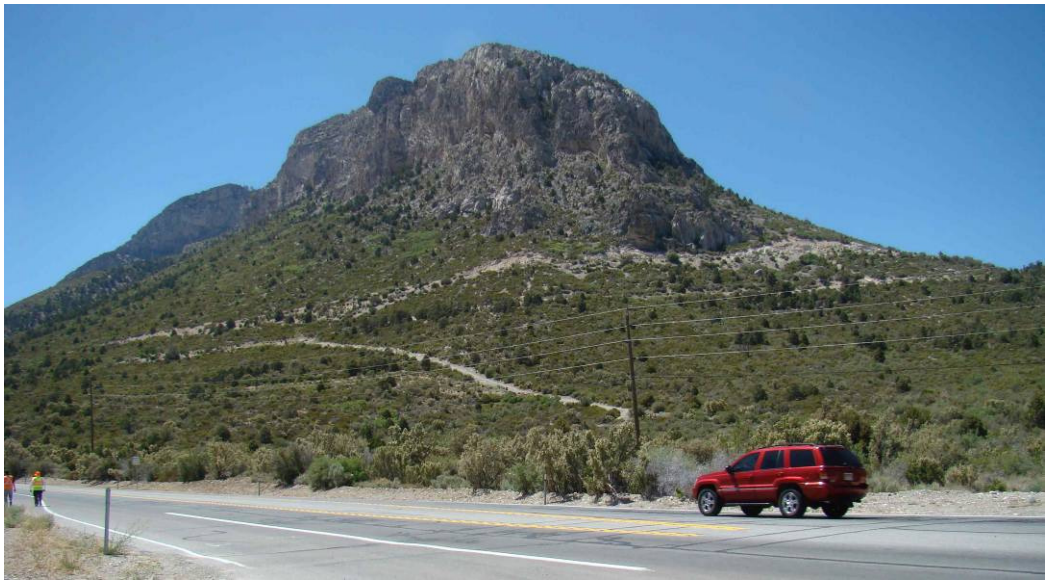
Yeh and Associates, Inc.
Consulting Engineers & Scientists

Final
Geotechnical Investigation and Pavement Design Report
Kyle and Lee Canyons
Clark County, Nevada
NV PFH 11-1(5)

Contract/Task Order Number: DTFH68-09-00002/T-11-035 and T-11-044



YA Project No. 211-220A
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APPENDICES

1.0 PURPOSE AND SCOPE OF WORK

Yeh and Associates, Inc. was retained by CH2M HILL and Central Federal Lands Highway Division (CFLHD) to provide preliminary and final geotechnical investigations and pavement designs for the proposed project at Kyle and Lee Canyons in Clark County, Nevada. The western approximately 9 miles of Kyle Canyon Road are located within the Toiyabe National Forest/Spring Mountains Recreation Area and the remaining 7.7 miles are located within BLM and private lands. The project area on Lee Canyon Road is located within the Toiyabe National Forest/Spring Mountains Recreation Area. The project vicinity is shown on below Figure 1.0.1.

The proposed improvements on Kyle Canyon Road (SR 157) include two roundabouts at the proposed Forest Service Visitors Center and roadway widening to add 4-foot shoulders for bicycle lanes from the intersection with US 95 to the proposed Visitors Center, a distance of approximately 16.7 miles. Kyle Canyon Road will be reconstructed with a median and curved alignments beginning approximately ½-mile east of the Visitors Center and extending to the west roundabout. The new streetscape is intended to aid traffic calming in the approach to the roundabouts. Three concrete box culverts will be extended or replaced in the widening area. These include a triple cell box culvert located near MP 11.0 and double and single cell box culverts near MP 7.0. Significant cut slopes are proposed at approximate MP 3.75 and MP 11.80 to provide additional width for drainage improvements and the bicycle lanes. A retaining wall is an option being considered to support the cut at MP 3.75. The proposed improvements on Lee Canyon Road (SR 156) consist of the construction of a roundabout at the intersections of the Old Mill and Foxtail Picnic Site entrances and SR 156.

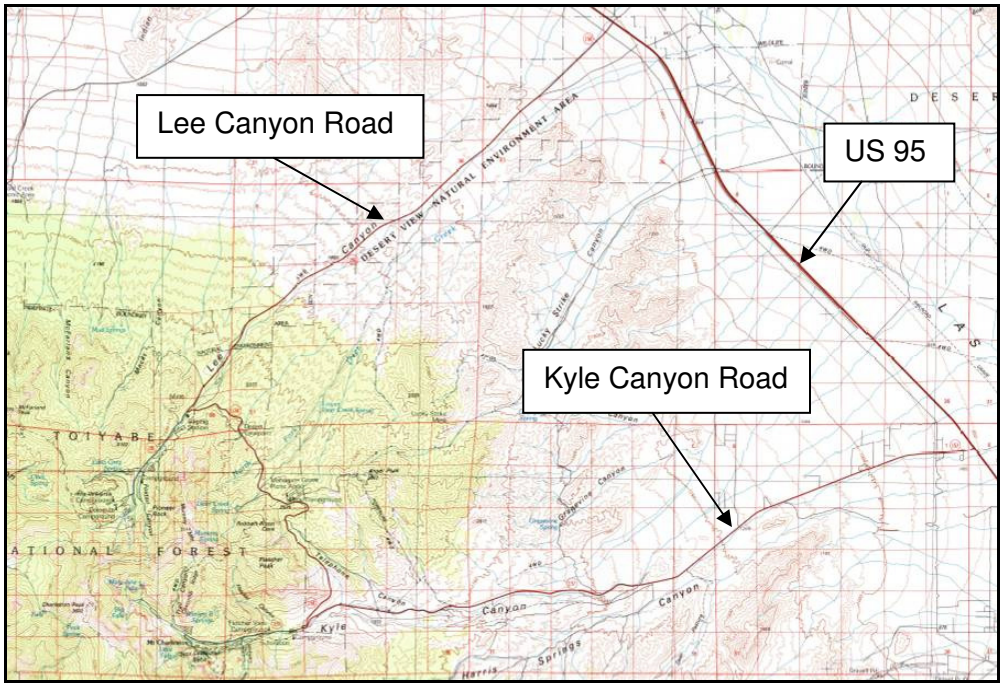


Figure 1.0.1: Project Vicinity Map

Construction of the proposed improvements will occur in two phases. Phase 1 will consist of the roundabouts and associated improvements to Kyle Canyon Road near the proposed Forest Service Visitors Center and the roundabout on Lee Canyon Road. Phase 2 construction will consist of the widening along Kyle Canyon Road from the Deer Creek Road to US 95 including the proposed cut slopes at MP 3.75 and MP 11.80. The widening will be designed to Nevada Department of Transportation (NDOT) standards and will be constructed in conjunction with the 3R improvements to Kyle Canyon Road proposed by NDOT.

The scope of our work included a preliminary geotechnical investigation and a supplemental investigation to provide recommendations for drainage structures, cut and fill slope grading and pavement designs for the proposed roundabouts and widening areas. The work included the following tasks:

- Perform a geologic reconnaissance to characterize the geologic setting.
- Conduct subsurface investigations to obtain information on the subsurface conditions.
- Perform laboratory testing on soil samples obtained during the subsurface investigations to determine the engineering characteristics of the on-site soils and bedrock.
- Provide interim geotechnical memoranda to convey preliminary design recommendations
- Evaluate pavement designs for the proposed roundabouts and widening
- Perform a global stability analysis to evaluate alternatives for the proposed cut slope at MP 3.75
- Prepare a preliminary report and a final report that summarize our evaluation of the field and laboratory data and present the results of our geotechnical engineering analyses and recommendations for the box culverts, slope grading and pavements within the project area.

2.0 REGIONAL GEOLOGY

2.1 Kyle Canyon

State Road 157 is located in Kyle Canyon in and below the Spring Mountains. The Spring Mountains at the project location are comprised of Mississippian to Permian aged rocks. These rocks composed primarily of limestone, with subordinate siltstone and some sandstone and shale comprise the Birdsong Formation. The thickest and most continuous exposure of the formation occurs near Lee Canyon and is over 7000 feet thick. These rocks form prominent peaks which rise to several thousand feet above upper Kyle Canyon.

The four primary project locations rest upon the Kyle Canyon Alluvial Fan. The Kyle Canyon Alluvial Fan is composed of alluvial sediments derived from two major ephemeral drainages; Kyle Canyon Wash and Harris Springs Wash, as well as several minor drainages. The Kyle Canyon Alluvial Fan is one of the largest alluvial fans on the eastern slopes of the Spring Mountains. The fan has been extensively mapped and four surfaces have been identified and aged. Ages range from pre 730,000 yBP for Surface 1 to approximately 5000 yBP for Surface 4.

All of these generations of alluvial material are comprised of gravelly sand and cobble stream deposits with little to no fines. Surfaces 1 and 2 include pedogenic calcrete which is visible in bluffs and stream banks in certain areas within the project limits. Surface 3 exhibits various stages of carbonate accumulation resulting in moderate cementation of the alluvium. Surface 4 are the recent stream deposits found in the channels such as those at both culvert locations.

2.2 Lee Canyon

State Road 156 - Lee Canyon Road is located in Lee Canyon in the Spring Mountains. The Spring Mountains at the project location are comprised of Mississippian to Permian aged rocks of the Birdsong Formation. These rocks are composed primarily of limestone, with subordinate siltstone and some sandstone and shale. The thickest and most continuous exposure of the formation occurs near Lee Canyon and is over 7000 feet thick. The project location rests upon recent alluvial material derived from these adjacent mountains. Following is a description of materials observed in surface exposures and as found in the borings.

3.0 SUBSURFACE INVESTIGATION

Fourteen borings were drilled for the preliminary investigation (Borings YA-1 through YA-14). Borings YA-1 through YA-4 and YA-7 and YA-8 were drilled for the proposed pavement improvements and roundabouts and Borings YA-9 through YA-14 were drilled for the box culverts in/along SR 157 - Kyle Canyon Road. Borings YA-5 and YA-6 were drilled for the proposed roundabout at SR 156 - Lee Canyon Road. Boring locations for the preliminary investigation are shown on Sheets A-1 through A-7, Engineering Geology, presented in Appendix A.

Ten borings were drilled for the supplemental investigation. Borings YA-12-01 through YA-12-07 and YA-12-09 were drilled to explore subsurface conditions in the proposed pavement widening areas along Kyle Canyon Road. The borings were spaced at approximately 3-mile intervals. Borings YA-12-08 and YA-12-10 were drilled below and above the proposed cut slope at MP 3.75 on Kyle Canyon Road, respectively. The locations of borings YA-12-08 and YA-12-10 are shown on Sheet A-7 in Appendix A.

The borings were drilled by Elite Drilling, Inc. of Las Vegas, Nevada using their truck-mounted CME 75 and Mobile B 57 drill rigs and track-mounted CME 55 drill rig equipped with 8-inch outside diameter, hollow-stem auger. The truck-mounted rigs were used for borings drilled

from the existing pavement and the track-mounted rig was used for borings drilled off the roadway. Traffic control during the drilling operations was provided by Highway Technologies, Inc. of Las Vegas, Nevada. The subsurface conditions encountered in the borings were logged by a representative of Yeh and Associates. The boring logs are included in Appendix B, Legend and Boring Logs.

Bulk (grab) samples were obtained from the soils encountered within the approximate top 1 to 4 feet of the pavement borings and structure borings. The recorded penetration resistance measurements were obtained by driving a modified California sampler or split spoon into the subsurface materials with an automatically dropped 140-pound hammer falling 30 inches, similar to ASTM D1586, "Standard Test Method for Standard Penetration Test (SPT) and Split Barrel Sampling of Soils". The penetration resistance value (N-value) is a useful index to the consistency and relative density or hardness of the materials encountered.

Groundwater was not encountered in the borings at the time of drilling. Year-round groundwater conditions were not established as part of the field investigations. Depending on final grading plans and foundation elevations, groundwater may be encountered during excavation. Groundwater conditions in the study area will likely vary considerably throughout the year. Variations can occur during different seasons, following precipitation events, irrigation, after construction and site grading, and due to changes in surface and subsurface drainage characteristics of the surrounding area.

4.0 LABORATORY TESTING

Yeh and Associates performed laboratory testing on samples to determine the classification and engineering characteristics of the on-site soil and bedrock. Laboratory tests performed included gradation (ASTM D 421, C 136 and AASHTO T 27), Atterberg limits (AASHTO T 89/T 90), moisture content (AASHTO T 265), density (ASTM D 7263), R-value (ASTM D 2844), water soluble sulfate content (AASHTO T290), pH (ASTM D 4972/AASHTO T 289), chloride ion content (ASTM D 4327) and soil resistivity (AASHTO T 288). Gradation and Atterberg limits test results were used to classify the soils in accordance with the AASHTO classification system and the Unified Soil Classification System (USCS). Moisture content provides an estimate of the moisture conditions of the subgrade and underlying materials. Density measurements on relatively undisturbed liner samples provide an estimate of the in-situ unit weight of soil. Soil R-value is a measure of soil subgrade strength used for pavement design. Tests for soluble sulfate content, pH, chloride content and resistivity are used to evaluate the potential of the soil to be aggressive to concrete and to corrode buried metal. The laboratory test results are presented in Appendix C and on the boring logs in Appendix B.

5.0 SUBSURFACE CONDITIONS

5.1 Kyle Canyon Road

Pavement Borings: Existing pavement sections encountered on Kyle Canyon Road consisted of 4 to 9 inches of asphalt. Soils encountered below the pavement sections generally consisted of native sandy gravel and gravelly sand with varying amounts of silt and clay. Layers of clayey sand with gravel were encountered in Borings YA-2 and YA-4. Borings YA-1 through YA-4 and supplemental Borings YA-12-01 through YA-12-7 and YA-12-09 were drilled to a maximum depth of 6.5 feet. Boring YA-12-08 was drilled to a depth of 15 feet. Borings YA-07 and YA-08 were drilled in the shoulders to depths of 16.5 feet and 15 feet, respectively and did not encounter pavement. The asphalt thicknesses and subsurface conditions encountered in pavement areas of Kyle Canyon Road are summarized below in Table 5.1.1.

Table 5.1.1: Summary of Conditions Encountered - Kyle Canyon Road Pavement Areas

Boring No.	Approx. Milepost	Approx. Station	Thickness of Asphalt (in)	Subgrade Soil Description	AASHTO Classification	R-Value
YA-12-01	20.62	1014+05	7.5	gravelly SAND	A-2-4 (0)	
YA-12-02	18.30	891+54	7	gravelly SAND	A-2-4 (0)	57
YA-08	17.82	866+00	-	sandy Gravel	A-1-a (0)	
YA-12-03	15.30	733+14	7.5	silty SAND	A-2-4 (0)	48
YA-07	12.81	602+00	-	silty Gravel	A-1-a (0)	
YA-12-04	12.34	574+74	7.5	silty SAND	A-2-6 (0)	
YA-12-05	9.30	416+34	6	silty SAND	A-2-4 (0)	46
YA-12-06	6.30	257+94	6	slightly silty SAND	A-1-b (0)	50
YA-03	4.55	165+50	6	silty GRAVEL	A-1-b (0)	
YA-02	4.52	164+00	4	clayey SAND	A-2-6 (0)	24
YA-04	4.28	151+00	6	clayey SAND	A-6 (2)	21
YA-12-07	4.27	150+50	5.5	silty SAND	A-2-4 (0)	29
YA-01	4.26	150+00	8	silty SAND	A-1-b (0)	
YA-12-08	3.74	123+00	4.5	gravelly SAND	A-1-b (0)	
YA-12-09	3.35	102+75	9	gravelly SAND	A-1-b (0)	55

Structure Borings: Borings YA-9, YA-10, YA-11 and YA-14 were drilled at the location of the box culverts along Kyle Canyon Road near Station 295+00. Engineering geology sheets showing the roadway alignment, structure locations and boring logs are presented on Sheets A-2 and A-3 in Appendix A. The subsoils encountered consist mainly of medium dense to very dense, silty to sandy gravel and gravelly sand. Medium dense to dense silty sand was encountered in Boring YA-10 below 3 inches of asphalt ditch pavement to a depth of 9 feet. Very dense gravelly

sand was encountered in Boring YA-10 below the silty sand to the bottom of the boring at a depth of 20.5 feet. The maximum depth of exploration at this location was 30 feet. The foundation soils encountered in the borings near Station 295+00 have AASHTO classifications of A-1-a (0) and A-1-b (0).

Borings YA-12 and YA-13 were drilled near the box culverts along Kyle Canyon Road at approximate Station 506+50. The borings encountered very dense gravelly sand to the maximum depths drilled, 20.7 feet in Boring YA-12 and 12 feet in Boring YA-13. The gravelly sand has an AASHTO classification of A-1-a (0).

Cut Slope Borings: Supplemental Borings YA-12-08 and YA-12-10 were drilled at the location of the proposed cut slope or wall near Station 122+00. Boring YA-12-08 was drilled in Kyle Canyon Road and encountered 4.5 inches of asphalt overlying 2 feet of dense gravelly sand. Very dense moderately to heavily cemented sand and gravel was encountered from a depth of 2.5 feet to the maximum depth drilled, 15 feet. Boring YA-12-10 was drilled at the top of the slope near Station 122+00, approximately 50 feet left of the centerline. The boring encountered medium dense to very dense, silty to sandy gravel and gravelly sand that is lightly to heavily cemented. The cementation was logged as alternating approximately 3-foot thick zones of lightly and heavily cemented deposits, to the maximum depth drilled, 25.2 feet, where auger refusal on heavily cemented material was encountered. The soils encountered in Boring YA-12-08 have an AASHTO classification of A-1-b (0). The locations of Borings YA-12-8 and YA-12-10 are shown on sheet A-7 in Appendix A.

5.2 Lee Canyon Road

Borings YA-5 and YA-6 were drilled at the location of the proposed roundabout on Lee Canyon Road. The locations of the borings are shown on Sheet A-5 in Appendix A. The thickness of existing asphalt pavement encountered in Boring YA-05 was 6 inches and 5 inches of asphalt was encountered in Boring YA-06. Below the asphalt, Boring 5 encountered 4 feet of dense silty sand with gravel over 1.5 feet of medium dense silty gravel with sand and Boring YA-06 encountered medium dense silty gravel with sand. Borings YA-05 and YA-06 were drilled to a depth of 6 feet. The silty gravel soils encountered in the borings have an AASHTO classification of A-1-b (0). R-value tests were performed on a representative combined bulk sample of A-1-b soil from borings YA-05 and YA-06 and the results indicate the soil has an R-value of 78.

6.0 CONCRETE BOX CULVERT RECOMMENDATIONS

The following design and construction details for the proposed concrete box culvert extensions (CBCs) should be observed for shallow conventional spread foundations placed on the very dense sand and gravel encountered at the site. Groundwater was not observed, however, it

is anticipated that the groundwater elevation will vary throughout the year. Depending on the time of year that the CBC is constructed, groundwater may be encountered during excavation for the CBC.

Visual inspection of the foundation subgrade is recommended to assure adequate foundation support and to minimize the potential for differential settlement. The foundation excavations should be observed by a qualified representative of a registered Professional Engineer to identify the quality of the foundation materials prior to placement of the CBC extensions. Areas of loose or soft material encountered in the foundation excavation should be removed and replaced with granular fill or flow fill.

The NDOT design standards require the use of Load Factor Design (LFD) methods (AASHTO 2002) rather than current Load and Resistance Factor Design (LRFD) methods (AASHTO 2012). LFD uses performance factors as opposed to resistance factors in LRFD (AASHTO 2007 & more recent). LFD factors are provided in our design recommendations below.

We recommend a nominal bearing capacity of 12 ksf for shallow spread footings designed to support the box culvert extensions and a LFD Bearing Capacity Performance Factor (using SPT) of 0.45.

Resistance to sliding at the bottom of foundations can be calculated based on a coefficient of friction at the interface between the concrete and the foundation soils. We recommend a nominal coefficient of friction of 0.40 with a LFD Sliding Performance Factor (CIP concrete) of 0.80.

It is estimated that the total settlement of the structure may be on the order of 1 to 2 inches. The structure settlement is controlled by the weight of the adjacent embankment fill. Thus, to reduce the potential for differential settlements, it is recommended that the embankment fill on both sides of the CBC be placed at a relatively uniform elevation.

Backfill adjacent to the CBC should be granular fill meeting the gradation of AASHTO classifications A-1, A-2-4, and A-3 compacted with moisture density control. Backfill materials shall have a low severity of sulfate exposure. Fill should be tested for severity of sulfate exposure before accepted by the project. The granular soils encountered in the borings drilled near the concrete box culvert locations are suitable for use as backfill.

7.0 LATERAL EARTH PRESSURE CONSIDERATIONS

External loads considered in the analyses of the CBC walls should consist of earth pressure loads and traffic loads. Drainage details, such as strip drains and perforated pipes, should be provided behind wing walls.

We recommend that a granular backfill be placed adjacent to the wing walls and abutments. The backfill should meet the gradation of AASHTO classifications A-1, A-2-4, and A-3

and be placed and compacted in accordance with NDOT Standard Specifications. An experienced geotechnical engineer should review the soil types proposed to be used as backfill and determine whether the design assumptions are valid.

Lateral wall movement or rotation of at least 0.5 percent of the wall height is typically required to develop the full active pressure condition. If the estimated wall movement is less than this amount, an at-rest soil pressure should be used in design.

We recommended that active, at-rest and passive lateral earth pressures used for the design of the wing walls be based on assumed effective angle of internal friction of 34 degrees for NDOT Granular Backfill meeting AASHTO classifications for A-1, A-2-4, or A-3 soils. A unit weight of 135 pcf is recommended for this type of NDOT Granular fill.

The lateral earth pressure coefficients may be determined from AASHTO Article 3.11.5 for specific wall backslopes and interface friction values. In all cases, the calculated active earth pressure used for design should not be less than an equivalent fluid density of 35 pcf. The lateral earth pressure induced by additional surcharge loads above the top of the walls should also be considered in design.

Nominal values anticipated lateral earth pressures are provided below as Equivalent Fluid Unit Weights.

Passive: 475 pcf

At-Rest: 60 pcf

Active: 38 pcf

These values assume relatively free draining granular soil with an effective phi angle of 34 degrees and an effective unit weight of 135 pcf. The equivalent fluid unit weight approach uses Rankine earth pressure coefficients. All of these values assume horizontal backfill and no surcharge loads. These earth pressure values are valid with the following conditions:

1. For uneven or varying backslopes, the surcharge effects of the backslope should be considered for a minimum of 2 times the exposed wall height or 10 feet, whichever is greater.
2. Hydrostatic pressures should be considered in design. Groundwater was not observed at the time of drilling, however, it is anticipated that the groundwater elevation will vary throughout the year. We recommend that the wall designer include appropriate drainage elements that are typically installed near the back and bottom of retaining walls, such as geocomposite strip drains, perforated pipes, filter materials and/or weep holes to provide drainage behind the walls to accommodate fluctuating surface water and groundwater conditions, thereby eliminating seepage pressures on the walls.

8.0 SITE GRADING

Soil fill embankments along Kyle Canyon fill embankments (soils) were observed as shallow approximately 5 or 6:1 (H:V) slopes up to steeper 1:1 slopes. The tallest of the observed embankments (about 1.6:1) stands about 30 feet high. The exact composition of the fill embankments is not known, however, the natural soils in the area appear to be generally granular and range from sands through gravels to cobbles with a relatively low percentage of fines. No major soil slope instabilities were visually identified during our field investigation.

The proposed site excavation and embankment grading should conform to NDOT Standard Specifications. Cut slopes should be protected from surface water runoff to prevent erosion and reduce the potential for slope failure. Good surface drainage should be provided around all permanent cuts and fills to direct surface runoff away from the slope faces. Fill slopes, cut slopes, and other stripped areas should be protected against erosion by re-vegetation or other methods.

Soils encountered in our borings generally consisted of native sandy gravel and gravelly sand with varying amounts of silt, with layers of clayey sand with gravel. These materials are likely suitable for use as fill and or backfill throughout the project area. The requirements for relative compaction and moisture content for subgrade soils and embankment materials are presented in Section 203.03 of the NDOT Standard Specifications.

9.0 PAVEMENT RECOMMENDATIONS

Recommendations for pavement designs in three separate areas are presented below. The areas are: 1) Roundabouts at the proposed Kyle Canyon Visitor's Center and at the intersections of the Old Mill and Foxtail Picnic Site entrances on Lee Canyon Road; 2) the proposed Kyle Canyon Road urbanized streetscape between and at the approaches to the roundabouts; and 3) the proposed shoulder widening along Kyle Canyon Road. The recommendations were prepared with input from NDOT so that the pavement designs will be consistent with NDOT policies. NDOT recommends rigid (Portland Cement Concrete) pavement in roundabouts to prevent the rutting and shoving that can occur in flexible pavements under loads from vehicle turning movements. A rigid pavement design is provided for the roundabouts and flexible pavement designs are provided for the other areas of Kyle Canyon Road.

9.1 Traffic Loads

Traffic loading for this project was estimated from information contained in an NDOT 2010 Traffic Study, provided by CH2M HILL. Average annual daily traffic counts (AADT) provided in the study were converted to Equivalent Single Axle Load Applications (ESALs) based on the traffic mix identified by the NDOT 2010 Traffic Study and using procedures, vehicle classifications

and truck factors presented in the FHWA Federal Lands Highway Project Development and Design Manual (PDDM), March 2008. The results of our ESAL calculations are presented on Table 9.0.1. Thirty-five-year rigid pavement ESALs for roundabouts and twenty-year flexible ESALs for travel lanes were calculated for the SR 157 – Kyle Canyon Road and SR156 – Lee Canyon Road pavement thickness designs. The AADTs provided by CH2M HILL, and used in our design are presented in Appendix D.

Traffic ESAL values for Kyle Canyon Road were also provided by NDOT. Because the ESAL values calculated by NDOT are higher (more conservative) than those calculated by Yeh and Associates, the NDOT ESAL values were used for the evaluation of flexible pavement thickness designs on Kyle Canyon Road and rigid pavement thickness designs at the three roundabouts. The NDOT ESALs are shown in Table 9.0.2.

Table 9.0.1: Yeh and Associates Design Traffic Loading ESALs

Roadway Segment	Travel Lanes 20-year (Flexible Pavement)	Roundabouts 35-year (Rigid Pavement)
Kyle Canyon	336,614	673,847
Lee Canyon	58,327	116,777

Table 9.0.2: NDOT Design Traffic Loading ESALs

Roadway Segment	Travel Lanes 20-year (Flexible Pavement)	Roundabouts 35-year (Rigid Pavement)
Kyle Canyon	394,000	776,728

9.2 Subgrade Strength Evaluation

The subgrade materials in the proposed roundabout areas along Kyle Canyon Road have R-values ranging from 21 to 29. The R-value of the subgrade soil encountered at the proposed roundabout on Lee Canyon Road is 78. An R-value of 24 was selected as representative for design of the roundabout pavements. This R-value corresponds to a Modulus of Subgrade Reaction (k-value) of 150 psi/in for use in Portland Cement Concrete Pavement (PCCP) design.

An R-value of 24 was selected as representative of subgrade conditions along Kyle Canyon Road between the roundabouts and in the urban streetscape section. The R-value was converted to a resilient modulus, as discussed below, for flexible pavement design.

Subgrade R-values for other sections of Kyle Canyon Road, where widening is proposed, ranged from 46 to 57. NDOT policy is to restrict design subgrade R-values to a maximum of 45. An R-value of 45 was used for evaluating flexible pavement alternatives in the widening areas.

The resilient modulus, M_R is used as one of the inputs to the DARWin flexible pavement design program. The following equations from the NCHRP Report 128 were used to calculate the resilient modulus using the R-value from AASHTO T190.

$S_1 = [(R-5)/11.29] +3$

$M_R = 10^{[(S_1 + 18.72)/6.24]}$

Where: M_R – resilient modulus (psi)
S_1 = the soil support value
R = the R-value obtained from the Hveem Stabilometer (AASHTO T 190)

R-values of 24 and 45 from laboratory tests were used to determine a design resilient modulus for each roadway section. These values were used in the design program to represent the strength of the soils immediately below the HACP. Using the above equations, the R-values yielded the following Resilient Moduli (M_R).

Table 9.2.1: Subgrade Strength Parameters

Location	R-Value	M_R (psi)
Between Roundabouts	24	5,630
Kyle Canyon Road Widening	45	11,183

9.3 Design Assumptions and Inputs

Pavement section thickness alternatives were evaluated using the DARWin Pavement Design and Analysis System which follows the 1993 AASHTO Pavement Design Guidelines. Input values for the DARWin software program are shown below for the rigid and flexible pavement design analyses.

Rigid Pavement Design Parameters		**Source**
Performance Period	35 Years	PDDM
Pavement Type	JPCP	NDOT
Initial Serviceability	4.5	PDDM
Terminal Serviceability	2.5	PDDM
28-day Mean PCC Modulus of Rupture	600 psi	NDOT
28-day Mean Elastic Modulus of Slab	3,600,000 psi	NDOT
Mean Effective k-value	150 psi/in	Yeh
Reliability Level	90 %	NDOT
Overall Standard Deviation	0.35	NDOT
Load Transfer Coefficient, J	2.8	NDOT
Overall Drainage Coefficient, Cd	1	PDDM

Flexible Pavement Design Parameters

Performance Period	20 Years	NDOT
Initial Serviceability	4.2	PDDM
Terminal Serviceability	2.5	PDDM
Reliability Level	75 %	NDOT
Overall Standard Deviation	0.45	NDOT
Structural Layer Coefficients:		
Plantmix Bituminous Surface (PBS)*	0.35	NDOT
Aggregate Base Course	0.10	PDDM
Cement Treated Aggregate Base**	0.18	NDOT

* PBS is the NDOT designation for Hot Asphalt Concrete Pavement (HACP)

** Cement Treated Aggregate Base should conform to NDOT Specifications for Roadbed Modification.

9.4 Pavement Thickness Recommendations

A pavement section is a layered structure designed to disperse dynamic traffic loads to the subgrade. The performance of the pavement structure depends on the traffic loadings and physical properties of the subgrade materials. Recommended pavement design thickness sections are summarized below.

Rigid and flexible pavement design calculations for Kyle and Lee Canyon Roads were performed using the program DARWin Version 3.1. Calculations and program outputs for all pavement designs are presented in Appendix D.

Rigid Pavement: The calculated PCCP pavement thickness using the parameters shown above and a design traffic load of 776,728 ESALs is 6.21 inches. This is less than the minimum PCCP thickness of 8.0 inches recommended for this traffic load in Exhibit 11.5-A of the PDDM. Therefore, in accordance with Exhibit 11.5-A, the recommended PCCP thickness is 8.0 inches and the pavement surface should be underlain by a minimum of 4.0 inches of aggregate base course (ABC). However, we understand it is NDOT practice to place ABC to a minimum thickness of 6.0 inches and to place 3.0 inches of dense grade PBS immediately below PCCP. The layer of PBS is used to stabilize the ABC surface and to provide a dense, controllable grade for PCCP construction. Use of the additional ABC and PBS should be considered in the roundabout pavements on Kyle Canyon and Lee Canyon Roads to comply with NDOT standards.

Flexible Pavements: Asphalt concrete (PBS or HACP) pavement section thicknesses were evaluated for the proposed Kyle Canyon Road improvements. The proposed flexible pavement areas are the urbanized section between roundabouts at approximate Stations 150+00 and 165+00 and the widening from the roundabouts east to US 95. The minimum design

structural numbers resulting from the DARWin analyses for flexible pavement design are shown on Table 9.4.1

Table 9.4.1: Design Structural Numbers (DSN)

Location	R-Value	ESALs	DSN
Between Roundabouts	24	394,000	2.30
Kyle Canyon Road Widening	45	394,000	3.00

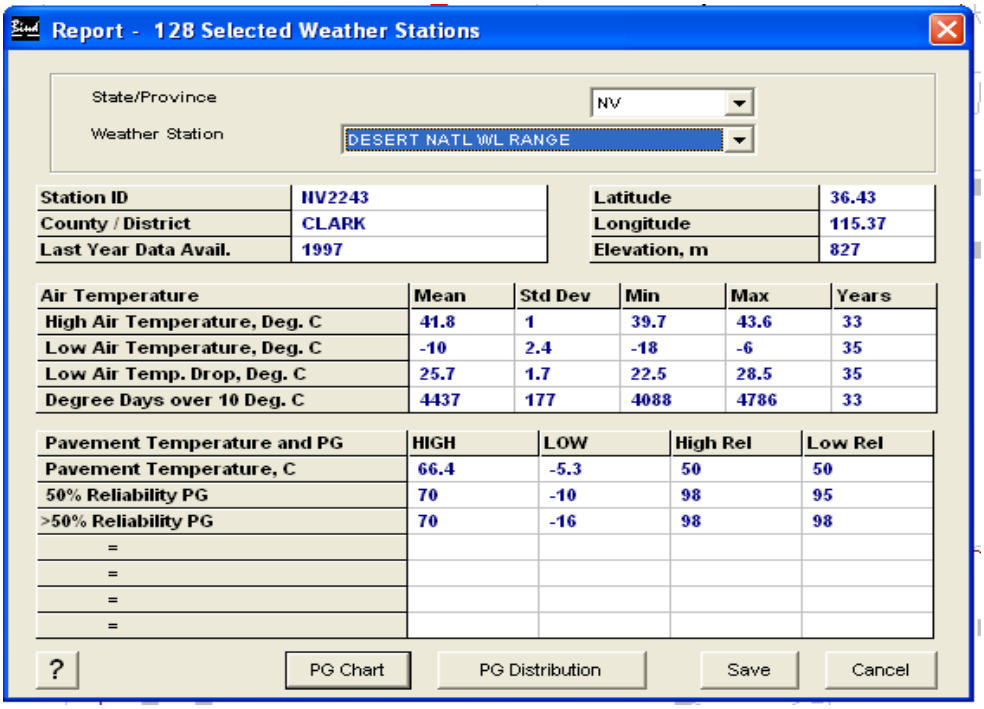
The proposed roundabouts and urbanized section near the new visitor's center will be constructed before the NDOT 3R project on Kyle Canyon Road. A flexible pavement section consisting of HACP over ABC was evaluated for the section of Kyle Canyon Road between the roundabouts. The results of the analysis show that 6 inches of HACP over 9 inches of ABC will be adequate to support the design traffic loads on the clayey sand subgrade soils. We understand that NDOT prefers to round up the design thickness of ABC to the nearest even number of inches. Placement of 10 inches of ABC below the HACP in the urbanized section should be considered to comply with NDOT design standards.

NDOT has proposed "Roadbed Modification" to construct a base for the HACP pavement on Kyle Canyon Road and in the widening area as part of their 3R project. Per Section 305 of the NDOT Standard Specifications for Road and Bridge Construction, Roadbed Modification consists of pulverizing, blending with cement and compacting an existing roadway. We understand the depth of Roadbed Modification proposed for Kyle Canyon Road is eight inches. The proposed HACP surface course is 4 inches and it will be covered with a ¾-inch open-graded friction course.

Flexible pavement designs for the widening were evaluated for HACP over Roadbed Modification (Cement Treated Base) and for HACP over untreated ABC. Results from the DARWin analysis show that 4 inches of HACP over 5 inches of Cement Treated Base will be will meet the design requirements for the widening pavement section. The proposed NDOT pavement section exceeds the design requirements and is therefore suitable for the pavement widening. The results of the DARWin analysis using untreated ABC shows that a pavement section consisting of 4 inches of HACP over 9 inches of untreated ABC (or 10 inches per NDOT) is an alternate pavement thickness design for the widening on Kyle Canyon Road.

9.5 Binder and Mix Recommendations

Using the Long Term Pavement Performance binder selection program LTPPBind, the 98% reliability binder recommended for the closest weather station at Desert National WL Range is PG 70-16. Figure 9.5.1 shows the print-out from the LTPP Binder Selection program based on historic weather information.



Report - 128 Selected Weather Stations

State/Province: NV

Weather Station: DESERT NATL WL RANGE

Station ID	NV2243	Latitude	36.43
County / District	CLARK	Longitude	115.37
Last Year Data Avail.	1997	Elevation, m	827

Air Temperature	Mean	Std Dev	Min	Max	Years
High Air Temperature, Deg. C	41.8	1	39.7	43.6	33
Low Air Temperature, Deg. C	-10	2.4	-18	-6	35
Low Air Temp. Drop, Deg. C	25.7	1.7	22.5	28.5	35
Degree Days over 10 Deg. C	4437	177	4088	4786	33

Pavement Temperature and PG	HIGH	LOW	High Rel	Low Rel
Pavement Temperature, C	66.4	-5.3	50	50
50% Reliability PG	70	-10	98	95
>50% Reliability PG	70	-16	98	98
=				
=				
=				
=				

? PG Chart PG Distribution Save Cancel

Figure 9.5.1: Recommended Mix Binder

The new HACP should be either a nominal 3/4-inch or 1/2-inch mix (NDOT Type 2 or Type 3) with the above recommended binder. Grading Designation C or E mix is recommended (as per FP-03). The Superpave Mix Design system and a 75-gyration mix design are recommended. The quantity of binder can be estimated at 6% by weight of the mix and the unit weight can be estimated at 145 lbs/ft^3. A mix design that is compatible with both CFLHD and NDOT specifications should be considered.

This project is in a relatively remote location and the asphalt batch plant may be several miles from the construction site. Loss of temperature and segregation of the hot asphalt mix can occur during long distance transport. We recommend the project specifications require the use of a material transfer device at the point of placement to insure uniform temperatures and prevent segregation of the mix during placement. Use of a material transfer device is especially important if the mix is placed in cool weather.

The application of tack coat (at 0.10 gallons/yd^2) is required on the pulverized base material prior to paving. The tack coat material should be CSS-1, CSS-1h, SS-1, or SS-1h. A tack coat at the above rate should be included between each lift of PBS.

If ABC is used on this project, the compacted ABC should receive a prime coat of an emulsion blended as a penetrating prime at a rate of 0.33 gallons/yd^2. If an emulsion such as CSS-1 is used for prime coat, it should be disked into the top 2-3 inches of ABC and re-compacted prior to placement to the new HACP.

10.0 CUT SLOPE STABILITY

Two borings were drilled to evaluate subsurface conditions at the location of the proposed cut slope/retaining wall between Sta. 121+00 and Sta. 124+55. The lower boring at the cut slope (YA-12-08) was drilled in the roadway to auger refusal at a depth of 15 feet with a truck-mounted Mobile B-57 drilling rig using 8-inch diameter hollow-stem augers. The boring above the cut slope (YA-12-10) was drilled with a track-mounted CME 55 drilling rig using 8-inch diameter hollow-stem augers and this boring encountered refusal at a depth of 25 feet. The subsurface materials encountered in the borings generally consisted of dense to very dense sand and gravel with cobbles with light to heavy cementation. A layer of lightly cemented medium dense gravelly sand was encountered in Boring YA-12-10 between depths of about 19 to 21 feet. Heavily cemented deposits consisting of gravel and cobbles in a calcareous matrix (pedogenic calcrete) were observed at the roadway elevation to about 10 feet above the roadway. Loose soils that have weathered from the existing cut slope have accumulated in the ditch at the edge of the road and allowed vegetation to establish. The loose soils and vegetation cover the surface of heavily cemented deposits at most locations.

A computer-aided limit-equilibrium stability analysis was performed to evaluate cut slope configurations with no retaining structure. The upper lightly cemented sand and gravel was assumed to have an angle of internal friction of 36 degrees based on the sampler N value and cohesion of 100 psf to represent the light cementation. The heavily cemented lower soil was assumed to have an angle of internal friction of 36 degrees and cohesion of 1000 psf to represent heavy cementation. Because the native materials in the lower portion of the slope are heavily cemented, the analysis indicates the cut slope will have a factor of safety against failure exceeding 1.4 for a 14 foot vertical height graded at 3V to 1H or flatter. An idealized cross-section of the proposed cut slope with the results of the computer-aided stability analysis is shown on Figure F-1 in Appendix F. Weathering of the lightly cemented deposits could result in accumulation of soils in the proposed ditch over time. Regular maintenance may be required to keep the ditch free of debris and vegetation.

The plan cross-sections show that the proposed cut slopes near Sta. 551+00 are to be graded at a slope angle approximately parallel to the existing cut slope angles. Observations of the slope conditions in this area indicate the materials in the existing slope consist of lightly cemented silty or clayey sand with gravel. Indications of slope failure were not observed in the existing cuts. Based on these observations, the proposed grading is not expected to reduce the stability of the slopes between Sta. 550+00 and Sta. 552+00.

11.0 OTHER DESIGN CONSIDERATIONS

11.1 Water-Soluble Sulfates

Laboratory results from the Yeh and Associates field investigation reported concentrations of water-soluble sulfates, measured in soil samples obtained from borings, ranging from 0.002 to 0.004 percent. This concentration of water-soluble sulfates represents a negligible degree of sulfate attack on concrete exposed to soils in the project area.

11.2 Corrosion

Test results on acidity (pH), water soluble sulfates, water soluble chlorides and electric resistivity of the soil samples indicated the following:

- pH of 7.9
- Water soluble sulfates in the range of 0.002 to 0.0.004 percent
- Water soluble chlorides in the range of 0.0102 to 0.020 percent
- Resistivity in the range of 1590 to 2387 ohm-cms

The pH test results indicate the subsurface materials are slightly basic. The resistivity levels indicate the subsurface materials are non-aggressive toward corrosion of buried metals.

11.3 Seismic Considerations

Based on the results of the subsurface investigation and AASHTO Specifications for LRFD Design Table 3.10.3.1-1, the Kyle Canyon project area is Site Class C. AASHTO Table 3.10.6-1 classifies the seismic zone as Zone 2.

The horizontal peak particle acceleration in the project area was obtained using the *Seismic Design Parameters* program Version 2.10, developed by Leyendecker, Frankel, and Rukstales. This program utilizes the 2002 United States Geological Survey (USGS) National Seismic Hazard Maps (Frankel, et. al., 2002) for horizontal peak ground acceleration (PGA) with a 7 percent probability of exceedance in 75 years and is referenced in the AASHTO LRFD Bridge Design Specifications document (2012). Latitude and longitude are general for the area.

Site class C is the site condition

Conterminous 48 States

2007 AASHTO Bridge Design Guidelines

Spectral Response Accelerations SDs and SD1

Latitude = 36.270160

Longitude = -115.592820

As = Fpga PGA, SDs = FaSs, and SD1 = FvS1

Site Class C - Fpga = 1.20, Fa = 1.20, Fv = 1.69

Data are based on a 0.05 deg grid spacing.

Period (sec)	Sa (g)	
0.0	0.143	As - Site Class C
0.2	0.339	SDs - Site Class C
1.0	0.192	SD1 - Site Class C

The spectral accelerations, Sa, are the accelerations adjusted for the Kyle and Lee Canyons site area. These values should be used for preliminary structural design in the Kyle and Lee Canyons area. The zero period (0 sec) As value of 0.143g, can be used for simple single degree of freedom structures oscillating at their fundamental period

11.4 Frost

The majority of the soils encountered in our borings are classified as sandy gravel and gravelly sand. These materials have a negligible to low degree of frost susceptibility. The clayey sand soils that were encountered in Borings YA-02 and YA-04 in Kyle Canyon have a low to moderate degree of frost susceptibility.

12.0 LIMITATIONS

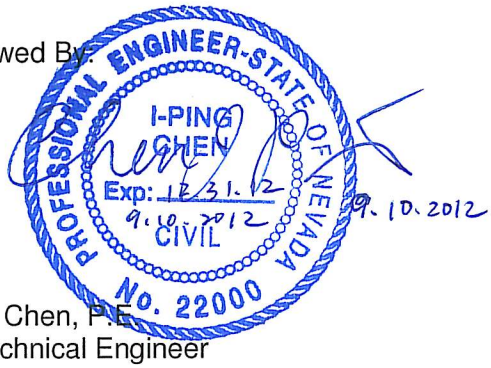
This Geotechnical Investigation and Pavement Design Report was prepared for the exclusive use of CH2M HILL and Central Federal Lands for specific use Kyle and Lee Canyon Roads in Clark County, Nevada. The conclusions and recommendations submitted in this report are based on the exploratory borings and field reconnaissance included in our investigation and the proposed type of construction. This study has been conducted in accordance with generally accepted geotechnical engineering practices in this area. The nature and extent of subsurface variations across the site may not become evident until excavation is performed. If during construction, fill, soil, or water conditions appear to be different from those described herein, this office should be advised at once so reevaluation of the recommendations may be made. We recommend on-site observation of excavations and foundation bearing strata by a representative of the Geotechnical Engineer of record. No warranty, expressed or implied, is made.

Yeh and Associates, Inc.

Prepared by:

Thomas L. Allen, P.E.
Senior Geotechnical Engineer

Reviewed By:



I-Ping Chen, P.E.
Geotechnical Engineer

Reviewed By:

Robert LaForce P.E.
Senior Materials Manager

13.0 REFERENCES

American Association of State Highway and Transportation Officials, 2010, AASHTO LRFD Bridge Design Specifications, Customary U.S. Units, 5th Edition: Washington DC

FHWA CFL Project Development and Design Manual (PDDM), March 2008

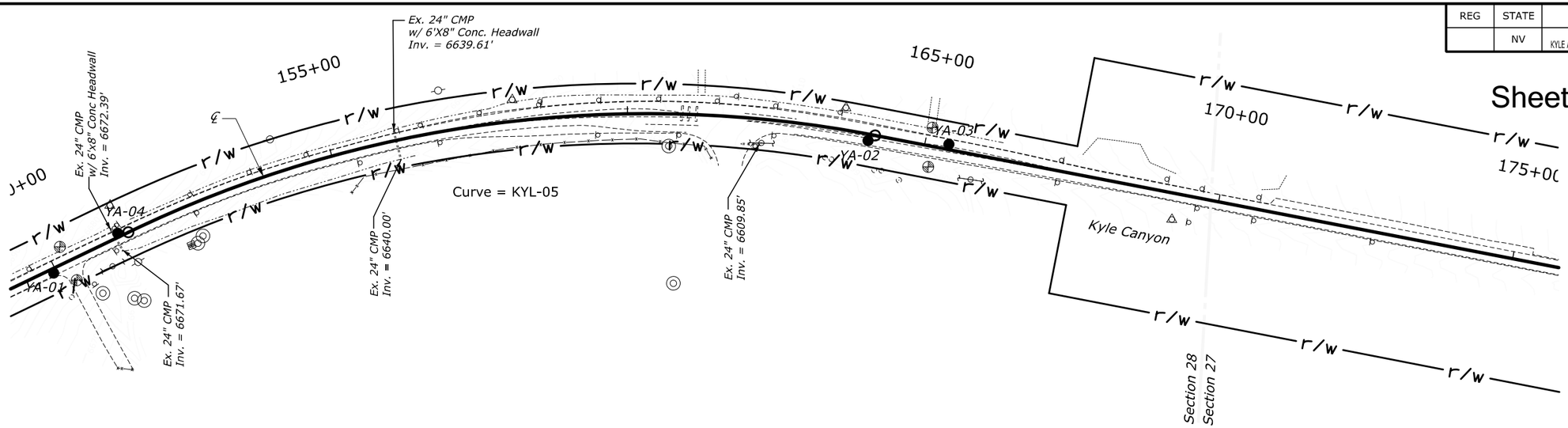
Nevada Department of Transportation, Standard Specifications for Road and Bridge Construction (2001)

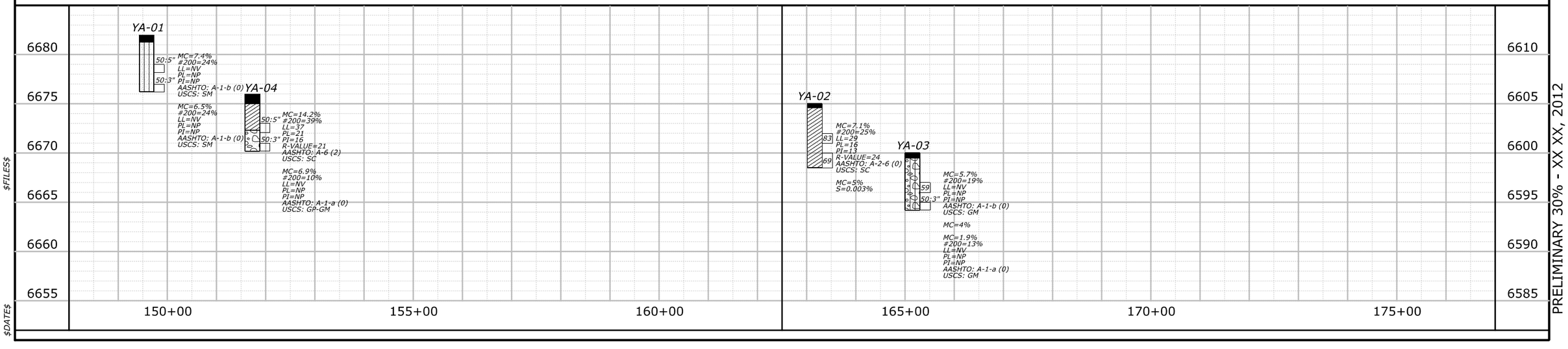
Sowers, Janet M., 1986, Geomorphic Map of the Kyle Canyon Alluvial Fan, Clark County, Nevada, USGS Open File Report 86-210

Appendix A, Engineering Geology Sheets

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
	NV	NV PFH 11-1(5) KYLE AND LEE CANYON WIDENING		

Sheet A-1





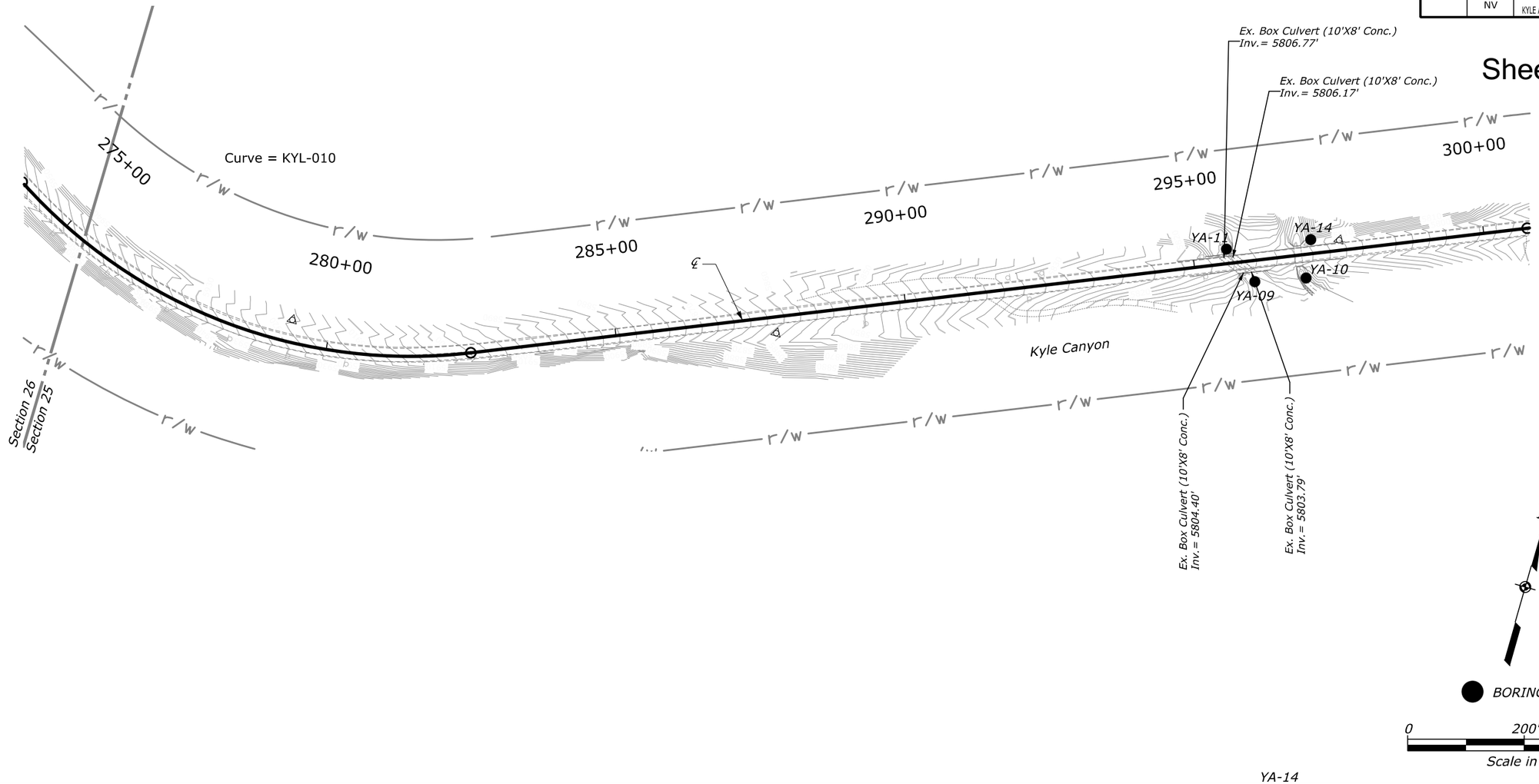
$FILES$

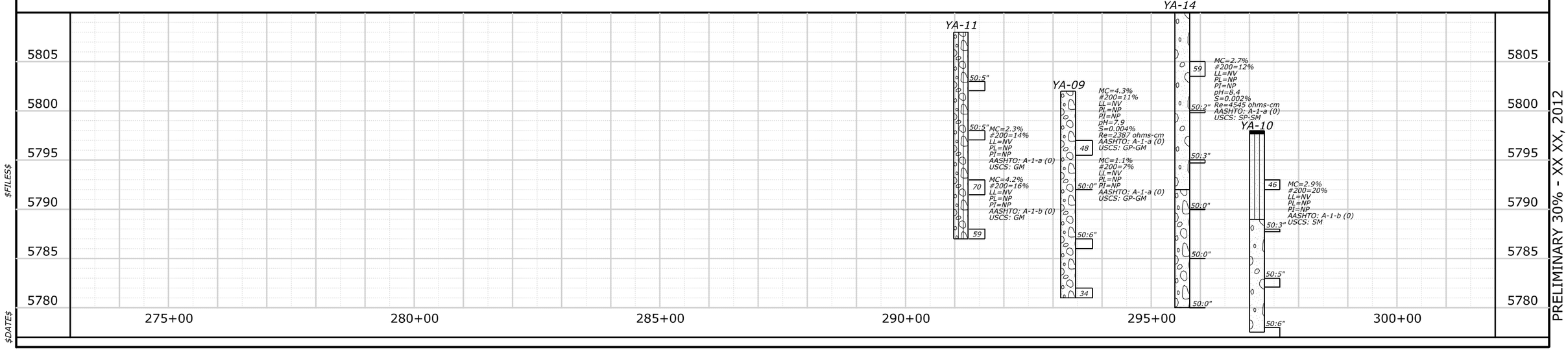
$DATE$

PRELIMINARY 30% - XX XX, 2012

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
	NV	NV PFH 11-1(5) KYLE AND LEE CANYON WIDENING		

Sheet A-2





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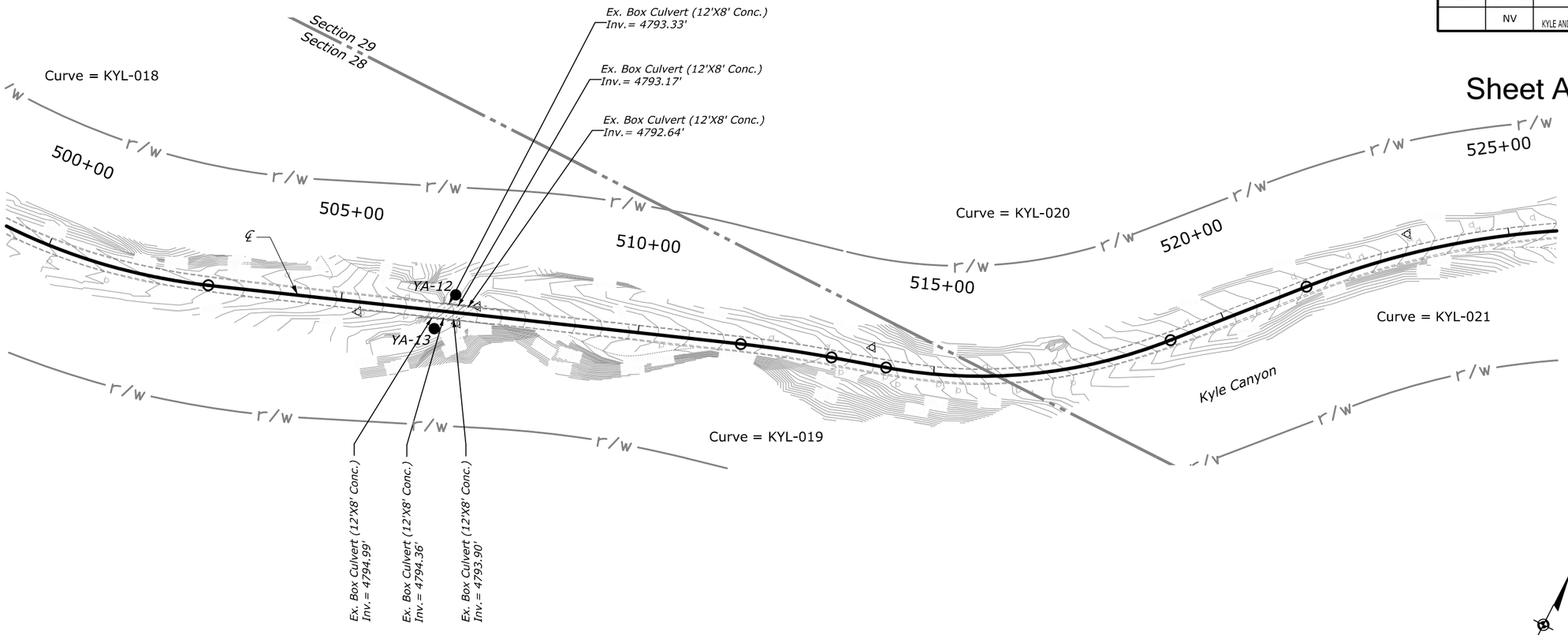
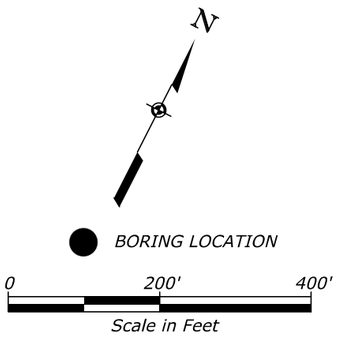
$DATES$

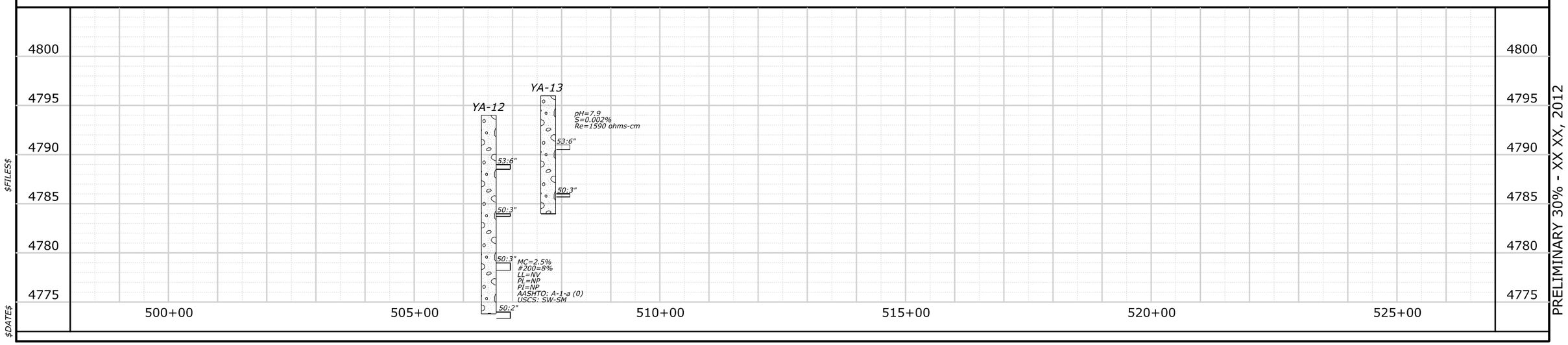
PRELIMINARY 30% - XX XX, 2012

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
	NV	NV PFH 11-1(5) KYLE AND LEE CANYON WIDENING		

Sheet A-3







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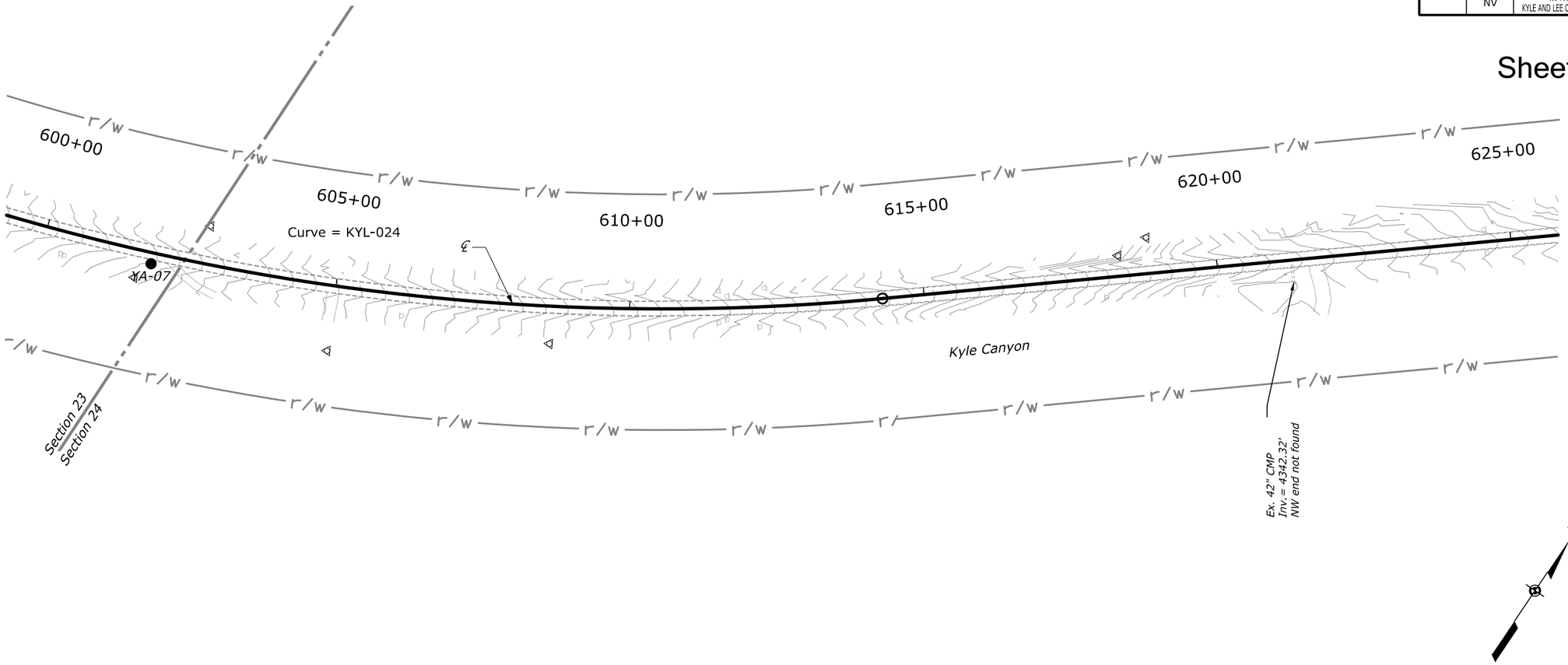
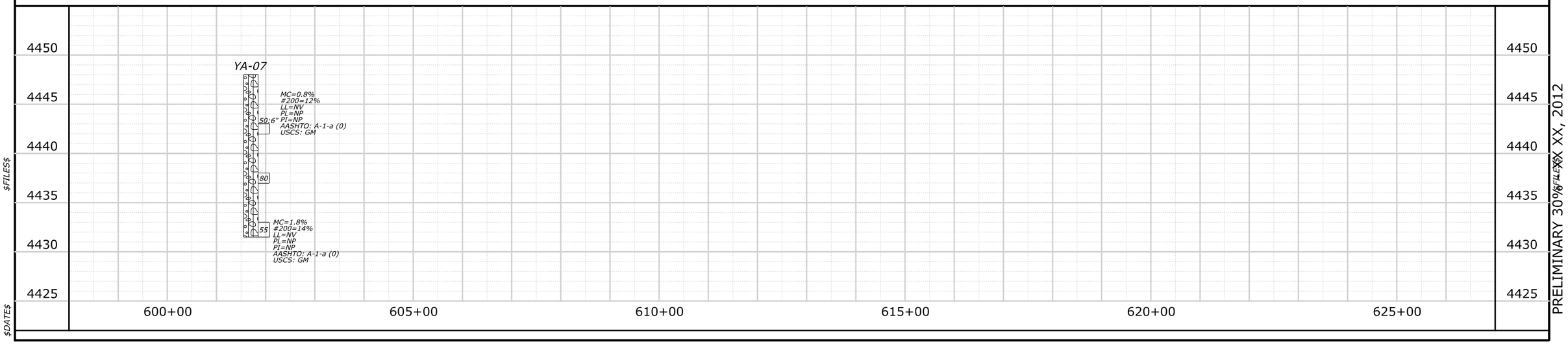
$DATE$

PRELIMINARY 30% - XX XX, 2012

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
	NV	NV PFH 11-1(5) KYLE AND LEE CANYON WIDENING		

Sheet A-4





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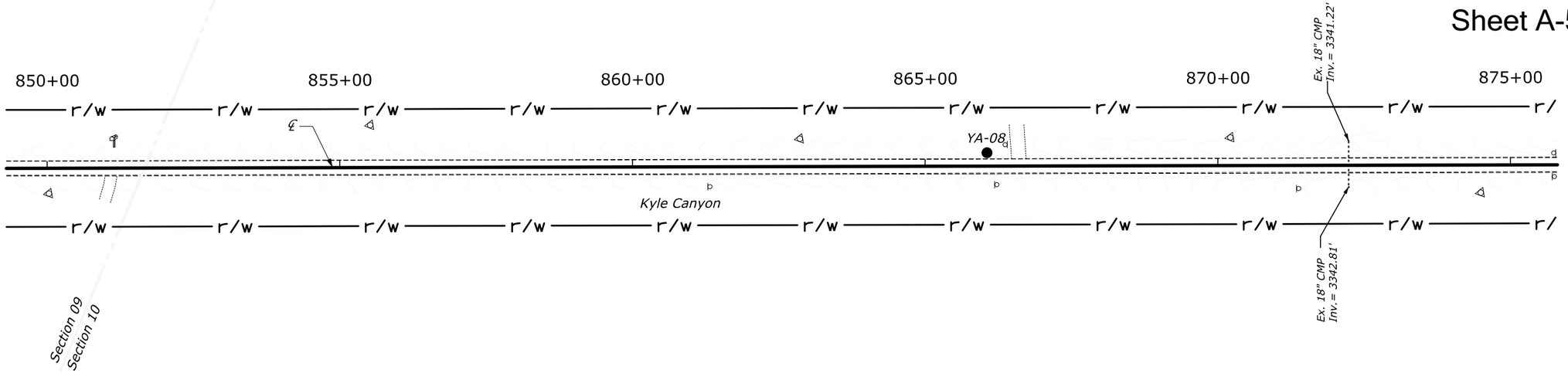
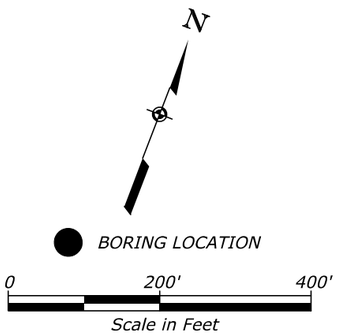
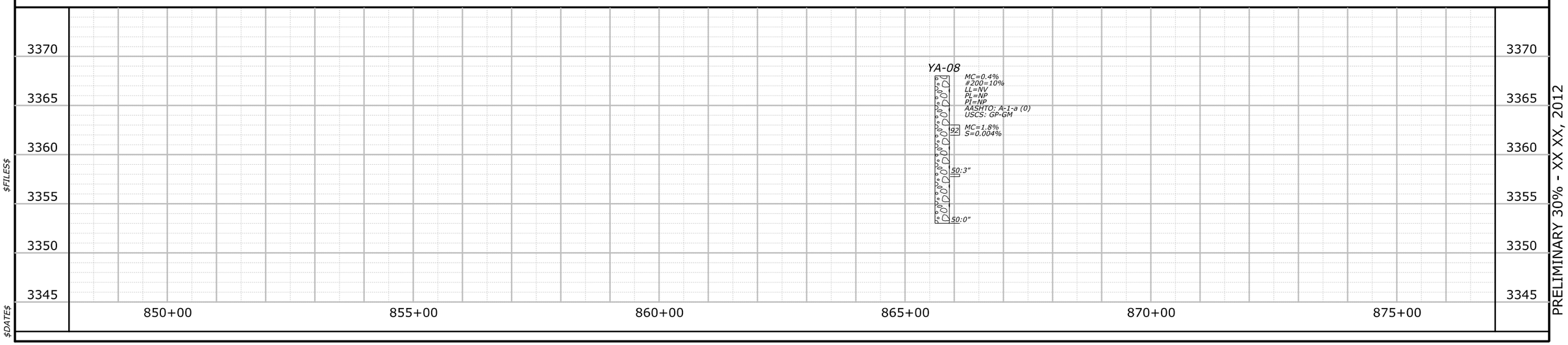
PRELIMINARY 30% - XX XX, 2012

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
	NV	NV PFH 11-1(5) KYLE AND LEE CANYON WIDENING		

Sheet A-5







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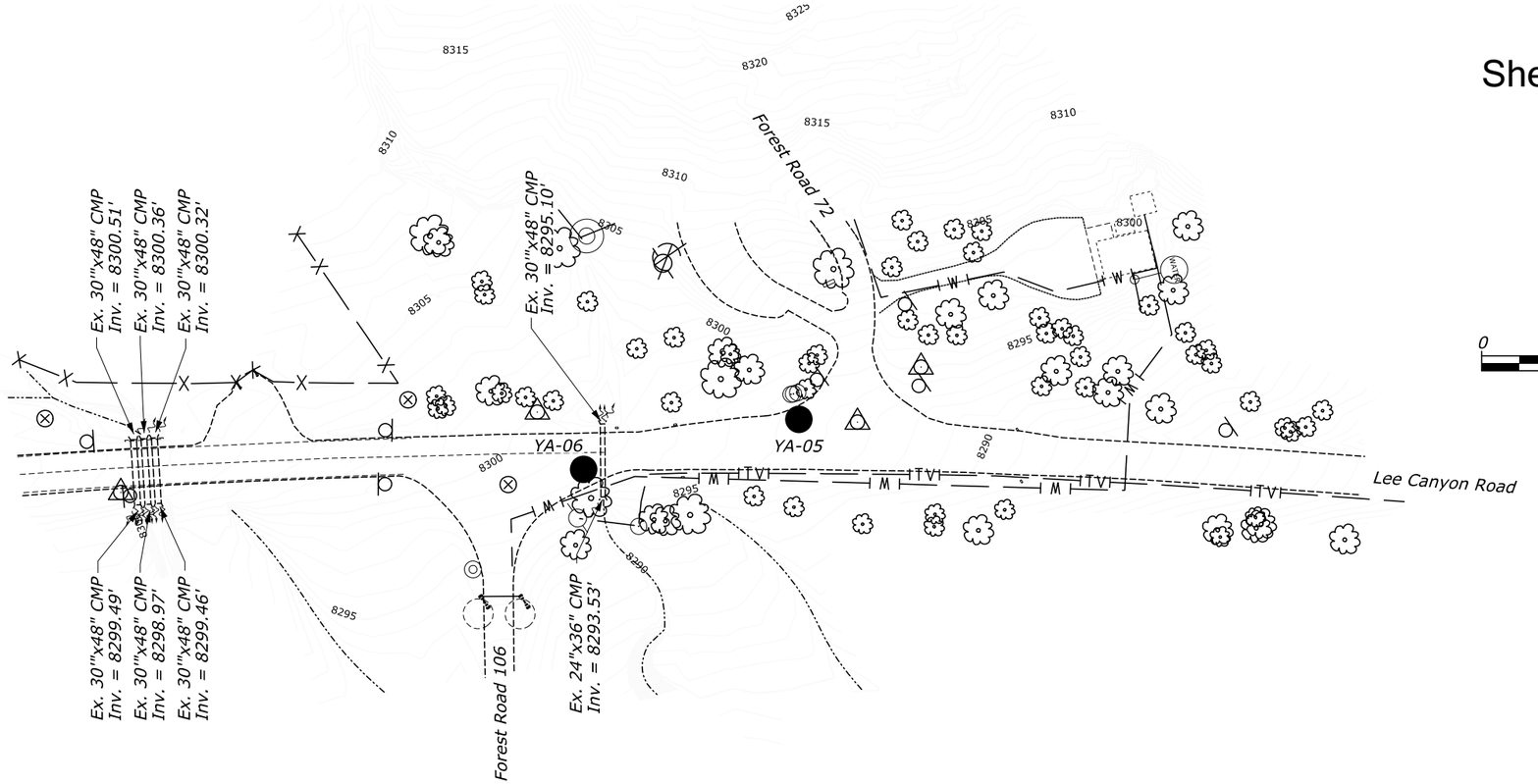
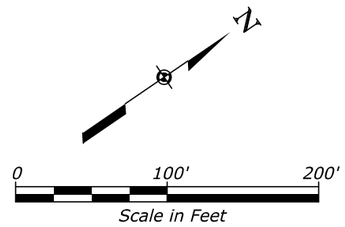
$DATES$

PRELIMINARY 30% - XX XX, 2012

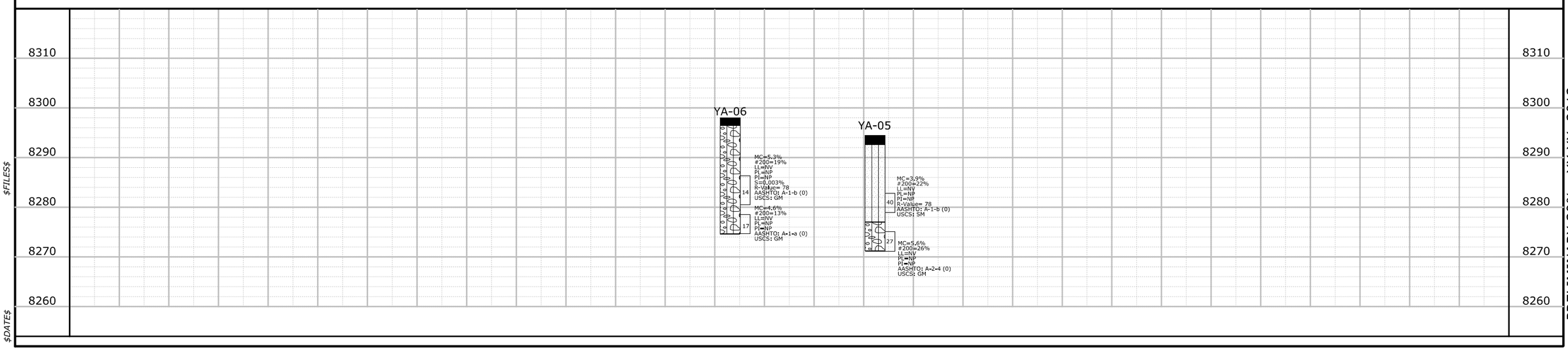
REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
	NV	NV-PFH 11-1(5) KYLE AND LEE CANYON WIDENING		

Sheet A-6





BORING LOCATION



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PRELIMINARY 30% - XX XX, 2012

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
	NV	NV PFH 11-1(5) KYLE CANYON ROAD	C2	C74

Sheet A-7

Curve = SR157-4
PI 125+85.26
Δ = 23° 27' 09" (LT)
R = 900.00'
T = 186.81'
L = 368.39'

121+00.00, Lt.
Begin rockery wall,
See sheet G2 and G3

120+20.00 Lt.
Begin riprap ditch,
See sheet G3

120+00

113+79.95, Lt.
Begin sawcut.
Begin pavement widening.
See Sawcut and Widening
Typical Section.

Proposed edge of pavement, typ.

115+00

Existing 24" CMP

PT 113+62.75

N 12° 57' 16" E

Existing edge of pavement, typ.

Proposed ℄

PC 115+09.73

Sawcut line, typ.

Kyle Canyon Road

Curve = SR157-3
PI 119+36.76
Δ = 63° 25' 53" (RT)
R = 691.00'
T = 427.03'
L = 765.00'

Existing 24" CMP

+13 Existing 36" CMP

Clean existing culvert

YA-12-10
ST # 122+40, 50' L

YA-12-8
ST# 122+40, 5' L

124+50.00, Lt.
End rockery wall,
See sheet G2 and G3

125+00

N 76° 23' 09" E

PT 122+74.73

PC 123+98.45

124+50.00 Lt.
End riprap ditch

125+57.99, Lt.
Begin sawcut.
Begin pavement widening.
See Sawcut and Widening
Typical Section.

123+80.84, Lt.
End sawcut.
End pavement widening.

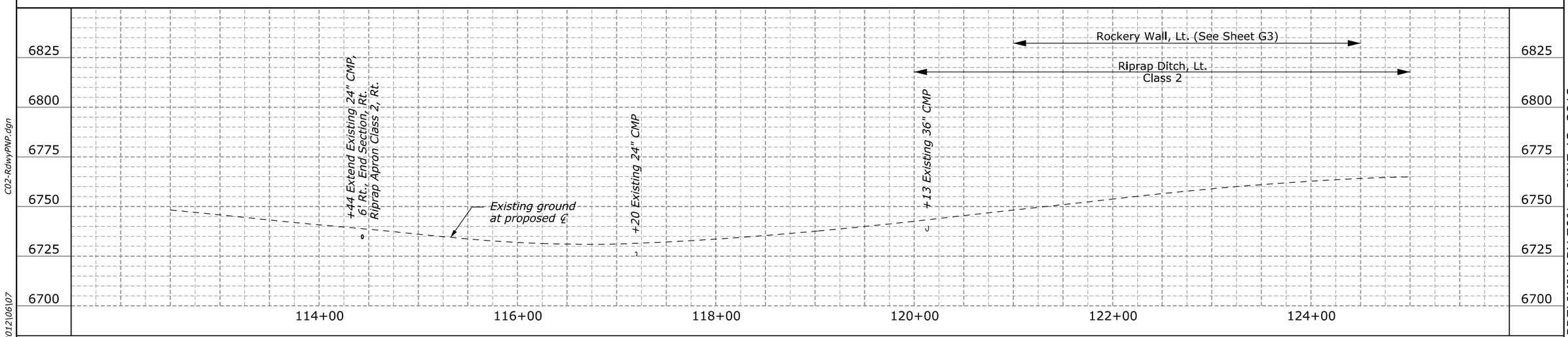
See design note on sheet C1

CH9082

CH9083

CH9084

0 100' 200'
Scale in Feet



C02-RdwyPNP.dgn
2012\06\07

PRELIMINARY 70% - JUNE 12, 2012

Appendix B, Legend and Boring Logs

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: CFL Kyle and Lee Canyons
Project Number: 211-220 Date:

Legend for Symbols Used on Borehole Logs

Sample Types


Auger Cuttings


Grab Sample


Modified California Sampler


Split Spoon

Soil Lithology


Asphalt

USCS Silty Sand


Concrete

USCS Poorly-graded Gravelly Sand


USCS Poorly-graded Sandy Gravel


USCS Clayey Sand


USCS-silty Gravel

Lab Test Abbreviations

MC-Moisture Content
DD-Dry Density
#200-Percent Passing #200 Sieve
LL-Liquid Limit
PL-Plastic Limit
PI-Plastic Index
S-Sulphate Content
S/C-Swell/Consolidation
UCCS-Unconfined Compressive Strength
Re-Resistivity
PtL-Point Load Test
AASHTO-AASHTO Classification
USCS-USCS Classification
Cl- Chloride
+#4-Percent Retained #4 Sieve

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: CFL Kyle and Lee Canyons
Project Number: 211-220 Date:

Boring: **YA-01**
Sheet 1 of 1

Boring Began: 1/30/2012
Completed: 1/30/2012
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit:
Drill: CME 75
Casing:
Driller: Elite Drilling
Weather:
Logged By: W. Hoon
Final By: I. Chen
Inclination: Vertical

Total Depth: 5.8 ft
Ground Elevation: 6682.0 ft
Location:
Coordinates: N: 26,800,505.1 E: 654,186.3

Ground Water Notes: Not Encountered During Drilling

Depth	-	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.7 ft. ASPHALT CONCRETE, 8 inches.	
								0.7 - 5.8 ft. silty SAND with gravel, brown, very dense.	
6680									MC= 7.4 % #200= 24 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SM
					22/50:5"	50:5"			
	5				14/50:3"	50:3"			MC= 6.5 % #200= 24 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SM
								Bottom of Hole at 5.8 ft.	
6675									
	10								
6670									
	15								
6665									
	20								

BORING LOG 211-220 BORING LOGS.GPJ YEH ASSOCIATES.GDT 3/19/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: CFL Kyle and Lee Canyons
Project Number: 211-220 Date:

Boring: **YA-02**
Sheet 1 of 1

Boring Began: 1/30/2012
Completed: 1/30/2012
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit:
Drill: CME 75
Casing:
Driller: Elite Drilling
Weather:
Logged By: W. Hoon
Final By: I. Chen
Inclination: Vertical

Total Depth: 6.5 ft
Ground Elevation: 6605.0 ft
Location:
Coordinates: N: 26,800,773.4 E: 655,537.5

Ground Water Notes: Not Encountered During Drilling

Depth	-	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.4 ft. ASPHALT CONCRETE, 5 inches.	
								0.4 - 6.5 ft. clayey SAND with gravel, brown, very dense.	MC= 7.1 % #200= 25 % LL= 29 PL= 16 PI= 13 R-Value= 24 AASHTO: A-2-6 (0) USCS: SC
					41/42	83			
6600	5				24/30/39	69			MC= 5 % S= 0.003 %
								Bottom of Hole at 6.5 ft.	
6595	10								
6590	15								
6585	20								

BORING LOG 211-220 BORING LOGS.GPJ YEH ASSOCIATES.GDT 3/19/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: CFL Kyle and Lee Canyons
Project Number: 211-220 Date:

Boring: **YA-03**
Sheet 1 of 1

Boring Began: 1/30/2012
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill: CME 75
Driller: Elite Drilling
Logged By: W. Hoon
Final By: I. Chen
Inclination: Vertical

Completed: 1/30/2012
Drill Bit:
Casing:
Weather:

Total Depth: 5.8 ft
Ground Elevation: 6600.0 ft
Location:
Coordinates: N: 26,800,772.2 E: 655,672.7

Ground Water Notes: Not Encountered During Drilling

Depth	-	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.5 ft. ASPHALT CONCRETE, 6 inches.	
								0.5 - 5.8 ft. silty GRAVEL with sand, grayish brown, very dense.	MC= 5.7 % #200= 19 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: GM
					25/34	59			
6595	5				12/50:3"	50:3"			MC= 4 % MC= 1.9 % #200= 13 % LL= NV PL= NP PI= NP AASHTO: A-1-a (0) USCS: GM
								Bottom of Hole at 5.8 ft.	
6590	10								
6585	15								
6580	20								

BORING LOG 211-220 BORING LOGS.GPJ YEH ASSOCIATES.GDT 3/19/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: CFL Kyle and Lee Canyons
Project Number: 211-220 Date:

Boring: **YA-04**
Sheet 1 of 1

Boring Began: 1/30/2012
Completed: 1/30/2012
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit:
Drill: CME 75
Casing:
Driller: Elite Drilling
Weather:
Logged By: W. Hoon
Final By: I. Chen
Inclination: Vertical

Total Depth: 5.8 ft
Ground Elevation: 6676.0 ft
Location:
Coordinates: N: 26,800,575.3 E: 654,290.8

Ground Water Notes: Not Encountered During Drilling

Depth	-	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
6675								**0.0 - 1.0 ft. ASPHALT CONCRETE**, 6 inches estimated.	
								1.0 - 3.7 ft. clayey SAND with gravel, brown, very dense.	MC= 14.2 % #200= 39 % LL= 37 PL= 21 PI= 16 R-Value= 21 AASHTO: A - 6 (2) USCS: SC
					28/50:5"	50:5"			
								3.7 - 5.8 ft. sandy GRAVEL with some silt, gray, very dense.	
	5				20/50:3"	50:3"			MC= 6.9 % #200= 10 % LL= NV PL= NP PI= NP AASHTO: A-1-a (0) USCS: GP - GM
6670								Bottom of Hole at 5.8 ft.	
	10								
6665									
	15								
6660									
	20								
6655									

BORING LOG 211-220 BORING LOGS.GPJ YEH ASSOCIATES.GDT 3/19/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: CFL Kyle and Lee Canyons
Project Number: 211-220 Date:

Boring: **YA-05**
Sheet 1 of 1

Boring Began: 1/30/2012
Completed: 1/30/2012
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit:
Drill: CME 75
Casing:
Driller: Elite Drilling
Weather:
Logged By: W. Hoon
Final By: I. Chen
Inclination: Vertical

Total Depth: 6.0 ft
Ground Elevation: 8295.0 ft
Location:
Coordinates: N: 26,800,417.3 E: 668,383.1

Ground Water Notes: Not Encountered During Drilling

Depth	-	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.5 ft. ASPHALT CONCRETE, 6 inches.	
								0.5 - 4.5 ft. silty SAND with gravel, brown, dense.	MC= 3.9 % #200= 22 % LL= NV PL= NP PI= NP R-Value= 78 AASHTO: A-1-b (0) USCS: SM
					23/17	40			
8290	5				12/15	27		**4.5 - 6.0 ft. silty GRAVEL** with sand, gray, medium dense.	MC= 5.6 % #200= 26 % LL= NV PL= NP PI= NP AASHTO: A-2-4 (0) USCS: GM
								Bottom of Hole at 6.0 ft.	
8285	10								
8280	15								
8275	20								

BORING LOG 211-220 BORING LOGS.GPJ YEH ASSOCIATES.GDT 3/19/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: CFL Kyle and Lee Canyons
Project Number: 211-220 Date:

Boring: **YA-06**
Sheet 1 of 1

Boring Began: 1/30/2012
Completed: 1/30/2012
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit:
Drill: CME 75
Casing:
Driller: Elite Drilling
Weather:
Logged By: W. Hoon
Final By: I. Chen
Inclination: Vertical

Total Depth: 6.0 ft
Ground Elevation: 8298.0 ft
Location:
Coordinates: N: 26,831,429.7 E: 630,209.9

Ground Water Notes: Not Encountered During Drilling

Depth	-	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.4 ft. ASPHALT CONCRETE, 5 inches.	
								0.4 - 6.0 ft. silty GRAVEL with sand, brown, medium dense.	
									MC= 5.3 %
									#200= 19 %
									LL= NV
8295									PL= NP
					6/8	14			PI= NP
									S= 0.003 %
	5								R-Value= 78
									AASHTO: A-1-b (0)
					9/8	17			USCS: GM
									MC= 4.6 %
								Bottom of Hole at 6.0 ft.	#200= 13 %
									LL= NV
									PL= NP
8290									PI= NP
									AASHTO: A-1-a (0)
									USCS: GM
	10								
8285									
	15								
8280									
	20								

BORING LOG 211-220 BORING LOGS.GPJ YEH ASSOCIATES.GDT 3/19/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: CFL Kyle and Lee Canyons
Project Number: 211-220 Date:

Boring: **YA-07**
Sheet 1 of 1

Boring Began: 1/30/2012
Completed: 1/30/2012
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill Bit:
Drill: CME 75
Casing:
Driller: Elite Drilling
Weather:
Logged By: W. Hoon
Final By: I. Chen
Inclination: Vertical

Total Depth: 16.5 ft
Ground Elevation: 4448.0 ft
Location:
Coordinates: N: 26,800,380.8 E: 668,296.3

Ground Water Notes: Not Encountered During Drilling

Depth	-	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 16.5 ft. silty GRAVEL with sand, brown, very dense.	
									MC= 0.8 % #200= 12 % LL= NV PL= NP PI= NP AASHTO: A-1-a (0) USCS: GM
4445									
	5				32/50:6"	50:6"			
4440									
	10				35/45	80			
4435									
	15				11/22/33	55			MC= 1.8 % #200= 14 % LL= NV PL= NP PI= NP AASHTO: A-1-a (0) USCS: GM
								Bottom of Hole at 16.5 ft.	
4430									
	20								

BORING LOG 211-220 BORING LOGS.GPJ YEH ASSOCIATES.GDT 3/19/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: CFL Kyle and Lee Canyons
Project Number: 211-220 Date:

Boring: **YA-08**
Sheet 1 of 1

Boring Began: 1/30/2012
Drilling Method: Hollow-Stem Auger (8" O.D.)
Drill: CME 75
Driller: Elite Drilling
Logged By: W. Hoon
Final By: I. Chen
Inclination: Vertical

Completed: 1/30/2012
Drill Bit:
Casing:
Weather:

Total Depth: 15.0 ft
Ground Elevation: 3368.0 ft
Location:
Coordinates: N: 26,800,340.4 E: 668,358.5

Ground Water Notes: Not Encountered During Drilling

Depth	-	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 15.0 ft. sandy GRAVEL with some silt, brown, very dense.	MC= 0.4 % #200= 10 % LL= NV PL= NP PI= NP AASHTO: A-1-a (0) USCS: GP - GM
3365									
	5				40/52	92			MC= 1.8 % S= 0.004 %
3360									
	10				50:3"	50:3"			
3355									
	15				50:0"	50:0"		Bottom of Hole at 15.0 ft.	
3350									
	20								

BORING LOG 211-220 BORING LOGS.GPJ YEH ASSOCIATES.GDT 3/19/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: CFL Kyle and Lee Canyons
Project Number: 211-220 Date:

Boring: **YA-09**
Sheet 1 of 1

Boring Began: 1/31/2012
Drilling Method: Hollow-Stem Auger
Drill: CME 75
Driller: Elite Drilling
Logged By: W. Hoon
Final By: I. Chen
Inclination: Vertical

Completed: 1/31/2012
Drill Bit:
Casing:
Weather:

Total Depth: 21.0 ft
Ground Elevation: 5802.0 ft
Location:
Coordinates: N: 26,800,798.9 E: 655,644.3

Ground Water Notes: Not Encountered During Drilling

Depth	-	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 21.0 ft. sandy GRAVEL with some silt, brown, medium dense to very dense.	MC= 4.3 % #200= 11 % LL= NV PL= NP PI= NP pH= 7.9 S= 0.004 % Re= 2387 ohms-cm AASHTO: A-1-a (0) USCS: GP - GM Cl= 0.0102 %
5800									
	5				22/26	48			MC= 1.1 % #200= 7 % LL= NV PL= NP PI= NP AASHTO: A-1-a (0) USCS: GP - GM
5795									
	10				50:0"	50:0"			
5790									
	15				34/50:6"	50:6"			
5785									
	20				12/22	34			
								Bottom of Hole at 21.0 ft.	

BORING LOG 211-220 BORING LOGS.GPJ YEH ASSOCIATES.GDT 3/19/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: CFL Kyle and Lee Canyons
Project Number: 211-220 Date:

Boring: **YA-10**
Sheet 1 of 1

Boring Began: 1/31/2012
Drilling Method: Hollow-Stem Auger
Drill: CME 75
Driller: Elite Drilling
Logged By: W. Hoon
Final By: I. Chen
Inclination: Vertical

Completed: 1/31/2012
Drill Bit:
Casing:
Weather:

Total Depth: 20.5 ft
Ground Elevation: 5798.0 ft
Location:
Coordinates: N: 26,800,733.2 E: 655,639.4

Ground Water Notes: Not Encountered During Drilling

Depth	-	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.3 ft. ASPHALT CONCRETE, 3 inches.	
								0.3 - 9.0 ft. silty SAND with gravel, brown, dense.	
5795									
	5				26/20	46			MC= 2.9 % #200= 20 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: SM
5790									
								9.0 - 20.5 ft. gravelly SAND, brown, very dense.	
	10				50:3"	50:3"			
5785									
	15				35/50:5"	50:5"			
5780									
	20				39/50:6"	50:6"			
								Bottom of Hole at 20.5 ft.	

BORING LOG 211-220 BORING LOGS.GPJ YEH ASSOCIATES.GDT 3/19/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: CFL Kyle and Lee Canyons
Project Number: 211-220 Date:

Boring: **YA-11**
Sheet 1 of 1

Boring Began: 1/31/2012
Drilling Method: Hollow-Stem Auger
Drill: CME 75
Driller: Elite Drilling
Logged By: W. Hoon
Final By: I. Chen
Inclination: Vertical

Completed: 1/31/2012
Drill Bit:
Casing:
Weather:

Total Depth: 21.0 ft
Ground Elevation: 5808.0 ft
Location:
Coordinates: N: 26,800,549.2 E: 654,195.0

Ground Water Notes: Not Encountered During Drilling

Depth	-	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 21.0 ft. silty GRAVEL with sand, brown, dense to very dense.	
5805									
	5				30/50:5"	50:5"			
5800									
	10				23/50:5"	50:5"			MC= 2.3 % #200= 14 % LL= NV PL= NP PI= NP AASHTO: A-1-a (0) USCS: GM
5795									
	15				34/36	70			MC= 4.2 % #200= 16 % LL= NV PL= NP PI= NP AASHTO: A-1-b (0) USCS: GM
5790									
	20				38/21	59			
								Bottom of Hole at 21.0 ft.	

BORING LOG 211-220 BORING LOGS.GPJ YEH ASSOCIATES.GDT 3/19/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: CFL Kyle and Lee Canyons
Project Number: 211-220 Date:

Boring: **YA-12**
Sheet 1 of 1

Boring Began: 2/1/2012
Drilling Method: Hollow-Stem Auger
Drill: CME 75
Driller: Elite Drilling
Logged By: W. Hoon
Final By: I. Chen
Inclination: Vertical

Completed: 2/1/2012
Drill Bit:
Casing:
Weather:

Total Depth: 20.7 ft
Ground Elevation: 4794.0 ft
Location:
Coordinates: N: 26,800,494.6 E: 654,225.3

Ground Water Notes: Not Encountered During Drilling

Depth	-	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 20.2 ft. gravelly SAND wtih some silt, brown, very dense.	
4790	5				53:6"	53:6"			
4785	10				50:3"	50:3"			
4780	15				43/50:3"	50:3"			MC= 2.5 % #200= 8 % LL= NV PL= NP PI= NP AASHTO: A-1-a (0) USCS: SW - SM
4775	20				38/50:2"	50:2"		Bottom of Hole at 20.7 ft.	

BORING LOG 211-220 BORING LOGS.GPJ YEH ASSOCIATES.GDT 3/19/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: CFL Kyle and Lee Canyons
Project Number: 211-220 Date:

Boring: **YA-13**
Sheet 1 of 1

Boring Began: 2/1/2012
Drilling Method: Hollow-Stem Auger
Drill: CME 75
Driller: Elite Drilling
Logged By: W. Hoon
Final By: I. Chen
Inclination: Vertical

Completed: 2/1/2012
Drill Bit:
Casing:
Weather:

Total Depth: 12.0 ft
Ground Elevation: 4796.0 ft
Location:
Coordinates: N: 26,831,568.2 E: 630,264.0

Ground Water Notes: Not Encountered During Drilling

Depth	-	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
4795								**0.0 - 12.0 ft. gravelly SAND** with silt and cobbles, brown, very dense.	pH= 7.9 S= 0.002 % Re= 1590 ohms-cm Cl= 0.02 %
	5				53:6"	53:6"			
4790									
	10				50:3"	50:3"			
4785								Bottom of Hole at 12.0 ft.	
	15								
4780									
	20								
4775									

BORING LOG 211-220 BORING LOGS.GPJ YEH ASSOCIATES.GDT 3/19/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: CFL Kyle and Lee Canyons
Project Number: 211-220 Date:

Boring: **YA-14**
Sheet 1 of 2

Boring Began: 2/1/2012
Drilling Method: Hollow-Stem Auger
Drill: CME 75
Driller: Elite Drilling
Logged By: W. Hoon
Final By: I. Chen
Inclination: Vertical

Completed: 2/1/2012
Drill Bit:
Casing:
Weather:

Total Depth: 30.0 ft
Ground Elevation: 5810.0 ft
Location:
Coordinates: N: 26,831,432.7 E: 630,229.4

Ground Water Notes: Not Encountered During Drilling

Depth	-	-	-	-
Date	-	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 18.0 ft. gravelly SAND with some silt, brown, very dense.	
5805	5				27/32	59			MC= 2.7 % #200= 12 % LL= NV PL= NP PI= NP pH= 8.4 S= 0.002 % Re= 4545 ohms-cm AASHTO: A-1-a (0) USCS: SP - SM Cl=0.0023 %
5800	10				50:2"	50:2"			
5795	15				50:3"	50:3"			
								18.0 - 30.0 ft. sandy GRAVEL, brown and white, very dense, calcareous.	
5790	20				50:0"	50:0"			

BORING LOG 211-220 BORING LOGS.GPJ YEH ASSOCIATES.GDT 3/19/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: CFL Kyle and Lee Canyons
Project Number: 211-220 Date:

Boring: **YA-14**
Sheet 2 of 2

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
5785	25				50:0"	50:0"			
5780	30				50:0"	50:0"		Bottom of Hole at 30.0 ft.	
5775	35								
5770	40								
5765	45								

BORING LOG 211-220 BORING LOGS.GPJ YEH ASSOCIATES.GDT 3/19/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Kyle Canyon
Project Number: 211-220A Date: 6/28/12

Boring: **YA-12-01**
Sheet 1 of 1

Boring Began: 6/26/2012
Drilling Method: Hollow-Stem Auger
Drill: Mobile B-57
Driller: Elite Drilling
Logged By: W. Hoon
Final By:
Inclination: Vertical

Completed: 6/26/2012
Drill Bit:
Casing:
Weather: Sunny

Total Depth: 6.5 ft
Ground Elevation:
Location: 8.5 ft Rt CL Sta. 337+00
Coordinates: N: E:

Ground Water Notes: Dry

Depth	Dry	-	-	-
Date	6/26/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.6 ft. 7.5 inches of asphalt.	
								0.6 - 6.5 ft. silty SAND , gravelly, light brown, moist, very dense, subangular, (alluvium).	
					8/21/30	51			MC= 2.3 % + #4= 33 % #200= 41 % LL= 17 PL= 14 PI= 3 AASHTO: A-2-4 (0) USCS: SM
					23/34/33	67			
	5				18/44/49	93			
								Bottom of Hole at 6.5 ft.	

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Kyle Canyon
Project Number: 211-220A Date: 6/28/12

Boring: **YA-12-02**
Sheet 1 of 1

Boring Began: 6/26/2012
Drilling Method: Hollow-Stem Auger
Drill: Mobile B-57
Driller: Elite Drilling
Logged By: W. Hoon
Final By:
Inclination: Vertical

Completed: 6/26/2012
Drill Bit:
Casing:
Weather: Sunny

Total Depth: 6.5 ft
Ground Elevation:
Location: 9 ft Lt CL Sta.299+42
Coordinates: N: E:

Ground Water Notes: Dry

Depth	Dry	-	-	-
Date	6/26/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples: Blows per 6 in	Soil Samples: N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.6 ft. 7.0 inches of asphalt.	
								0.6 - 6.5 ft. silty SAND gravellty, light brown, moist, dense, subangular to rounded, (alluvium).	
					20/22/16	38			MC= 3.2 % + #4= 33 % #200= 41 % LL= 17 PL= 14 PI= 3 R-Value= 57 AASHTO: A-2-4 (0) USCS: SM
					13/17/26	43			
	5				13/18/27	45			
								Bottom of Hole at 6.5 ft.	

BORING LOG KYLE CANYON 6-28-12.GPJ YEH ASSOCIATES.GDT 8/22/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Kyle Canyon
Project Number: 211-220A Date: 6/28/12

Boring: **YA-12-03**
Sheet 1 of 1

Boring Began: 6/26/2012
Drilling Method: Hollow-Stem Auger
Drill: Mobile B-57
Driller: Elite Drilling
Logged By: W. Hoon
Final By:
Inclination: Vertical

Completed: 6/26/2012
Drill Bit:
Casing:
Weather: Sunny

Total Depth: 5.4 ft
Ground Elevation:
Location: 8 ft Rt CL Sta. 251+14
Coordinates: N: E:

Ground Water Notes: Dry

Depth	Dry	-	-	-
Date	6/26/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples: Blows per 6 in	Soil Samples: N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.6 ft. 7.5 inches of asphalt.	
								0.6 - 2.8 ft. silty SAND few subangular fine gravels, light brown, moist, medium dense, (alluvium).	
					8/8/5	13			
					10/50(.3)	50(.3)		**2.8 - 5.9 ft. silty GRAVEL** and SAND, light brown, moist, very dense, angular to subangular, moderate cementation, caliche present, (alluvium).	MC= 3.1 % + #4= 38 % #200= 36 % LL= 19 PL= 15 PI= 4 R-Value= 48 AASHTO: A-2-4 (0) USCS: GM-GC
	5				17/50(.4)	50(.4)			
								Bottom of Hole at 5.4 ft.	

BORING LOG KYLE CANYON 6-28-12.GPJ YEH ASSOCIATES.GDT 8/22/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Kyle Canyon
Project Number: 211-220A Date: 6/28/12

Boring: **YA-12-04**
Sheet 1 of 1

Boring Began: 6/26/2012
Drilling Method: Hollow-Stem Auger
Drill: Mobile B-57
Driller: Elite Drilling
Logged By: W. Hoon
Final By:
Inclination: Vertical

Completed: 6/26/2012
Drill Bit:
Casing:
Weather: Sunny

Total Depth: 5.7 ft
Ground Elevation:
Location: 9 ft Lt CL Sta. 202+84
Coordinates: N: E:

Ground Water Notes: Dry

Depth	Dry	-	-	-
Date	6/26/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.6 ft. 7.5 inches of asphalt.	
								0.6 - 2.4 ft. silty SAND some gravel, light brown, moist, medium dense, angular to rounded, (alluvium).	
					8/8/11	19			
					12/50(.3)	50(.3)		**2.4 - 5.7 ft. silty SAND** gravelly, light brown, moist, very dense, angular to rounded, moderate cementation, caliche present, (alluvium).	MC= 4.2 % + #4= 31 % #200= 40 % LL= 20 PL= 14 PI= 6 AASHTO: A-2-6 (0) USCS: SM-SC
	5				20/50(.7)	50(.7)			
								Bottom of Hole at 5.7 ft.	

BORING LOG KYLE CANYON 6-28-12.GPJ YEH ASSOCIATES.GDT 8/22/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Kyle Canyon
Project Number: 211-220A Date: 6/28/12

Boring: **YA-12-05**
Sheet 1 of 1

Boring Began: 6/26/2012
Drilling Method: Hollow-Stem Auger
Drill: Mobile B-57
Driller: Elite Drilling
Logged By: W. Hoon
Final By:
Inclination: Vertical

Completed: 6/26/2012
Drill Bit:
Casing:
Weather: Sunny

Total Depth: 6.5 ft
Ground Elevation:
Location: 8 ft Rt CL Sta. 505+44
Coordinates: N: E:

Ground Water Notes: Dry

Depth	Dry	-	-	-
Date	6/26/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.5 ft. 6.0 inches of asphalt.	
								0.5 - 2.5 ft. silty SAND some gravel, light brown, moist, medium dense, subangular to rounded, (alluvium).	
					15/12/12	24			
					13/23/25	48		**2.5 - 6.5 ft. silty SAND** gravelly, light brown, moist, dense, subangular to rounded, weak cementation, (alluvium).	MC= 3.2 % + #4= 31 % #200= 43 % LL= 17 PL= 14 PI= 3 R-Value= 46 AASHTO: A-2-4 (0) USCS: SM
	5				20/28/30	58		Very dense.	
								Bottom of Hole at 6.5 ft.	

BORING LOG KYLE CANYON 6-28-12.GPJ YEH ASSOCIATES.GDT 8/22/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Kyle Canyon
Project Number: 211-220A Date: 6/28/12

Boring: **YA-12-06**
Sheet 1 of 1

Boring Began: 6/26/2012
Drilling Method: Hollow-Stem Auger
Drill: Mobile B-57
Driller: Elite Drilling
Logged By: W. Hoon
Final By:
Inclination: Vertical

Completed: 6/26/2012
Drill Bit:
Casing:
Weather: Sunny

Total Depth: 6.5 ft
Ground Elevation:
Location: 7 ft Lt CL Sta. 347+04
Coordinates: N: E:

Ground Water Notes: Dry

Depth	Dry	-	-	-
Date	6/26/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.5 ft. 6.0 inches of asphalt.	
								0.5 - 2.5 ft. silty SAND some gravel, light brown, moist, medium dense, subangular to rounded, (alluvium).	
					12/12/13	25			
					17/13/12	25		**2.5 - 6.5 ft. silty SAND** gravelly, light brown, moist, medium dense, subangular to rounded, (alluvium).	MC= 3.6 % + #4= 32 % #200= 44 % LL= 20 PL= 15 PI= 5 R-Value= 50 AASHTO: A-1-b (0) USCS: SM-SC
	5				20/33/32	65		Very dense.	
								Bottom of Hole at 6.5 ft.	

BORING LOG KYLE CANYON 6-28-12.GPJ YEH ASSOCIATES.GDT 8/22/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Kyle Canyon
Project Number: 211-220A Date: 6/28/12

Boring: **YA-12-07**
Sheet 1 of 1

Boring Began: 6/26/2012
Drilling Method: Hollow-Stem Auger
Drill: Mobile B-57
Driller: Elite Drilling
Logged By: W. Hoon
Final By:
Inclination: Vertical

Completed: 6/26/2012
Drill Bit:
Casing:
Weather: Sunny

Total Depth: 5.8 ft
Ground Elevation:
Location: 13 ft Rt CL Sta. 238+80
Coordinates: N: E:

Ground Water Notes: Dry

Depth	Dry	-	-	-
Date	6/26/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.4 ft. 5.5 inches of asphalt.	
								0.4 - 3.5 ft. clayey SAND some gravel, light brown, moist, loose, subangular to rounded, (alluvium).	
					5/4/2	6			MC= 6.1 % + #4= 34 % #200= 36 % LL= 26 PL= 17 PI= 9 R-Value= 29 AASHTO: A-2-4 (0) USCS: SC
					4/8/18	26			
								3.5 - 5.8 ft. clayey SAND gravelly, light brown, moist, medium dense, subangular, (alluvium).	
	5							Very dense, moderate cementation.	
					30/50(.3)	50(.3)			
								Bottom of Hole at 5.8 ft.	

BORING LOG KYLE CANYON 6-28-12.GPJ YEH ASSOCIATES.GDT 8/22/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Kyle Canyon
Project Number: 211-220A Date: 6/28/12

Boring: **YA-12-08**
Sheet 1 of 1

Boring Began: 6/26/2012
Drilling Method: Hollow-Stem Auger
Drill: Mobile B-57
Driller: Elite Drilling
Logged By: W. Hoon
Final By:
Inclination: Vertical

Completed: 6/26/2012
Drill Bit:
Casing:
Weather: Sunny

Total Depth: 16.5 ft
Ground Elevation:
Location: 9 ft Lt CL Sta. 212+40
Coordinates: N: E:

Ground Water Notes: Dry

Depth	Dry	-	-	-
Date	6/26/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.5 ft. 4.5 inches of asphalt.	
					10/17/27	44		**0.5 - 16.5 ft. silty SAND** gravelly, few cobbles, light brown, moist, dense, subangular to subrounded, cementation varies from weak to strong in alternating layers to 3 feet thick, (alluvium).	
					17/50(.3)	50(.3)			MC= 1.6 % + #4= 36 % #200= 45 % LL= 14 PL= 13 PI= 1 AASHTO: A-1-b (0) USCS: SM
	5				11/43/50(.3)	50(.3)		Very dense.	
	10				50(.3)	50(.3)			
	15				28/33/40	73		Strong cementation.	
								Bottom of Hole at 16.5 ft.	

BORING LOG KYLE CANYON 6-28-12.GPJ YEH ASSOCIATES.GDT 8/22/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Kyle Canyon
Project Number: 211-220A Date: 6/28/12

Boring: **YA-12-09**
Sheet 1 of 1

Boring Began: 6/26/2012
Drilling Method: Hollow-Stem Auger
Drill: Mobile B-57
Driller: Elite Drilling
Logged By: W. Hoon
Final By:
Inclination: Vertical

Completed: 6/26/2012
Drill Bit:
Casing:
Weather: Sunny

Total Depth: 6.5 ft
Ground Elevation:
Location: 5 ft Rt CL Sta. 14+40
Coordinates: N: E:

Ground Water Notes: Dry

Depth	Dry	-	-	-
Date	6/26/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 0.8 ft. 9.0 inches of asphalt.	
					15/19/20	39		**0.8 - 6.5 ft. silty SAND** gravelly, light brown, moist, dense, angular to subrounded, (alluvium).	
					9/16/22	38			MC= 2.7 % + #4= 23 % #200= 54 % LL= 15 PL= 14 PI= 1 R-Value= 55 AASHTO: A-1-b (0) USCS: SM
	5				18/18/15	33			
								Bottom of Hole at 6.5 ft.	

BORING LOG KYLE CANYON 6-28-12.GPJ YEH ASSOCIATES.GDT 8/22/12

YEH AND ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING CONSULTANTS

Project: Kyle Canyon
Project Number: 211-220A Date: 6/28/12

Boring: **YA-12-10**
Sheet 1 of 1

Boring Began: 6/27/2012
Drilling Method: Hollow-Stem Auger
Drill: CME 55 Track
Driller: Elite Drilling
Logged By: W. Hoon
Final By:
Inclination: Vertical

Completed: 6/27/2012
Drill Bit:
Casing:
Weather: Sunny

Total Depth: 25.2 ft
Ground Elevation:
Location: 35 ft Lt CL Sta. 212+40
Coordinates: N: E:

Ground Water Notes: Dry

Depth	Dry	-	-	-
Date	6/27/12	-	-	-
Time	-	-	-	-

Elevation (feet)	Depth (feet)	Run / Sample Type	Recovery (%)	Rock RQD	Soil Samples Blows per 6 in	Soil Samples N	Lithology	Material Description	Field Notes and Lab Tests
								0.0 - 25.2 ft. silty SAND gravelly, light brown, moist, very dense, subangular to rounded, cementation varies from weak to strong in alternating layers to 3 feet thick, (alluvium).	
					50/.4	50/.4			
	5								
					50/.5	50/.5			
	10								
					on RX	on RX			
	15								
					29/15/12	27		Medium dense.	
	20								
					on RX	on RX		On boulder.	
	25							Bottom of Hole at 25.2 ft.	

BORING LOG KYLE CANYON 6-28-12.GPJ YEH ASSOCIATES.GDT 8/22/12

Appendix C, Laboratory Test Results

YEH & ASSOCIATES, INC

Summary of Laboratory Test Results

Project No: 211-220 Project Name: CFL Kyle and Lee Canyons Investigation NV Date: 2/17/2012

Sample Location			Natural Moisture Content (%)	Natural Dry Density (pcf)	Gradation			Atterberg			pH	Water Soluble Sulfate %	Resistivity ohm.cm	Chloride %	R-VALUE	CLASSIFICATION	
Boring NO.	Depth (ft)	Sample Type			Gravel > #4 (%)	Sand (%)	Fines < #200 (%)	LL	PL	PI						AASHTO	USCS
YA-1	2-3	Bulk	7.4	–	37	40	24	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SM
YA-1	5-5.3	SS	6.5	–	31	45	24	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SM
YA-2	2-3	Bulk	7.1	–	36	39	25	29	16	13	–	–	–	–	24	A-2-6 (0)	SC
YA-2	3.5-4	CA	5.0	–	–	–	–	–	–	–	–	0.003	–	–	–	–	–
YA-3	2-3	Bulk	5.7	–	52	29	19	NV	NP	NP	–	–	–	–	–	A-1-b (0)	GM
YA-3	3.5-4	CA	4.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–
YA-3	5-5.8	SS	1.9	–	46	41	13	NV	NP	NP	–	–	–	–	–	A-1-a (0)	GM
YA-4	2-3	Bulk	14.2	–	26	35	39	37	21	16	–	–	–	–	21	A - 6 (2)	SC
YA-4	5.3-5.8	CA	6.9	–	61	29	10	NV	NP	NP	–	–	–	–	–	A-1-a (0)	GP - GM
YA-5	2-3	Bulk	3.9	–	33	45	22	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SM
YA-5	5.5-6	CA	5.6	–	40	34	26	NV	NP	NP	–	–	–	–	–	A-2-4 (0)	GM
YA-6	2-3	Bulk	5.3	–	42	39	19	NV	NP	NP	–	0.003	–	–	–	A-1-b (0)	GM
YA-6	4-4.5	CA	4.6	–	65	22	13	NV	NP	NP	–	–	–	–	–	A-1-a (0)	GM
YA-7	1-2	Bulk	0.8	–	69	19	12	NV	NP	NP	–	–	–	–	–	A-1-a (0)	GM
YA-7	15-16.5	SS	1.8	–	50	36	14	NV	NP	NP	–	–	–	–	–	A-1-a (0)	GM
YA-8	0-1	Bulk	0.4	–	72	18	10	NV	NP	NP	–	–	–	–	–	A-1-a (0)	GP - GM

YEH & ASSOCIATES, INC

Summary of Laboratory Test Results

Project No: 211-220 Project Name: CFL Kyle and Lee Canyons Investigation NV Date: 2/17/2012

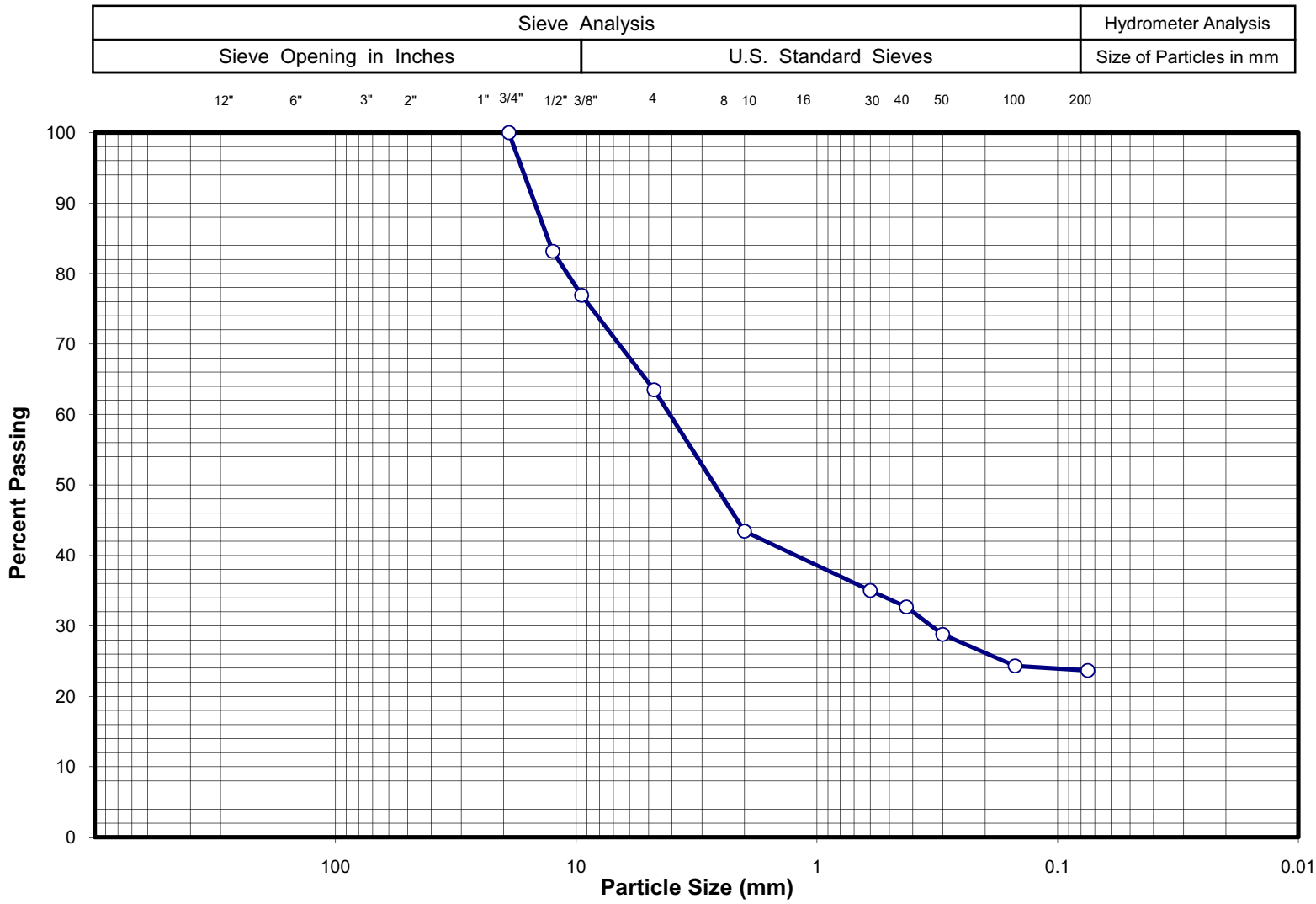
Sample Location			Natural Moisture Content (%)	Natural Dry Density (pcf)	Gradation			Atterberg			pH	Water Soluble Sulfate %	Resistivity ohm.cm	Chloride %	R-VALUE	CLASSIFICATION	
Boring NO.	Depth (ft)	Sample Type			Gravel > #4 (%)	Sand (%)	Fines < #200 (%)	LL	PL	PI						AASHTO	USCS
YA-8	5-6.5	CA	1.8	–	–	–	–	–	–	–	–	0.004	–	–	–	–	–
YA-9	0-1	Bulk	4.3	–	52	37	11	NV	NP	NP	7.9	0.004	2387	0.0102	–	A-1-a (0)	GP - GM
YA-9	6-6.5	CA	1.1	–	73	20	7	NV	NP	NP	–	–	–	–	–	A-1-a (0)	GP - GM
YA-10	5.5-6	CA	2.9	–	40	40	20	NV	NP	NP	–	–	–	–	–	A-1-b (0)	SM
YA-11	10-10.9	Bulk	2.3	–	50	36	14	NV	NP	NP	–	–	–	–	–	A-1-a (0)	GM
YA-11	15-16.5	CA	4.2	–	53	31	16	NV	NP	NP	–	–	–	–	–	A-1-b (0)	GM
YA-12	15-15.8	CA	2.5	–	41	51	8	NV	NP	NP	–	–			–	A-1-a (0)	SW - SM
YA-13	1-2	Bulk	–	–	–	–	–	–	–	–	7.9	0.002	1590	0.0200	–	–	–
YA-14	5-6.5	CA	2.7	–	44	44	12	NV	NP	NP	8.4	0.002	4545	0.0023	–	A-1-a (0)	SP - SM
(YA-5)+(YA-6)		–	–	–	–	–	–	–	–	–	–	–	–	–	78	–	–
(YA-5)+(YA-6)		–	–	–	–	–	–	–	–	–	–	–	–	–	78	–	–

YEH & ASSOCIATES, INC

Summary of Laboratory Test Results

Project No: 211-220A Project Name: Kyle Canyon Date: 7/18/2012

Sample Location			Natural Moisture Content (%)	Natural Dry Density (pcf)	Gradation			Atterberg			pH	Water Soluble Sulfate %	Chloride %	Resistivity OHMS per cm	R-Value	CLASSIFICATION	
Boring #	Depth (ft)	Sample Type			Gravel > #4 (%)	Sand (%)	Fines < #200 (%)	LL	PL	PI						AASHTO	USCS
YA 12-01	2.0-4.0'	BULK	2.3		33	41	26	17	14	3						A-2-4 (0)	SM
YA 12-02	2.0-4.0'	BULK	3.2		33	41	26	17	17	3					57	A-2-4 (0)	SM
YA 12-03	2.0-4.0'	BULK	3.1		38	36	26	19	15	4					48	A-2-4 (0)	GM-GC
YA 12-04	2.0-4.0'	BULK	4.2		31	40	29	20	14	6						A-2-6 (0)	SM-SC
YA 12-05	2.0-4.0'	BULK	3.2		31	43	26	17	14	3					46	A-2-4 (0)	SM
YA 12-06	2.0-4.0'	BULK	3.6		32	44	24	20	15	5					50	A-1-b (0)	SM-SC
YA 12-07	2.0-4.0'	BULK	6.1		34	36	30	26	17	9					29	A-2-4 (0)	SC
YA 12-08	2.0-4.0'	BULK	1.6		36	45	19	14	13	1						A-1-b (0)	SM
YA 12-09	2.0-4.0'	BULK	2.7		23	54	23	15	14	1					55	A-1-b (0)	SM



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	-
1"	-
¾ "	100
½"	83
⅜"	77
#4	63
#10	43
#40	33
#200	24

Gravel (%)	37	LL	NV	Project Name:	CFL Kyle and Lee Canyons
Sand (%)	39	PL	NP	Sample ID:	YA-1
Fines (%)	24	PI	NP	Sample Depth (ft.):	2-3
Sample Description:	SM / A - 1 - b (0)				

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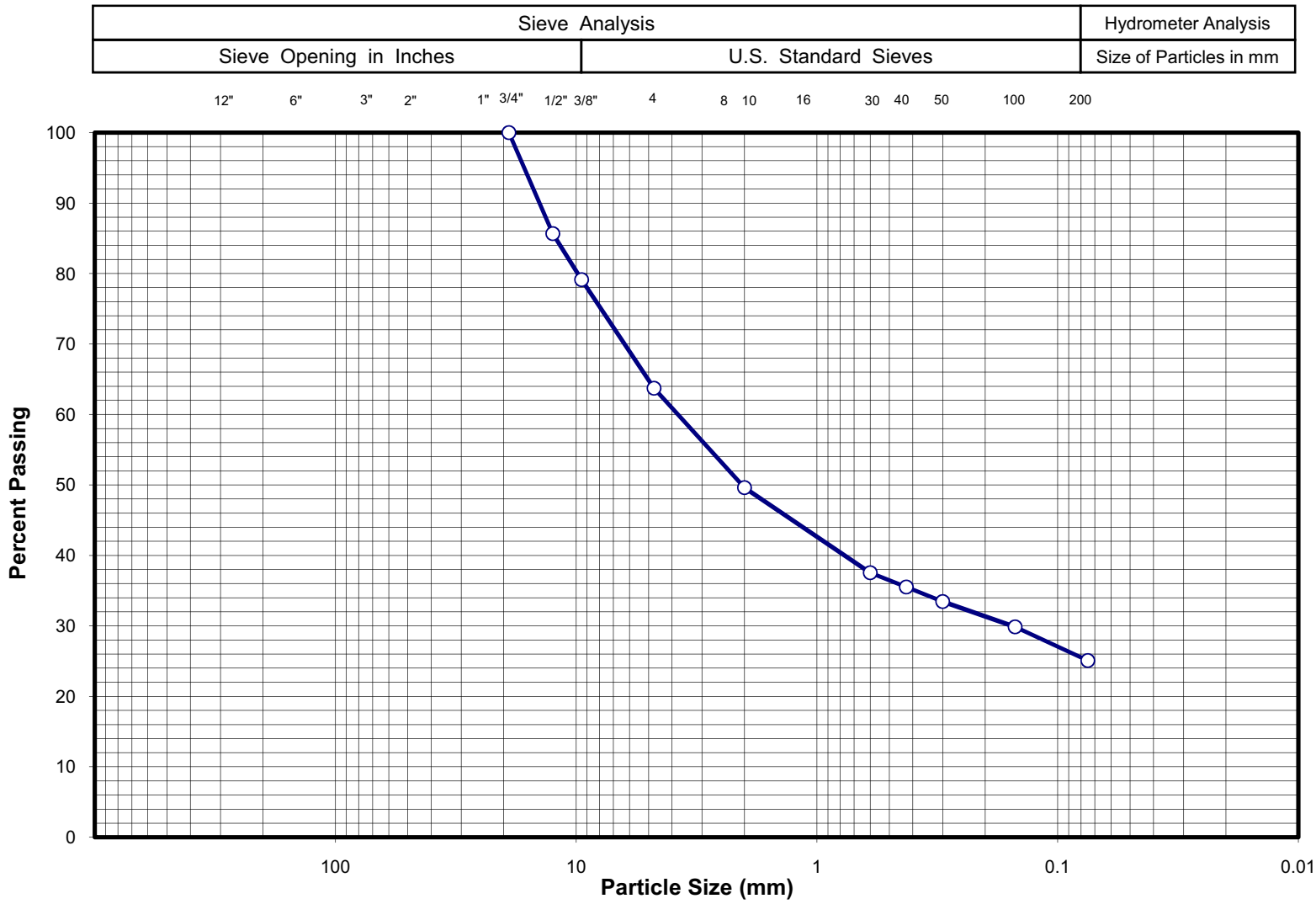
SIEVE ANALYSIS

Drawn By:	MA	Project No.:	211-220
Checked By:	SCS	Figure No.:	-
Date:	02/13/12		

Revised 04/27/2004



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	-
1"	-
¾ "	100
½"	86
⅜"	79
#4	64
#10	50
#40	35
#200	25

Gravel (%)	36	LL	29	Project Name:	CFL Kyle and Lee Canyons
Sand (%)	39	PL	16	Sample ID:	YA-2
Fines (%)	25	PI	13	Sample Depth (ft.):	2-3
Sample Description:	SC / A - 2 - 6 (0)				

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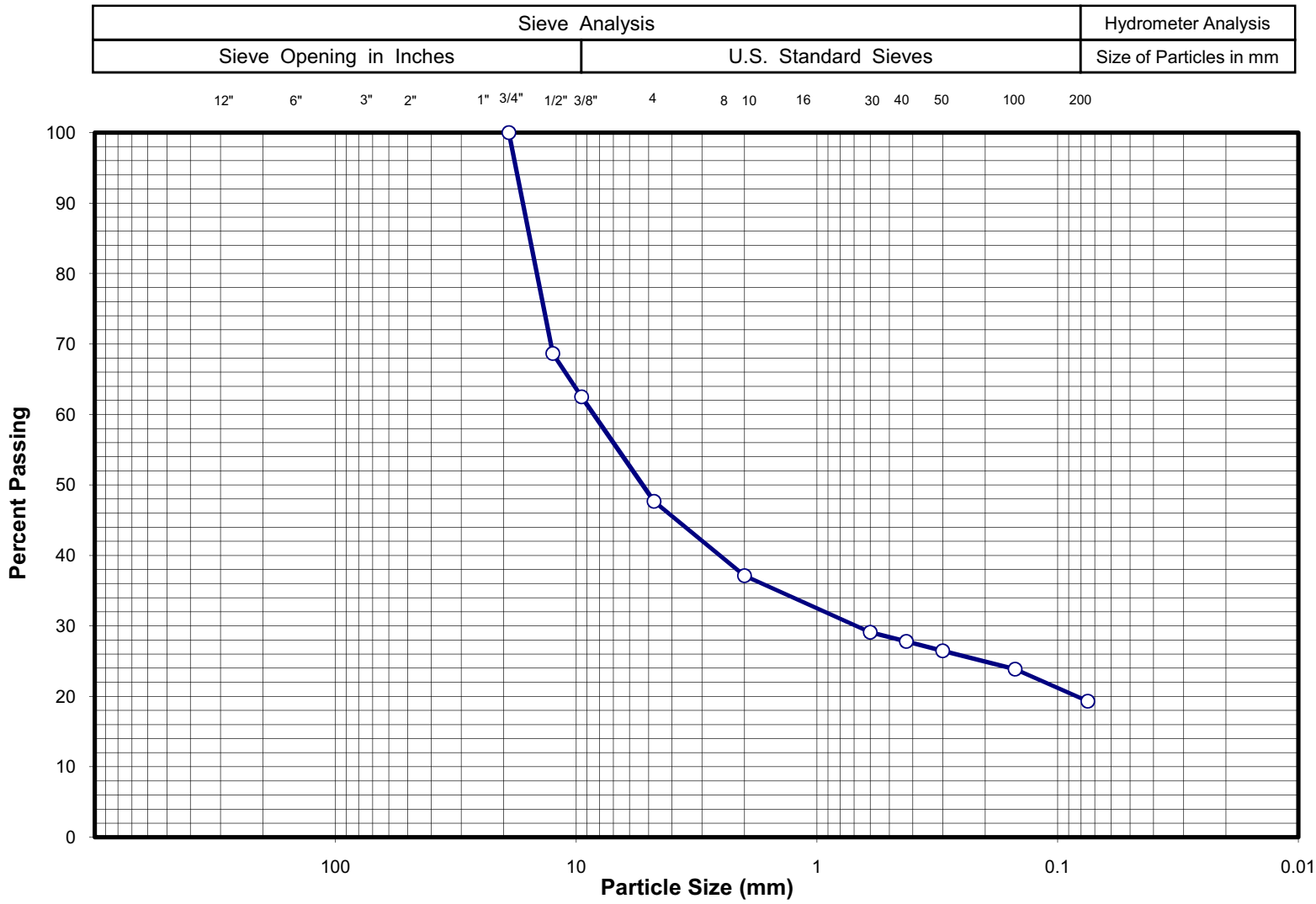
SIEVE ANALYSIS

Drawn By:	MA	Project No.:	211-220
Checked By:	SCS	Figure No.:	-
Date:	02/13/12		

Revised 04/27/2004



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	-
1"	-
¾ "	100
½"	69
⅜"	62
#4	48
#10	37
#40	28
#200	19

Gravel (%)	52	LL	NV	Project Name:	CFL Kyle and Lee Canyons
Sand (%)	29	PL	NP	Sample ID:	YA-3
Fines (%)	19	PI	NP	Sample Depth (ft.):	2-3
Sample Description:	GM / A - 1 - b (0)				

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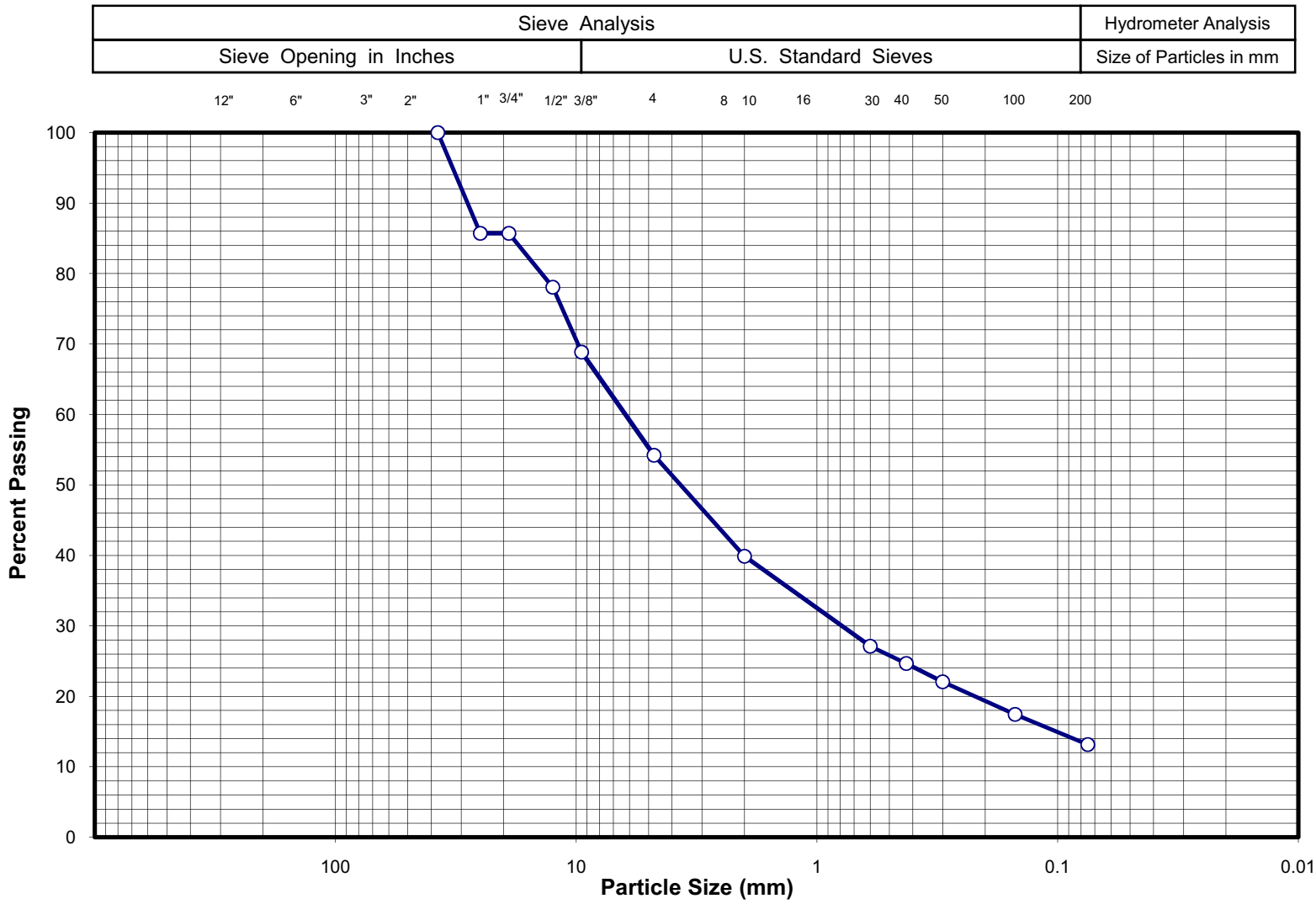
SIEVE ANALYSIS

Drawn By:	MA	Project No.:	211-220
Checked By:	SCS	Figure No.:	-
Date:	02/13/12		

Revised 04/27/2004



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	100
1"	86
¾ "	86
½"	78
⅜"	69
#4	54
#10	40
#40	25
#200	13

Gravel (%)	46	LL	NV	Project Name:	CFL Kyle and Lee Canyons
Sand (%)	41	PL	NP	Sample ID:	YA-3
Fines (%)	13	PI	NP	Sample Depth (ft.):	5-5.8
Sample Description:	GM / A - 1 - a (0)				

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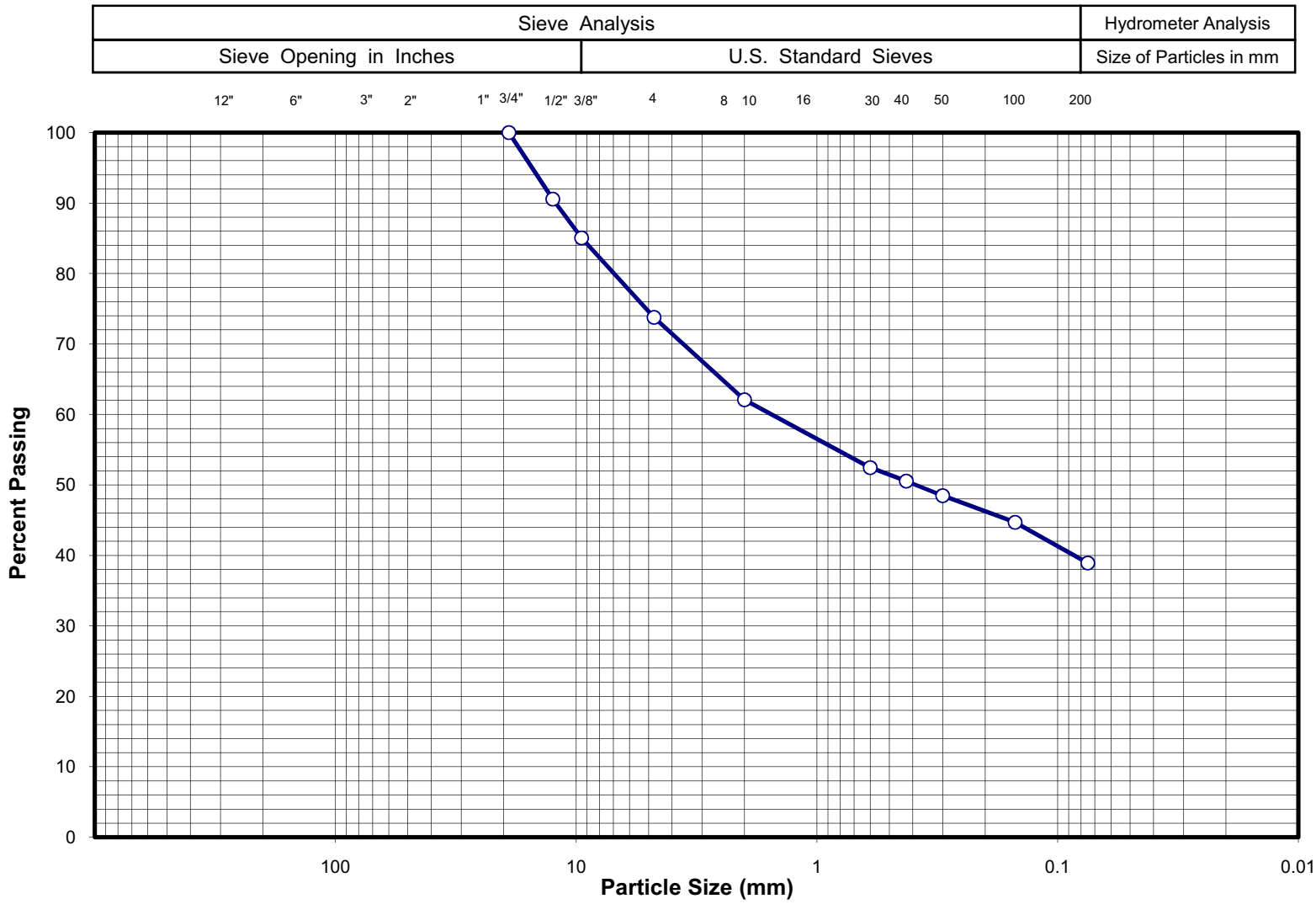
SIEVE ANALYSIS

Drawn By:	MA	Project No.:	211-220
Checked By:	SCS	Figure No.:	-
Date:	02/13/12		

Revised 04/27/2004



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	-
1"	-
¾ "	100
½"	91
⅜"	85
#4	74
#10	62
#40	51
#200	39

Gravel (%)	26	LL	37	Project Name:	CFL Kyle and Lee Canyons
Sand (%)	35	PL	21	Sample ID:	YA-4
Fines (%)	39	PI	16	Sample Depth (ft.):	2-3
Sample Description:	SC / A - 6 (2)				

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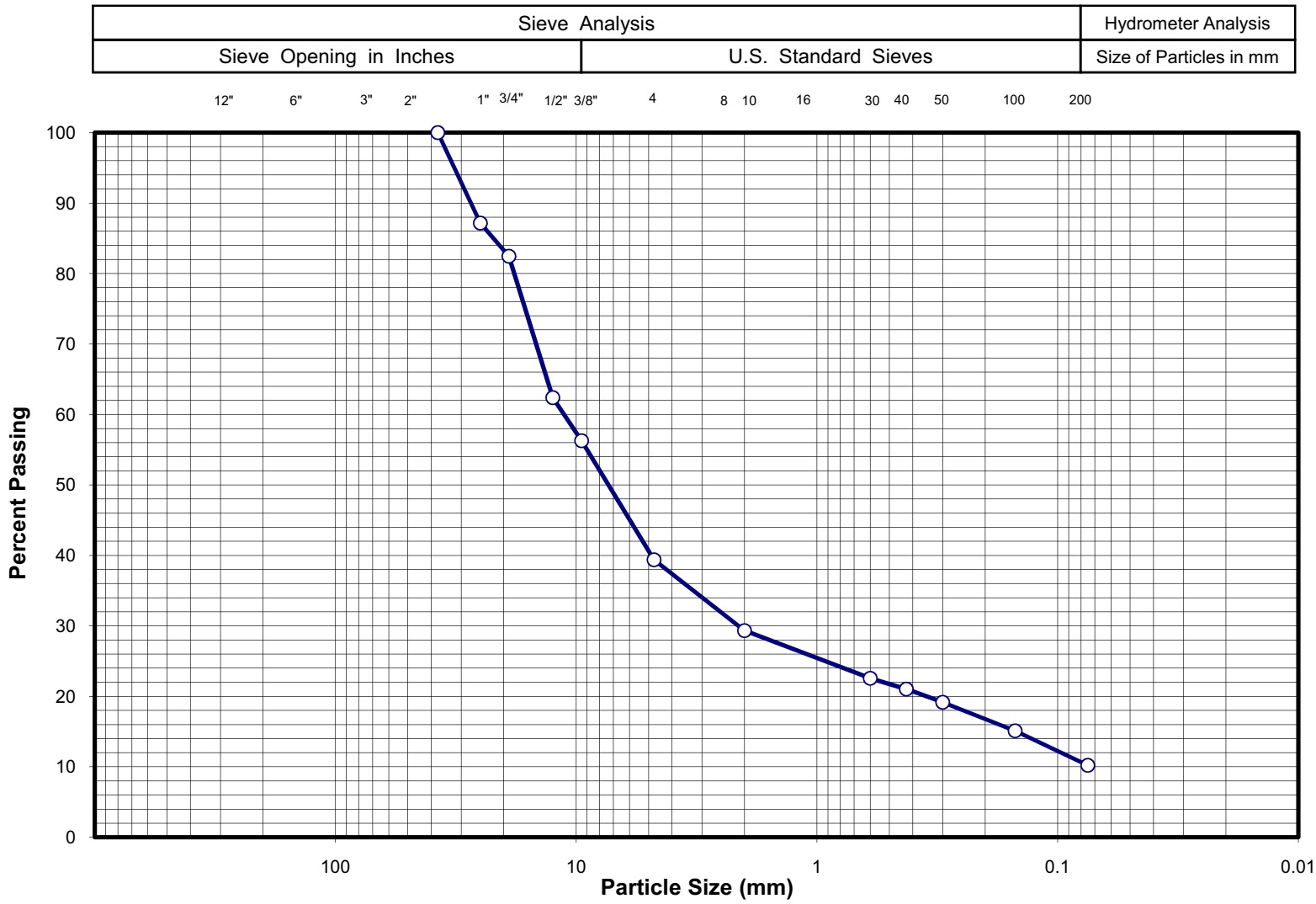
SIEVE ANALYSIS

Drawn By:	MA	Project No.:	211-220
Checked By:	SCS	Figure No.:	-
Date:	02/13/12		

Revised 04/27/2004



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	100
1"	87
¾ "	82
½"	62
⅜"	56
#4	39
#10	29
#40	21
#200	10

Gravel (%)	61	LL	NV	Project Name:	CFL Kyle and Lee Canyons
Sand (%)	29	PL	NP	Sample ID:	YA-4
Fines (%)	10	PI	NP	Sample Depth (ft.):	5.3-5.8
Sample Description:	GP - GM / A - 1 - a (0)				

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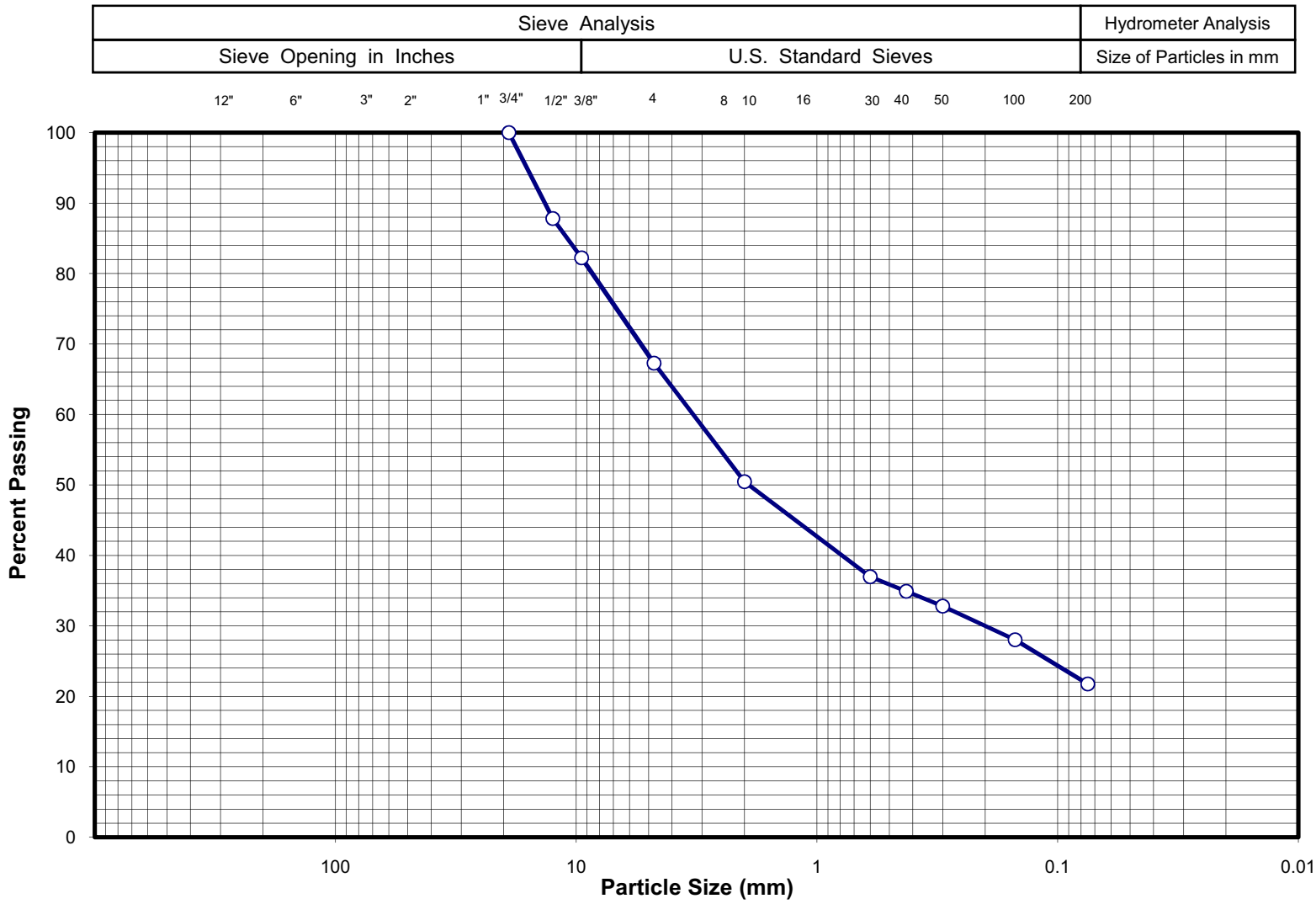
SIEVE ANALYSIS

Drawn By:	MA	Project No.:	211-220
Checked By:	SCS	Figure No.:	-
Date:	02/13/12		

Revised 04/27/2004



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	-
1"	-
¾ "	100
½"	88
⅜"	82
#4	67
#10	50
#40	35
#200	22

Gravel (%)	33	LL	NV	Project Name:	CFL Kyle and Lee Canyons
Sand (%)	45	PL	NP	Sample ID:	YA-5
Fines (%)	22	PI	NP	Sample Depth (ft.):	2-3
Sample Description:	SM / A - 1 - b (0)				

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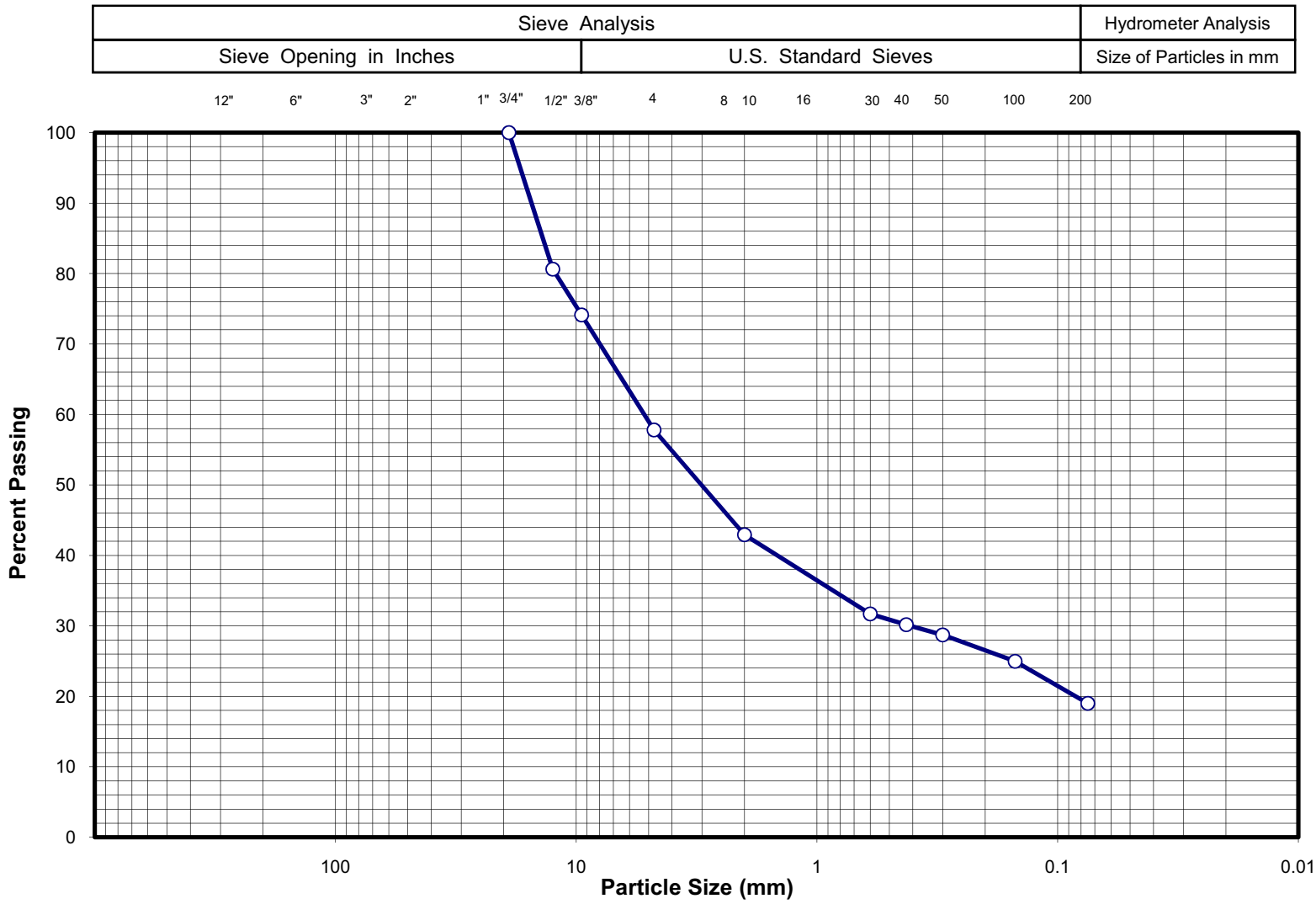
SIEVE ANALYSIS

Drawn By:	MA	Project No.:	211-220
Checked By:	SCS	Figure No.:	-
Date:	02/13/12		

Revised 04/27/2004



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	-
1"	-
¾ "	100
½"	81
⅜"	74
#4	58
#10	43
#40	30
#200	19

Gravel (%)	42	LL	NV	Project Name:	CFL Kyle and Lee Canyons
Sand (%)	39	PL	NP	Sample ID:	YA-6
Fines (%)	19	PI	NP	Sample Depth (ft.):	2-3
Sample Description:	GM / A - 1 - b (0)				

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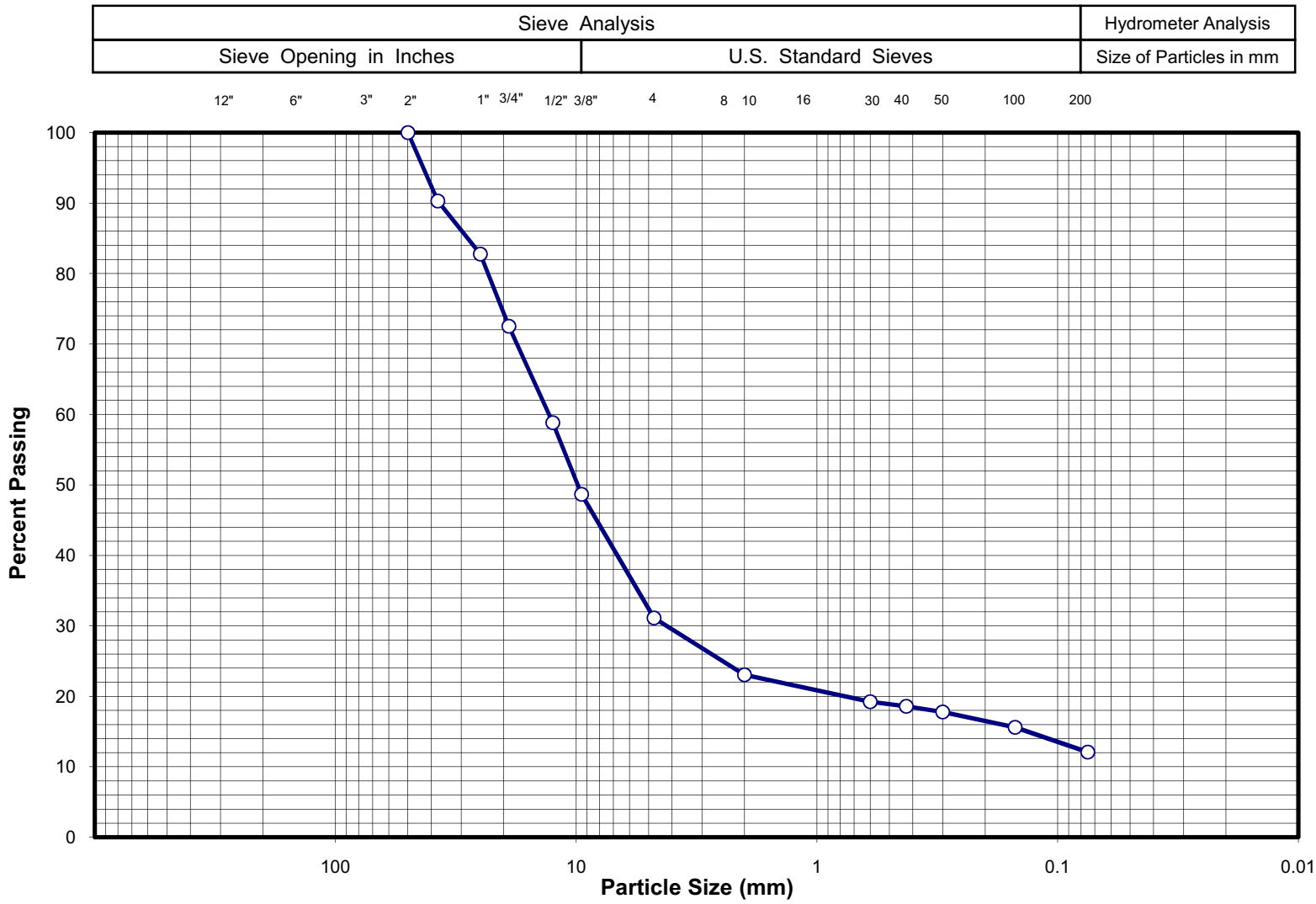
SIEVE ANALYSIS

Drawn By:	MA	Project No.:	211-220
Checked By:	SCS	Figure No.:	-
Date:	02/13/12		

Revised 04/27/2004



Sieve Size	% Passing
3"	-
2 ½"	-
2"	100
1 ½"	90
1"	83
¾ "	72
½"	59
⅜"	49
#4	31
#10	23
#40	19
#200	12

Gravel (%)	69	LL	NV	Project Name:	CFL Kyle and Lee Canyons
Sand (%)	19	PL	NP	Sample ID:	YA-7
Fines (%)	12	PI	NP	Sample Depth (ft.):	1-2
Sample Description:	GM / A - 1 - a (0)				

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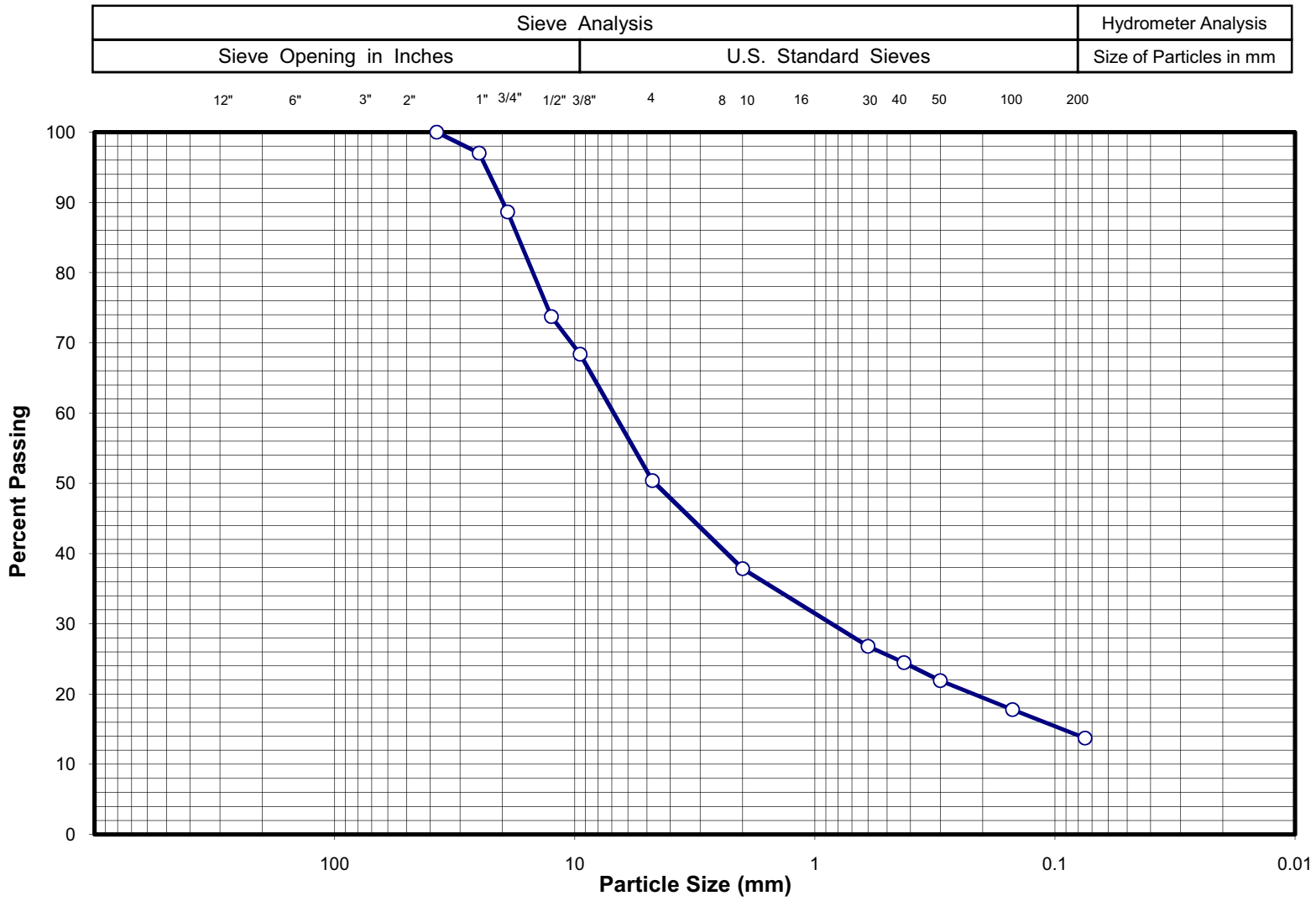
SIEVE ANALYSIS

Drawn By:	MA	Project No.:	211-220
Checked By:	SCS	Figure No.:	-
Date:	02/13/12		

Revised 04/27/2004



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	100
1"	97
¾ "	89
½"	74
⅜"	68
#4	50
#10	38
#40	24
#200	14

Gravel (%)	50	LL	NV	Project Name:	CFL Kyle and Lee Canyons
Sand (%)	36	PL	NP	Sample ID:	YA-7
Fines (%)	14	PI	NP	Sample Depth (ft.):	15-16.5
Sample Description:	GM / A - 1 - a (0)				

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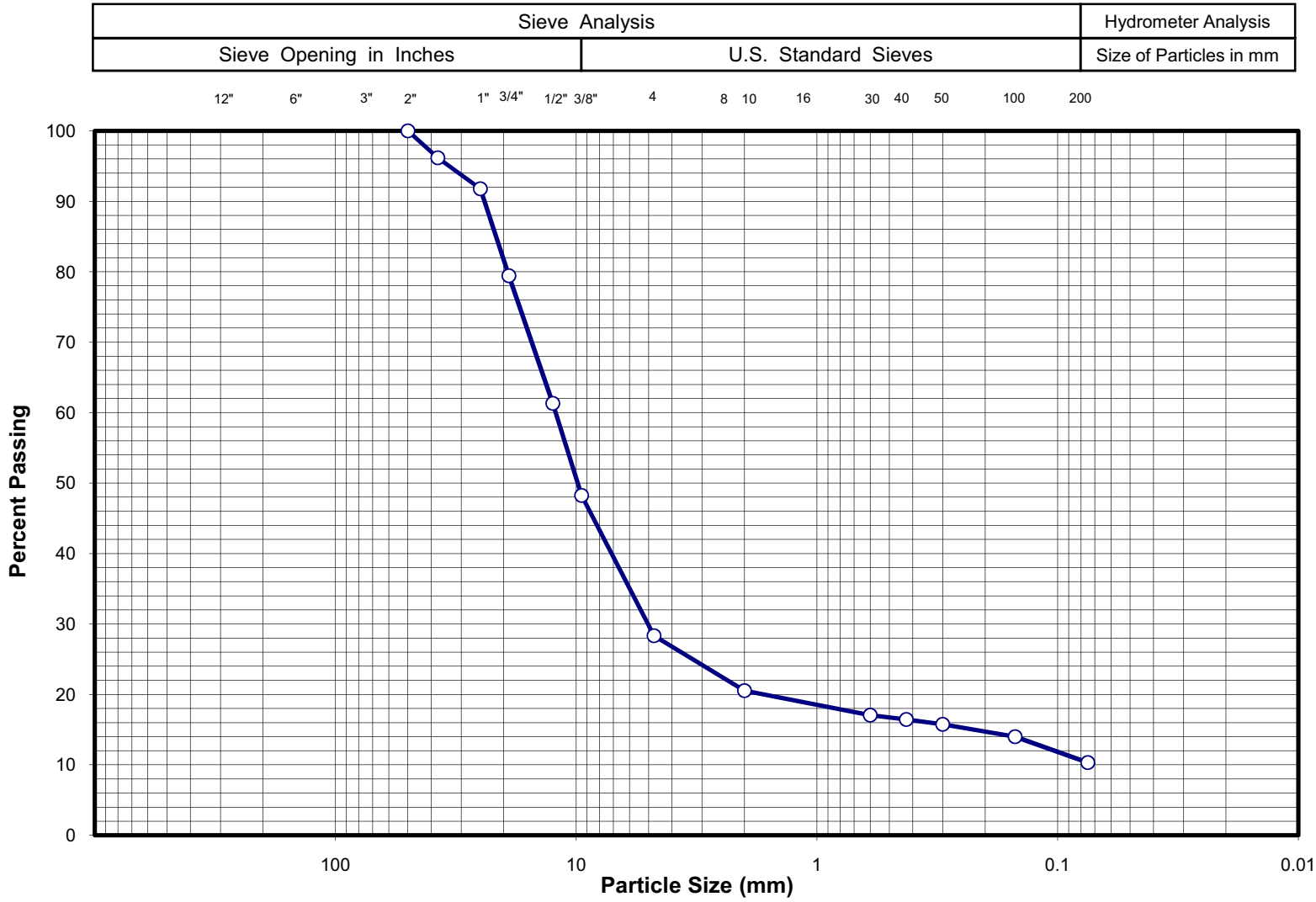
SIEVE ANALYSIS

Drawn By:	MA	Project No.:	211-220
Checked By:	SCS	Figure No.:	-
Date:	02/13/12		

Revised 04/27/2004



Sieve Size	% Passing
3"	-
2 ½"	-
2"	100
1 ½"	96
1"	92
¾ "	79
½"	61
⅜"	48
#4	28
#10	21
#40	16
#200	10

Gravel (%)	72	LL	NV	Project Name:	CFL Kyle and Lee Canyons
Sand (%)	18	PL	NP	Sample ID:	YA-8
Fines (%)	10	PI	NP	Sample Depth (ft.):	0-1
Sample Description:	GP-GM / A - 1 - a (0)				

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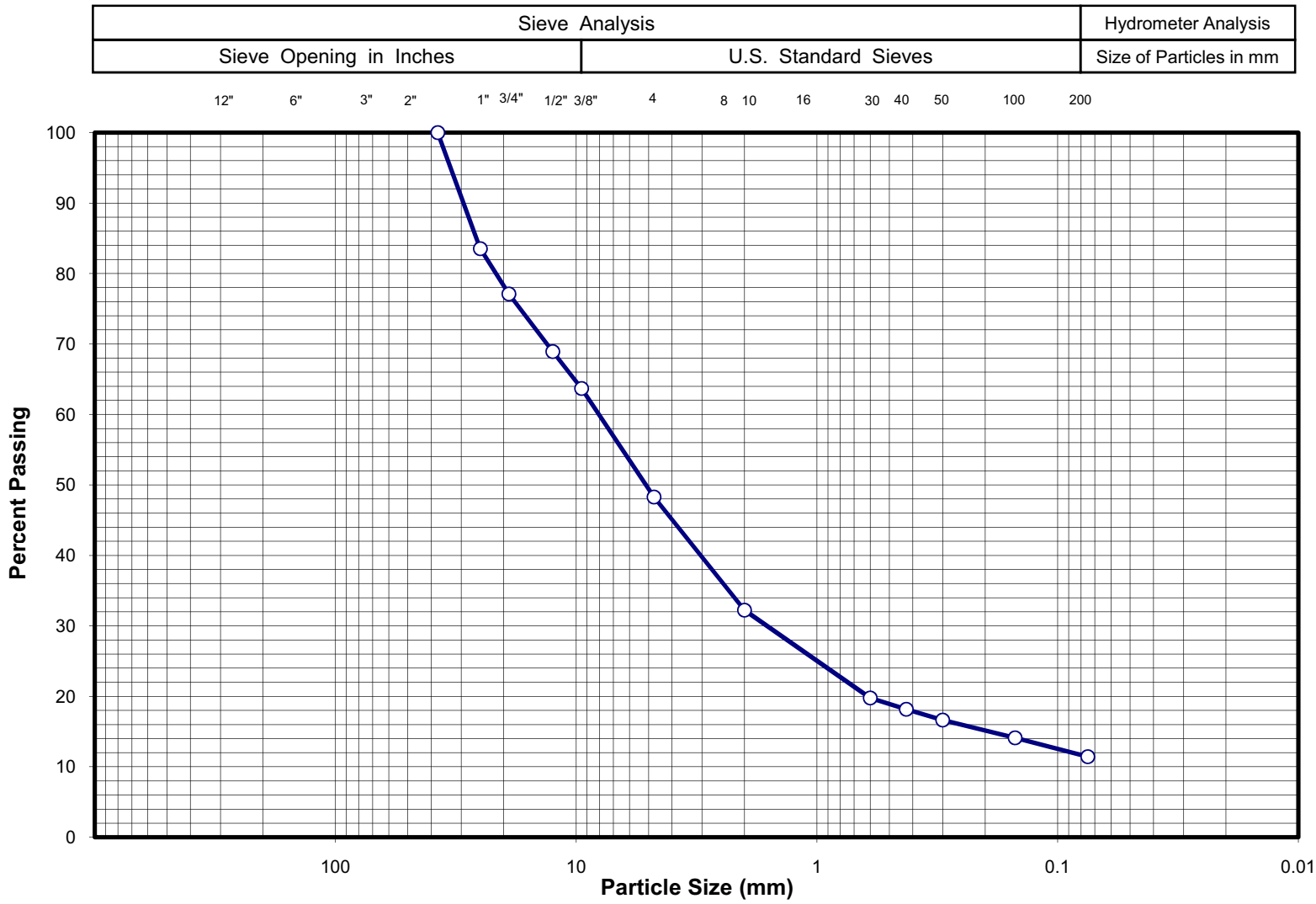
SIEVE ANALYSIS

Drawn By:	MA	Project No.:	211-220
Checked By:	SCS	Figure No.:	-
Date:	02/13/12		

Revised 04/27/2004



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	100
1"	84
¾ "	77
½"	69
⅜"	64
#4	48
#10	32
#40	18
#200	11

Gravel (%)	52	LL	NV	Project Name:	CFL Kyle and Lee Canyons
Sand (%)	37	PL	NP	Sample ID:	YA-9
Fines (%)	11	PI	NP	Sample Depth (ft.):	0-1
Sample Description:	GP - GM / A - 1 - a (0)				

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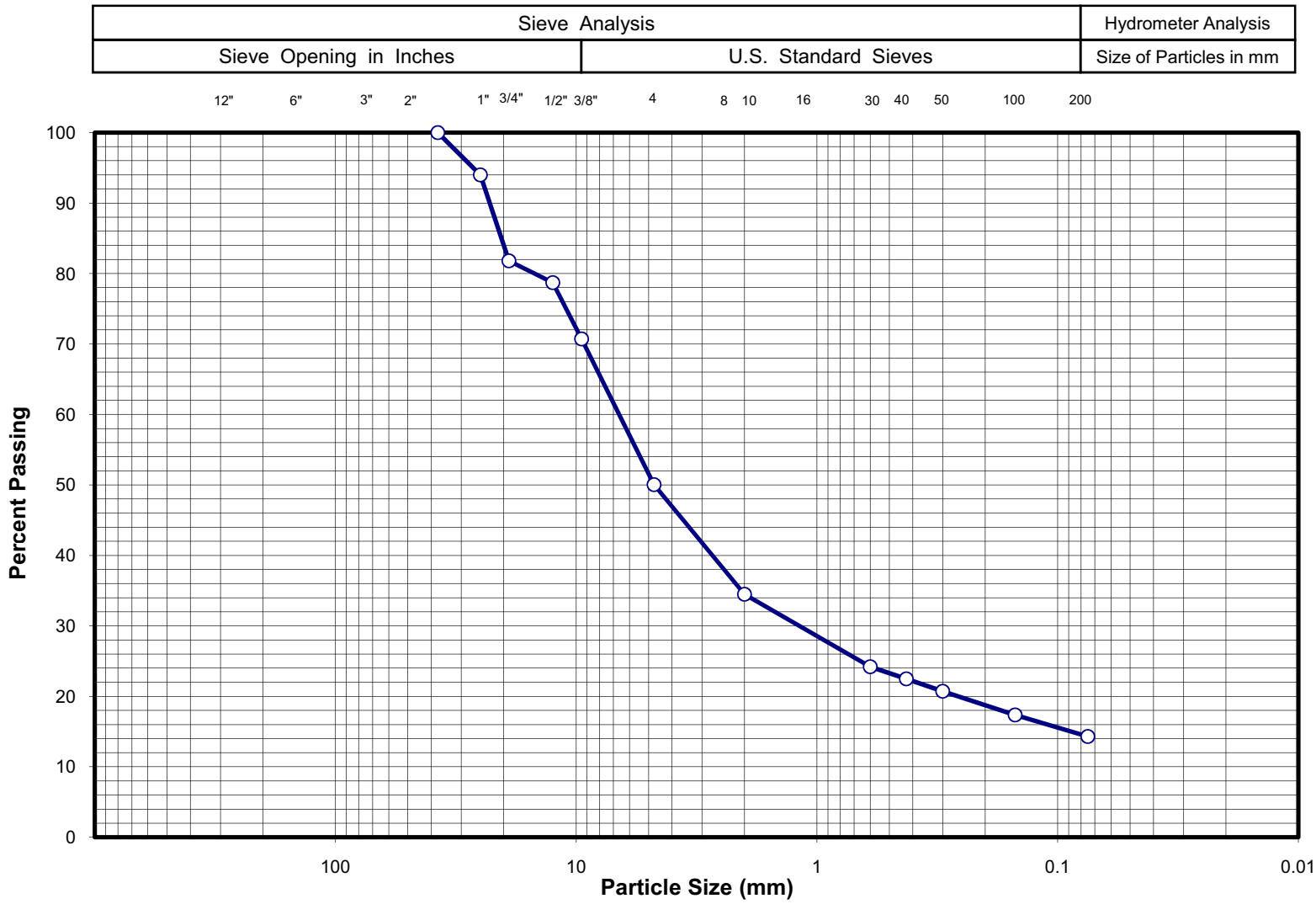
SIEVE ANALYSIS

Drawn By:	MA	Project No.:	211-220
Checked By:	SCS	Figure No.:	-
Date:	02/13/12		

Revised 04/27/2004



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	100
1"	94
¾ "	82
½"	79
⅜"	71
#4	50
#10	34
#40	22
#200	14

Gravel (%)	50	LL	NV	Project Name:	CFL Kyle and Lee Canyons
Sand (%)	36	PL	NP	Sample ID:	YA-11
Fines (%)	14	PI	NP	Sample Depth (ft.):	10-10.9
Sample Description:	GM / A - 1 - a (0)				

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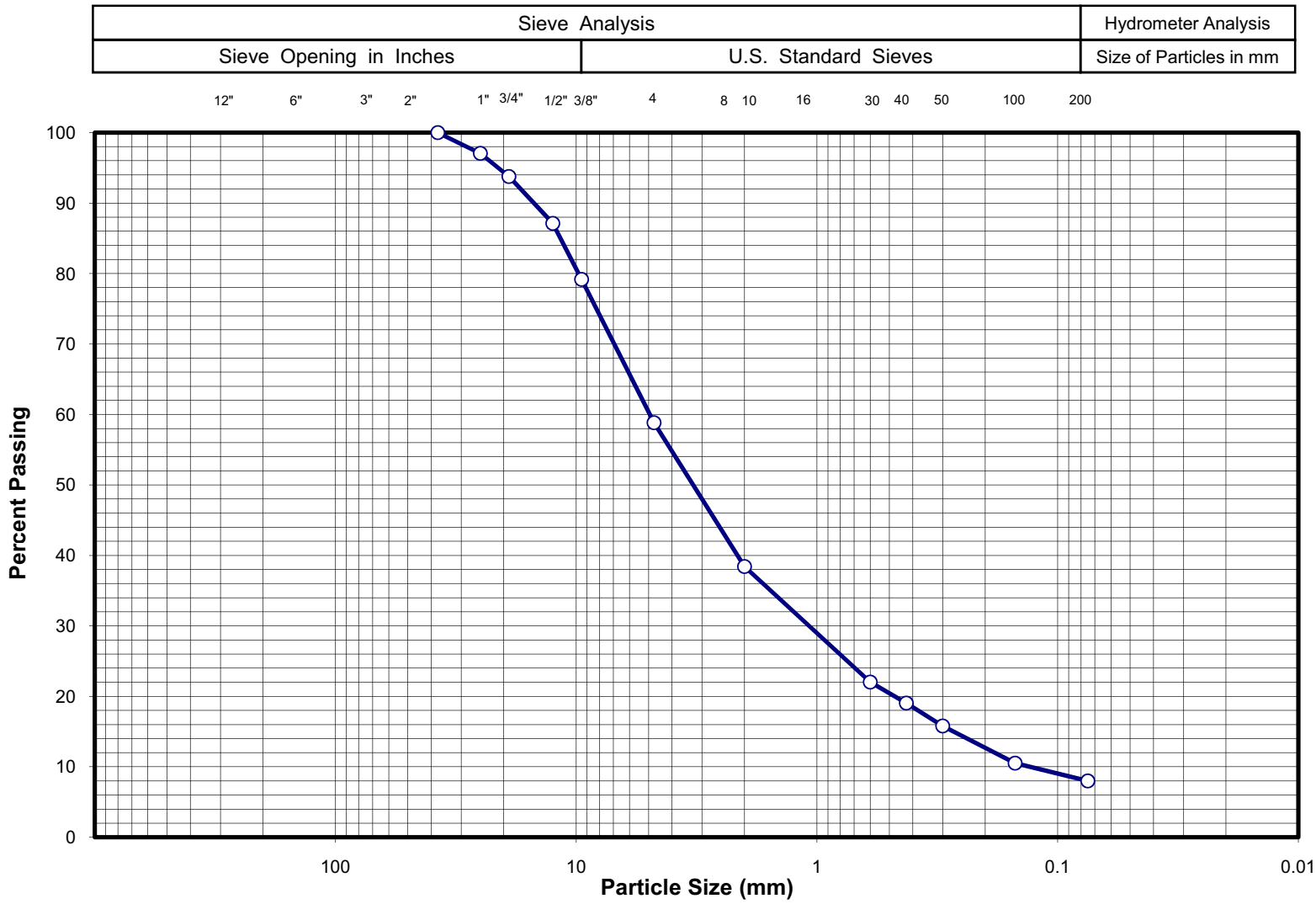
SIEVE ANALYSIS

Drawn By:	MA	Project No.:	211-220
Checked By:	SCS	Figure No.:	-
Date:	02/13/12		

Revised 04/27/2004



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	100
1"	97
¾ "	94
½"	87
⅜"	79
#4	59
#10	38
#40	19
#200	8

Gravel (%)	41	LL	NV	Project Name:	CFL Kyle and Lee Canyons
Sand (%)	51	PL	NP	Sample ID:	YA-12
Fines (%)	8	PI	NP	Sample Depth (ft.):	15-15.8
Sample Description:	SW-SM / A - 1 - a (0)				

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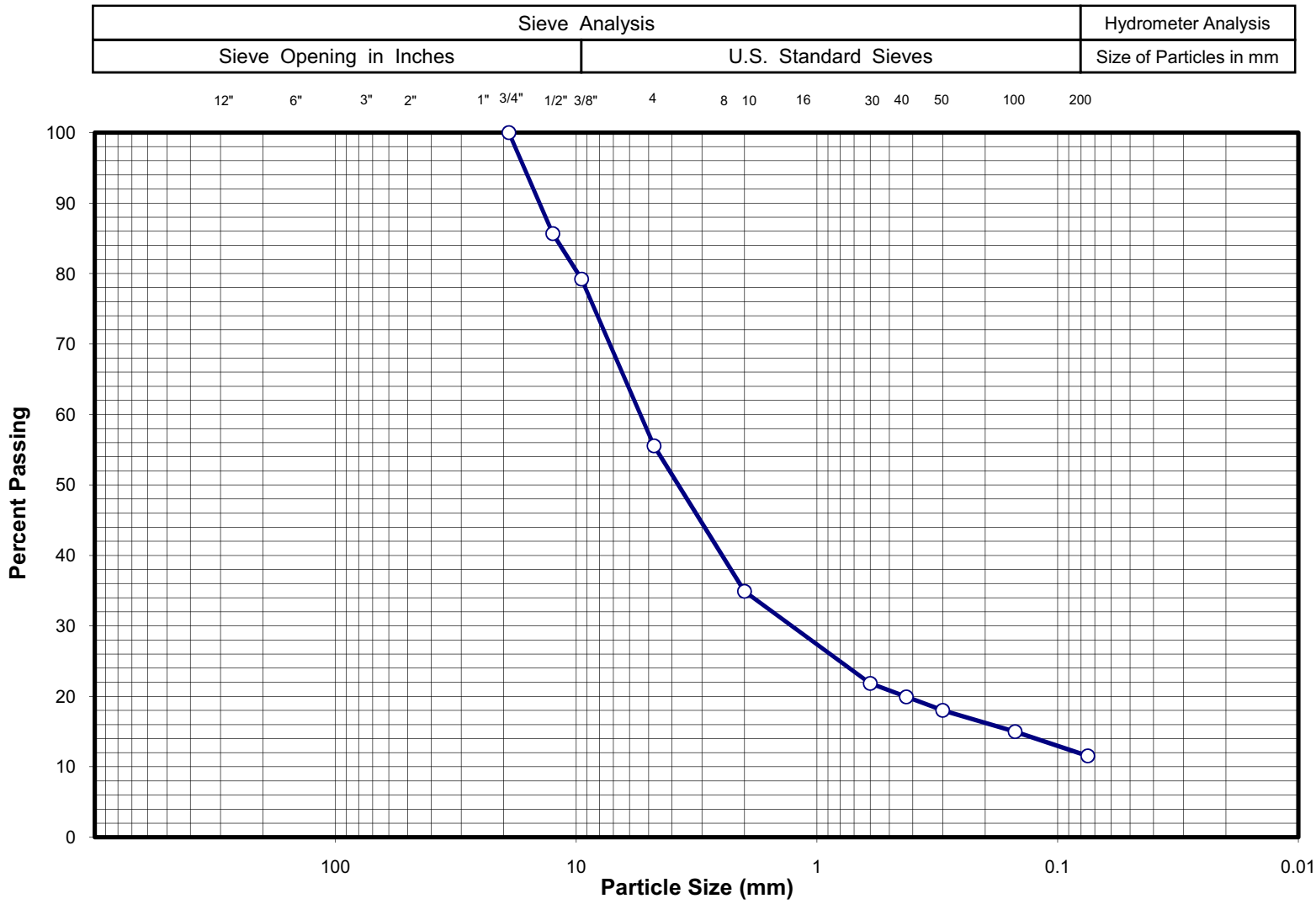
SIEVE ANALYSIS

Drawn By:	MA	Project No.:	211-220
Checked By:	SCS	Figure No.:	-
Date:	02/13/12		

Revised 04/27/2004



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	-
1"	-
¾ "	100
½"	86
⅜"	79
#4	56
#10	35
#40	20
#200	12

Gravel (%)	44	LL	NV	Project Name:	CFL Kyle and Lee Canyons
Sand (%)	44	PL	NP	Sample ID:	YA-14
Fines (%)	12	PI	NP	Sample Depth (ft.):	5-6.5
Sample Description:					

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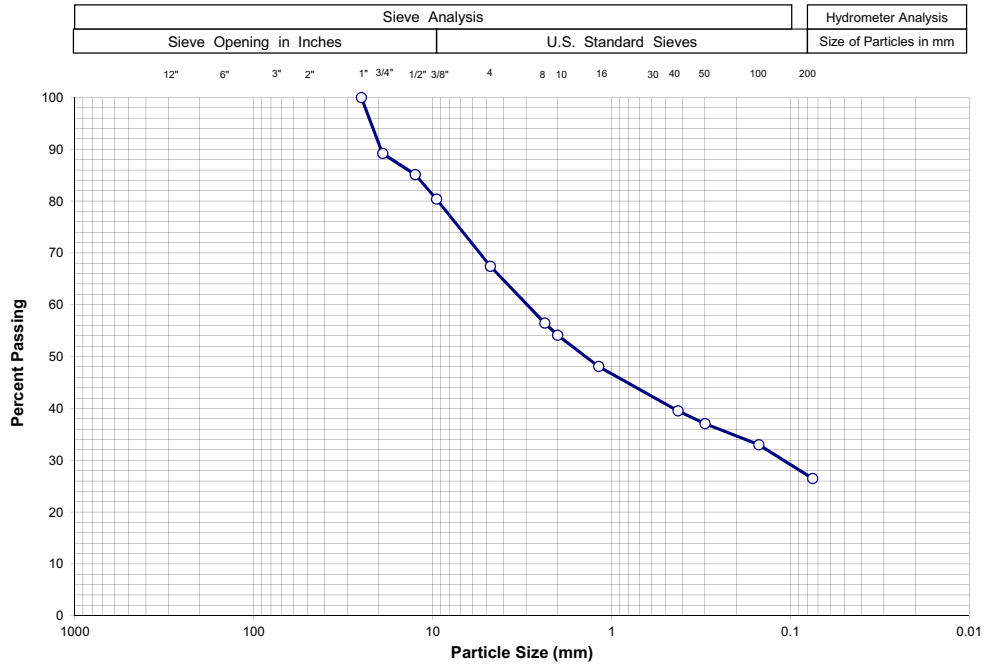
SIEVE ANALYSIS

Drawn By:	MA	Project No.:	211-220
Checked By:	SCS	Figure No.:	-
Date:	02/13/12		

Revised 04/27/2004



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	-
1"	100
¾ "	89
½"	85
⅜"	80
#4	67
#10	54
#40	40
#200	26.5

Gravel (%)	33	LL	17	Project Name:	Kyle Canyon
Sand (%)	41	PL	14	Sample:	YA 12-01
Fines (%)	26	PI	3	Sample Depth (ft.):	2-4'
Sample Description:	0	SM	A-2-4	(0)	

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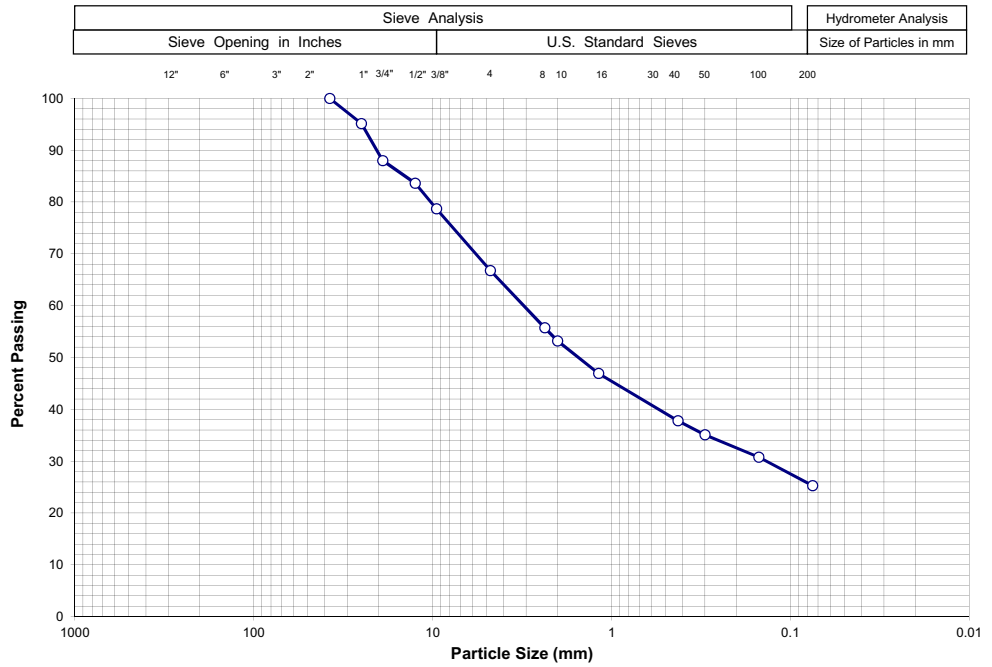
SIEVE ANALYSIS

Drawn By:	TLA	Project No.:	211-220A
Checked By:	TLA	Figure No.:	-
Date:	07/05/12		



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	100
1"	95
¾ "	88
½"	84
⅜"	79
#4	67
#10	53
#40	38
#200	25.3

Gravel (%)	33	LL	17	Project Name:	Kyle Canyon
Sand (%)	42	PL	14	Sample:	YA 12-02
Fines (%)	25	PI	3	Sample Depth (ft.):	2-4'
Sample Description:	0	SM	A-2-4	(0)	

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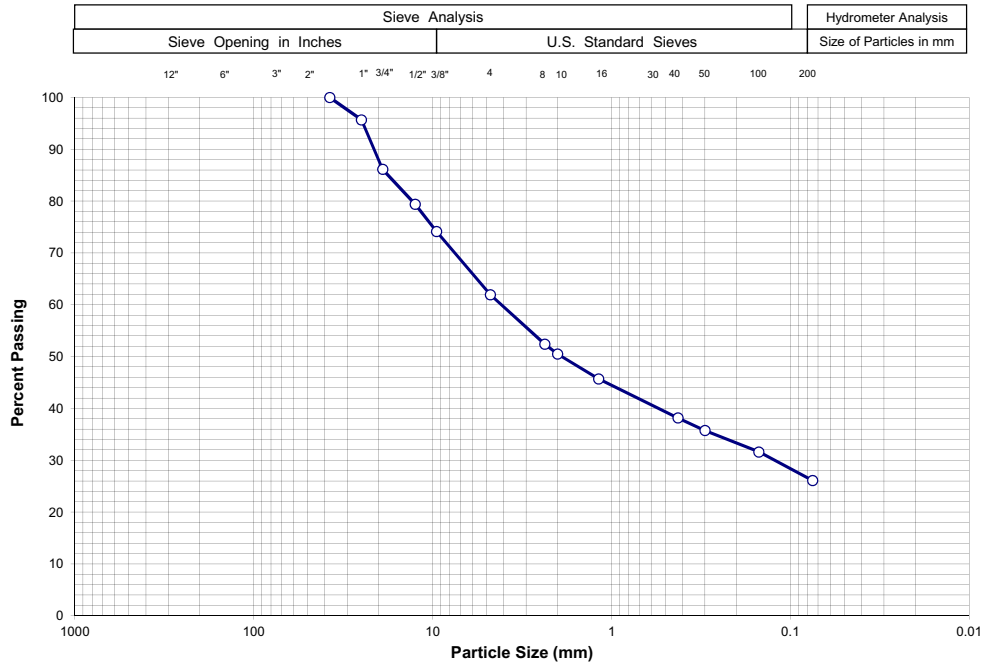
SIEVE ANALYSIS

Drawn By:	TLA	Project No.:	211-220A
Checked By:	TLA	Figure No.:	-
Date:	07/05/12		



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	100
1"	96
¾ "	86
½"	79
⅜"	74
#4	62
#10	50
#40	38
#200	26.1

Gravel (%)	38	LL	19	Project Name:	Kyle Canyon
Sand (%)	36	PL	15	Sample:	YA 12-03
Fines (%)	26	PI	4	Sample Depth (ft.):	2-4'
Sample Description:	0	GM-GC	A-2-4	(0)	

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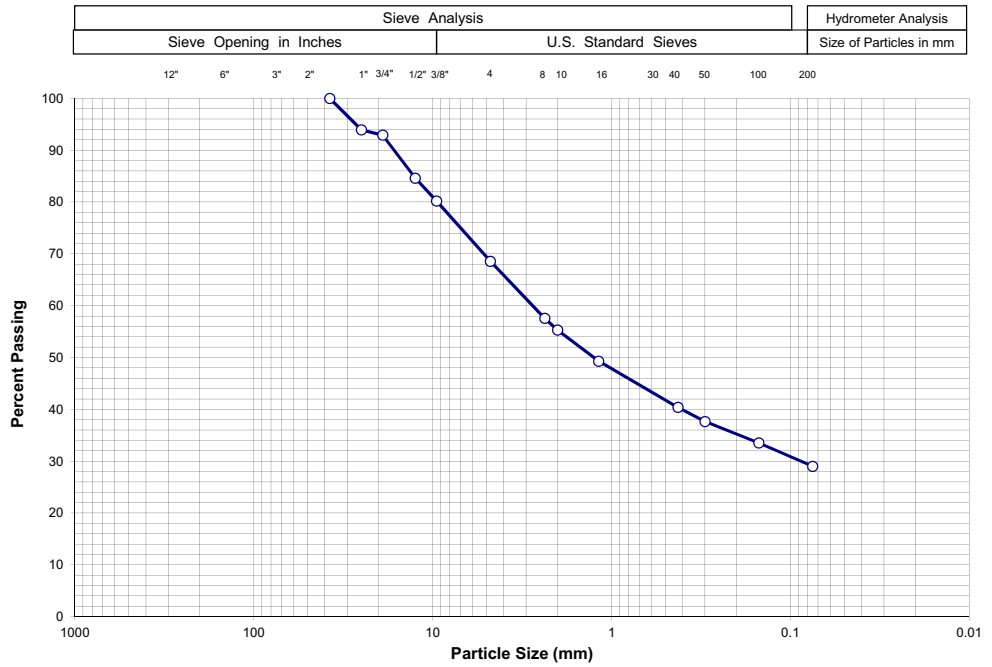
SIEVE ANALYSIS

Drawn By:	TLA	Project No.:	211-220A
Checked By:	TLA	Figure No.:	-
Date:	07/05/12		



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	100
1"	94
¾ "	93
½"	85
⅜"	80
#4	69
#10	55
#40	40
#200	29.0

Gravel (%)	31	LL	20	Project Name:	Kyle Canyon
Sand (%)	40	PL	14	Sample:	YA 12-04
Fines (%)	29	PI	6	Sample Depth (ft.):	2-4'
Sample Description:	0	SM-SC	A-2-4	(0)	

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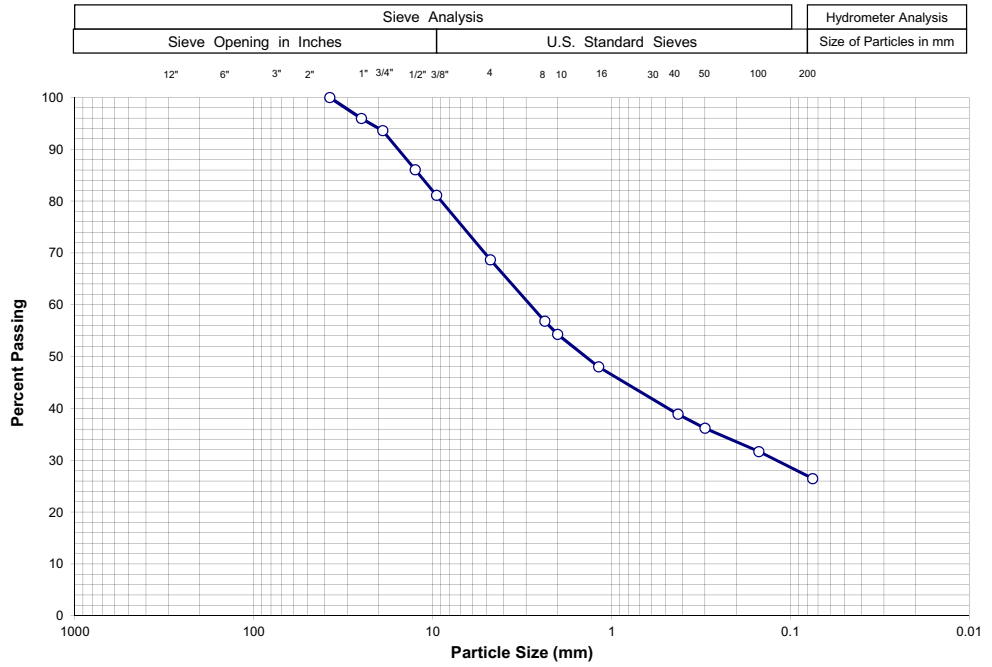
SIEVE ANALYSIS

Drawn By:	TLA	Project No.:	211-220A
Checked By:	TLA	Figure No.:	-
Date:	07/05/12		



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	100
1"	96
¾ "	94
½"	86
⅜"	81
#4	69
#10	54
#40	39
#200	26.5

Gravel (%)	31	LL	17	Project Name:	Kyle Canyon
Sand (%)	43	PL	14	Sample:	YA 12-05
Fines (%)	26	PI	3	Sample Depth (ft.):	2-4'
Sample Description:	0	SM	A-2-4	(0)	

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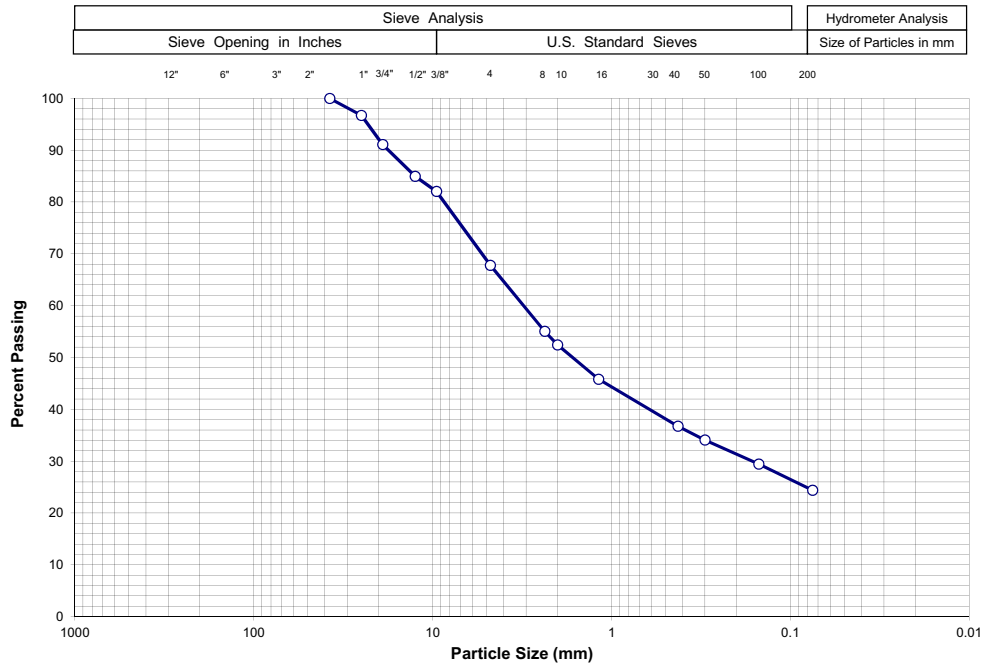
SIEVE ANALYSIS

Drawn By:	TLA	Project No.:	211-220A
Checked By:	TLA	Figure No.:	-
Date:	07/05/12		



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	100
1"	97
¾ "	91
½"	85
⅜"	82
#4	68
#10	52
#40	37
#200	24.4

Gravel (%)	32	LL	20	Project Name:	Kyle Canyon
Sand (%)	44	PL	15	Sample:	YA 12-06
Fines (%)	24	PI	5	Sample Depth (ft.):	2-4'
Sample Description:	0	SM-SC	A-1-b	(0)	

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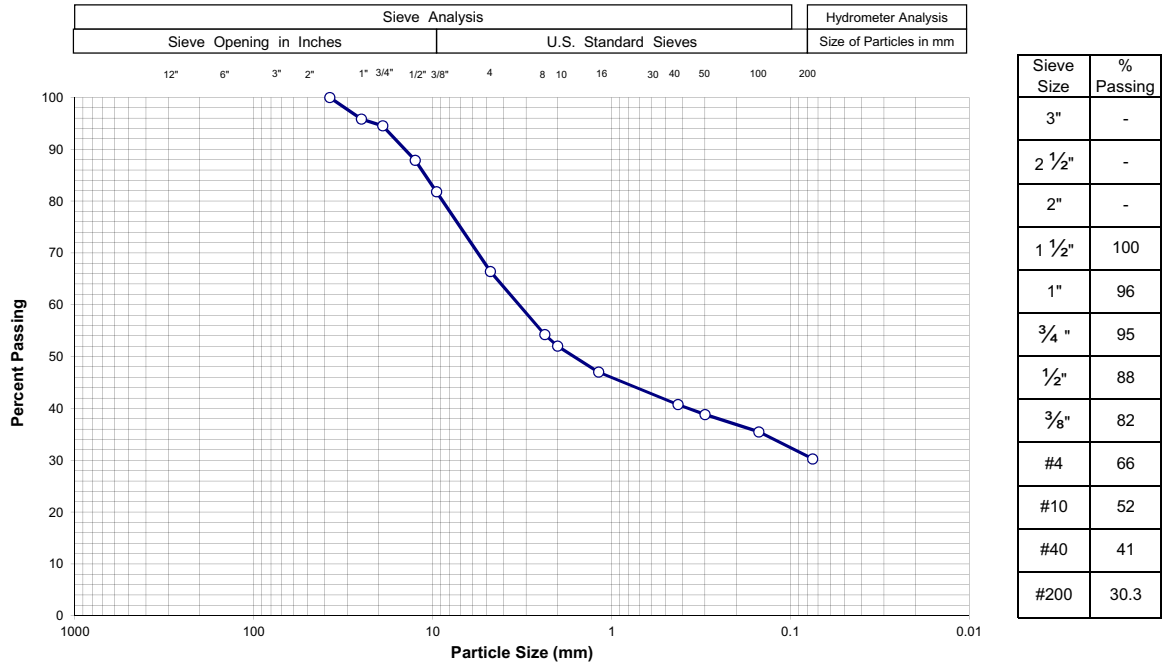
SIEVE ANALYSIS

Drawn By:	TLA	Project No.:	211-220A
Checked By:	TLA	Figure No.:	-
Date:	07/05/12		



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	100
1"	96
¾ "	95
½"	88
⅜"	82
#4	66
#10	52
#40	41
#200	30.3

Gravel (%)	34	LL	26	Project Name:	Kyle Canyon
Sand (%)	36	PL	17	Sample:	YA 12-07
Fines (%)	30	PI	9	Sample Depth (ft.):	2-4'
Sample Description:	0	SC	A-2-4	(0)	

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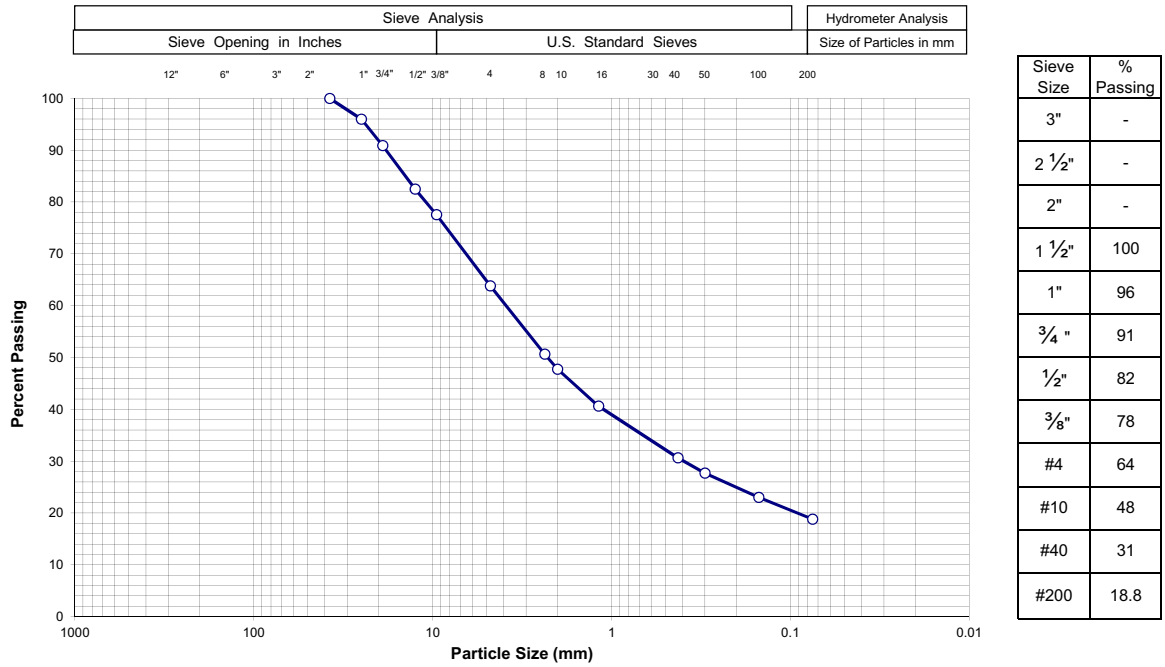
SIEVE ANALYSIS

Drawn By:	TLA	Project No.:	211-220A
Checked By:	TLA	Figure No.:	-
Date:	07/05/12		



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	100
1"	96
¾ "	91
½"	82
⅜"	78
#4	64
#10	48
#40	31
#200	18.8

Gravel (%)	36	LL	14	Project Name:	Kyle Canyon
Sand (%)	45	PL	13	Sample:	YA 12-08
Fines (%)	19	PI	1	Sample Depth (ft.):	2-4'
Sample Description:	0	SM	A-1-b	(0)	

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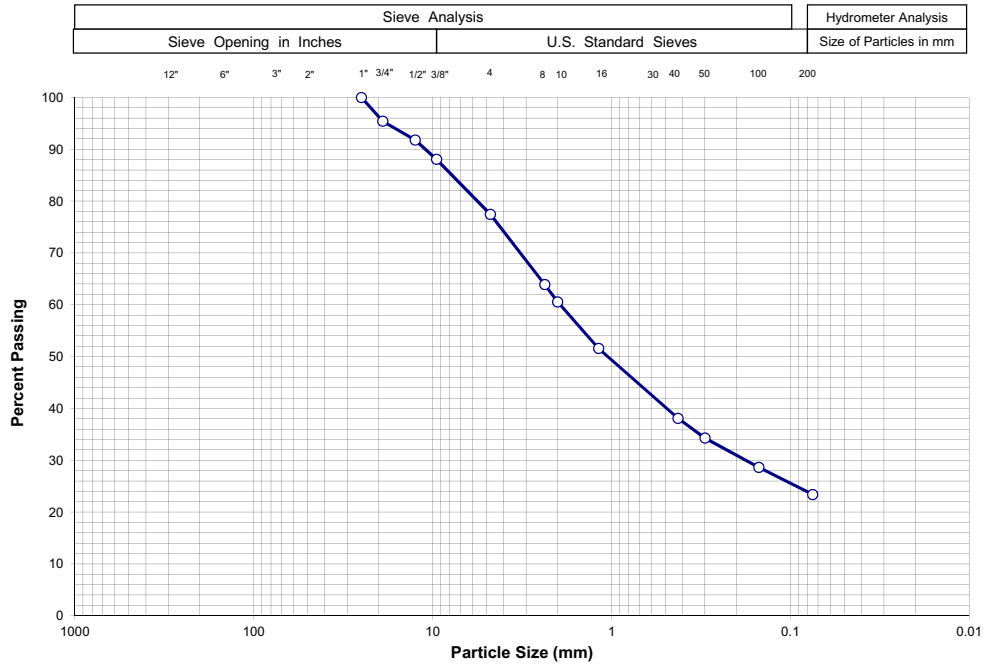
SIEVE ANALYSIS

Drawn By:	TLA	Project No.:	211-220A
Checked By:	TLA	Figure No.:	-
Date:	07/05/12		



Sieve Size	% Passing
3"	-
2 ½"	-
2"	-
1 ½"	-
1"	100
¾ "	95
½"	92
⅜"	88
#4	77
#10	61
#40	38
#200	23.4

Gravel (%)	23	LL	15	Project Name:	Kyle Canyon
Sand (%)	54	PL	14	Sample:	YA 12-09
Fines (%)	23	PI	1	Sample Depth (ft.):	2-4'

Sample Description: 0 SM A-1-b (0)

Yeh & Associates, Inc.
Geotechnical Engineering Consultants

SIEVE ANALYSIS

Drawn By:	TLA	Project No.:	211-220A
Checked By:	TLA	Figure No.:	-
Date:	07/05/12		

YEH AND ASSOCIATES, INC

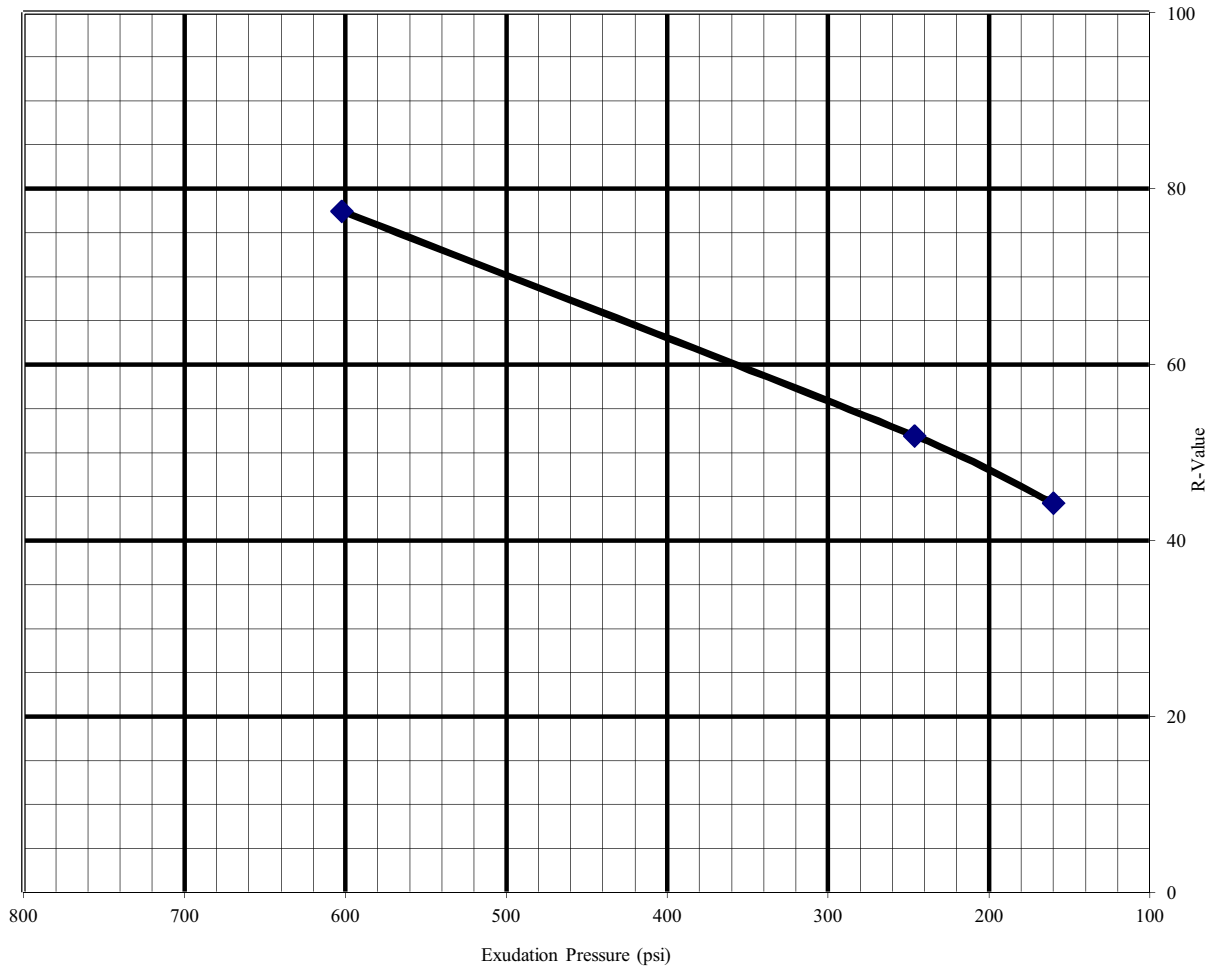
R-Value Test Report

Project Number: 211-220 A **Project Name:** CFL Kyle Canyons Investigation NV

Sample Id: YA-12-2 **Depth (ft):**

Soil Description: **Classification:**

R-Value at 300 psi exudation pressure = 57



Test No.	Compact. Press. (psi)	Density (pcf)	Moist. (%)	Horizont. Pressure (psi)'@ 160 psi	Sample Height (in).	Exud. Pressure (psi)	R Value	R Value Correct.
1	300	143.5	9	68	2.31	160	46	44
2	300	142.1	8	59	2.32	246	54	52
3	300	142.4	7	32	2.61	602	74	77

Tested by: Mustapha Aichiouene **Checked by:** RFL

Rev.2-2/2011

YEH AND ASSOCIATES, INC

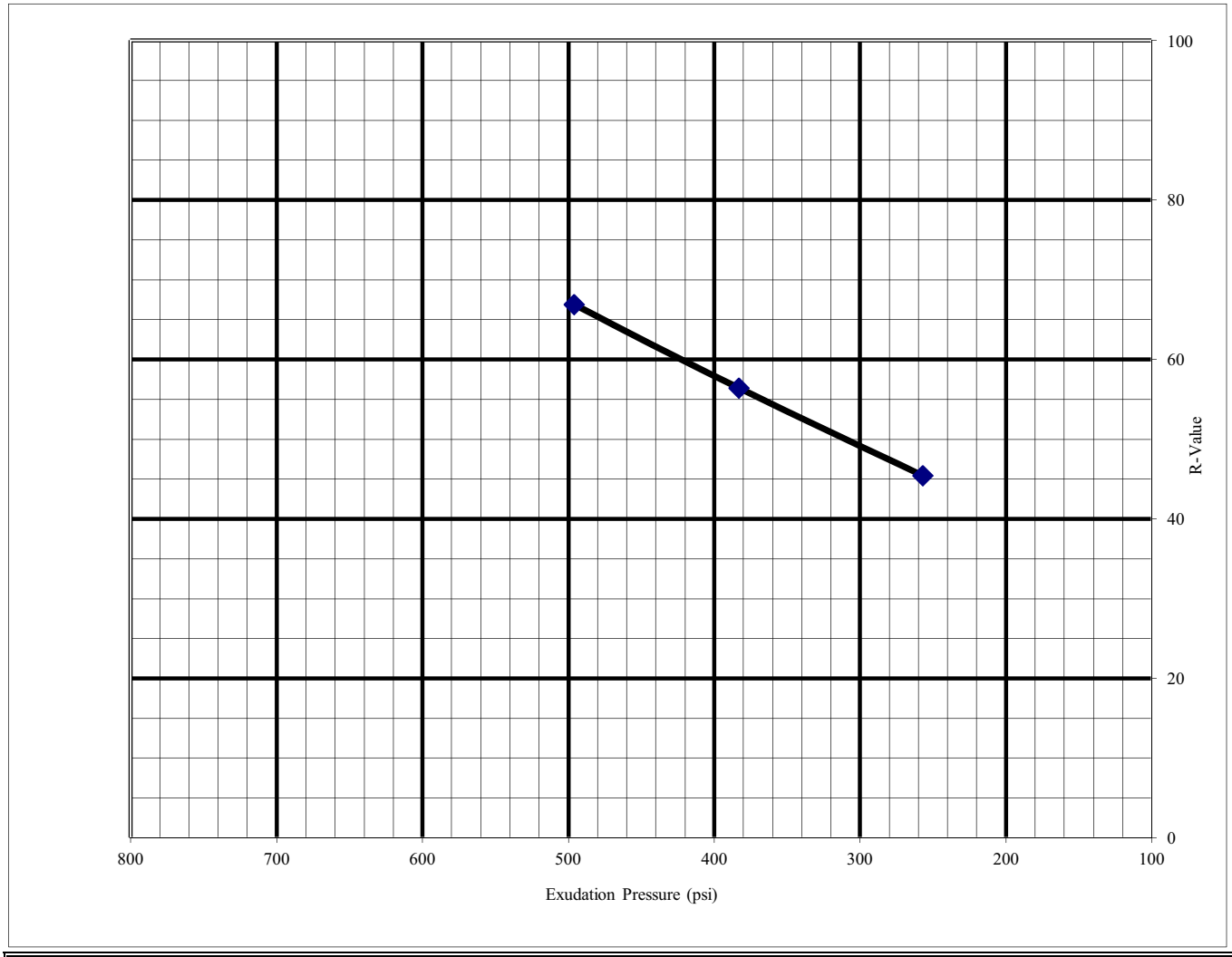
R-Value Test Report

Project Number: 211-220 A **Project Name:** CFL Kyle Canyons Investigation NV

Sample Id: YA-12-3 **Depth (ft):**

Soil Description: **Classification:**

R-Value at 300 psi exudation pressure = **48**



Test No.	Compact. Press. (psi)	Density (pcf)	Moist. (%)	Horizont. Pressure (psi)'@ 160 psi	Sample Height (in).	Exud. Pressure (psi)	R Value	R Value Correct.
1	300	138.6	8	69	2.38	257	47	45
2	300	138.8	8	52	2.49	383	58	56
3	300	139.1	7	49	2.51	496	62	67

Tested by: Mustapha Aichiouene **Checked by:** RFL

Rev.2-2/2011

YEH AND ASSOCIATES, INC

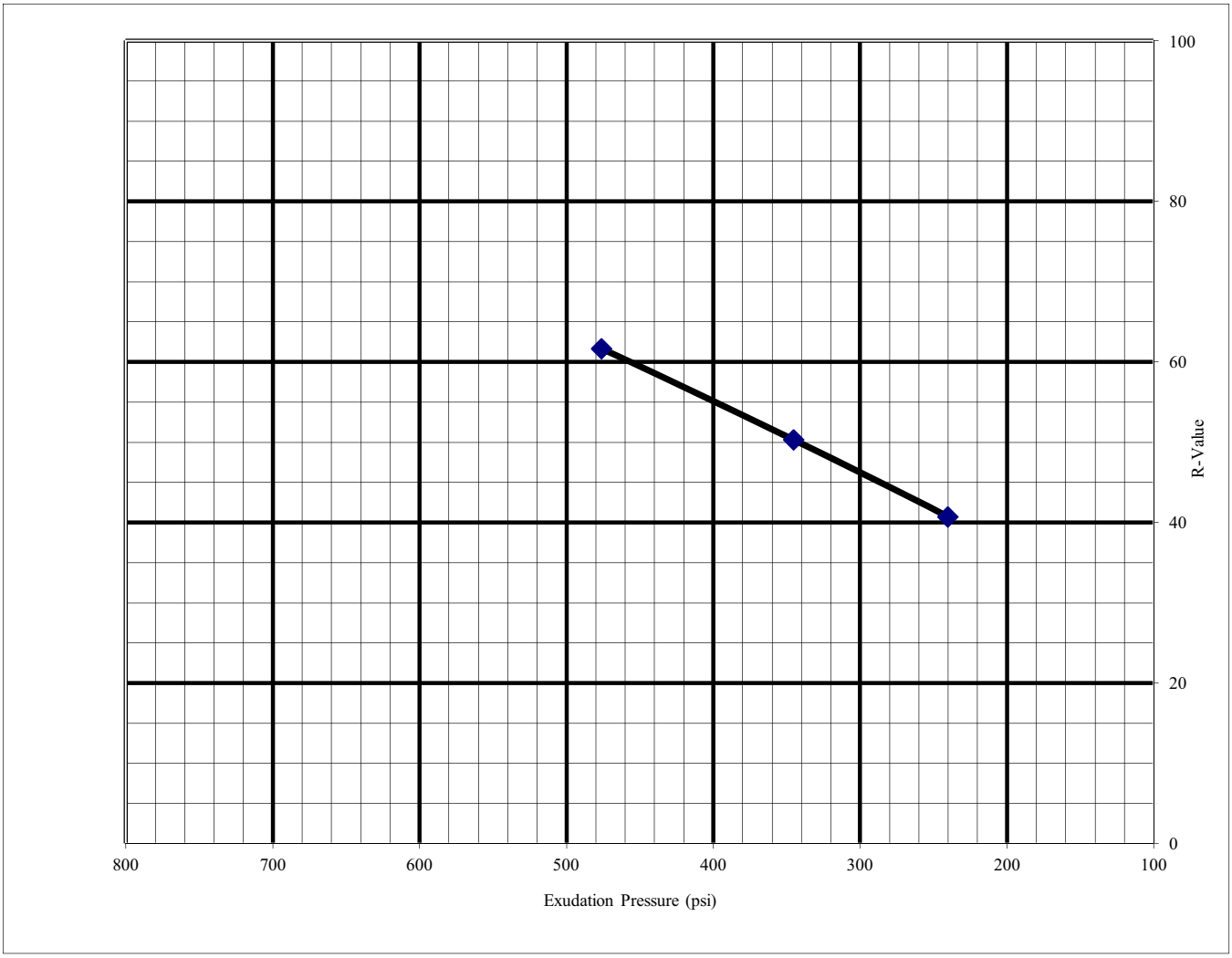
R-Value Test Report

Project Number: 211-220 A **Project Name:** CFL Kyle Canyons Investigation NV

Sample Id: YA-12-5 **Depth (ft):**

Soil Description: **Classification:**

R-Value at 300 psi exudation pressure = **46**



Test No.	Compact. Press. (psi)	Density (pcf)	Moist. (%)	Horizont. Pressure (psi)'@ 160 psi	Sample Height (in).	Exud. Pressure (psi)	R Value	R Value Correct.
1	300	144.8	7.5	75	2.32	240	43	41
2	300	143.8	7	60	2.42	345	52	50
3	300	143.6	7	49	2.39	476	64	62

Tested by: Mustapha Aichiouene **Checked by:** RFL

Rev.2-2/2011

YEH AND ASSOCIATES, INC

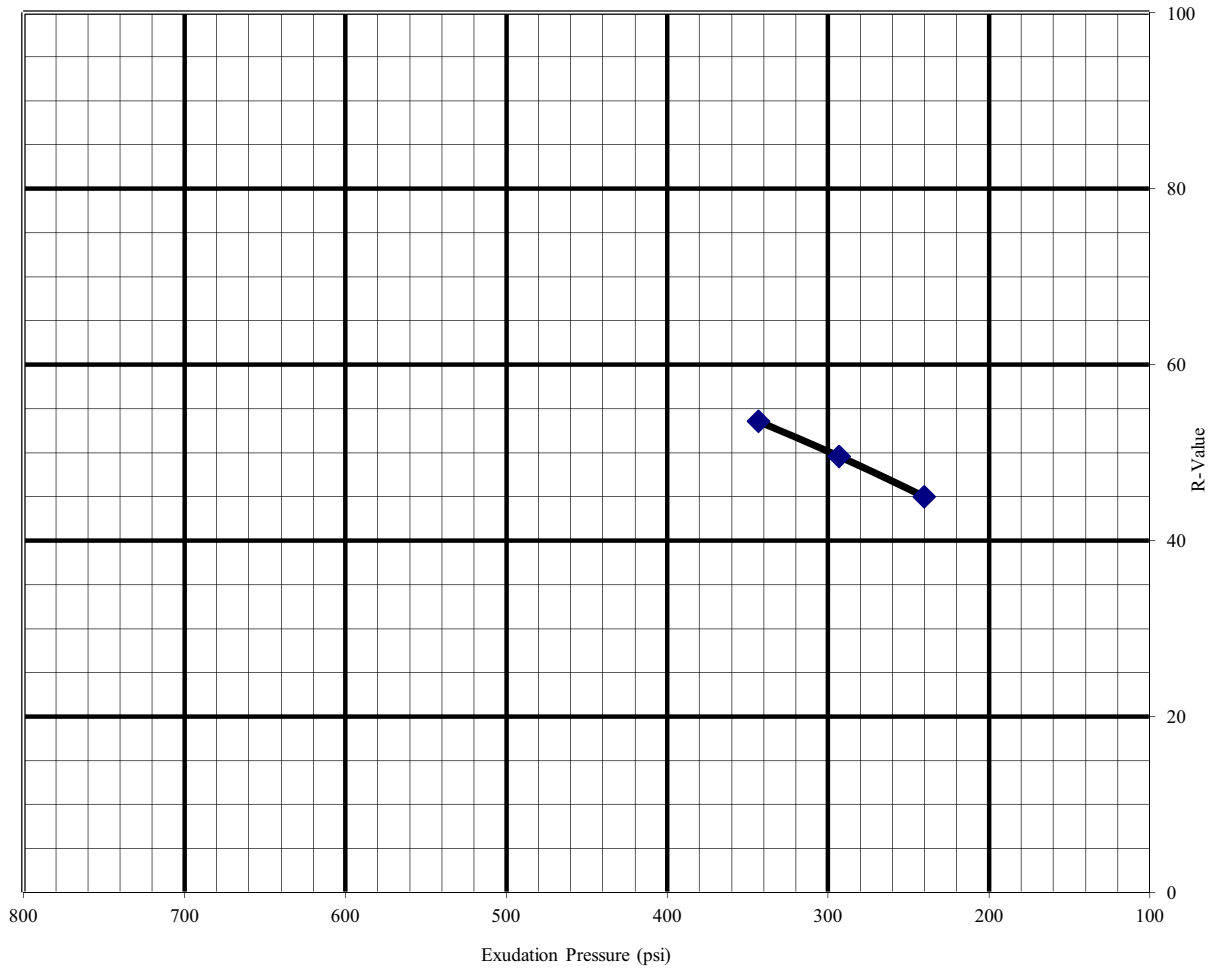
R-Value Test Report

Project Number: 211-220 A **Project Name:** CFL Kyle Canyons Investigation NV

Sample Id: YA-12-6 **Depth (ft):**

Soil Description: **Classification:**

R-Value at 300 psi exudation pressure = **50**



Test No.	Compact. Press. (psi)	Density (pcf)	Moist. (%)	Horizont. Pressure (psi)'@ 160 psi	Sample Height (in).	Exud. Pressure (psi)	R Value	R Value Correct.
1	300	0.0	8	68	2.36	240	47	45
2	300	142.6	8	62	2.45	293	52	50
3	300	0.0	7	58	2.48	343	56	54

Tested by: Mustapha Aichiouene **Checked by:** RFL

Rev.2-2/2011

YEH AND ASSOCIATES, INC

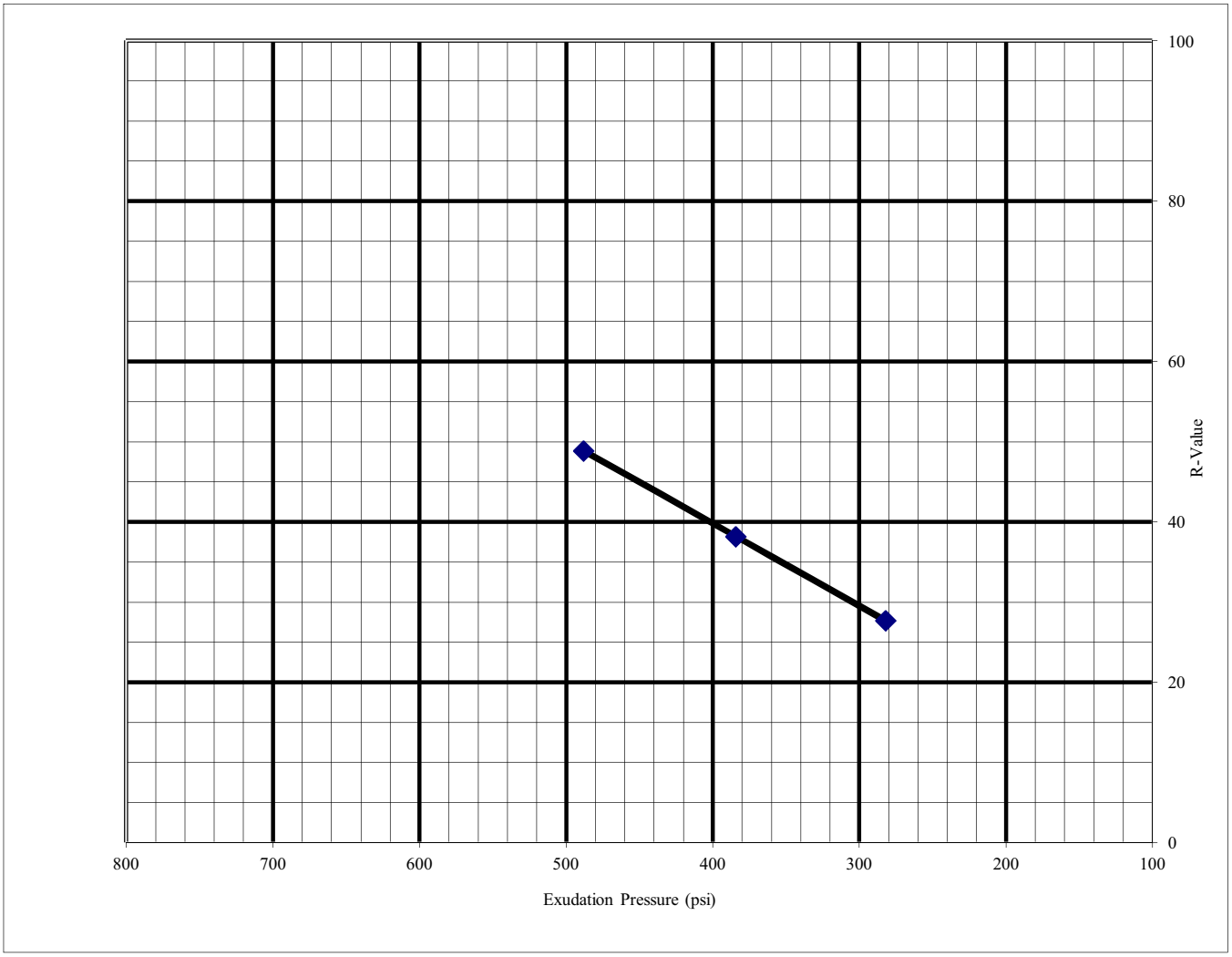
R-Value Test Report

Project Number: 211-220 A **Project Name:** CFL Kyle Canyons Investigation NV

Sample Id: YA-12-7 **Depth (ft):**

Soil Description: **Classification:**

R-Value at 300 psi exudation pressure = **29**



Test No.	Compact. Press. (psi)	Density (pcf)	Moist. (%)	Horizont. Pressure (psi)'@ 160 psi	Sample Height (in).	Exud. Pressure (psi)	R Value	R Value Correct.
1	300	133.3	9	77	2.54	488	44	49
2	300	133.5	10	82	2.39	384	40	38
3	300	133.0	10	97	2.43	282	30	28

Tested by: Mustapha Aichiouene **Checked by:** RFL

Rev.2-2/2011

YEH AND ASSOCIATES, INC

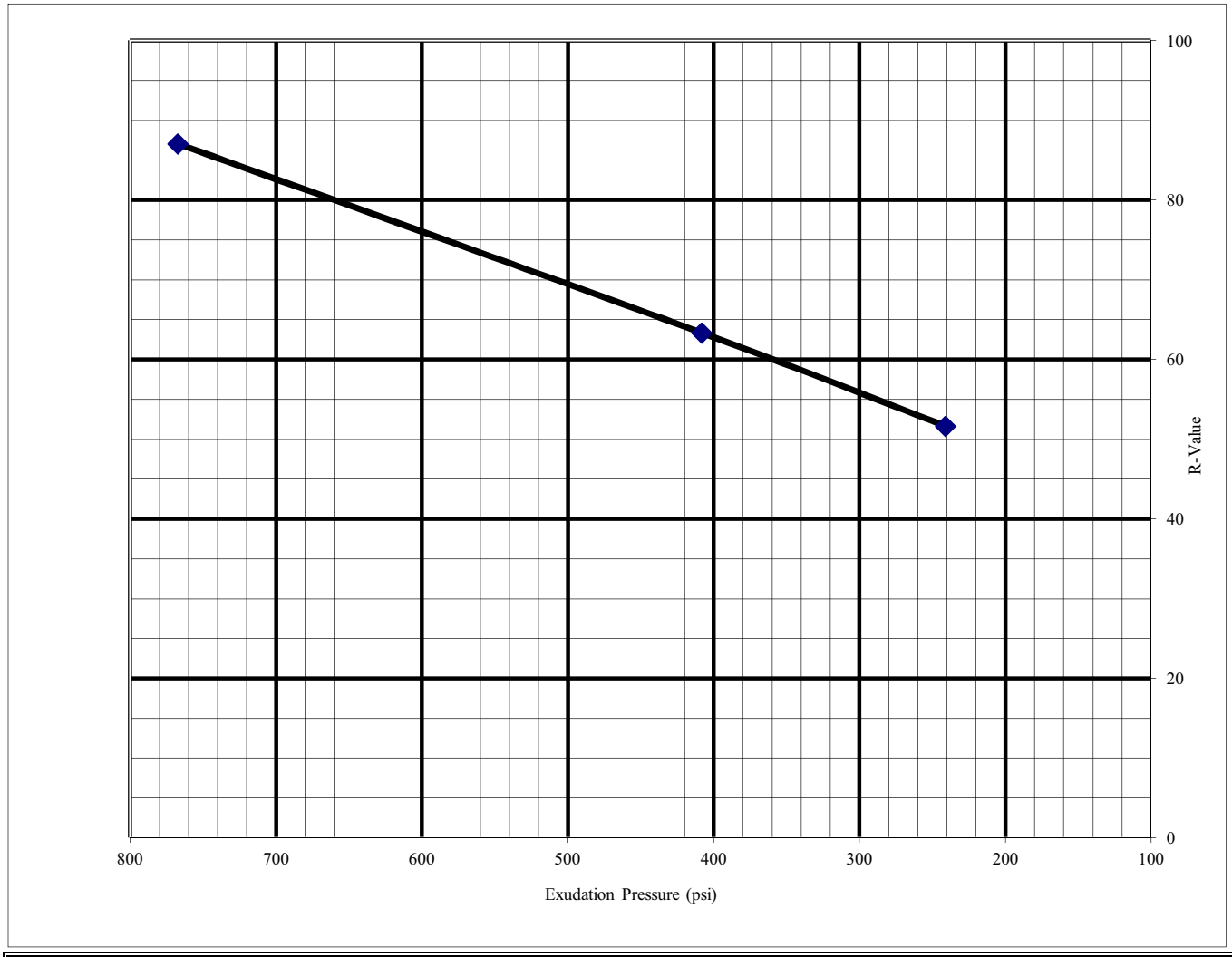
R-Value Test Report

Project Number: 211-220 A **Project Name:** CFL Kyle Canyons Investigation NV

Sample Id: YA-12-9 **Depth (ft):**

Soil Description: s **Classification:**

R-Value at 300 psi exudation pressure = **55**



Test No.	Compact. Press. (psi)	Density (pcf)	Moist. (%)	Horizont. Pressure (psi)'@ 160 psi	Sample Height (in).	Exud. Pressure (psi)	R Value	R Value Correct.
1	300	145.0	7	58	2.35	241	54	52
2	300	145.0	7	43	2.41	408	65	63
3	300	145.2	6	14	2.42	767	88	87

Tested by: Mustapha Aichiouene **Checked by:** RFL

Rev.2-2/2011

Appendix D, Pavement Design and Traffic Information

Kyle Canyon Road ESAL Calculations

Worksheet for Calculating 18kip equivalent single axle load (ESAL) applications.

PROJECT: Kyle and Lee Canyon Roads, Clark County, NV
LOCATION: Kyle Canyon Road - SH 157 Roundabout **ANALYSIS PERIOD(YR):** 35
Pavement Type : RIGID **NUMBER OF LANES:** 2
Traffic Growth Factor = 1.5% per year

2010 ADT 2,900 2045 ADT: 4,890 Avg ADT: 3,895

VEHICLE TYPES	FHWA Class	%ADT	ADT	ADT X 365 X Dsn Yr	ESAL FACTOR	DESIGN ESAL
Passenger Car	2	98.19%	3,825	48,857,994	0.0008	39,086
Buses	4	0.17%	7	84,590	1.75	148,032
2 Ax	5	1.00%	39	497,586	0.7	348,310
3 Ax	6	0.30%	12	149,276	1.5	223,914
4 Ax	8	0.17%	7	84,590	2	169,179
5 Ax	9	0.17%	7	84,590	2.3	194,556
TOTAL			**3,895**			**1,123,078**

DESIGN ESAL'S	1,123,078
X Direction Factor	0.6
X Lane Distribution Factor	1
DESIGN YR TOTAL	**673,847**

35 YEAR TOTAL ESAL's **673,847**

Worksheet for Calculating 18kip equivalent single axle load (ESAL) applications.

PROJECT: Kyle and Lee Canyon Roads, Clark County, NV
LOCATION: Kyle Canyon Road - SH 157 Travel Lanes **ANALYSIS PERIOD(YR):** 20
Pavement Type : FLEXIBLE **NUMBER OF LANES:** 2
Traffic Growth Factor = 1.5% per year

2010 ADT: 2,900 2030 ADT: 3,910 Avg ADT: 3,405

VEHICLE TYPES	FHWA Class	%ADT	ADT	ADT X 365 X Dsn Yr	ESAL FACTOR	DESIGN ESAL
Passenger Car	2	98.19%	3,343	24,406,597	0.0008	19,525
Buses	4	0.17%	6	42,256	1.75	73,948
2 Ax	5	1.00%	34	248,565	0.7	173,996
3 Ax	6	0.30%	10	74,570	1.5	111,854
4 Ax	8	0.17%	6	42,256	2	84,512
5 Ax	9	0.17%	6	42,256	2.3	97,189
TOTAL			**3,405**			**561,024**

DESIGN ESAL'S	561,024
X Direction Factor	0.6
X Lane Distribution Factor	1
DESIGN YR TOTAL	**336,614**

20 YEAR TOTAL ESAL's **336,614**

Lee Canyon Road ESAL Calculations

Worksheet for Calculating 18kip equivalent single axle load (ESAL) applications.

PROJECT: Kyle and Lee Canyon Roads, Clark County, NV
LOCATION: Lee Canyon Road - SH 156 Roundabout **ANALYSIS PERIOD(YR):** 35
Pavement Type : RIGID **NUMBER OF LANES:** 1
Traffic Growth Factor = 1.5% per year

2010 ADT 500 2045 ADT: 850 Avg ADT: 675

VEHICLE TYPES	FHWA Class	%ADT	ADT	ADT X 365 X Dsn Yr	ESAL FACTOR	DESIGN ESAL
Passenger Car	2	98.19%	663	8,467,046	0.0008	6,774
Buses	4	0.17%	1	14,659	1.75	25,654
2 Ax	5	1.00%	7	86,231	0.7	60,362
3 Ax	6	0.30%	2	25,869	1.5	38,804
4 Ax	8	0.17%	1	14,659	2	29,319
5 Ax	9	0.17%	1	14,659	2.3	33,716
TOTAL			**675**			**194,628**

DESIGN ESAL'S	194,628
X Direction Factor	0.6
X Lane Distribution Factor	1
DESIGN YR TOTAL	**116,777**

35 YEAR TOTAL ESAL's **116,777**

Worksheet for Calculating 18kip equivalent single axle load (ESAL) applications.

PROJECT: Kyle and Lee Canyon Roads, Clark County, NV
LOCATION: Lee Canyon Road - SH 156 Travel Lanes **ANALYSIS PERIOD(YR):** 20
Pavement Type : FLEXIBLE **NUMBER OF LANES:** 2
Traffic Growth Factor = 1.5% per year

2010 ADT: 500 2030 ADT: 680 Avg ADT: 590

VEHICLE TYPES	FHWA Class	%ADT	ADT	ADT X 365 X Dsn Yr	ESAL FACTOR	DESIGN ESAL
Passenger Car	2	98.19%	579	4,229,043	0.0008	3,383
Buses	4	0.17%	1	7,322	1.75	12,813
2 Ax	5	1.00%	6	43,070	0.7	30,149
3 Ax	6	0.30%	2	12,921	1.5	19,382
4 Ax	8	0.17%	1	7,322	2	14,644
5 Ax	9	0.17%	1	7,322	2.3	16,840
TOTAL			**590**			**97,211**

DESIGN ESAL'S	97,211
X Direction Factor	0.6
X Lane Distribution Factor	1
DESIGN YR TOTAL	**58,327**

20 YEAR TOTAL ESAL's **58,327**

STATE OF NEVADA
AVERAGE DAY VEHICLE CLASSIFICATION DISTRIBUTION REPORT
By Route

Route / Street	Segment Description						Motor Cycles	Light Trucks			Heavy Trucks			Truck AADT	Year of Data
	From	CO.	M. P.	To	CO.	M. P.		Buses	2 Ax	3+ Ax	4 Ax	5 Ax	6+ Ax		
SR28	US50	DO	0.00	Village Blvd.	WA	7.03	175	30	60	20	15	65	10	200	2010
SR28	Village Blvd	WA	7.03	SR431	WA	8.13	175	65	700	40	120	95	10	1,030	2008
SR28	SR431	WA	8.13	California	WA	10.99	200	70	975	30	140	80	5	1,300	2008
SR88	California	DO	0.00	Centerville Ln.	DO	4.37	60	25	175	35	60	90	5	390	2009
SR88	Centerville Ln.	DO	4.37	US395	DO	7.87	60	25	115	15	50	100	5	310	E
SR117	US50	CH	0.00	US95	CH	6.91	15	15	25	15	10	145	25	235	2010
SR146	IR15	CL	0.00	IR215 (Pecos Interchange)	CL	6.67	5	35	100	115	15	215	105	585	2005
SR157	Kyle Canyon Recreation Area	CL	0.00	US95	CL	21.43	110	5	30	10	5	5	0	55	2010
SR159	SR-160 (Pahrump Vy Rd)	CL	0.00	West Urban Limit.	CL	13.62	5	15	35	5	10	115	25	205	2003
SR159	West Urban Limits.	CL	13.62	SR612 Nellis Blvd.	CL	31.01									
SR160	SR604 (Las Vegas Blvd.)	CL	0.00	Rainbow Blvd	CL	4.32	5	150	680	320	75	985	280	2,490	2003
SR160	Rainbow Blvd.	CL	4.32	SR159 (Blue Diamond)	CL	11.00	5	35	210	25	50	210	40	570	2003
SR160	SR159 (Blue Diamond)	CL	11.00	SR372 (Charles Brown Hwy)	NY	9.74	285	70	135	20	40	85	5	355	2009
SR160	SR372 (Charles Brown Hwy)	NY	9.74	US95	NY	37.03	20	10	25	5	20	45	15	120	2009
SR163	US95	CL	0.00	Needles Hwy.	CL	15.74	110	130	200	30	140	875	30	1,405	2010
SR 163	Laughlin Civic Dr	CL	15.74	Arizona	CL	19.26									
SR 170	IR15	CL	0.00	W. Mesquite Blvd.	CL	12.27									
SR206	SR88 Woodsford Rd.	DO	0.00	SR207	DO	6.20	100	5	50	5	5	15	5	85	2003
SR206	SR207	DO	6.20	Genoa Ln.	DO	15.44	90	10	30	5	5	10	5	65	2009
SR207	US50	DO	0.00	SR206	DO	11.09	100	35	55	15	5	65	10	185	2009
SR207	SR206	DO		SR88	DO		5	10	75	10	10	25	5	135	2003
SR208	US395	DO	0.00	US95 Alt.	LY	29.10	15	5	10	5	5	15	5	45	2009
SR225	Idaho St.	EL	0.00	SR226 (Deep Creek Rd.)	EL	27.14	5	5	30	5	10	25	10	85	2005
SR227	SR535 (Idaho St.)	EL	0.00	Spring Creek	EL	11.56									
SR278	US50	EU	0.00	IR80 (Carlin)	EL	4.91	0	0	20	90	5	40	20	175	2008
SR294	PE/HU line	HU	0.00	SR-794 (3rd. St.)	HU	8.97									
SR305	US50	LA	0.00	Fish Creek Basin Rd.	LA	49.97	15	5	5	5	5	25	15	60	2009
SR305	Fish Creek Basin Rd.	LA	49.97	SR304	LA	87.72	10	5	10	5	5	30	65	120	2009
SR318	US93 / SR375	LN	0.00	US6	WP	22.57	5	5	65	5	31	230	25	361	2009
SR319	US93	LN	0.00	NV / UT State line	LN	20.91	0	5	15	15	5	25	10	75	2008
SR339	SR208 (Yerrington Rd.)	LY	0.00	US95 Alt.	LY	11.52	15	10	30	5	10	60	5	120	2010
SR341	US50	LY	0.00	SR-342 (in V. C.)	ST	3.14	0	25	250	50	65	105	25	520	2008
SR341	SR342. (in V. C.)	ST	3.14	US395	WA	6.30	300	50	120	50	15	90	30	355	2010
SR360	US6	MI	0.00	US95	MI	22.25	0	80	20	5	10	230	10	355	2008
SR362	US95	MI	0.00	US95	MI	1.30	40	75	125	30	185	455	45	915	E
SR373	California	NY	0.00	US95	NY	16.03	0	5	5	5	5	90	10	120	2008
SR376	US6	NY	0.00	US50 (Austin)	LA	18.07	5	5	5	5	5	15	10	45	2009

Date: 17-JUN-11

State of Nevada Department of Transportation

Annual Average Daily Traffic Count Stations

County Name CLARK

Station	Route / Location	2001 AADT	2002 AADT	2003 AADT	2004 AADT	2005 AADT	2006 AADT	2007 AADT	2008 AADT	2009 AADT	2010 AADT
0030372	SR156, Lee Canyon Rd, 2 mi W of SR-158 to the Deer Creek Camp Area.	600	520	500	510	340	550	750	580	580	600*
0030373	SR156, Lee Canyon Rd, .6 mi W of US-95.	480	370	520	490	350	470	640	490	550	500
0030374	US95, 5.9 mi N of SR-156 to Lee Canyon.	4,900	4,850	5,100*	5,500	5,450	5,550	6,000	6,400	6,700	7,000
0030375	US95, .1 mi N of mp 129 and 9.25 mi N of Indian Springs.	3,800	3,550	3,550	3,900	3,900	3,650	4,000	3,600	3,800	3,600
0030377	Eastern Av, 250' S of Ferguson Av .3 mi North of Carey Av.	14,000	14,500*	16,400	17,400	17,300	18,400	18,000	20,000	20,000	16,000
0030378	IR15, 1 mi N of the Craig Rd Intch 'Exit 48'.	23,000	25,800	25,800	27,700	30,000*	35,000*	36,000	34,000	31,000	38,000
0030379	IR15, S/B off-ramp of the Craig Rd Intch 'Exit 48' .	1,650*	2,100	1,600	2,400	3,950	2,750	2,900	2,900*	2,900	1,800
0030380	SR573, Craig Rd, 300' W of the IR-15 Craig Rd Intch 'Exit 48'.	41,500*	49,500	49,000	49,000*	54,000	57,500	56,000	53,000*	56,000	61,000
0030381	IR15, S/B on-ramp of the Craig Rd Intch from E/B Craig Rd 'Exit 48'.	10,000	10,700	12,600	11,200*	13,400	14,100	14,000	14,000*	14,000	15,000
0030382	IR15, N/B off-ramp of the Craig Rd Intch 'Exit 48'.	21,000*	22,430*	22,100	24,400	25,700	24,600	24,000	23,000*	23,000	24,000
0030383	IR15, N/B on ramp of the Craig Rd Intch 'Exit 48'.	2,700	3,250	2,650	2,700	4,400	3,500	3,300	3,300*	3,300	2,200
0030384	Airport Connector Rd, W/B on-ramp of the McCarran Co Intch from Sunset Rd.	6,000	6,700	6,650	6,250	6,900	6,850	7,100	7,300	7,700	8,300
0030385	SR573, Craig Rd, 300' E of IR-15 Craig Rd Intch 'Exit 48'.	43,000	48,400	47,400*	59,500	57,500	60,500	52,000	50,000*	49,000	48,000
0030387	IR15, 1.0 mi N of the Cheyenne Av Intch 'Exit 46'.	58,580	62,880*	66,600	67,000	73,500	75,500	75,000	72,000*	69,000	78,000
0030388	IR15, S/B off-ramp of the Cheyenne Av Intch 'Exit 46'.	2,400	2,450	2,750	3,400	3,400	3,500	3,400	2,900	2,900	2,700
0030389	SR574, Cheyenne Av, 350' E of Losee Rd.	57,500	57,500*	62,000	65,000	64,000	68,000	64,000	72,000	65,000	61,000*
0030390	IR15, S/B on-ramp of the Cheyenne Av Intch 'Exit 46'.	20,430*	20,875*	23,400	24,800	24,200	22,200	22,000	23,000	22,000	19,000
0030391	IR15, N/B off-ramp of the Cheyenne Av Intch 'Exit 46'.	18,180	22,300	24,800	26,200	28,500	27,500	27,000	28,000	28,000	20,000
0030392	SR574, Cheyenne Av, 75' W of SR-607 (Civic Center Dr).	44,000	44,000*	48,800	51,000	49,000	51,500	49,000	53,000	48,000	46,000
0030393	Hidden Well Rd, E of Bermuda Rd.	2,900	3,450	3,350	3,350*	4,100	4,600	6,900	6,900	5,900	5,700

* Data Adjusted or Estimated

Date: 17-JUN-11

State of Nevada Department of Transportation

Annual Average Daily Traffic Count Stations

County Name CLARK

Station	Route / Location	2001 AADT	2002 AADT	2003 AADT	2004 AADT	2005 AADT	2006 AADT	2007 AADT	2008 AADT	2009 AADT	2010 AADT
0030342	Lamb Bl, 1000' N of Owens Av.	24,000	24,000*	27,400	27,900	28,000*	33,500*	31,000	29,000	31,000	30,000*
0030345	Lamb Bl, 100' N of Sherrill Av.	39,000	39,000*	42,000	42,500	44,500	44,500	45,000	41,000	43,000	42,000*
0030346	Lamb Bl, .1 mi N of Sahara Av & 50' N of Cleveland St.	27,000	27,000*	28,000	31,500	33,500	31,500	34,000	32,000	30,000	28,000
0030348	SR589, E Sahara Av, .1 mi E of Rainbow Bl & .2 mi W of Torrey Pines Dr.	45,000	45,000	47,500	51,500	52,000	52,000	50,000	45,000	44,000	42,000
0030349	SR595, Rainbow Bl, .2 mi N of SR-589 (Sahara Av).	56,000	58,000	62,500	52,000	55,500	57,500	56,000*	52,000	57,000	54,000*
0030350	SR595, Rainbow Bl, 150' S of Laredo St South of SR-589 (Sahara Av).	51,000	51,500	51,500*	48,000	53,500	55,500	54,000	50,000	52,000	48,000
0030351	SR595, Rainbow Bl, 200' N of SR-593 (Tropicana Av).	34,000	40,500	39,800*	42,500	49,500	48,500*	49,000*	47,000	49,000	46,000
0030352	SR593, Tropicana Av, 200' E of SR-595 (Rainbow Bl).	40,000	42,000	44,500	48,500	46,500	44,000	40,000	39,000	35,000	36,000
0030353	Rainbow Bl, .1 mi S of SR-593 (Tropicana Av).	33,500*	38,500			47,500	47,000	47,000	47,000	48,000	45,000
0030354	Rainbow Bl, .7 mi N of SR-160 (Pahrump Vy Rd).	7,900	9,150	9,150*	12,700	13,000*	16,100*	16,000*	16,000*	21,000	21,000
0030356	SR159, Charleston Bl, .2 mi W of Durango Dr.	31,000	31,500	33,500	37,500	38,000	40,500	38,000*	36,000	35,000	35,000
0030357	Alexander Rd, .2 mi E of Pecos Rd.	4,000	4,000*	4,600	5,150	5,400	5,450	6,400*	5,900	5,200	5,100
0030358	SR159, Charleston Blvd, .1 mi N of county rd to Red Rock Canyon.	3,100	4,150	3,650	5,100	4,550	5,300	4,800	4,500	4,800	4,300
0030359	SR159, Blue Diamond Rd, 0.2 mi N of SR-160 (Pahrump Vy Rd).	2,250	2,250*	1,950	1,950	2,250	2,600	2,000	1,900	2,000	1,400
0030360	SR160, Pahrump Valley Rd, .3 mi W of SR-159 to Blue Diamond.	6,900*	7,550	7,450	8,050	8,600	8,850	8,900	8,100	8,800	7,800
0030361	SR160, Pahrump Valley Rd, E of SR-159 to Blue Diamond.	9,800*	8,600	8,600*	11,000*	9,550	9,750	9,900*	9,900	10,000	8,400
0030365	Fairway Dr, 50' E of Mancha Dr	530	520	490	490	460	490	500	460	480	440
0030366	SR599, Rancho Dr, 50' S of SR-573 (Craig Rd).	22,000	21,700	21,700*	24,200	23,100	24,900	25,000	24,000	22,000	21,000
0030367	US95, .5 mi S of the Snow Mountain Intch.	7,070*	6,900	7,200	7,950	7,700	7,700	8,500	9,200	9,200	10,000
0030368	SR157, Charleston Park Rd, .2 mi W of US-95.	3,200	2,600	3,000	2,850	2,700	2,750	3,200	2,600	3,000	2,900
0030371	SR158, Deer Creek Rd, 450' S of SR-156 (Lee Canyon Rd).	450	330	480	440	410	450	500*	400	430	460

* Data Adjusted or Estimated

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare
Computer Software Product

Richard Johnson

Rigid Structural Design Module

Kyle & Lee Canyons Roads
Roundabouts
211-220A

Rigid Structural Design

Pavement Type	JPCP
18-kip ESALs Over Initial Performance Period	776,728
Initial Serviceability	4.5
Terminal Serviceability	2.5
28-day Mean PCC Modulus of Rupture	600 psi
28-day Mean Elastic Modulus of Slab	3,600,000 psi
Mean Effective k-value	150 psi/in
Reliability Level	90 %
Overall Standard Deviation	0.35
Load Transfer Coefficient, J	2.8
Overall Drainage Coefficient, Cd	1
Calculated Design Thickness	6.21 in

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare
Computer Software Product

Richard Johnson

Flexible Structural Design Module

Kyle & Lee Canyons Roads
Roundabouts
211-220A

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	394,000
Initial Serviceability	4.2
Terminal Serviceability	2.5
Reliability Level	75 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	5,630 psi
Stage Construction	1
Calculated Design Structural Number	3.00 in

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Plantmix Bituminous Surface (PBS)	0.35	1	6	12	2.10
2	Aggregate Base Course (ABC)	0.1	1	9	12	0.90
Total	-	-	-	15.00	-	3.00

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare
Computer Software Product

Richard Johnson

Flexible Structural Design Module

Kyle & Lee Canyons Roads
Widening
211-220A

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	394,000
Initial Serviceability	4.2
Terminal Serviceability	2.5
Reliability Level	75 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	11,183 psi
Stage Construction	1
Calculated Design Structural Number	2.30 in

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Plantmix Bituminous Surface (PBS)	0.35	1	4	12	1.40
2	Cement Treated Base (CTB)	0.18	1	5	12	0.90
Total	-	-	-	9.00	-	2.30

1993 AASHTO Pavement Design

DARWin Pavement Design and Analysis System

A Proprietary AASHTOWare
Computer Software Product

Richard Johnson

Flexible Structural Design Module

Kyle & Lee Canyons Roads
Widening
211-220A

Flexible Structural Design

18-kip ESALs Over Initial Performance Period	394,000
Initial Serviceability	4.2
Terminal Serviceability	2.5
Reliability Level	75 %
Overall Standard Deviation	0.45
Roadbed Soil Resilient Modulus	11,183 psi
Stage Construction	1
Calculated Design Structural Number	2.30 in

Specified Layer Design

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di)(in)	Width (ft)	Calculated SN (in)
1	Plantmix Bituminous Surface (PBS)	0.35	1	4	12	1.40
2	Aggregate Base Course (ABC)	0.1	1	9	12	0.90
Total	-	-	-	13.00	-	2.30

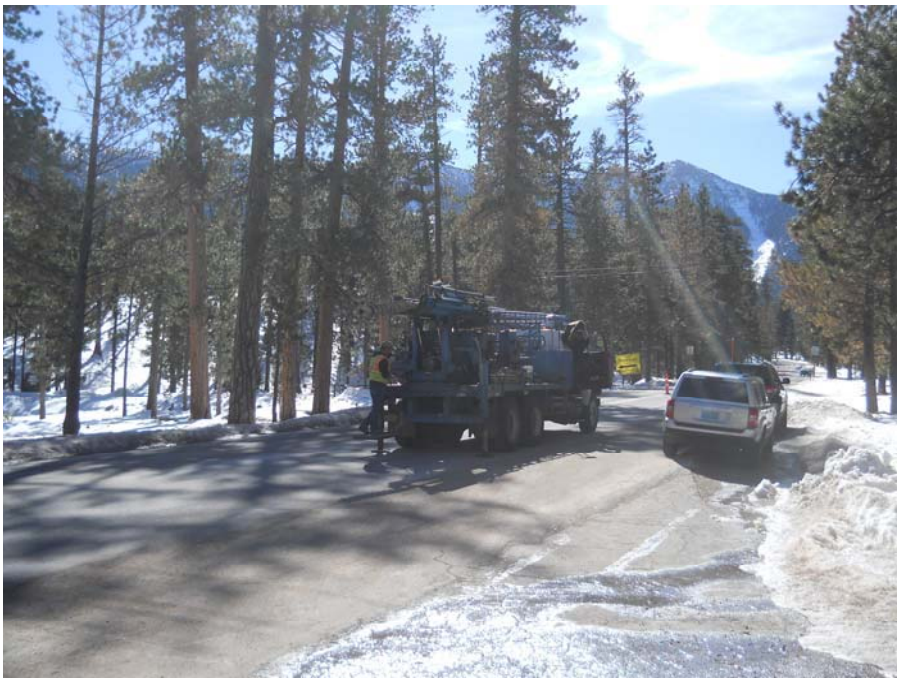
Appendix E, Site Photographs

YA-01 – Kyle West Roundabout – Eastbound

YA-02 – Kyle East Roundabout – Eastbound

YA-03 – Kyle East Roundabout – Westbound

YA-04 – Kyle West Roundabout – Westbound



YA-05 – Lee at Old Mill Access

YA-06 – Lee at Foxtail Access

YA-07 – Kyle Canyon Road near Scottie Road – Eastbound


YA-08 – Kyle Canyon Road near Lucky Star Road – Westbound

YA-09 - Kyle Canyon at MP 7.00 Double Box Culvert Outlet

YA-10 - Kyle Canyon at MP 7.00 Single Box Culvert Outlet

YA-11 - Kyle Canyon at MP 7.00 Double Box Culvert Inlet

YA-12 - Kyle Canyon at MP 11.00 Triple Box Culvert Outlet

YA-13 - Kyle Canyon at MP 11.00 Triple Box Culvert Inlet

YA-14 - Kyle Canyon at MP 7.00 Near Single Box Culvert Inlet

Boring Location For YA-12-01

YA-12-02

YA-12-03

YA-12-04

YA-12-05

YA-12-06

YA-12-07

YA-12-08

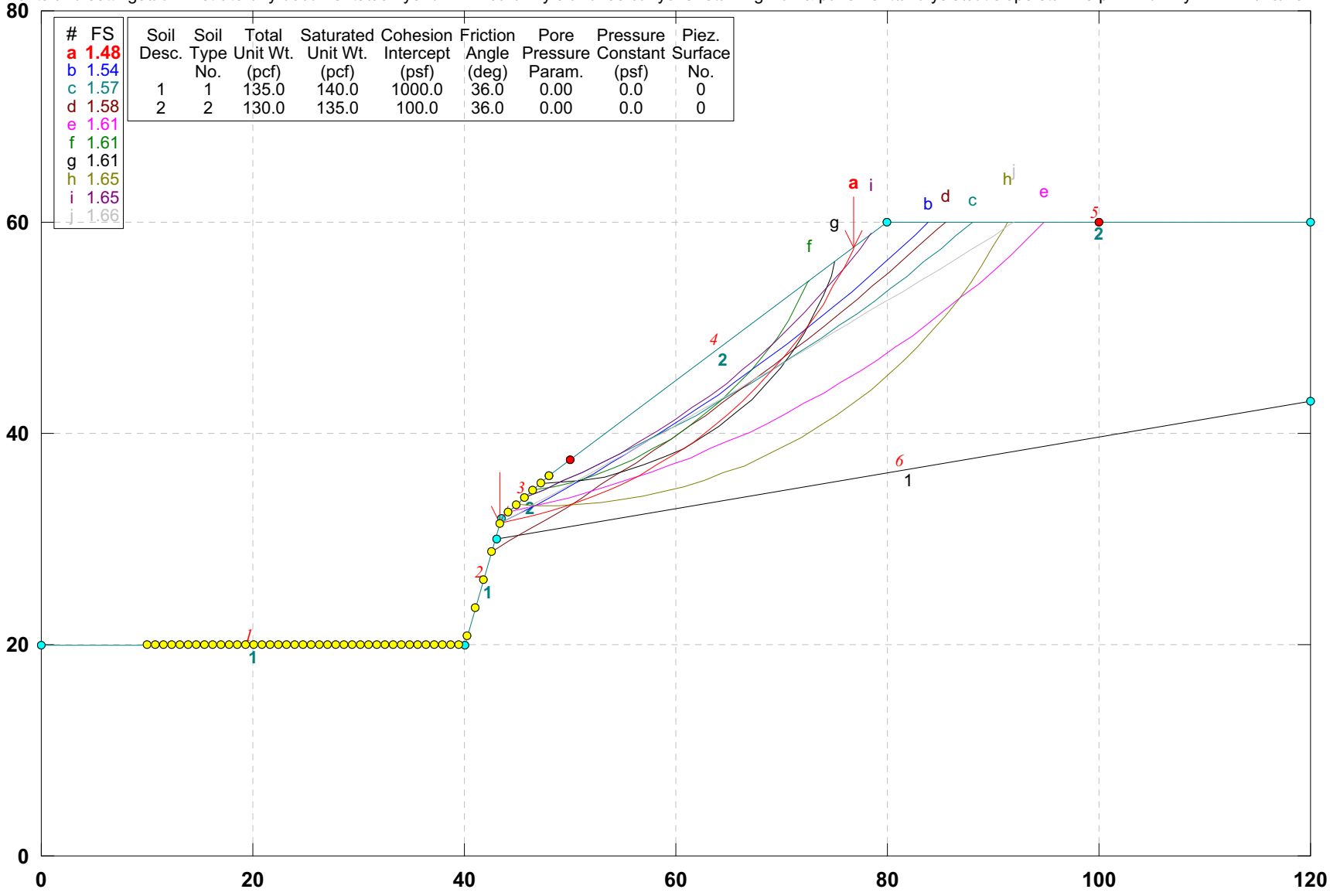
YA-12-09

YA-12-10

Appendix F, Stability Analysis

Kyle Canyon Sta. 123+00 3V:1H

d:\documents and settings\administrator\my documents\001 yeh\211-220a cfl kyle and lee canyons retaining wall & pavement\analysis\cut slope sta 123.pl2 Run By: TLA 7/10/2012 06:27PM



GSTABL7 v.2 FSmin=1.48

Safety Factors Are Calculated By The Modified Bishop Method