GEOTECHNICAL ENGINEERING SERVICES
NEW MAINTENANCE BUILDING
IDAHO DEPARTMENT OF CORRECTIONS
OROFINO, IDAHO

MARCH 3, 2011

PROFESSIONAL ENGINEER
REGISTERED
6024
STATE OF IDAHO
CHRIS C. BECK
3/3/11

ALLWEST
Testing & Engineering

ALLWEST Testing & Engineering

Materials Testing
Geotechnical Engineering
Environmental Services

March 3, 2011
Project No.: 311-022G

Mr. Mark Knowles
State of Idaho Division of Public Works
P.O. Box 83720
Boise, Idaho 83720-0072

RE: Geotechnical Engineering Evaluation
New Maintenance Building
Idaho Department of Corrections
Orofino, Idaho

Dear Mr. Knowles,

ALLWEST Testing & Engineering has completed the authorized geotechnical engineering evaluation for the proposed Idaho Department of Corrections maintenance building at 318 West Hospital Drive in Orofino, Idaho. The purpose of this evaluation was to characterize the soil and geologic conditions on the property. The attached report presents the results of the field evaluation, laboratory testing and our recommendations to assist project planning and design.

We appreciate the opportunity to work with you on this project. If you have any questions, or need additional information, please do not hesitate to call us at (208) 762-4721.

Sincerely,

ALLWEST Testing & Engineering, LLC

Kevin R. Funke, E.I.T.
Staff Engineer

Chris Beck, P.E.
Principal Geotechnical Engineer

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GEOTECHNICAL ENGINEERING EVALUATION

Orofino Prison Maintenance Building
318 W. Hospital Drive
Orofino, Idaho
Project No. 311-022G

PREPARED FOR:

Mr. Mark Knowles
State of Idaho Division of Public Works
P.O. Box 83720
Boise, Idaho 83720-0072

PREPARED BY:

ALLWEST Testing & Engineering, LLC
690 W. Capstone Court
Hayden, Idaho 83835
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March 3, 2011

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Orofino, Idaho

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Appendix C – Laboratory Test Results – 3 pages

GEOTECHNICAL ENGINEERING EVALUATION
New Maintenance Building
Idaho Department of Corrections
Orofino, Idaho

INTRODUCTION

ALLWEST Testing & Engineering (ALLWEST) has completed the authorized geotechnical engineering evaluation for the proposed Idaho Department of Corrections maintenance building at 318 W. Hospital Drive in Orofino, Idaho. The purpose of this evaluation was to characterize the subsurface soil and geologic conditions on the property. This report presents the results of the field evaluation, laboratory testing and our recommendations to assist project planning and design.

SCOPE OF WORK

To complete the geotechnical engineering evaluation we accomplished the following scope of work:

1. Reviewed USDA Natural Resources Conservation Service, U.S. Geologic Survey mapping information, and aerial photographs for the vicinity of the project site.

2. Completed a site reconnaissance by walking the project area and observing exposed soil conditions, vegetation, surface drainage and erosion features.

3. Performed a field evaluation by excavating three test pits within the proposed construction areas, visually classified and described the soil conditions encountered in these test pits at the time of excavation, and logged the subsurface profile.

4. Performed laboratory tests on soil samples from the test pits to assess some of the soil engineering parameters.

5. Reviewed the results of the field evaluation and laboratory test results with respect to the proposed construction.

6. Performed engineering analyses and formulated recommendations to assist project planning, design, and construction.

7. Prepared this final report.

PROPOSED DEVELOPMENT

The proposed Idaho Department of Corrections maintenance building will be located on the south side of the main parking lot at the facilities in Orofino, Idaho. The general location of the property is shown on the Site Location Map included in Appendix A. It is our understanding that the proposed maintenance building will be a one- to two-story, wood-frame structure located south of the parking lot and north of the volleyball pit. Storm water will be treated on-site and discharged to natural drainageways or existing storm water management facilities.

EVALUATION PROCEDURES

Prior to the excavation of test pits we reviewed USDA Natural Resources Conservation Service data, U.S. Geologic Survey mapping information, aerial photographs, and previous land use information for the vicinity of the project site.

We evaluated the subsurface conditions at the site by excavating three test pits within the proposed construction area. The locations of the test pits are shown on the Test Pit Location Map included with this report (Appendix A). The test pits were excavated by a backhoe using a 36-inch-wide bucket equipped with standard soil excavation teeth. The test pits were excavated to depths ranging from 9 to 10 feet below existing site grade. The test pits were terminated at these depths after encountering consistent native soils to termination depth. The soils encountered in the test pits were visually described and classified in general accordance with ASTM D 2487 and D 2488.

The test pits were loosely backfilled at the conclusion of the field evaluation. The backfill will consolidate with time. We recommend that the test pits be re-located at the time of construction. The backfill should be re-excavated and the material replaced and compacted to at least 95 percent of the maximum dry density as determined by ASTM D 1557 (Modified Proctor). The field work was performed on February 21, 2011.

SITE CONDITIONS

The property is located in Lot 6 of Section 6, Township 36 North, Range 2 East of the Boise Meridian in Clearwater County, Idaho. At the time of our field reconnaissance, the ground surface on the property ranged from slightly to moderately sloping. The maximum relief across the property is on the order of 11 feet. Vegetation on the site consisted of a moderately thin growth of evergreen trees with an undergrowth of landscaped deciduous bushes and grasses.

GENERAL SOIL CONDITIONS

The USDA Natural Resources Conservation Service (NRCS) has mapped the soils on the subject property in the Soil Survey of Clearwater County (Appendix A) as Fordcreek loam (map unit 85). The Fordcreek loam soils are described as moderately deep, well-drained soils that formed in loess over residuum weathered from granite and/or metamorphic rock. The available water capacity is moderate. The soils encountered in the test pits appear to be generally consistent with the Fordcreek loam.

GENERAL GEOLOGIC CONDITIONS

The bedrock geology on the property has been mapped as Holocene alluvial fan deposits (Appendix A) on the Geologic Map of the Orofino West Quadrangle, Clearwater, Lewis, and Nez Perce Counties, Idaho by Kauffman, Davidson, Lewis, and Burmester, 2005. The alluvial deposit is described as poorly stratified, poorly sorted gravel in a matrix of granules, sand, silt, and clay. Gravel varies in size from pebbles to boulders.

SUBSURFACE CONDITIONS

Soil Profile

Topsoil was encountered at the surface of each test pit consisting of sandy silty clay and organic material. Depths of the topsoil varied throughout the site, generally ranging between 1 to 2 feet.

Fill was encountered beneath the topsoil layer at test pits TP-1 and TP-3. The fill appeared to be composed of a mixture of the native soils and debris from previous construction at the site. It was in a loose condition and contained various debris including pieces of concrete slab, brick, and plastic. Depths of the fill ranged from approximately 4.5 to 6 feet where encountered.

Native soils that were encountered consisted of sandy silty clay to depths of 6.5 to 10 feet. These soils were in a wet condition and appeared to be stiff. Each of the test pits encountered native soil beneath the topsoil or fill. The test pits were terminated in native soils.

Detailed descriptions of the soil and geologic conditions encountered in the explorations are presented on the Logs of Test Pits included in Appendix B. The descriptive soil terms used on the test pit logs and in this report can be referenced by the Unified Soil Classification System (USCS) included in Appendix B for reference.

Ground Water

Ground water was not encountered in any of the test pits during the field investigation. Based on well logs near the project site, we anticipate that ground water likely exists approximately 30 to 50 feet below the ground surface, most likely at a soil/bedrock interface. However, changes in ground water depth may occur due to seasonal changes in precipitation and runoff or variations in bedrock depth.

LABORATORY TESTING

Laboratory testing was performed on bulk soil samples obtained from the test pits for an assessment of some of the engineering characteristics of the on-site soils. Samples of the native sandy silty clay were taken for grain size analysis, modified Proctor, and Atterberg Limits testing. The tests were performed in general accordance with the following standards:

- Grain Size Analysis — ASTM C 136
- Modified Proctor — ASTM D 1557
- Atterberg Limits — ASTM D 4318

The testing was performed by ALLWEST. Individual sheets summarizing the results of the tests are included in Appendix C.

CONCLUSIONS AND RECOMMENDATIONS

The following recommendations are presented to assist the planning and design of the proposed new maintenance building at the Idaho Department of Corrections facility in Orofino, Idaho. Our recommendations are based on our reconnaissance of the property, field evaluation, experience with similar soil and geologic conditions, laboratory testing and our understanding of the proposed construction. If the construction plans or site conditions are different than those described in this report, we should be notified so we can review and revise our recommendations, if necessary.

Discussion

Based on the data obtained from the test pits and laboratory tests, it is our opinion that the native soils below the topsoil and on-site fill are suitable for support of conventional spread footings, slabs and pavements. The topsoil and fill layers should not be relied upon for support of structures.

Based on the soil profiles observed in the test pits, it appears the existing fill soils may be located across a significant portion of the project site. It is possible that long term settlements will occur in the fill materials. These soils should be excavated from the proposed building area prior to construction of foundations, slabs, etc. It appears that the on-site fill is associated with the demolition of previously existing structures and that some of the resulting debris was mixed and buried with soils located at the site. The fill and topsoil are not suitable for the support of foundations and slabs, and we recommend their removal. The depths of the fill are shown on the Logs of Test Pits in Appendix B.

It should be noted that the existing fill may be encountered elsewhere on the site where test pits were not excavated and that the thickness of the layers may vary. At the owner's discretion, the fill soils may be left in place in landscaped areas with the understanding that settlement could occur below walks, patios, terraces, or other improvements placed over the fill. The owner will need to accept the risk and cost of potential damage to such improvements if the fill is left in place.

Site Preparation

We recommend that all topsoil, including the root zone, and any existing uncontrolled fill be excavated and removed from the proposed building and pavement areas. Excavation should expose native sandy silty clay soils. The upper 12 inches of the exposed native soils should be surface compacted prior to placing structural fill or forms for footings. We recommend that the exposed native soils be compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM D 1557 (Modified Proctor).

We recommend any areas where the decision has been made to leave existing fill soil in place also be surface compacted. Such compaction may reduce the potential for settlement of the fill soils.

We recommend the prepared subgrades be evaluated at the time of construction by a geotechnical engineer for support of the proposed structure or pavement section prior to placement of structural fill or concrete forms. Unsuitable soils should be sub-excavated and replaced with compacted structural fill similar to the surrounding soil.

Slope Stability

The natural slopes on the property are slightly to moderately steep. Site development should be planned using excavated slopes no steeper than 1.5:1 (horizontal to vertical) and fill slopes no steeper than 2:1. Sloughing and erosion should be anticipated on slopes until vegetation is re-established.

Structural Fill

Structural fill is defined as soil that is placed or moved on a site that will support any structural element including buildings, slabs or pavement. Structural fill typically includes the footprint area and 5 feet beyond for structures. Non-structural fill is soil placed beyond the structural fill area. Structural fill should be free of organic matter, frozen soil and deleterious debris. Prior to placing structural fill, topsoil, organic material, uncontrolled fill and debris should be removed. The ground surface should be relatively level. Structural fill should be placed on subgrades prepared as directed in the Site Preparation section of this report.

We recommend the structural fill consist of sands or gravels (GW, GP, GW-GM, GP-GM, SW or SP) with minor amounts of fines (material passing #200 sieve). The on-site soils should not be used as structural fill. The topsoil and uncontrolled fill are not considered suitable for use as structural fill due the presence of organic material and debris. These soils may be stockpiled for later use as non-structural fill in landscape areas or removed from the site and wasted.

Structural fill should be placed in 8-inch-thick (maximum) loose lifts at or near optimum moisture content and compacted to a minimum of 95 percent of the modified Proctor maximum dry density. Non-structural fill may be placed in 12-inch-thick (maximum) loose lifts and compacted to a minimum of 85 percent of the modified Proctor maximum dry density. Appropriately sized compaction equipment should be used. If in-place density testing of the soil is not feasible due to an excessive amount of large particle sizes, we recommend establishing a consistent pattern for placement and compaction as described below.

Compaction testing will likely not be feasible on structural fill containing more than 30 percent by weight of soil particles retained on a ¾-inch sieve. In this case, we recommend compaction efforts consist of a minimum of 5 passes with a heavy roller for each 6 inches of lift thickness or fraction thereof. A heavy roller is defined as a roller having the following minimum requirements: vibratory rollers with a rated dynamic force of 30,000 pounds per impact and at least 1,000 vibrations per minute; or grid rollers having a static weight of at least 20,000 pounds and 4,000 pounds per foot of drum width. Rolling requirements may be reduced by one pass per 6-inch lift for each increase of 5,000 pounds per impact for vibratory rollers or 1,000 pounds per foot of drum width for grid rollers. Regardless of roller size, at least one pass per 6-inch lift thickness shall be made. Roller speed should be limited to no more than 4 miles per hour (mph) for grid rollers and 1.5 mph for vibratory rollers.

The compaction efforts should result in the soil being compacted to a firm, dense and unyielding condition (to the point where no further compression is observed following compaction efforts). We recommend a geotechnical engineer or experienced engineering technician observe the placement and compaction process to assess if sufficient compaction is achieved.

Excavation Characteristics

Based on our observations, it is our opinion the on-site soils can be excavated with standard soil excavation equipment. Large excavation equipment with mechanical thumbs may be required to grip and remove large concrete debris from excavations. During the dry months of the year, a water truck may be necessary to suppress air-borne dust.

We recommend excavations greater than four feet deep be sloped no steeper than 1.5:1 (horizontal to vertical). Alternatively, deeper excavations may be shored or braced in accordance with OSHA specifications and local codes. The soils encountered are Type B soils according to OSHA guidelines.

Ground Water

Ground water was not observed in the test pits at the time of exploration. Ground water is believed to be currently located at some depth below the exploration termination depths. The elevation of the water table will vary with seasonal changes in precipitation, infiltration, irrigation and many other factors and may occur at other depths or locations at some time in the future.

Foundation Design

All topsoil and uncontrolled fill should be removed from the foundation subgrade and expose native soil. If the exposed native soils become wet or disturbed, the soils over excavated and removed. We recommend that foundations be placed at least 24 inches below the exposed ground surface for frost protection or as required by local building codes. We recommend that spread footing subgrades consist of a minimum of one foot of compacted granular structural fill placed over compacted native soils. Exposed native soils and structural fill should be compacted to 95 percent of the modified Proctor maximum dry density

It is our opinion that compacted granular structural fill placed over compacted native soil is suitable for support of spread footings designed for a net allowable bearing pressure of 2,000 pounds per square foot (psf) provided the subgrades are prepared as previously recommended. This recommended bearing capacity includes a safety factor of at least 3.0 against shear failure. The maximum net allowable bearing pressure values may be increased up to 30 percent to account for transient loads such as wind and seismic.

We recommend that all backfill placed on the exterior sides of the foundation walls be compacted to a minimum of 85 percent of the modified Proctor maximum dry density. Beneath slabs, steps or sidewalks, backfill should be compacted to a minimum of 95 percent of the modified Proctor maximum dry density.

We also recommend that backfill placed within 24 inches of the exterior foundation walls consist of a coarse, free-draining aggregate (sand and gravel) with less than 5 percent fines (material passing the 200 sieve) by weight. We recommend a perimeter foundation drain be installed to ensure proper drainage and to prevent pooling of water at the foundations.

Concrete Slab-On-Grade Floors

After building pad preparations have been completed, the slab subgrade will consist of structural fill placed over native soils. Structural fill in interior footing and mechanical trenches should be compacted to a minimum of 95 percent of the Modified Proctor maximum dry density.

We recommend placing a minimum of six inches of crushed gravel having less than 5 percent by weight passing a 200 sieve immediately below the slab. The crushed gravel should be compacted to a minimum of 95 percent of the Modified Proctor maximum dry density.

For a granular structural fill subgrade, we recommend using a subgrade modulus of 150 pounds per cubic inch per inch of deflection (pci) to design the slabs. If a minimum of 6 inches of well-graded, crushed gravel base (3/4 inch minus) is placed above the structural fill subgrade, a modulus of 200 pci could be used for design.

If floor coverings or coatings less permeable than the concrete slab will be used, we recommend placing a moisture vapor retarder beneath the slab to prevent moisture migration through the slab. The retarder is commonly placed directly under the slab or beneath a thin cushion of clean coarse sand. Placement directly below the slab may contribute to "curling." To avoid this, many contractors prefer to place the vapor retarder under the sand cushion. However, placing the vapor retarder below the sand cushion risks trapping water between the vapor retarder and slab.

Exterior Slabs

The soil at the site is considered to be moderately to highly frost-susceptible. If these soils are saturated or become saturated and freeze, heaving may occur. This heave may become a nuisance for slabs or steps in front of doors or at other critical grade areas adjacent to the buildings. Proper drainage which prevents the soils from saturating will likely be the most effective method for reducing the potential for heave.

If proper drainage is not feasible, one way to reduce heave potential is to remove the frost–susceptible soils down to the anticipated frost depth and replace them with free-draining sand or gravel. Sand or gravel having less than 5 percent of the particles by weight passing a 200 sieve is considered to be non-frost-susceptible. We recommend consideration be given to over-excavation of such areas and replacement with sand or gravel during earthwork for site preparation. An alternative to the above options would be to support slabs or steps on frost depth footings. A void space should be provided between the bottoms of the slabs/steps and swell-susceptible and/or frost-susceptible soils to allow the soils to heave without affecting the slabs/steps.

Pavements

We anticipate that the subgrade soil in the pavement areas will consist of native sandy silty clay. It is important that the subgrade surface be shaped to provide for positive drainage to minimize the potential for water to pond in the subgrade.

Prior to placing the aggregate base, we recommend that all subgrade areas be proof-rolled with a loaded dump truck. This precautionary measure would assist in detecting any localized soft areas. Any soft areas discovered during the proof-rolling operation should be excavated and replaced with a suitable structural fill material. We recommend that the proof-rolling process be observed by a geotechnical engineer to make the final evaluation of the subgrade.

We recommend the pavement section consist of a minimum of 2 inches of asphalt over 6 inches of crushed gravel base course and 12 inches of crushed ballast.

Lateral Earth Pressures

Any retaining or below-grade walls should be designed to resist lateral earth pressures. The equivalent fluid pressure used to design the walls will depend on the soil type used as backfill and whether the walls are designed to be flexible (allowed to move) or rigid (not allowed to move). We recommend using the following values for design:

Wall Type	Soil Type	Active Earth Pressure Coefficient (K_a)	At-Rest Earth Pressure Coefficient (K_o)	Equivalent Fluid Pressure (pcf)
Flexible	Native Sandy Silty Clay	0.44	NA	46
Rigid	Native Sandy Silty Clay	NA	0.61	64

The lateral earth pressures were estimated based on using the on-site sandy silty clays with an assumed unit weight of 105 pcf and an angle of internal friction of 23 degrees.

The listed pressures assume unsaturated soil conditions behind the wall. Below grade walls should be designed to drain to prevent the build up of hydrostatic pressures behind the wall. We recommend that backfill placed within 24 inches of the back of walls consist of a coarse, free-draining aggregate (sand and gravel) with less than 5 percent fines (material passing the 200 sieve) by weight. It is our opinion a perimeter foundation drain will be necessary due to the low permeability of the on-site soils.

Friction Coefficients

For mass concrete placed over granular structural fill, we recommend using a coefficient of friction against sliding of 0.40. For concrete placed on a vapor barrier of sand soils, we recommend using a coefficient of friction against sliding of 0.35.

Seismic Design Parameters

We anticipate the 2009 International Building Code (IBC) will be used as the basis for design of the proposed structures. The following seismic parameters were calculated using Earthquake Ground Motion Parameters software, version 5.0.9a (USGS, October 21, 2009). Data are based on 0.05 degree grid spacing.

Latitude: 46.4908° N Longitude: -116.2612° W

The following maximum earthquake spectral response accelerations have been adjusted for site class and should be used for design:

Short Period Response (S_{MS}) – 0.441g for Site Class D (Table 1613.1)
One Second Response (S_{M1}) – 0.240g for Site Class D (Table 1613.1)

Storm Water, Site Grading and Drainage

We recommend that the site be graded such that storm run-off water is directed away from the building and pavement areas to a storm water drainage system. We recommend that landscape areas be sloped a minimum of 6 inches within 10 feet of the building and that slabs be sloped a minimum of 2 inches. In addition, we recommend gutters and downspouts with long splash blocks or extensions.

We anticipate that storm water runoff will be directed to ponds or swales which will infiltrate the water in a grassed infiltration area and direct overflow into existing storm water management facilities or dry wells through inlets placed in the bottoms of the infiltration areas. The SCS reports that the permeability for soils in the project area ranges from 0.2 inches per hour to 2.0 inches per hour. We anticipate that the on-site soils will have limited permeability.

It has been our experience that grass infiltration areas can fail if construction traffic and/or other activities impact the infiltration area. We recommend the grass infiltration areas be constructed toward the end of the project when construction activity is ending. The areas should be scarified to loosen the upper soil if compaction has occurred.

Cold Weather Construction

If site grading and construction are anticipated during cold weather, we recommend that good winter construction practices be observed. All snow and ice should be removed from excavated and fill areas prior to additional earthwork or construction. No fill, footings, or slabs should be placed on soils which contain frozen material. No frozen soils should be used as backfill or fill.

Wet Weather Construction

Due to the climatic effects in this region during the late fall, winter, and early spring (generally wet conditions), we recommend that construction (especially site grading) take place during the late spring and summer season, if possible. If construction occurs during or immediately after excessive precipitation, it may be necessary to over-excavate and replace disturbed subgrade soils that might otherwise be suitable. We recommend that the contractors have means and equipment available for altering surface water collection and de-watering open excavations.

If the site soils become wet and unstable, we recommend that construction traffic be minimized where these soils are exposed. Low ground pressure (tracked) equipment should be used to minimize disturbance. All soft and disturbed subgrade areas should be excavated to undisturbed soil and backfilled with structural fill similar to the surrounding native soils. Assuming the soil is wet and soft but not disturbed, the initial layer of fill placed over the native soil should be at least 12 inches in depth. Compaction of the fill should be sufficient to preclude pumping of the native soil.

Observation and Testing

We recommend that a geotechnical engineer observe all subgrade soils prior to placing structural fill to evaluate if the soils are suitable for support of the proposed structures and to evaluate whether the soils are consistent with the test pits.

We recommend in-place density tests be performed on all fill placed to verify that adequate compaction has been achieved. We recommend at least one test for every 2,500 square feet in the structural areas for each foot of fill placed with at least one test for every vertical foot of fill placed. At least one density test should be taken for every 100 linear feet of trench at vertical intervals not exceeding one foot. If in-place density testing can not be preformed on fill due to over-sized soil particles, we recommend a geotechnical engineer or engineering technician observe the compaction process to assess if adequate compaction is being achieved.

Erosion Control

The on-site surficial soils are described as well drained. The potential for erosion of exposed native soil on level portions of the site is slight but will increase with increases in gradient. Earthwork activities on or which create sloping ground surfaces may lead to gullying and erosion of the exposed soil. Erosion control measures such as swales, silt fence, rip rap dikes and/or water bars may be necessary if construction occurs during periods of heavy precipitation in the winter and spring months. To reduce the potential for erosion, we recommend covering or revegetating disturbed areas as soon as practical. We also recommend construction occur during drier times of the year.

Additional Services Recommended

We recommend that ALLWEST be retained to review the final plans and specifications for the proposed project prior to construction. Also, we should be retained to provide construction monitoring to verify the soil and geologic conditions at the time of construction and that the report recommendations are incorporated into the actual construction. Compaction testing should be performed by an experienced engineering technician to verify the recommended levels of compaction are achieved in the various materials. If we are not retained to provide the recommended plan review and construction monitoring services, we cannot be responsible for soil engineering related construction errors or omissions.

EVALUATION LIMITATIONS

The analyses and recommendations submitted in this report are based on the data obtained from the test pits performed at the locations indicated on the Test Pit Location Map in Appendix A. It should be recognized that the test pits excavated for this evaluation reveal subsurface conditions only at discreet locations across the project site and actual conditions in other areas could vary. Furthermore, the nature and extent of any such variations would not become evident until additional explorations are performed or until construction activities have begun. If variations are observed at that time, we may need to modify our conclusions and recommendations contained in this report to reflect the actual site conditions.

This report has been prepared to assist the design and construction of the proposed Idaho Department of Corrections maintenance building in Orofino, Idaho. This report is for the exclusive use of the addressee and their consultants for use in design of the proposed project and preparation of construction documents. In the absence of our written approval, we make no representations and assume no responsibility to other parties regarding this report. The data, analyses, and recommendations may not be appropriate for other structures or purposes.

Our services consist of professional opinions and conclusions made in accordance with generally accepted geotechnical engineering principles and practices in our area at the time of this report. This acknowledgement is in lieu of all warranties either expressed or implied. The following plates complete this report:

Appendix A – Site Location Map, NRCS Map, Site Geology Map, Test Pit Location Map – 4 pages
Appendix B – Logs of Test Pits – 3 pages, Unified Soil Classification System
Appendix C – Laboratory Test Results – 3 pages

APPENDIX A
SITE LOCATION MAP, NRCS MAP, SITE GEOLOGY MAP, TEST PIT LOCATION MAP

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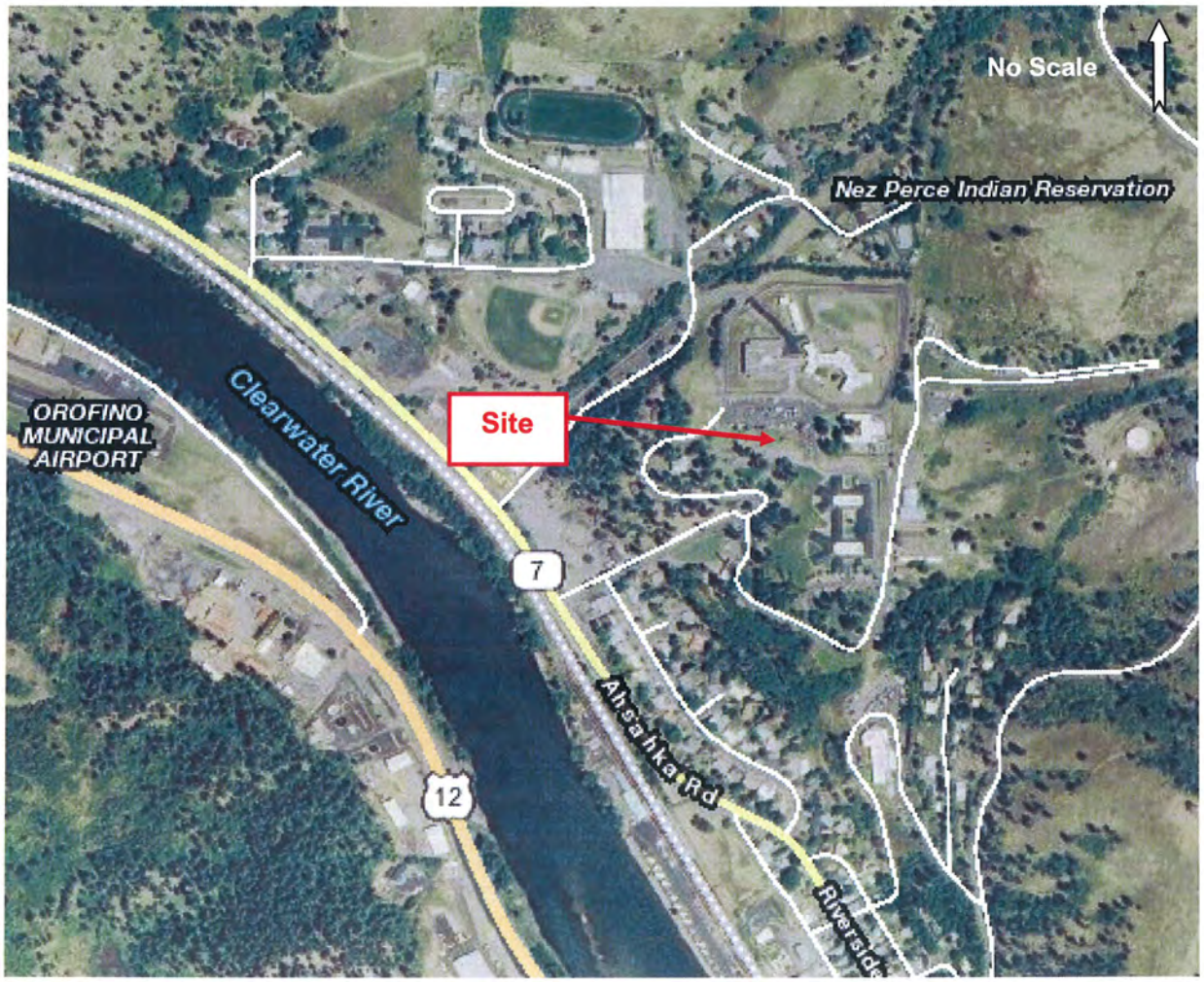
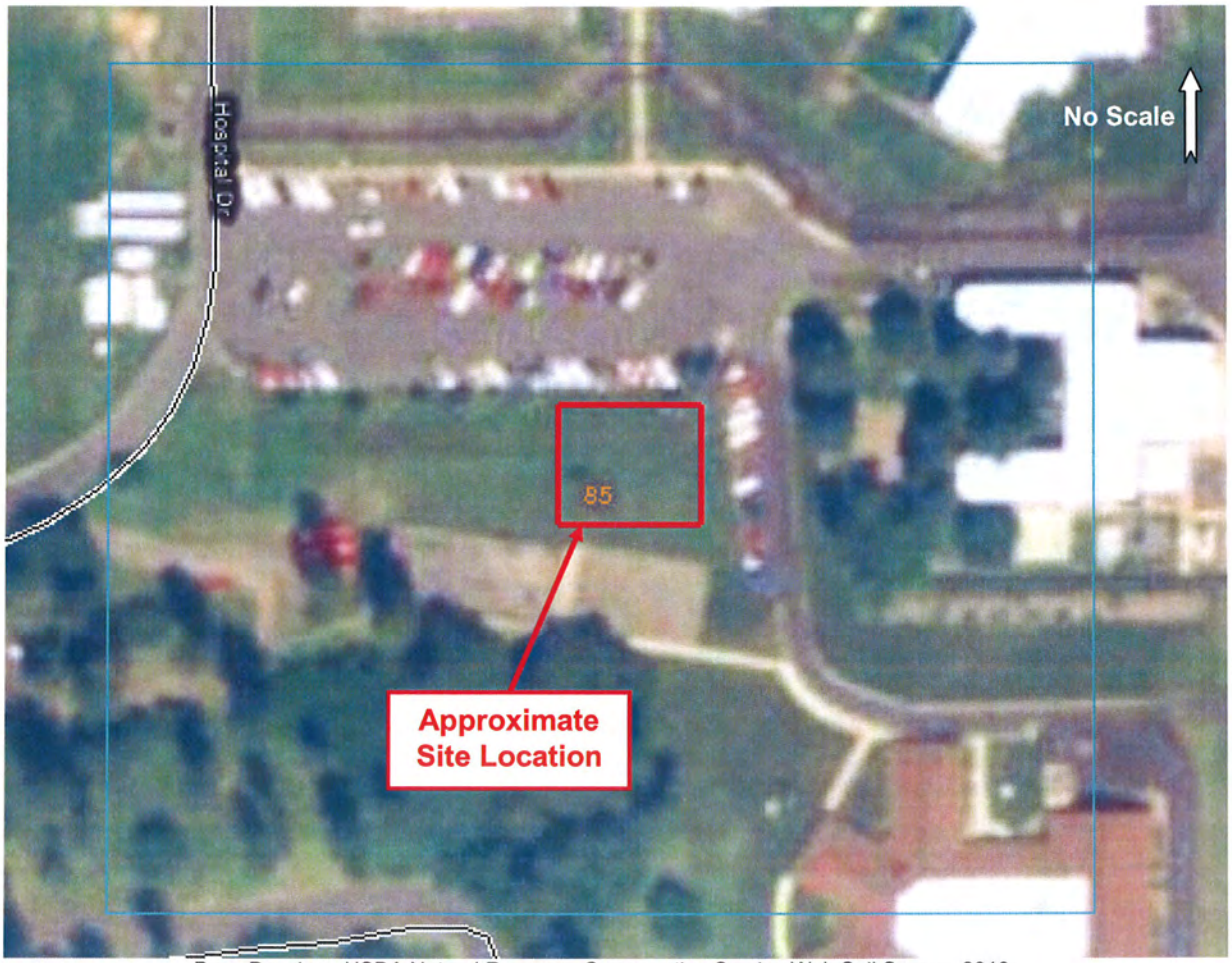
Figure 1



	Site Location Map	
Designed By: KRF	Proposed Maintenance Building Idaho Department of Corrections	Project 311-022G
ALLWEST Testing & Engineering	318 W. Hospital Drive Orofino, Idaho	March 3, 2011

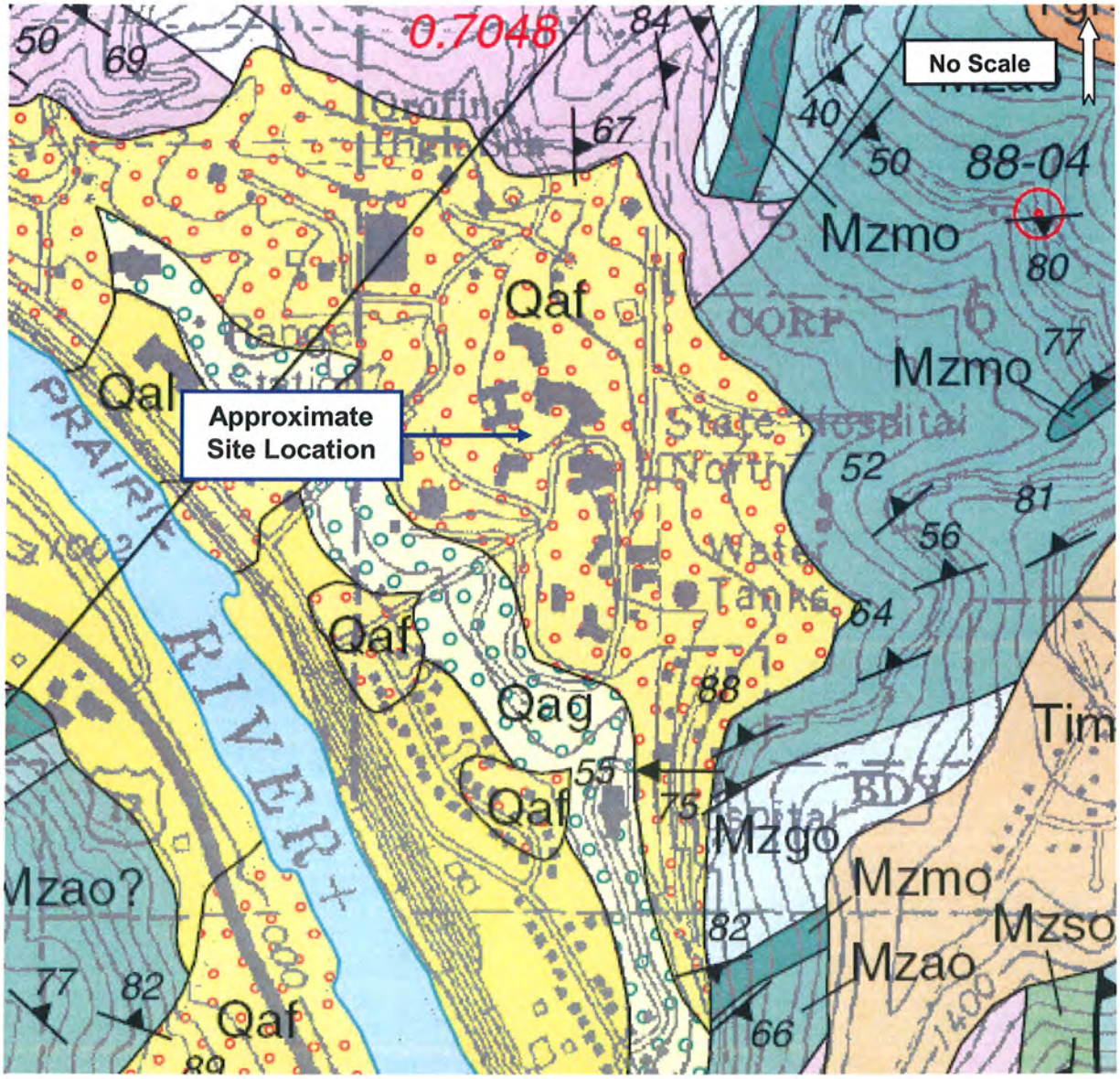
Figure 2



Base Drawing: USDA Natural Resource Conservation Service Web Soil Survey, 2010.

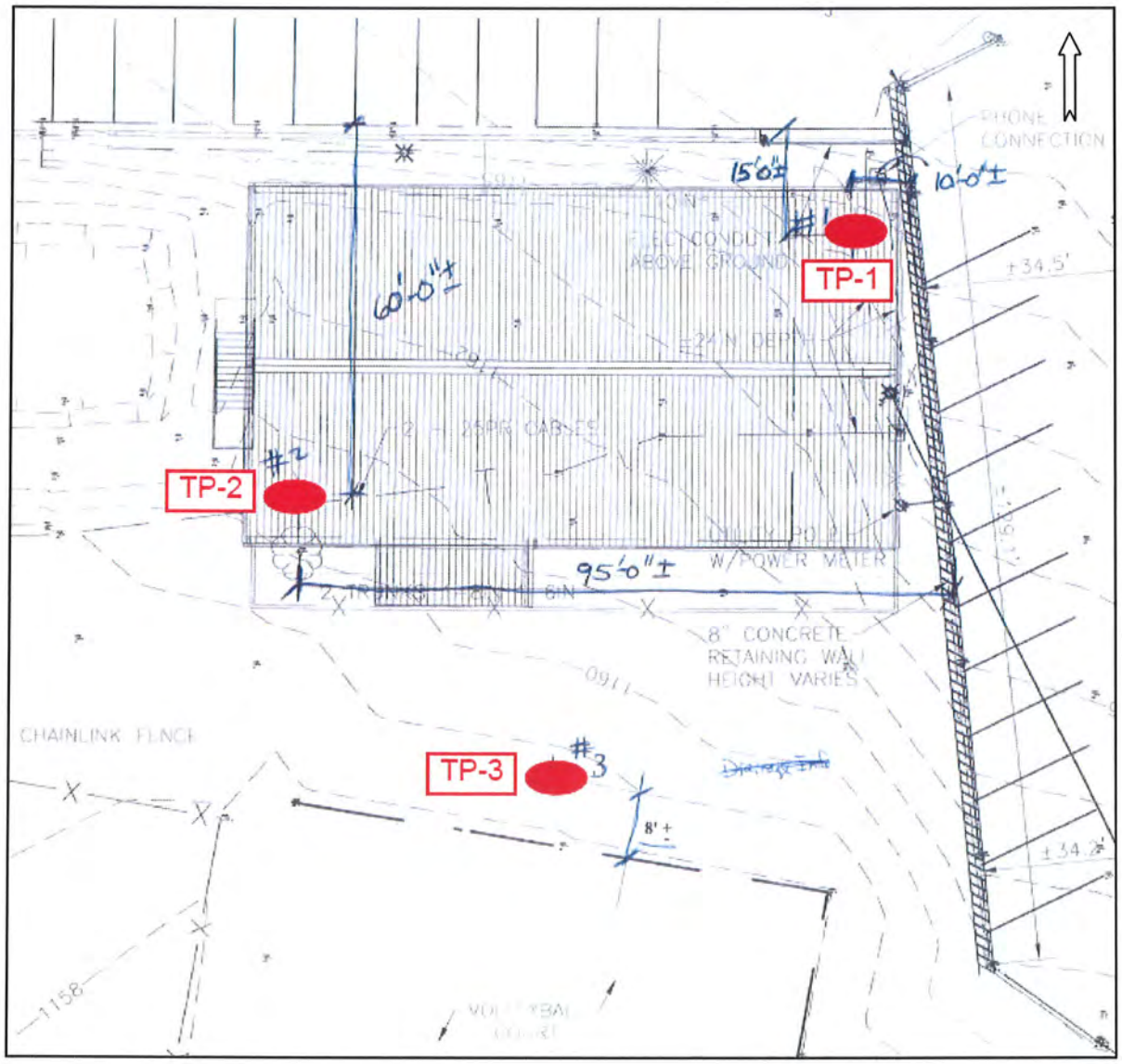
	NRCS Map	
Designed By: KRF	Proposed Maintenance Building Idaho Department of Corrections	Project 311-022G
ALLWEST Testing & Engineering	318 W. Hospital Drive Orofino, Idaho	March 3, 2011

Figure 3



	Site Geology Map	
Designed By: KRF	Proposed Maintenance Building Idaho Department of Corrections	Project 311-022G
ALLWEST Testing & Engineering	318 W. Hospital Drive Orofino, Idaho	March 3, 2011

Figure 4



	Test Pit Location Map	
Designed By: KRF	Proposed Maintenance Building Idaho Department of Corrections	Project 311-022G
ALLWEST Testing & Engineering	318 W. Hospital Drive Orofino, Idaho	March 3, 2011

APPENDIX B
LOGS OF TEST PITS,
UNIFIED SOIL CLASSIFICATION SYSTEM

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LOG OF TEST PIT

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PROJECT:	TEST PIT: TP-1
Geotechnical Evaluation **Orofino Prison Maintenance Building** **Idaho Department of Public Works** **Orofino, Idaho**	LOCATION: **See Test Pit Location Map**
Project No. 311-022G	DATE: **2-21-2011** SCALE: **1" = 5'**

Depth 0.0	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
1.0	FILL	FILL: Silty Sand, fine to coarse grained, with cobbles and roots, black, wet. (Topsoil)		
6.0	FILL	FILL: Sandy Silty Clay, fine to coarse grained, with gravel and cobbles, with concrete and brick debris, brown to black, wet.		Nuclear density reading at 5'. 87.5 pcf, 23.9% moisture.
10.0	CL-ML	SANDY SILTY CLAY, with gravel and cobbles, brown to light brown, wet. (Loess)		
		End of test pit. Groundwater not encountered at 10 feet at time of excavation. Test pit immediately backfilled to surface.		

(See Report and Standard Plates for elevation and descriptive terminology.)

LOG OF TEST PIT

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PROJECT:	TEST PIT: TP-2
Geotechnical Evaluation **Orofino Prison Maintenance Building** **Idaho Department of Public Works** **Orofino, Idaho**	LOCATION: **See Test Pit Location Map**
Project No. 311-022G	DATE: **2-21-2011** SCALE: **1" = 5'**

Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.0				
2.0	FILL	FILL: Sandy Silty Clay, fine to coarse grained, with cobbles and roots, black, wet. (Topsoil)		
6.5	CL-ML	SANDY SILTY CLAY, with gravel and cobbles, brown to light brown, wet. (Loess)		Nuclear density reading at 4.5'. 104.3 pcf, 21.6% moisture. Bulk sample from 4.5' to 5.5'.
9.0	CL-ML	SANDY SILTY CLAY, with gravel and cobbles, brown to black, wet. (Residuum)		
		End of test pit. Groundwater not encountered at 9 feet at time of excavation . Test pit immediately backfilled to surface.		

(See Report and Standard Plates for elevation and descriptive terminology.)

LOG OF TEST PIT

ALLWEST Testing & Engineering

PROJECT:	TEST PIT: TP-3
Geotechnical Evaluation **Orofino Prison Maintenance Building** **Idaho Department of Public Works** **Orofino, Idaho**	LOCATION: **See Map**
Project No. 311-022G	DATE: **2-21-2011** SCALE: **1" = 5'**

Depth	ASTM D2487 Symbol	Description of Materials	WL	Tests or Notes
0.0				
1.0	FILL	FILL: Sandy Silty Clay, fine to coarse grained, with cobbles and roots, black, wet. (Topsoil)		
4.5	FILL	FILL: Sandy Silty Clay with Gravel, fine to coarse grained, with cobbles, with concrete, metal, and plastic debris, brown to black, wet.		
8.5	CL-ML	SANDY SILTY CLAY, with gravel and cobbles, brown to light brown, wet. (Loess)		
9.0	CL-ML	SANDY SILTY CLAY, with gravel and cobbles, brown to black, wet. (Residuum)		
		End of test pit. Groundwater not encountered at 9 feet at time of excavation. Test pit immediately backfilled to surface.		

(See Report and Standard Plates for elevation and descriptive terminology.)

Unified Soil Classification System

MAJOR DIVISIONS			SYMBOL	TYPICAL NAMES
COARSE GRAINED SOILS	GRAVELS	CLEAN GRAVELS	GW	Well-Graded Gravel, Gravel-Sand Mixtures.
			GP	Poorly-Graded Gravel, Gravel-Sand Mixtures.
		GRAVELS WITH FINES	GM	Silty Gravel, Gravel-Sand-Silt Mixtures.
			GC	Clayey Gravel, Gravel-Sand-Clay Mixtures.
	SANDS	CLEAN SANDS	SW	Well-Graded Sand, Gravelly Sand.
			SP	Poorly-Graded Sand, Gravelly Sand.
		SANDS WITH FINES	SM	Silty Sand, Sand-Silt Mixtures.
			SC	Clayey Sand, Sand-Clay Mixtures.
FINE GRAINED SOILS	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50%		ML	Inorganic Silt, Silty or Clayey Fine Sand.
			CL	Inorganic Clay of Low to Medium Plasticity, Sandy or Silty Clay.
			OL	Organic Silt and Clay of Low Plasticity.
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH	Inorganic Silt, Elastic Silt, Micaceous Silt, Fine Sand or Silt.
			CH	Inorganic Clay of High Plasticity, Fat Clay.
			OH	Organic Clay of Medium to High Plasticity.
Highly Organic Soils			PT	Peat, Muck and Other Highly Organic Soils.

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APPENDIX C
LABORATORY TEST RESULTS

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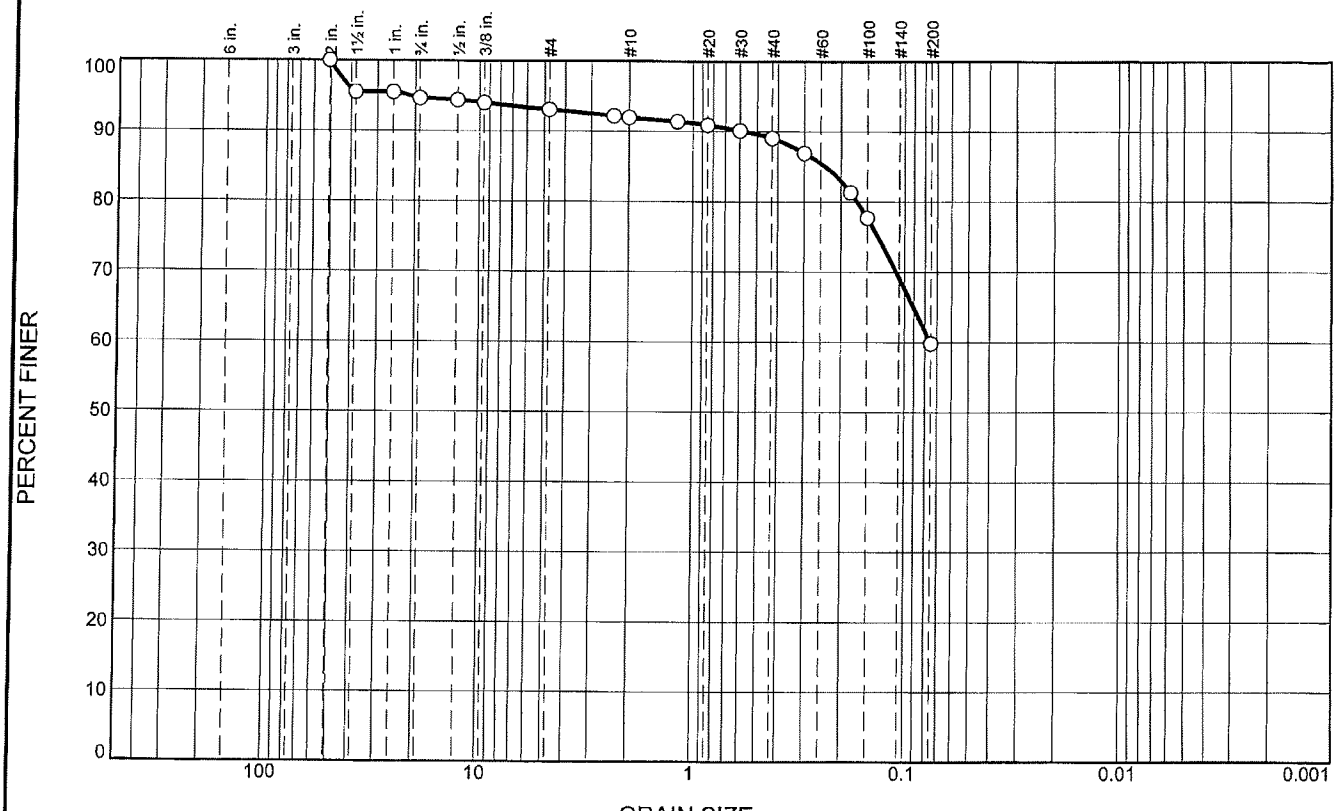
Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.4	1.5	1.1	3.0	29.2	59.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2"	100.0		
1 1/2"	95.5		
1"	95.5		
3/4"	94.6		
1/2"	94.4		
3/8"	94.0		
#4	93.1		
#8	92.2		
#10	92.0		
#16	91.4		
#20	90.9		
#30	90.1		
#40	89.0		
#50	87.0		
#80	81.4		
#100	77.7		
#200	59.8		

* (no specification provided)

Sample Description

Native Silt with Sand & Gravel

Atterberg Limits

PL= 19 LL= 23 PI= 4

Coefficients

D_{90}= 0.5695 D_{85}= 0.2369 D_{60}= 0.0755
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL-ML AASHTO= A-4(0)

Remarks

Date Sampled: 2/21/11
Sampled By: K. Funke

Source of Sample: Test Pit #2
Sample Number: 1 (S311-003)

Date: 2/23/11

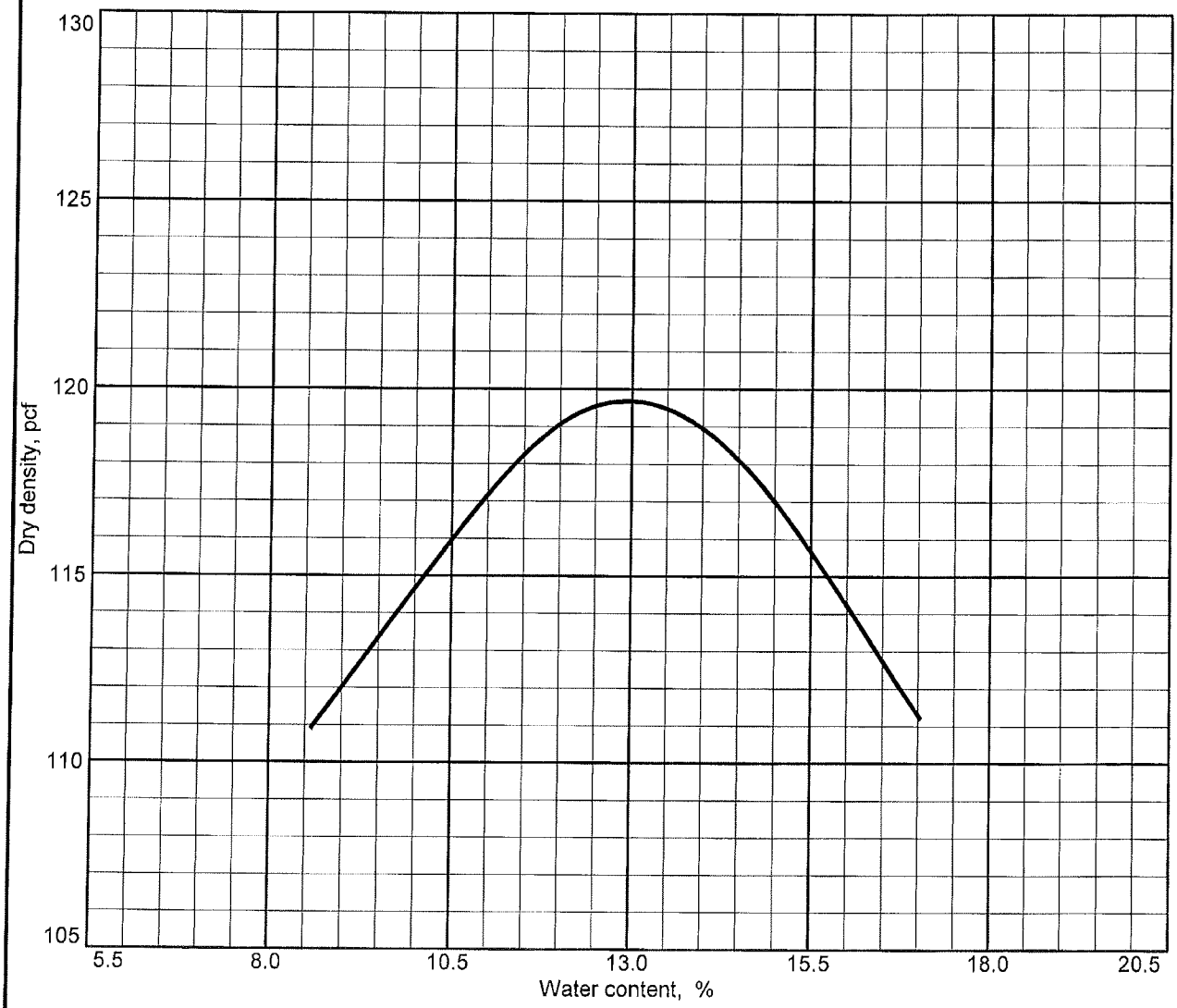
ALLWEST TESTING & ENGINEERING Lewiston, ID

Client: State of Idaho Division of Public Works
Project: Idaho Dept. of Corrections New Maintenance Building Orofino, Idaho
Project No: 311-022G

Figure

Tested By: Ed Funke **Checked By:** Scott Neumann

MOISTURE DENSITY CURVE



Test specification: ASTM D 1557-00 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	CL-ML	A-4(0)			23	4	6.9	59.8

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 119.7 pcf Optimum moisture = 12.9 %	Native Silt with Sand & Gravel

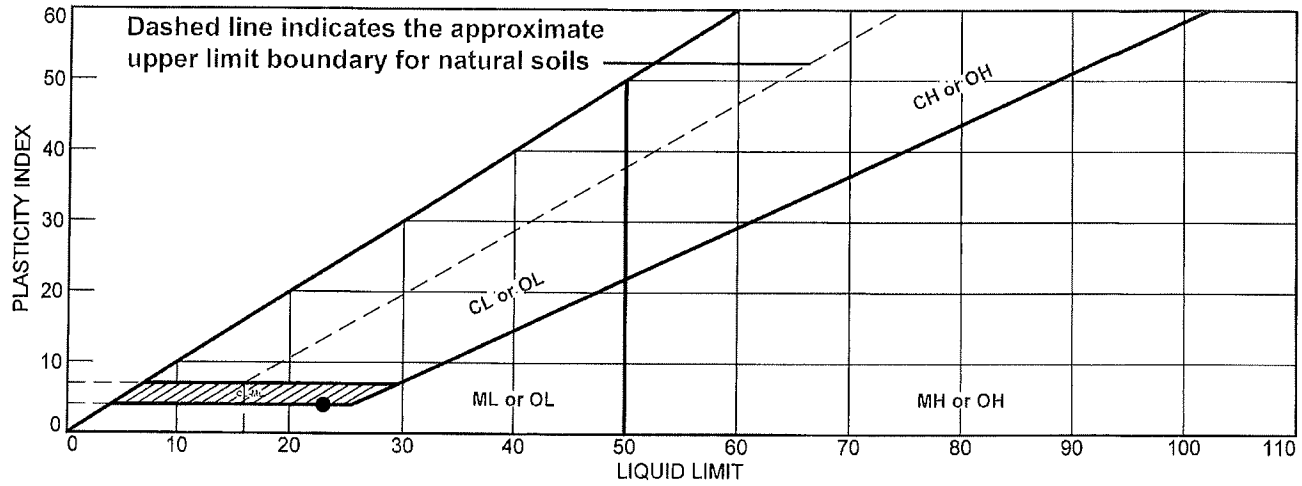
Project No. 311-022G **Client:** State of Idaho Division of Public Works
Project: Idaho Dept. of Corrections New Maintenance Building
Orofino, Idaho
● **Source:** Test Pit #2 **Sample No.:** 1 (S311-003)

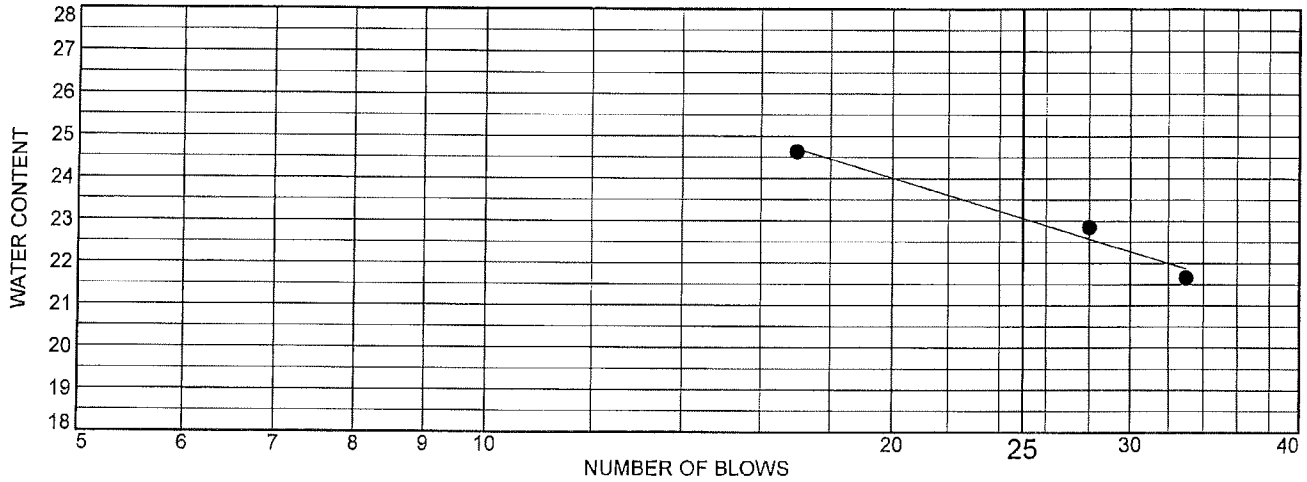
ALLWEST TESTING & ENGINEERING
Lewiston, ID

Remarks:
Date Sampled: 2/21/11
Sampled By: K. Funke
Date Tested: 2/22/11
Tested By: E. Funke
Reviewed By:

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Native Silt with Sand & Gravel	23	19	4	89.0	59.8	CL-ML

Project No. 311-022G **Client:** State of Idaho Division of Public Works

Project: Idaho Dept. of Corrections New Maintenance Building
Orofino, Idaho

● **Source of Sample:** Test Pit #2 **Sample Number:** 1 (S311-003)

Remarks:
● Date Sampled: 2/21/11
Sampled By: K. Funke

ALLWEST TESTING & ENGINEERING

Lewiston, ID

Figure

Tested By: Brandon Eikum **Checked By:** Scott Neumann