench 12 excavation. This range also is conservative and is adequate to handle leachate flow in the LCRS and LDS systems. A calculation included in Attachment 3 shows that a gravel permeability specification of 1.0 cm/sec or higher is acceptable in the design application for LCRS collectors and sump and LDS sump.

Sump gravel testing results are provided in Attachment 1.

6. LEACHATE MANAGEMENT

Leachate management calculations for the 1996 design were done with the assumption that runoff generated by the design storm could be separated into 'clean water' that would not be allowed to come into contact with disposed waste and 'leachate" that would be allowed to come into contact with waste (including the initial layer of select fill in the definition of waste). After further discussions of this subject between USEN and NDEP, it was determined that it is impractical (and perhaps not possible) to maintain positive separation between in-cell precipitation and waste inside a disposal cell containing waste. Thus, for the purposes of the 2007 calculation, all water collected inside a disposal cell containing waste (including select fill) is considered to be leachate requiring appropriate management.

6.1 LCRS/LDS DESIGN

The following are important details that were considered in the 2007 calculations made to refine the LCRS and LDS designs.

- The 25-year, 24-hour storm generated about 2.0 inches of precipitation in a 24-hour period (NOAA, 1973);
- The sacrificial liner on trench sidewalls will cause all precipitation to collect on and be managed from the trench/cell floor; and
- All rainwater (or other precipitation) collected inside one or more disposal cells in Trench 12 (including precipitation on trench sidewalls) will be managed in the respective disposal cell as leachate.

Other assumptions made to make the LCRS and LDS design calculations are provided in Attachment 3.

6.2 LEACHATE MANAGEMENT

Compliance schedule items 7.12.6 (requirement for development of a Response Action Plan, or RAP) and 7.12.7 (requirement to demonstrate that there is capacity to store runoff generated from a 25-year, 24-hour storm event) are linked requirements. Both refer to liquids collected inside the waste disposal cell (i.e., leachate) that are to be addressed by the RAP and calculations that estimate leachate collection volume and pumping requirements. These permit requirements will be addressed by RAP language describing how leachate will be managed.

The RAP (to be provided separately at least 60 days prior to accepting waste in Trench 12) will acknowledge that collected leachate will be used for dust control inside Trench 12. If the collected leachate volume exceeds the volume that can be used for dust control, any excess leachate removed from the active cell will be disposed as a hazardous liquid.

7. EXCAVATION STABILITY

The Trench 12 excavation side slopes in the 1996 Design and the Final Design are identical at 0.5:1.0 (H:V) or about 63 degrees. The maximum depth below average ground surface of the Trench 12 excavation in the two designs also is identical at approximately 75 feet. Extensive slope stability evaluations were included in the 1996 Design and the supporting design documentation that are referenced in the RCRA Permit. Since design slopes, depths, and subsurface materials are unchanged between the 1996 Design and Final Design, the prior slope stability evaluations are equally applicable to both designs. Important aspects of the slope stability evaluations are summarized below.

- The 75-feet deep, 0.5:1.0 (H:V) excavation slopes were determined to be acceptably stable under static loading and pseudo-static loading. Pseudo-static loading simulates the maximum horizontal acceleration from a seismic event (earthquake) with a 90 percent or greater probability of not being exceeded in 250 years, per NAC 444.6793.

- Of the possible deep-seated failure planes evaluated, the planes exhibiting the lowest safety factors (but still higher than minimum requirements) extended from near the toe of the excavation slope to about 50 to 60 feet from the excavation crest.

- Considering the excavation crest location (i.e., HCL location) on south side of Trench 12 in the Final Design, this possible failure plane extends just a few feet (horizontally) into the area of the closed LLRW trenches.

- The period of time during which a deep-seated slope failure of this type is conceivable will be very brief, likely only a few months in duration, since waste disposal in Trench 12 will begin to buttress the excavation slope, and increase safety factors, as soon as the first waste is placed against the toe of the south trench side slope.

A calculation verifying acceptable excavation slope stability with the natural, relatively loose surface soil layer in place (and unimproved) are provided in Attachment 3.

8. SURFACE-WATER MANAGEMENT

8.1 DURING OPERATIONS

The 1996 Design and Final Design include measures to manage stormwater runoff during disposal operations and after final closure. During disposal operations, these measures will include temporary berms and drainage channels directing runoff to natural or enhanced drainage channels outside of the facility boundaries. With the exception of the disposal cell bottoms, neither design includes features intended to cause stormwater retention (ponding) inside or outside the facility boundaries.

Stormwater falling inside the trench during disposal operations will be managed as leachate. There are no situations where leachate would be allowed to enter surface water outside the trench.

8.2 POST-CLOSURE

With regard to post-closure surface-water management, the 1996 Design and Final Design include final covers that essentially are identical. Both final cover designs will incorporate measures intended to manage stormwater runoff from the cover and control cover material erosion. Stormwater runoff conveyances constructed on both covers lead to stormwater channels along the base of the cover that lead to natural or enhanced drainage channels outside of the facility boundaries.

The Final Design will include a corridor about 15-feet wide between the toe of the final Trench 12 cover and the toe of the closed LLRW site cover that will provide for permanent routing of surface-water runoff originating on the adjoining portions of Trench 12 and the closed LLRW site.

9. CONSTRUCTION HEALTH AND SAFETY

The RCRA Permit includes requirements whose primary purpose is to protect persons involved in the construction of Trench 12. In addition to providing protection against conditions and hazards associated with excavation, earthwork, and other common construction activities that will be required for Trench 12 construction, these RCRA Permit requirements address potential unique hazards that might be associated with construction near the closed LLRW disposal area. These Permit requirements include a pre-construction magnetic (geophysical) survey of Area C and development of a Construction Health and Safety Plan.

9.1 MAGNETIC (GEOPHYSICAL) SURVEY

A geophysical survey of Area C (except for the part of the area already excavated to more than 20 feet deep) was completed during the design process. The survey purpose was to identify buried metallic objects potentially related to the closed LLRW area. Features identified as possible buried metallic objects were exposed by excavation to determine their nature and appropriate management action.

No materials, metallic or otherwise, related to previous waste disposal activities in the LLRW area were identified by the geophysical survey. The metallic objects identified and exposed by excavation, with one exception, were small objects related to USEN use of Area C for temporary storage of construction materials, construction equipment, and scrap metal. The exception was the identification of a buried metal pipe (caisson casing) installed by the U.S. Geological Survey. That large metallic caisson casing was identified at the expected location. It is an object related to past investigation of the LLRW area, and is not a waste material. It will be removed by USEN during Trench 12 excavation.

The report of the geophysical survey is provided in Attachment 2.

9.2 CONSTRUCTION HEALTH AND SAFETY PLAN

Prior to the beginning of Trench 12 excavation, a Construction Health and Safety Plan (CHSP) will be prepared and submitted to NDEP. This CHSP will be implemented during construction activities and will remain in effect during subsurface disposal activities in Trench 12. The CHSP

will specifically address monitoring for radioactive decay particles within the excavation, guidelines to be followed if suspected materials of potential radiological significance are unearthed, and measures to be employed preventing impacts to existing radiological disposal trenches.

ATTACHMENT 1

TRENCH 12 SOIL TESTING RESULTS

AquAeTer

optimizing
environmental resources | water, air, earth

7340 E. Caley Avenue, Ste 200 • Centennial, CO 80111 • Phone (303) 771-9150 • Fax (303) 771-8776

December 28, 2007 073113

RCRA Permitting Branch Supervisor
Bureau of Waste Management
Nevada Division of Environmental Protection
901 S. Stewart Street, Suite 4001
Carson City, NV 89701-5249

RECEIVED
JAN 3 - 2008
US ECOLOGY NEVADA

Attn: Mr. Sree Kailash, CEM, P.E.

RE: Additional Trench 12 Soil Testing Results – Subgrade Permeability
US Ecology Nevada, Inc., Beatty NV
EPA ID# NVT330010000, Permit No: NEVHW0019

Dear Mr. Kailash:

Please insert the enclosed pages into Attachment 1, Trench 12 Soil Testing Results, in the copies of the Landfill Report that were provided to you on October 10th. These pages are the results for hydraulic conductivity testing of a mixture of five percent (by weight) local clay mixed with 95 percent (by weight) natural Trench 12 soil. Also enclosed is a revised version of the Attachment 1 table, "Summary of Soil Testing Results for Trench 12 Samples." As the summary table and laboratory results indicate, the five percent SEP/SAP mixture provides a hydraulic conductivity that is lower than the 1×10^{-5} cm/sec requirement for the Trench 12 subgrade. This test result confirms the construction specification for "Trench liner subgrade, except beneath LCRS Sumps" that was provided to NDEP in a letter dated October 30, 2007 (and as reprinted below).

> Trench liner subgrade, except beneath LCRS Sumps: Construct the 9-inch thick liner subgrade by mixing a select soil amendment with native soil satisfying the gradation requirements of Section 2.2 of Appendix B to the Construction Quality Assurance Plan for Trench 12 (Attachment 4 to the October 2007 Landfill Report). The select soil amendment will be sepiolite/saponite (SEP/SAP) fines (a product of IMV Nevada, Amargosa Valley, NV) comprising 5.0 percent, by weight (dry), of the native soil/clay mixture. The mixture will be placed and compacted to satisfy the specifications included in Section 2.2.

Please contact us if you have any questions with regard to these soil testing results.

Sincerely,

AquAeTer, Inc.

Stephen L. Wampler, P.E.
Project Engineer

cc: Mr. Robert Marchand, US Ecology Nevada, Inc.
Mr. Simon Bell, American Ecology, Inc.

Summary of Soil Testing Results for Trench 12 Samples

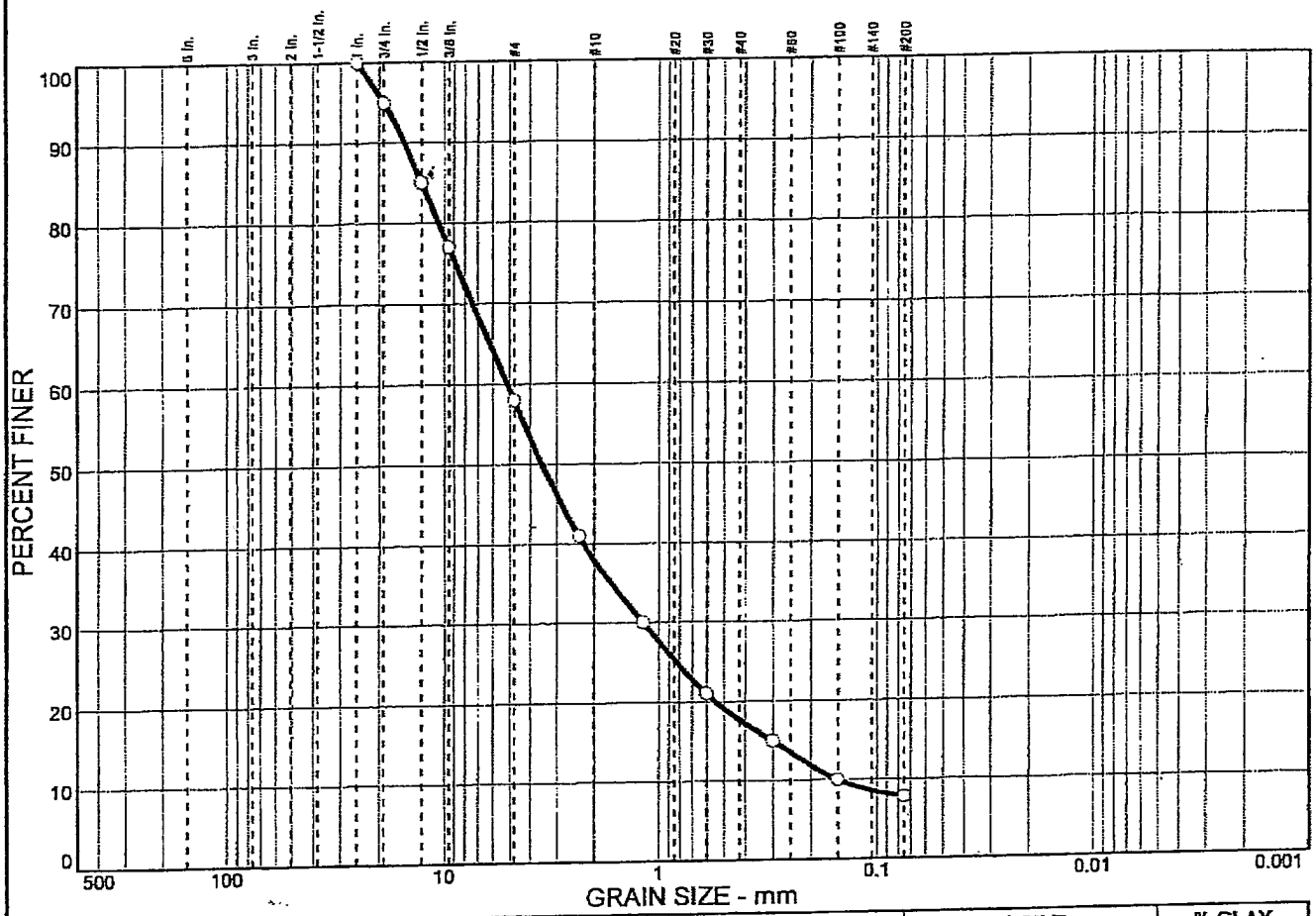
Sample Number	Material	Grain Size (% by weight)			Amendment	ASTM D1557 Maximum Dry Density (pcf) (see Note 1)	ASTM D1557 Optimum Moisuture Content (%)	Hydraulic Conductivity Sample Properties				Hydraulic Conductivity (cm/sec)	Direct Shear Test Sample Properties				Cohesion (psf)	Friction Angle (degrees)
		Gravel	Sand	Silt/Clay				Dry Density (psf)	% MDD	Moisture Content (%)	Difference from OMC % + or (-)		Dry Density (psf)	% MDD	Moisture Content (%)	Difference from OMC % + or (-)		
June-July 2007 Samples: Trench 12 samples for various trench construction objectives (subgrade, sump gravel, surface soil improvement, and final cover)																		
Zeolite clay (ZC)	Imported fines	24.0	23.0	53.0	--													
A1	Subgrade	31.0	59.7	9.3	--	120.5	11.0	123.4	102.4%	9.3	(1.7)	3.90E-07	--	--	--	--	--	--
A2	Subgrade	29.0	69.0	2.0	--	114.5	6.0	117.0	102.2%	6.1	0.1	2.60E-04	--	--	--	--	--	--
A2	Subgrade	47.0	48.1	4.9	5% Pit Run ZC	106.0	7.0	106.5	100.5%	6.8	(0.2)	5.30E-04	--	--	--	--	--	--
A3	Subgrade	21.0	74.8	4.2	--	120.0	10.0	119.3	99.4%	10.4	0.4	5.55E-04	--	--	--	--	--	--
B1	Gravel	97.0	2.6	0.4	--	--	--	88.3 (wet)	--	--	--	1.7	--	--	--	--	--	--
B1	Gravel	98.0	1.6	0.4	--	--	--	88.1 (wet)	--	--	--	2.1	--	--	--	--	--	--
C1	Surface soil	14.0	76.7	9.3	--	115.0	9.5	--	--	--	--	--	110.9	96.5%	8.7	(0.8)	420	32.8
C2	Surface soil	20.0	70.9	9.1	--	119.0	10.0	--	--	--	--	--	114.2	95.9%	8.4	(1.6)	320	39.9
C1-C2	Surface soil	17.0	72.0	11.0	5% Pit Run ZC	118.0	10.0	--	--	--	--	--	112.9	95.6%	10.4	0.4	320	41.1
D1	Cover soil	22.0	74.7	3.3	--	118.5	12.0	--	--	--	--	--	100.8	85.1%	15.1	3.1	210	34.5
D2	Cover soil	26.0	68.8	5.2	--	122.5	10.5	--	--	--	--	--	101.3	82.7%	12.5	2.0	130	36.7
D1-D2	Cover soil	30.0	62.6	7.4	5% Pit Run ZC	124.0	9.5	--	--	--	--	--	103.1	83.1%	13.0	3.5	270	36.2
September-October 2007 Samples: Possible subgrade improvement samples																		
Mix 1	Trench 12 material	37	55	8	5% IMVite 1016	127.5	8.0	114.5	89.8%	8.1	0.1	1.15E-05						
Mix 2	Trench 12 material	38	51	11	10% IMVite 1016	127.5	8.5	114.9	90.1%	8.5	0.0	6.32E-06						
Mix 3	Trench 12 material	45	41	14	15% IMVite 1016	124.5	9.0	112.7	90.5%	7.5	(1.5)	5.54E-06						
Mix 4	Trench 12 material	46	42	12	10% SEP/SAP	124.0	9.5	113.0	91.1%	9.1	(0.4)	6.13E-06						
Mix 5	Trench 12 material	45	39	16	15% SEP/SAP	122.0	10.0	110.7	90.7%	9.8	(0.2)	6.24E-06						
Mix 6	Trench 12 material	47	45.5	7.5	5% Portland Cement	128.0	7.5	115.5	90.2%	7.3	(0.2)	6.68E-07						
Mix 7	Trench 12 material	42	50.2	7.8	5% SEP/SAP	127.0	8.0	114.5	90.2%	8.0	0.0	8.34E-06						

NOTES Values are not corrected for the presence of over-size materials

-- Indicates that the test was not run on this sample.

IMVite 1016 and SEP/SAP are clay products of IMV Nevada, Amargosa Valley NV

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	42	50	8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100		
3/4 in.	95		
1/2 in.	85		
3/8 in.	77		
#4	58		
#8	41		
#16	30		
#30	21		
#50	15		
#100	10		
#200	7.8		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 12.7 D_{60}= 5.12 D_{50}= 3.50
D_{30}= 1.18 D_{15}= 0.300 D_{10}= 0.150
C_u= 34.12 C_c= 1.81

Classification

USCS= AASHTO=

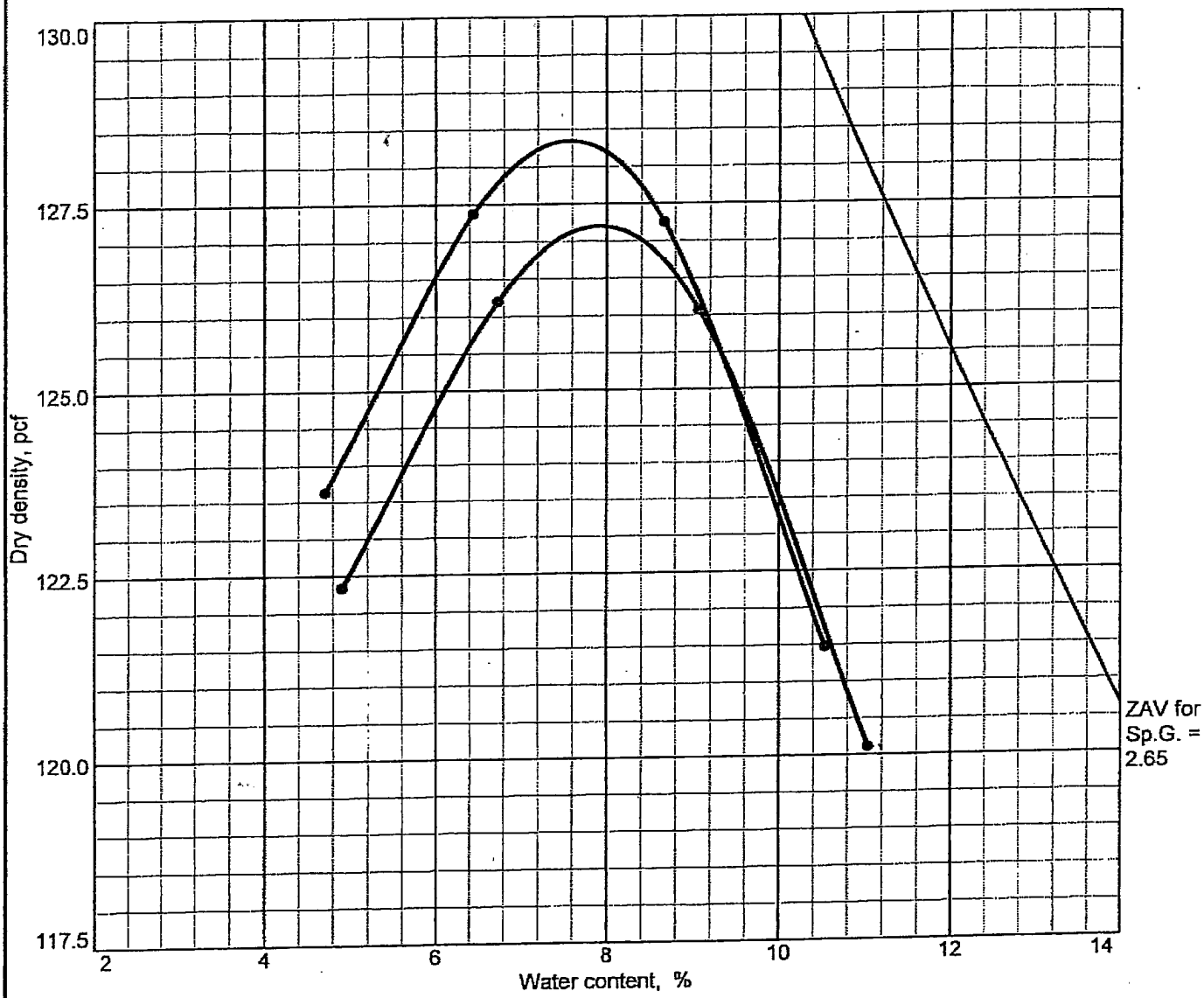
Remarks

Sample No.: 07-0852 **Source of Sample:** Native **Date:** 11/7/2007
Location: Trench 12 Material Mixed w/5% SEP/SAP MIX 7 **Elev./Depth:**

J.A. CESARE AND ASSOCIATES, INC.
Geotechnical Engineering Consultants

Client: U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
Project No: 07.1243 **Figure** 07-0852

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Procedure C Modified
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
				2.48				7.8

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 128.5 pcf	127 pcf	
Optimum moisture = 7.5 %	8 %	

Project No. 07.1243 **Client:** U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
• **Location:** Trench 12 Material Mixed w/5% SEP/SAP MIX 7

Remarks:

COMPACTION TEST REPORT

JOSEPH A. CESARE AND ASSOCIATES, INC.

Figure 07-0852

Converse Consultants
Geotechnical Engineering and Environmental Sciences

222 Huntington Rd. Suite 211
Monrovia - California 91016
Telephone: (626) 930 1200
Facsimile:(626) 930 1212

Project Number :07-1243
Report to : JA Cesar
Attention : Joshua Williams
Sample Identification : 07-0852
Sample description: Trench 12 Material w/5% SEP/SAP

Project Name: US Ecology Testing
Date Received: 11
Date of Report : 12/11/2007
Reported By: Juan L. Martinez

MIX 7

OBS: Test performed on material passing #4, compacted 90% of the uncorrected maximum dry density

PERMEABILITY OF FINE GRAINED SOILS

ASTM D 5084, "Measurement of Hydraulic Conductivity of Saturated Porous Materials using a Flexible Wall Permeameter" Method A

					Average
Initial Height of Sample (inches):	4.012	4.018	4.022	4.011	4.016
Final Height of Sample (inches):					
Initial Diameter of Sample (inches):	2.409	2.402	2.411	2.402	2.402
Final Diameter of Sample (inches):					

Area of Sample [3.1416 x B^2 / 4]:	4.531	in^2
Area of Sample [C x 6.452]:	29.234	cm^2
Cell Pressure:	25	psi
Upper Cap Pressure:	23	psi
Lower Cap Pressure:	22	psi
Loss of Head [(F - G) / 0.036 x 2.54]:	70.56	cm
Maximum Dry Density:	127	lbs/ft^3
Optimum % Moisture:	8.0 %	
Weight of Sample:	590.7	grams
Sample % Moisture:	8.0 %	
Dry Density [K/(AxC)x3.8095x(1+L/100)]:	114.5	lbs/ft^3
Sample % Compaction [M/Ix100]:	90.2 %	

	#1	#2	#3	#4	#5
Initial Inlet Burette Reading:	0.1	0.1	0.1	0.1	
Final Inlet Burette Reading:	22.6	23.2	22.0	20.4	
Initial Outlet Burette Reading:	24.0	24.0	24.0	24.0	
Final Outlet Burette Reading:	1.5	0.8	2.3	3.3	
Initial Reading Time:	5:23:00 AM	9:14:00 AM	1:02:00 PM	5:30:00 AM	
Final Reading Time:	9:14:00 AM	1:02:00 PM	4:34:00 PM	8:56:00 AM	
Elapsed Time [T-S] (H:M:S):	3:51:00	3:48:00	3:32:00	3:26:00	
Elapsed Time (seconds)	13860	13680	12720	12360	
Inlet Flow [P-O]:	22.5	23.1	21.9	20.3	
Outlet Flow [R-Q] (should be ± 5 % of W):	22.5	23.2	21.7	20.7	
Temperature (°C):	19.1	19.8	20.5	19.6	
Correction Factor [-0.02452 x Y + 1.495]:	1.02667	1.0095	0.99234	1.01441	
Permeability [(A x W x 2.54) / (D x H x V) x Z]:	8.241 E-06	8.429 E-06	8.448 E-06	8.238 E-06	

Average Permeability (cm/s): 8.339 E-06 cm/s

Summary of Soil Testing Results for Trench 12 Samples

Sample Number	Material	Grain Size (% by weight)			Amendment	ASTM D1557 Maximum Dry Density (pcf) (see Note 1)	ASTM D1557 Optimum Moisuture Content (%)	Hydraulic Conductivity Sample Properties				Hydraulic Conductivity (cm/sec)	Direct Shear Test Sample Properties				Cohesion (psf)	Friction Angle (degrees)
		Gravel	Sand	Silt/Clay				Dry Density (psf)	% MDD	Moisture Content (%)	Difference from OMC % + or (-)		Dry Density (psf)	% MDD	Moisture Content (%)	Difference from OMC % + or (-)		
June-July 2007 Samples: Trench 12 samples for various trench construction objectives (subgrade, sump gravel, surface soil improvement, and final cover)																		
Zeolite clay (ZC)	Imported fines	24.0	23.0	53.0	--													
A1	Subgrade	31.0	59.7	9.3	--	120.5	11.0	123.4	102.4%	9.3	(1.7)	3.90E-07	--	--	--	--	--	--
A2	Subgrade	29.0	69.0	2.0	--	114.5	6.0	117.0	102.2%	6.1	0.1	2.60E-04	--	--	--	--	--	--
A2	Subgrade	47.0	48.1	4.9	5% Pit Run ZC	106.0	7.0	106.5	100.5%	6.8	(0.2)	5.30E-04	--	--	--	--	--	--
A3	Subgrade	21.0	74.8	4.2	--	120.0	10.0	119.3	99.4%	10.4	0.4	5.55E-04	--	--	--	--	--	--
B1	Gravel	97.0	2.6	0.4	--	--	--	88.3 (wet)	--	--	--	1.7	--	--	--	--	--	--
B1	Gravel	98.0	1.6	0.4	--	--	--	88.1 (wet)	--	--	--	2.1	--	--	--	--	--	--
C1	Surface soil	14.0	76.7	9.3	--	115.0	9.5	--	--	--	--	--	110.9	96.5%	8.7	(0.8)	420	32.8
C2	Surface soil	20.0	70.9	9.1	--	119.0	10.0	--	--	--	--	--	114.2	95.9%	8.4	(1.6)	320	39.9
C1-C2	Surface soil	17.0	72.0	11.0	5% Pit Run ZC	118.0	10.0	--	--	--	--	--	112.9	95.6%	10.4	0.4	320	41.1
D1	Cover soil	22.0	74.7	3.3	--	118.5	12.0	--	--	--	--	--	100.8	85.1%	15.1	3.1	210	34.5
D2	Cover soil	26.0	68.8	5.2	--	122.5	10.5	--	--	--	--	--	101.3	82.7%	12.5	2.0	130	36.7
D1-D2	Cover soil	30.0	62.6	7.4	5% Pit Run ZC	124.0	9.5	--	--	--	--	--	103.1	83.1%	13.0	3.5	270	36.2
September-October 2007 Samples: Possible subgrade improvement samples																		
Mix 1	Trench 12 material	37	55	8	5% IMVite 1016	127.5	8.0	114.5	89.8%	8.1	0.1	1.15E-05						
Mix 2	Trench 12 material	38	51	11	10% IMVite 1016	127.5	8.5	114.9	90.1%	8.5	0.0	6.32E-06						
Mix 3	Trench 12 material	45	41	14	15% IMVite 1016	124.5	9.0	112.7	90.5%	7.5	(1.5)	5.54E-06						
Mix 4	Trench 12 material	46	42	12	10% SEP/SAP	124.0	9.5	113.0	91.1%	9.1	(0.4)	6.13E-06						
Mix 5	Trench 12 material	45	39	16	15% SEP/SAP	122.0	10.0	110.7	90.7%	9.8	(0.2)	6.24E-06						
Mix 6	Trench 12 material	47	45.5	7.5	5% Portland Cement	128.0	7.5	115.5	90.2%	7.3	(0.2)	6.68E-07						
Mix 7	Trench 12 material	42	50.2	7.8	5% SEP/SAP	127.0	8.0	114.5	90.2%	8.0	0.0	8.34E-06						

NOTES Values are not corrected for the presence of over-size materials

-- Indicates that the test was not run on this sample.

IMVite 1016 and SEP/SAP are clay products of IMV Nevada, Amargosa Valley NV

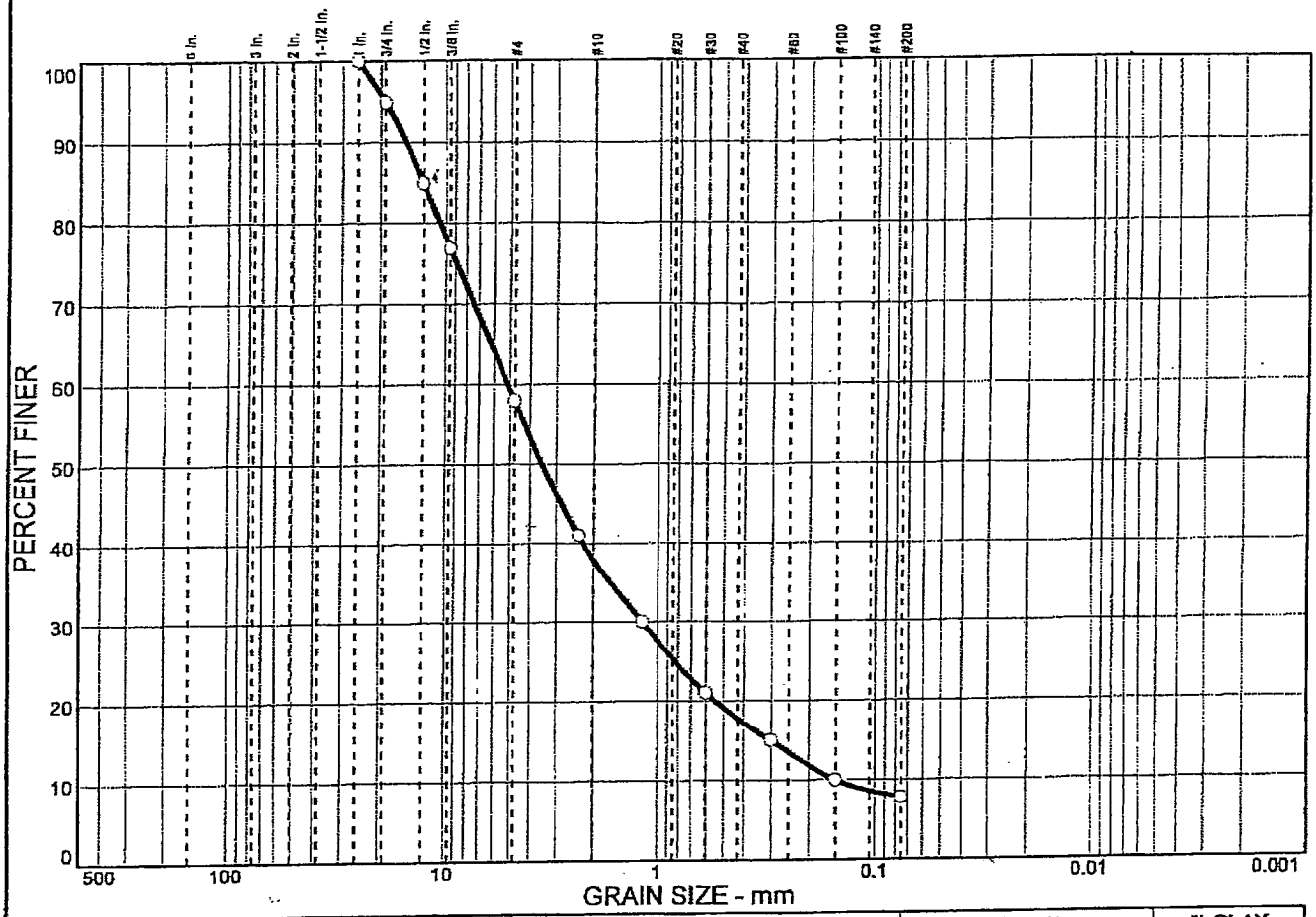
10. SITE ACCESSIBILITY

Trench 12 construction under the Final Design is not expected to have any effect on the LLRW area south of the fence marking the boundary between that area and Area C. Access along the south side of Trench 12 will be temporarily limited during trench excavation and liner construction. Passenger vehicle, light truck, or personnel access to the perimeter of Area C and the adjoining LLRW area will not be prevented by Trench 12 operation (except as access to all areas of the hazardous waste disposal facility is carefully controlled by USEN).

The interior fence between Area C and the LLRW area might be temporarily removed during Trench 12 construction. Security for Area C and the remainder of the USEN facility and for the LLRW area will be maintained during Trench 12 construction by a combination of permanent and temporarily relocated perimeter fencing and the presence of USEN and security service personnel.

In the Final Design, a corridor that is about 15-feet wide will remain between the toe of the final Trench 12 cover and the toe of the LLRW area cover. This dimension is sufficient for vehicular access along the boundary between the LLRW site and Area C, and also is sufficient for permanent routing of surface-water runoff originating on the adjoining portions of both sites.

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	42	50	8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100		
3/4 in.	95		
1/2 in.	85		
3/8 in.	77		
#4	58		
#8	41		
#16	30		
#30	21		
#50	15		
#100	10		
#200	7.8		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 12.7 D_{60}= 5.12 D_{50}= 3.50
D_{30}= 1.18 D_{15}= 0.300 D_{10}= 0.150
C_u= 34.12 C_c= 1.81

Classification

USCS= AASHTO=

Remarks

Sample No.: 07-0852 **Source of Sample:** Native **Date:** 11/7/2007
Location: Trench 12 Material Mixed w/5% SEP/SAP MIX 7 **Elev./Depth:**

JACESARE AND ASSOCIATES, INC.
Geotechnical Engineering Consultants

Client: U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
Project No: 07.1243 **Figure** 07-0852

11. REFERENCES

CETCO, 2007, product information available at www.cetco.com.

Grant Environmental. Geotechnical Investigation for Cell 12 at the US Ecology Hazardous Waste Management Facility, Beatty, Nevada. July 14, 1994.

Gundle SLT Environmental, 2007, product information available at www.gseworld.com.

HMA Environmental, 1996, Response to Notice of Deficiency for the Trench 12 Design Report, US Ecology, Beatty, Nevada, Facility.

HMA Environmental, 1997, Response to Verbal Comments, US Ecology, Inc. Beatty, Nevada, Facility.

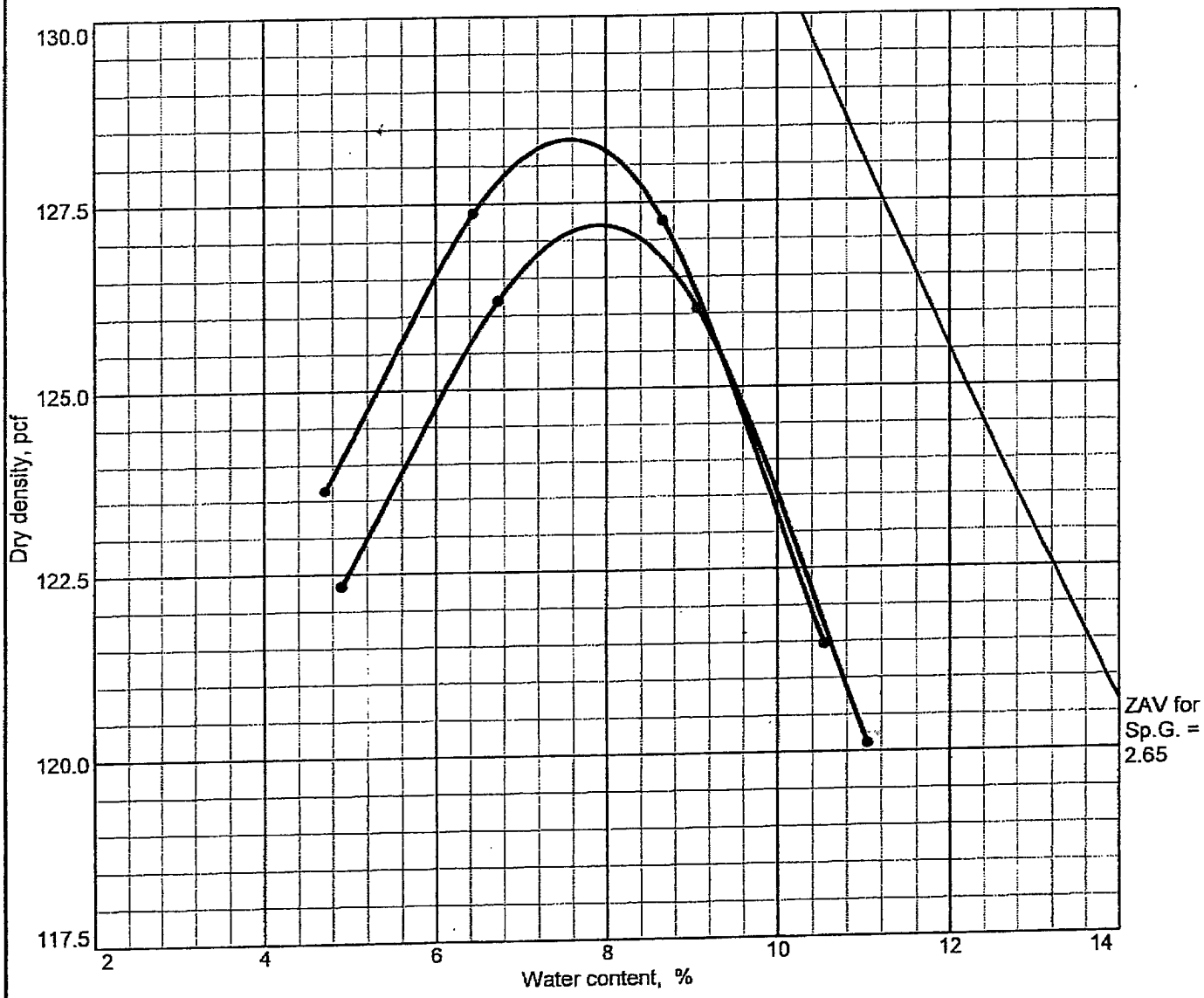
National Oceanic and Atmospheric Administration. Atlas 2, Precipitation Frequency Atlas of the Western United States, Volume VII- Nevada. 1973.

Nevada Division of Environmental Protection. Letter to US Ecology, Inc. regarding "US Ecology, Inc. - Beatty, Nevada Facility, Renewal Application - Trench 12 Design Problems." September 22, 1995.

TRC Environmental Solutions, March 1996, "Cell 12 Design Report," Volumes I and II, Prepared for USEN.

US Ecology, Inc. Section IV.D Landfill Report, US Ecology, Inc., Beatty, Nevada. Revision 3. August 1, 1994.

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Procedure C Modified
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
				2.48				7.8

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 128.5 pcf	127 pcf	
Optimum moisture = 7.5 %	8 %	

Project No. 07.1243 **Client:** U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113

● **Location:** Trench 12 Material Mixed w/5% SEP/SAP MIX 7

Remarks:

COMPACTION TEST REPORT

JOSEPH A. CESARE AND ASSOCIATES, INC.

Figure 07-0852

Converse Consultants
Geotechnical Engineering and Environmental Sciences

222 Huntington Rd. Suite 211
Monrovia - California 91016
Telephone: (626) 930 1200
Facsimile:(626) 930 1212

Project Number :07-1243
Report to : JA Cesar
Attention : Joshua Williams
Sample Identification : 07-0852
Sample description: Trench 12 Material w/5% SEP/SAP

Project Name: US Ecology Testing
Date Received: 11
Date of Report : 12/11/2007
Reported By: Juan L. Martinez

MIX 7

OBS: Test performed on material passing #4, compacted 90% of the uncorrected maximum dry density

PERMEABILITY OF FINE GRAINED SOILS

ASTM D 5084, "Measurement of Hydraulic Conductivity of Saturated Porous Materials using a Flexible Wall Permeameter" Method A

					Average
Initial Height of Sample (inches):	4.012	4.018	4.022	4.011	4.016
Final Height of Sample (inches):					
Initial Diameter of Sample (inches):	2.409	2.402	2.411	2.402	2.402
Final Diameter of Sample (inches):					

Area of Sample [3.1416 x B^2 / 4]:	4.531	in^2
Area of Sample [C x 6.452]:	29.234	cm^2
Cell Pressure:	25	psi
Upper Cap Pressure:	23	psi
Lower Cap Pressure:	22	psi
Loss of Head [(F - G) / 0.036 x 2.54]:	70.56	cm
Maximum Dry Density:	127	lbs/ft^3
Optimum % Moisture:	8.0 %	
Weight of Sample:	590.7	grams
Sample % Moisture:	8.0 %	
Dry Density [K/(AxC)x3.8095x(1+L/100)]:	114.5	lbs/ft^3
Sample % Compaction [M/Ix100]:	90.2 %	

	#1	#2	#3	#4	#5
Initial Inlet Burette Reading:	0.1	0.1	0.1	0.1	
Final Inlet Burette Reading:	22.6	23.2	22.0	20.4	
Initial Outlet Burette Reading:	24.0	24.0	24.0	24.0	
Final Outlet Burette Reading:	1.5	0.8	2.3	3.3	
Initial Reading Time:	5:23:00 AM	9:14:00 AM	1:02:00 PM	5:30:00 AM	
Final Reading Time:	9:14:00 AM	1:02:00 PM	4:34:00 PM	8:56:00 AM	
Elapsed Time [T-S] (H:M:S):	3:51:00	3:48:00	3:32:00	3:26:00	
Elapsed Time (seconds)	13860	13680	12720	12360	
Inlet Flow [P-O]:	22.5	23.1	21.9	20.3	
Outlet Flow [R-Q] (should be * 5 % of W):	22.5	23.2	21.7	20.7	
Temperature (°C):	19.1	19.8	20.5	19.6	
Correction Factor [-0.02452 x Y + 1.495]:	1.02667	1.0095	0.99234	1.01441	
Permeability [(A x W x 2.54) / (D x H x V) x Z]:	8.241 E-06	8.429 E-06	8.448 E-06	8.238 E-06	

Average Permeability (cm/s): 8.339 E-06 cm/s

AquAeTer

optimizing
environmental resources | water, air, earth

7340 E. Caley Avenue, Ste 200 • Centennial, CO 80111 • Phone (303) 771-9150 • Fax (303) 771-8776

October 30, 2007

073113

RCRA Permitting Branch Supervisor
Bureau of Waste Management
Nevada Division of Environmental Protection
901 S. Stewart Street, Suite 4001
Carson City, NV 89701-5249

RECEIVED
NOV - 5 2007
US ECOLOGY NEVADA

Attn: Mr. Sree Kailash, CEM, P.E.

RE: Additional Trench 12 Soil Testing Results
US Ecology Nevada, Inc., Beatty NV
EPA ID# NVT330010000, Permit No: NEVHW0019

Dear Mr. Kailash:

Please insert the enclosed pages into Attachment 1, Trench 12 Soil Testing Results, in the copies of the Landfill Report that were provided to you in our recent (October 10th) meeting in Carson City. These pages are the results of hydraulic conductivity testing of six different mixtures of local clay or Portland cement with natural Trench 12 soil samples. Also enclosed is a revised version of the table at the beginning of Attachment 1, "Summary of Soil Testing Results for Trench 12 Samples." As the summary table and laboratory results indicate, each mixture tested provides a hydraulic conductivity that is less than the 1×10^{-5} cm/sec requirement for the Trench 12 subgrade. Based on these results, US Ecology Nevada expects to incorporate the following details into its plan for Trench 12 construction.

Trench liner subgrade beneath LCRS Sumps: Construct the 36-inch thick liner subgrade by creating a soil cement mixture comprised of 5.0 percent Portland cement, by weight (dry), and 95 percent, by weight (dry), of native soil satisfying the gradation requirements of Section 2.2 of Appendix B to the Construction Quality Assurance Plan for Trench 12 (Attachment 4 to the October 2007 Landfill Report). The mixture will be placed and compacted to satisfy the specifications included in Section 2.2.

Trench liner subgrade, except beneath LCRS Sumps: Construct the 9-inch thick liner subgrade by mixing a select soil amendment with native soil satisfying the gradation requirements of Section 2.2 of Appendix B to the Construction Quality Assurance Plan for Trench 12 (Attachment 4 to the October 2007 Landfill Report). The select soil amendment will be sepiolite/saponite (SEP/SAP) fines (a product of IMV Nevada, Amargosa Valley, NV)

comprising 5.0 percent, by weight (dry) of the native soil/clay mixture. The mixture will be placed and compacted to satisfy the specifications included in Section 2.2.

Hydraulic conductivity testing of the 5.0 percent SEP/SAP mixture has not been completed. However, based on the results of testing of other SEP/SAP mixtures, US Ecology Nevada is confident that the 5.0 percent SEP/SAP mixture will provide a satisfactory hydraulic conductivity. The results of the testing of this mixture will be provided to NDEP as soon as possible.

Please contact us if you have any questions with regard to these soil testing results.

Sincerely,

AquAeTer, Inc.

Stephen L. Wampler, P.E.
Project Engineer

cc: Mr. Robert Marchand, US Ecology Nevada, Inc.
Mr. Simon Bell, American Ecology, Inc.

Summary of Soil Testing Results for Trench 12 Samples

Sample Number	Material	Grain Size (% by weight)			Amendment	ASTM D1557 Maximum Dry Density (pcf) (see Note 1)	ASTM D1557 Optimum Moisture Content (%)	Hydraulic Conductivity Sample Properties				Hydraulic Conductivity (cm/sec)	Direct Shear Test Sample Properties				Cohesion (psf)	Friction Angle (degrees)
		Gravel	Sand	Silt/Clay				Dry Density (psf)	% MDD	Moisture Content (%)	Difference from OMC % + or (-)		Dry Density (psf)	% MDD	Moisture Content (%)	Difference from OMC % + or (-)		
June-July 2007 Samples: Trench 12 samples for various trench construction objectives (subgrade, sump gravel, surface soil improvement, and final cover)																		
Zeolite clay (ZC)	Imported fines	24.0	23.0	53.0	--													
A1	Subgrade	31.0	59.7	9.3	--	120.5	11.0	123.4	102.4%	9.3	(1.7)	3.90E-07	--	--	--	--	--	--
A2	Subgrade	29.0	69.0	2.0	--	114.5	6.0	117.0	102.2%	6.1	0.1	2.60E-04	--	--	--	--	--	--
A2	Subgrade	47.0	48.1	4.9	5% Pit Run ZC	106.0	7.0	106.5	100.5%	6.8	(0.2)	5.30E-04	--	--	--	--	--	--
A3	Subgrade	21.0	74.8	4.2	--	120.0	10.0	119.3	99.4%	10.4	0.4	5.55E-04	--	--	--	--	--	--
B1	Gravel	97.0	2.6	0.4	--	--	--	88.3 (wet)	--	--	--	1.7	--	--	--	--	--	--
B1	Gravel	98.0	1.6	0.4	--	--	--	88.1 (wet)	--	--	--	2.1	--	--	--	--	--	--
C1	Surface soil	14.0	76.7	9.3	--	115.0	9.5	--	--	--	--	--	110.9	96.5%	8.7	(0.8)	420	32.8
C2	Surface soil	20.0	70.9	9.1	--	119.0	10.0	--	--	--	--	--	114.2	95.9%	8.4	(1.6)	320	39.9
C1-C2	Surface soil	17.0	72.0	11.0	5% Pit Run ZC	118.0	10.0	--	--	--	--	--	112.9	95.6%	10.4	0.4	320	41.1
D1	Cover soil	22.0	74.7	3.3	--	118.5	12.0	--	--	--	--	--	100.8	85.1%	15.1	3.1	210	34.5
D2	Cover soil	26.0	68.8	5.2	--	122.5	10.5	--	--	--	--	--	101.3	82.7%	12.5	2.0	130	36.7
D1-D2	Cover soil	30.0	62.6	7.4	5% Pit Run ZC	124.0	9.5	--	--	--	--	--	103.1	83.1%	13.0	3.5	270	36.2
September-October 2007 Samples: Possible subgrade improvement samples																		
Mix 1	Trench 12 material	37	55	8	5% IMVite 1016	127.5	8.0	114.5	89.8%	8.1	0.1	1.15E-05						
Mix 2	Trench 12 material	38	51	11	10% IMVite 1016	127.5	8.5	114.9	90.1%	8.5	0.0	6.32E-06						
Mix 3	Trench 12 material	45	41	14	15% IMVite 1016	124.5	9.0	112.7	90.5%	7.5	(1.5)	5.54E-06						
Mix 4	Trench 12 material	46	42	12	10% SEP/SAP	124.0	9.5	113.0	91.1%	9.1	(0.4)	6.13E-06						
Mix 5	Trench 12 material	45	39	16	15% SEP/SAP	122.0	10.0	110.7	90.7%	9.8	(0.2)	6.24E-06						
Mix 6	Trench 12 material	47	45.5	7.5	5% Portland Cement	128.0	7.5	115.5	90.2%	7.3	(0.2)	6.68E-07						

NOTES Values are not corrected for the presence of over-size materials

-- Indicates that the test was not run on this sample.

IMVite 1016 and SEP/SAP are clay products of IMV Nevada, Amargosa Valley NV

Converse Consultants
Geotechnical Engineering and Environmental Sciences

222 Huntington Rd. Suite 211
Monrovia - California 91016
Telephone: (626) 930 1200
Facsimile:(626) 930 1212

Project Number :07-33102-01
Report to :
Attention :
Sample Identification : 07-07705A (#8289)
Sample description: Trench #12 Material mixed w/ 5% Invite 1016

Project Name: U.S. Ecology NV
Date Received: 1'
Date of Report :
Reported By: *Juan L. Martinez*

OBS: Test performed on material passing #4, compacted 90% of the uncorrected Maximum dry density

PERMEABILITY OF FINE GRAINED SOILS

ASTM D 5084, "Measurement of Hydraulic Conductivity of Saturated Porous Materials using a Flexible Wall Permeameter" Method A

			Average
Initial Height of Sample (inches):	4.000		4.000
Final Height of Sample (inches):	4.000		4.000
Initial Diameter of Sample (inches):	2.400		2.402
Final Diameter of Sample (inches):	2.400		2.400
Area of Sample [3.1416 x B^2 / 4]:	4.531	in^2	
Area of Sample [C x 6.452]:	29.234	cm^2	
Cell Pressure:	30	psi	
Upper Cap Pressure:	27	psi	
Lower Cap Pressure:	26.2	psi	
Loss of Head [(F - G) / 0.036 x 2.54]:	56.44	cm	
Maximum Dry Density:	127.5	lbs/ft^3	
Optimum % Moisture:	8.0 %		
Weight of Sample:	588.9	grams	
Sample % Moisture:	8.1 %		
Dry Density [K/(AxC)x3.8095x(1+L/100)]:	114.5	lbs/ft^3	
Sample % Compaction [M/Ix100]:	89.8 %		

	#1	#2	#3	#4	#5
Initial Inlet Burette Reading:	0.1	0.1	0.1	0.1	
Final Inlet Burette Reading:	18.5	19.1	19.9	15.6	
Initial Outlet Burette Reading:	24.0	24.0	24.0	24.0	
Final Outlet Burette Reading:	5.5	5.1	4.3	8.4	
Initial Reading Time:	4:38:00 AM	7:59:00 AM	11:39:00 AM	3:10:00 PM	
Final Reading Time:	7:45:00 AM	11:15 AM	2:45:00 PM	5:00:00 PM	
Elapsed Time [T-S] (H:M:S):	3:07:00	3:16:00	3:06:00	1:50:00	
Elapsed Time (seconds)	11220	11760	11160	6600	
Inlet Flow [P-O]:	18.4	19.0	19.8	15.5	
Outlet Flow [R-Q] (should be * 5 % of W):	18.5	18.9	19.7	15.6	
Temperature (°C):	20.1	20.1	19.5	19.5	
Correction Factor [-0.02452 x Y + 1.495]:	1.00215	1.00215	1.01686	1.01686	
Permeability [(A x W x 2.54) / (D x H x V) x Z]:	1.012 E-05	9.970 E-06	1.111 E-05	1.471 E-05	

Average Permeability (cm/s): 1.148 E-05 cm/s

Converse Consultants
Geotechnical Engineering and Environmental Sciences

222 Huntington Rd. Suite 211
Monrovia - California 91016
Telephone: (626) 930 1200
Facsimile:(626) 930 1212

Project Number :07-33102-01
Project Name: U.S. Ecology NV
Report to :
Date Received: 1
Attention :
Date of Report :
Sample Identification : 07-07705B (#8290)
Reported By: *Juan L. Martinez*
Sample description: Trench #12 Material mixed w/ 10% Invile 1016
OBS: Test performed on material passing #4, compacted 90% of the uncorrected Maximum dry density

PERMEABILITY OF FINE GRAINED SOILS

ASTM D 5084, "Measurement of Hydraulic Conductivity of Saturated Porous Materials using a Flexible Wall Permeameter" Method A

			Average
Initial Height of Sample (inches):	4.000		4.000
Final Height of Sample (inches):	4.000		4.000
Initial Diameter of Sample (inches):	2.400		2.402
Final Diameter of Sample (inches):	2.400		2.400
Area of Sample [3.1416 x B^2 / 4]:	4.531	in^2	
Area of Sample [C x 6.452]:	29.234	cm^2	
Cell Pressure:	30	psi	
Upper Cap Pressure:	27	psi	
Lower Cap Pressure:	26.2	psi	
Loss of Head [(F - G) / 0.036 x 2.54]:	56.44	cm	
Maximum Dry Density:	127.5	lbs/ft^3	
Optimum % Moisture:	8.5 %		
Weight of Sample:	589.5	grams	
Sample % Moisture:	8.5 %		
Dry Density [K/(AxC)x3.8095x(1+L/100)]:	114.9	lbs/ft^3	
Sample % Compaction [M/Ix100]:	90.1%		

	#1	#2	#3	#4	#5
Initial Inlet Burette Reading:	0.1	0.1	0.1	0.1	
Final Inlet Burette Reading:	15.6	16.3	15.2	15.8	
Initial Outlet Burette Reading:	24.0	24.0	24.0	24.0	
Final Outlet Burette Reading:	8.3	7.3	7.8	9.2	
Initial Reading Time:	4:36:00 AM	7:45:00 AM	11:35:00 AM	3:10:00 PM	
Final Reading Time:	7:45:00 AM	11:15:00 AM	2:55:00 PM	6:32:00 PM	
Elapsed Time [T-S] (H:M:S	3:09:00	3:30:00	3:20:00	3:22:00	
Elapsed Time (seconds)	11340	12600	12000	12120	
Inlet Flow [P-O]:	18.4	19.0	19.8	15.5	
Outlet Flow [R-Q] (should be * 5 % of W):	18.5	18.9	19.7	15.6	
Temperature (°C):	20.9	20.1	19.9	19.5	
Correction Factor [-0.02452 x Y + 1.495]:	0.98253	1.00215	1.00705	1.01686	
Permeability [(A x W x 2.54) / (D x H x V) x Z]	5.471 E-06	6.125 E-06	6.193 E-06	6.471 E-06	

Average Permeability (cm/s): 6.315 E-06 cm/s

Converse Consultants
Geotechnical Engineering and Environmental Sciences

222 Huntington Rd. Suite 211
Monrovia - California 91016
Telephone: (626) 930 1200
Facsimile:(626) 930 1212

Project Number :07-33102-01
Report to :
Attention :
Sample Identification : 07-07705C (#8291)
Sample description: Trench #12 Material mixed w/ 15% Invite

Project Name: U.S. Ecology NV
Date Received: 1·
Date of Report :
Reported By: *Juan L. Martinez*

OBS: Test performed on material passing #4, compacted 90% of the uncorrected Maximum dry density

PERMEABILITY OF FINE GRAINED SOILS

ASTM D 5084, "Measurement of Hydraulic Conductivity of Saturated Porous Materials using a Flexible Wall Permeameter" Method A

			Average
Initial Height of Sample (inches):	4.000		4.000
Final Height of Sample (inches):	4.000		4.000
Initial Diameter of Sample (inches):	2.400		2.402
Final Diameter of Sample (inches):	2.400		2.400
Area of Sample [3.1416 x B^2 / 4]:	4.531	in^2	
Area of Sample [C x 6.452]:	29.234	cm^2	
Cell Pressure:	30	psi	
Upper Cap Pressure:	27	psi	
Lower Cap Pressure:	26	psi	
Loss of Head [(F - G) / 0.036 x 2.54]:	70.56	cm	
Maximum Dry Density:	124.5	lbs/ft^3	
Optimum % Moisture:	9.0 %		
Weight of Sample:	576.4	grams	
Sample % Moisture:	7.5 %		
Dry Density [K/(AxC)x3.8095x(1+L/100)]:	112.7	lbs/ft^3	
Sample % Compaction [M/Ix100]:	90.5 %		

	#1	#2	#3	#4	#5
Initial Inlet Burette Reading:	0.1	0.1	0.1	0.1	
Final Inlet Burette Reading:	11.7	12.1	12.2	10.2	
Initial Outlet Burette Reading:	24.0	24.0	24.0	24.0	
Final Outlet Burette Reading:	12.5	12.3	12.0	13.6	
Initial Reading Time:	4:35:00 AM	7:55:00 AM	11:30:00 AM	3:00:00 PM	
Final Reading Time:	7:45:00 AM	11:15 AM	2:45:00 PM	5:00:00 PM	
Elapsed Time [T-S] (H:M:S):	3:10:00	3:20:00	3:15:00	2:00:00	
Elapsed Time (seconds)	11400	12000	11700	7200	
Inlet Flow [P-O]:	11.6	12.0	12.1	10.1	
Outlet Flow [R-Q] (should be " 5 % of W):	11.5	11.7	12.0	10.4	
Temperature (°C):	20.1	20.1	19.5	19.5	
Correction Factor [-0.02452 x Y + 1.495]:	1.00215	1.00215	1.01686	1.01686	
Permeability [(A x W x 2.54) / (D x H x V) x Z]:	5.023 E-06	4.936 E-06	5.180 E-06	7.026 E-06	

Average Permeability (cm/s): 5.541 E-06 cm/s

Converse Consultants
Geotechnical Engineering and Environmental Sciences

222 Huntington Rd. Suite 211
Monrovia - California 91016
Telephone: (626) 930 1200
Facsimile:(626) 930 1212

Project Number :07-33102-01
Report to :
Attention :
Sample Identification : 07-07705D (#8292)
Sample description: Trench #12 Material mixed w/ 10% SEP/SAP

Project Name: U.S. Ecology NV
Date Received: 1·
Date of Report :
Reported By: *Juan L. Martinez*

OBS: Test performed on material passing #4, compacted 90% of the uncorrected Maximum dry density

PERMEABILITY OF FINE GRAINED SOILS

ASTM D 5084, "Measurement of Hydraulic Conductivity of Saturated Porous Materials using a Flexible Wall Permeameter" Method A

			Average
Initial Height of Sample (inches):	4.000		4.000
Final Height of Sample (inches):	4.000		4.000
Initial Diameter of Sample (inches):	2.400		2.402
Final Diameter of Sample (inches):	2.400		2.400
Area of Sample [3.1416 x B^2 / 4]:	4.531	in^2	
Area of Sample [C x 6.452]:	29.234	cm^2	
Cell Pressure:	30	psi	
Upper Cap Pressure:	27	psi	
Lower Cap Pressure:	26	psi	
Loss of Head [(F - G) / 0.036 x 2.54]:	70.56	cm	
Maximum Dry Density:	124	lbs/ft^3	
Optimum % Moisture:	9.5 %		
Weight of Sample:	586.4	grams	
Sample % Moisture:	9.1 %		
Dry Density [K/(AxC)x3.8095x(1+L/100)]:	113.0	lbs/ft^3	
Sample % Compaction [M/Ix100]:	91.1 %		

	#1	#2	#3	#4	#5
Initial Inlet Burette Reading:	0.0	0.0	0.0	0.0	
Final Inlet Burette Reading:	15.1	15.5	15.0	15.6	
Initial Outlet Burette Reading:	24.0	24.0	24.0	24.0	
Final Outlet Burette Reading:	9.0	8.4	8.9	8.4	
Initial Reading Time:	5:50:00 AM	9:33:00 AM	1:15:00 PM	6:46:00 AM	
Final Reading Time:	9:15:00 AM	1:00 PM	4:35:00 PM	10:15:00 AM	
Elapsed Time [T-S] (H:M:S):	3:25:00	3:27:00	3:20:00	3:29:00	
Elapsed Time (seconds)	12300	12420	12000	12540	
Inlet Flow [P-O]:	15.1	15.5	15.0	15.6	
Outlet Flow [R-Q] (should be * 5 % of W):	15.0	15.6	15.1	15.6	
Temperature (*C):	20.9	20.1	19.9	19.5	
Correction Factor [-0.02452 x Y + 1.495]:	0.98253	1.00215	1.00705	1.01686	
Permeability [(A x W x 2.54) / (D x H x V) x Z]:	5.937 E-06	6.156 E-06	6.196 E-06	6.227 E-06	

Average Permeability (cm/s): 6.129 E-06 cm/s

Converse Consultants
Geotechnical Engineering and Environmental Sciences

222 Huntington Rd. Suite 211
Monrovia - California 91016
Telephone: (626) 930 1200
Facsimile:(626) 930 1212

Project Number :07-33102-01
Report to :
Attention :
Sample Identification : 07-07705E (#8293)
Sample description: Trench #12 Material mixed w/ 15% SEP/SAP

Project Name: U.S. Ecology NV
Date Received: 1·
Date of Report :
Reported By: *Juan L. Martinez*

OBS: Test performed on material passing #4, compacted 90% of the uncorrected Maximum dry density

PERMEABILITY OF FINE GRAINED SOILS

ASTM D 5084, "Measurement of Hydraulic Conductivity of Saturated Porous Materials using a Flexible Wall Permeameter" Method A

			Average
Initial Height of Sample (inches):	4.000		4.000
Final Height of Sample (inches):	4.000		4.000
Initial Diameter of Sample (inches):	2.400		2.402
Final Diameter of Sample (inches):	2.400		2.400
Area of Sample [3.1416 x B^2 / 4]:	4.531	in^2	
Area of Sample [C x 6.452]:	29.234	cm^2	
Cell Pressure:	30	psi	
Upper Cap Pressure:	27	psi	
Lower Cap Pressure:	26	psi	
Loss of Head [(F - G) / 0.036 x 2.54]:	70.56	cm	
Maximum Dry Density:	122	lbs/ft^3	
Optimum % Moisture:	10.0 %		
Weight of Sample:	578.1	grams	
Sample % Moisture:	9.8 %		
Dry Density [K/(AxC)x3.8095x(1+L/100)]:	110.7	lbs/ft^3	
Sample % Compaction [M/Ix100]:	90.7 %		

	#1	#2	#3	#4	#5
Initial Inlet Burette Reading:	0.0	0.0	0.0	0.0	
Final Inlet Burette Reading:	16.4	15.9	16.9	15.3	
Initial Outlet Burette Reading:	24.0	24.0	24.0	24.0	
Final Outlet Burette Reading:	7.6	8.1	7.1	8.7	
Initial Reading Time:	5:45:00 AM	9:25:00 AM	1:08:00 PM	6:34:00 AM	
Final Reading Time:	9:15:00 AM	12:58 PM	4:34:00 PM	10:14:00 AM	
Elapsed Time [T-S] (H:M:S):	3:30:00	3:33:00	3:26:00	3:40:00	
Elapsed Time (seconds)	12600	12780	12360	13200	
Inlet Flow [P-O]:	16.4	15.9	16.9	15.3	
Outlet Flow [R-Q] (should be ± 5 % of W):	16.4	15.9	16.9	15.3	
Temperature (°C):	21.2	20.1	19.9	19.5	
Correction Factor [-0.02452 x Y + 1.495]:	0.97518	1.00215	1.00705	1.01686	
Permeability [(A x W x 2.54) / (D x H x V) x Z]:	6.248 E-06	6.137 E-06	6.778 E-06	5.802 E-06	

Average Permeability (cm/s): 6.241 E-06 cm/s

Converse Consultants
Geotechnical Engineering and Environmental Sciences

222 Huntington Rd. Suite 211
Monrovia - California 91016
Telephone: (626) 930 1200
Facsimile:(626) 930 1212

Project Number :07-33102-01
Report to :
Attention :
Sample Identification : 07-07705F (#8294)
Sample description: Trench #12 Material mixed w/ 5% of Portland Cement

Project Name: U.S. Ecology NV
Date Received:
Date of Report :
Reported By: *Juan L. Martinez*

OBS: Test performed on material passing #4, compacted 90% of the uncorrected Maximum dry density

PERMEABILITY OF FINE GRAINED SOILS

ASTM D 5084, "Measurement of Hydraulic Conductivity of Saturated Porous Materials using a Flexible Wall Permeameter" Method A

			Average
Initial Height of Sample (inches):	4.000		4.000
Final Height of Sample (inches):	4.000		4.000
Initial Diameter of Sample (inches):	2.400		2.402
Final Diameter of Sample (inches):	2.400		2.400
Area of Sample [3.1416 x B^2 / 4]:	4.531	in^2	
Area of Sample [C x 6.452]:	29.234	cm^2	
Cell Pressure:	40	psi	
Upper Cap Pressure:	38	psi	
Lower Cap Pressure:	36	psi	
Loss of Head [(F - G) / 0.036 x 2.54]:	141.11	cm	
Maximum Dry Density:	128	lbs/ft^3	
Optimum % Moisture:	7.5 %		
Weight of Sample:	589.7	grams	
Sample % Moisture:	7.3 %		
Dry Density [K/(AxC)x3.8095x(1+L/100)]:	115.5	lbs/ft^3	
Sample % Compaction [M/Ix100]:	90.2 %		

	#1	#2	#3	#4	#5
Initial Inlet Burette Reading:	0.0	0.0	0.0	0.0	
Final Inlet Burette Reading:	9.7	9.9	12.5	10.3	
Initial Outlet Burette Reading:	24.0	24.0	24.0	24.0	
Final Outlet Burette Reading:	14.1	14.2	11.4	13.9	
Initial Reading Time:	5:25:00 AM	6:12:00 AM	4:30:00 AM	6:46:00 AM	
Final Reading Time:	3:34:00 PM	4:33:00 PM	4:35:00 PM	5:31:00 PM	
Elapsed Time [T-S] (H:M:S):	10:09:00	10:21:00	12:05:00	10:45:00	
Elapsed Time (seconds)	36540	37260	43500	38700	
Inlet Flow [P-O]:	9.7	9.9	12.5	10.3	
Outlet Flow [R-Q] (should be ± 5 % of W):	9.9	9.8	12.6	10.1	
Temperature (°C):	20.2	20.1	20.1	20.2	
Correction Factor [-0.02452 x Y + 1.495]:	0.9997	1.00215	1.00215	0.9997	
Permeability [(A x W x 2.54) / (D x H x V) x Z]:	6.529 E-07	6.551 E-07	7.087 E-07	6.547 E-07	

Average Permeability (cm/s): 6.679 E-07 cm/s

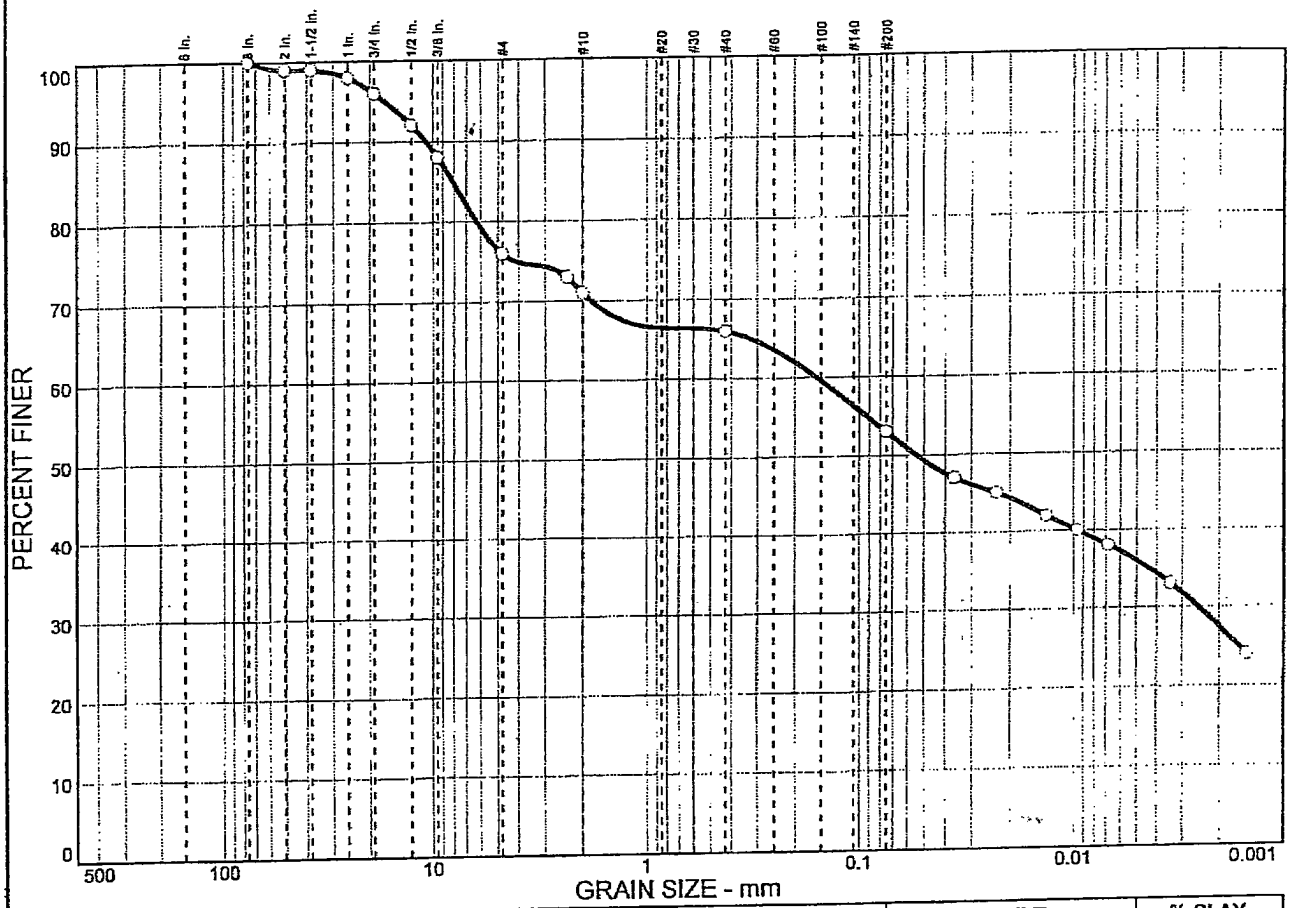
Summary of Soil Testing Results for Trench 12 Samples

Sample Number	Material	Grain Size (% by weight)			Amendment	ASTM D1557 Maximum Dry Density (pcf)	ASTM D1557 Optimum Moisuture Content (%)	Hydraulic Conductivity Sample Properties				Hydraulic Conductivity (cm/sec)	Direct Shear Test Sample Properties				Cohesion (psf)	Friction Angle (degrees)
		Gravel	Sand	Silt/Clay				Dry Density (psf)	% MDD	Moisture Content (%)	Difference from OMC % + or (-)		Dry Density (psf)	% MDD	Moisture Content (%)	Difference from OMC % + or (-)		
June and July 2007 Samples: Trench 12 samples for various trench construction objectives (subgrade, sump gravel, surface soil improvement, and final cover)																		
Zeolite clay (ZC)	Imported fines	24.0	22.0	54.0	--													
A1	Subgrade	31.0	59.7	9.3	--	123.5	9.5	123.4	99.9%	9.3	(0.2)	3.90E-07	--	--	--	--	--	--
A2	Subgrade	29.0	69.0	2.0	--	117.0	5.5	117.0	100.0%	6.1	0.6	2.60E-04	--	--	--	--	--	--
A2	Subgrade	47.0	48.1	4.9	5% Pit Run ZC	110.0	6.0	106.5	96.8%	6.8	0.8	5.30E-04	--	--	--	--	--	--
A3	Subgrade	21.0	74.8	4.2	--	122.5	9.0	119.3	97.4%	10.4	1.4	5.55E-04	--	--	--	--	--	--
B1	Gravel	97.0	2.6	0.4	--	--	--	88.3 (wet)	--	--	--	1.7	--	--	--	--	--	--
B1	Gravel	98.0	1.6	0.4	--	--	--	88.1 (wet)	--	--	--	2.1	--	--	--	--	--	--
C1	Surface soil	14.0	76.7	9.3	--	116.5	9.0	--	--	--	--	--	110.9	95.2%	8.7	(0.3)	420	32.8
C2	Surface soil	20.0	70.9	9.1	--	121.0	9.0	--	--	--	--	--	114.2	94.4%	8.4	(0.6)	320	39.9
C1-C2	Surface soil	17.0	72.0	11.0	5% Pit Run ZC	118.0	10.0	--	--	--	--	--	112.9	95.6%	10.4	0.4	320	41.1
D1	Cover soil	22.0	74.7	3.3	--	121.0	11.0	--	--	--	--	--	100.8	83.3%	15.1	4.1	210	34.5
D2	Cover soil	26.0	68.8	5.2	--	125.0	9.5	--	--	--	--	--	101.3	81.1%	12.5	3.0	130	36.7
D1-D2	Cover soil	30.0	62.6	7.4	5% Pit Run ZC	128.0	8.5	--	--	--	--	--	103.1	80.5%	13.0	4.5	270	36.2
September 2007 Samples: Possible subgrade and/or surface soil improvement samples																		
Mix 1	Trench 12 material	37	55	8	5% IMVite 1016	130.5	7.0											
Mix 2	Trench 12 material	38	51	11	10% IMVite 1016	118.5	7.5											
Mix 3	Trench 12 material	45	41	14	15% IMVite 1016	129.5	7.0											
Mix 4	Trench 12 material	46	42	12	10% SEP/SAP	126.0	8.5											
Mix 5	Trench 12 material	45	39	16	15% SEP/SAP	126.0	8.5											
Mix 6	Trench 12 material	47	45.5	7.5	5% Portland Cement	132.0	6.0											

Shading indicates that testing is incomplete (as of 10-5-07)

Results of Particle Size Analyses

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	24	23	17	36

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100		
2 in.	99		
1-1/2 in.	99		
1 in.	98		
3/4 in.	96		
1/2 in.	92		
3/8 in.	88		
#4	76		
#8	73		
#10	71		
#40	66		
#200	53		

* (no specification provided)

Soil Description

Zeolite Clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 8.09 D_{60}= 0.157 D_{50}= 0.0543
D_{30}= 0.0025 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

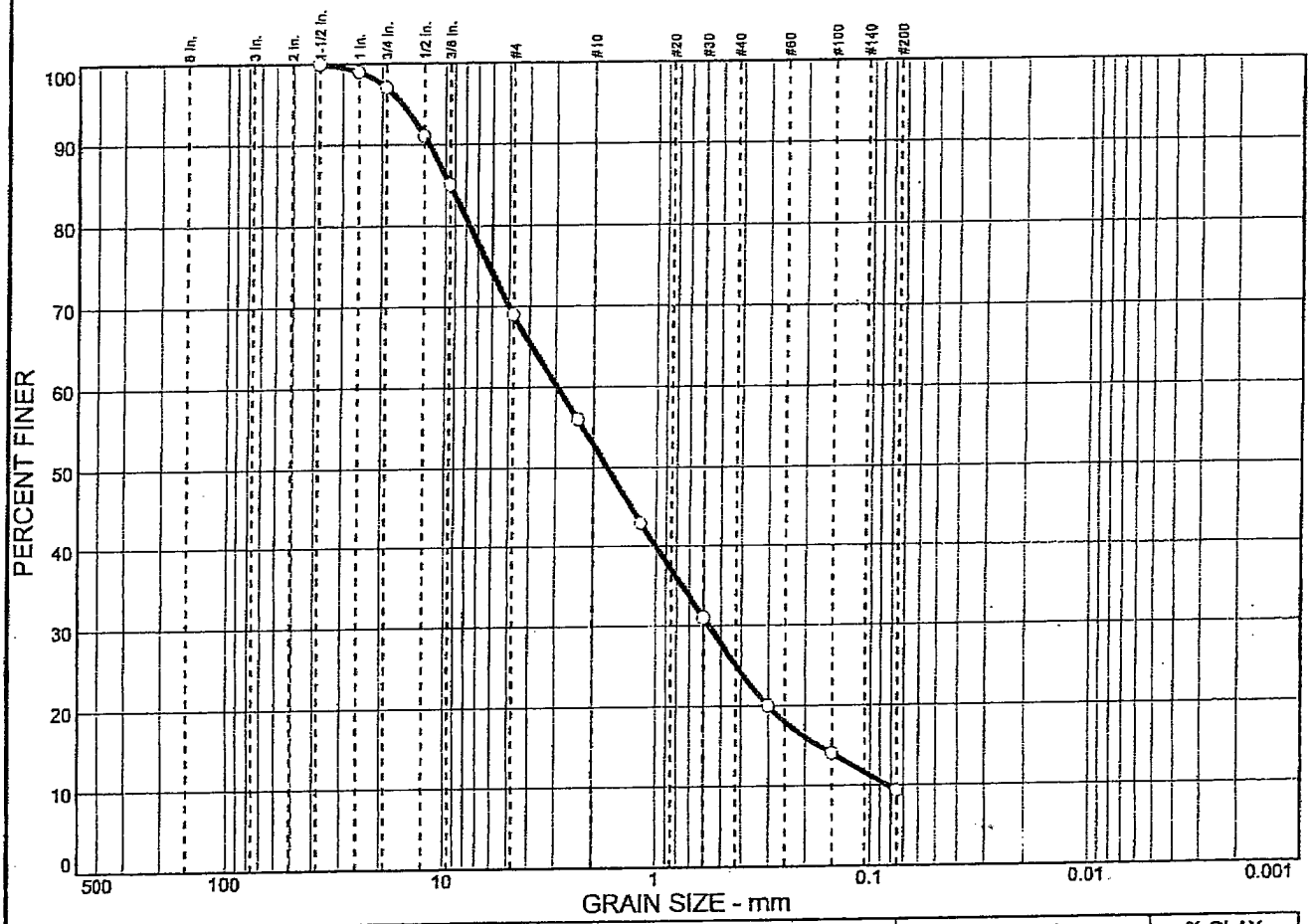
Remarks

Sample No.: 07-0510 Source of Sample: Zeolite Clay Date: 07/19/2007
Location: On-Site Elev./Depth:

JA CESARE AND ASSOCIATES, INC.
Geotechnical Engineering Consultants

Client: U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
Project No: 07.1243 Figure 07-0510

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	31	60	9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2 in.	100		
1 in.	99		
3/4 in.	97		
1/2 in.	91		
3/8 in.	85		
#4	69		
#8	56		
#16	43		
#30	31		
#50	20		
#100	14		
#200	9.3		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 9.52 D_{60}= 2.95 D_{50}= 1.71
D_{30}= 0.567 D_{15}= 0.173 D_{10}= 0.0832
C_u= 35.50 C_c= 1.31

Classification

USCS= AASHTO=

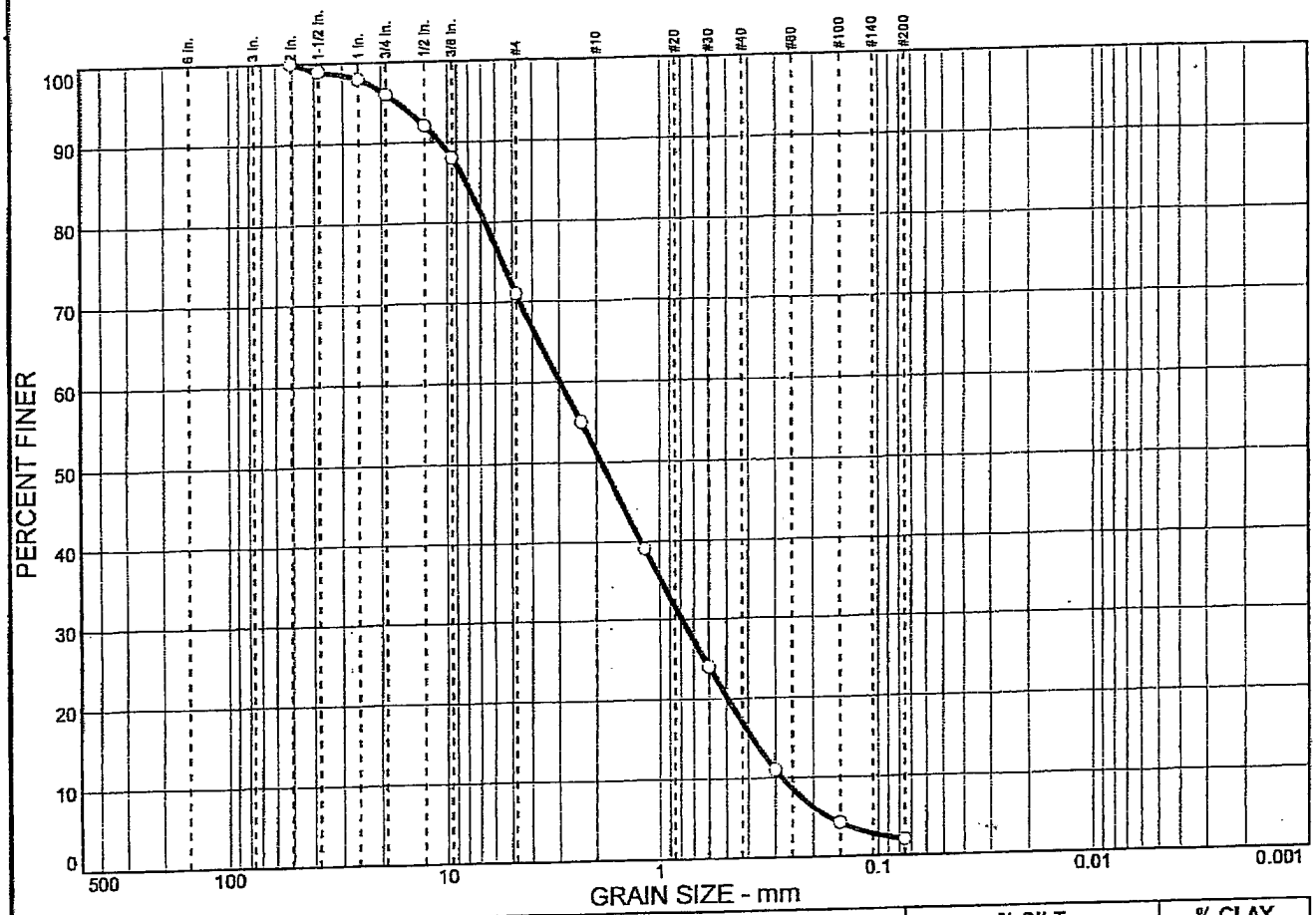
Remarks

Sample No.: 07-0430A **Source of Sample:** Native **Date:** 06/14/2007
Location: USEN-A1 **Elev./Depth:**

JACESARE AND ASSOCIATES, INC.
Geotechnical Engineering Consultants

Client: U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
Project No: 07.1243 **Figure** 07-0430A

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	29	69	2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2 in.	100		
1-1/2 in.	99		
1 in.	98		
3/4 in.	96		
1/2 in.	92		
3/8 in.	88		
#4	71		
#8	55		
#16	39		
#30	24		
#50	11		
#100	4		
#200	2.0		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 8.21 D_{60}= 2.96 D_{50}= 1.89
D_{30}= 0.792 D_{15}= 0.382 D_{10}= 0.280
C_u= 10.59 C_c= 0.76

Classification

USCS= AASHTO=

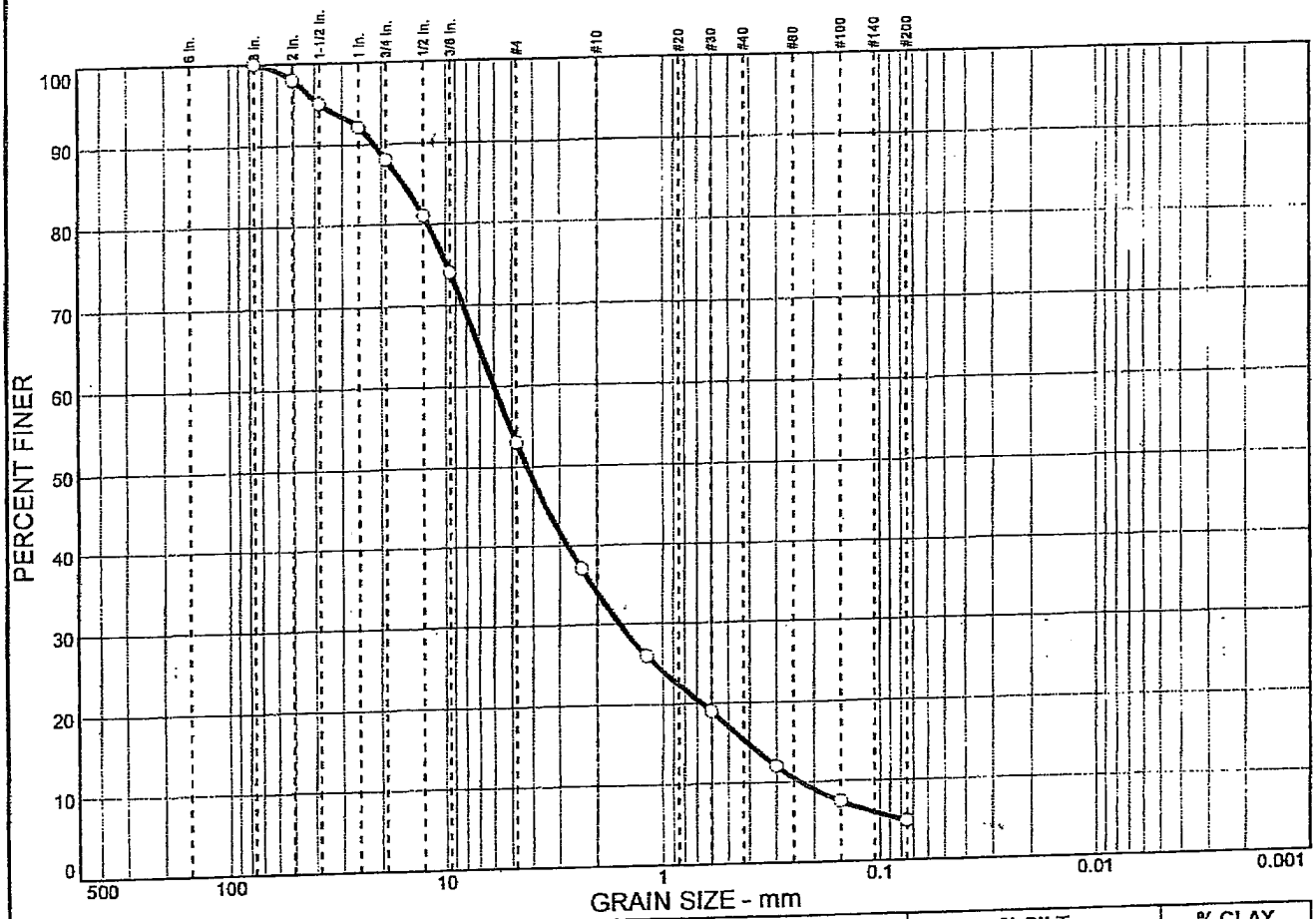
Remarks

Sample No.: 07-0430B **Source of Sample:** Native **Date:** 06/14/2007
Location: USEN-A2 **Elev./Depth:**

JA CESARE AND ASSOCIATES, INC.
Geotechnical Engineering Consultants

Client: U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
Project No: 07.1243 **Figure** 07-0430B

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	47	48	5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100		
2 in.	98		
1-1/2 in.	95		
1 in.	92		
3/4 in.	88		
1/2 in.	81		
3/8 in.	74		
#4	53		
#8	37		
#16	26		
#30	19		
#50	12		
#100	8		
#200	4.9		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 15.8 D_{60}= 6.00 D_{50}= 4.25
D_{30}= 1.57 D_{15}= 0.409 D_{10}= 0.232
C_u= 25.84 C_c= 1.77

Classification

USCS= AASHTO=

Remarks

Date: 08/07/2007

Sample No.: 07-0605A Source of Sample: Native Elev./Depth:

Location: USEN-A2 w/5% Zeolite Clay

JACESARE AND ASSOCIATES INC
Geotechnical Engineering Consultants

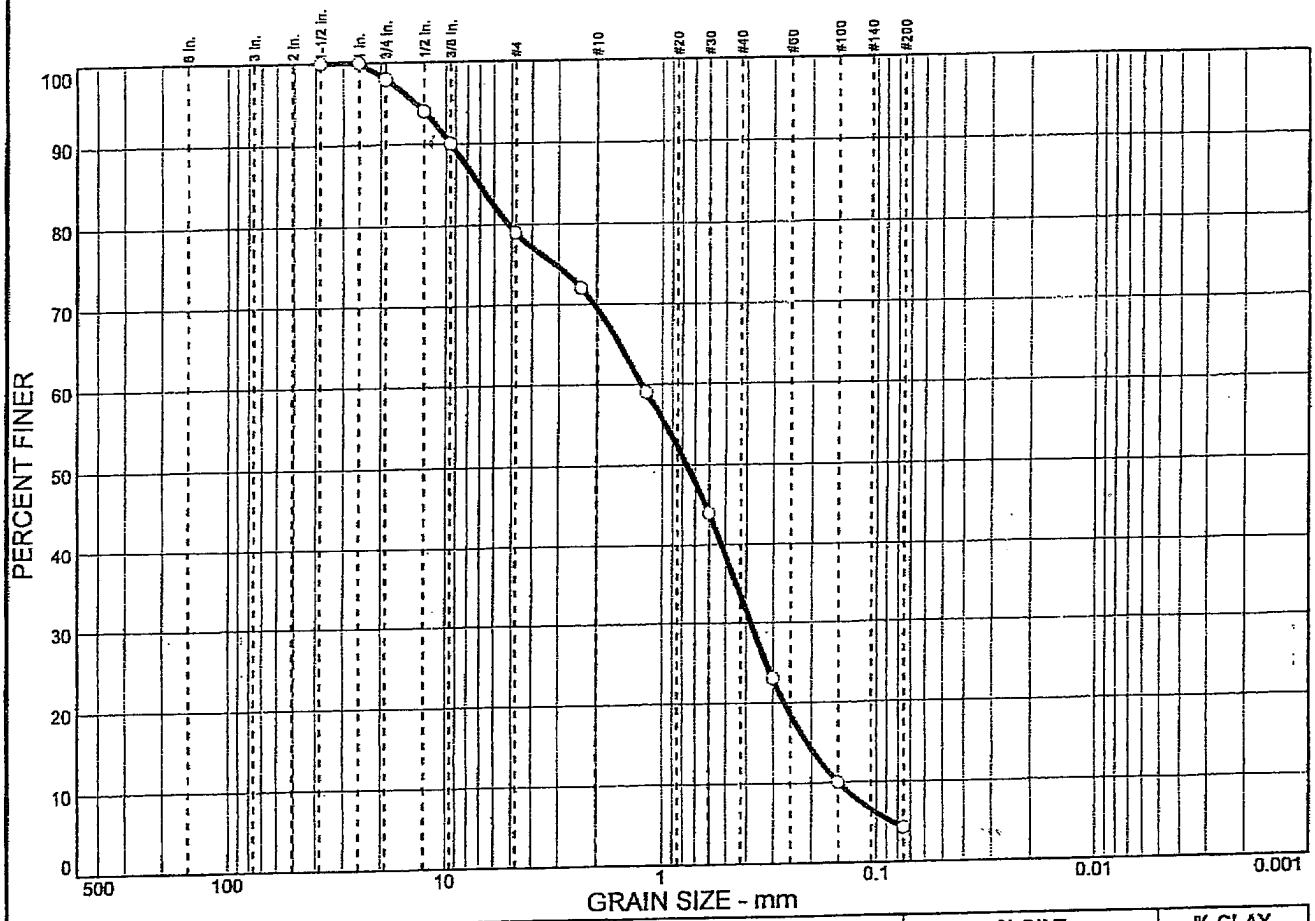
Client: U.S. Ecology-NV

Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113

Project No: 07.1243

Figure 07-0605A

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	21	75	4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2 in.	100		
1 in.	100		
3/4 in.	98		
1/2 in.	94		
3/8 in.	90		
#4	79		
#8	72		
#16	59		
#30	44		
#50	23		
#100	10		
#200	4.2		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 7.06 D_{60}= 1.24 D_{50}= 0.765
D_{30}= 0.380 D_{15}= 0.210 D_{10}= 0.150
C_u= 8.26 C_c= 0.78

Classification

USCS= AASHTO=

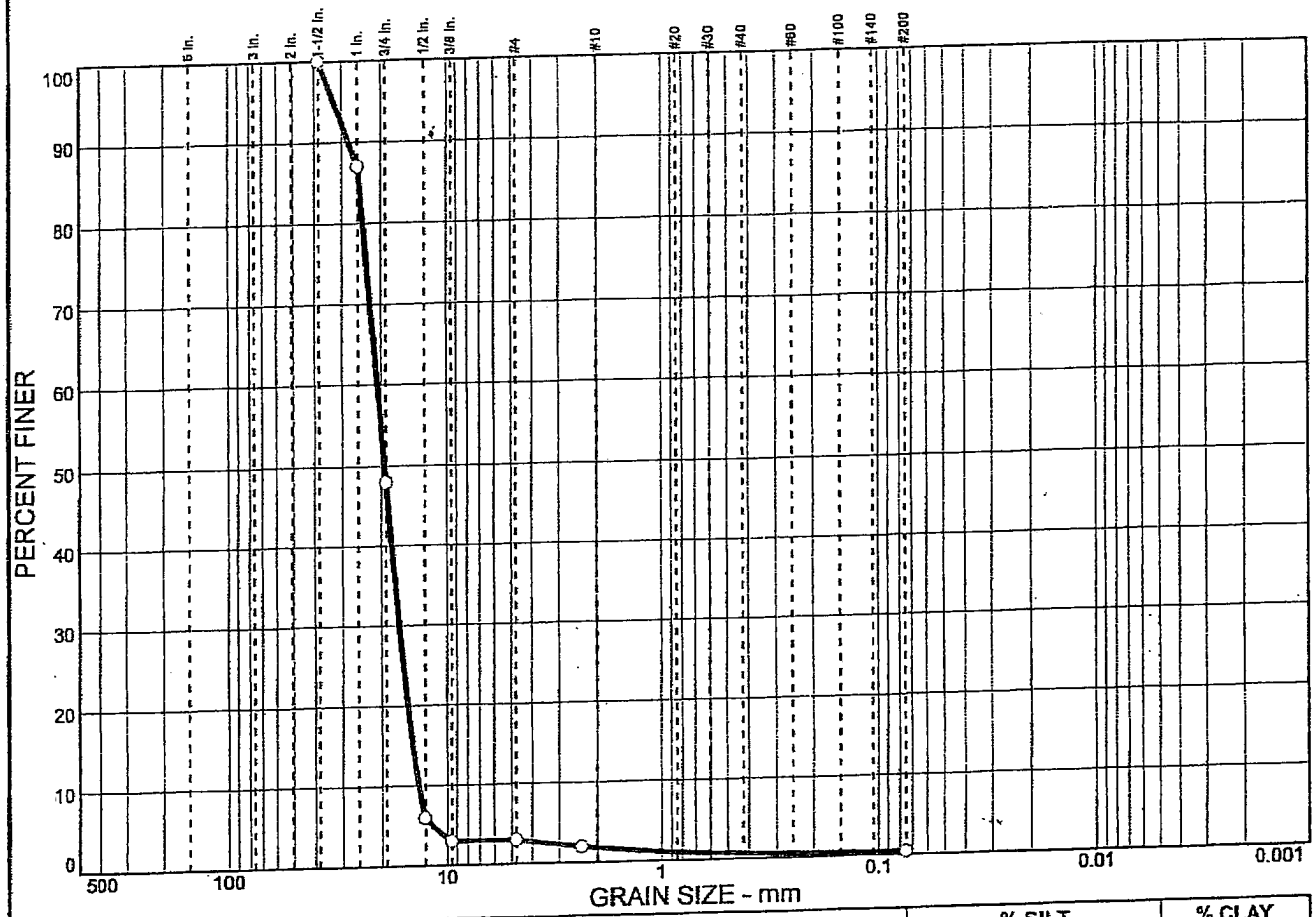
Remarks

Sample No.: 07-0430C **Source of Sample:** Native **Date:** 06/14/2007
Location: USEN-A3 **Elev./Depth:**

DeCESARE AND ASSOCIATES INC.
Geotechnical Engineering Consultants

Client: U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
Project No: 07.1243 **Figure** 07-0430C

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	97	3	0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2 in.	100		
1 in.	87		
3/4 in.	48		
1/2 in.	6		
3/8 in.	3		
#4	3		
#8	2		
#200	0.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 25.0 D_{60}= 20.8 D_{50}= 19.3
D_{30}= 16.6 D_{15}= 14.4 D_{10}= 13.6
C_u= 1.53 C_c= 0.97

Classification

USCS= AASHTO=

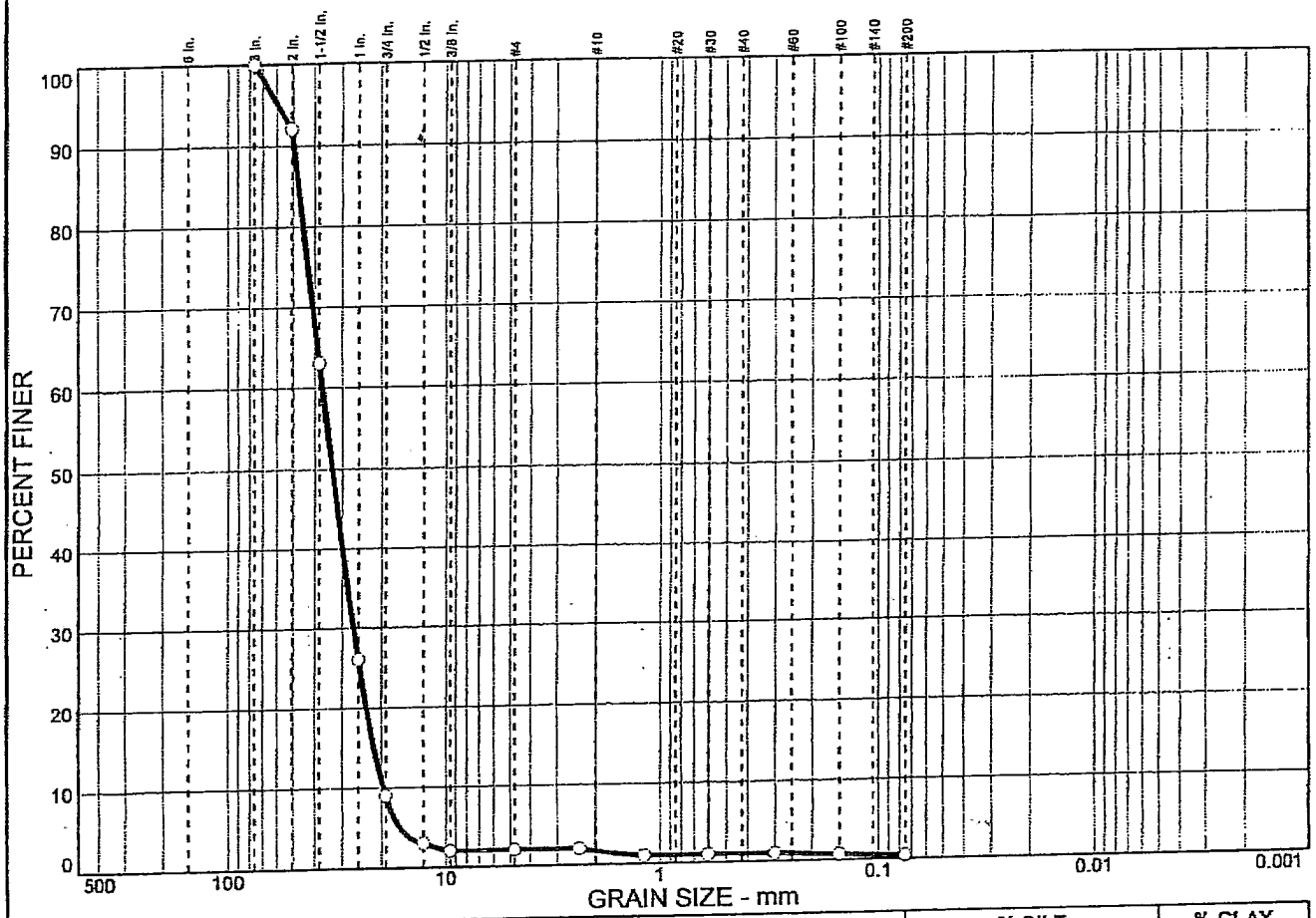
Remarks

Sample No.: 07-0430D **Source of Sample:** Native **Date:** 06/14/2007
Location: USEN-B1 **Elev./Depth:**

JACESARE AND ASSOCIATES, INC.
Geotechnical Engineering Consultants

Client: U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
Project No: 07.1243 **Figure** 07-0430D

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	98	2	0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100		
2 in.	92		
1-1/2 in.	63		
1 in.	26		
3/4 in.	9		
1/2 in.	3		
3/8 in.	2		
#4	2		
#8	2		
#16	1		
#30	1		
#50	1		
#100	1		
#200	0.4		

* (no specification provided)

Soil Description

Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 47.4 D_{60}= 37.0 D_{50}= 33.4
D_{30}= 26.7 D_{15}= 21.6 D_{10}= 19.5
C_u= 1.89 C_c= 0.99

Classification

USCS= AASHTO=

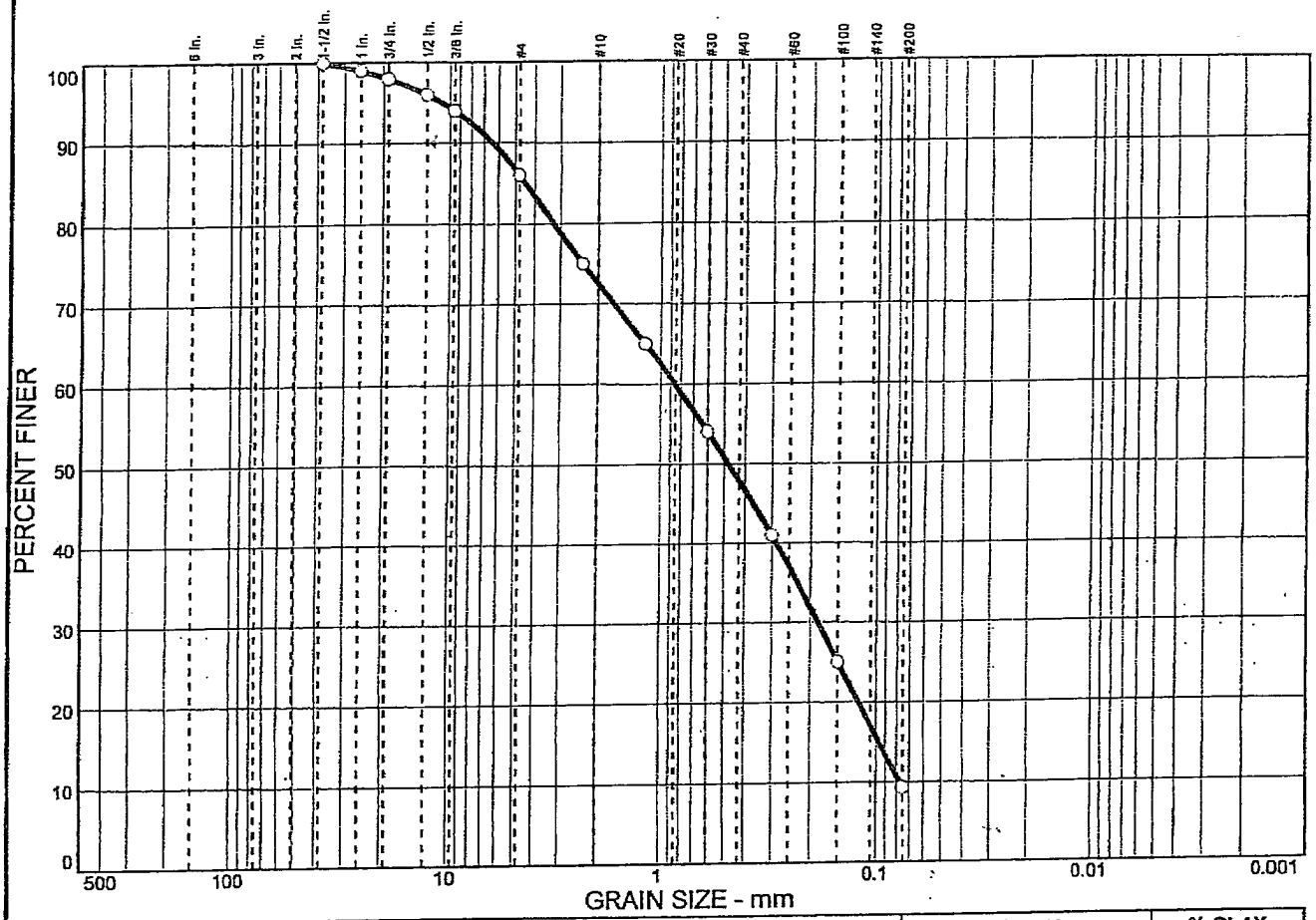
Remarks

Sample No.: 07-0605E **Source of Sample:** Native **Date:** 08/15/2007
Location: USEN-B1 **Elev./Depth:**

JACESARE AND ASSOCIATES, INC.
Geotechnical Engineering Consultants

Client: U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
Project No: 07.1243 **Figure** 07-0605E

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	14	77	9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2 in.	100		
1 in.	99		
3/4 in.	98		
1/2 in.	96		
3/8 in.	94		
#4	86		
#8	75		
#16	65		
#30	54		
#50	41		
#100	25		
#200	9.3		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 4.44 D_{60}= 0.857 D_{50}= 0.478
D_{30}= 0.185 D_{15}= 0.0968 D_{10}= 0.0774
C_u= 11.08 C_c= 0.52

Classification

USCS= AASHTO=

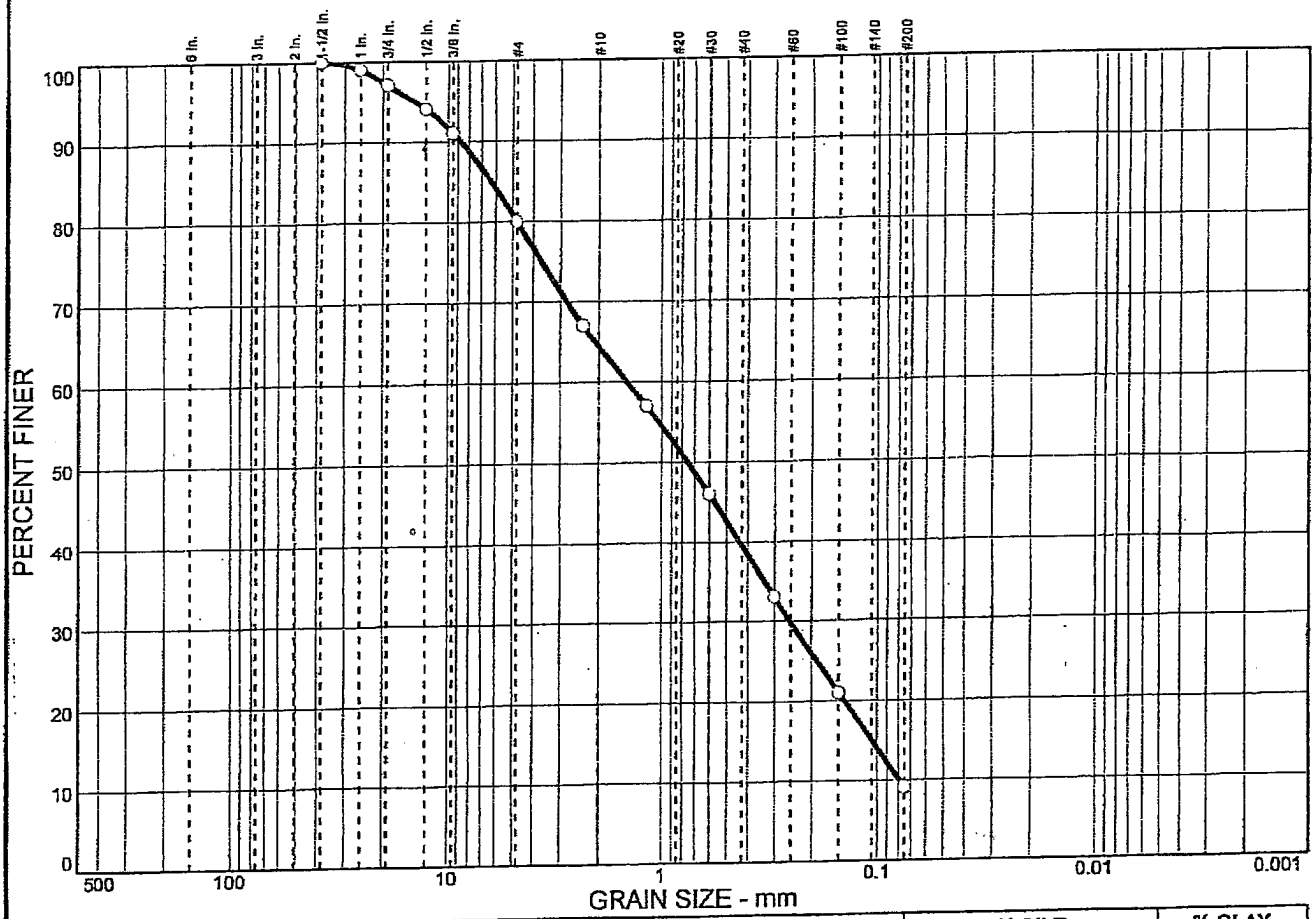
Remarks

Sample No.: 07-0430E **Source of Sample:** Native **Date:** 06/14/2007
Location: USEN-C1 **Elev./Depth:**

JACESARE AND ASSOCIATES, INC.
Geotechnical Engineering Consultants

Client: U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
Project No: 07.1243 **Figure** 07-0430E

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	20	71	9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2 in.	100		
1 in.	99		
3/4 in.	97		
1/2 in.	94		
3/8 in.	91		
#4	80		
#8	67		
#16	57		
#30	46		
#50	33		
#100	21		
#200	9.1		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 6.30 D_{60}= 1.46 D_{50}= 0.754
D_{30}= 0.254 D_{15}= 0.106 D_{10}= 0.0790
C_u= 18.51 C_c= 0.56

Classification

USCS= AASHTO=

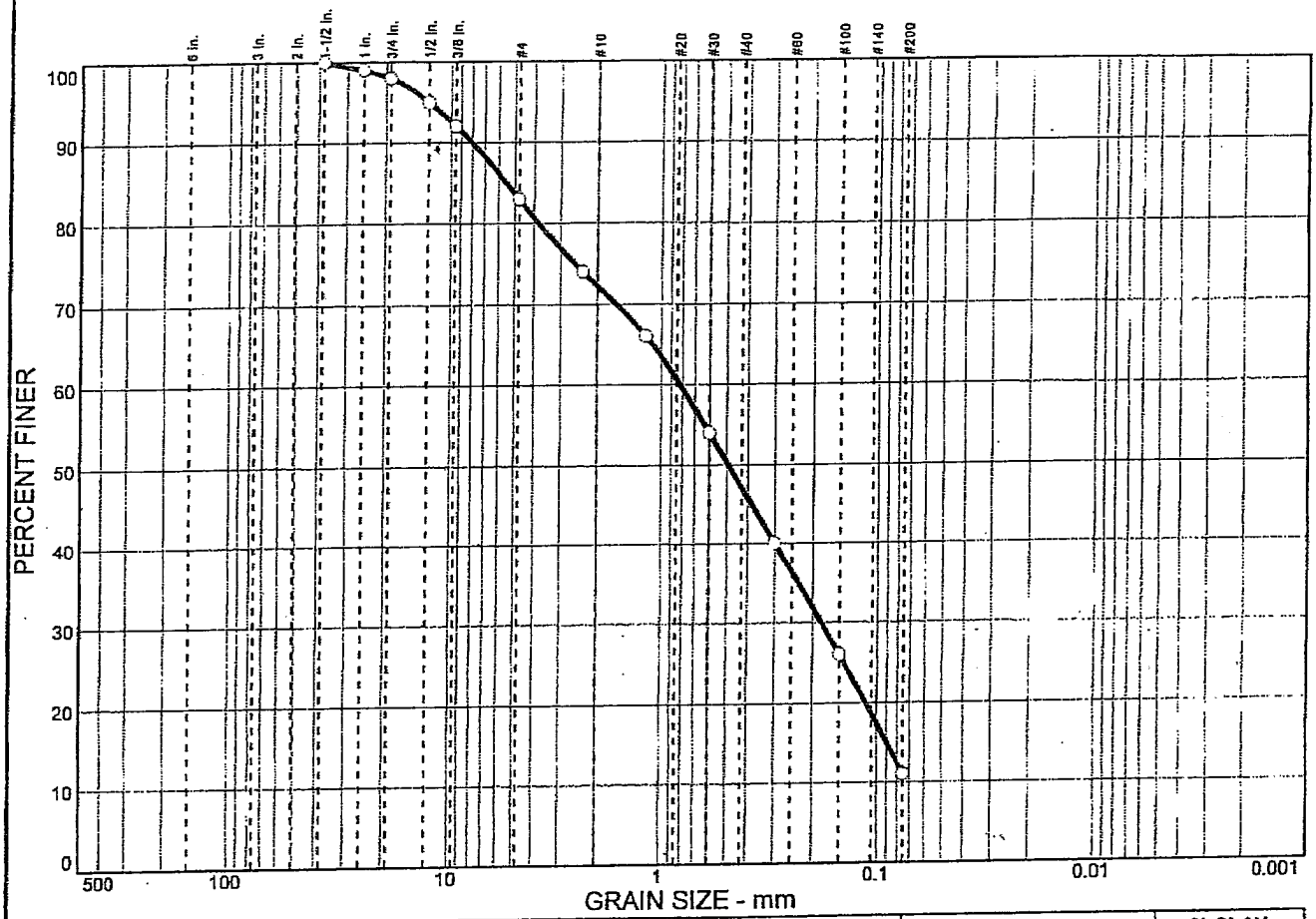
Remarks

Sample No.: 07-0430F **Source of Sample:** Native **Date:** 06/14/2007
Location: USEN-C2 **Elev./Depth:**

JA CESARE AND ASSOCIATES INC
Geotechnical Engineering Consultants

Client: U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
Project No: 07.1243 **Figure** 07-0430F

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	17	72	11	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2 in.	100		
1 in.	99		
3/4 in.	98		
1/2 in.	95		
3/8 in.	92		
#4	83		
#8	74		
#16	66		
#30	54		
#50	40		
#100	26		
#200	11		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 5.50 D_{60}= 0.820 D_{50}= 0.491
D_{30}= 0.182 D_{15}= 0.0899 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

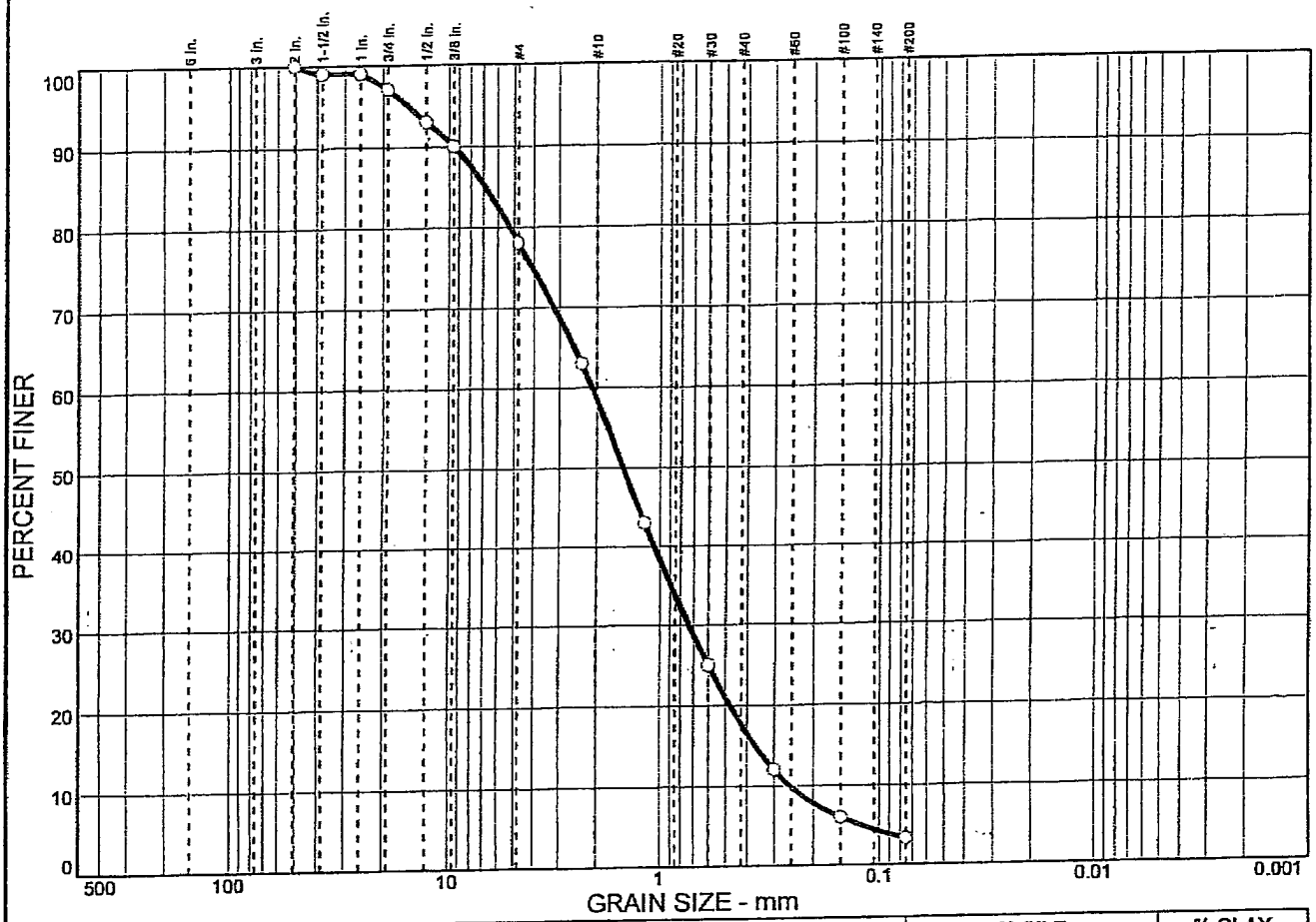
Remarks

Sample No.: 07-0605C **Source of Sample:** Native **Date:** 08/07/2007
Location: USEN-C1 and C2 w/5% Zeolite Clay **Elev./Depth:**

JA CESARE AND ASSOCIATES, INC.
Geotechnical Engineering Consultants

Client: U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
Project No: 07.1243 **Figure** 07-0605C

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	22	75	3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2 in.	100		
1-1/2 in.	99		
1 in.	99		
3/4 in.	97		
1/2 in.	93		
3/8 in.	90		
#4	78		
#8	63		
#16	43		
#30	25		
#50	12		
#100	6		
#200	3.3		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 6.86 D_{60}= 2.11 D_{50}= 1.49
D_{30}= 0.736 D_{15}= 0.366 D_{10}= 0.254
C_u= 8.29 C_c= 1.01

Classification

USCS= AASHTO=

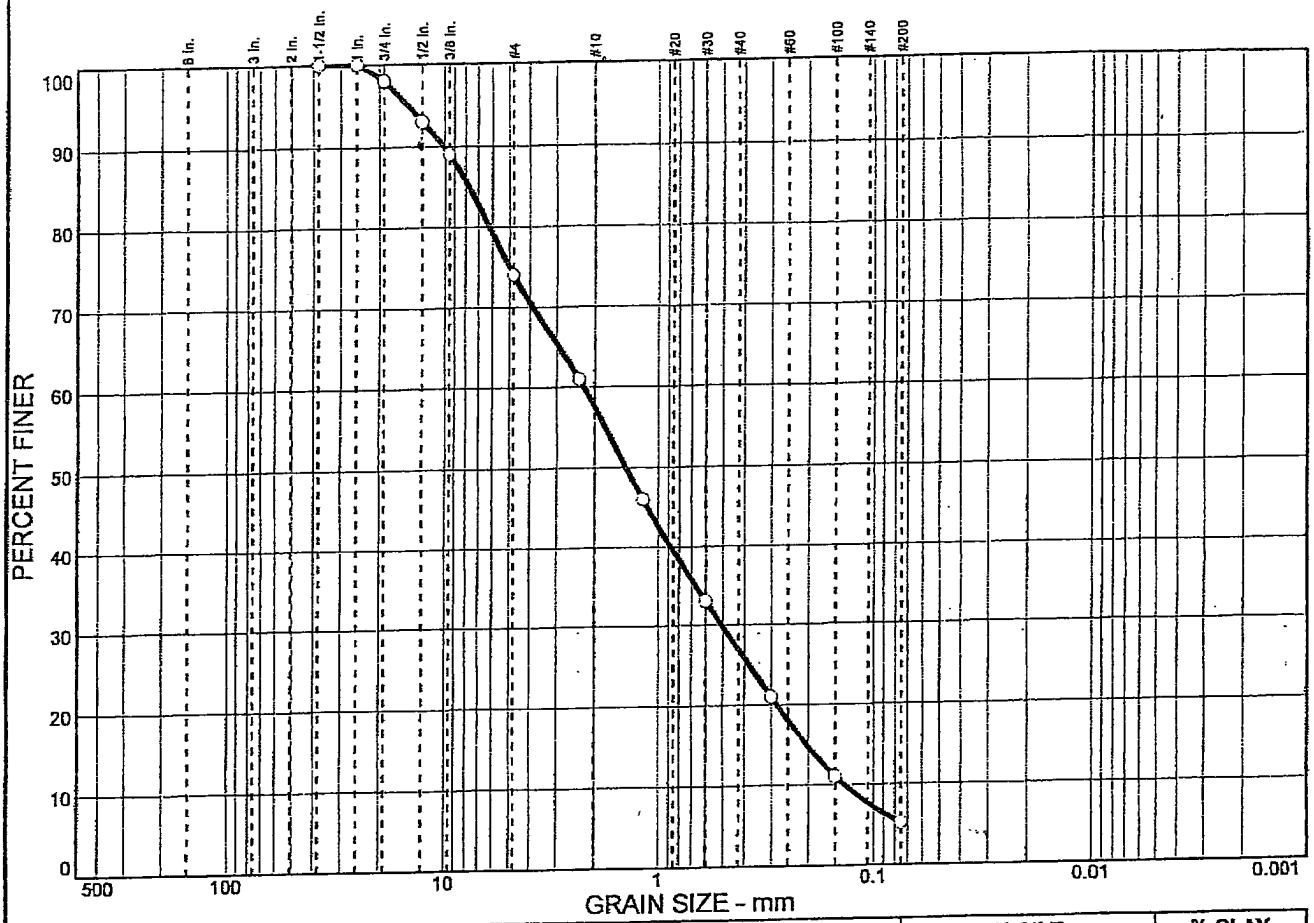
Remarks

Sample No.: 07-0430G **Source of Sample:** Native **Date:** 06/14/2007
Location: USEN-D1 **Elev./Depth:**

JACESARE AND ASSOCIATES, INC.
Geotechnical Engineering Consultants

Client: U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
Project No: 07.1243 **Figure** 07-0430G

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	26	69	5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2 in.	100		
1 in.	100		
3/4 in.	98		
1/2 in.	93		
3/8 in.	89		
#4	74		
#8	61		
#16	46		
#30	33		
#50	21		
#100	11		
#200	5.2		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 7.73 D_{60}= 2.24 D_{50}= 1.42
D_{30}= 0.507 D_{15}= 0.204 D_{10}= 0.137
C_u= 16.43 C_c= 0.84

Classification

USCS= AASHTO=

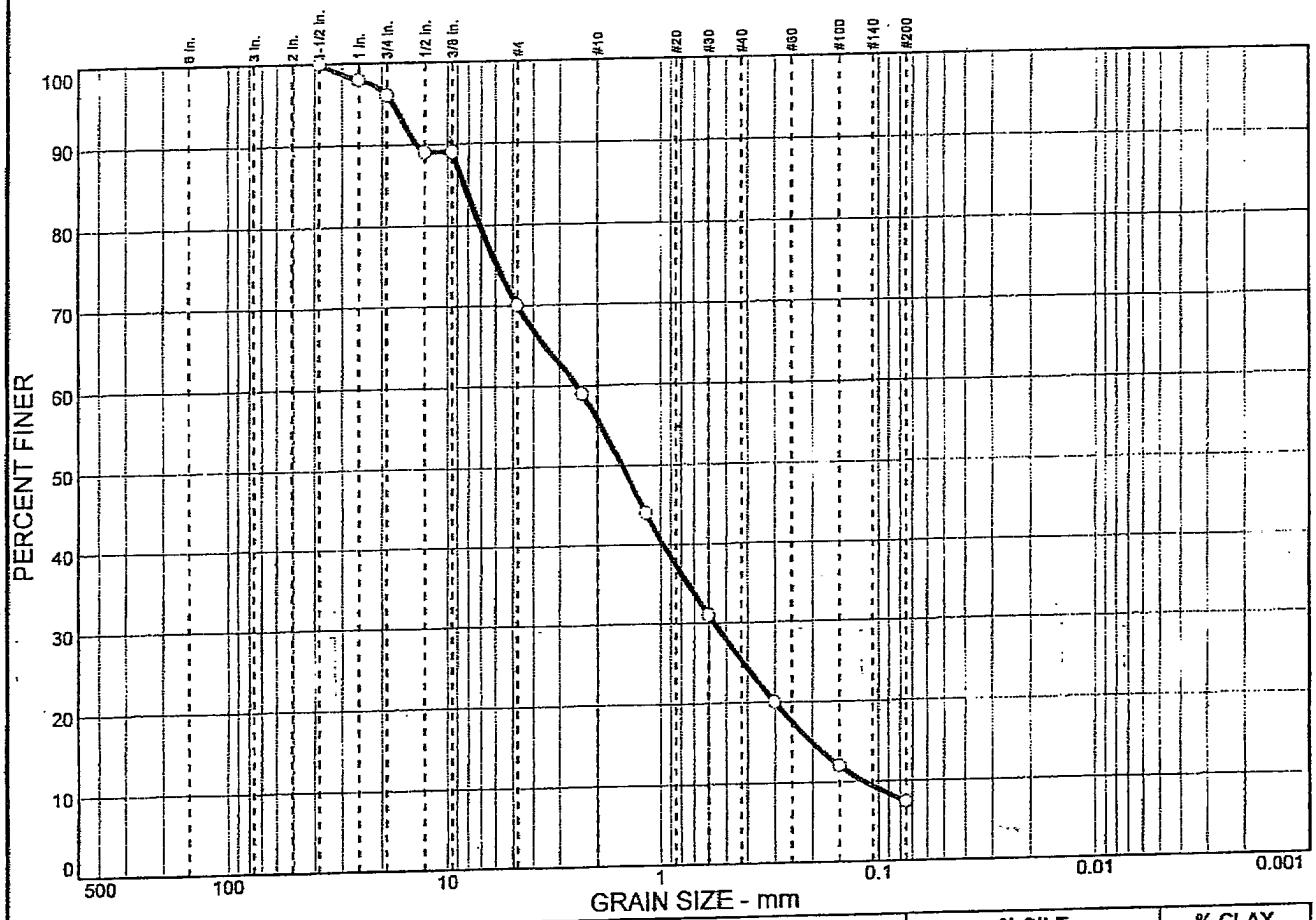
Remarks

Sample No.: 07-0430H **Source of Sample:** Native **Date:** 06/14/2007
Location: USEN-D2 **Elev./Depth:**

J.A. CESARE AND ASSOCIATES, INC.
Geotechnical Engineering Consultants

Client: U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
Project No: 07.1243 **Figure** 07-0430H

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	30	63	7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-1/2 in.	100		
1 in.	98		
3/4 in.	96		
1/2 in.	89		
3/8 in.	89		
#4	70		
#8	59		
#16	44		
#30	31		
#50	20		
#100	12		
#200	7.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 8.36 D_{60}= 2.50 D_{50}= 1.54
D_{30}= 0.566 D_{15}= 0.202 D_{10}= 0.116
C_u= 21.65 C_c= 1.11

Classification

USCS= AASHTO=

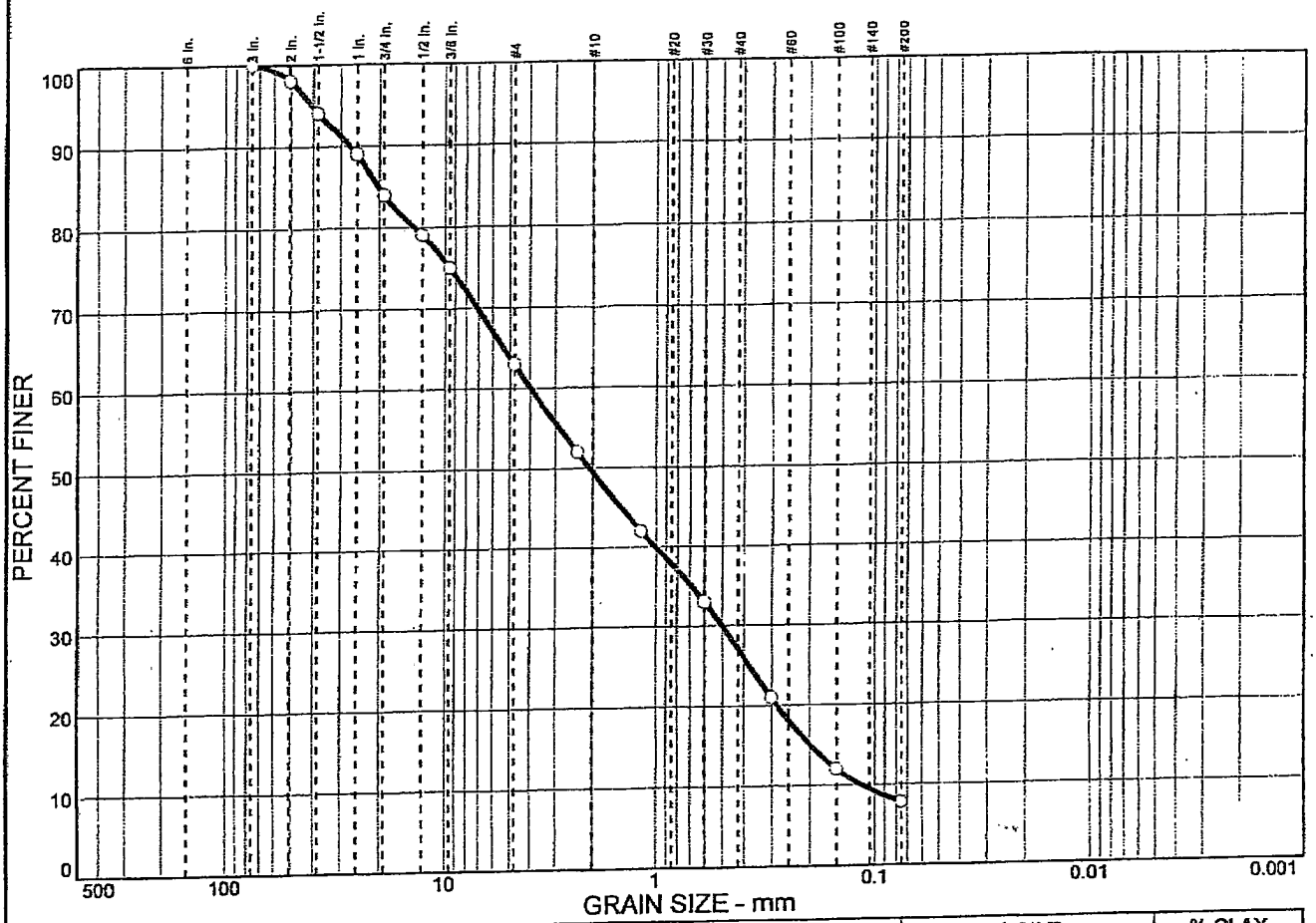
Remarks

Sample No.: 07-0605D **Source of Sample:** Native **Date:** 08/07/2007
Location: USEN-D1 and D2 w/5% Zeolite Clay **Elev./Depth:**

JACESARE AND ASSOCIATES, INC.
Geotechnical Engineering Consultants

Client: U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
Project No: 07.1243 **Figure** 07-0605D

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	37	55	8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100		
2.0 in.	98		
1-1/2 in.	94		
1 in.	89		
3/4 in.	84		
1/2 in.	79		
3/8 in.	75		
#4	63		
#8	52		
#16	42		
#30	33		
#50	21		
#100	12		
#200	7.8		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 20.2 D_{60}= 3.96 D_{50}= 2.07
D_{30}= 0.500 D_{15}= 0.199 D_{10}= 0.115
C_u= 34.49 C_c= 0.55

Classification

USCS= AASHTO=

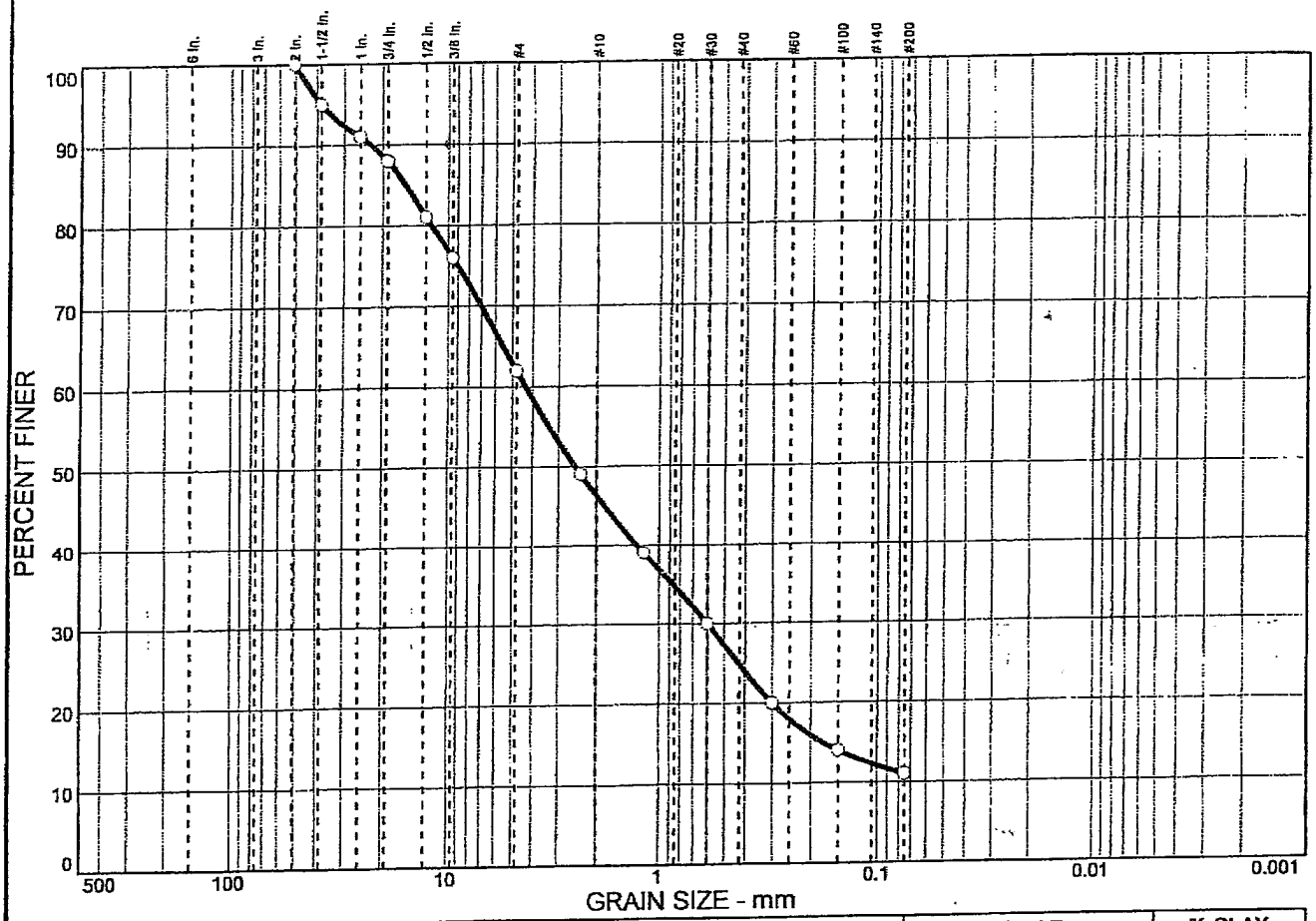
Remarks

Sample No.: 07-0705A **Source of Sample:** Native **Date:** 9/14/07
Location: Trench 12 Material mixed w/5% Imvite 1016 MIX 1 **Elev./Depth:**

JACESARE AND ASSOCIATES INC.
Geotechnical Engineering Consultants

Client: U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
Project No: 07.1243 **Figure** 07-0705A

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	38	51	11	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2 in.	100		
1-1/2 in.	95		
1 in.	91		
3/4 in.	88		
1/2 in.	81		
3/8 in.	76		
#4	62		
#8	49		
#16	39		
#30	30		
#50	20		
#100	14		
#200	11		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 15.8 D_{60}= 4.30 D_{50}= 2.51
D_{30}= 0.600 D_{15}= 0.176 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

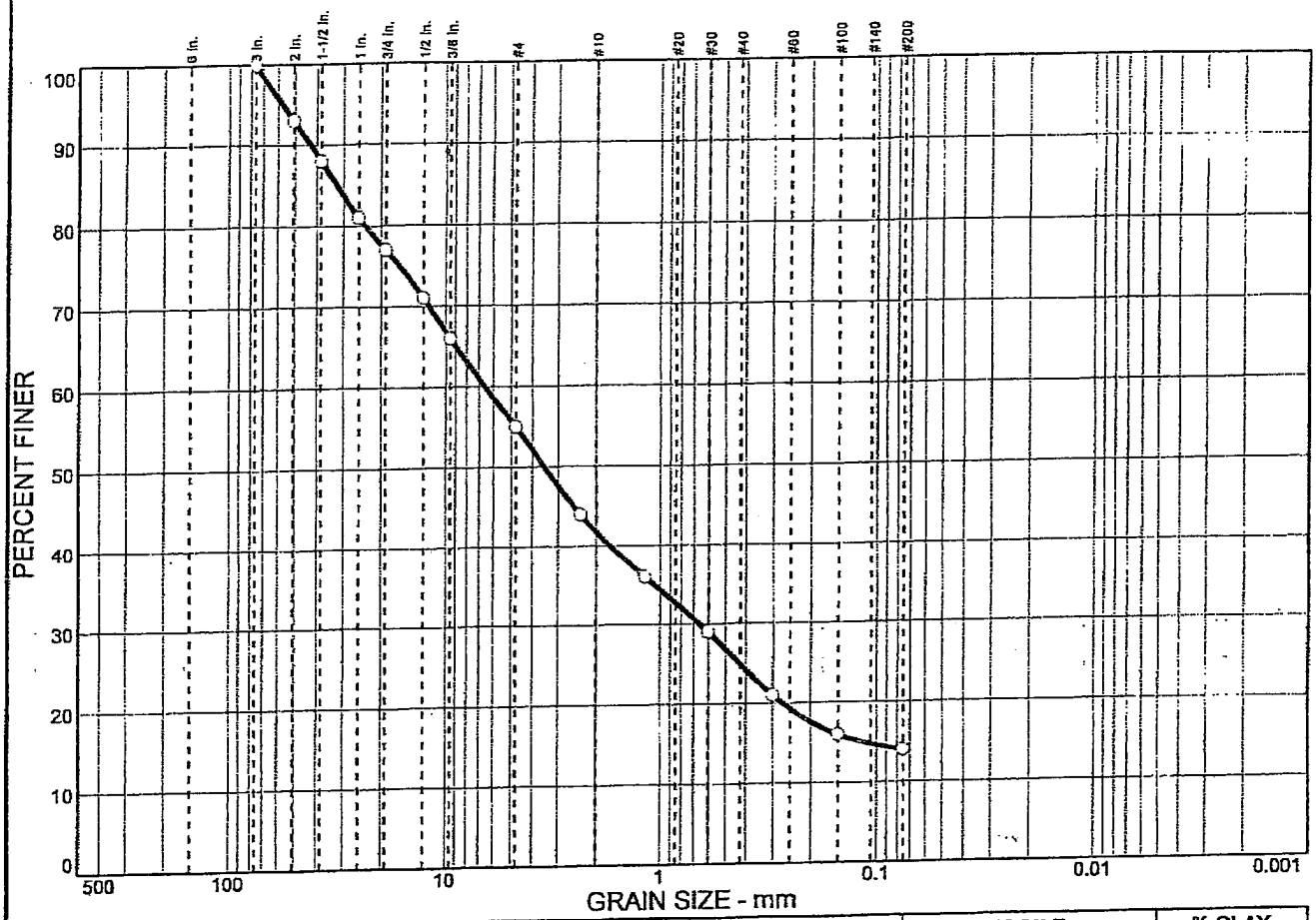
Remarks

Sample No.: 07-0705B **Source of Sample:** Native **Date:** 9/14/07
Location: Trench 12 Material mixed w/10% Imvite 1016 MIX 2 **Elev./Depth:**

J.A. CESARE AND ASSOCIATES, INC.
Geotechnical Engineering Consultants

Client: U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
Project No: 07.1243 **Figure** 07-0705B

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	45	41	14	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100		
2.0 in.	93		
1-1/2 in.	88		
1 in.	81		
3/4 in.	77		
1/2 in.	71		
3/8 in.	66		
#4	55		
#8	44		
#16	36		
#30	29		
#50	21		
#100	16		
#200	14		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 32.2 D_{60}= 6.56 D_{50}= 3.49
D_{30}= 0.656 D_{15}= 0.114 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

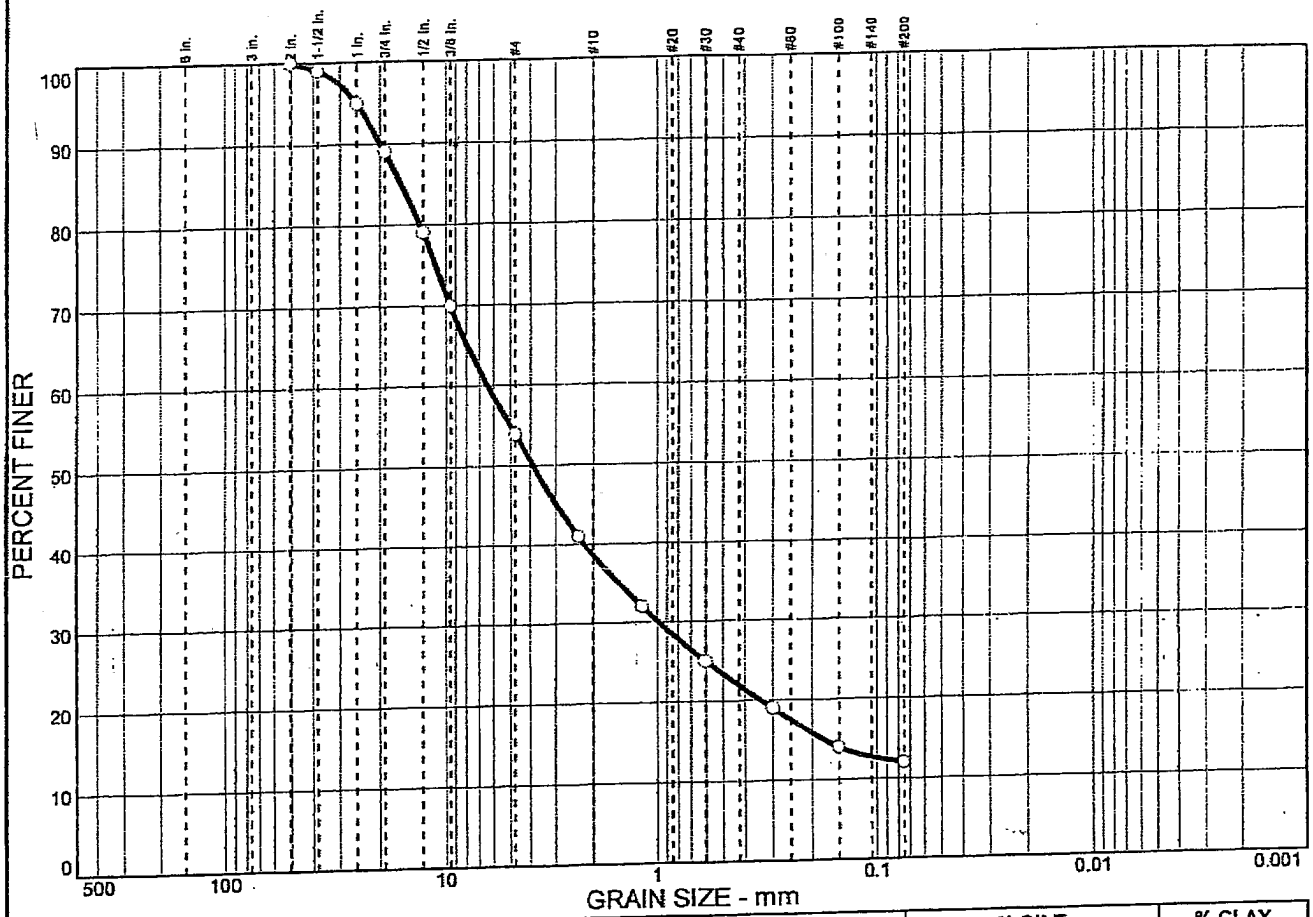
Remarks

Sample No.: 07-0705C Source of Sample: Native Date: 9/14/07
Location: Trench 12 Material mixed w/15% lmvite MIX 3 Elev./Depth:

J.A. CESARE AND ASSOCIATES, INC.
Geotechnical Engineering Consultants

Client: U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
Project No: 07.1243 Figure 07-0705C

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	46	42	12	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2 in.	100		
1-1/2 in.	99		
1 in.	95		
3/4 in.	89		
1/2 in.	79		
3/8 in.	70		
#4	54		
#8	41		
#16	32		
#30	25		
#50	19		
#100	14		
#200	12		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 16.0 D_{60}= 6.39 D_{50}= 3.88
D_{30}= 0.983 D_{15}= 0.178 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Date: 9/14/07

Sample No.: 07-0705D Source of Sample: Native Elev./Depth:

Location: Trench 12 Material mixed w/10% SEP/SAP MIX 4

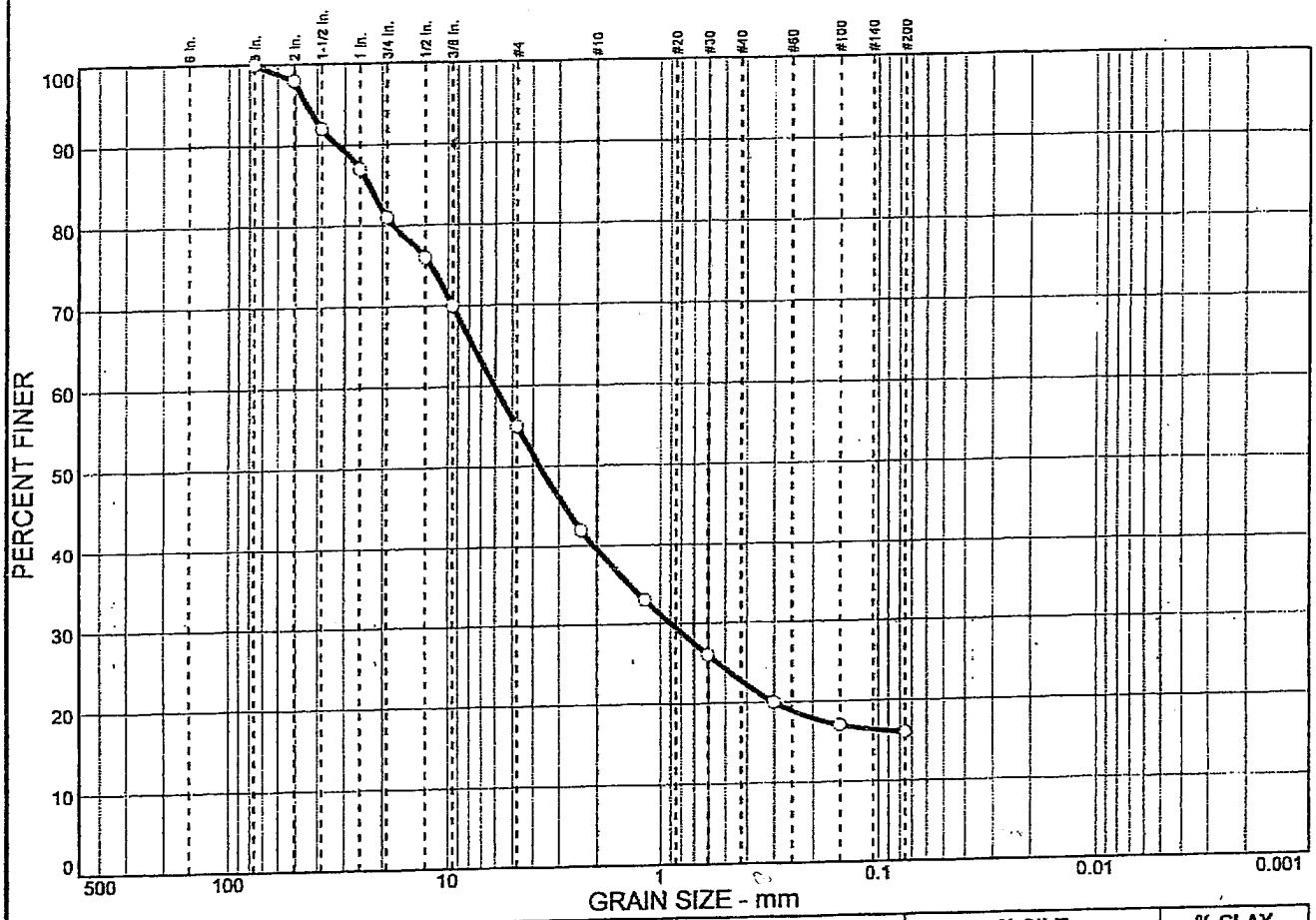
JACESARE AND ASSOCIATES, INC.
Geotechnical Engineering Consultants

Client: U.S. Ecology-NV

Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113

Project No: 07.1243 Figure 07-0705D

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	45	39	16	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100		
2.0 in.	98		
1.5 in.	92		
1.0 in.	87		
3/4 in.	81		
1/2 in.	76		
3/8 in.	70		
#4	55		
#8	42		
#16	33		
#30	26		
#50	20		
#100	17		
#200	16		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 23.0 D_{60}= 6.05 D_{50}= 3.70
D_{30}= 0.892 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample No.: 07-0705E Source of Sample: Native Date: 9/14/07
Location: Trench 12 material mixed w/15% SEP/SAP MIX 5 Elev./Depth:

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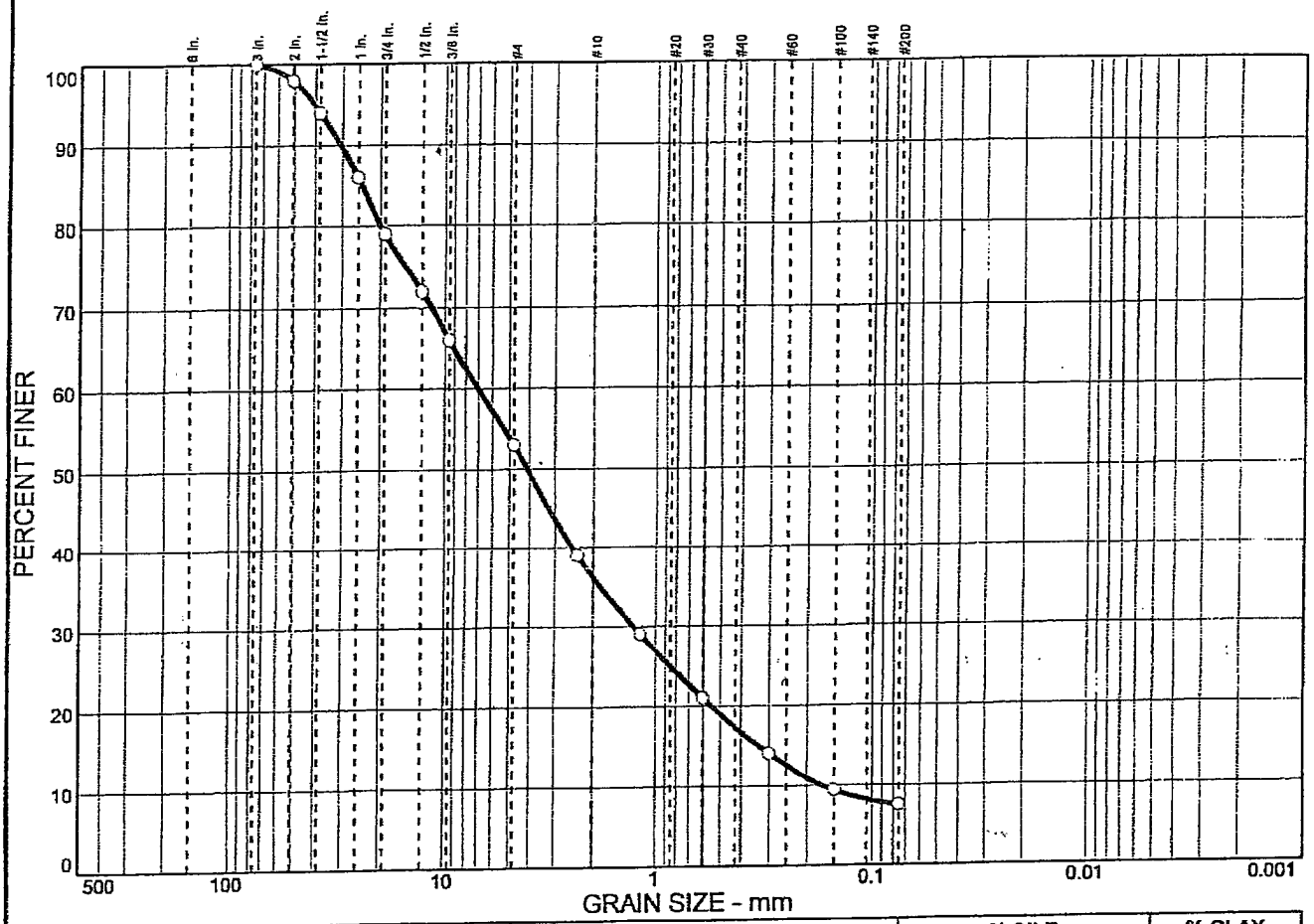
Geotechnical Engineering Consultants

Client: U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
Project No: 07.1243 Figure 07-0705E

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0	47	46	8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3 in.	100		
2 in.	98		
1-1/2 in.	94		
1 in.	86		
3/4 in.	79		
1/2 in.	72		
3/8 in.	66		
#4	53		
#8	39		
#16	29		
#30	21		
#50	14		
#100	9		
#200	7.5		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 24.4 D_{60}= 6.97 D_{50}= 4.09
D_{30}= 1.28 D_{15}= 0.336 D_{10}= 0.170
C_u= 41.04 C_c= 1.38

Classification

USCS= AASHTO=

Remarks

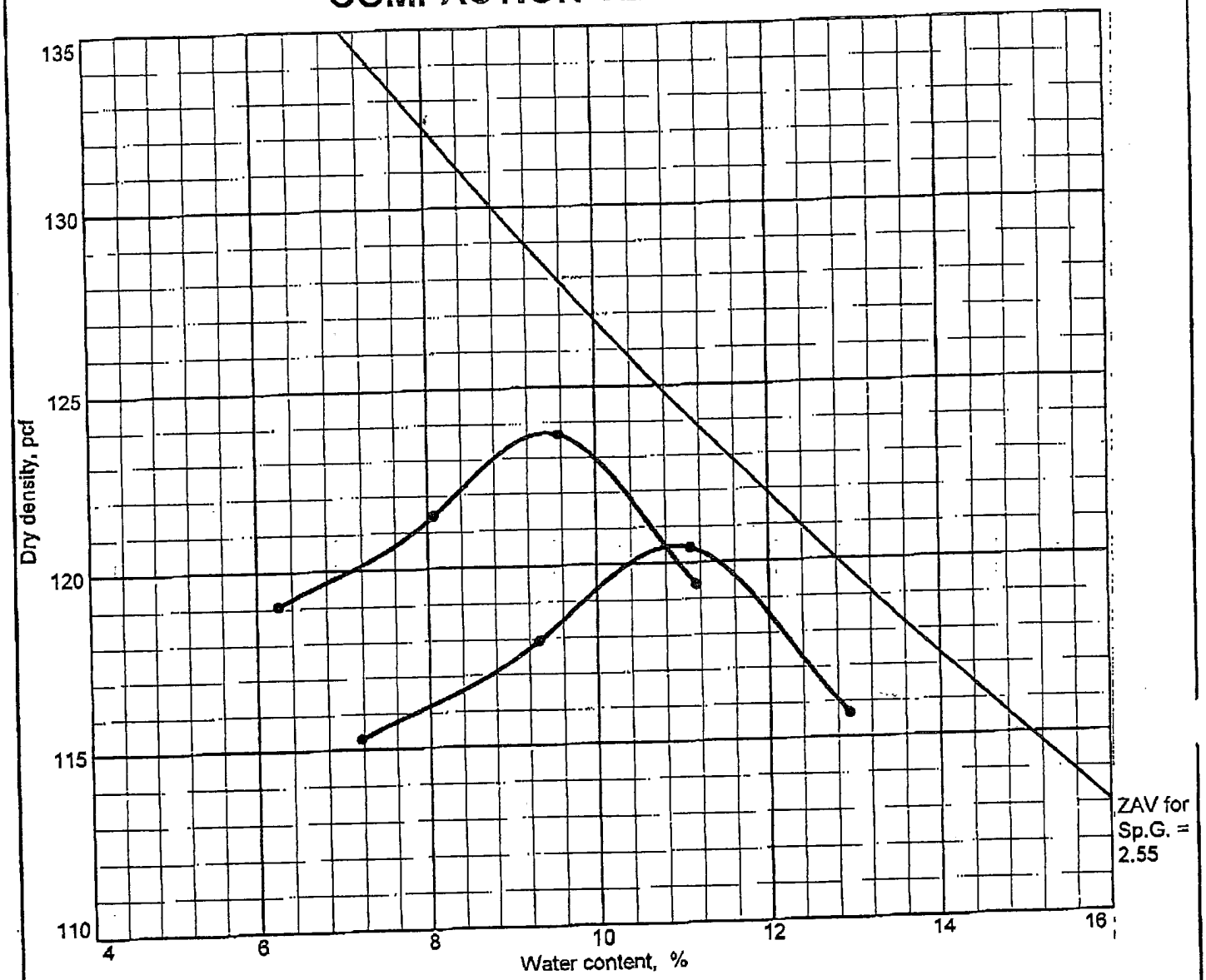
Sample No.: 07-0705F **Source of Sample:** Native **Date:** 09/14/2007
Location: Trench 12 Material Mixed w/5% Portland Cement MIX 6 **Elev./Depth:**

JACESARE AND ASSOCIATES, INC.
Geotechnical Engineering Consultants

Client: U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
Project No: 07.1243 **Figure** 07-0705F

Results of ASTM D1557 Moisture-Density Relationship Testing

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Procedure B Modified
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 In.	% < No.200
	USCS	AASHTO						
	SW-SC			2.34	34	15	15.0	9.3

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 123.5 pcf	120.5 pcf
Optimum moisture = 9.5 %	11 %

MATERIAL DESCRIPTION
Well-graded sand with clay and gravel

Project No. 07.1243 **Client:** U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113

● **Location:** USEN-A1

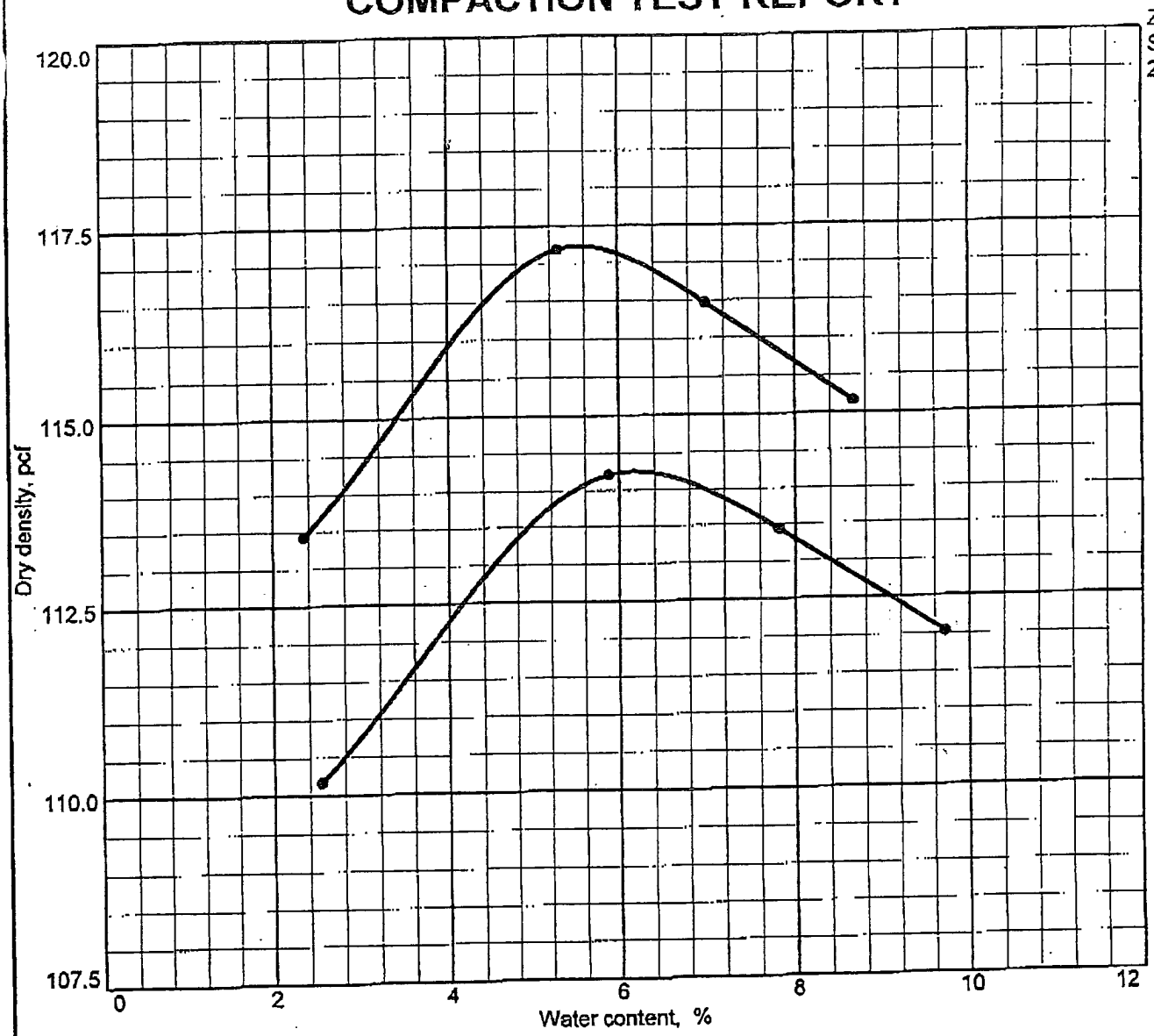
Remarks:

COMPACTION TEST REPORT

JOSEPH A. CESARE AND ASSOCIATES, INC.

Figure 07-0430A

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Procedure B Modified
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
	SP			2.32	NP	NP	12.0	2.0

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 117 pcf	114.5 pcf
Optimum moisture = 5.5 %	6 %

MATERIAL DESCRIPTION

Poorly graded sand with gravel

Remarks:

Project No. 07.1243 **Client:** U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113

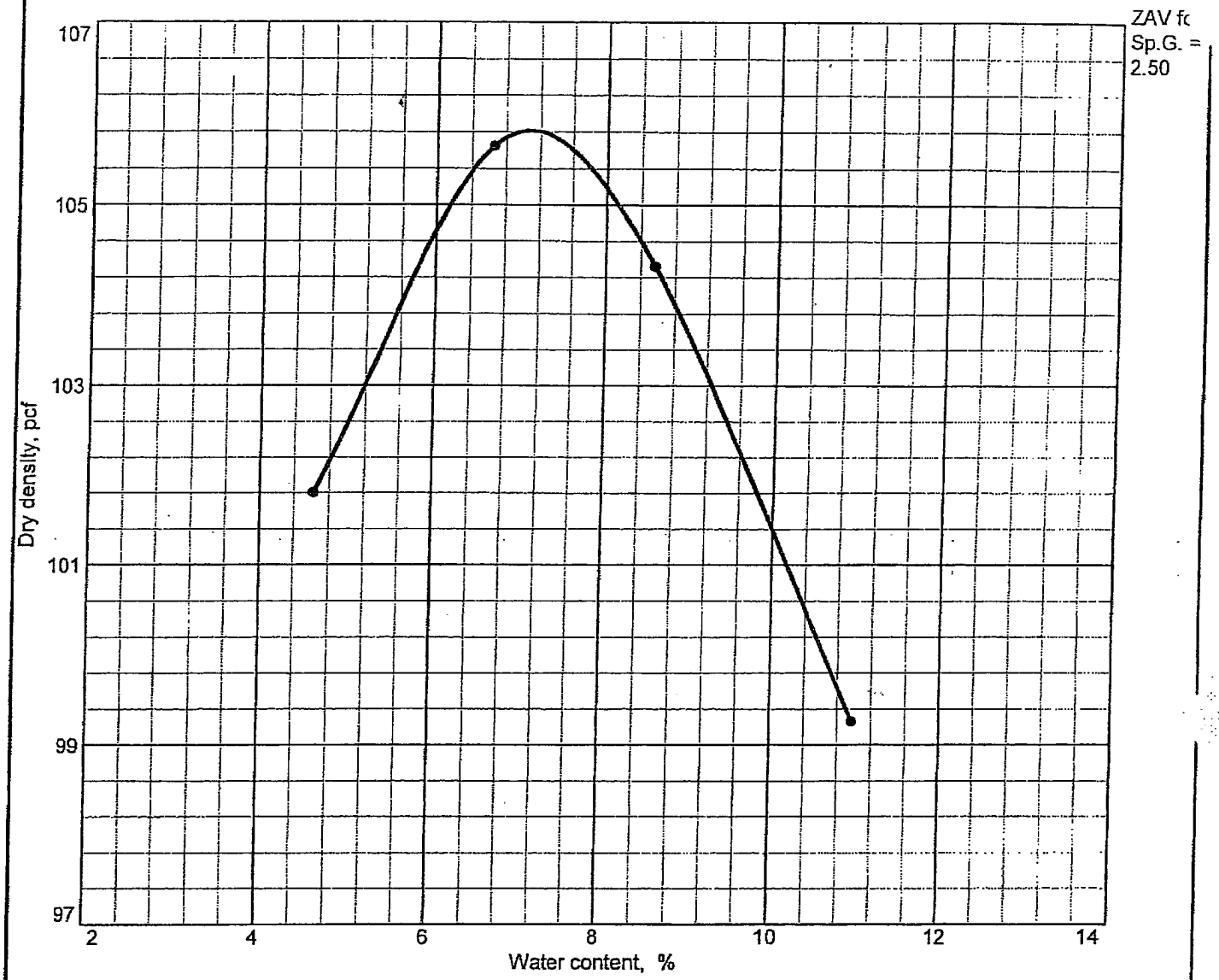
• **Location:** USEN-A2

COMPACTION TEST REPORT

JOSEPH A. CESARE AND ASSOCIATES, INC.

Figure 07-0430B

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Procedure A Modified
Oversize correction applied to final results

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
							12.0	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 110 pcf	106 pcf	
Optimum moisture = 6 %	7 %	

Project No. 07.1243 **Client:** U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113

- **Location:** USEN-A2 w/5% Zeolite Clay

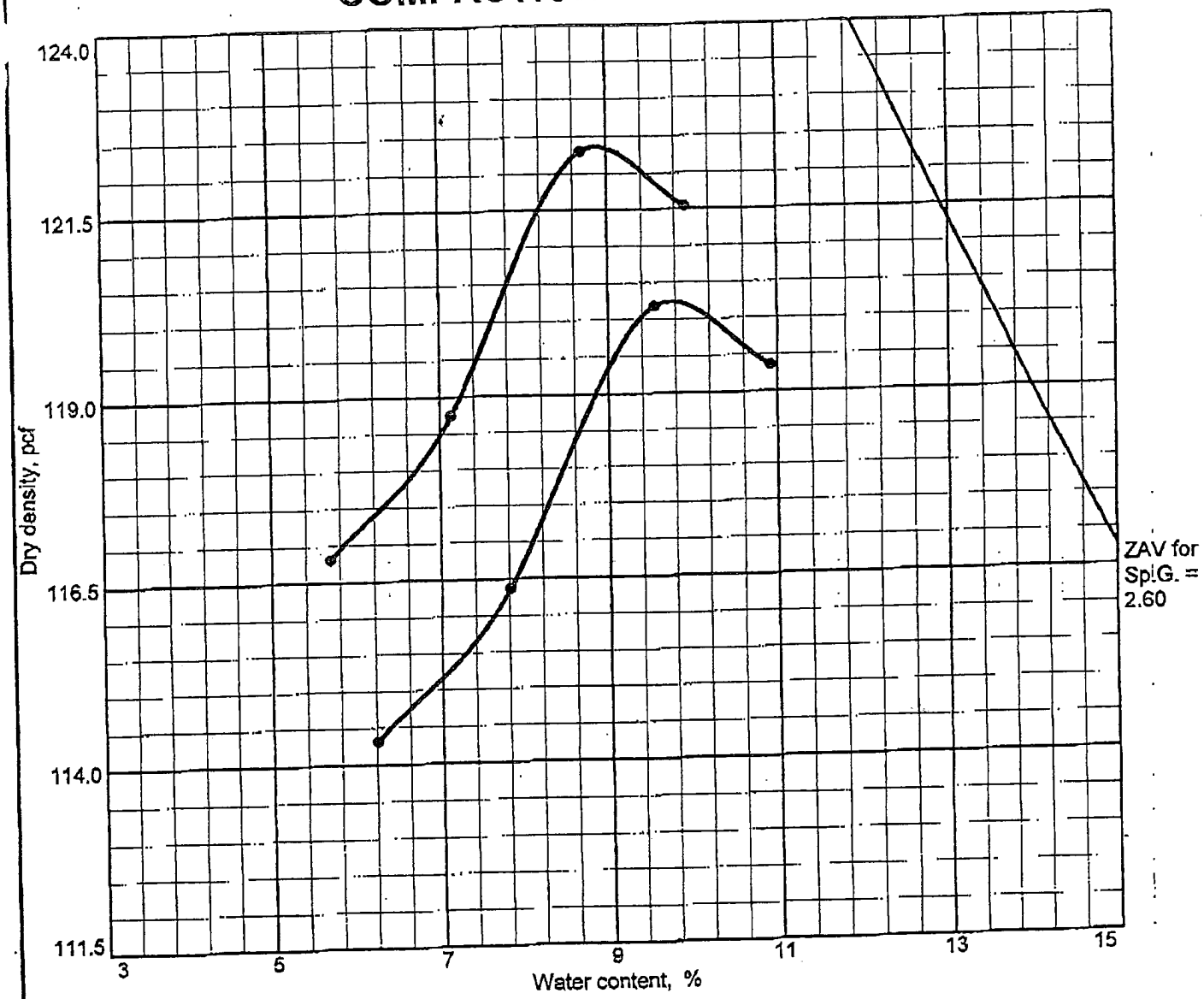
Remarks:

COMPACTION TEST REPORT

JOSEPH A. CESARE AND ASSOCIATES, INC.

Figure 07-0605A

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Procedure B Modified
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
	SP			2.33	NP	NP	10.0	4.2

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 122.5 pcf	120 pcf
Optimum moisture = 9 %	10 %

MATERIAL DESCRIPTION

Poorly graded sand with gravel

Remarks:

Project No. 07.1243 **Client:** U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113

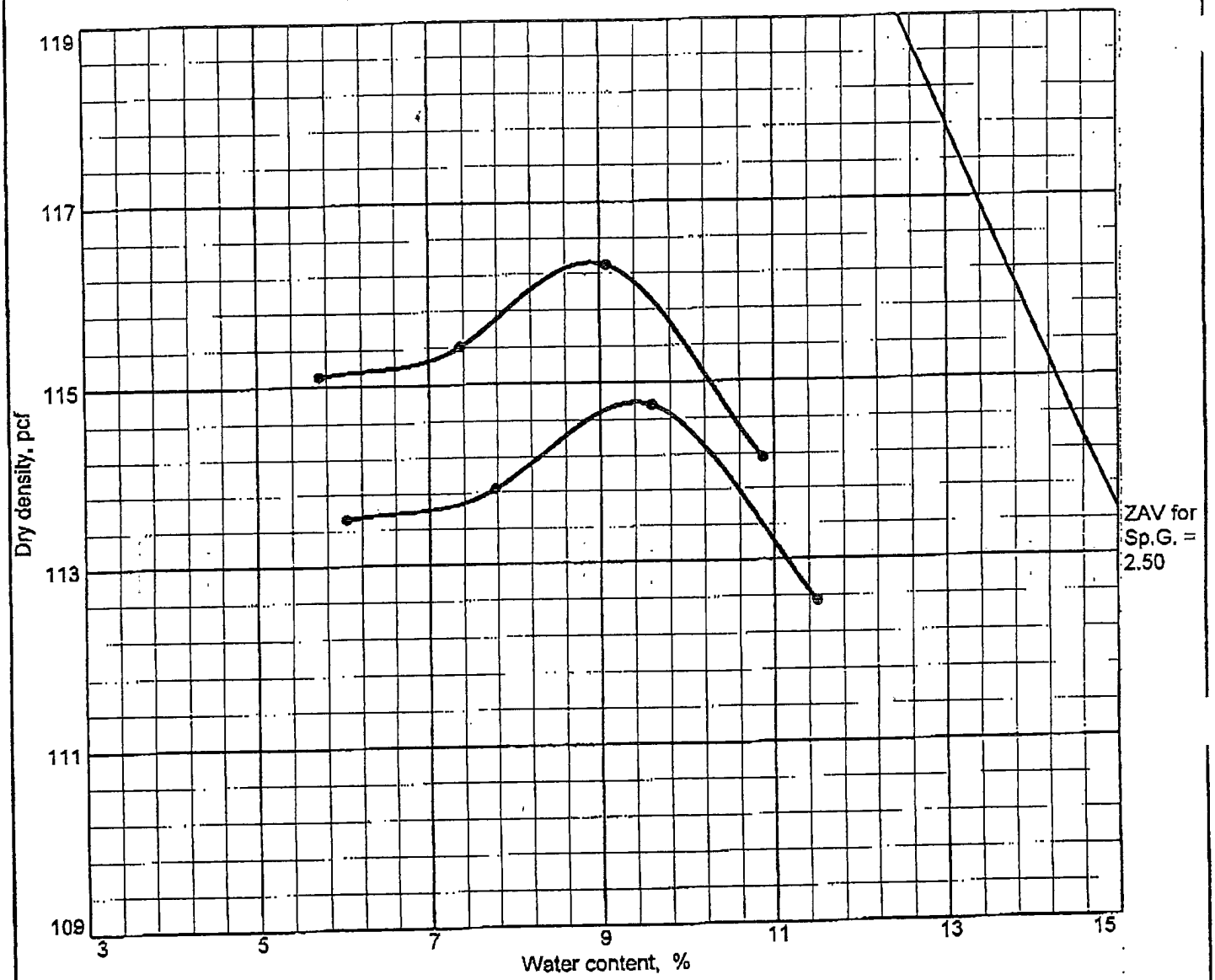
Location: USEN-A3

COMPACTION TEST REPORT

JOSEPH A. CESARE AND ASSOCIATES, INC.

Figure 07-0430C

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Procedure B Modified
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
	SP-SM			2.36	NP	NP	6.0	9.3

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 116.5 pcf	115 pcf	Poorly graded sand with silt
Optimum moisture = 9 %	9.5 %	

Project No. 07.1243 **Client:** U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113

● **Location:** USEN-C1

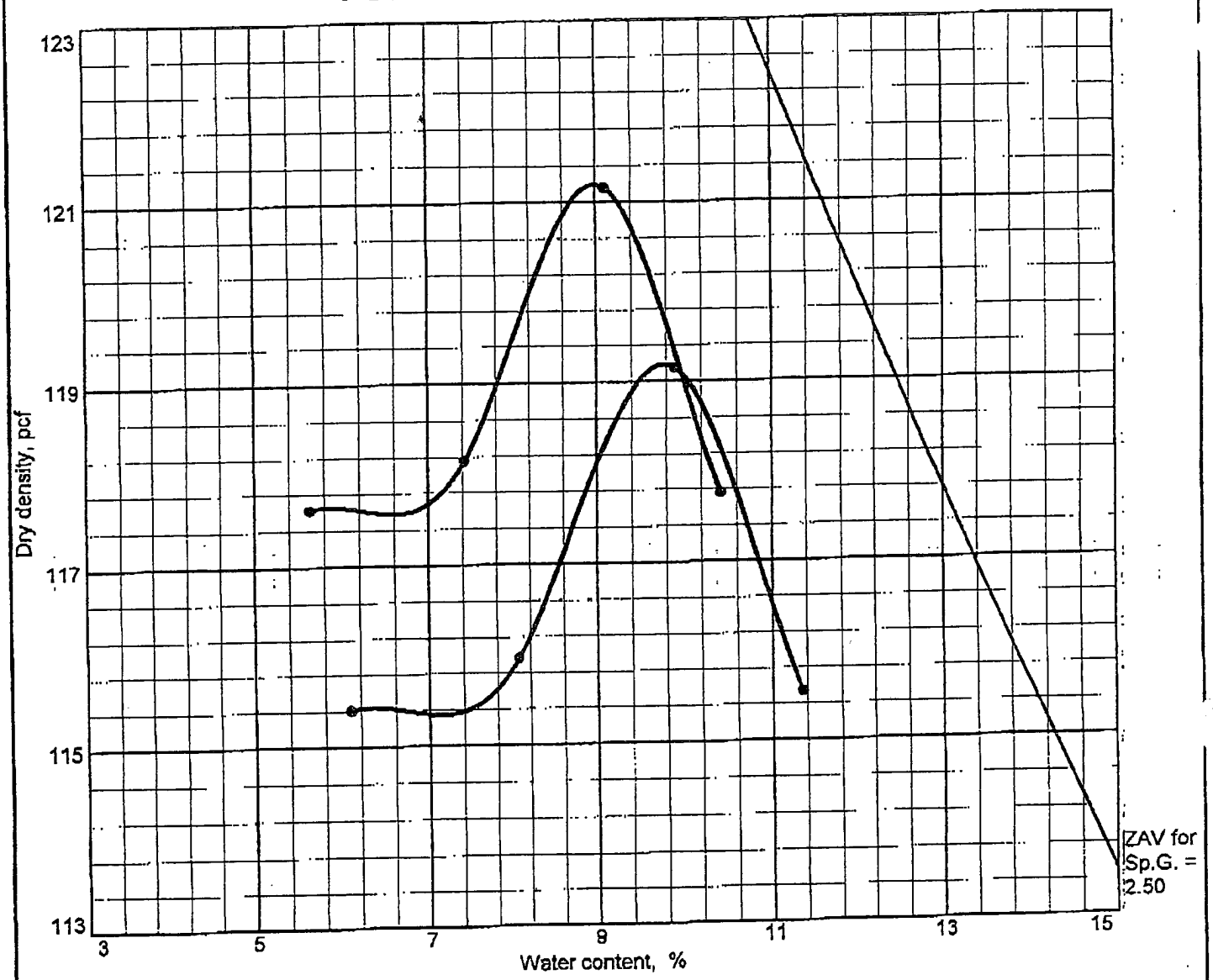
Remarks:

COMPACTION TEST REPORT

JOSEPH A. CESARE AND ASSOCIATES, INC.

Figure 07-0430E

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Procedure B Modified
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
	SP-SM			2.34	NP	NP	9.0	9.1

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 121 pcf	119 pcf
Optimum moisture = 9 %	10 %

MATERIAL DESCRIPTION

Poorly graded sand with silt and gravel

Project No. 07.1243 **Client:** U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113

- **Location:** USEN-C2

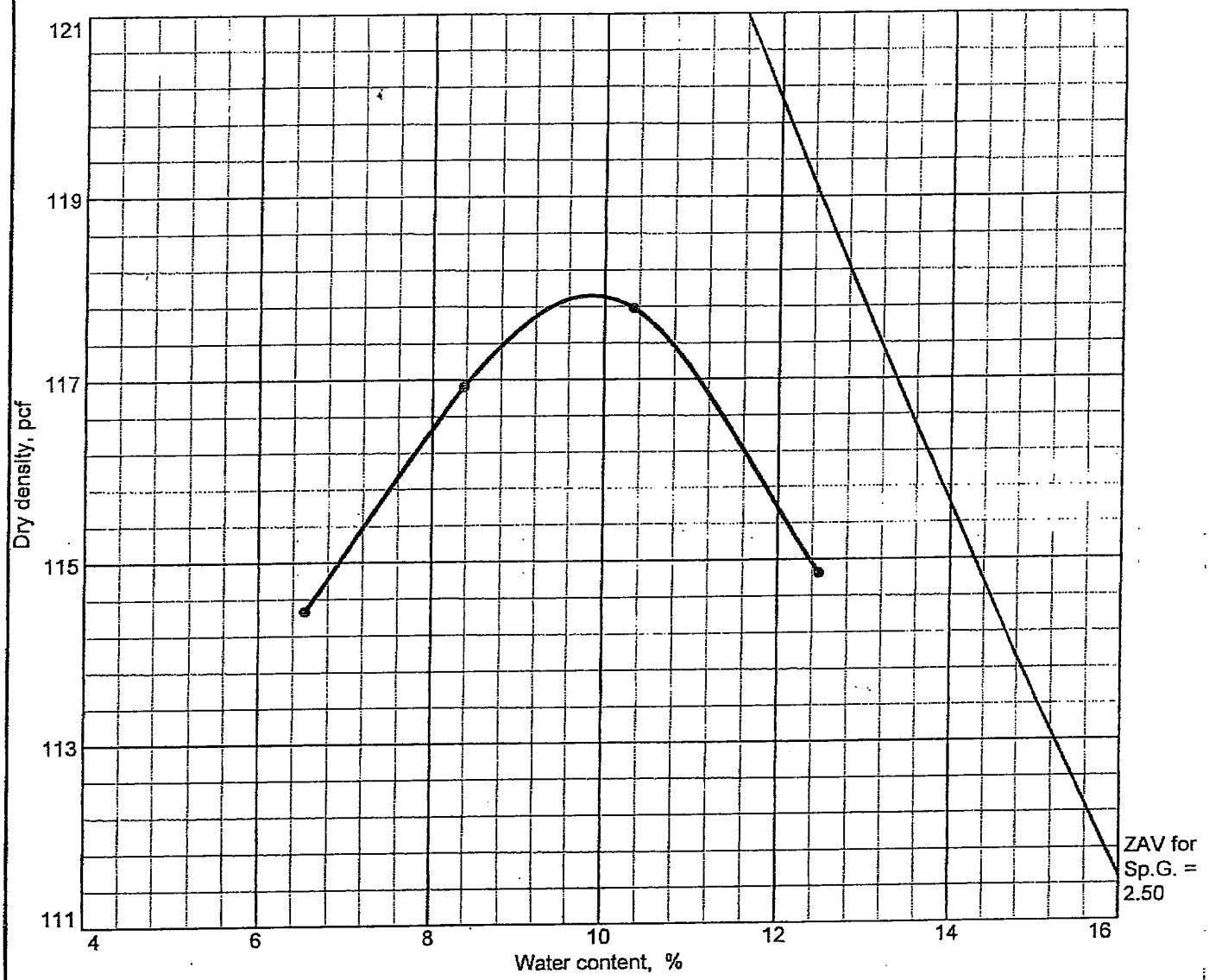
Remarks:

COMPACTION TEST REPORT

JOSEPH A. CESARE AND ASSOCIATES, INC.

Figure 07-0430F

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Procedure A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
							18.0	

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 118 pcf Optimum moisture = 10 %	

Project No. 07.1243 **Client:** U.S. Ecology-NV

Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113

● **Location:** USEN-C1 and C2 w/5% Zeolite Clay

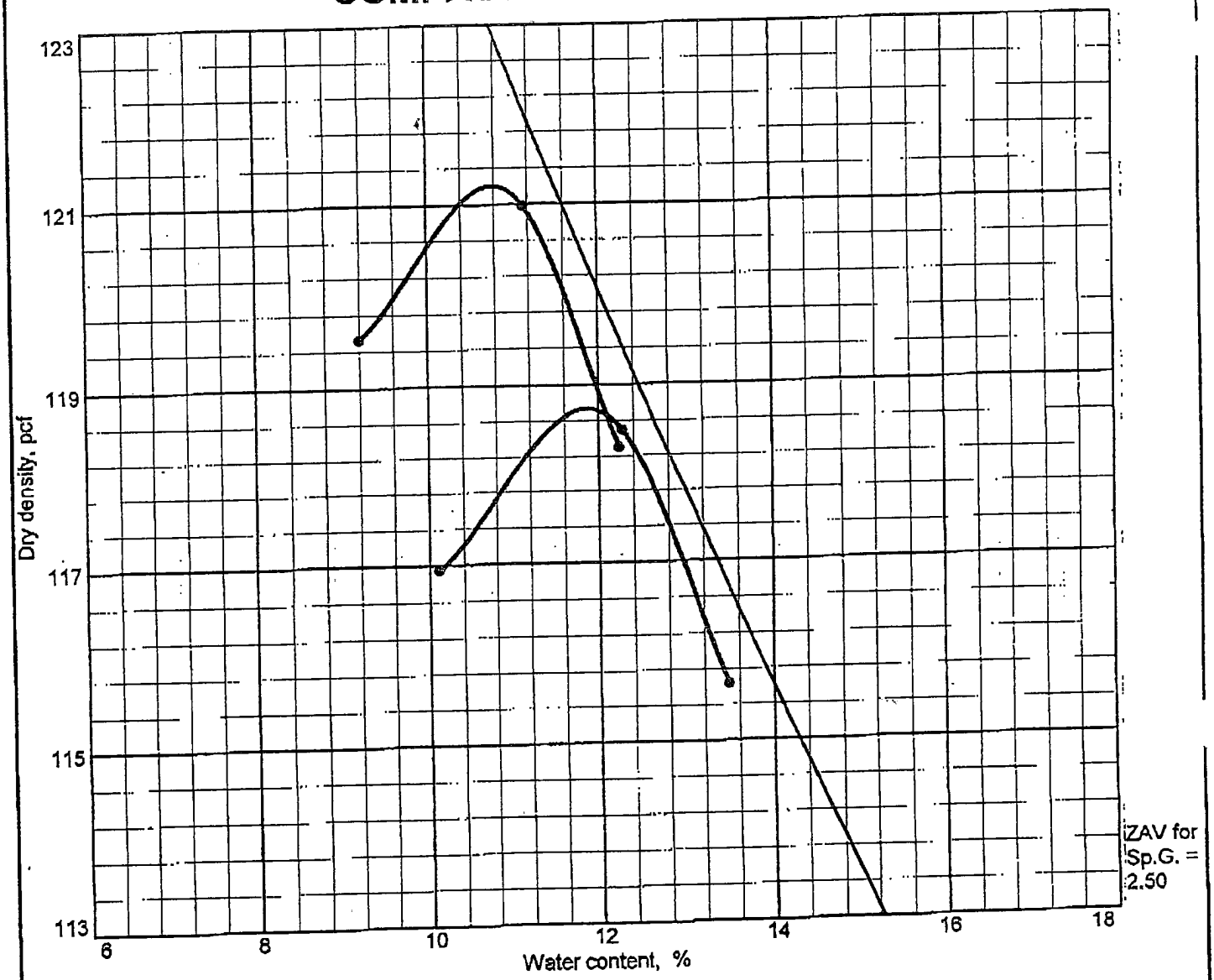
Remarks:

COMPACTION TEST REPORT

JOSEPH A. CESARE AND ASSOCIATES, INC.

Figure 07-0605C

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Procedure B Modified
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
	SW			2.39	NP	NP	10.0	3.3

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 121 pcf	118.5 pcf
Optimum moisture = 11 %	12 %

MATERIAL DESCRIPTION
Well-graded sand with gravel

Project No. 07.1243 **Client:** U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
Location: USEN-D1

Remarks:

COMPACTION TEST REPORT

JOSEPH A. CESARE AND ASSOCIATES, INC.

Figure 07-0430G

COMPACTION TEST REPORT

Test specification: ASTM D 1557-00 Procedure B Modified
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
	SP-SM			2.34	NP	NP	11.0	5.2

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 125 pcf	122.5 pcf	Poorly graded sand with silt and gravel
Optimum moisture = 9.5 %	10.5 %	

Project No. 07.1243 **Client:** U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113

● **Location:** USEN-D2

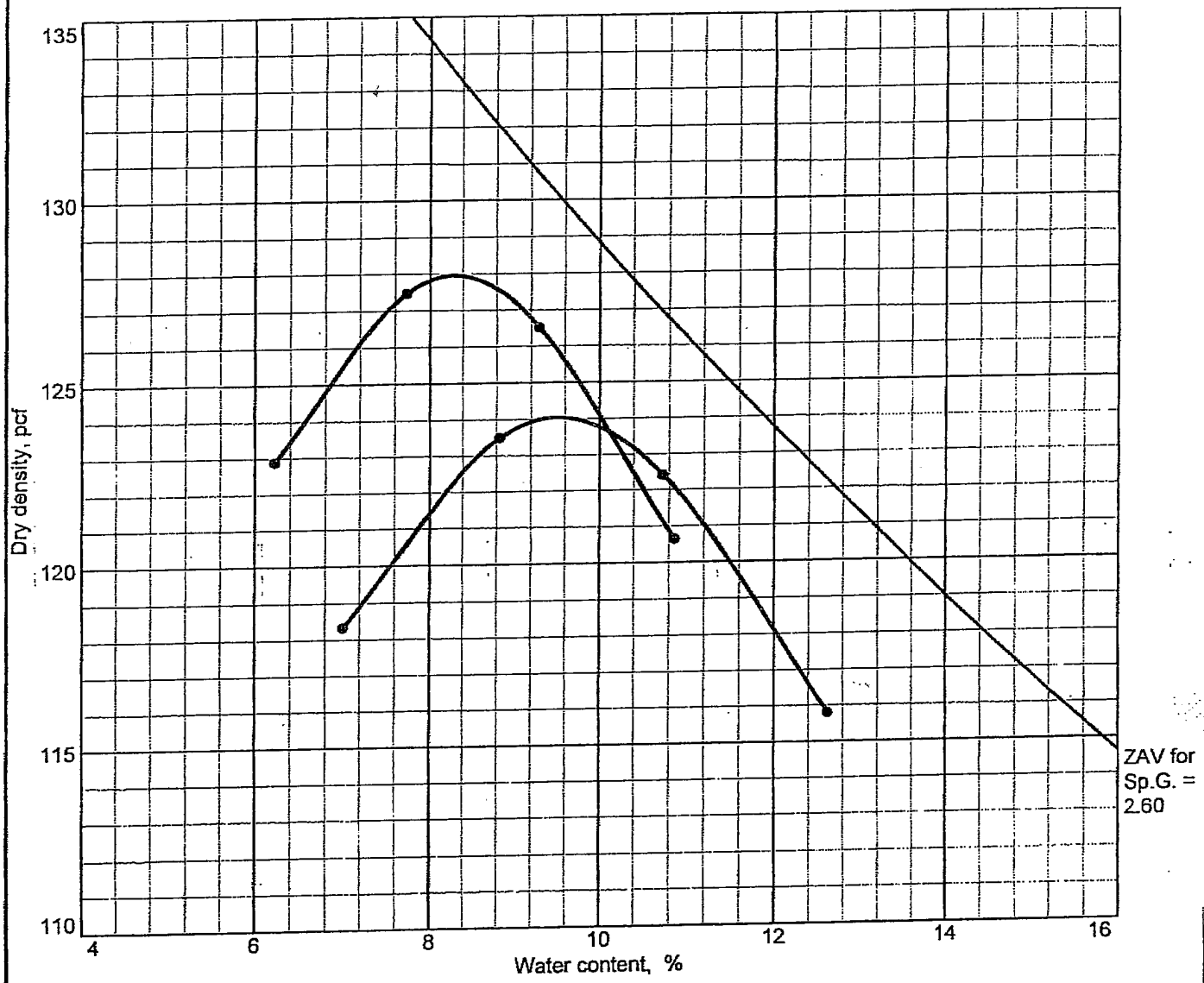
Remarks:

COMPACTION TEST REPORT

JOSEPH A. CESARE AND ASSOCIATES, INC.

Figure 07-0430H

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Procedure B Modified
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
				2.41			17.4	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 128 pcf	124 pcf	
Optimum moisture = 8.5 %	9.5 %	

Project No. 07.1243 **Client:** U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113

- **Location:** USEN-D1 and D2 w/5% Zeolite Clay

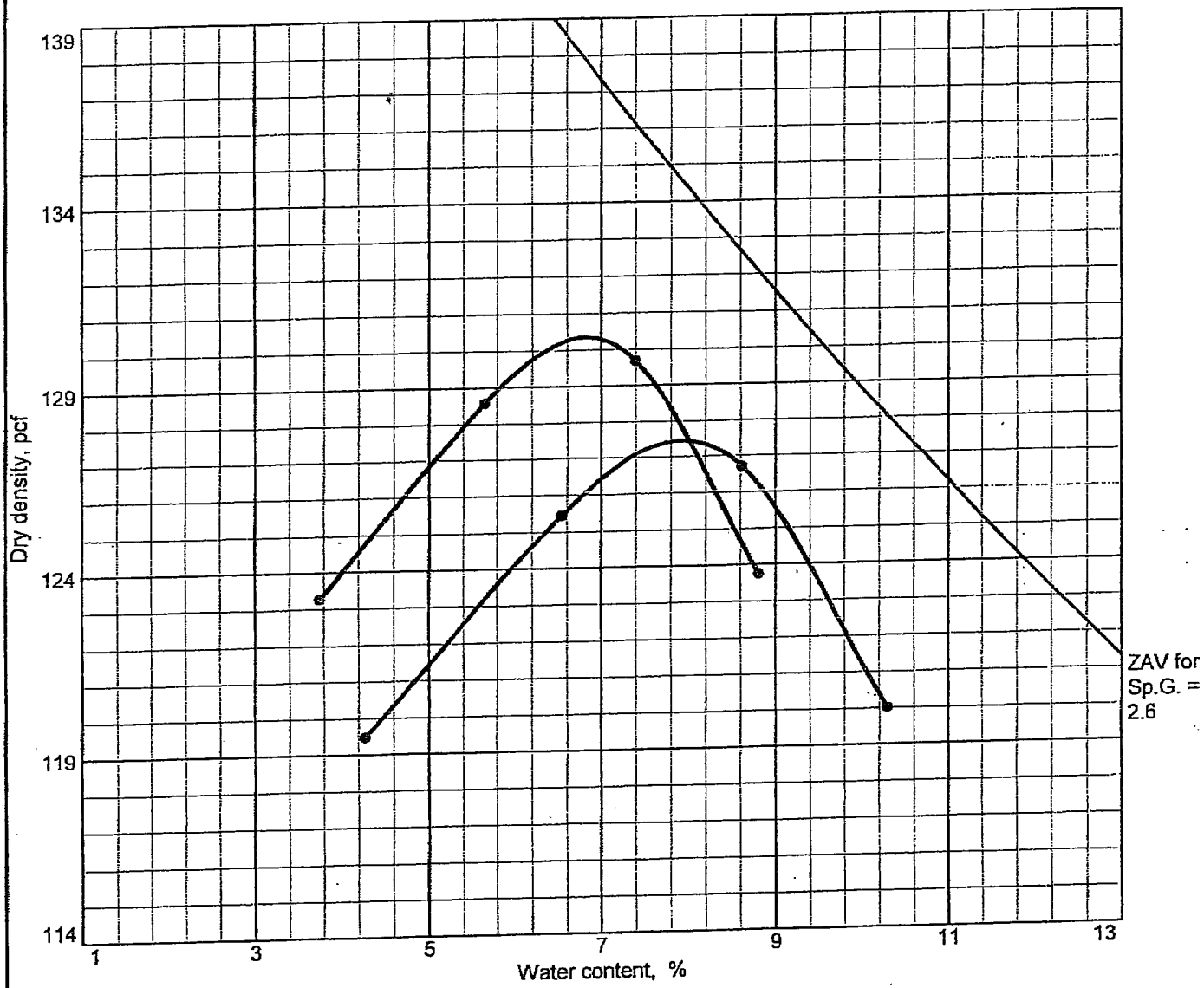
Remarks:

COMPACTION TEST REPORT

JOSEPH A. CESARE AND ASSOCIATES, INC.

Figure 07-0605D

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Procedure C Modified
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
				2.37			16.0	7.8

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 130.5 pcf	127.5 pcf	
Optimum moisture = 7 %	8 %	

Project No. 07.1243 **Client:** U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113
● **Location:** Trench 12 Material mixed w/5% Imvite 1016 MIX 1

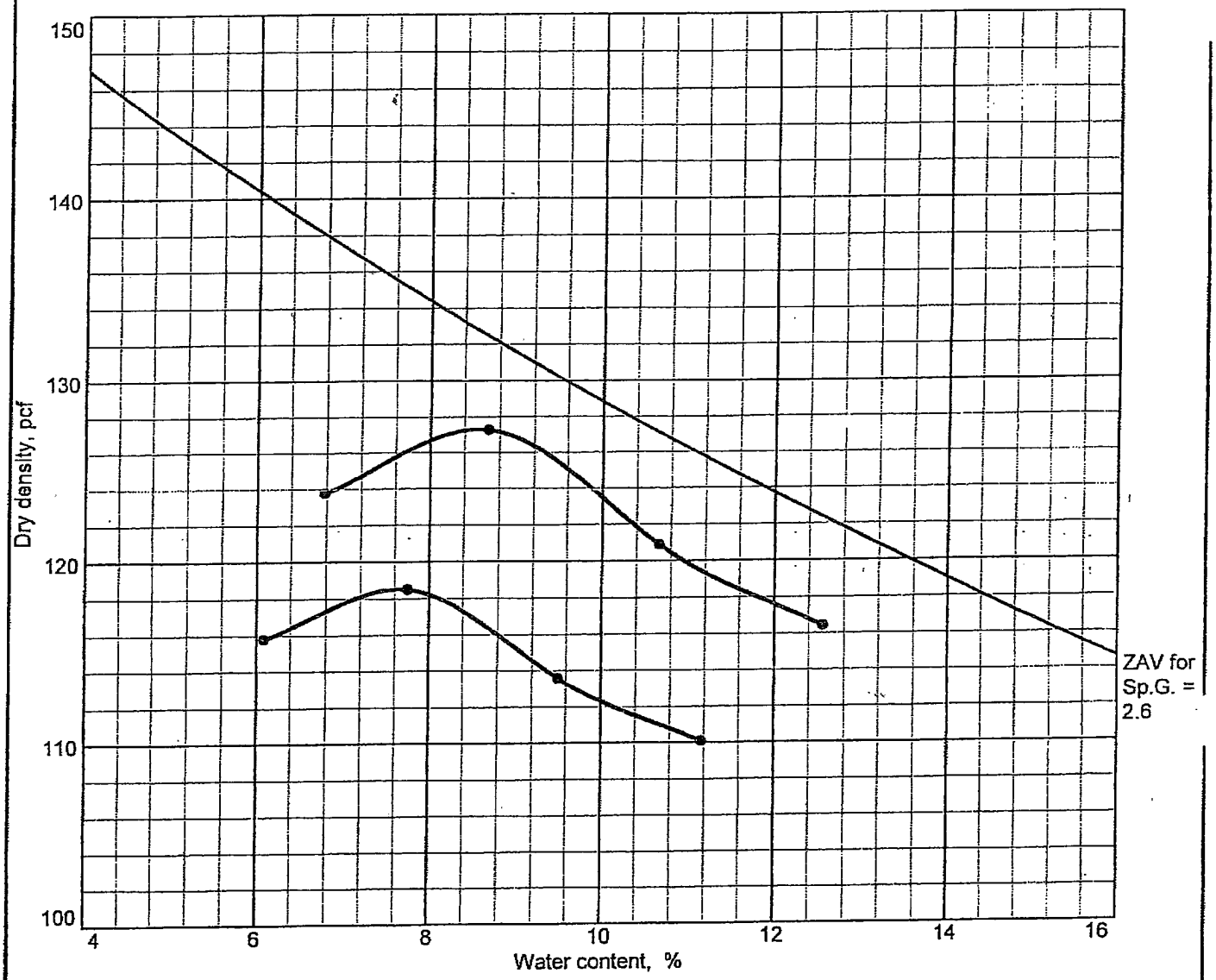
Remarks:
Sampled 9/14/07 ; Native w/5% Imvite 1016 ; Lab#07-0705A

COMPACTION TEST REPORT

JOSEPH A. CESARE AND ASSOCIATES, INC.

Figure 07-0705A

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Procedure C Modified
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
				1.26			12.0	11

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 118.5 pcf	127.5 pcf	
Optimum moisture = 7.5 %	8.5 %	

Project No. 07.1243 **Client:** U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113

● **Location:** Trench 12 Material mixed w/10% Imvite 1016 MIX 2

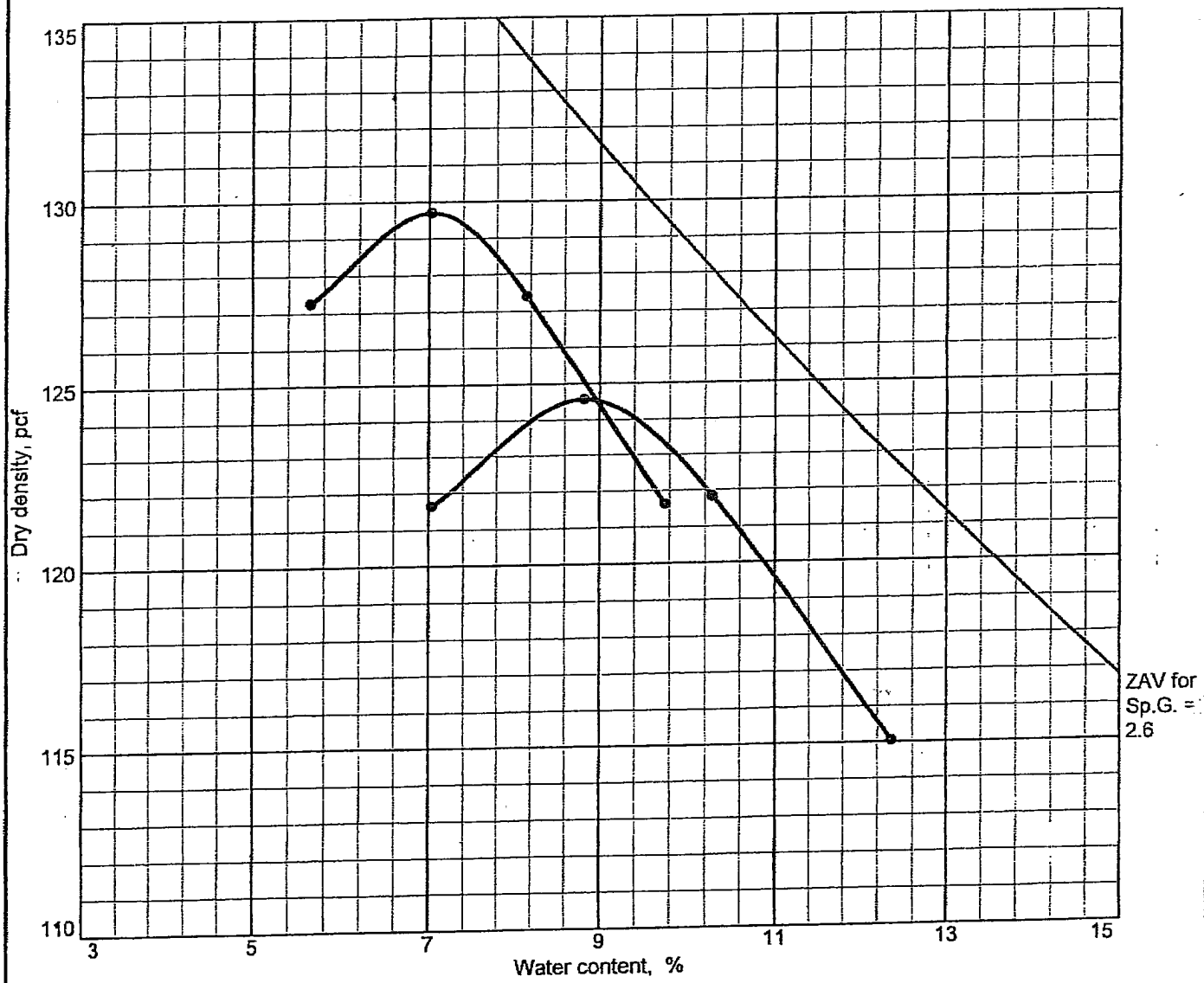
Remarks:
Samled 9/14/07 ; Native mixed w/10% Imvite ; Lab#07-0705B

COMPACTION TEST REPORT

JOSEPH A. CESARE AND ASSOCIATES, INC.

Figure 07-0705B

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Procedure C Modified
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
				2.41			23.0	14

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 129.5 pcf	124.5 pcf	
Optimum moisture = 7 %	9 %	

Project No. 07.1243 **Client:** U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113

- **Location:** Trench 12 Material mixed w/15% Imvite MIX 3

Remarks:
Sampled 9/14/07 ; ;Native mixed w/15% Imvite1016 ; Lab#07- 0705C

COMPACTION TEST REPORT

JOSEPH A. CESARE AND ASSOCIATES, INC.

Figure 07-0705C

COMPACTION TEST REPORT

Test specification: ASTM D 1557-00 Procedure C Modified
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
				2.38			11.0	12

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 126 pcf	124 pcf	
Optimum moisture = 8.5 %	9.5 %	

Project No. 07.1243 **Client:** U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113

● **Location:** Trench 12 Material mixed w/10% SEP/SAP MIX 4

Remarks:
Sampled 9/14/07 ; Native mixed w/SEP/SAP ; Lab#07-0750D

COMPACTION TEST REPORT

JOSEPH A. CESARE AND ASSOCIATES, INC.

Figure 07-0705D

COMPACTION TEST REPORT

Test specification: ASTM D 1557-00 Procedure C Modified
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
				2.37			19.0	16

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 126 pcf	122 pcf	
Optimum moisture = 8.5 %	10 %	

Project No. 07.1243 **Client:** U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113

- **Location:** Trench 12 material mixed w/15% SEP/SAP MIX 5

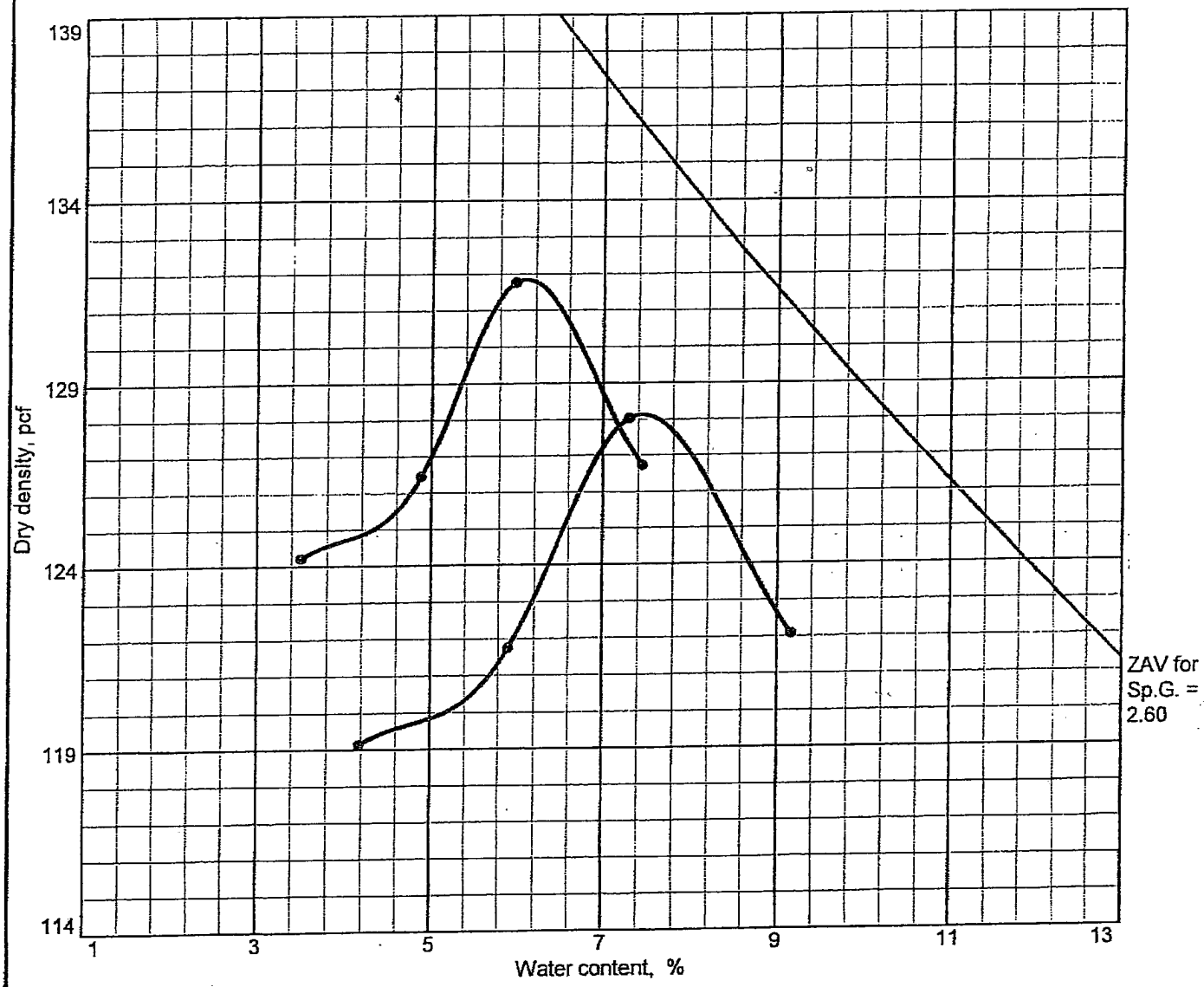
Remarks:
Sampled 9/14/07 ; Native mixed with 15% SEP/SAP ; Lab#07- 0705E

COMPACTION TEST REPORT

JOSEPH A. CESARE AND ASSOCIATES, INC.

Figure 07-0705E

COMPACTION TEST REPORT



Test specification: ASTM D 1557-00 Procedure C Modified
Oversize correction applied to each point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
				2.37			21.0	7.5

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 132 pcf	128 pcf	
Optimum moisture = 6 %	7.5 %	

Project No. 07.1243 **Client:** U.S. Ecology-NV
Project: U.S. Ecology-NV Miscellaneous Testing Proj.# 07.3113

• **Location:** Trench 12 Material Mixed w/5% Portland Cement MIX 6

Remarks:

COMPACTION TEST REPORT

JOSEPH A. CESARE AND ASSOCIATES, INC.

Figure 07-0705F

Result of Permeability Testing

Knight Piésold CONSULTING

Falling Head Permeability

Manual of Soil Laboratory Testing (K.H. Head) Section 10.7.2

Project	U.S. Ecology-NV Misc.Testing Proj.#07-3113	Project No.	07.1243
Lab No.		Date of Test	7/23 - 7/31/07
Sample No.	07-0430A	Tested By	spb
Location	Native, USEN-A1 1800 ml	Checked By	SPB

Specimen Data

Sample Parameters:	Wet Sample Mass, g	7366.5
	Dry Sample Mass, g	6739.7
	Dry Unit Weight, pcf	123.4
	Moisture Content, %	9.3

Specimen Diameter,	in.	8.020	mm	203.7
Specimen Height,	in.	4.119	mm	104.6
Standpipe Diameter	in.	0.250	mm	6.4
Specimen Area,	$in.^2$	50.52	mm^2	32,591.6
Standpipe Area,	$in.^2$	0.05	mm^2	31.7

Permeability Trial Data

Trial No.	Elapsed Time sec	Initial Head h_1 mm	Final Head h_2 mm	h_1/h_2	$\log10(h_1/h_2)$	Hydraulic Conductivity k m/s	Hydraulic Conductivity k cm/sec
1	60240.0	647.0	70.0	9.243	0.965806	3.8E-09	3.8E-07
2	2580.0	587.0	531.0	1.105	0.043544	4.0E-09	4.0E-07
3	5860.0	53.1	42.4	1.252	0.097729	3.9E-09	3.9E-07
4	4360.0	42.4	35.7	1.188	0.074698	4.0E-09	4.0E-07
5	6600.0	35.7	27.7	1.289	0.110188	3.9E-09	3.9E-07
Averages						3.9E-09	3.9E-07

General Notes:

$$k = \frac{3.84 * a * L}{A * t} \log10(h1/h2) \times 1E\text{-}05$$

a = standpipe cross sectional area, mm^2

A = specimen cross sectional area, mm^2

L = specimen length, mm

t = elapsed time, minutes

Knight Piésold CONSULTING

Constant Head Permeability

USBR 5605, Amended

Project	U.S. Ecology-NV Misc.Testing Proj.#07-3113	Project No.	07.1243
Lab No.		Date of Test	7/25 - 7/26/07
Sample No.	07-0430B	Tested By	spb
Location	Native, USEN-A2	Checked By	SPB

Specimen Data

Target Dry Density, pcf	117.0	Wet Sample Wt. + Tare, lbs.	16.458
Target Density, t/m^3	NA	Tare, lbs.	0.000
Moisture Content, %	6.1	Wet Sample Wt., lbs.	16.458
Mold Diameter, in.	8.02	Sample Length, in.	4.488
Mold Area, in.^{2}	50.52	Sample Volume, in.^{3}	226.7
Mold Area, ft^2	0.3508	Sample Volume, ft^3	0.1312
Depth to Mold Bottom, in.	8.701	Wet Density, pcf	125.4
		Initial Depth to Plate, in.	4.213
Normal Stress Range, psf	144		

Permeability Trial Data

Normal Stress, psf	144			Head, cm	11.6
Avg. Depth to Plate, in.	4.252	Consolidated Length, in.	4.449	Wet Density, pcf	126.5

Trial No.	Q cc	Time sec	Flow cc/sec	Permeability k, cm/sec
1	34.3	240.00	0.143	4.3E-04
2	40.8	360.00	0.113	3.4E-04
3	58.9	540.00	0.109	3.3E-04
4	90.6	1020.00	0.089	2.7E-04
5	148.6	1740.00	0.085	2.6E-04
6	586.4	6840.00	0.086	2.6E-04
7	864.2	9780.00	0.088	2.6E-04
Averages			0.102	2.6E-04

General Notes:

1) Tap water was used as permeant.
2) Flow conditions may vary depending on the particle distribution in the field.
3) The sample was allowed to saturate overnight prior to initializing flow trials.
4) The sample was prepared by placing the material in three lifts to achieve the desired 100% MDD target density.

Knight Piésold CONSULTING

Constant Head Permeability

USBR 5605, Amended

Project	U.S. Ecology-NV Misc. Testing Proj.#07-3113	Project No.	07.1243
Lab No.		Date of Test	08/22/07
Sample No.	07-0605A	Tested By	spb
Location	A2 WITH 5% ZEOLITE CLAY	Checked By	SPB

Specimen Data

Target Dry Density, pcf	106.5	Wet Sample Wt. + Tare, lbs.	18.193
Target Density, t/m^3	NA	Tare, lbs.	0.170
Moisture Content, %	6.8	Wet Sample Wt., lbs.	18.023
Mold Diameter, in.	8.02	Sample Length, in.	5.422
Mold Area, in.^{2}	50.52	Sample Volume, in.^{3}	273.9
Mold Area, ft^2	0.3508	Sample Volume, ft^3	0.1585
Depth to Mold Bottom, in.	8.701	Wet Density, pcf	113.7
		Initial Depth to Plate, in.	3.279
Normal Stress Range, psf	144		

Permeability Trial Data

Normal Stress, psf	144			Head, cm	10.2
Avg. Depth to Plate, in.	0.070	Consolidated Length, in.	8.631	Wet Density, pcf	71.4

Trial No.	Q cc	Time sec	Flow cc/sec	Permeability k, cm/sec
1	219.7	3029.00	0.073	4.8E-04
2	396.4	4672.00	0.085	5.6E-04
3	312.6	3875.00	0.081	5.3E-04
4	756.7	9520.00	0.079	5.2E-04
5	557.9	6883.00	0.081	5.3E-04
Averages			0.080	5.3E-04

General Notes:

1) Tap water was used as permeant.
2) Flow conditions may vary depending on the particle distribution in the field.
3) The sample was allowed to saturate overnight prior to initializing flow trials.
4) The sample was prepared by placing the material in the mold loosely and then lightly tapping the sides of the mold.

FLEXIBLE WALL PERMEABILITY TEST

ASTM D 5084-03

Falling Head/Increasing Tailwater Pressure

CLIENT:	J.A. Cesare		
PROJECT:	U.S. Ecology-NV Misc.Testing Proj.#07-3113	PROJECT NO. :	DV108-59.7
BORING NO.		LAB NO. :	
DEPTH		SAMPLE ID:	
SAMPLE NO.	07-0605B (A3)	TEST STARTED :	08/21/07
SAMPLE TYPE	Cal. Liner	TEST FINISHED :	08/24/07
CONF. PRESSURE. (psi)	3	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST
Wt. Soil + Moisture (g)	1685.40	1751.80
Wt. Wet Soil & Pan (g)	1685.40	2170.70
Wt. Dry Soil & Pan (g)	1527.10	1946.00
Wt. Moisture Lost (g)	158.30	224.70
Wt. of Pan Only (g)	0.00	418.90
Wt. of Dry Soil (g)	1527.10	1527.10
Moisture Content %	10.4	14.7
Wet Density (pcf)	131.7	137.8
Dry Density (pcf)	119.3	120.1

Init. Diameter (in)	3.940	(cm) 10.008
Init. Area (sq in)	12.192	(sq cm) 78.659
Init. Height (in)	4.000	(cm) 10.160
Height Change (in)	0.024	(cm) 0.061
Consol. Height (in)	3.976	(cm) 10.099
Area After Consol. (sq in)	12.184	(sq cm) 78.609

Vol. Before Consol. (cu ft)	0.02822	Specific Gravity 2.67
Vol. Before Consol. (cc)	799.2	Assumed? Yes
Change in Vol. (cc)	5.3	
Cell Exp. (cc)	0.0	Init. Saturation 69.7
Vol. After Consol. (cc)	793.9	Init. Void Ratio 0.397
Vol. After Consol. (cu ft)	0.02804	Final Saturation 100.0
Effective Porosity %	28.43	Final Void Ratio 0.388
Pressure Difference (psi):	0.00	
C =	0.13604	Buret Constant, a 0.920
k, cm/s = (C/t)*log(h1/h2)		Buret Stand 3

Permeability Test Trials

Time min.	Cap Elevation cc	Pedestal Elevation cc	Elevation Head cm	Total Head cm	Permeability k cm/sec
0.00	48.0	1.5	50.2	50.2	
0.25	45.1	4.7	43.6	43.6	5.5E-04
0.25	42.2	7.5	37.5	37.5	6.0E-04
0.25	39.8	9.8	32.4	32.4	5.7E-04
0.25	37.8	11.8	28.1	28.1	5.6E-04
0.25	36.0	13.6	24.2	24.2	5.9E-04
0.25	34.5	15.1	21.0	21.0	5.7E-04
			Avg.of Last 4 Rdgs.		5.7E-04

General Test Notes:
1) Tap water was used as the permeant.
2) Back pressure saturation continued until 'B' parameter a minimum of 0.95.

FLEXIBLE WALL PERMEABILITY TEST

ASTM D 5084-03

Falling Head/Increasing Tailwater Pressure

CLIENT:	J.A. Cesare		
PROJECT:	U.S. Ecology-NV Misc.Testing Proj.#07-3113	PROJECT NO. :	DV108-59.7
BORING NO.		LAB NO. :	
DEPTH		SAMPLE ID:	
SAMPLE NO.	07-0605B (A3)	TEST STARTED :	08/21/07
SAMPLE TYPE	Cal. Liner	TEST FINISHED :	08/24/07
CONF. PRESSURE. (psi)	10	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST
Wt. Soil + Moisture (g)	1685.40	1749.80
Wt. Wet Soil & Pan (g)	1685.40	2168.70
Wt. Dry Soil & Pan (g)	1527.10	1946.00
Wt. Moisture Lost (g)	158.30	222.70
Wt. of Pan Only (g)	0.00	418.90
Wt. of Dry Soil (g)	1527.10	1527.10
Moisture Content %	10.4	14.6
Wet Density (pcf)	131.7	137.9
Dry Density (pcf)	119.3	120.4

Init. Diameter (in)	3.940	(cm) 10.008
Init. Area (sq in)	12.192	(sq cm) 78.659
Init. Height (in)	4.000	(cm) 10.160
Height Change (in)	0.024	(cm) 0.061
Consol. Height (in)	3.976	(cm) 10.099
Area After Consol. (sq in)	12.153	(sq cm) 78.411

Vol. Before Consol. (cu ft)	0.02822	Specific Gravity 2.67
Vol. Before Consol. (cc)	799.2	Assumed? Yes
Change in Vol. (cc)	7.3	
Cell Exp. (cc)	0.0	Init. Saturation 69.7
Vol. After Consol. (cc)	791.9	Init. Void Ratio 0.397
Vol. After Consol. (cu ft)	0.02796	Final Saturation 100.0
Effective Porosity %	28.43	Final Void Ratio 0.385
Pressure Difference (psi):	0.00	
C =	0.13638	Buret Constant, a 0.920
k, cm/s = (C/t)*log(h1/h2)		Buret Stand 3

Permeability Test Trials

Time min.	Cap Elevation cc	Pedestal Elevation cc	Elevation Head cm	Total Head cm	Permeability k cm/sec
0.00	48.7	2.0	50.4	50.4	
0.25	45.9	5.0	44.2	44.2	5.2E-04
0.25	43.1	7.6	38.3	38.3	5.6E-04
0.25	40.9	10.0	33.4	33.4	5.5E-04
0.25	38.8	11.9	29.1	29.1	5.5E-04
			Avg.of Last 4 Rdgs.		5.4E-04

General Test Notes:
1) Tap water was used as the permeant.
2) Back pressure saturation continued until 'B' parameter a minimum of 0.95.

Knight Piésold CONSULTING

Constant Head Permeability

USBR 5605, Amended

Project	U.S. Ecology-NV Misc.Testing Proj.#07-3113	Project No.	07.1243
Lab No.		Date of Test	7/21 - 7/22/07
Sample No.	07-0430D	Tested By	spb
Location	Native, USEN-B1	Checked By	SPB

Specimen Data

Target Dry Density, pcf	NA	Wet Sample Wt. + Tare, lbs.	37.119
Target Density, t/m^3	NA	Tare, lbs.	17.813
Moisture Content, %	NA	Wet Sample Wt., lbs.	19.306
Mold Diameter, in.	8.02	Sample Length, in.	7.520
Mold Area, in.^{2}	50.52	Sample Volume, in.^{3}	379.9
Mold Area, ft^2	0.3508	Sample Volume, ft^3	0.2198
Depth to Mold Bottom, in.	8.701	Wet Density, pcf	87.8
		Initial Depth to Plate, in.	1.181
Normal Stress Range, psf	144		

Permeability Trial Data

Normal Stress, psf	144			Head, cm	1.3
Avg. Depth to Plate, in.	1.220	Consolidated Length, in.	7.481	Wet Density, pcf	88.3

Trial No.	Q cc	Time sec	Flow cc/sec	Permeability k, cm/sec
1	1132.5	29.67	38.2	1.7E+00
2	1132.5	29.47	38.4	1.7E+00
3	1132.5	29.41	38.5	1.7E+00
4	1132.5	29.56	38.3	1.7E+00
5	1132.5	29.73	38.1	1.7E+00
6	1132.5	29.81	38.0	1.7E+00
7	1132.5	29.66	38.2	1.7E+00
Averages			38.241	1.7E+00

General Notes:

1) Tap water was used as permeant.
2) Flow conditions may vary depending on the particle distribution in the field.
3) The sample was allowed to saturate overnight prior to initializing flow trials.
4) The sample was prepared by placing the material in the mold loosely and then lightly tapping the sides of the mold.

Knight Piésold CONSULTING

Constant Head Permeability

USBR 5605, Amended

Project	U.S. Ecology-NV Misc.Testing Proj.#07-3113	Project No.	07.1243
Lab No.		Date of Test	08/20/07
Sample No.	07-0605E	Tested By	spb
Location	Native, USEN-B1, SECOND SAMPLE	Checked By	SPB

Specimen Data

Target Dry Density, pcf	NA	Wet Sample Wt. + Tare, lbs.	38.158
Target Density, t/m^3	NA	Tare, lbs.	15.920
Moisture Content, %	NA	Wet Sample Wt., lbs.	22.238
Mold Diameter, in.	8.02	Sample Length, in.	8.701
Mold Area, in.^{2}	50.52	Sample Volume, in.^{3}	439.5
Mold Area, ft^2	0.3508	Sample Volume, ft^3	0.2544
Depth to Mold Bottom, in.	8.701	Wet Density, pcf	87.4
		Initial Depth to Plate, in.	0.000
Normal Stress Range, psf	144		

Permeability Trial Data

Normal Stress, psf	144			Head, cm	1.2
Avg. Depth to Plate, in.	0.070	Consolidated Length, in.	8.631	Wet Density, pcf	88.1

Trial No.	Q cc	Time sec	Flow cc/sec	Permeability k, cm/sec
1	453	11.87	38.2	2.1E+00
2	453	12.13	37.3	2.1E+00
3	453	12.18	37.2	2.1E+00
4	453	11.88	38.1	2.1E+00
5	453	12.04	37.6	2.1E+00
6	453	12.08	37.5	2.1E+00
7	453	12.00	37.8	2.1E+00
Averages			37.672	2.1E+00

General Notes:

1) Tap water was used as permeant.
2) Flow conditions may vary depending on the particle distribution in the field.
3) The sample was allowed to saturate overnight prior to initializing flow trials.
4) The sample was prepared by placing the material in the mold loosely and then lightly tapping the sides of the mold.