amec

GEOTECHNICAL ENGINEERING REPORT
DAYBREAK ACTIVE ADULT
SOUTH JORDAN, UTAH

Submitted To:

Nolte Associates, Inc.
5217 South State Street
Murray, UT 84107

Submitted By:

AMEC Earth & Environmental, Inc.
9865 South 500 West
Sandy, Utah 84070
(801) 999-2002

March 6, 2009

Project No. 8-817-005265

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March 6, 2009

Mr. Brent Morgan, PE
Nolte Associates, Inc.
5217 South State Street
Murray, UT 84107

Re: **Geotechnical Engineering Report**
Daybreak Active Adult
South Jordan, Utah
AMEC Job No. 8-817-005265

1. INTRODUCTION

1.1 Objectives and Scope

This report presents the results of our geotechnical study for the design of roadways and pavements for the Daybreak Active Adult area of the Daybreak development in South Jordan, Utah. The approximate location of the site is shown on Figure 1, Vicinity Map. The locations of the test pits completed in conjunction with this study are shown on Figure 2, Site Map. The objectives of this investigation were to explore and evaluate subsurface materials and conditions and develop pavement recommendations for the residential streets associated within the Daybreak Active Adult Community. The studies were conducted in accordance with the scope of work outlined in AMEC's proposal PL08-069 dated October 9, 2008. AMEC's scope of work included a site reconnaissance, field explorations, laboratory testing, engineering analyses, and report preparation.

2. PROJECT DESCRIPTION

We understand that the project will consist of construction of residential roads and collectors within the Daybreak development. The project grades are being established by mass grading, consisting of cuts and fills across the site. Grading will range from approximately 15 feet of cut to approximately 15 feet of fill, depending on the area. Much of the area is within 5 feet of the planned grade. On residential streets, we anticipate only occasional truck traffic; for collectors, we anticipate a light volume of light trucks with occasional heavy trucks.

3. SITE DESCRIPTION

3.1 Site Conditions

The planned Active Adult area consists primarily of vacant land, whose surface soils have been somewhat disturbed during construction processes. Minor to moderate elevation changes occur across the site. Vegetation is minimal.

3.2 Geology

The project site is located near the eastern edge of the Basin and Range physiographic province, which extends from the Sierra Nevada Mountains to the Wasatch Mountains. The Basin and Range province is characterized by north-trending mountain ranges and intervening sediment-filled valleys. The mountain ranges are bounded by high-angle normal faults formed in response to regional extension of the earth's crust.

Based on our review of the available geologic literature[1] and our experience with other nearby projects, we anticipate the site is mantled with lacustrine sand and gravel deposited during the Bonneville Lake cycle. A review of hazards maps for Salt Lake County[2] indicates that the project site is located in an area designated as very low in liquefaction potential and outside of special study areas for surface fault rupture.

4. FIELD EXPLORATIONS & LABORATORY TESTING

4.1 Field Explorations

Subsurface materials and conditions at the project site were investigated on November 12 though 13, 2008 with 9 test pits designated TP-1006 to TP-1014. The approximate locations of the test pits are shown on Figure 2, Site Map. All field operations were observed by a staff engineer or technician provided by our firm, who maintained a detailed log of the materials and conditions encountered in each test pit and directed the sampling operation. Additional information on the field exploration is presented in Appendix A, Field Explorations.

4.2 Laboratory Testing

Laboratory testing consisted of natural moisture contents gradations, dry unit weights, Atterberg limits, moisture density relationships, and California Bearing Ratio tests. Details concerning the tests and the laboratory results can be found in Appendix B, Laboratory Testing.

5. SUBSURFACE CONDITIONS

5.1 Fill and Disturbed Soil Conditions

Subsurface investigations encountered approximately 4.5 feet of fill across some areas of the site. Fill generally consisted of silty sand with gravel and sandy silt with some areas of clayey sand and gravel.

5.2 Geotechnical Profile

Logs of the test pits are presented on Figures A1 through A10, Log of Test Pits. The terms used to describe the soils disclosed by the borings are defined on Figure 4, Soil Classification Chart & Legend.

Native soils generally consist of sandy silt, sandy clay with gravel, lean clay, silty sand and silty gravel. California Bearing Ratios (CBRs) performed on samples taken within the community roadways indicate values greater than 10. Liquid limits range from non-plastic to 33. Plasticity indices range from non plastic to 13.

5.3 Groundwater

Although moist conditions were encountered below the ground surface, groundwater was not encountered in any of the test pits. Groundwater is not anticipated to impact pavement design, road constructability, or utility installation.

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1 Biek, R.F., Solomon, F.J., Keith, J.D., and Smith, T.W., 2004, Interim geologic map of the Copperton, Magna, and Tickville Spring quadrangles, Salt Lake and Utah Counties, Utah, UGS Open File Report 434, Plate 1, scale 1:24,000

2 Nelson, C.V., and Bryant, B.A., compilers, 1989, Surface rupture liquefaction potential special study areas Salt Lake County, Utah, scale 1:48,000

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 General

The site is generally favorable for the support of roadways over native soils and structural fill. Soils are typically dense and granular throughout the project area. These soils should provide good pavement support characteristics.

Undocumented fill at the site should be removed and replaced with structural fill to the final subgrade elevation.

Pavement sections for residential streets include approximately 3.5 inches of asphalt over 8 inches of base course materials. Pavement sections for collector streets include 6 inches of asphaltic concrete over 6 inches of base course.

6.2 Earthwork

6.2.1 Site Preparation

Preparation of the subgrade must include the removal of all non-engineered fills, topsoil, excessively loose and/or disturbed soils, and any other deleterious materials from areas, which will ultimately be structurally loaded by pavements.

Subsequent to stripping and over-excavation, and prior to the placement of base or sub base materials, pavement areas should be observed by a representative of the soils engineer followed by proof-rolling the entire subgrade. Site experience indicates that the best method of preparing the subgrade is to compact with a vibratory roller. After compacting the sub base, the initial lift of either sub base or base course should be spread and compacted. Wheeled equipment traffic should be limited on the gravel subgrade to reduce loosening of the surface. If loose, or otherwise unsuitable subgrade soils are encountered during proof-rolling, these materials must be removed and replaced with compacted granular structural fill.

It is recommended that preparation of subgrade soils be conducted principally during the drier and warmer periods of the year. If fine-grained soil is exposed to significant precipitation, snow melt, or other sources of water, it may become soft and disturbed by construction traffic. Disturbed and softened soils are unsuitable for support of pavement and should be removed and replaced with granular structural fill as needed. Additional costs associated with fill placement during wetter months should be expected.

Some on-site gravel soils contain very little fines (material finer than the No. 200 sieve). When confined, these soils have high bearing and low compressibility characteristics; however, when unconfined at the ground surface, these soils have a tendency to displace or "shove" easily when subjected to construction traffic. A method that has been used successfully in the past to stabilize these clean granular materials has been to cap the gravel surface with a layer (6-inch minimum) of crushed angular material, such as base course.

6.2.2 Excavations

Temporary construction excavations in soils not exceeding 4 feet in depth may be constructed with near-vertical side slopes. Temporary excavation slopes up to 10 feet in height and above the water table may be constructed no steeper than one and one-half horizontal to one vertical (1.5H:1V). If excessive sloughing occurs, the excavation slope should be flattened. Excavations encountering the groundwater table or perched groundwater will require much flatter slopes, shoring and bracing, and/or dewatering. Excavation safety and dewatering is the responsibility of the contractor. All excavations should be constructed in conformance with Federal, State and local regulations. All excavations must be inspected periodically by qualified personnel. If any signs of instability are noted, immediate remedial action must be initiated.

6.2.3 Fill Requirements

Fill material should be free from debris, vegetation, roots, frozen material, excess moisture, and other unsuitable material. Structural fill should also conform to the gradation and plasticity requirements shown in the following table, Fill Material Requirements.

FILL MATERIAL REQUIREMENTS

Fill Name	Type	Application	Max Size in.	Max Percent Passing No. 4	Max Percent Passing No. 10	Max Percent Passing No. 200	Max Liquid Limit	Max Plasticity Index
Structural	S1	Below Pavements & Within Utility Trenches	4	-	50	25	30	10
Free Draining	FD	Drainage Layers of Drainage Backfill	4		5	2	-	-

Existing site fill may be reused as structural site grading fill if it meets the requirements of structural fill and is clean from all debris.

6.2.4 Fill Placement and Compaction Requirements

Structural fill and floor slab fill should be compacted to at least 95 percent of the maximum dry density at a moisture content within about 3 percent of optimum as determined by ASTM D-1557 (modified Proctor). Structural fill should extend out from the edge of footings a distance equal to half the depth of the fills. For example, if the structural fill depth is 4 feet, the fill should extend out at least 2 feet past the outside edge of the footing.

Fill should be placed and compacted in lifts. The lift thickness should be appropriate for the type of equipment being used so that the entire lift thickness is compacted to the required level. With heavy compaction equipment, we recommend that loose lift thickness be limited to a maximum of 12 inches unless specific arrangements are made with the testing entity to verify compaction in thicker lifts. Fill compaction should be tested frequently. The contractor should have sufficient testing early to verify that compaction methods are adequate to meet compaction requirements and regular additional testing to demonstrate consistent compaction.

Where free draining fill is used to collect or drain water, a filter fabric capable of preventing the migration of fines into the free draining fill should be placed between the fill and native soil on all sides.

Fill in landscaped areas should be compacted to a minimum of 85 percent of the maximum dry density as determined by ASTM D-1557.

If pumping of the subgrade occurs when compacting fill, compaction should immediately stop and the geotechnical engineer consulted for appropriate action.

6.2.5 Fill Placement Considerations

In general, we recommend that the contractor be left to determine the most cost effective and practical means to place and compact fill. However, the following information may be helpful.

When performing compaction testing, the measured degree of compaction is only meaningful if gradation of the soil tested in the field corresponds to the gradation of the samples tested in the lab from which the maximum dry density and optimum moisture was determined. The fill material should be sampled and tested in the laboratory at a frequency appropriate for the variability of the fill. For highly variable soils this can be extremely difficult to ensure and there is a significant risk that field testing may not be representative. Additional measures such as limiting lift thickness may be advised.

The maximum particle size should generally be limited to ½ of the compacted lift thickness. Oversize pieces at the lift surface can carry the weight of the compaction equipment resulting in a poorly compacted zone around the oversized particle. Over a relatively firm subgrade, large pieces extending above the surface of the fill can result in a concentrated foundation load and/or thin section of footing.

All compaction equipment has a limited depth of influence. For hand operated equipment such as vibratory plate or "jumping jack" compactors, we recommend that the compacted lift thickness be limited to 4 inches. For small "trench" rollers, moderate sized roller compactors, and larger roller compactors we recommend that compacted lift thickness be limited to 6, 8 and 12 inches, respectively unless it can be demonstrated that the recommended compaction can be achieved throughout the lift with thicker lifts.

6.2.6 Utility Trenches

All backfill placed in utility trench excavations within the limits of buildings and paved areas should consist of sand, sand and gravel, or crushed rock with a maximum size of up to 2-inches and with not more than 15 percent passing the No. 200 sieve (washed analysis). In our opinion, the granular backfill should be placed in 6-inch-thick lifts (loose) and compacted using vibratory plate compactors or tamping units to at least 95 percent of the maximum dry density as determined by ASTM D 1557. Flooding or jetting the backfilled trenches with water to achieve the recommended compaction should not be permitted.

6.3 Pavements

Existing site surface soils exhibit good support characteristics for pavements. From available laboratory data, we estimate the subgrade to have a CBR value of at least 10. This value was used to calculate pavement sections according to standard Utah Department of Transportation design recommendations.

Prior to placement of any structural fill or the pavement design section, the exposed subgrade should be prepared as discussed in Section 6.2.1, Site Preparation. If subgrade soils become loose, saturated, or disturbed they should be recompacted to the requirements for structural fill or be removed and replaced with structural fill. A suitable pavement section resulting in adequate pavement performance is highly dependent on actual traffic loading [18 kip equivalent single axle loads (ESALs)] especially for heavy truck traffic. Sidewalks not subject to vehicle traffic can consist of 4 inches of concrete over 4 inches of granular base.

If the design team considers that any assumptions are not accurate, AMEC should be informed so that we may review and revise the pavement design as necessary. Similarly, AMEC should be contacted if alternate designs are needed. The pavement materials and placement should be in accordance with the Utah Department of Transportation or American Public Works Association specifications.

Pavement Design Parameters

Design Life	20 years
Initial Serviceability	4.5
Terminal Serviceability	2.5
Reliablilty	90%
Std Deviation - Flexible	0.45
Asphaltic-Concrete Structural Coefficient	0.4
Untreated Base Course Coefficient	0.10
Granular Sub base Coefficient	0.08
Design CBR	10

Flexible Pavement Sections

Roadway Areas	Flexible	
	AC	UTBC
Residential Streets	3.5"	8.0"
Collector Streets	6.0"	6.0"

Notes:
1. Full depth asphalt or increased asphalt thickness can be increased by adding 1.0-inch asphalt for each 4 inches of base course or granular borrow replaced.

7. LIMITATIONS

This report has been prepared to aid the architect and engineer in the design of this project. The scope is limited to the specific project and location described herein, and our description of the project represents our understanding of the significant aspects of the project relevant to the design and construction of the earthwork, and pavements. In the event that any changes in the design as outlined in this report are planned, we should be given the opportunity to review the changes and to modify or reaffirm the conclusions and recommendations of this report in writing.

The conclusions and recommendations submitted in this report are based on the data obtained from the test pits made at the locations indicated on Figure 2, Site Map, and from other sources of information discussed in this report. In the performance of subsurface investigations, specific information is obtained at specific locations at specific times. However, it is acknowledged that variations in soil conditions may exist between explorations. This report does not reflect any variations that may occur between these explorations. The nature and extent of variation may not become evident until construction. If, during construction, subsurface conditions are different from those encountered in the explorations, we should be advised at once so that we can observe and review these conditions and reconsider our recommendations where necessary.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices at this time along the Wasatch Front.

We appreciate the opportunity to provide this service for you. If you have any questions or require additional information, please do not hesitate to contact us.

Respectfully submitted,

AMEC Earth & Environmental, Inc.

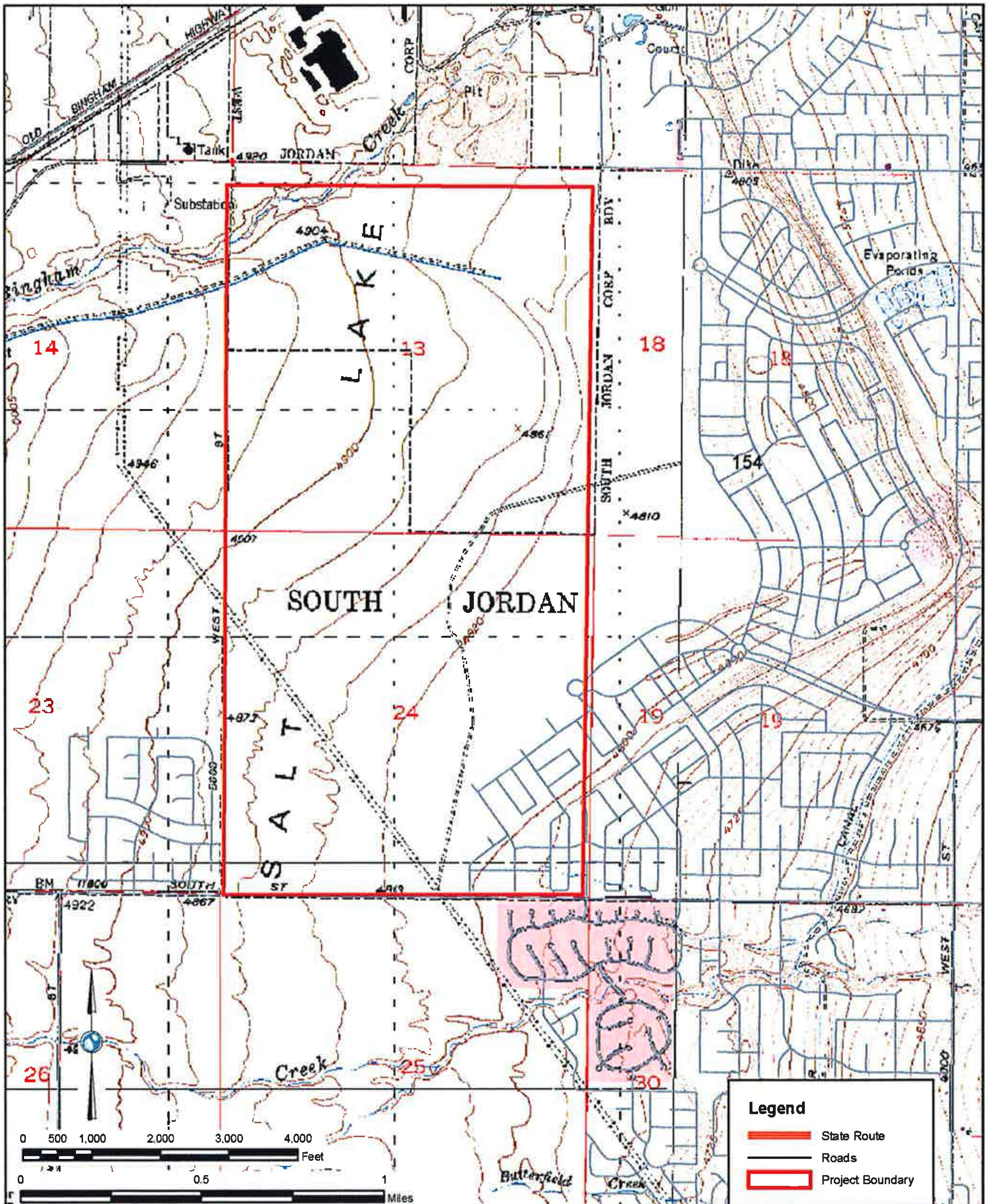
3/6/09

Daniel W. DeDen, P.E.
Professional Engineer

Reviewed by:

David K. Fadling, P.E.
Senior Professional Engineer

Addressee (4)



AMEC Earth & Environmental 9865 South 500 West Sandy, Utah 84070 Tel: (801) 999-2002 Fax: (801) 999-2035	amec	Salt Lake City South and Magna Quadrangles USGS 7.5 Minute Series (Topographic)	CLIENT Nolte Associates, Inc. 5217 South State Street, suite 300 Murray, Utah 84104-4828

PROJECT	DWN BY: GWH	DATUM: NAD 83	DATE: 02/16/09
Daybreak Active Adult Daybreak View Pkwy & Oakmond Rd South Jordan, Utah	CHK'D BY: SC	X:\Projects\8-817-005265\MXD\Figure I_Vicinity_Map.mxd	PROJECT NO: 8-817-005265
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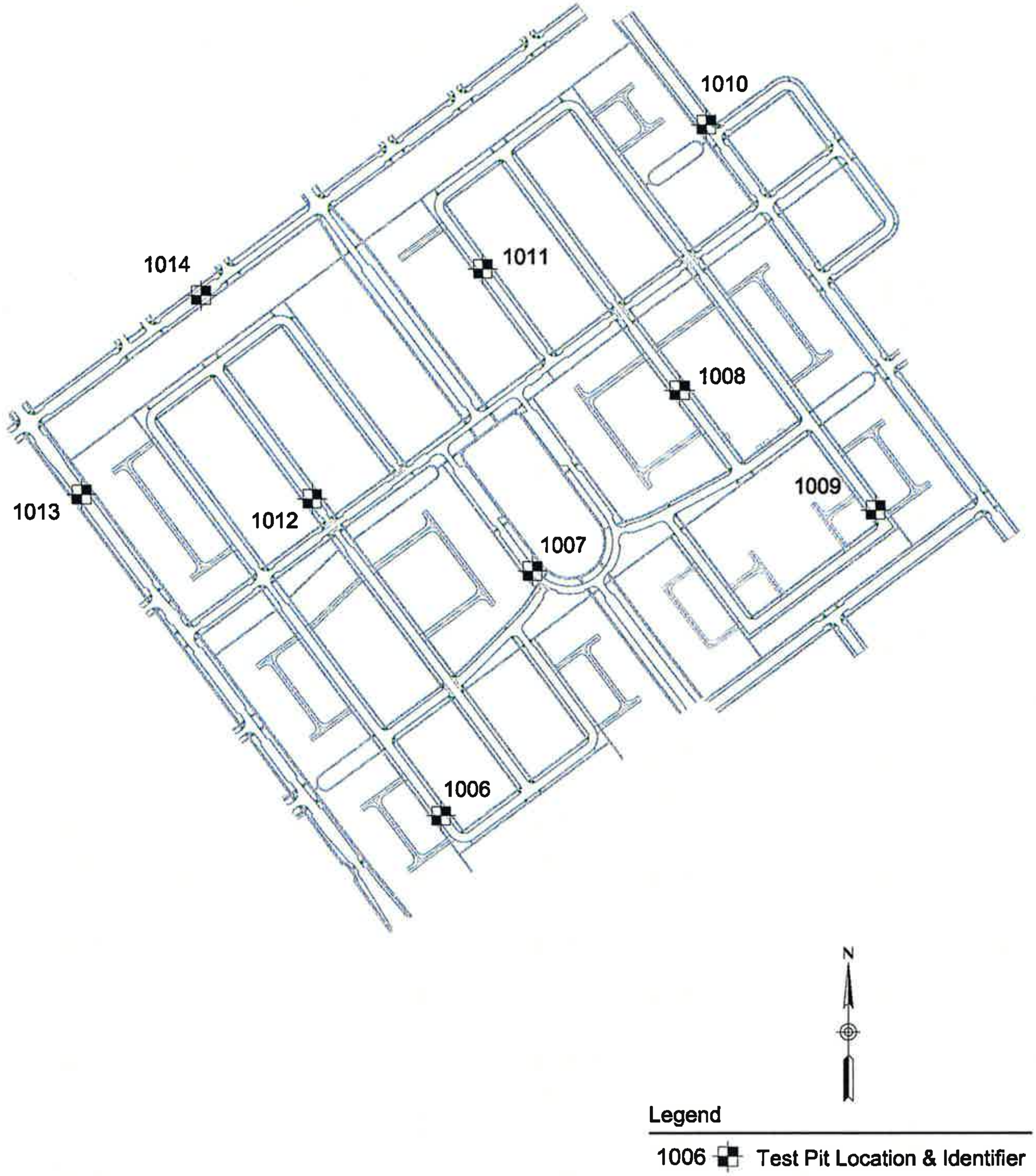

AMEC Earth & Environmental
9865 South 500 West
Sandy, Utah 84070
Tel: (801) 999-2002, Fax: (801) 999-2035

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CLIENT
Nolte Associates, Inc.
5217 South State Street, suite 300
Murray, Utah 84107-4828

Daybreak Active Adult
Daybreak View Pkwy & Oakmond Rd
South Jordan, Utah

SITE MAP

DWN BY: GWH	DATUM:	DATE: 1/28/09
CHK'D BY: SC	REV. NO.:	PROJECT NO: 8-617-005265
PROJECTION:	SCALE: SCALE	FIGURE No. 2

G:\Engineering Department\Salt Lake Office\Site Maps.dwg

APPENDIX A

FIELD EXPLORATIONS

APPENDIX A

FIELD EXPLORATIONS – TEST PITS

General

Subsurface materials and conditions at the project site were investigated on November 12 through 13, 2008 with 9 test pits designated TP-1006 through TP-1014. The approximate locations of the test pits are shown on Figure 2, Site Map. All field operations were observed by a staff engineer provided by our firm, who maintained a detailed log of the materials and conditions encountered in each boring and directed the sampling operations.

Test Pits

The test pits were excavated with a backhoe excavator provided and operated by Skyline Excavating of Bluffdale, UT. The test pits were excavated to depths of 5 to 6.5 feet below grade. Disturbed samples were obtained from the test pits at various intervals. The soil samples obtained were carefully examined in the field, and representative portions were saved in plastic bags and transported to our laboratory for further examination and physical testing.

The field program was supervised by a member of our geotechnical staff who maintained a continuous log of the subsurface conditions encountered. The soils were classified by visual and textural examination in the field. These classifications were later reviewed by subsequent re-examination of the soil samples in our laboratory. Graphical representations of the subsurface conditions encountered are presented on Figures A1 through A10, Log of Test Pits. Terms used to describe the soil are presented on Figure 4, Unified Soil Classification System. The stratification boundaries indicated on the logs are approximate. Actual transitions between differing materials may be gradual.

LOG OF TEST PIT NO. TP-1006

Project Name: **Daybreak Active Adult**	Date Excavated: **11/12/08**
Location: **South Jordan, UT**	Equipment Type: **JCB 214S**
	Excavated By: **Skyline**
Project No: **8-817-005265** Sheet 1 of 1	Logged By: **S. Clausen**

amec

Surface El.:
Station:
Offset:

Elevation, feet	Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Samples	Unit Dry Weight, pcf	Water Content, %	% Passing No. 200 Sieve	Liquid Limit	Plasticity Index	REMARKS
			SILT [ML] medium stiff, tan, moist, angular blocks of gray-brown clay in silty matrix, root holes	1						CBR = 35
			3.3							
			Lean CLAY [CL] medium stiff, dark brown, moist							
			3.7							
			SILT [ML] medium stiff, tan, moist							
	5		5.0							
			End Test Pit at 5 Feet							
	10									

Remarks:

Water Level Observations	
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The discussion in the report is necessary for a proper understanding of the nature of subsurface materials.

Figure A1

AMEC SLC TEST PIT 1 BASE 8-817-005265_GINT.GPJ AMEC SLC GENGEO.1.GDT 3/6/09

LOG OF TEST PIT NO. TP-1007

Project Name: **Daybreak Active Adult**	Date Excavated: **11/12/08**
Location: **South Jordan, UT**	Equipment Type: **JCB 214S**
Project No: **8-817-005265** Sheet 1 of 1	Excavated By: **Skyline**
	Logged By: **S. Clausen**

amec

Surface El.:
Station:
Offset:

Elevation, feet	Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Samples	Unit Dry Weight, pcf	Water Content, %	% Passing No. 200 Sieve	Liquid Limit	Plasticity Index	REMARKS
			Sandy CLAY with Gravel [CL] medium stiff, gray-brown, moist, medium to low plasticity							
			1.5	1				31	11	
			Lean CLAY [CL] medium stiff, tan, moist, root holes, high plasticity							
			3.0							
			Clayey GRAVEL [GC] medium dense, dark brown, dry to moist							
			3.3							
			SILT [ML] medium stiff, tan, moist, non-plastic							
	5			2						
			6.0							
			End Test Pit at 6 Feet							
	10									

Remarks:

Water Level Observations		
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The discussion in the report is necessary for a proper understanding of the nature of subsurface materials.

Figure A2

AMEC SLC TEST PIT 1 BASE 8-817-005265_GINT.GPJ AMEC SLC GENGEO 1.GDT 3/6/09

LOG OF TEST PIT NO. TP-1008

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Project Name: **Daybreak Active Adult**	Date Excavated: **11/13/08**
Location:	Equipment Type: **JCB 214S**
South Jordan, UT	Excavated By: **Skyline**
Project No: **8-817-005265** Sheet 1 of 1	Logged By: **R. Buxton**

Surface El.:
Station:
Offset:

Elevation, feet	Depth, feet	MATERIAL DESCRIPTION	Samples	Unit Dry Weight, pcf	Water Content, %	% Passing No. 200 Sieve	Liquid Limit	Plasticity Index	REMARKS
		Silty SAND & GRAVEL [GM-SM] loose, brown, moist, fill (to 0.5)							
		SILT with Sand [ML] loose, brown, moist, non-plastic, mottled, fill (to 2.0)	1	82	21				
		Silty GRAVEL with Sand [GM] medium dense, dark brown to brown, moist (to 3.5)							
	5	**Lean CLAY [CL]** medium stiff, gray-brown, moist, low plasticity (to 5.0)	2			92	33	13	
		End Test Pit at 5 Feet							
	10								

Remarks:

Water Level Observations		
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The discussion in the report is necessary for a proper understanding of the nature of subsurface materials.

Figure A3

LOG OF TEST PIT NO. TP-1009

Project Name: **Daybreak Active Adult**	Date Excavated: **11/12/08**
Location: **South Jordan, UT**	Equipment Type: **JCB 214S**
	Excavated By: **Skyline**
Project No: **8-817-005265** Sheet 1 of 1	Logged By: **S. Clausen**

Surface El.:
Station:
Offset:

Elevation, feet	Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Samples	Unit Dry Weight, pcf	Water Content, %	% Passing No. 200 Sieve	Liquid Limit	Plasticity Index	REMARKS
			Silty Sandy GRAVEL [GP-GM] medium dense, brown, moist to wet, fill, construction debris	1						
	3.5		**Sandy & Clayey GRAVEL [GP-GC]** medium dense, gray-brown, moist to dry, meium to low plasticity, native							
	5.0		End Test Pit at 5 Feet							

Depth scale: 5, 10

Remarks:

Water Level Observations		
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The discussion in the report is necessary for a proper understanding of the nature of subsurface materials.

Figure A4

AMEC.SLC TEST PIT 1 BASE 8-817-005265_GINT.GPJ AMEC.SLC.GENGEO.1.GDT 3/6/09

LOG OF TEST PIT NO. TP-1010

Project Name:	**Daybreak Active Adult**	Date Excavated:	**11/13/08**
Location:	**South Jordan, UT**	Equipment Type:	**JCB 214S**
Project No:	**8-817-005265** Sheet 1 of 1	Excavated By:	**Skyline**
		Logged By:	**R. Buxton**

amec

Surface El.:
Station:
Offset:

Elevation, feet	Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Samples	Unit Dry Weight, pcf	Water Content, %	% Passing No. 200 Sieve	Liquid Limit	Plasticity Index	REMARKS
	0–0.5		**SILT with Sand [ML]** loose, brown, moist, non-plastic, fill							
	0.5–1.5		**SILT with Sand [ML]** loose, brown, moist, non-plastic							
	1.5–5.0		**Poorly Graded GRAVEL with Sand [GP]** loose to medium dense, brown, moist, non-plastic	1			5			
	5		End Test Pit at 5 Feet							
	10									

Remarks:

Water Level Observations		
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The discussion in the report is necessary for a proper understanding of the nature of subsurface materials.

Figure A5

AMEC.SLC.TEST PIT.1 BASE 8-817-005265_GINT.GPJ AMEC.SLC.GENGEO.1.GDT 3/6/09

LOG OF TEST PIT NO. TP-1011

Project Name: **Daybreak Active Adult**	Date Excavated: **11/13/08**
Location: **South Jordan, UT**	Equipment Type: **JCB 214S**
	Excavated By: **Skyline**
Project No: **8-817-005265** Sheet 1 of 1	Logged By: **R. Buxton**

amec

Surface El.:
Station:
Offset:

Elevation, feet	Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Samples	Unit Dry Weight, pcf	Water Content, %	% Passing No. 200 Sieve	Liquid Limit	Plasticity Index	REMARKS
	0–1.0		**SILT with Sand some Gravel [ML]** loose to medium dense, brown, moist, non-plastic, fill							
	1.0–4.0		**SILT with Sand [ML]** loose to medium dense, brown, moist, non-plastic	1						
	4.0–5.0		**Silty SAND [SM]** loose to medium dense, light gray, moist							
	5		End Test Pit at 5 Feet							
	10									

Remarks:

Water Level Observations		
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The discussion in the report is necessary for a proper understanding of the nature of subsurface materials.

Figure A6

LOG OF TEST PIT NO. TP-1012

Project Name: **Daybreak Active Adult**	Date Excavated: **11/13/08**
Location: **South Jordan, UT**	Equipment Type: **JCB 214S**
	Excavated By: **Skyline**
Project No: **8-817-005265** Sheet 1 of 1	Logged By: **R. Buxton**

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Surface El.:
Station:
Offset:

Elevation, feet	Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Samples	Unit Dry Weight, pcf	Water Content, %	% Passing No. 200 Sieve	Liquid Limit	Plasticity Index	REMARKS
	0–1.0		**SILT with Sand & Gravel [ML]** loose to medium dense, brown, moist, non-plastic, fill							
	1.0–2.5		**Clayey GRAVEL with Sand [GC]** medium stiff, dark brown, moist, low plasticity, fill	1						
	2.5–4.5		**Silty SAND & GRAVEL [GM-SM]** medium dense, brown, moist, non-plastic, fill	2						
	4.5–5.3		**SILT with Sand [ML]** loose, dark brown, moist							
	5.3–6.5		**Silty SAND with Gravel [SM]** medium dense, gray-brown, moist, non-plastic							
	6.5		End Test Pit at 6.5 Feet							

Depth scale: 5, 10

Remarks:

Water Level Observations		
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The discussion in the report is necessary for a proper understanding of the nature of subsurface materials.

Figure A7

LOG OF TEST PIT NO. TP-1013

Project Name: **Daybreak Active Adult**	Date Excavated: **11/13/08**
Location: **South Jordan, UT**	Equipment Type: **JCB 214S**
	Excavated By: **Skyline**
Project No: **8-817-005265** Sheet 1 of 1	Logged By: **R. Buxton**

amec

Surface El.:
Station:
Offset:

Elevation, feet	Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Samples	Unit Dry Weight, pcf	Water Content, %	% Passing No. 200 Sieve	Liquid Limit	Plasticity Index	REMARKS
			Silty SAND & GRAVEL [GM-SM] loose, brown, moist, non-plastic, fill							
	1.0		**SILT with Sand [ML]** medium stiff, brown, moist, non-plastic to low plasticity	1						
	5									
	5.5		End Test Pit at 5.5 Feet							
	10									

Remarks:

Water Level Observations		
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The discussion in the report is necessary for a proper understanding of the nature of subsurface materials.

Figure A8

AMEC SLC TEST PIT 1 BASE 8-817-005265_GINT.GPJ AMEC SLC GENGEO 1.GDT 3/6/09

LOG OF TEST PIT NO. TP-1014

Project Name: **Daybreak Active Adult**	Date Excavated: **11/13/08**
Location: **South Jordan, UT**	Equipment Type: **JCB 214S**
	Excavated By: **Skyline**
Project No: **8-817-005265** Sheet 1 of 1	Logged By: **R. Buxton**

amec

Surface El.:
Station:
Offset:

Elevation, feet	Depth, feet	Graphic Log	MATERIAL DESCRIPTION	Samples	Unit Dry Weight, pcf	Water Content, %	% Passing No. 200 Sieve	Liquid Limit	Plasticity Index	REMARKS
			SILT with Sand [ML] loose, brown, moist, non-plastic							
				2	84	18				
				1			78	NP	NP	CBR = 26
			2.0							
			SILT [ML] medium stiff, gray, moist, low plasticity							
				3						
			3.5							
			Silty GRAVEL with Sand [GM] loose, brown, moist							
	5									
			5.5							
			End Test Pit at 5.5 Feet							
	10									

Remarks:

Water Level Observations		
∇		
▼		

The discussion in the report is necessary for a proper understanding of the nature of subsurface materials.

Figure A9

AMEC.SLC.TEST PIT.1 BASE 8-817-005265_GINT.GPJ AMEC.SLC.GENGEO.1.GDT 3/6/09

SOIL CLASSIFICATION CHART & LEGEND

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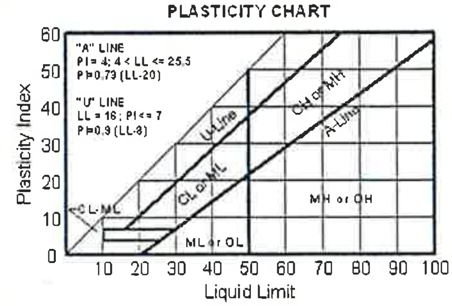
MAJOR DIVISIONS				GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS Less than 50% passes No. 200 sieve	GRAVELS (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passing No. 200 sieve)			GW	Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures
					GP	Poorly graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures
		GRAVELS WITH FINES (More than 12% Passing No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		GM	Silty gravels, gravel-sand-silt mixtures
			Limits plot above "A" line & hatched zone on plasticity chart		GC	Clayey gravels, gravel-sand-silt mixtures
	SANDS (50% or more of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passing No. 200 sieve)			SW	Well graded sands, gravelly sands
					SP	Poorly graded sands, gravelly sands
		SANDS WITH FINES (More than 12% Passing No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		SM	Silty sands, sand-silt mixtures
			Limits plot above "A" line & hatched zone on plasticity chart		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS 50% or more passes No. 200 sieve	SILTS Limits Plot Below A Line	SILTS OF LOW PLASTICITY (Liquid Limit less than 50)			ML	Inorganic silts, clayey silts of low to medium plasticity
		SILTS OF HIGH PLASTICITY (Liquid Limit 50 or more)			MH	Inorganic silts, micaceous or diatomacaeous silty soils, elastic silts
	CLAYS Limits Plot Above A Line	CLAYS OF LOW PLASTICITY (Liquid Limit less than 50)			CL	Inorganic clays of low to medium plasticity, gravelly, sandy, and silty clays
		CLAYS OF HIGH PLASTICITY (Liquid Limit 50 or more)			CH	Inorganic clays of high plasticity, fat clays, sandy clays of high plasticity
	ORGANICS SILTS AND CLAYS	ORGANIC SILTS AND CLAYS OF LOW PLASTICITY (Liquid Limit less than 50)			OL	Organic silts and clays of low to medium plasticity, sandy organic silts and clays
		ORGANIC SILTS AND CLAYS OF HIGH PLASTICITY (Liquid Limit 50 or more)			OH	Organic silts and clays of high to medium plasticity, sandy organic silts and clays
ORGANIC SOILS		PRIMARILY ORGANIC MATTER (dark in color and organic odor)			PT	Peat

NOTE: Coarse-grained soils with between 5% and 12% passing the No. 200 sieve and fine-grained soils with limits plotting in the gray zone on the plasticity chart have dual classifications.

- D - Dames and Moore Sampler
- S - Split Spoon Sampler (SPT)
- T - Pushed Thin Walled Tube
- GS - Grab Sample
- BS - Bulk Sample
- DT - Driven Thin Wall
- C - Rock Core Sample
- CS - Continuous Soil Sample
- R - California Ring Sampler
- Water Level at Time of Drilling
- Stabilized Water Level
- CBR California Bearing Ratio
- PP Pocket Penetrometer, tsf
- ST Swell Test
- TOR Torvane Shear, psf
- UC Unconfined Compression, psf
- NR No Recovery

PLASTICITY CHART



Material	Particle Size	
	mm	Sieve sizes
Boulders	304.8 to 914.4	12 in to 36 in
Cobble	76.2 to 304.8	3 in to 12 in
Gravel Fine Coarse	 4.76 to 19.1 19.1 to 76.2	 3/4 in to 3 in #4 to 3/4 in
Sand Fine Medium Coarse	 2.00 to 4.76 0.42 to 2.00 0.074 to 0.42	 #10 to #4 #40 to #10 #200 to #40
Silt & Clay	<0.074	<#200

Figure A10

APPENDIX B

LABORATORY TESTING

APPENDIX B

LABORATORY TESTING

General

All samples obtained from the field were transported to our laboratory for examination and testing. The physical characteristics were noted, and the field classifications were modified where necessary. The laboratory testing program was conducted to provide data for our engineering analyses. The laboratory program included determinations of natural moisture content, dry unit weights, gradation tests, Atterberg limits, moisture density relationships, and CBR. The following sections describe the testing program in more detail.

Natural Moisture Content

Natural moisture content determinations were made in general conformance with ASTM D 2216. The results are presented on Figures 3A through 3I, Log of Test Pits.

Unit Weight

The dry unit weight, or density, of undisturbed soil samples was determined in the laboratory in general conformance with ASTM D 2937.

Gradation Tests

Gradation tests were preformed on selected samples in general accordance with ASTM C 136 to aid in classifying soils. The oven-dried samples were weighed and vibrated through a series of different size sieves. The individual sieves were then weighed in order to calculate the percentage of gravel, sand and fine grained material.

Atterberg Limits

Atterberg Limit tests were performed in general accordance with ASTM D 4318 on representative samples of the native soils encountered at the site to verify field classifications.

Modified Proctor Compaction Test

Compaction tests were performed in general accordance with ASTM D 1557 on representative disturbed samples to determine moisture density relationships.

California Bearing Ratio Tests

California Bearing Ratio Tests were performed in accordance with ASTM D 1883 to obtain subgrade characteristics of existing site soils. Soils were compacted to 95 percent of the modified proctor (ASTM D 1557). Tests were performed with a 10 lb surcharge weight.

Tabulation of Test Data

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Sample Identification	Depth Interval, ft	Dry Density, psf	Moisture Content, %	Grain Distribution, %			Liquid Limit	Plastic Limit	Plasticity Index	Resistivity	pH	Sulfates, ppm	Chlorides, ppm	California Bearing Ratio	Soil Classification
				Gravel	Sand	Silt/Clay									
TP-1006, 1	0.0 - 4.5	--	--	--	--	--	--	--	--	--	--	--	--	35	--
TP-1007, 1	0.0 - 2.5	--	--	--	--	--	31	20	11	--	--	--	--	--	--
TP-1008, 2	3.5 - 5.0	--	--	0	8	92	33	20	13	--	--	--	--	--	LEAN CLAY (CL)
TP-1010, 1	2.0 - 5.0	--	--	65	30	5	--	--	--	--	--	--	--	--	POORLY GRADED GRAVEL with SAND (GP)
TP-1014, 1	0.0 - 3.0	--	--	0	22	78	NP	NP	NP	--	--	--	--	26	SILT with SAND (ML)

Project Name: Daybreak Active Adult
Location:
South Jordan, UT
Project No: 8-817-005265

This tabulation may not contain all moisture content and dry unit weight data. Complete results may be found on individual logs.

GRAIN SIZE DISTRIBUTION

Project: Daybreak Active Adult
Location:
South Jordan, UT
Project No: 8-817-005265

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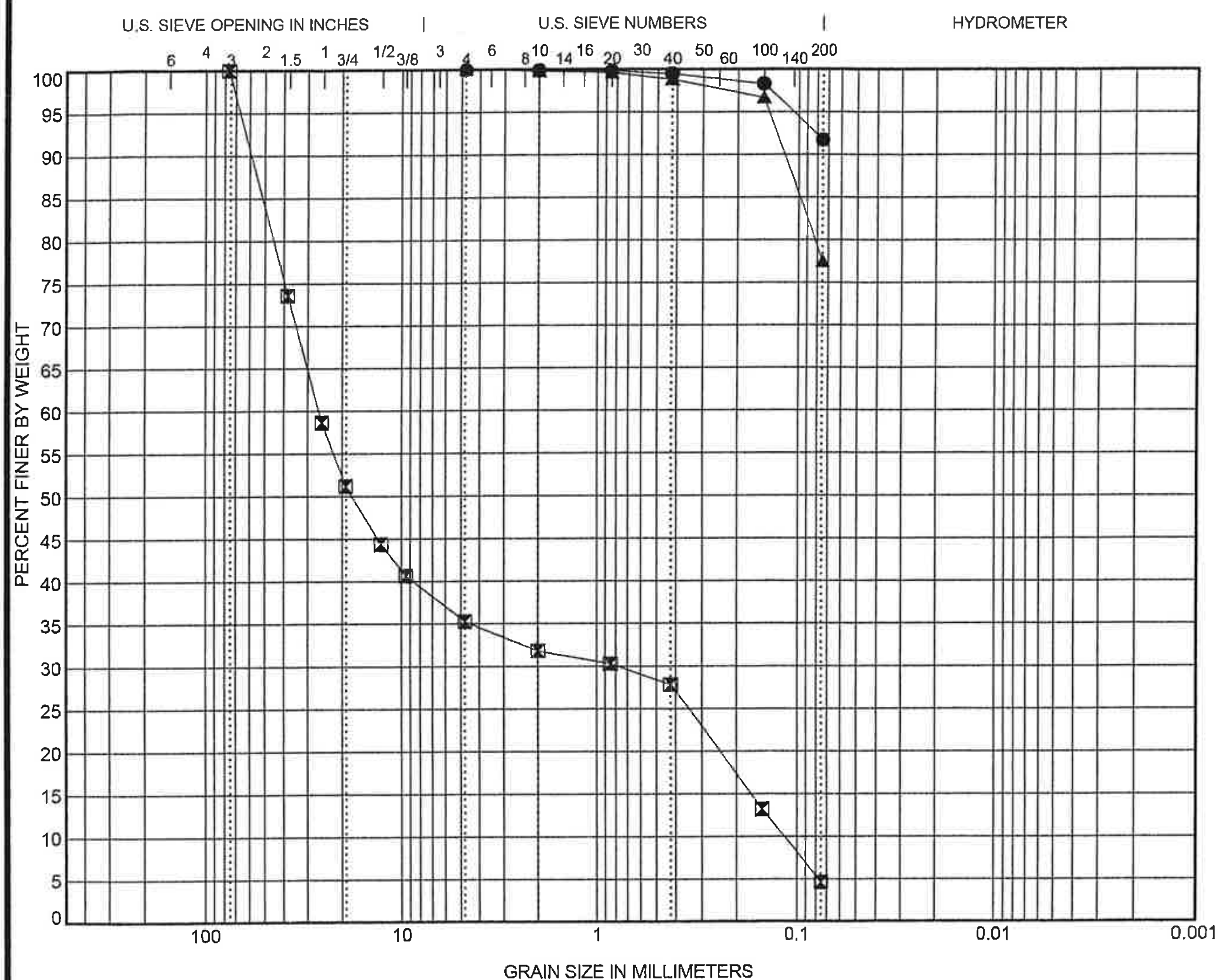


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

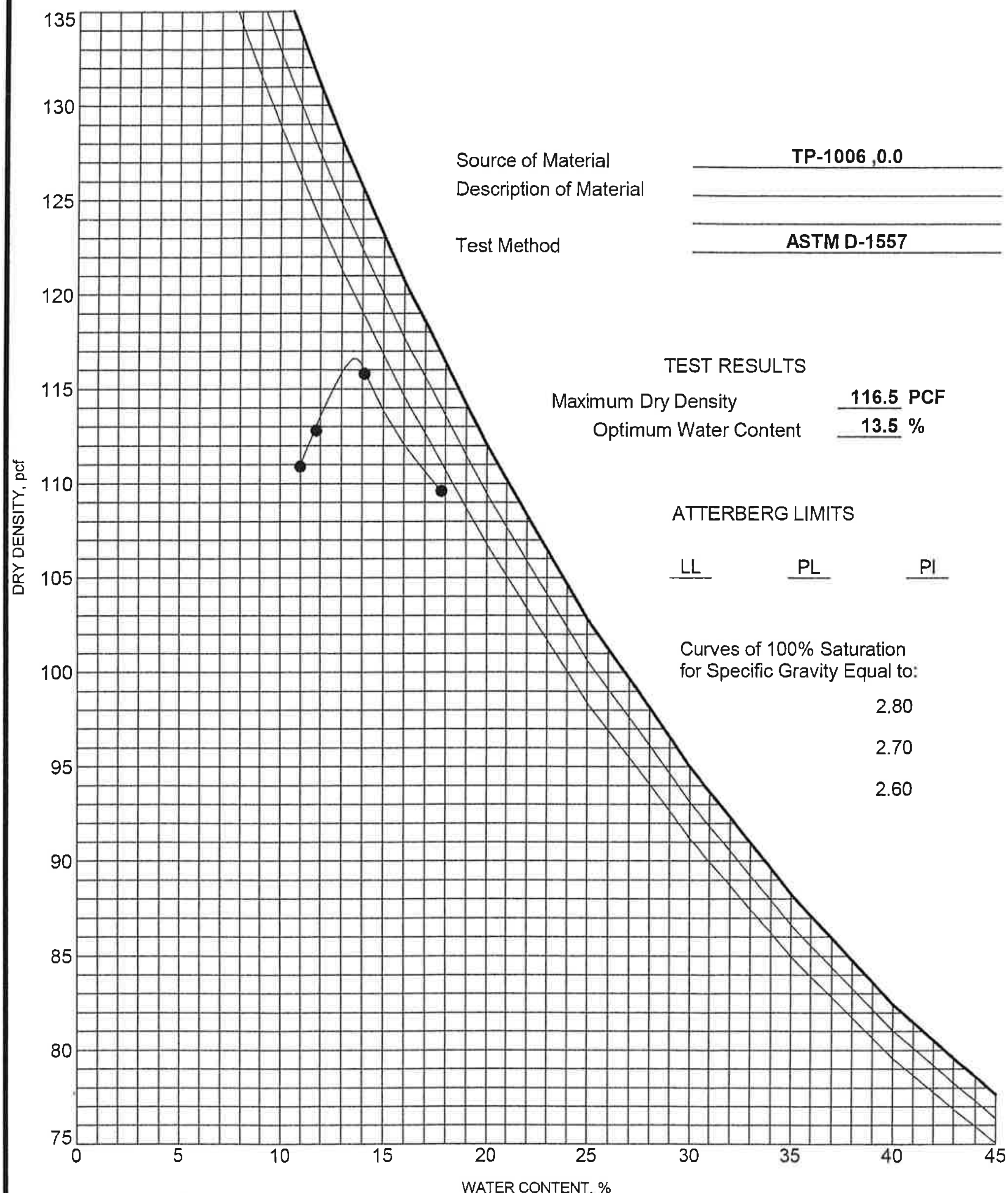
Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	TP-1008	3.5	LEAN CLAY(CL)	33	20	13		
⊠	TP-1010	2.0	POORLY GRADED GRAVEL with SAND(GP)				0.20	227.05
▲	TP-1014	0.0	SILT with SAND(ML)	NP	NP	NP		

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP-1008	3.5	4.75				0.0	8.3	91.7	
⊠	TP-1010	2.0	76.2	26.315	0.782	0.116	64.1	30.7	4.6	
▲	TP-1014	0.0	4.75				0.0	22.5	77.5	

MOISTURE-DENSITY RELATIONSHIP

Project: Daybreak Active Adult
Location:
South Jordan, UT
Project No: 8-817-005265

amec



Source of Material: **TP-1006 ,0.0**
Description of Material:

Test Method: **ASTM D-1557**

TEST RESULTS

Maximum Dry Density **116.5** **PCF**
Optimum Water Content **13.5** **%**

ATTERBERG LIMITS

LL	PL	PI

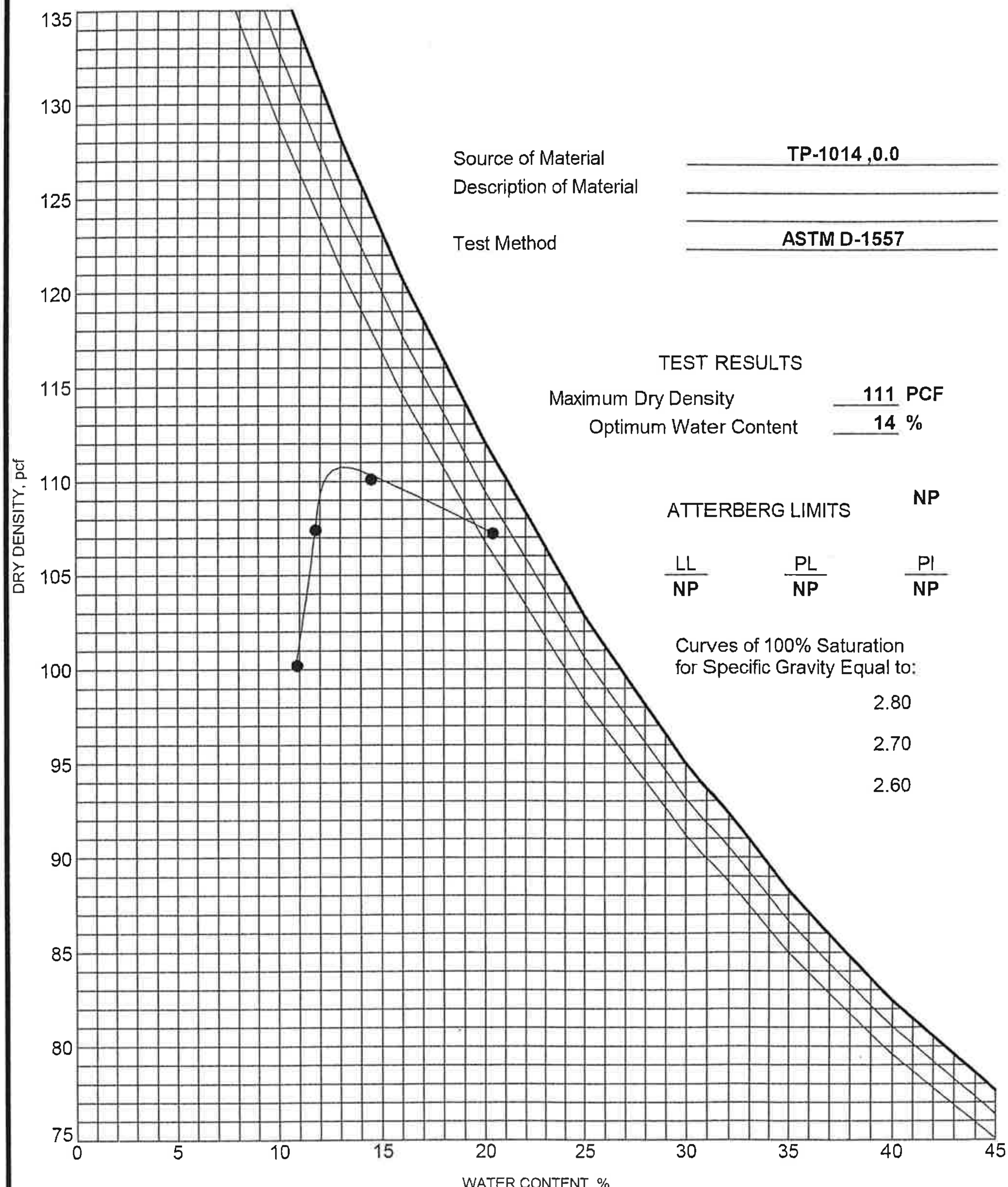
Curves of 100% Saturation
for Specific Gravity Equal to:

2.80
2.70
2.60

MOISTURE-DENSITY RELATIONSHIP

Project: Daybreak Active Adult
Location:
South Jordan, UT
Project No: 8-817-005265

amec



Source of Material: TP-1014 ,0.0
Description of Material:
Test Method: ASTM D-1557

TEST RESULTS

Maximum Dry Density: 111 PCF
Optimum Water Content: 14 %

ATTERBERG LIMITS NP

LL	PL	PI
NP	NP	NP

Curves of 100% Saturation for Specific Gravity Equal to:

2.80
2.70
2.60