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GEOLOGIC HAZARD/LAND USE STUDY, AND PRELIMINARY SUBSURFACE SOIL INVESTIGATION – ADDENDUM ORIGNIAL REPORT ENTECH JOB NO. 98104, DATED FEBRUARY 24, 2004 MESA RIDGE PARKWAY AND SOUTH POWERS BOULEVARD EL PASO COUNTY, COLORADO

Prepared for:

Norwood Development
111 South Tejon Street, Suite 222
Colorado Springs, CO 80903

Attn: Bobby Ingels

Job No. 220393

March 28, 2022

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March 28, 2022

Norwood Development
111 South Tejon Street, Suite 222
Colorado Springs, CO 80903

Attn: Bobby Ingels

Re: Geologic Hazard/Land Use Study, and PSSI – Addendum
Original Report Entech Job No. 98104, dated February 24, 2004
Mesa Ridge – Overall Development Plan
Mesa Ridge Parkway and South Powers Boulevard
El Paso County, Colorado

Dear Mr. Ingels:

A Geologic Hazard/Land Use Study, and Preliminary Subsurface Soil Investigation was previously prepared by Entech Engineering, Inc., February 24, 2004, for the above referenced site (Reference 1). This addendum addresses updates made to the overall development plan. The revised Development Plan is presented in Figure 1.

The site was revisited by personnel of Entech Engineering, Inc., February 16, 2022. The site is relatively unchanged from the conditions observed at the time of the original Geologic Hazard/Land Use Study, and Preliminary Subsurface Soil Investigation. The northwestern portion of the site have been developed (Parcels A, O, and a portion of Parcel B). The remaining parcels are relatively unchanged except for fill piles located in the northeastern and western portion of the site. Recent site photographs, taken February 16, 2022 are included in Appendix A. The original Geologic Hazard/Land Use Study, and Preliminary Subsurface Soil Investigation is included in Appendix B (Reference 1).

Current site conditions across the site are consistent with what is described in the original Geologic Hazard/Land Use Study, and Preliminary Subsurface Soil Investigation by Entech (Reference 1, Appendix B). The *Geologic Map of the Fountain Quadrangle* distributed by the Colorado Geological Survey in 2017, is presented in (Figure 2, Reference 2). Site-specific geologic mapping was performed as a part of the Geologic Hazard Study by Entech (Reference 1) and recent mapping by the Colorado Geological Survey (Figure 2, Reference 2). Seven mappable units were identified on the site, which are identified as follows: Qaf/da: Artificial Fill and Disturbed areas of Holocene Age, Qal: Alluvium of Holocene Age, Qf: Young Alluvial-Fan Deposits of late to middle Holocene Age, Qav: Valley Fill Alluvium of Holocene Age, Qa_3: Alluvium Three of lower to middle? Holocene Age, Qlo: Eolian Loess of lower Holocene and Upper Pleistocene Age, and the Kp: Pierre Shale of upper Cretaceous Age (References 1 through 3). The Geology/Engineering Geology Map from the previous investigation is presented in Figure 3, and is included in Appendix B.

The geologic hazards identified on this site include artificial fill, hydrocompaction, collapsible or loose soils, unstable slopes, potentially unstable slopes, expansive soils, floodplains, seasonally high groundwater areas, and potentially high groundwater areas. These hazards and recommended mitigation have been addressed in the Geologic Hazard Investigation, Appendix B and are briefly discussed below. These areas can be either avoided or mitigated through grading and proper design and construction practices.

The eastern portion of the site is mapped within floodplain zones according to the FEMA Map Nos. 08041CO956G and 08041CO958G, December 7, 2018 (Figure 4, Reference 4). The Fountain Mutual Irrigation Ditch borders the northern boundary of the site and flows in an easterly direction. No water was observed flowing in these ditches at the time of previous investigation and recent site observations. The natural drainages on the site flow in a southerly direction. The Jimmy Camp Creek Drainage exists in the eastern portion of the property, flowing in a southwesterly direction. Development adjacent to the floodplain may require drains to mitigate the potential for shallow groundwater during periods of high runoff. Finished floor must be a minimum of one foot above floodplain levels. Exact floodplain locations and drainage studies are beyond the scope of this report. Specific recommendations have been made in the Soil, Geology and Geologic Hazard Investigation (Reference 1, Appendix B).

Three drainage basins are proposed in the southern portion of the site. The soils encountered in the area of the proposed drainage basins consisted of sandy to silty clay, sandy clay-silt, silty to slightly silty sand, and weathered to formational claystone and shale (Test Boring Nos. 15, 21 and 41, Reference 1, Appendix B). In general, the site soils encountered in the test boring are suitable for the proposed detention pond. Groundwater may be encountered in the deeper cuts. Dewatering of the area may be required during site grading and embankment construction. Saturated unstable soil conditions may be encountered during construction of the basin and embankment. Excavation of saturated soils will be difficult with rubber-tired equipment. Stabilization using shot rock or geogrids may be necessary in areas where groundwater is approached or encountered.

Any areas to receive new fill should have all topsoil, organic material, uncontrolled fill, or debris removed. Fill must be properly benched and compacted to minimize potentially unstable conditions in slope areas. Fill slopes should be 3:1 or flatter. The subgrade should be scarified and moisture conditioned to within 2% of optimum moisture content and compacted to a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557, prior to placing new fill. Areas receiving fill may require stabilization with shotrock or fabric if water is encountered or approached. Any soft/loose areas should be removed and recompacted.

New fill should be placed in lifts not to exceed 6 inches after compaction while maintaining at least 95% of its maximum Modified Proctor Dry Density, ASTM D-1557. These materials should be placed at a moisture content conducive to compaction, usually ±2% of Proctor optimum moisture content. The placement and compaction of fill should be observed and tested by Entech during construction/grading. Entech should approve any import materials prior to hauling them to the site.

Minor unstable slope areas have been mapped along the irrigation ditches on the site. According to the Geologic Hazard/Land Use Study, and Preliminary Subsurface Soil Investigation, a building setback of 20 feet from the unstable slopes was recommended. It appears there is sufficient distance to allow for the building setback. Additional foundation reinforcement may be necessary should the foundations encroach on this area. Specific recommendations have been made in the Geologic Hazard/Land Use Study, and Preliminary Subsurface Soil Investigation (Reference 1, Appendix B) and remain valid.

Norwood Development
Geologic Hazard/Land Use Study, and PSSI - Addendum
Mesa Ridge – Overall Development Plan
Mesa Ridge Parkway and South Powers Boulevard
El Paso County, Colorado

It is our opinion the conclusions and recommendations in the Geologic Hazard/Land Use Study, and Preliminary Subsurface Soil Investigation remain valid and the report may be used for the proposed development.

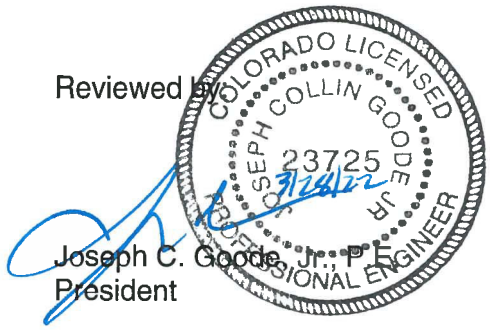
We trust that this has provided you with the information you required. If you have any questions or need further information, please do not hesitate to contact us.

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Logan L. Langford, P.G.
Geologist

Reviewed by:



Joseph C. Goode, Jr., P.E.
President

LLL

Encl.
Entech Job No. 220393
AA Projects/2022/220393 geohaz addendum

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1. Entech Engineering, Inc. February 24, 2004. *Geologic Hazard/Land Use Study and Preliminary Subsurface Soil Investigation, Cross Creek at Mesa Ridge, El Paso County, Colorado*. Entech Job No. 98104.

2. White, J.L., Lindsey, K.O., Morgan, M.L., and Mahan, S.A., 2017. *Geologic Map of the Fountain Quadrangle, El Paso County, Colorado.* Colorado Geological Survey. Open-File Report 17-05.

3. Trimble, Donald E. and Machette. Michael N., 1979. *Geologic Map of the Colorado Springs-Castle Rock Area, Front Range Urban Corridor, Colorado.* U.S. Geological Survey. Map I-847-F.

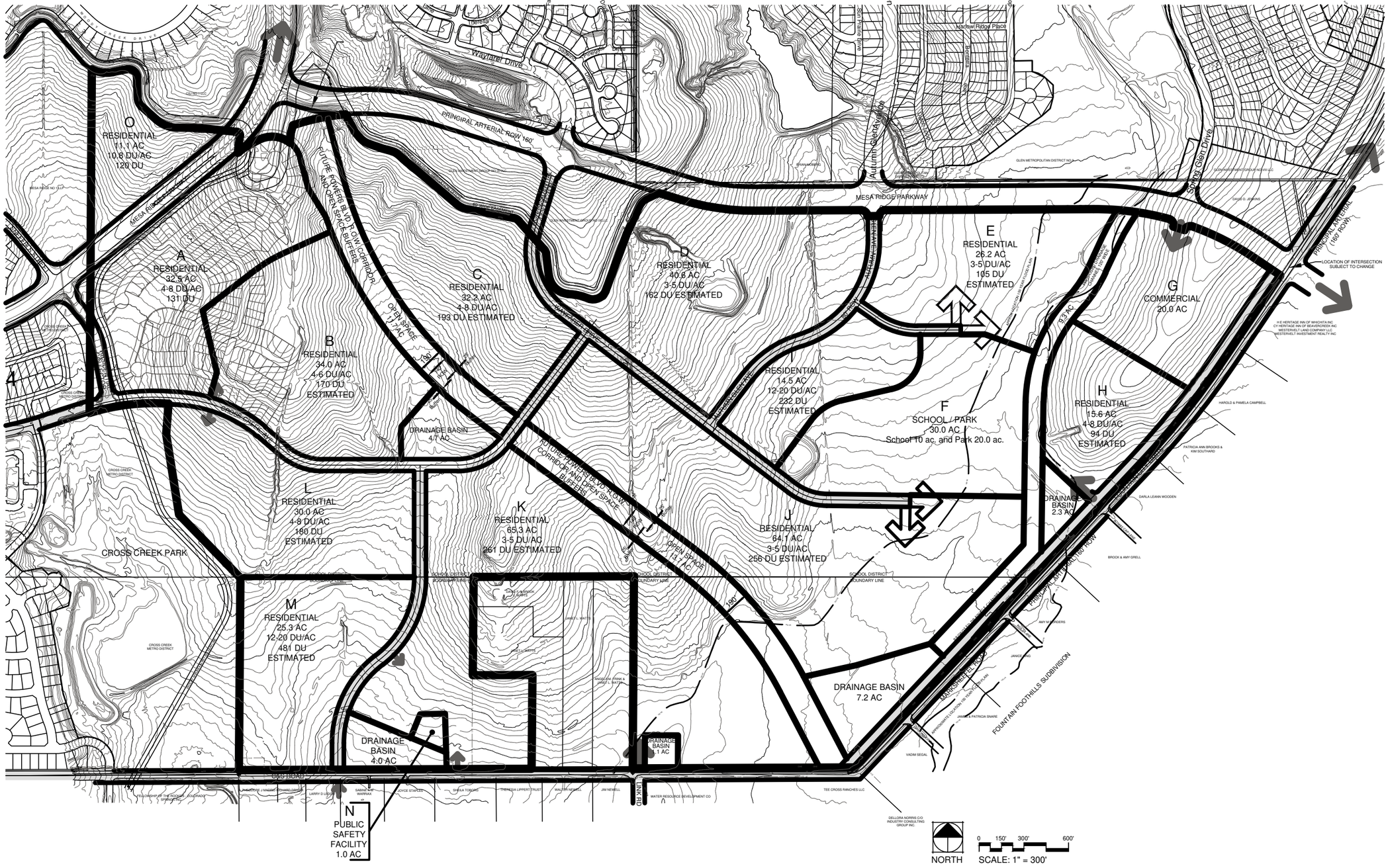
4. Federal Emergency Management Agency, December 7, 2018. *Flood Insurance Rate Maps for the City of Colorado Springs, Colorado*. Map Numbers 08041CO956G and 08041CO958G.

FIGURES

MESA RIDGE

OVERALL DEVELOPMENT PLAN AMENDMENT #5

CITY OF FOUNTAIN, COLORADO



REVISION	BY

ENTECH ENGINEERING, INC.
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COLORADO SPRINGS, CO. 80907
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DEVELOPMENT PLAN/TEST BORING LOCATON MAP
MESA RIDGE PKWY & S. POWERS BLVD
FOUNTAIN, CO
FOR: NORWOOD

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DATE	3/21/22
SCALE	AS SHOWN
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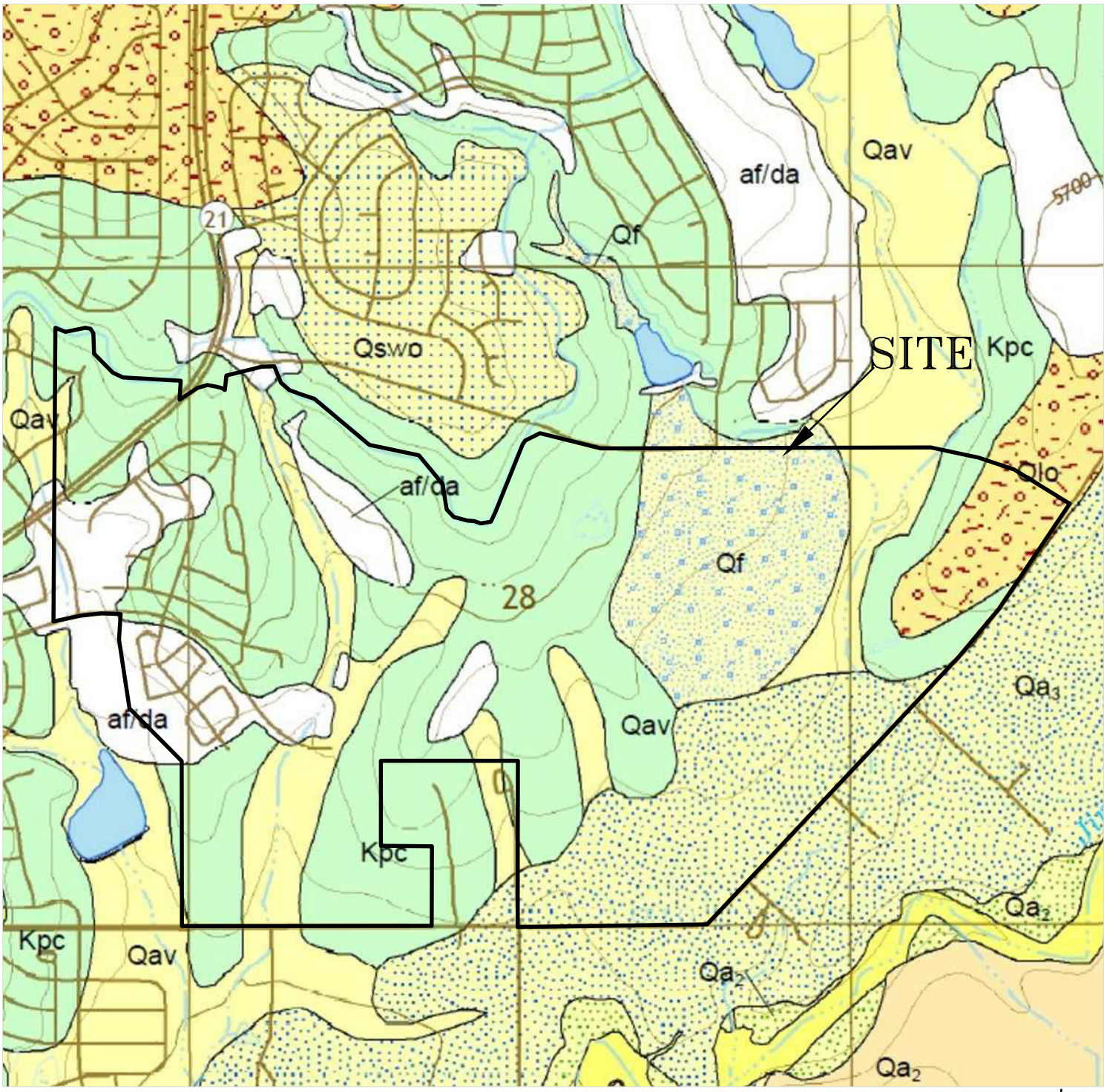
FIGURE No.	1



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FOUNTAIN QUADRANGLE GEOLOGY MAP
MESA RIDGE OVERAL DEVELOPMEN PLAN
MESA RIDGE PKWY & S. POWERS BLVD
FOUNTAIN, CO
FOR: NORWOOD

DRAWN:	DATE:	CHECKED:	DATE:
LLL	3/21/22		

JOB NO.: 220393

FIG NO.: 2

REVISION	BY:

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GOELOGY/ ENGINEERING GEOLOGY MAP
CROSS CREEK @ MESA RIDGE
FOUNTAIN, CO.
FOR: NORWOOD DEVELOPMENT

LEGEND

- Qaf - Artificial Fill of Quaternary Age: Man-made fill deposits.
- Qal - Recent Alluvium of Quaternary Age: Recent stream deposits.
- Qp - Piney Creek Alluvium of Quaternary Age: Stream deposited silty to clayey sands.
- Qes - Eolian Sands of Quaternary Age : Wind blown sand deposits.
- Qv - Verdos Alluvium of Quaternary Age: Terrace deposits of silty to clayey sands.
- Kp - Pierre Shale Formation of Cretaceous Age: Claystone and shale.
- h - hydrocompaction
- pu - potentially unstable slope
- us - unstable slope
- fp - floodplain
- psw - potentially seasonally wet area
- sw - seasonally wet area
- w - areas of ponded water
- ex - expansive soils

DRAWN BY:	R.J. OLSON
DESIGNED BY:	KAH
CHECKED BY:	
DATE:	9FEB04
SCALE:	N.T.S.
JOB NO.:	98104
FIGURE NO.:	3

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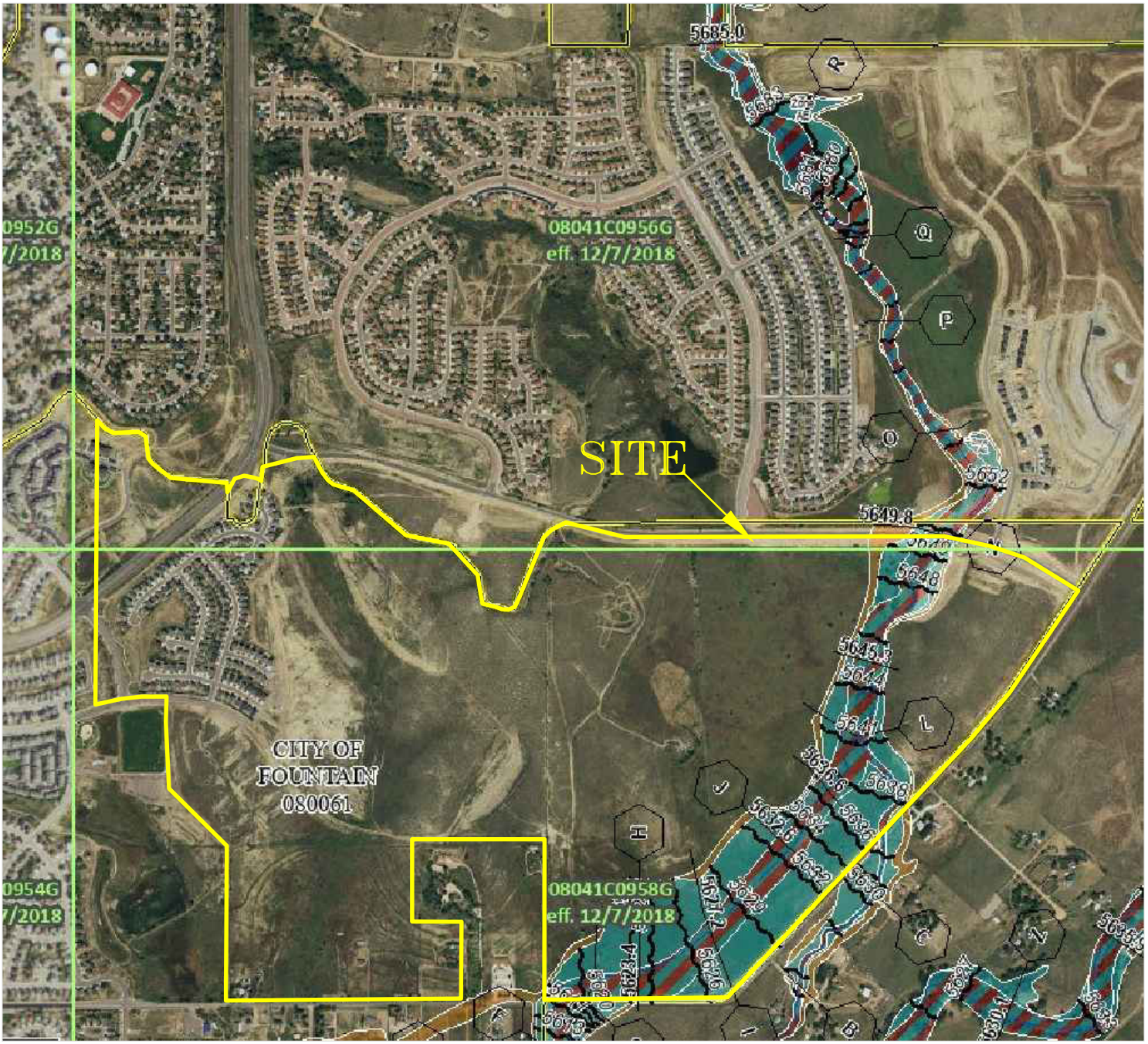

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FLOODPLAIN MAP
MESA RIDGE OVERAL DEVELOPMEN PLAN
MESA RIDGE PKWY & S. POWERS BLVD
FOUNTAIN, CO
FOR: NORWOOD DEVELOPMENT

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JOB NO.: 220393

FIG NO.: 4

APPENDIX A: Site Photographs

1

Looking north from the west-central portion of the site.

February 16, 2022

2

Looking east from the west-central portion of the site.

February 16, 2022

Job No. 220393

3

Looking southwest from the north-central portion of the site.

February 16, 2022

4

Looking south from the north-central portion of the site.

February 16, 2022

Job No. 220393

5

Looking west from the northeastern portion of the site.

February 16, 2022

6

Looking south along drainage in the northeastern portion of the site.

February 16, 2022

Job No. 220393

7

Looking east from the northeastern portion of the site.

February 16, 2022

8

Looking southeast from the northeastern side of the site.

February 16, 2022

Job No. 220393

APPENDIX B: Entech Engineering, Inc. Geologic Hazard/Land Use Study, and Preliminary Subsurface Soil Investigation Entech Job No. 98104

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GEOLOGIC HAZARD / LAND USE STUDY
AND PRELIMINARY
SUBSURFACE SOIL INVESTIGATION
CROSS CREEK AT MESA RIDGE
EL PASO COUNTY, COLORADO

Prepared for

Nor'wood Development
4065 Sinton Road
Colorado Springs, Colorado 80907

Attn: Dave Jenkins

February 24, 2004

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Kristen A. Andrew-Hoeser
Professional Engineering Geologist

Stanley C. Culp
P.E. #36723

COLORADO REGISTERED
STANLEY CLARE CULP
36723
PROFESSIONAL ENGINEER

Reviewed by:

Joseph C. Goode, Jr., P.E.
President

KAH/SCC/ek

Encl.

Entech Job No. 98104
2MSW/rep/2004/98104ghs/lus/pssi

Table of Contents

- Detailed site-specific mapping of major geographic and geologic features.
- Identification of geologic hazards and impacts on the proposed development.
- Recommended mitigation of geologic hazards where they affect development.
- Preliminary recommendations pertaining to foundations, floor slabs and concrete, and land use.

4.0 FIELD INVESTIGATION

Our field investigation consisted of the preparation of a geologic map of bedrock features and significant surficial deposits. The Soil Conservation Service (SCS) survey was also reviewed to evaluate the site.

The position of mappable units within the subject property are shown on the Geologic Map. Our mapping procedures involved field reconnaissance, measurements and interpretation. The same mapping procedures have also been utilized to produce the Engineering Geology Map which identifies pertinent geologic conditions affecting development.

Additionally, 53 test borings were drilled as a part of the preliminary subsurface soil investigation for the site. The borings were drilled with a power driven continuous flight auger drill rig to depths ranging from 15 to 40 feet. Samples were obtained during drilling using the Standard Penetration Test, ASTM D-1586, utilizing a 2-inch O.D. Split Barrel Sampler and a California Sampler. Results of the penetration tests are shown on the drilling logs to the right of the sampling point. The location of the test borings is shown on the Test Boring Location Map, Figure 3. The drilling logs are included in Appendix B.

Laboratory testing was performed to classify and determine the soils engineering characteristic. Laboratory tests included moisture content, ASTM D-2216, grain size analysis, ASTM D-422, and Atterberg Limits, ASTM D-4318. Swell test included both FHA and Denver

1.0 SUMMARY

Project Location:

The project lies in portions of Sections 28 and 29, Township 15 South, Range 65 West of the 6th Principal Meridian. The site is located north of C&S Road between Fountain Mesa Road and Marksheffel Road in El Paso County, Colorado.

Project Description:

Total acreage involved in the project is approximately 600 acres. Commercial and residential development is proposed. A development plan was not available at the time of this report.

Scope of Report:

The report presents the results of our geologic investigation and treatment of engineering geologic hazard study. This report presents the results of our geologic reconnaissance, a review of available maps, aerial photographs and our conclusions with respect to the impacts of the geologic conditions on development. Preliminary foundation recommendations are also included.

Land Use and Engineering Geology:

Specific grading or development plans are not available at this time; however, the site was found to be suitable for development. Geologic conditions will impose some constraints on development. These include areas of artificial fill, hydrocompaction and loose or potentially collapsible soils, unstable slopes, potentially unstable slopes, expansive soils, floodplain, areas of ponded water, seasonally high groundwater areas and potentially seasonally high groundwater areas. Shallow bedrock will also be encountered in portions of the site. Site conditions will be discussed in greater detail in this report. All recommendations are subject to the limitations discussed in the report.

2.0 GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION

The site is located in portions of Sections 28 and 29, Township 15 South, Range 65 West of the 6th Principal Meridian, in El Paso County, Colorado. The site is located north of C&S Road between Fountain Mesa Road and Marksheffel Road. The western portions of the site lie within the city limits of Fountain, Colorado. The eastern portions of the site lie in El Paso County. The location of the site is shown on the Vicinity Map, Figure 1.

The topography of the site is generally gently to moderately sloping to the south with some minor steep slopes along irrigation ditches on-site. The Fountain Mutual Irrigation Ditch borders the northern boundary of the site and flows in an easterly direction. Other irrigation ditches on-site flow in southerly directions. No water was observed flowing in these ditches at the time of this investigation. The irrigation ditch is not lined along the majority of the property. The natural drainages on-site flow in a southerly direction. The Jimmy Camp Creek drainage exists in the eastern portion of the property, flowing in a southwesterly direction. No water was observed flowing in any of the drainages at the time of this investigation; however, areas of ponded water were observed behind embankments on site. The area of the site is indicated on the USGS Map, Figure 2. Previous site uses have included grazing and pasture lands. Areas of dumping have occurred in the past. The majority of this debris had been removed at the time of this investigation. The site contains primarily low field grasses, weeds and yucca with some widely scattered shrubs in the drainages. Site photographs are included in Appendix A. The approximate locations and directions of the photographs are indicated on Figure 3.

Total acreage involved in the proposed development is approximately 600 acres. Commercial and residential development is proposed. The Master Plan is presented on the Test Boring Map, Figure 3. Development and grading plans were not available at the time of this report.

3.0 SCOPE OF THE REPORT

The scope of this report will include the following:

- A geologic analysis of the site utilizing published geologic data, and subsurface soils information.

- Detailed site-specific mapping of major geographic and geologic features.

- Identification of geologic hazards and impacts on the proposed development.

- Recommended mitigation of geologic hazards where they affect development.

- Preliminary recommendations pertaining to foundations, floor slabs and concrete, and land use.

4.0 FIELD INVESTIGATION

Our field investigation consisted of the preparation of a geologic map of bedrock features and significant surficial deposits. The Soil Conservation Service (SCS) survey was also reviewed to evaluate the site.

The position of mappable units within the subject property are shown on the Geologic Map. Our mapping procedures involved field reconnaissance, measurements and interpretation. The same mapping procedures have also been utilized to produce the Engineering Geology Map which identifies pertinent geologic conditions affecting development.

Additionally, 53 test borings were drilled as a part of the preliminary subsurface soil investigation for the site. The borings were drilled with a power driven continuous flight auger drill rig to depths ranging from 15 to 40 feet. Samples were obtained during drilling using the Standard Penetration Test, ASTM D-1586, utilizing a 2-inch O.D. Split Barrel Sampler and a California Sampler. Results of the penetration tests are shown on the drilling logs to the right of the sampling point. The location of the test borings is shown on the Test Boring Location Map, Figure 3. The drilling logs are included in Appendix B.

Laboratory testing was performed to classify and determine the soils engineering characteristic. Laboratory tests included moisture content, ASTM D-2216, grain size analysis, ASTM D-422, and Atterberg Limits, ASTM D-4318. Swell test included both FHA and Denver

Swell/Consolidation Testing. Results of the laboratory testing are included in Appendix C. A Summary of Laboratory Test Results is presented in Table 1.

A Preliminary Subsurface Soil Investigation was performed by Entech Engineering, Inc. for portions of the southwest parts of the site and areas southwest of the site (Reference 1). Additionally, several Subsurface Soil Investigations were performed by Entech Engineering, Inc. for the area immediately southwest of the site (References 2 through 5). A Geologic Hazard Study was performed by Entech Engineering, Inc. for a property immediately south of the site (Reference 6). Information from all of these reports was used in evaluating the site.

5.0 SOIL, GEOLOGY AND ENGINEERING GEOLOGY

5.1 General Geology

Physiographically, the site lies in the western portion of the Great Plains Physiographic Province. Approximately 8 miles to the west is a major structural feature known as Ute Pass Fault. This fault, along with the Rampart Range Fault to the north, marks the boundary between the Great Plains Physiographic Province and the Southern Rocky Mountain Province. The site exists within the southern edge of a large structural feature known as the Denver Basin. Bedrock in the area tends to be gently dipping in a northeasterly direction. The rocks in the area of the site are sedimentary in nature, and typically Cretaceous in age. The bedrock underlying the site itself is the Pierre Shale Formation. Overlying the Pierre Shale are unconsolidated deposits of artificial, residual, alluvial, and eolian soils. The site's stratigraphy will be discussed in more detail in Section 5.3.

5.2 Soil Conservation Service

The Soil Conservation Service (Reference 7) has mapped seven soil types on the site (Figure 4). In general, the soils range from clay loam to sandy and gravelly loam. Soils are described as follows:

Soil Type	Description
31	Fort Collins loam, 3-8% slopes: Brown loam with a brown clay loam subsoil. May contain areas of sandy loam. Permeability is moderate. Erosion hazard is moderate. Limitations include limited ability to support a load and shrink-swell potential.
33	Heldt clay loam, 0-3% slopes: Light brownish gray clay loam with a silty clay subsoil. Permeability is slow. Erosion hazard is slight to moderate. Limitations include shrink-swell potential.
56	Nelson-Tassel fine sandy loams, 3-18% slopes: Grayish brown fine sandy loam. Permeability is moderately rapid. Erosion hazard is moderate to high. Limitations include depth to bedrock and slope.
59	Nunn clay loam, 0-3% slopes: Grayish brown clay loam with heavy clay loam subsoil. Permeability is moderately slow. Erosion hazard is slight. Limitations include slow permeability, low strength and shrink-swell potential.
75	Razor-Midway Complex: Light brownish gray or yellowish brown clay loam with heavy clay loam or clay subsoil. Permeability is slow. Erosion hazard is moderate to high. Limitations include depth to shale, slow permeability, shrink-swell potential and slope.
82	Schamber-Razor Complex, 8-15% slopes: Grayish brown gravelly loam and gray clay loam. Permeability is rapid to slow. Erosion hazard is moderate to high. Limitations include steep slopes, depth to shale, slow permeability, limited ability to support a load and shrink-swell potential.
87	Stoneham Sandy Loam, 8-15% slopes: Brown sandy loam. May include silt loam. Permeability is moderate. Erosion hazard is moderate. Limitations include frost action and slope.

Complete descriptions of the soils are presented in Figures 5 through 11. The soils have generally been described to have slow to rapid permeabilities. Limitations to development are varied on the different soil types and include limited ability to support a load, shrink-swell potential, frost action potential, depth to bedrock, low strength, and slope. Possible hazards with soil erosion are present on the site. The erosion potential can be controlled with vegetation. The majority of the soils have been described to have slight to high erosion hazards.

5.3 Site Stratigraphy

The Colorado Springs Geologic Map showing the site is presented in Figure 12 (Reference 8). The Fountain Quadrangle Geology Map shows the site is presented in Figure 13 (Reference 9). The Geology Map prepared for the site is presented in Figure 14. Six mappable units were identified on this site, which are identified as follows:

- **Qaf** **Artificial Fill of Quaternary Age:** These are man-made fill deposits. Some of the fill is associated with earthen dam embankments on-site. Much of the fill is associated with grading and roadways that exist on the site. One area of fill in the northeastern portion of the site is associated with filling an old gully that existed behind an earthen dam. Some dumping had occurred in this area in the past. It is our understanding the debris had been removed prior to filling the gully, however, this has not been verified.

- **Qal** **Recent Alluvium of Quaternary Age:** These are recent stream deposits that have been deposited along the valley floors and in the drainages that exist on-site. These materials consist of silty to clayey sands and sandy clays. Some of these alluviums contain highly organic soils.

- **Qp** **Piney Creek Alluvium of Quaternary Age:** This is a stream deposited material typically occurring as terrace deposits along the main drainage of Jimmy Camp Creek in the eastern portion of the site. The Piney Creek typically consists of dark brown silty to clayey sands and may contain some silt and clay lenses.

- **Qes** **Eolian Sand of Quaternary Age:** These are deposits are fine to medium grained soil deposited by the action of the prevailing winds from the northwest. They typically occur as large dune deposits or narrow ridges. These soil types are typically tan to brown in color and tend to have a very uniform or well-sorted gradation. These materials tend to have a relatively high permeability and low density.

- **Qv** **Verdos Alluvium of Quaternary Age:** These are alluvial terrace deposits which occur as reddish brown silty to clayey sands. Generally this deposit is well stratified and may contain lenses of clay, silt and gravel.

- **Kp** **Pierre Shale of Cretaceous Age:** This deposit consists of marine deposited claystones and shales. They typically are olive to gray in color and may contain beds of fine calcareous sandstone or limestone. In many places on this site a variable residual soil layer exists overlying the bedrock materials. This soil layer is derived from the in-situ weathering of the bedrock materials and typically consists of silty and sandy clay and has a variable thickness.

The soils listed above were mapped from the *Reconnaissance Geologic Map of Colorado Springs and Vicinity, Colorado* by Scott and Wobus (Reference 8, Figure 12) and The Robinson Study prepared for El Paso County Planning Department (Reference 9, Figure 13). *The Geologic Map of the Colorado Springs-Castle Rock Area Front Range Urban Corridor, Colorado*, by Trimble and Machette, 1979 (Reference 10) and the test borings from the subsurface investigation were also used in evaluating the site. The test boring logs are included in Appendix B of this report. A Summary of the Geologic Units mapped on this site by the Robinson Study (Figure 14) is included in Table 2 (Reference 11).

5.4 Soil Conditions

The soils encountered in the test borings can be grouped into five general soil types. The soils were classified using the Unified Soil Classification System (USCS).

Soil Type 1 consists of sandy clay fill (CL). The fill soils were encountered in the upper soil profile of two of the test borings to depths of 2 and 8 feet. These soils were encountered at soft

to stiff consistencies and moist conditions. Soil Type 1 has 74 percent passing the 200 sieve on the sample tested. An FHA Swell pressure of 1515 psf and a Denver Swell of 4.0% were measured on the sandy clay fill. These swells are in the moderate to high expansion range.

Soil Type 2 consists of slightly silty, silty and very clayey sand (SP-SM, SW-SM, SM, SC-CL). The sands were encountered in approximately half of the test borings in the upper and lower soil profiles. The sands were encountered at very loose to dense states and dry to wet conditions. The samples tested in this type have 7 to 49 percent passing the 200 sieve. An FHA Swell pressure of 846 psf and Denver Swells ranging from 0.2% to 0.7% were measured on the silty and clayey sands. These swells are in the low expansion range. A consolidation of 1.0% was also measured on the silty sands.

Soil Type 3 consists of the silty, sandy clays and clay-silts (CL, CH, CL-ML). The clays were encountered in the upper soil profile of most of the test borings at depths ranging from 0 to 40 feet. The clays were encountered at very soft to hard consistencies and moist to wet conditions. The samples classified in this type have 50 to 99 percent passing the 200 sieve. FHA Swell pressures ranging from 738 psf to 3924 psf were measured on the clays. Swells ranging from 0.0% to 8.8% were measured in the Denver Swell/ Consolidation Tests conducted on the clays. These swells are in the low to very high expansion range and consolidations in the low consolidation range. Consolidations of 0.2% were also measured on some of the clays and clay-silts in the Denver Swell/ Consolidation Test.

Soil Type 4 consists of sandy to silty claystone bedrock (CL). The claystone was encountered in most of the test borings at depths ranging from 2 to 19 feet below the surface. The claystone was encountered at very stiff to hard consistencies and moist conditions. The claystone samples tested have 53 to 99 percent passing the 200 sieve. FHA Swell pressures ranging from 1962 to 3597 psf were measured on the claystone samples. Denver Swells ranging from 0.3% to 5.0% were measured on the claystone samples. These swells are in the low to very high expansion range.

Soil Type 5 consists of shale bedrock (CL). The shale was encountered in 6 of the test borings at depths ranging from 11 to 19 feet below the existing ground surface. The shale was encountered at hard to very hard consistencies and moist conditions. The shale has 76 percent passing the 200 sieve in the samples tested. An FHA Swell pressure of 1723 psf was

measured on the shale sample. A swell of 2.8% was measured in the Denver Swell/ Consolidation Test on the shale. These swells are in the moderate to high expansion range.

A Summary of Laboratory Results is presented in Table 1. Laboratory results are included in Appendix C. A Summary of the Depth to Bedrock and Depth of Artificial Fill is included in Table 3.

5.5 Groundwater

Groundwater was encountered at depths ranging from 6.5 feet to 19.5 feet in 30 of the test borings. Groundwater was not encountered in any of the other test borings during or subsequent to drilling which were drilled to depths ranging from 15 to 20 feet. A table showing the depth to groundwater is presented in Table 3.

Fluctuation in groundwater conditions may occur due to variations in rainfall and other factors not readily apparent at this time. Also, the irrigation ditch north of the site was dry at the time of this study. This ditch will affect the groundwater on the site. Isolated sand layers within the variable soil profile, sometimes only a few feet in thickness and width, can carry water in the subsurface. Water may also flow on top of the claystone.

6.0 ENGINEERING GEOLOGY - IDENTIFICATION AND MITIGATION OF GEOLOGIC HAZARDS

As mentioned previously, detailed mapping has been performed on this site to produce an Engineering Geology Map (Figure 14). This map shows the location of various geologic conditions of which the developers and planners should be cognizant during the planning, design and construction stages of the project. The hazards identified on this site include artificial fill, hydrocompaction, collapsible or loose soils, unstable slopes, potentially unstable slopes, expansive soils, floodplains, seasonally high groundwater areas and potentially high groundwater areas. The following hazards will need to be addressed during development of the site:

Expansive Soils

Expansive soils were encountered in the test borings drilled on-site. The site is classified in areas of low to moderate swell potential according to the *Map of Potentially Swelling Soil and Rock in the Front Range Urban Corridor, Colorado* by Hart, 1974 (Reference 12); however, highly expansive soils have been encountered on the site. The expansive soils have been identified in areas mapped as Kp: Pierre Shale on Figure 14, however, sporadic expansive layers are also possible in other areas of the site not identified as ex: expansive soils. Expansive clays and claystone can cause differential movement in the structure foundation.

Mitigation: Mitigation of expansive soils will require special foundation design. Overexcavation and replacement with non-expansive soils at 90% of its maximum Modified Proctor Dry Density, ASTM D-1557 is a suitable mitigation which is common in the area. Drilled piers are another option that is used in areas where highly expansive soils are encountered. Typical minimum pier depths are on the order of 18 feet or more and require penetration into the bedrock material a minimum of 4 to 6 feet, depending upon building loads. Moisture conditioning and recompacting expansive soils is another mitigation technique that is being used to mitigate expansive soils. The depth of removal, moisture conditioning and recompaction varies with the soil characteristics and building types. Moisture conditioning to depths of 10 feet are common for highly expansive clays.

Floor slabs on expansive soils should be expected to experience movement. Overexcavation and replacement has been successful in minimizing slab movements. The use of structural floors can be considered for basement construction on highly expansive clays. Final recommendations should be determined after additional investigation of each subdivision or building site.

Subsidence Area

Based on a review of a Subsidence Investigation Report for the Colorado Springs area by Dames and Moore, 1985 (Reference 13) and the mining report for the Colorado Springs coal field (Reference 14), the site is not undermined. The closest underground mines in the area are 9 miles to the north and the site is not mapped within any potential subsidence zones.

Slope Stability and Landslide Hazard

The majority of the slopes on-site are gently to moderately sloping and do not exhibit any past or potential unstable slopes or landslides. The steeply sloping areas along some of the irrigation ditches on the site have been identified as unstable slopes. Additionally, a small area in the south-central portion of the site has been identified as potentially unstable. The mitigation recommendation for these areas is as follows:

Unstable slopes: At the time of this investigation, water was not flowing in any of these ditches. At times during periods of high water, erosion can occur. The slopes adjacent to the ditches are subject to failure due to erosion by the water. We would anticipate development not to be planned in the area of these slopes unless they are regraded. Due to the possibility of failure to the slopes above from undercutting by the water, buildings should be located a minimum of 20 feet away from the crest or toe of any unstable slope if they are not regraded. Additional setbacks may be warranted depending on proposed development plans. Riprap along the toe of the slopes may be necessary to control the erosion and undercutting of the slope. This is especially true of the slopes on the outside curves of the ditch where the water is actively cutting during high runoff periods. Should regrading be considered, slopes should be no steeper than 3:1. In clay areas 4:1 slopes may be required.

Potentially unstable slopes: This is a steep portion of the hillside in the south-central portion of the site. Due to the limited extent of this area, it is recommended that the slope be regraded during construction to an angle no steeper than 3:1. In clay areas 4:1 slopes may be required.

Debris Fans

Based on-site observations, debris fans were not observed in this area.

Groundwater and Floodplain Areas

Areas within the drainages and irrigation ditches on-site have been identified as areas of seasonally high groundwater areas, potentially seasonally high groundwater areas and floodplains. Additionally, areas of ponded water also exist on-site. Water was not flowing in the any of the ditches or drainages at the time of this investigation. It should be noted that higher groundwater levels may be experienced adjacent to the irrigation ditches when they are flowing. The Jimmy Camp Creek drainage has been mapped as a floodplain zone

according to the FEMA Map Nos. 08041CO952F, 08041CO954F, 08041CO956F, and 08041CO958F, Figure 15 (Reference 15). These areas are discussed as follows:

Floodplain: Construction is not anticipated within the major drainages or the main channel of the Jimmy Camp Creek floodway. It is anticipated any proposed construction within the floodplain zone would involve drainage improvements and channelization of the floodplain. Development within the floodplain will require approval of the Drainage Plan prior to construction. Building areas within the floodplain will require filling to raise the building area above floodplain and seasonally high groundwater levels. Mitigation for Seasonally High Groundwater levels discussed in the following sections is recommended for construction in the floodplain zone. Finished floor levels must be one foot above the floodplain level. Exact floodplain locations and drainage studies are beyond the scope of this report.

Potentially Seasonal High Groundwater: In these areas, we would anticipate the potential for periodically high subsurface moisture conditions and possible frost heave potential, depending on the soil conditions.

Mitigation: In these locations, foundations in areas subject to severe frost heave potential should penetrate sufficient depth so as to discourage the formation of ice lenses beneath foundations. At this location and elevation, a foundation depth for frost protection of 2.5 feet is recommended. In areas where high subsurface moisture conditions are anticipated periodically, a subsurface perimeter drain will be necessary to help prevent the intrusion of water into areas located below grade. A typical perimeter drain detail is presented in Figure 16. Additionally, swales should be created to intercept surface runoff and carry it safely around and away from structures. It is anticipated that the site grading may mitigate the drainages in some areas. The water table may be of sufficient depth to minimize the effects on buildings in some areas. Should higher water levels be encountered in the vicinity of the irrigation ditches during peak flow, these recommendations may be necessary in these areas as well.

Seasonally High Groundwater Area: In these areas, high subsurface moisture condition, frost heave potential and highly organic soils may exist, particularly on a seasonal basis.

Mitigation: These areas lie within drainages and in many areas can be avoided by development. In areas where development is desired, overlot grading may mitigate the drainages. All organic material, soft or wet soils should be removed prior to any filling. The

same mitigation recommendations for potentially high groundwater areas as discussed previously should be followed in these areas of seasonally high groundwater. In some areas, it may be necessary to dewater the excavation. Underslab drains or interceptor drains may be used in addition to perimeter drains to prevent the intrusion of water into areas below grade. Typical Drain Details are presented in Figures 16 through 18. It may be desirable to build up the building areas to raise the foundation further above the groundwater level. Any grading should be done in a manner that directs surface flow around construction to avoid areas of ponded water. Structures should not block drainages, but swales should be created to intercept surface runoff and carry it safely around and away from structures. Additional investigation will be necessary to determine the water depth and its affect on development. Other areas than those mapped could encounter groundwater that could affect shallow foundations on-site.

Areas of Ponded Water: These are areas where water is ponded behind earthen dams on-site. It is anticipated these areas could be avoided by development. These areas will likely be removed during site grading. Should construction be considered in these areas, regrading will be necessary in order to fill the area above the groundwater level. All soft or organic soils should be removed prior to filling. The same mitigation techniques for seasonally high groundwater areas are recommended for these ponded areas as well.

Artificial Fill

Areas of artificial fill were observed in areas of the site. Some areas are associated with existing roadway embankments on-site. Other areas are associated with overlot grading and stockpiling that is being performed in areas of the site. Some artificial fill is associated with earthen dams that exist on-site. Additionally, a small gully in the northeastern portion of the site was used for dumping in the past. This gully has recently been filled with soil. It is our understanding the debris was removed prior to filling, however, this has not been verified.

Mitigation: Where fill has been placed in a controlled manner and records are available of observation and density testing, no mitigation is necessary. Where uncontrolled fill is encountered beneath foundations, mitigation will be necessary. Mitigation typically involves removal and recompaction at 90% of its maximum Modified Proctor Dry Density, ASTM D-1557. In areas of deeper fill, drilled piers are another option. Drilled piers have been discussed under Expansive Soils. If debris exists underlying the fill in the gully in the

northeastern portion of the site, it will require complete removal prior to construction in this area. Any contaminated soils will also require removal. Environmental testing may be required. It is our understanding that debris that has been dumped on the site has been hauled off.

Hydrocompaction

Areas in which hydrocompaction have been identified are acceptable as building sites. In areas identified for this hazard classification, however, we anticipate a potential for settlement movements upon saturation of these surficial soils. The low density, uniform grain sized, windblown sand deposits are particularly susceptible to this type of phenomenon.

Mitigation: The potential for settlement movement is directly related to saturation of the soils below the foundation areas. Therefore, good surface and subsurface drainage is extremely critical in these areas in order to minimize the potential for saturation of these soils. The ground surface around all permanent structures should be positively sloped away from the structure to all points, and water must not be allowed to stand or pond anywhere on the site. We recommend that the ground surface within 10 feet of the structures be sloped away with a minimum gradient of ten percent. If this is not possible on the upslope side of the structures, then a well-defined swale should be created to intercept the surface water and carry it quickly and safely around and away from the structures. Roof drains should be made to discharge well away from the structures and into areas of positive drainage. Where several structures are involved, the overall drainage design should be such that water directed away from one structure is not directed against an adjacent building. Planting and watering in the immediate vicinity of the structures, as well as general lawn irrigation, should be minimized.

Loose or Collapsible Soils

Areas of loose and collapsible soils were encountered in the test borings drilled on-site. These areas are sporadic, therefore, none have been indicated on the map. Consolidations ranging from 1.0% to 0.2% were measured on some of the soil samples tested. Areas of very loose and loose densities were encountered in the soil profiles of some of the test borings.

Mitigation: Should loose or collapsible soils be encountered beneath foundations, removal and recompaction with thorough moisture conditioning and recompaction will be necessary. The depth of removal and recompaction can range from 2 to 10 feet. Where fill is

required, it will be necessary to remove the soft or loose soils prior to placement of the fill. Specific recommendations should be made after additional investigation of each building site.

Faults

The closest fault is the Ute Pass Fault, located approximately 8 miles to the west. No faults are mapped on the site itself. Previously Colorado was mapped entirely within Seismic Zone 1, a very low seismic risk. Additionally, the Uniform Building Code (UBC), 1997, currently places this area in Seismic Risk Zone 1. According to a report by the Colorado Geological Survey by Kirkman and Rogers, 1981, (Reference 16) this area should be designed for Zone 2 due to more recent data on the potential for movement in this area, and any resultant earthquakes.

Dipping Bedrock

The bedrock underlying the site is the Pierre Shale Formation of Cretaceous Age. The bedrock in this area is gently dipping a northeasterly direction according to the *Geologic Structure Map of the Pueblo 1x2 Quadrangle, South-Central Colorado* (1978) (Reference 17). The bedrock encountered in the test borings did not exhibit steeply dipping characteristics, therefore mitigation is not necessary.

Radioactivity

Radon levels for the area have been reported by the Colorado Geologic Survey in the Open-File, Report No. 91-4 (Reference 18). Radon levels ranging from 0 to 20 pci/l have been measured in the area. The following is a table of radon levels in this area.

0<4 pci/l	50.00%
4<10 pci/l	50.00%
10<20 pci/l	0.00
>20 pci/l	0.00

Only four readings have been taken in the area. The minimal information from this report is not sufficient to determine if radon levels are higher for this site. No occurrences of radioactive minerals have been identified within a 9-mile radius (Reference 19). No known occurrences exist on the site, however, radon gas originating in the bedrock underlying the site could migrate up into the upper soil profile.

Mitigation: The potential exists for radon gas to build up in areas of the site. Build-ups of radon gas can be mitigated by providing increased ventilation of basements and crawlspaces and sealing of joints. Specific requirements for mitigation should be based on-site specific testing after the site is constructed.

7.0 EROSION CONTROL

The soil types observed on the site are mildly to moderately susceptible to wind erosion, and moderately to highly susceptible to water erosion. A minor wind erosion and dust problem may be created for a short time during and immediately after construction. Should the problem be considered severe enough during this time, watering of the cut areas or the use of chemical palliative may be required to control dust. However, once construction has been completed, and vegetation reestablished, the potential for wind erosion should be considerably reduced.

With regard to water erosion, loosely compacted soils will be the most susceptible to water erosion, residually weathered soils and weathered bedrock materials become increasingly less susceptible to water erosion. For the typical soils observed on-site, allowable velocities or unvegetated and unlined earth channels would be on the order of 3 to 4 feet/second, depending upon the sediment load carried by the water. Permissible velocities may be increased through the use of vegetation to something on the order of 4 to 7 feet/second, depending upon the type of vegetation established. Should the anticipated velocities exceed these values, some form of channel lining material may be required to reduce erosion potential. These might consist of some of the synthetic channel lining materials on the market or conventional riprap.

In cases where ditch-lining materials are still insufficient to control erosion, small check dams or sediment traps may be required. The check dams will serve to reduce flow velocities, as well as provide small traps for containing sediment. The determination of the amount, location and placement of ditch linings, check dams and of the special erosion control features should be performed by or in conjunction with the drainage engineer who is more familiar with the flow quantities and velocities.

Cut and fill slope areas will be subjected primarily to sheetwash and rill erosion. Unchecked rill erosion can eventually lead to concentrated flows of water and gully erosion. The best means to combat this type of erosion is, where possible, the adequate re-vegetation of cut and fill

slopes. Cut and fill slopes having gradients more than three (3) horizontal to one (1) vertical become increasingly more difficult to re-vegetate successfully. Therefore, recommendations pertaining to the vegetation of the cut and fill slopes may require input from a qualified landscape architect and/or the Soil Conservation Service.

8.0 ECONOMIC MINERAL RESOURCES

Some of the sandy materials on-site could be considered a low grade sand resource. According to the *El Paso County Aggregate Resource Evaluation Map* (Reference 20), portions of the site are mapped as valley fill and stream terrace deposits. According to the *Atlas of Sand, Gravel and Quarry Aggregate Resources, Colorado Front Range Counties* distributed by the Colorado Geological Survey (Reference 21), portions of the site are mapped as U1 - Upland deposits: gravel, relatively clean and sound, T4 – Stream terrace deposit: probably aggregate resource, and V4: Valley fill: probably aggregate resource. According to the *Evaluation of Mineral and Mineral Fuel Potential* (Reference 22), tracts in the area of the site have been mapped as "Fair" for industrial minerals. Quarries exist in the area of the site for sand and gravel, particularly in the Eolian Sand and Verdos Alluvium deposits. No gravel quarries are known to have existed on the site itself. Additionally, the clays, claystones and shales associated with the Pierre Shale formation have been mined for the construction of bricks and tiles. No mines are known to have existed on this site. Considering the limited extent on this site, and/or abundance of similar materials through the region, they would be considered to have little significance as an economic resource.

According to *the Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands* (Reference 22), the tracts in the area of the site have been mapped as "Little or no Potential" for coal resources or metallic mineral resources.

The site has been mapped as "Fair" for oil and gas resources (Reference 22). No oil or gas fields have been discovered in the area of the site. A well was drilled 2.5 miles northeast of the site to 1,250 feet deep in 1901. No hydrocarbons were recorded, therefore, the well was plugged and abandoned. The sedimentary rocks in the area lack the essential elements for oil or gas.

9.0 RELEVANCE OF GEOLOGIC AND SITE CONDITIONS TO LAND USE PLANNING

Site Conditions

It is our opinion that the existing geologic and engineering geologic conditions will impose some constraints on the proposed development and construction. Avoidance or regrading may mitigate some of the hazards such as unstable slopes, potentially unstable slopes, floodplain, seasonally high groundwater areas, potentially seasonal high groundwater areas, or areas of ponded water. Other constraints identified on the site such as hydrocompaction, loose or collapsible soils, expansive soils, artificial fill and seasonal high groundwater areas can be mitigated through proper engineering design and construction. Geologic conditions and land use considerations are presented in Table 2.

The majority of the soils at typical foundation depths consist of clays and claystone with minor areas of sands. Areas of shallow bedrock will be encountered on this site particularly in areas mapped as Kp: Pierre Shale. The areas of shallow bedrock encountered in the test borings are indicated on Figure 19. Excavation in the harder claystone or shale bedrock may be difficult in areas. Expansive soils will require special foundation design and/or overexcavation and replacement with non-expansive material compacted at 90% of its maximum Modified Proctor Dry Density ASTM D-1557. Moisture conditioning and recompaction of the clay soils to 95% of standard proctor ASTM D-698 is also being used to mitigate expansive soils. Additional testing is required to evaluate this approach and the depth of removal required. These soils will not prohibit development.

Areas of seasonal high groundwater may be encountered on the site (Figure 20). In these areas, drains may be necessary in order to prevent the seepage of water below grade. Additional investigation is recommended after grading and prior to construction to determine the depth of groundwater and its affects on construction or when grading and development plans are available. Grading can eliminate some of the minor drainages/wet areas. Very soft wet soils were encountered along the edges of the drainages and where the Piney Creek Alluvium is encountered. All soft or organic soils should be removed prior to any fill placement. Higher groundwater levels may be experienced adjacent to the irrigation ditches during peak flow,

particularly in the areas topographically lower than the Fountain Mutual Irrigation ditch that borders the northern portion of the site. Short sections of the ditch are concrete lined with the majority of the ditch unlined. Drains may be necessary in these areas.

The floodplain area of the Jimmy Camp Creek drainage exists in the eastern portion of the site. Should development be considered in the floodplain, channelization and drainage improvements will be necessary as well as raising building areas above the floodplain level. Finished floor elevations must be a minimum of one foot above the floodplain level and drains may be necessary to help prevent the intrusion of water into areas below grade. Soft, unstable soils were encountered in the flood channel. Approval of the Drainage Plan will be necessary prior to construction in the floodplain zone. Specific floodplan location and drainage studies are beyond the scope of this report.

Areas of hydrocompaction have been identified on this site where there is the potential for settlement movements upon saturation of the surficial soils. Good surface and subsurface drainage is critical in these areas and the ground surface should be positively sloped away from structures at all points. Roof drains should be made to discharge well away from structures and planting and watering in the immediate vicinity of structures should be minimized.

Soft and collapsible soils were encountered in some of the test borings drilled on-site. Some of these soils are at shallow depths and are associated with very silty residual clays and silty sand that are potentially collapsible. Other areas contain very soft, wet clays that may experience settlement when placed under a load. These soft, wet soils were typically encountered in areas mapped as Qp: Piney Creek Alluvium and Qal: Recent Alluvium. These soils are encountered at greater depths than the residual silty clays. All soft, collapsible, or wet soils should be removed prior to any construction or fill placement. A map identifying the soft soil areas encountered in the test borings is presented in Figure 21. Areas of anticipated shallow, as well as deep overexcavation are indicated on the map.

The areas of unstable slopes along the ditches on the site can be either avoided by development or regraded. A minimum building setback of 20 feet is recommended from the crest or toe of the unstable slopes if not regraded. Erosion protection may be necessary along these slopes to prevent further erosion. The unstable and potentially unstable slopes can be mitigated by regrading to no steeper than 3:1. In areas of softer clays, 4:1 slopes may be required.

An area of erosion (gully) was observed in the southeastern portion of the site (Figure 14). Other areas of minor erosion were observed that have not been identified on the site. Regrading and vegetation may mitigate the majority of erosion potential after site grading and construction. Where erosion is more severe or continues, the use of check dams or sediment traps may be necessary. Erosion control has been discussed in Section 7.0 of this report.

Preliminary Foundation Recommendations

Structures can be supported on shallow foundations if the expansive soils are mitigated or drilled piers that extend into bedrock. Shallow foundations consisting of standard spread footing/stemwall systems in conjunction with overexcavation and replacement in areas of expansive soils or recompaction in areas of loose or collapsible soils can be used on the site. Moisture conditioned soils can also support shallow foundations. Post-tensioned slabs can be used in areas of expansive soils if designed for differential heave. Areas of uncontrolled fill may be encountered across the site and all foundation members must fully penetrate all uncontrolled fill. Reinforcing for foundations should be designed to span a minimum of 10 feet under the design load and should extend a minimum of 30 inches below finished grade for frost protection. Interior support columns may be supported by isolated concrete pads. Additional subsurface investigation is recommended for each subdivision as development plans are finalized. Actual bearing capacities for each site will be determined after additional investigation.

Drilled piers foundation systems are a suitable alternative to overexcavation and replacement of expansive soils. Drilled piers must extend into bedrock. Drilled piers on the order of 20 to 30 feet will likely be required on this site. Longer piers would be required in areas of deep bedrock and in areas of very high swelling claystone. Dewatering would be required in areas where groundwater is encountered. Casing of piers may be required.

Floor Slabs

Floor slabs placed on expansive clays or loose sands should be expected to experience movement. Removal and replacement of clay soils with granular soils or removal and recompaction of granular soils is recommended to minimize slab movement. Floor slabs on grade, if any should be separated from structural portions of the building and allowed to float freely. Interior partitions must be constructed in such a manner that they do not transmit floor

slab movement to the roof or overlying floor. Backfill placed below floor slabs should be compacted to a minimum of 90% of its maximum Modified Proctor Dry Density, ASTM D- 1557. Structural floors are also an alternative in highly expansive soils.

Surface and Subsurface Drainage

Positive surface drainage must be maintained around all structures to minimize infiltration of surface water. A minimum gradient of 10% in the first 10 feet adjacent to foundation walls for landscaped areas and 2% for paved areas is recommended. The use of drainage swales may be required on the upslope of the structures. All downspouts should be extended to discharge well beyond the backfill zone of the structures.

Subsurface perimeter drains are recommended for useable space below finished ground surfaces. If expansive clays are encountered in the excavation, perimeter drains are recommended around the entire structure. Depending on groundwater conditions, underslab or interceptor drains may be necessary. Drains should consist of a perforated drainpipe, gravel collector and approved filter fabric. Any drains should be provided with a free gravity outlet. If such an outlet is not available, a sump and pump will be required. Typical drain details are presented in Figures 14 through 16.

Backfill

Backfill placed around the foundations and in utility trenches should be compacted to a minimum of 90% of its maximum Modified Proctor Dry Density, ASTM D-1557. Material should be placed in lifts having a compacted thickness of six inches or less and a moisture content conducive to adequate compaction, usually ±2% of optimum Proctor moisture content. Mechanical methods should be used in placement of backfill; however, heavy equipment should be kept away from foundation walls. No water flooding techniques of any type should be used in compaction of backfill on the site.

Trench backfill should be performed in accordance with City of Colorado Springs and City of Fountain specifications. All excavating should be performed in accordance with OSHA guidelines.

Structural Fill

Any areas to receive fill should have all topsoil, organic material, or debris removed. Any uncontrolled fill should be recompacted prior to placing new fill. The surface should be scarified and moisture conditioned to within 2% of optimum moisture content and compacted to a minimum of 90% of its maximum Modified Proctor Dry Density, ASTM D-1557, prior to placing new fill. New fill should be placed in thin lifts not to exceed 6 inches after compaction while maintaining at least 90% of its maximum Modified Proctor Dry Density, ASTM D-1557. Fill material should be free of vegetation or other unsuitable material and shall not contain rocks or pieces greater than six (6) inches. Top soil and strippings should not be mixed in the structural fill. Fill material should be placed at a moisture content conducive to compaction, usually ±2% of Proctor optimum moisture content. Fill slopes should be constructed at no steeper than 3:1 and properly benched into native soils. The placement and compaction of fill should be observed and tested by the Soils Engineer during construction. Any import materials should be approved by the Soils Engineer prior to hauling to the site.

10.0 CLOSURE

It is our opinion that the existing geologic engineering and geologic conditions will impose some constraints on development and construction of the site. The geologic hazards identified on the site can either be avoided by development or satisfactorily mitigated through proper engineering design and construction practices.

It should be pointed out that because of the nature of data obtained by random sampling of such variable and non-homogeneous materials as soil and rock, it is important that we be informed of any differences observed between surface and subsurface conditions encountered in construction and those assumed in the body of this report. Reporting such discrepancies to Entech Engineering, Inc. soon after they are discovered would be greatly appreciated and could possibly help avoid construction and development problems. Additional investigation is recommended as development and grading plans are finalized. Planning and design personnel should be made familiar with the contents of this report.

This report has been prepared for Nor'wood Development for application to the proposed project in accordance with generally accepted geologic soil and engineering practices. No other warranty expressed or implied is made.

We trust this report has provided you with all the information you required. Should you require additional information, please do not hesitate to contact Entech Engineering, Inc.

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TABLES

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE
JOB BO. 98104

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	FHA SWELL (PSF)	SWELL/ CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	TB-16	2-5'	74.6%	35	19	1515		CL	FILL, CLAY, SILTY, SANDY
1	TB-16	5'					4.0%	CL	FILL, CLAY, SILTY, SANDY
2	TB-19	5'					0.5%	SM	SAND, VERY SILTY
2	TB-4	15-20'	6.8%	NV	NP			SP-SM	SAND, SLIGHTLY SILTY, GRAVELLY
2	TB-21	15-16'	6.9%	NV	NP			SW-SM	SAND, SLIGHTLY SILTY
2	TB-33	15-20'	26.8%					SM	SAND, SILTY
2	TB-18	2-3'					0.7%	SM	SAND, SILTY
2	TB-31	2-5'	49.1%	25	10	846		SC-CL	SAND, VERY CLAYEY
2	TB-31	5'					0.2%	SC-CL	SAND, VERY CLAYEY
2	TB-51	5'					-1.0%	SM	SAND, SILTY
3	TB-34	20'	99.5%	63	35	3924		CH	CLAY
3	TB-1	2-5'	87.0%	36	21	2182		CL	CLAY, SANDY
3	TB-4	2-3'				2213		CL	CLAY, SLIGHTLY SANDY
3	TB-14	5-10'	52.1%	24	6	738		CL-ML	CLAY-SILT, VERY SANDY
3	TB-26	2-5'	56.2%			1000		CL-ML	CLAY-SILT, VERY SANDY
3	TB-27	15'	50.1%	20	5			CL-ML	CLAY-SILT, VERY SANDY
3	TB-34	5'	54.2%					CL	CLAY, VERY SANDY
3	TB-1	5'					4.2%	CL	CLAY, SANDY
3	TB-2	10'					6.2%	CL	CLAY, SANDY
3	TB-5	10'					-0.2%	CL	CLAY, SILTY, SLIGHTLY SANDY
3	TB-14	10'					0.1%	CL-ML	CLAY-SILT, VERY SANDY
3	TB-23	5'					1.0%	CL	CLAY, VERY SILTY, SANDY
3	TB-24	10'					0.0%	CL	CLAY, SILTY, SANDY
3	TB-27	15'					-0.2%	CL-ML	CLAY-SILT, VERY SANDY
3	TB-28	5'					2.8%	CL-ML	CLAY-SILT, SANDY
3	TB-34	5'					0.0%	CL	CLAY, VERY SANDY
3	TB-39	2'	61.4%	29	14			CL	CLAY, VERY SILTY, SANDY
3	TB-40	10'				1303		CL	CLAY, SANDY
3	TB-35	5'					0.0%	CL	CLAY, SANDY
3	TB-39	2'					2.1%	CL	CLAY, VERY SILTY, SANDY
3	TB-40	10'					2.0%	CL	CLAY, SANDY
3	TB-44	5-10'	82.2%	31	16	1970		CL	CLAY, SANDY
3	TB-4	10'					6.9%	CL	CLAY, SILTY, SLIGHTLY SANDY
3	TB-6	2-3'					8.8%	CL	CLAY, SANDY

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	FHA SWELL (PSF)	SWELL/ CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
3	TB-9	5'					2.1%	CL	CLAY, SANDY
3	TB-13	10'					0.0%	CL	CLAY, VERY SANDY
3	TB-47	2-5'	60.4%	29	13	1341		CL	CLAY, VERY SILTY, VERY SANDY
3	TB-44	5'					0.3%	CL	CLAY, SANDY
3	TB-45	2-3'					4.8%	CL	CLAY, SANDY
3	TB-47	5'					1.9%	CL	CLAY, VERY SILTY, VERY SANDY
3	TB-49	5-10'	64.4%	27	11	1085		CL	CLAY, VERY SILTY, SANDY
3	TB-15	10'					4.6%	CL	CLAY, SLIGHTLY SANDY
3	TB-21	2-3'					2.0%	CL-ML	CLAY-SILT, SANDY
3	TB-22	10'					3.4%	CL	CLAY, SANDY
3	TB-25	5'					1.7%	CL	CLAY, SILTY, SLIGHTLY SANDY
3	TB-49	10'					0.1%	CL	CLAY, VERY SILTY, SANDY
3	TB-26	10'					3.0%	CL	CLAY, VERY SANDY
3	TB-32	2-3'					3.7%	CL	CLAY, SILTY, SANDY
3	TB-33	5'					3.6%	CL	CLAY, VERY SANDY
3	TB-51	2-3'	78.5%	35	21			CL	CLAY, SANDY
3	TB-53	5-10'	84.5%	45	28			CL	CLAY, SANDY
3	TB-24	20'					-0.2%	CL	CLAY, SILTY, SANDY
3	TB-35	9-10'					0.0%	CL	CLAY, SANDY
3	TB-52	2-3'					4.9%	CL	CLAY, SANDY
3	TB-53	15'					0.3%	CL	CLAY
4	TB-3	20'	70.5%	34	20			CL	CLAYSTONE, SANDY
4	TB-6	10'				3466		CL	CLAYSTONE, SILTY
4	TB-19	15-20'	53.8%					CL	CLAYSTONE, VERY SANDY
4	TB-20	10-15'	90.7%	38	18	1962		CL	CLAYSTONE, SANDY
4	TB-3	20'					2.3%	CL	CLAYSTONE, SANDY
4	TB-7	10'					5.0%	CL	CLAYSTONE
4	TB-8	10'					2.8%	CL	CLAYSTONE, SILTY
4	TB-20	10'					1.6%	CL	CLAYSTONE, SANDY
4	TB-30	10'	80.3%	35	20			CL	CLAYSTONE, SANDY
4	TB-30	10'					2.7%	CL	CLAYSTONE, SANDY
4	TB-36	10'					0.3%	CL	CLAYSTONE, SANDY
4	TB-37	5'					2.1%	CL	CLAYSTONE
4	TB-31	15'	59.0%	33	17			CL	CLAYSTONE, VERY SANDY
4	TB-41	5-10'	99.1%			3597		CL	WEATHERED CLAYSTONE
4	TB-10	10'					2.1%	CL	CLAYSTONE, SANDY
4	TB-12	10'					1.7%	CL	CLAYSTONE, SANDY
4	TB-38	15'					3.8%	CL	CLAYSTONE
4	TB-41	5'					7.1%	CL	WEATHERED CLAYSTONE
4	TB-42	10'					4.2%	CL	CLAYSTONE
4	TB-43	5'					4.9%	CL	CLAYSTONE
4	TB-46	15'					3.4%	CL	CLAYSTONE, SANDY

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	FHA SWELL (PSF)	SWELL/ CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
4	TB-17	10'					3.3%	CL	CLAYSTONE, SANDY
4	TB-48	5'					0.6%	CL	CLAYSTONE, SANDY
4	TB-50	10'					1.3%	CL	CLAYSTONE, SANDY
4	TB-29	10'					1.9%	CL	CLAYSTONE, SANDY
5	TB-12	20'	76.6%	34	22			CL	SHALE, SANDY
5	TB-11	15'					2.8%	CL	SHALE
5	TB-48	15'				1723		CL	SHALE, SANDY

Table 2: Summary of Geologic Units

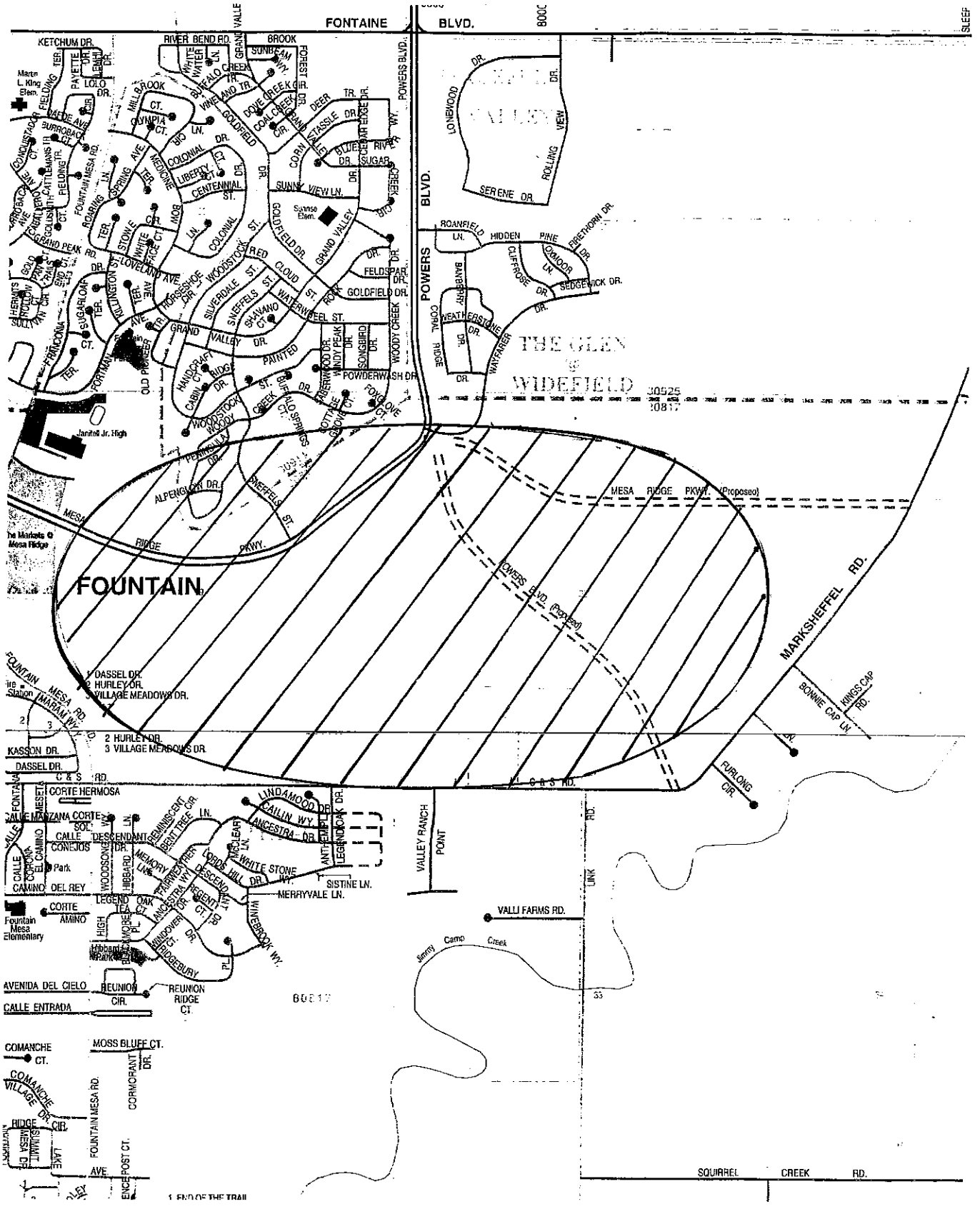
MAP SYMBOL	MAP UNIT, DESCRIPTION & PHYSICAL CHARACTERISTICS	WORKABILITY	SURFACE DRAINAGE, ERODIBILITY & GROUNDWATER	SUITABILITY FOR WASTE DISPOSAL	FOUNDATION STABILITY	POTENTIAL GEOLOGIC HAZARDS	KNOWN, REPORTED & POSSIBLE GEOLOGIC RESOURCES
Qp	PINEY CREEK ALLUVIUM: Organic rich clayey silt and sand with gravel, cobbles and boulders in terraces along most of the present streams. Locally alluvium, derived from expansive bedrock will have a low to high potential for swelling. Top of terraces is about 20 feet above stream level.	Excavation and compaction easy.	Infiltration: Medium to low. Runoff: Moderate to rapid. Locally water may stand in flat areas for several days following heavy precipitation. Moderately resistant to erosion. Water table may be permanently or seasonally within a few feet of the surface. Yield to wells range 1 to 100 gallons per minute. Along Fountain Creek south of Colorado Springs yield in excess of 1000 gallons per minute.	Septic Systems: Excellent to poor. In some areas ground water table may be too high.	Good to poor. May have expansive clay or high ground water in some areas.	Locally expansive soils; low areas may be subject to flooding. Steep slopes along stream channels may be unstable or undercut by stream erosion.	Source of sand and gravel.
Qes	EOLIAN SAND (wind-deposited sand): Coarse to fine-grained sand. Occurs adjacent to streams and on upland ridges east of Monument and Fountain Creeks. Forms rolling upland surface in southeastern Colorado Springs and in Peterson Field area. Extensive deposits occur north and east of Falcon.	Excavation: Easy. Compaction: Vibratory equipment may be necessary for proper compaction.	Infiltration: Medium to high. Runoff: Low. Erodible by wind if vegetation is removed.	Septic Systems: Poor to fair depending on percolation rate. Dump Site: Unsatisfactory because of high infiltration rates.	Fair to good. May be subject to compaction.	Susceptible to wind erosion if vegetation is removed. May be subject to hydrocompaction. Walls of trenches may collapse if unsupported.	Source of commercial sand.

MAP SYMBOL	MAP UNIT, DESCRIPTION & PHYSICAL CHARACTERISTICS	WORKABILITY	SURFACE DRAINAGE, ERODIBILITY & GROUNDWATER	SUITABILITY FOR WASTE DISPOSAL	FOUNDATION STABILITY	POTENTIAL GEOLOGIC HAZARDS	KNOWN, REPORTED & POSSIBLE GEOLOGIC RESOURCES
Qv	VERDOS ALLUVIUM: (pediment deposit): Poorly sorted stratified bouldery gravel containing lenses of sand, silt and clay. Close to mountain front large boulders are common. Boulders and gravel are weathered and coated with calcium carbonate. Occurs as broad gently sloping pediment deposits along mountain front or as isolated pediment remnants. Top of terrace is 160 to 200 feet above major streams.	Excavation and compaction easy except in boulders.	Filtration: High in gravels, generally low in silt and clay. Runoff: Low. Resistant to erosion. Water table generally not present. Dissected terraces preclude a large scale accumulation of ground water within deposits.	Septic Systems: Fair to poor dependent on adequate fine-grained materials. Dump Site: Unsatisfactory because of high infiltration rates.	Excellent except near steep slopes at edge of terraces.	Slopes at edge of terraces may be unstable where underlying Pierre Shale becomes saturated.	Source of sand and gravel. Contains significant amounts of unsound rock fragments.
Kp (Kpt) (Kps)	COLLUVIUM PIERRE SHALE (includes areas of bedrock): Silty sand and clay derived from siltstone, sandstone and shale. Much of the shale has a low to very high swelling potential. (Kpt) – Upper transition member: Shale, siltstone and sandstone. (Ikps) – sandstone. (Kp) – Main part of formation: Predominantly shale beds, contains irregular limestone masses that weather into conical mounds called tepee buttes.	Excavation and compaction easy to base of weathered zone except for tepee buttes.	Infiltration: Negligible. Runoff: Rapid but water may pond in undrained depressions. Low resistance to erosion.	Septic Systems: Unsatisfactory in clay and shale: fair in sand and sandstone. Dump Site: Commonly excellent; excavation easy and risk of ground water pollution negligible. Locally fair to good in sandstone and concretionary zones that are more difficult to excavate.	Very poor to fair. Locally expands excessively and exerts high swelling pressure when moisture content increases; shrinks on drying.	Slopes in shale no steeper than 5 degrees may slide if saturated and toe of slope is removed. Beds at edge of terraces and adjacent to streams are commonly unstable when saturated. Exposed slopes erode readily.	Source of material for expanded lightweight aggregate. Clay for brick and tile.

Table 3: Summary of Depth to Bedrock and Groundwater and Depth of Fill

Test Boring No.	Depth to Bedrock (ft.)	Depth to Groundwater (ft.)	Depth of Fill (ft.)
1	>20	>20	Ø
2	>20	>20	Ø
3	19	>18	2
4	>20	>20	Ø
5	13.5	15	Ø
6	9	10.5	Ø
7	4	13.5	Ø
8	8	17.5	Ø
9	18	10.5	Ø
10	9	15.5	Ø
11	2	6.5	Ø
12	4	15	Ø
13	13	18.5	Ø
14	18	14	Ø
15	>20	19.5	Ø
16	8	>19.5	8
17	7	>19	Ø
18	8	>14	Ø
19	8	>19.5	Ø
20	6	>19.5	Ø
21	>20	19	Ø
22	>20	>19.5	Ø
23	>20	>19.5	Ø
24	>20	13	Ø
25	>40	18	Ø
26	>20	19.5	Ø
27	>20	19	Ø
28	>20	>19	Ø
29	8	>15	Ø
30	5	>14	Ø
31	12	>19	Ø
32	>20	>18.5	Ø
33	>20	19	Ø
34	>20	9	Ø
35	19	8.5	Ø
36	5	>19	Ø
37	3	6.5	Ø
38	2	18	Ø
39	2.5	>19	Ø
40	14	>19	Ø
41	4	14	Ø
42	2	14	Ø
43	4	19	Ø
44	>20	14.5	Ø
45	4	13	Ø
46	4	>15	Ø
47	7	>20	Ø
48	2	>14.5	Ø
49	18	17	Ø
50	4	14.5	Ø
51	>20	9.5	Ø
52	>20	19.5	Ø
53	>20	>20	Ø

FIGURES



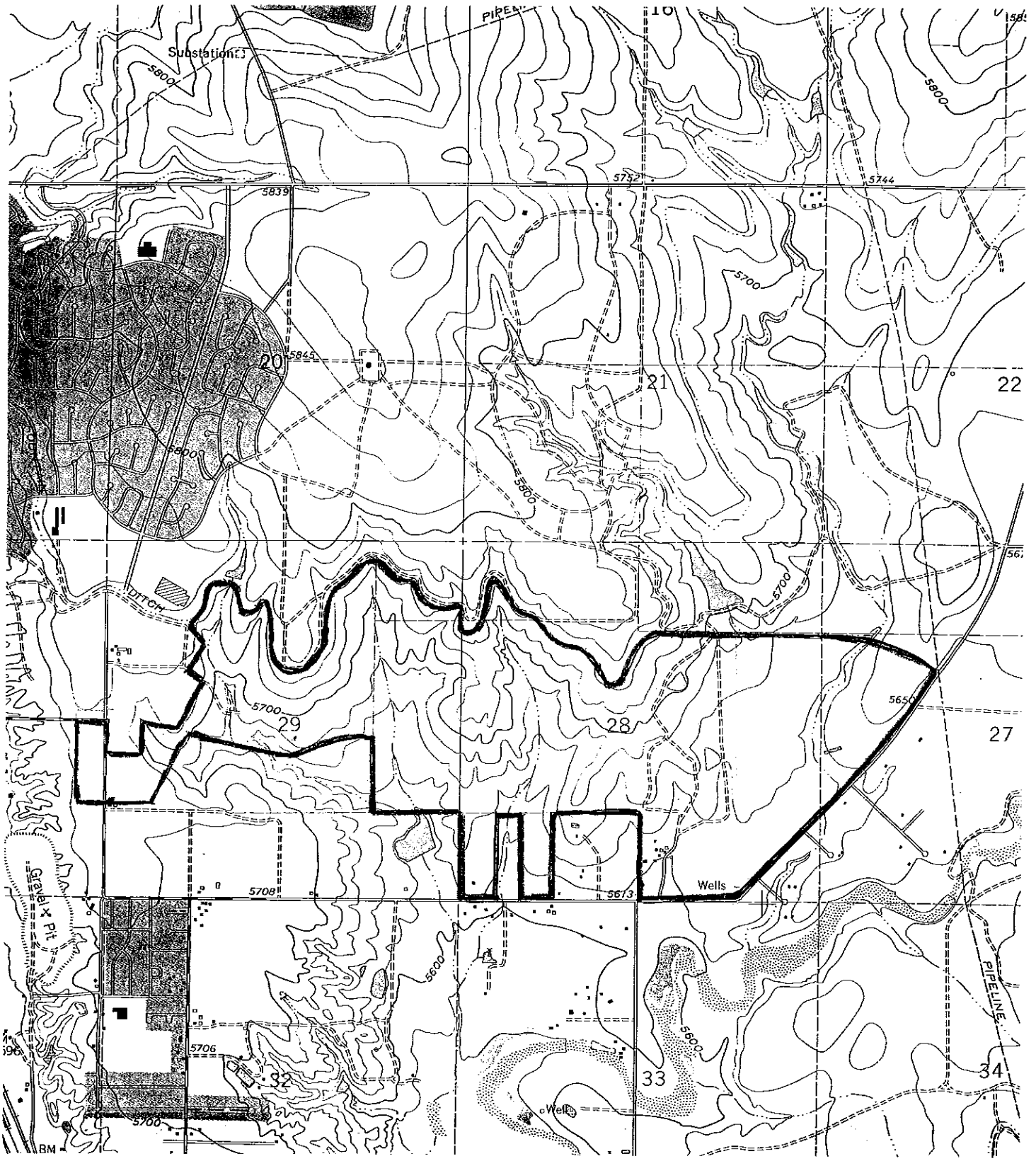
ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907 (719) 531-5599

VICINITY MAP
CROSS CREEK
FOR: NORWOOD DEVELOPMENT

DRAWN:	DATE:	CHECKED:	DATE:
RJO	2FEB04	KAH	2/13/04

JOB NO.: 98104

FIG NO.: 1



ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907 (719) 531-5599

USGS MAP
CROSS CREEK
FOR: NORWOOD DEVELOPMENT

DRAWN:	DATE:	CHECKED:	DATE:
RJO	2FEB04	[illegible]	2/13/04

JOB NO.: 98104

FIG NO.: 2

REVISION	BY:

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE (719) 531-5599
COLORADO SPRINGS, CO. 80907

TEST BORING LOCATION PLAN
CROSS CREEK @ MESA RIDGE
FOUNTAIN, CO.
FOR: NORWOOD DEVELOPMENT

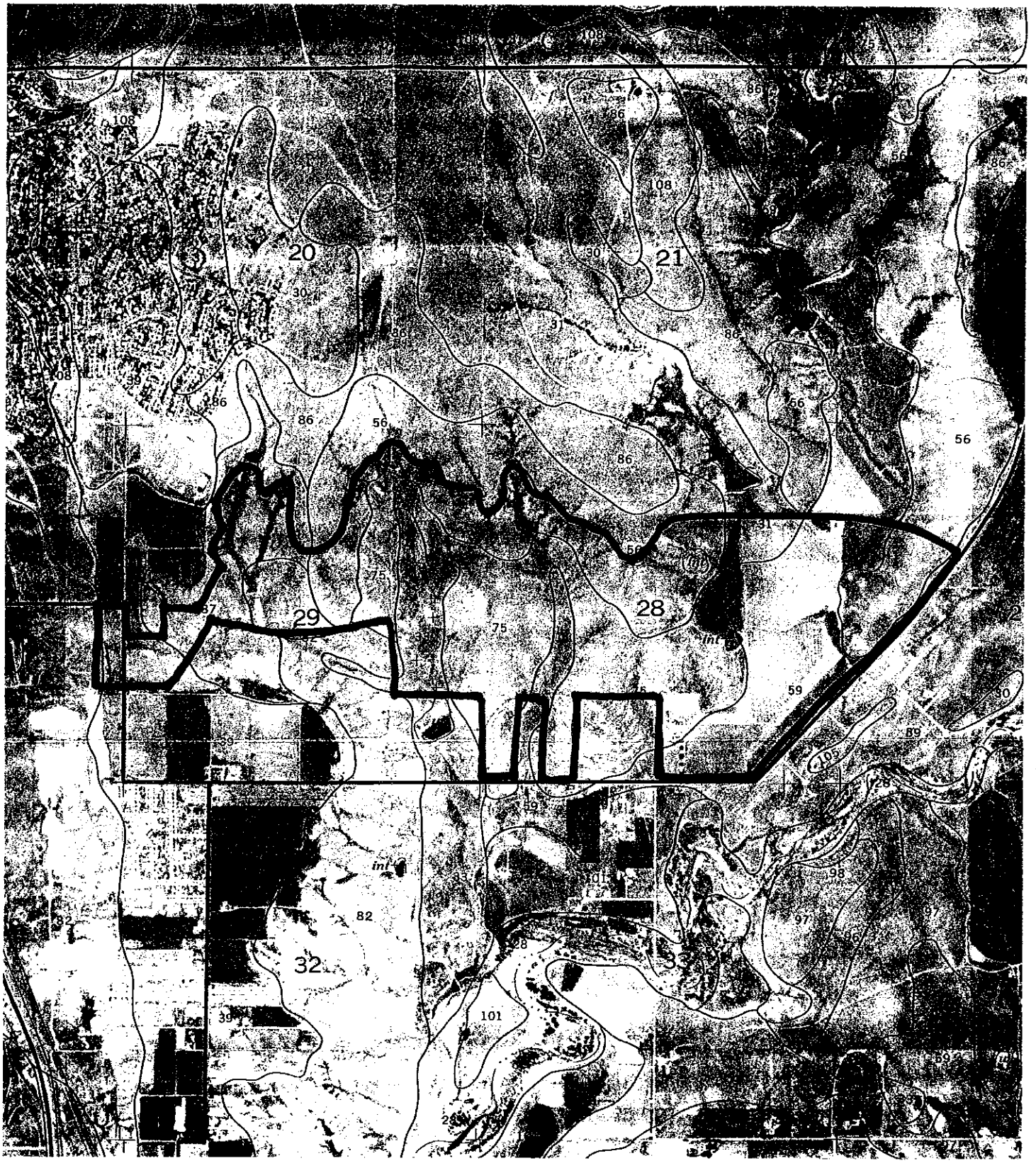
LEGEND

TB# - Approximate Test Boring location and number

P# - Approximate Photo location, direction, and number

DRAWN BY:	R.J. OLSON
DESIGNED BY:	
CHECKED BY:	
DATE:	11FEB04
SCALE:	N.T.S.
JOB NO.:	98104
FIGURE NO.:	3

C:\ta_Drafting\2004\GEOHAZ MAPS\CROSSCREEK\MF98104(CROSS CREEK)GEO_TB.dwg



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ENGINEERING, INC.
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COLORADO SPRINGS, CO. 80907 (719) 531-5599

SCS MAP
CROSS CREEK
FOR: NORWOOD DEVELOPMENT

DRAWN:	DATE:	CHECKED:	DATE:
RJO	2FEB04	[illegible]	2/13/04

JOB NO.: 98104

FIG NO.: 4

31—Fort Collins loam, 3 to 8 percent slopes. This deep, well drained soil formed in medium textured alluvium on uplands. Elevation ranges from 5,200 to 6,500 feet. The average annual precipitation ranges from about 13 inches at the lower elevations to about 15 inches at the higher elevations, the average annual temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is brown loam about 6 inches thick. The subsoil is brown clay loam about 15 inches thick. The substratum is pale brown loam.

Included with this soil in mapping are small areas of Stoneham sandy loam, 3 to 8 percent slopes; Keith silt loam, 0 to 3 percent slopes; Bresser sandy loam, 5 to 9 percent slopes; and Wiley silt loam, 3 to 9 percent slopes.

Permeability of this Fort Collins soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate.

This soil is well suited to the production of native vegetation suitable for grazing. Native vegetation is mainly blue grama, western wheatgrass, side-oats grama, and sand dropseed. Needleandthread, big bluestem, and native bluegrasses also grow on this soil in the northern part of the survey area.

Fencing and proper location of livestock watering facilities help to control grazing of animals. Deferment of grazing may be necessary to maintain a needed balance between livestock use and forage production. In areas where the plant cover has been depleted, pitting can be used to help the native vegetation recover. Chemical control practices may be needed in disturbed areas where dense stands of pricklypear occur. Precaution must be taken to leave ample amounts of litter and forage on the soil because of the high hazard of soil blowing.

Windbreaks and environmental plantings generally are well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is well suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for homesites. The main limitations are its limited ability to support a load and moderate shrink-swell potential. Roads can be designed to offset these limitations. Capability subclass VIe.

33—Heldt clay loam, 0 to 3 percent slopes. This deep, well drained soil is on terraces, alluvial fans, and valley side slopes. It formed in fine textured alluvial fan sediment derived from clay shale. Most areas of this soil are in the Fountain area, but a few small areas are around Calhan. Elevation ranges from 5,200 to 6,500 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is light brownish gray clay loam about 5 inches thick. The subsoil is light brownish gray silty clay about 36 inches thick. The substratum is light olive gray silty clay loam.

Included with this soil in mapping are small areas of Limon clay, 0 to 3 percent slopes; Manzanola clay loam, 0 to 1 percent slopes; Manzanola clay loam, 1 to 3 percent slopes; Nunn clay loam, 0 to 3 percent slopes; and Ustic Torrifluvents, loamy.

Permeability of this Heldt soil is slow. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is slight to moderate. Gullies are along some of the drainageways.

Most areas of this soil are used as native rangeland. A small acreage is in irrigated alfalfa, corn, and pasture. The corn is usually cut for silage.

Where irrigation water is available, this soil is suited to the production of corn, alfalfa, and pasture. Other suited crops are sugar beets, oats, and barley. Because of its high clay content, maintenance of organic matter content and timely tillage are needed to keep this soil workable. All crops respond to nitrogen and phosphate fertilizer where the irrigation water supply is adequate for optimum crop yields. Irrigation water is best applied to field crops by the furrow and border methods.

Where irrigation water is not available, this soil is used mostly for range. Native vegetation is mainly alkali sacaton, western wheatgrass, and galleta. There are lesser amounts of blue grama. Needleandthread, junegrass, and side-oats grama are also present where this soil occurs in the northern part of the survey area. Four-wing saltbush is a common shrub. The presence of princesplume, two-groove milkvetch, and Fremont goldenweed indicates that selenium-bearing plants are in the stand.

This soil is very difficult to revegetate, and it is especially important that livestock grazing be carefully managed. Fencing helps to control distribution of livestock. Where the plant cover has been depleted, pitting aids the recovery of the native vegetation.

Windbreaks and environmental plantings generally are not suited to this soil. Onsite investigation is needed to determine if plantings are feasible.

Openland wildlife is favored on this soil when its primary use is for crops that supply small grain, grasses, and other habitat elements needed by openland wildlife. Where water is available for irrigation, wildlife habitat, especially shrub and grass plantings, can be developed to encourage pheasant and many kinds of songbirds. In areas of this soil near Fountain Creek, numerous habitat niches exist. If this soil is used as rangeland, scaled quail and antelope should be attracted to it; livestock grazing management is needed to encourage wildlife.

High shrink-swell potential limits use of this soil as homesites. Special site or building designs are needed to overcome this limitation. This soil is unsuited to septic tank absorption fields because of slow permeability. Capability subclasses IVe, nonirrigated, and IIIe, irrigated.

56—Nelson-Tassel fine sandy loams, 3 to 18 percent slopes. These gently sloping to moderately steep soils are on hills and ridges of uplands. Coarse fragments of ironstone or fine grained sandstone gravel are commonly scattered on the surface of these soils. Elevation ranges from 5,600 to 6,400 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Included with these soils in mapping are areas of Midway clay loam, 3 to 25 percent slopes; Razor clay loam, 3 to 9 percent slopes; and Wiley silt loam, 3 to 9 percent slopes.

The Nelson soil makes up about 45 percent of the complex, the Tassel soil about 30 percent, and other soils about 25 percent. The Nelson soil is commonly in the lower positions on the landscape and has slopes of 3 to 12 percent. The Tassel soil is in the higher positions and has slopes of 3 to 18 percent.

The Nelson soil is moderately deep and well drained. It formed in moderately coarse textured, calcareous residuum derived from interbedded sedimentary rock. Typically, the surface layer is grayish brown fine sandy loam about 7 inches thick. The substratum is light brownish gray fine sandy loam about 19 inches thick. Interbedded weathered sandstone, shale, and loamstone are at a depth of about 26 inches.

Permeability of the Nelson soil is moderately rapid. The effective rooting depth is 20 to 40 inches. Available water capacity is low. Surface runoff is slow, and the hazard of erosion is moderate.

The Tassel soil is shallow and well drained. It formed in calcareous residuum derived from sandstone. Typically, the surface layer is grayish brown fine sandy loam about 4 inches thick. The substratum is brown fine sandy loam about 3 inches thick over pale brown sandy loam about 3 inches thick. Sandstone is at a depth of about 10 inches.

Permeability of the Tassel soil is moderately rapid. Effective rooting depth is less than 20 inches. Available water capacity is low. Surface runoff is medium, and the hazard of erosion is moderate to high.

Almost all areas of these soils are used as rangeland.

These soils are suited to the production of native vegetation suitable for grazing. Native vegetation is mainly blue grama, which has a typical bunchgrass growth form and makes up one-third to one-half of the cover. Other species are sand dropseed, needleandthread, side-oats grama, and buckwheat.

Seeding is advisable if the range has deteriorated, and seeding the native grasses is a good practice. If the range is severely eroded and blowouts have developed, the new seeding should be fertilized. Brush control may be needed, and grazing management may improve the depleted range. Grazing should be managed so that enough forage is left standing to protect the soil from blowing, to increase infiltration of water, and to catch and hold snow.

Windbreaks and environmental plantings generally are not suited to this soil. Onsite investigation is needed to determine if plantings are feasible.

These soils are best suited to habitat for openland and rangeland wildlife. Rangeland widlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The potential of these soils for homesites in places is limited by depth to bedrock and slope. Deep cuts, to provide essentially level building sites, can expose bedrock. Roads on the Nelson soil must be designed to minimize frost-heave damage. Because of the depth to sandstone, septic tank absorption fields do not function properly. Capability subclass VIe.

59—**Nunn clay loam, 0 to 3 percent slopes.** This deep, well drained soil is on terraces, fans, and uplands. It formed in mixed alluvium. Elevation ranges from about 5,400 to 6,500 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is grayish brown clay loam about 12 inches thick. The subsoil is grayish brown heavy clay loam about 18 inches thick. The substratum to a depth of 72 inches is light olive brown sandy clay loam in the upper part and light brownish gray clay in the lower part. Visible lime occurs as soft masses and streaks throughout the substratum.

Included with this soil in mapping are small areas of Manzanola clay loam, 0 to 1 percent slopes; Manzanola clay loam, 1 to 3 percent slopes; Sampson loam, 0 to 3 percent slopes; and Ustic Torrifluvents, loamy.

Permeability of this Nunn soil is moderately slow. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is slow to medium, and the hazard of erosion is slight.

About 70 percent of the acreage of this soil is in dryland and irrigated crops. Wheat is the main dryland crop, and corn and alfalfa are the main irrigated crops. The remaining acreage is used as rangeland.

This soil is suited to the production of native vegetation suitable for grazing. The native vegetation is mainly western wheatgrass, blue grama, alkali sacaton, needleandthread, and side-oats grama. Galleta and fourwing saltbush are also present where this soil occurs in the southern part of the survey area. The presence of princesplume, two-groove milkvetch, and Fremont goldenweed indicates that selenium-bearing plants are in the stand.

Good grazing management is essential to maintain the desirable grasses. Deferment of grazing early in spring helps to maintain the vigor of cool-season grasses. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings generally are well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by providing nesting areas and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided for in plans for habitat development; this is especially true for intensively farmed areas. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of this soil for urban use are slow permeability, low strength, and shrink-swell potential. Buildings and roads must be designed to overcome the limitations of low bearing strength and shrink-swell potential. Septic tank absorption fields do not function properly because of the slow permeability. Capability subclasses IIIc, nonirrigated, and IIe, irrigated.

75—**Razor-Midway complex.** These gently sloping to moderately steep, clayey soils formed in residuum derived from calcareous shale on uplands. Slope ranges from 3 to 25 percent. Elevation ranges from 5,300 to 6,100 feet. The average annual precipitaton is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

The Razor soil makes up about 50 percent of the complex, the Midway soil about 30 percent, and other soils about 20 percent.

Included with these soils in mapping are areas of Limon clay, 0 to 3 percent slopes; Stoneham sandy loam, 3 to 8 percent slopes; and geological formations called teepee buttes. The teepee buttes are conspicuous cone-shaped piles of marine rubble that rise above the more nearly level plains and occur at random on the landscape. The material of these formations is hard sedimentary rock and some petri' . marine life.

The Razor soil is moderately deep and well drained. Typically, the surface layer is light brownish gray clay loam about 3 inches thick. The subsoil is grayish brown heavy clay loam or clay about 15 inches thick. The substratum is grayish brown clay that grades to calcareous shale at a depth of about 31 inches. Visible lime is in the lower part of the subsoil and in the substratum.

Permeability of the Razor soil is slow. Effective rooting depth is 20 to 40 inches. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate.

The Midway soil is shallow and well drained. Typically, the surface layer is light yellowish brown clay loam about 4 inches thick. The substratum is light yellowish brown clay about 4 inches thick over grayish brown clay about 5 inches thick. It grades to calcareous shale at a depth of about 13 inches.

Permeability of the Midway soil is slow. Effective rooting depth is less than 20 inches. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high.

The soils in this complex are used primarily as rangeland and for wildlife habitat.

The native vegetation on these soils is mainly alkali sacaton, western wheatgrass, galleta, and blue grama; there are lesser amounts of blue grama on the Razor soil. Fourwing saltbush is a common shrub. Needleandthread, junegrass, and side-oats grama are also present where these soils occur in the northern par of the survey area. The presence of princesplume, two-groove milkvetch, and Fremont goldenweed indicates that selenium-bearing plants are in the stand.

The Razor soil is very difficult to revegetate, and it is especially important that livestock grazing be carefully managed. Fencing helps to control the distribution of grazing. Where the plant cover has been depleted, pitting aids in the recovery of the native vegetation.

The Midway soil generally is difficult to revegetate, and it is therefore important that livestock grazing be carefully managed. Excessive removal of vegetation can result in severe erosion. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings generally are not suited to the soils in this complex. Onsite investigation is needed to determine if plantings are feasible.

These soils are suited to wildlife habitat. They are best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope and scaled quail, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations for urban use or homesite development are depth to shale, slow permeability, shrink-swell potential, and slope. Special designs for buildings and roads are needed to overcome these limitations. Because of the depth to shale and slow permeability, septic tank absorption fields do not function properly. Community sewerage systems are required in areas of moderate to high population density. Capability subclass VIe.

82—Schamber-Razor complex, 8 to 50 percent slopes. These gently rolling to steep soils are on eroded breaks and remnants of granite outwash over shale. Elevation ranges from 5,500 to 6,500 feet. The average annual precipitation is about 13 inches, and the average annual air temperature is about 49 degrees F.

The Schamber soil makes up about 40 percent of the complex, the Razor soil about 30 percent, and other soils about 30 percent.

Included with these soils in mapping are areas of Chaseville-Midway complex; Kim loam, 1 to 8 percent slopes; Razor stony clay loam, 5 to 15 percent slopes; and Heldt clay loam, 0 to 3 percent slopes.

The Schamber soil is deep and well drained. It formed in eolian material mixed with alluvium and colluvium derived from granite. Typically, the surface layer is grayish brown gravelly loam about 5 inches thick. The underlying material is brown very gravelly loam about 9 inches thick over light yellowish brown very gravelly sand that extends to a depth of 60 inches or more.

Permeability of the Schamber soil is rapid. The effective rooting depth is 60 inches or more, and available water capacity is low to moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate.

The Razor soil is moderately deep and well drained. It formed in residuum derived from calcareous shale. Slope is 8 to 15 percent. Typically, the surface layer is light brownish gray clay loam about 3 inches thick. The subsoil is grayish brown heavy clay loam or clay about 15 inches thick. The substratum is grayish brown clay that grades to calcareous shale at a depth of about 31 inches. Visible lime is in the lower part of the subsoil and in the substratum.

Permeability of the Razor soil is slow. The effective rooting depth is 20 to 40 inches. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high.

The soils in this complex are used as native rangeland, for wildlife habitat, and as military impact areas.

These soils are suited to the production of native vegetation suitable for grazing. Native vegetation on the Schamber soil is western wheatgrass, blue grama, sideoats grama, and little bluestem. The common shrubs are skunkbush sumac, fourwing saltbush, and buckwheat. Native vegetation on the Razor soil is alkali sacaton, western wheatgrass, galleta, and lesser amounts of blue grama. Fourwing saltbush is a common shrub. The presence of princesplume, two-groove milkvetch, and Fremont goldenweed indicates that selenium-bearing plants are in the stand.

These soils are very difficult to revegetate, and it is especially important that livestock grazing be carefully managed. Fencing and properly locating livestock watering facilities help to control grazing. Where the plant cover has been depleted, especially on the Razor soil, pitting aids in the recovery of the native vegetation.

Windbreaks and environmental plantings are suited to this soil. Low available water capacity is the main limitation for the establishment of tree and shrub plantings. Summer fallow a year in advance and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac and lilac.

These soils are poorly suited to wildlife habitat. They are typically used as habitat for rangeland wildlife, such as scaled quail and antelope. Livestock grazing must be very carefully managed if wildlife is to satisfy most of its habitat requirements.

The main limitation for construction on the Schamber soil is steep slopes. Because of rapid permeability, there is a hazard of pollution if this soil is used for septic tank absorption fields. The high content of coarse fragments may cause problems with excavations, mainly because cut banks cave in. Special designs for buildings and roads are necessary to offset the limitation of slope. The Razor soil is limited by depth to shale, slow permeability, limited ability to support a load, shrink-swell potential, and slope. Both soils are limited by frost-action potential. Special designs for buildings and roads are needed to overcome these limitations. Capability subclass VIIe.

87—Stoneham sandy loam, 8 to 15 percent slopes. This deep, well drained soil formed in medium textured, calcareous sediment on uplands. Elevation ranges from 5,100 to 6,500 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is pale brown sandy loam about 4 inches thick. The subsoil is pale brown sandy clay loam about 7 inches thick. The substratum is very pale brown loam to a depth of 60 inches or more. The lower part of the subsoil and the substratum have visible soft masses of lime.

Included with this soil in mapping are small areas of Fort Collins loam, 3 to 8 percent slopes; Keith silt loam, 0 to 3 percent slopes; and Wiley silt loam, 3 to 9 percent slopes.

Permeability of this Stoneham soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is rapid, and the hazard of erosion is moderate. A few gullies have formed along drainageways. Soil slippage is common.

Most areas of this soil are used as rangeland and for wildlife habitat.

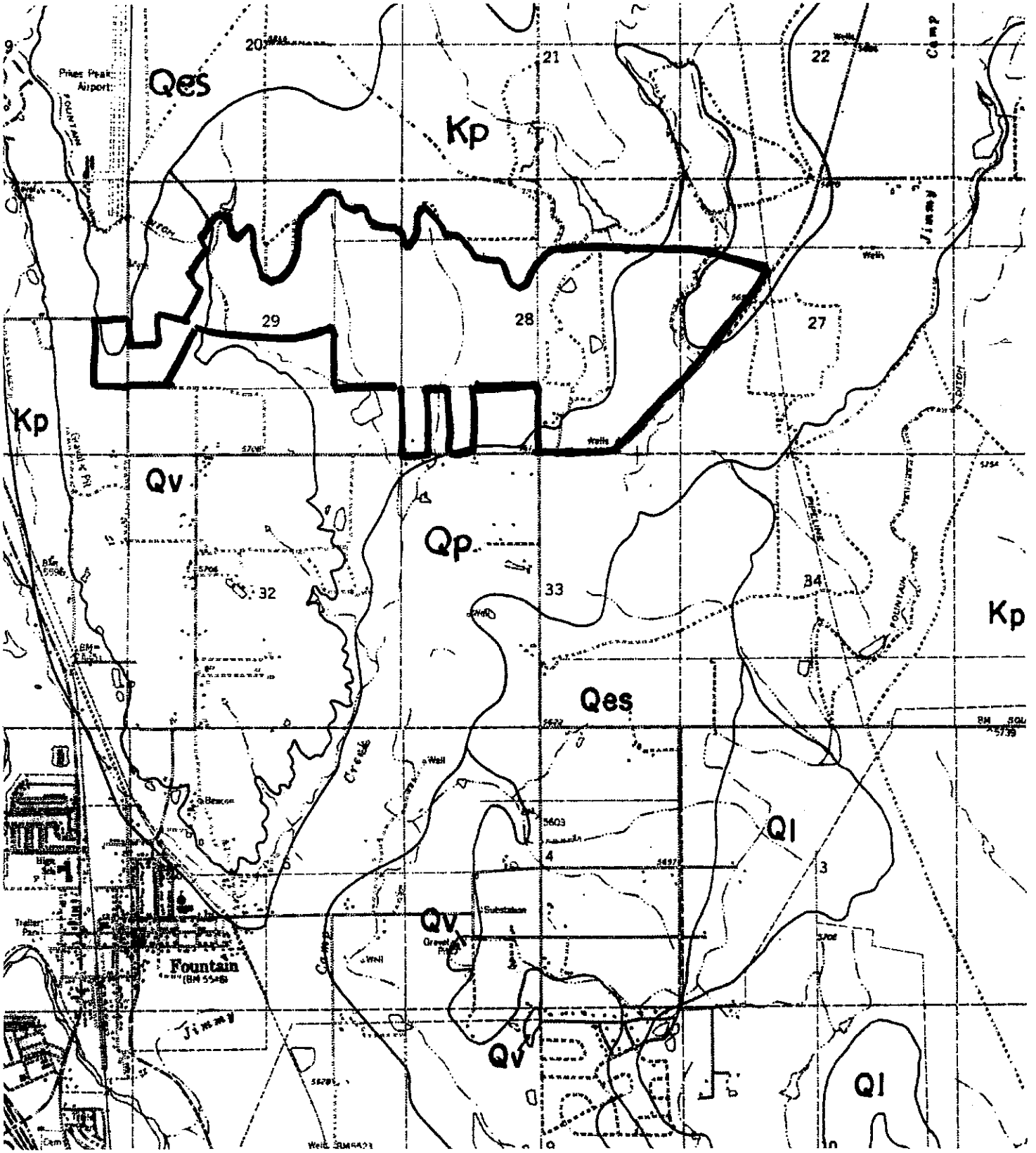
This soil is suited to the production of native vegetation suitable for grazing. The native vegetation is mainly blue grama, which has typical bunchgrass growth form and makes up one-third to one-half of the cover. Other species are sand dropseed, needleandthread, side-oats grama, and buckwheat. Western wheatgrass, little bluestem, and junegrass are also present where this soil occurs in the northern part of the survey area.

Seeding is a good practice if the range has deteriorated. Native grasses should be used. If the range is severely eroded and blowouts have developed, fertilizing the new seeding is a good practice. Brush control and grazing management also help to improve the depleted range. Grazing should be managed so that enough forage is left standing to protect the soil from blowing, to increase infiltration of water, and to catch and hold snow.

Windbreaks and environmental plantings generally are well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure the establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitations of this soil for homesites and local roads and streets is potential frost action and slope. Special designs for buildings and roads are needed to overcome these limitations. Access roads should have adequate cut-slope grade and be provided with drains to control surface runoff and thus keep soil losses to a minimum. Capability subclass VIe.



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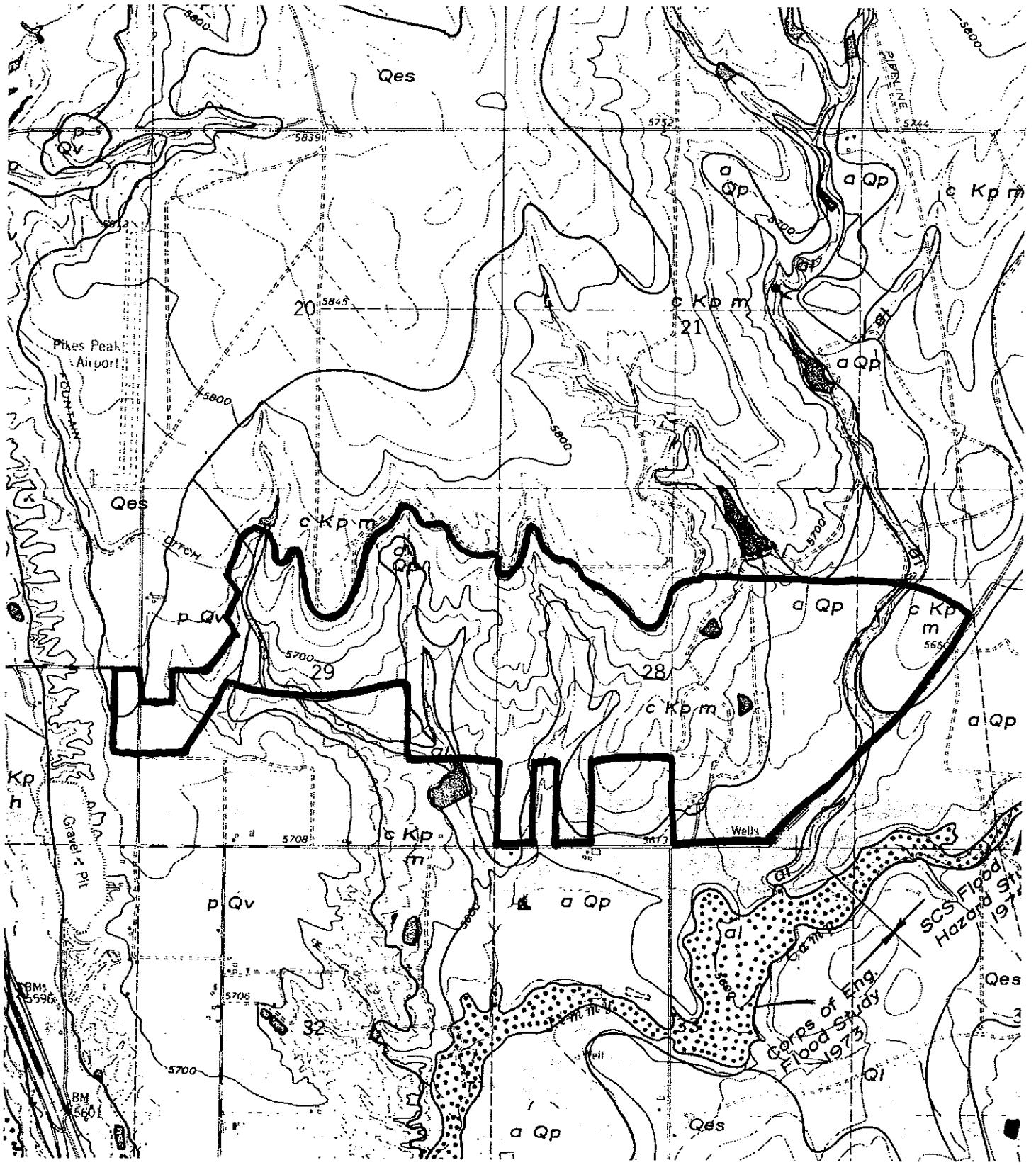
COLORADO SPRINGS GEOLOGY MAP
CROSS CREEK
FOR: NORWOOD DEVELOPMENT

DRAWN:	DATE:	CHECKED:	DATE:
RJO	2FEB04		2/13/04

JOB NO.: 98104

FIG NO.: 12



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FOUNTAIN QUAD GEOLOGY MAP
CROSS CREEK
FOR: NORWOOD DEVELOPMENT

DRAWN:	DATE:	CHECKED:	DATE:
RJO	2FEB04	KAH	2/13/04

JOB NO.: 98104

FIG NO.: 13

REVISION	BY:

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GOELOGY/ ENGINEERING GEOLOGY MAP
CROSS CREEK @ MESA RIDGE
FOUNTAIN, CO.
FOR: NORWOOD DEVELOPMENT

LEGEND

- Qaf - Artificial Fill of Quaternary Age: Man-made fill deposits.
- Qal - Recent Alluvium of Quaternary Age: Recent stream deposits.
- Qp - Piney Creek Alluvium of Quaternary Age: Stream deposited silty to clayey sands.
- Qes - Eolian Sands of Quaternary Age : Wind blown sand deposits.
- Qv - Verdos Alluvium of Quaternary Age: Terrace deposits of silty to clayey sands.
- Kp - Pierre Shale Formation of Cretaceous Age: Claystone and shale.
- h - hydrocompaction
- pu - potentially unstable slope
- us - unstable slope
- fp - floodplain
- psw - potentially seasonally wet area
- sw - seasonally wet area
- w - areas of ponded water
- ex - expansive soils

DRAWN BY:	R.J. OLSON
DESIGNED BY:	KAH
CHECKED BY:	
DATE:	9FEB04
SCALE:	N.T.S.
JOB NO.:	98104
FIGURE NO.:	14

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LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100–YEAR FLOOD

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE A99 To be protected from 100–year flood by Federal flood protection system under construction; no base elevations determined.

ZONE V Coastal flood with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X Areas of 500–year flood; areas of 100–year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100–year flood.

OTHER AREAS

ZONE X Areas determined to be outside 500–year floodplain.

ZONE D Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

Flood Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.

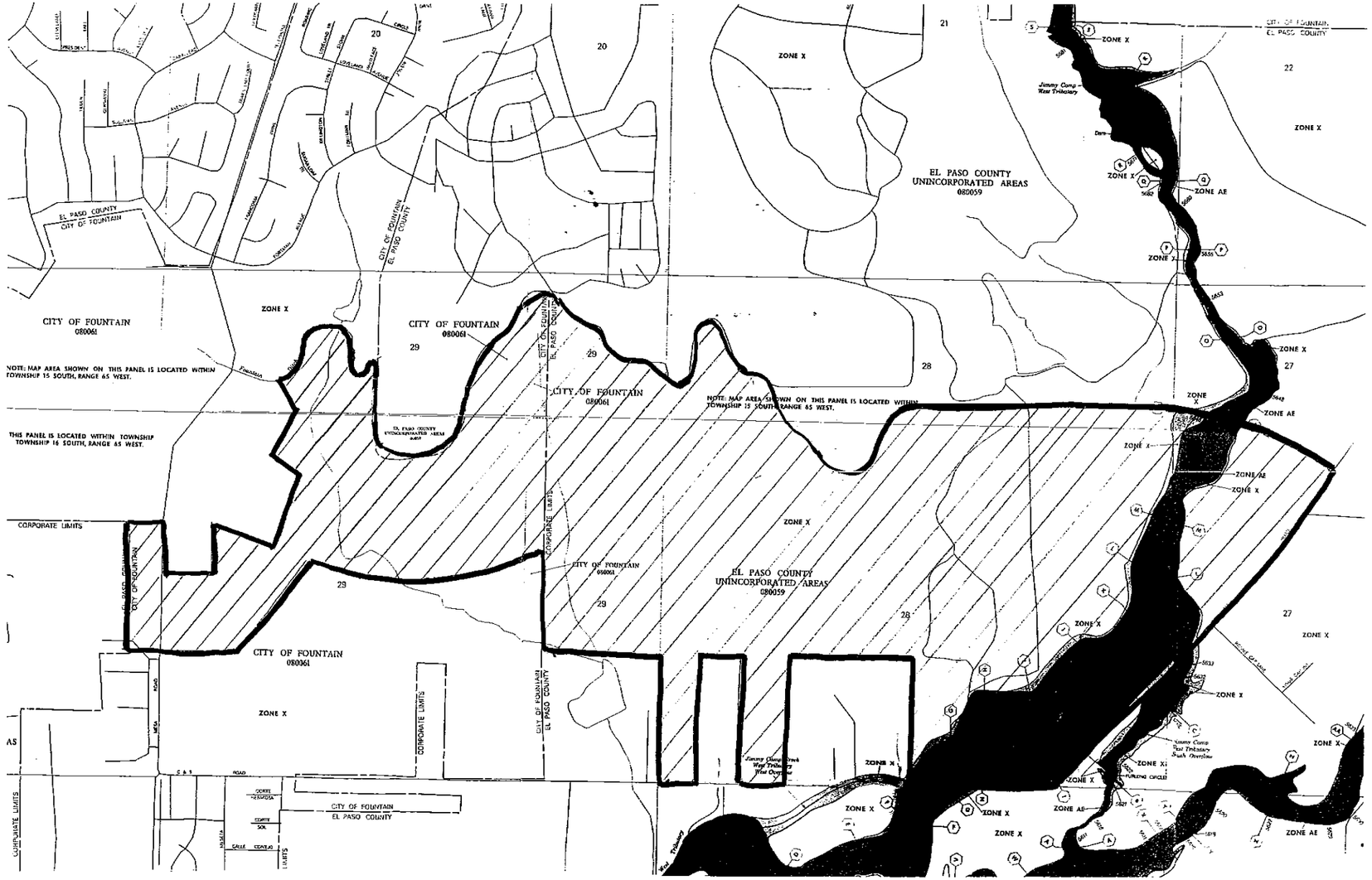
D — D — Cross Section Line

(EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.

RM7 × — Elevation Reference Mark

● M2 — River Mile

97°07'30", 32°22'30" — Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.



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COLORADO SPRINGS, CO. 80907

FLOODPLAIN MAP
CROSS CREEK
FOR: NORWOOD

DRAWN	M. WELLS
CHECKED	
DATE	2/5/04
SCALE	AS SHOWN
JOB NO.	98104
FIGURE No.	15

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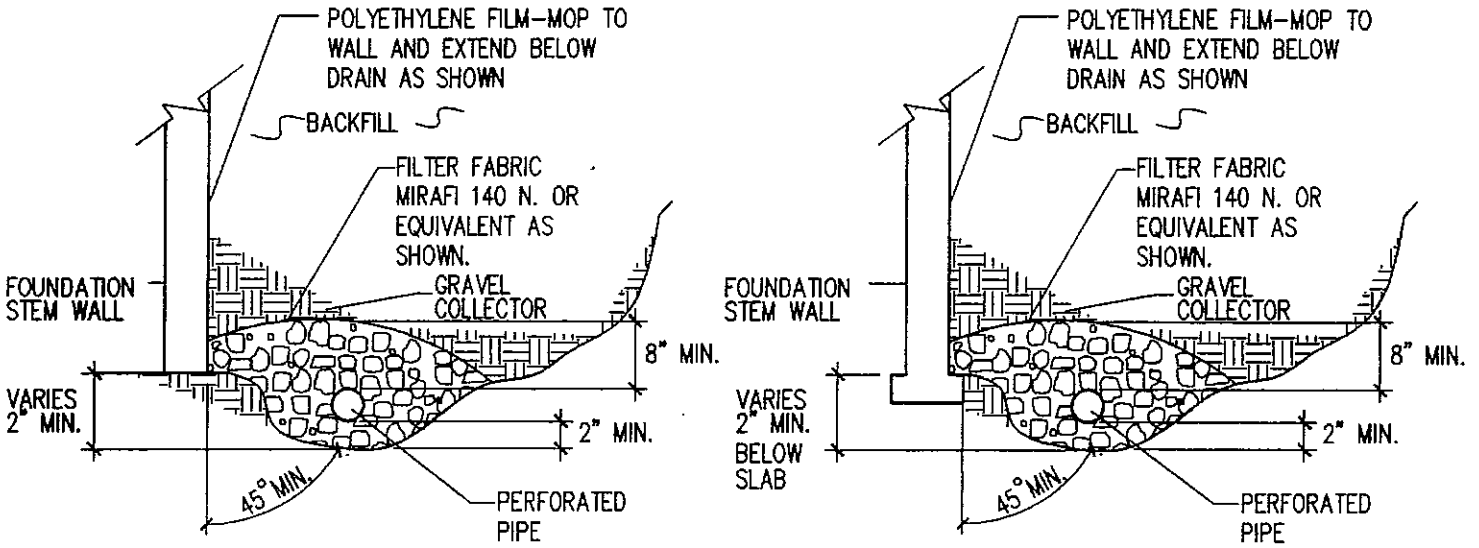

NOTES:

–GRAVEL SIZE IS RELATED TO DIAMETER OF PIPE PERFORATIONS–85% GRAVEL GREATER THAN 2x PERFORATION DIAMETER.

–PIPE DIAMETER DEPENDS UPON EXPECTED SEEPAGE. 4–INCH DIAMETER IS MOST OFTEN USED.

–ALL PIPE SHALL BE PERFORATED PLASTIC. THE DISCHARGE PORTION OF THE PIPE SHOULD BE NON–PERFORATED PIPE.

–FLEXIBLE PIPE MAY BE USED UP TO 8 FEET IN DEPTH, IF SUCH PIPE IS DESIGNED TO WITHSTAND THE PRESSURES. RIGID PLASTIC PIPE WOULD OTHERWISE BE REQUIRED.

–MINIMUM GRADE FOR DRAIN PIPE TO BE 1% OR 3 INCHES OF FALL IN 25 FEET.

–DRAIN TO BE PROVIDED WITH A FREE GRAVITY OUTFALL, IF POSSIBLE. A SUMP AND PUMP MAY BE USED IF GRAVITY OUT FALL IS NOT AVAILABLE.

DRAWN	M. VAN KAMPEN
CHECKED	KAH
DATE	7/13/04
SCALE	NTS
JOB NO.	98104
FIG. NO.	16

PERIMETER DRAIN DETAILS

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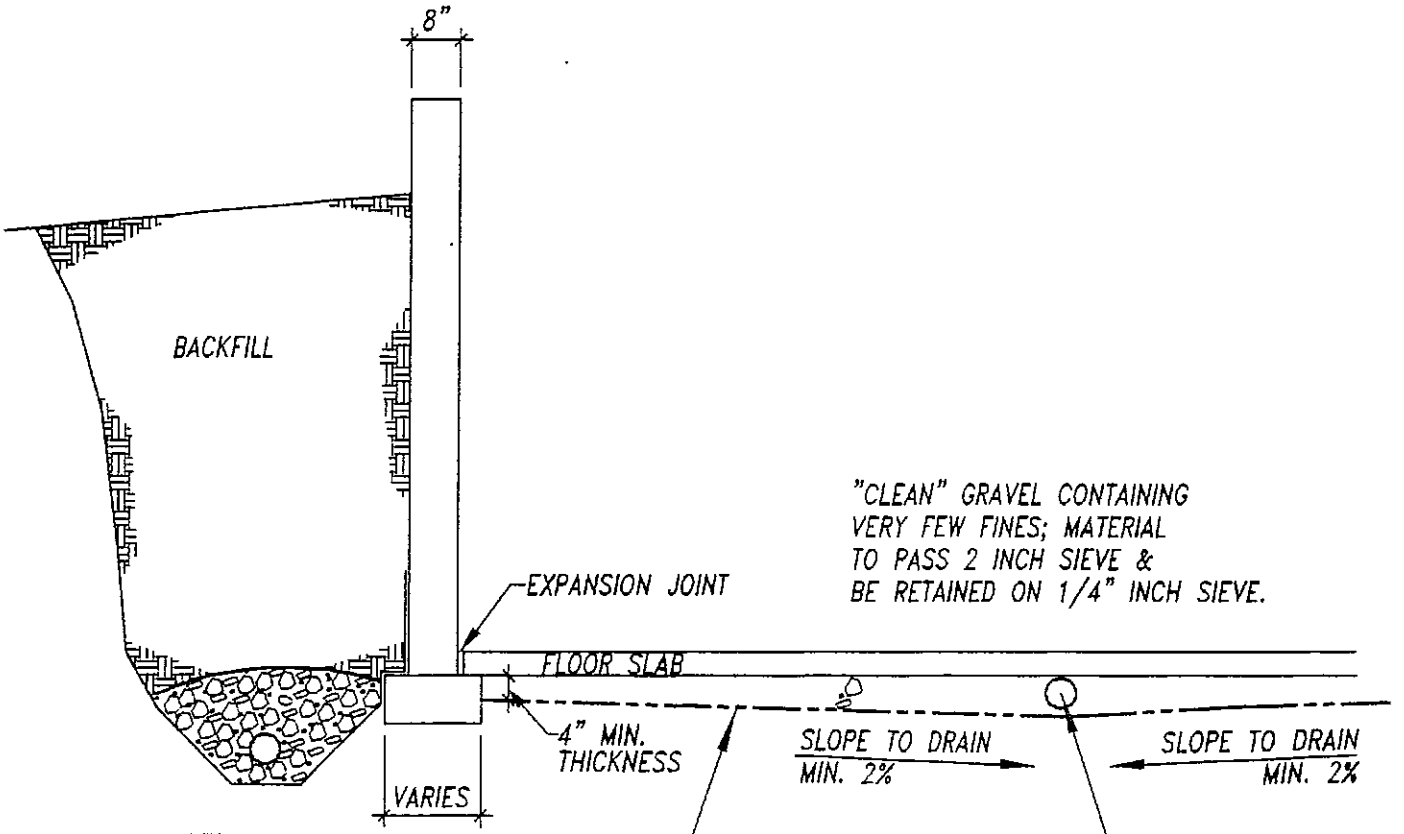
REVISION	BY



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DRAWN	C. WALTON
CHECKED	KAH
DATE	2/13/04
SCALE	NTS
JOB NO.	98104
SHEET	17

TYP. UNDERSLAB DRAINAGE
LAYER (CAPILLARY BREAK)

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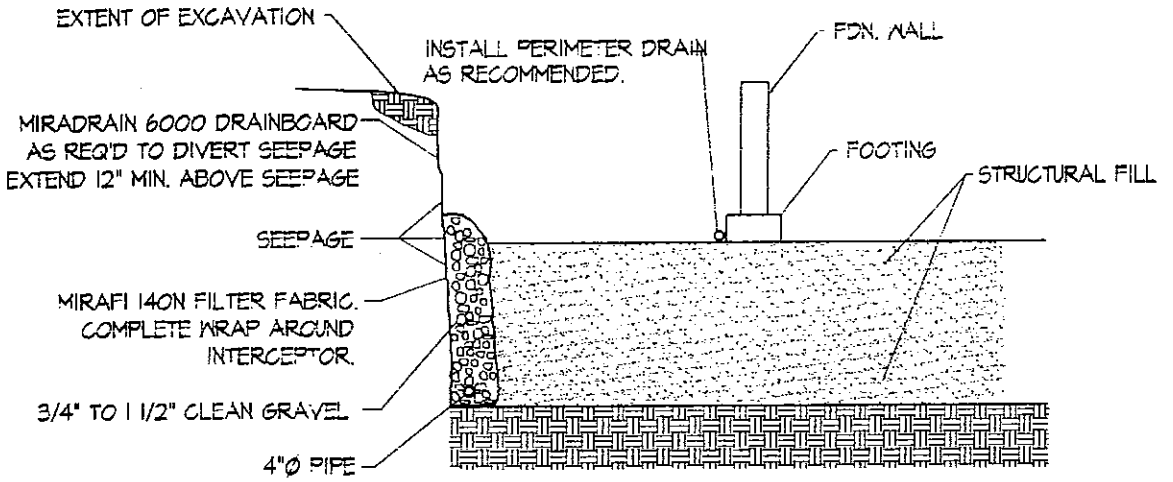

NOTE:
EXTEND INTERCEPTOR DRAIN TO DAYLIGHT

INTERCEPTOR DRAIN DETAIL

N.T.S.

DRAWN	R.TEITI
CHECKED	KAH
DATE	2/13/04
SCALE	NTS
JOB NO.	98104
OF SHEET	19 SHEETS

INTERCEPTOR DRAIN DETAIL

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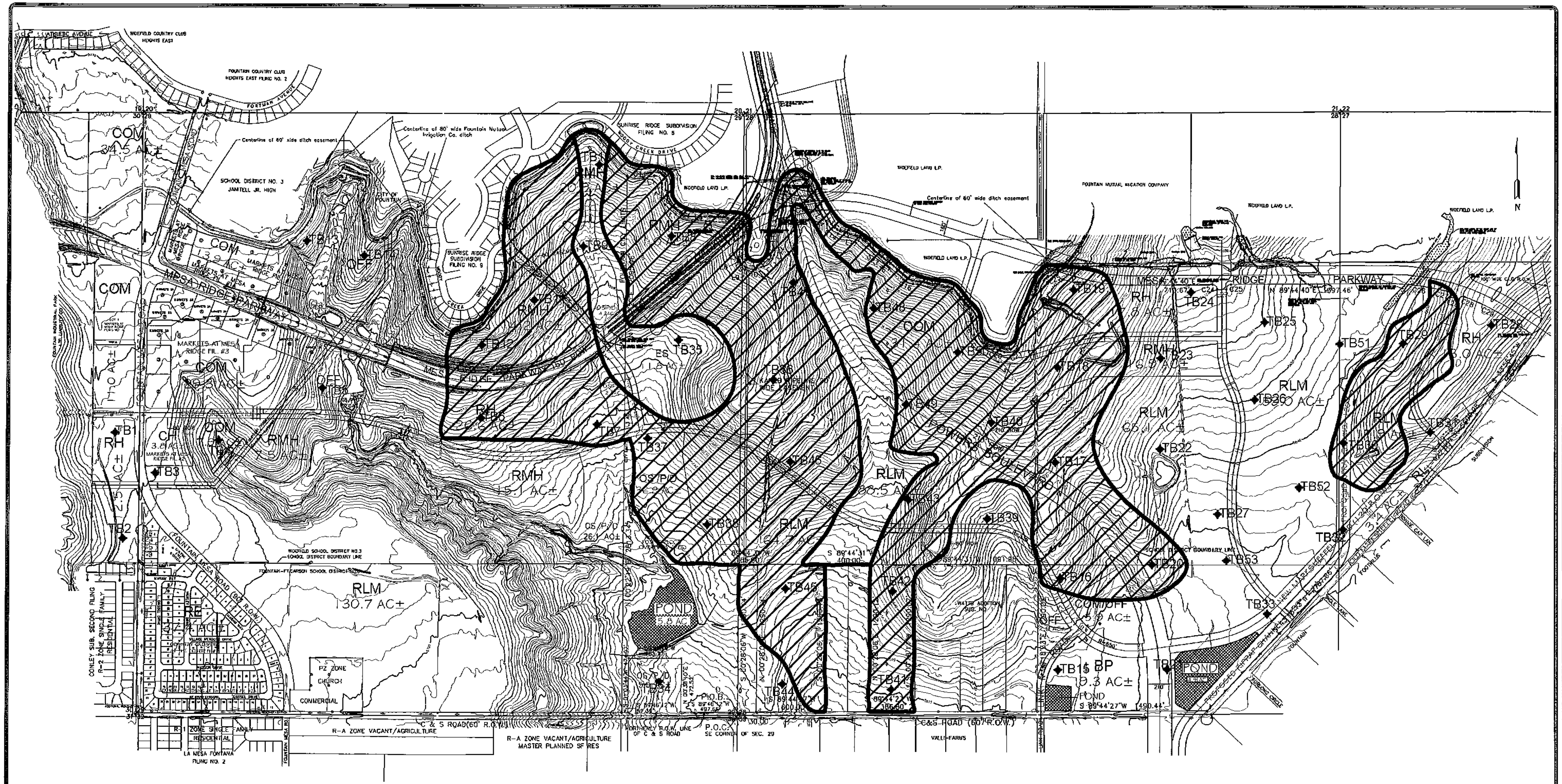
REVISION	BY



LEGEND

TB# - Approximate Test Boring location and number

[hatched box] - Approximate Area of Shallow Bedrock

REVISION	BY:

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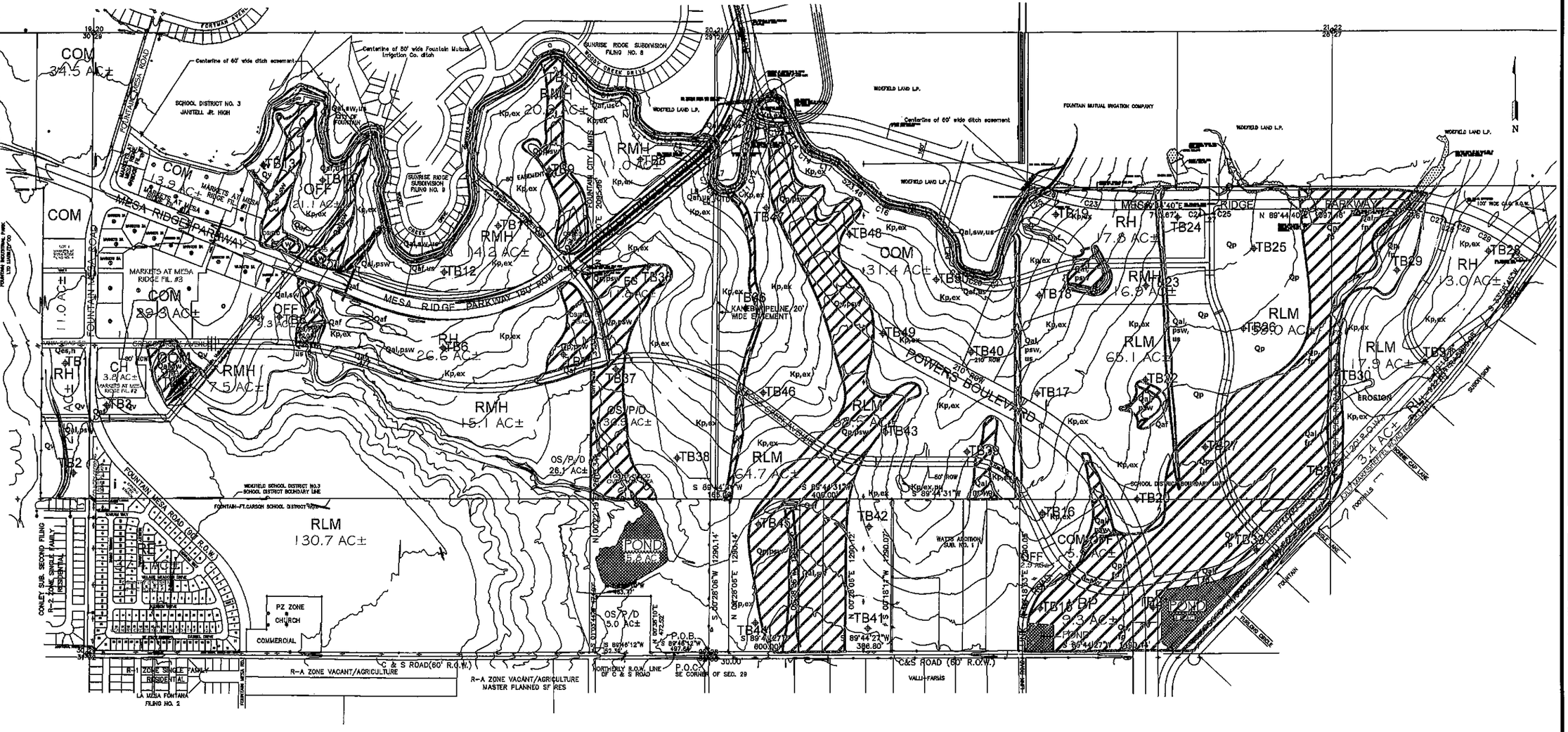
COLORADO SPRINGS, CO. 80907
(719) 531-5599

SHALLOW BEDROCK PLAN
CROSS CREEK @ MESA RIDGE
FOUNTAIN, CO.
FOR: NORWOOD DEVELOPMENT

DRAWN BY: R.J. OLSON
DESIGNED BY:
CHECKED BY:
DATE: 11FEB04
SCALE: AS SHOWN
JOB NO.: 98104
FIGURE NO.: 19



LEGEND

TB# - Approximate Test Boring location and number

- Approximate Area of Seasonal Shallow Ground Water

REVISION	BY:

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COLORADO SPRINGS, CO. 80907
(719) 531-5599

HIGH GROUND WATER AREA
CROSS CREEK @ MESA RIDGE
FOUNTAIN, CO.
FOR: NORWOOD DEVELOPMENT

DRAWN BY:	R.J. OLSON
DESIGNED BY:	
CHECKED BY:	
DATE:	11FEB04
SCALE:	AS SHOWN
JOB NO.:	98104
FIGURE NO.:	20

REVISION	BY:

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MAP OF SOFT SOILS
CROSS CREEK @ MESA RIDGE
FOUNTAIN, CO.
FOR: NORWOOD DEVELOPMENT

LEGEND

TB# - Approximate Test Boring location and number

- Approximate Area of Soft Soils with Shallow Overexcavation Anticipated

- Approximate Area of Soft Soils with Deeper Overexcavation Anticipated

DRAWN BY:	R.J. OLSON
DESIGNED BY:	
CHECKED BY:	
DATE:	11FEB04
SCALE:	AS SHOWN
JOB NO.:	98104
FIGURE NO.:	21

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APPENDIX A: Site Photographs

1

From western portion of site, looking north.

2

From western portion of site, looking northeast.

3

From west-central portion of site, looking east.

4

From central portion of site, looking west.

5

From northwestern portion of site, looking south.

6

From northwest portion of site, looking south.

7

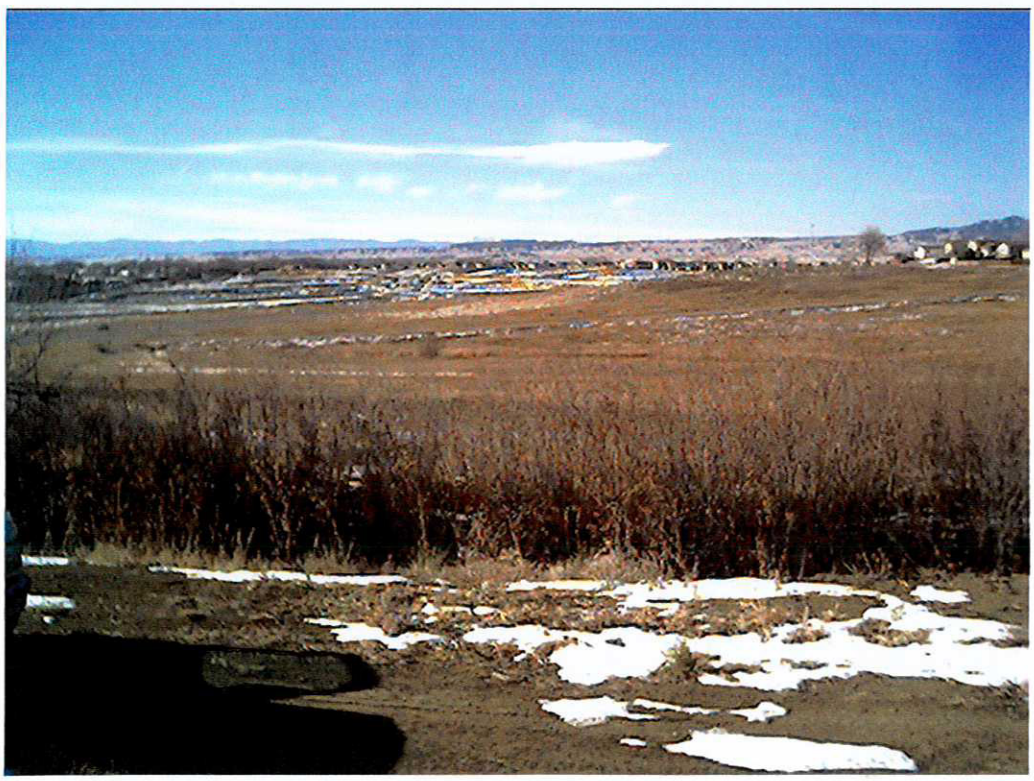
From northwestern portion of site, looking west.

8

From north-central portion of site, looking south.

9

From north-central portion of site, looking east.



10

From north-central portion of site, looking southwest.

11

Looking south at ditch in central portion of site.

12

Looking southwest from central portion of site.

13

Looking south from north-central portion of site.

14

Looking southwest from central portion of site.

15

Looking east from central portion of site.

16

Looking southeast at filled gully in northern portion of site.

17

Looking northeast from central portion of site towards Jimmy Camp Creek floodplain.

18

Looking southwest from eastern portion of site.

APPENDIX B: Test Boring Logs

TEST BORING NO. 1
DATE DRILLED 1/28/04
Job # 98104

REMARKS

DRY TO 20', 2/7/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	CLAY, SANDY, LIGHT BROWN, STIFF, MOIST		18	10.2	3
5			19	10.1	3
10			22	10.8	3
15	CLAY, SANDY, CALCAREOUS, BROWN-LIGHT BROWN, VERY STIFF, MOIST		40	11.2	3
20			45	15.9	3

TEST BORING NO. 2
DATE DRILLED 1/28/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

DRY TO 20', 1/28/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	CLAY, SANDY, CALICHE STRINGERS, LIGHT BROWN, STIFF TO VERY STIFF, MOIST		17	9.1	3
5			14	10.2	3
10			27	10.4	3
15			36	13.1	3
20	SAND, GRAVELLY, SLIGHTLY SILTY, FINE TO COARSE GRAINED, REDDISH TAN, DENSE, MOIST		32	0.9	2

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: B-1

TEST BORING NO. 3
DATE DRILLED 1/28/04
Job # 98104

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 18', 2/7/04						
POSSIBLE FILL 0-2', CLAY, SANDY, SL. GRAVELLY, BROWN						1
CLAY, SANDY, LIGHT BROWN, STIFF, MOIST				29	9.1	3
	5			19	10.0	3
	10			19	10.5	3
CLAY, CALCAREOUS, LIGHT BROWN, HARD, MOIST	15			50/11"	15.2	3
CLAYSTONE, SANDY, LIGHT YELLOWISH BROWN, HARD, MOIST	20			50/11"	11.7	4

TEST BORING NO. 4
DATE DRILLED 1/28/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 20', 2/7/04						
CLAY, SLIGHTLY SANDY, DARK BROWN, VERY STIFF, MOIST				37	12.0	3
CLAY, SILTY, SLIGHTLY SANDY, LIGHT BROWN, VERY STIFF, MOIST	5			44	10.6	3
CLAY, SILTY, SANDY, LIGHT BROWN, VERY STIFF, MOIST	10			40	10.7	3
SAND, SLIGHTLY SILTY, GRAVELLY, FINE TO COARSE GRAINED, LIGHT BROWN, DENSE, DRY TO MOIST	15			36	1.5	2
	20			30	2.1	2

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: B-2

TEST BORING NO. 5
DATE DRILLED 1/29/04
Job # 98104

REMARKS

WATER @ 15', 2/7/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			29	11.6	3	CLAY, SILTY, SLIGHTLY SANDY, LIGHT BROWN TO BROWN, STIFF TO SOFT, MOIST
5			8	12.8	3	
10			12	20.9	3	
15			50/10"	17.5	4	CLAYSTONE, SILTY, BROWN, HARD, MOIST, IRON STAINS
20			50/9"	19.0	4	

TEST BORING NO. 6
DATE DRILLED 1/29/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

WATER @ 10.5', 2/7/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			35	18.1	3	CLAY, SANDY, BROWN, VERY STIFF, MOIST
5			32	18.2	3	CLAY, SANDY, LIGHT GRAY-BROWN, VERY STIFF, MOIST
10			50/10"	17.7	4	CLAYSTONE, SILTY, LIGHT GRAY-BROWN, HARD, MOIST, IRON STAINS
15			50/11"	20.0	4	
20			50/8"	15.6	4	

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: B-3

TEST BORING NO. 7
DATE DRILLED 1/29/04
Job # 98104

REMARKS

WATER @ 13.5', 2/7/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			11	11.1	3	CLAY, SANDY, SILTY, BROWN, FIRM, MOIST
5			50	14.8	4	CLAYSTONE, WITH WEATHERED ZONES, BROWN, VERY STIFF TO HARD, MOIST, IRON STAINING
10			50/9"	16.7	4	
15			50/11"	17.4	4	
20			50	20.0	4	

TEST BORING NO. 8
DATE DRILLED 1/30/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

WATER @ 17.5', 2/11/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			12	5.5	3	CLAY, VERY SILTY, SANDY, CALCAREOUS, TAN, FIRM, MOIST
5			12	9.8	3	
10			50/5"	8.4	4	CLAYSTONE, SILTY, BROWN, HARD, MOIST
15			50/4"	8.6	4	
20			50/10"	12.7	4	CLAYSTONE, SANDY, LIGHT GRAY, HARD, MOIST

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KH	2/13/04

JOB NO.: 98104
FIG NO.: B-4

TEST BORING NO. 9
DATE DRILLED 1/30/04
Job # 98104

REMARKS

WATER @ 10.5', 2/11/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
					3
			14	10.6	3
5			9	13.9	3
10			44	15.7	3
15			26	16.1	3
20			50/9"	15.7	4

CLAY, SANDY, BROWN
CLAY, SANDY, CALCAREOUS, LIGHT BROWN, FIRM, MOIST
CLAY, VERY SANDY, SILTY, LIGHT BROWN, VERY STIFF TO STIFF, MOIST
CLAYSTONE, SILTY, LIGHT BROWN, HARD, MOIST

TEST BORING NO. 10
DATE DRILLED 1/30/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

WATER @ 15.5', 1/30/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
					3
			11	7.5	3
5			18	16.7	3
10			50/8"	14.7	4
15			50/7"	12.7	4
20			50/10"	15.5	4

CLAY, VERY SILTY, SANDY, LIGHT BROWN, FIRM, MOIST
CLAY, SANDY, LIGHT BROWN-BROWN, STIFF, MOIST
CLAYSTONE, SANDY, BROWN, HARD, MOIST

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: B-5

TEST BORING NO. 11
DATE DRILLED 1/30/04
Job # 98104

REMARKS

WATER @ 6.5', 2/7/04

CLAY, VERY SILTY, LIGHT BROWN

WEATHERED CLAYSTONE, BROWN, VERY STIFF, MOIST

CLAYSTONE, BROWN TO GRAY BROWN, HARD, MOIST

SHALE, GRAY, VERY HARD, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
					3
			30	15.7	4
5			50 9"	14.5	4
10			50 5"	12.8	4
15			50 2"	10.4	5
20					

TEST BORING NO. 12
DATE DRILLED 1/30/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

WATER @ 15', 2/11/04

CLAY-SILT, SANDY, LIGHT BROWN, STIFF, MOIST

CLAYSTONE, SANDY, LIGHT BROWN TO BROWN GRAY, HARD, MOIST

SHALE, SANDY, GRAY, VERY HARD, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			22	6.5	3
5			50 11"	11.0	4
10			50 6"	13.5	4
15			50 8"	12.4	4
20			50 2"	9.5	5

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: B-6

TEST BORING NO. 13
DATE DRILLED 1/30/04
Job # 98104

REMARKS

WATER @ 18.5', 2/10/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	CLAY-SILT, SANDY, LIGHT BROWN, SOFT, MOIST		5	9.2	3
5	CLAY, VERY SANDY, LIGHT BROWN, STIFF TO FIRM, MOIST		16	9.0	3
10			13	17.6	3
	CLAYSTONE, BROWN				4
15	CLAYSTONE, VERY SANDY, SILTY, RUSTY BROWN, HARD, MOIST		50/9"	13.7	4
20			50/9"	17.6	4

TEST BORING NO. 14
DATE DRILLED 1/30/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

WATER @ 14', 2/10/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	CLAY, VERY SANDY, SILTY, TAN, STIFF, MOIST		20	11.6	3
5	CLAY-SILT, VERY SANDY, LIGHT BROWN, SOFT TO FIRM, MOIST TO WET		8	13.8	3
10			11	19.3	3
15			9	22.7	3
20	CLAYSTONE, SANDY, LIGHT BROWN, HARD, MOIST		50/11"	18.0	4

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: B-7

TEST BORING NO. 15
DATE DRILLED 1/31/04
Job # 98104

REMARKS

WATER @ 19.5', 2/10/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			42	8.7	3
5			25	10.2	3
10			50/11"	13.8	3
15			13	18.9	3
20			12	21.6	2

CLAY, SILTY, SANDY, LIGHT BROWN, VERY STIFF TO STIFF, MOIST

CLAY, SLIGHTLY SILTY, DARK BROWN, HARD, MOIST

CLAY, SANDY, BROWN, FIRM, MOIST

SAND, SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE, MOIST TO WET

TEST BORING NO. 16
DATE DRILLED 1/31/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

DRY TO 19.5', 2/10/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			7	10.0	1
5			27	13.0	1
10			50/8"	15.2	3
15			50/6"	14.4	3
20			50/6"	14.1	3

FILL 0-8', CLAY, SILTY, SANDY, SOFT TO STIFF, MOIST

CLAYSTONE, SILTY, LIGHT BROWN-BROWN, HARD, MOIST

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: B-8

TEST BORING NO. 17
DATE DRILLED 1/31/04
Job # 98104

REMARKS

DRY TO 19', 2/11/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			20	6.1	3
5			10	24.2	3
					3
10			50 10"	13.1	4
15			50 6"	12.3	4
20			50 4"	11.3	4

CLAY-SILT, SANDY, LIGHT BROWN, STIFF TO FIRM, MOIST

CLAY, SANDY, LIGHT BROWN

CLAYSTONE, SANDY, LIGHT BROWN-BROWN, RUSTY ZONES, HARD, MOIST

THIN INTERBEDDED SANDSTONE/SILTSTONE

TEST BORING NO. 18
DATE DRILLED 1/31/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

DRY TO 14', 2/11/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			24	4.9	2
5			29	9.3	2
10			50 4"	8.0	4
15			50 4"	12.7	4
20					

SAND, SILTY, FINE GRAINED, LIGHT BROWN, MEDIUM DENSE, MOIST

SAND, SILTY, CLAYEY, FINE GRAINED, TAN, MEDIUM DENSE, MOIST

CLAYSTONE, SILTY, SANDY, BROWN, HARD, MOIST

SANDSTONE LENSES @ 11.5-12.5'

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		BAK	2/13/04

JOB NO.: 98104
FIG NO.: B-9

TEST BORING NO. 19
DATE DRILLED 1/31/04
Job # 98104

REMARKS

DRY TO 19.5', 2/11/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, VERY SILTY, FINE GRAINED, LIGHT BROWN, LOOSE TO MEDIUM DENSE, MOIST		10	6.3	2
5			15	7.1	2
	CLAYSTONE, VERY SANDY, LIGHT BROWN, HARD, MOIST				
10			50/7"	12.0	4
15			50/4"	10.7	4
20			50/5"	12.3	4

TEST BORING NO. 20
DATE DRILLED 1/31/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

DRY TO 19.5', 2/10/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	CLAY, VERY SILTY, SANDY, LIGHT BROWN, HARD TO VERY STIFF, MOIST		50/6"	5.2	3
5			30	13.9	3
	CLAYSTONE, SANDY, RUSTY BROWN, HARD, MOIST				
10			50/8"	13.1	4
15			50/9"	18.4	4
20			50/7"	14.4	4

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: B-10

TEST BORING NO. 21
DATE DRILLED 2/2/04
Job # 98104

REMARKS

WATER @ 19', 2/10/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			15	8.6	3	CLAY-SILT, SANDY, LIGHT BROWN, STIFF, MOIST
5			18	10.8	3	
						SAND, SILTY, FINE TO COARSE GRAINED, LIGHT BROWN, MEDIUM DENSE, DRY TO MOIST
10			16	3.7	2	
						SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, LIGHT BROWN, MEDIUM DENSE, MOIST TO WET
15			12	3.6	2	
20			11	12.9	2	

TEST BORING NO. 22
DATE DRILLED 2/2/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

DRY TO 19.5', 2/11/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			20	8.7	3	CLAY-SILT, SANDY, LIGHT BROWN, STIFF, MOIST
5			9	7.9	2	SAND, SILTY, FINE GRAINED, TAN, LOOSE, MOIST
10			21	12.0	3	CLAY, SANDY, BROWN TO DARK BROWN, STIFF, MOIST
15			28	13.0	3	
20			16	11.8	2	SAND, SILTY, SLIGHTLY CLAYEY, FINE GRAINED, BROWN, MEDIUM DENSE, MOIST

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: B-11

TEST BORING NO. 23
DATE DRILLED 2/2/04
Job # 98104

REMARKS

DRY TO 19.5', 2/11/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			7	7.3	2
			13	6.1	3
5					
			15	6.2	3
10					
			15	7.6	3
15					
			7	14.2	3
20					

SAND, VERY SILTY, FINE GRAINED, LIGHT BROWN, LOOSE, MOIST

CLAY, VERY SILTY, SANDY, LIGHT BROWN TO BROWN, FIRM TO STIFF, MOIST

CLAY, SANDY, BROWN, SOFT, MOIST

TEST BORING NO. 24
DATE DRILLED 2/2/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

WATER @ 13', 2/11/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			14	7.7	3
			7	10.3	3
5					
			4	20.0	3
10					
			1	28.5	3
15					
			5	27.6	3
20					

CLAY-SILT, SANDY, LIGHT BROWN, FIRM TO SOFT, MOIST

CLAY, SILTY, SANDY, BROWN, SOFT TO VERY SOFT, MOIST TO WET

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: B-12

TEST BORING NO. 25
DATE DRILLED 2/2/04
Job # 98104

REMARKS

WATER @ 18', 2/11/04

CLAY-SILT, LIGHT BROWN, SOFT, MOIST

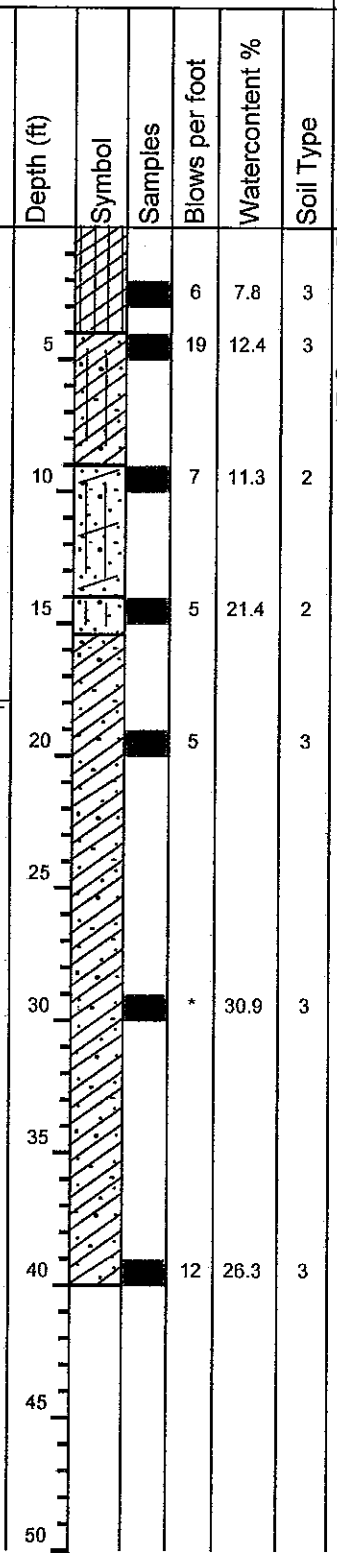
CLAY, SILTY, SLIGHTLY SANDY, BROWN, STIFF, MOIST

SAND, CLAYEY, SILTY FINE TO MEDIUM GRAINED, BROWN, LOOSE, MOIST

SAND, SILTY, FINE TO MEDIUM GRAINED, BROWN, LOOSE, VERY MOIST

CLAY, VERY SANDY, BROWN, SOFT TO FIRM, MOIST TO WET

* BULK SAMPLE TAKEN



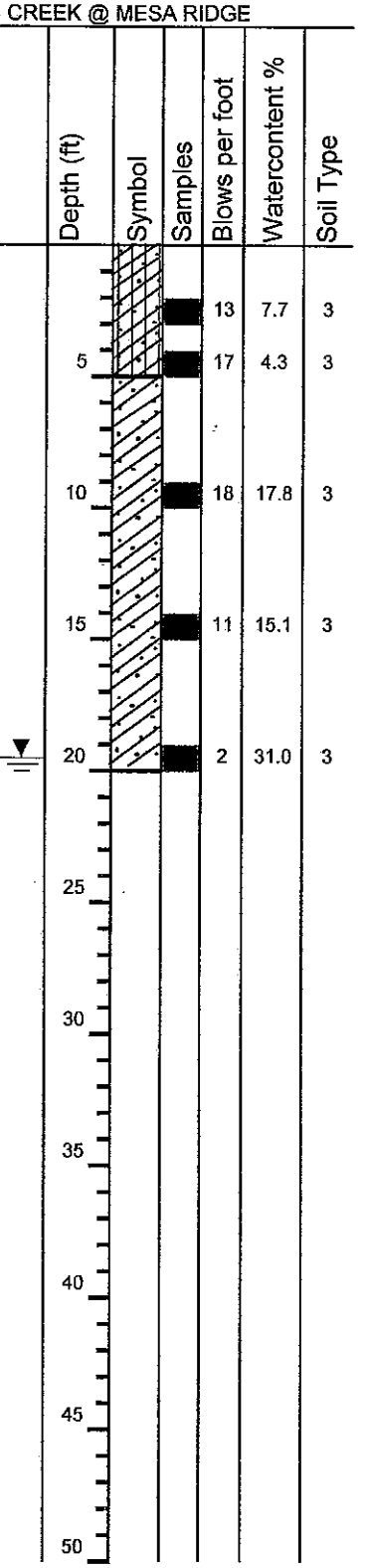
TEST BORING NO. 26
DATE DRILLED 2/2/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

WATER @ 19.5', 2/11/04

CLAY-SILT, SANDY, LIGHT BROWN, FIRM TO STIFF, MOIST, CALCAREOUS

CLAY, VERY SANDY TO SANDY, BROWN, STIFF TO VERY SOFT, MOIST TO WET



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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		BAH	2/13/04

JOB NO.: 98104
FIG NO.: B-13

TEST BORING NO. 27
DATE DRILLED 2/2/04
Job # 98104

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 19', 2/2/04						
CLAY, SANDY, LIGHT BROWN-BROWN, STIFF, MOIST, CALCAREOUS				25	17.9	3
SAND, VERY SILTY, FINE GRAINED, LIGHT BROWN, LOOSE, MOIST	5			7	7.8	2
CLAY, SANDY, BROWN, STIFF, MOIST						
	10			26	14.8	3
CLAY-SILT, VERY SANDY, BROWN, SOFT, MOIST	15			6	11.4	3
CLAY, SANDY, BROWN, SOFT, MOIST TO WET	20			3	32.1	3

TEST BORING NO. 28
DATE DRILLED 2/3/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 19', 2/10/04						
CLAY-SILT, SANDY, LIGHT BROWN, STIFF, MOIST				18	6.9	3
CLAY-SILT, SANDY, LIGHT BROWN, STIFF TO VERY STIFF, MOIST, CALCAREOUS	5			29	7.3	3
	10			32	8.6	3
SAND, SILTY, FINE TO MEDIUM GRAINED, LIGHT BROWN, MEDIUM DENSE, MOIST	15			21	5.9	2
	20			16	7.9	2

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KH	2/13/04

JOB NO.: 98104
FIG NO.: B-14

TEST BORING NO. 29
DATE DRILLED 2/3/04
Job # 98104

REMARKS

DRY TO 15', 2/11/04

SAND, SILTY, FINE GRAINED, TAN, LOOSE, MOIST

CLAY, SILTY, SLIGHTLY SANDY, LIGHT BROWN, STIFF, MOIST, CALCAREOUS

CLAYSTONE SANDY WITH INTERBEDDED SANDSTONE LENSES, BROWN-LIGHT BROWN, HARD, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			6	5.0	2
5			21	9.0	3
10			50/7"	9.6	4
15			50/5"	10.9	4
20					

TEST BORING NO. 30
DATE DRILLED 2/3/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

DRY TO 14', 2/10/04

SAND, SILTY, FINE GRAINED, TAN, MEDIUM DENSE, DRY TO MOIST

CLAYSTONE, SANDY, LIGHT BROWN-BROWN, VERY STIFF TO HARD, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			17	3.8	2
5			50	10.8	4
10			50/10"	10.9	4
15			50/5"	12.5	4
20					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: B-15

TEST BORING NO. 31
DATE DRILLED 2/3/04
Job # 98104

REMARKS

DRY TO 19', 2/10/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
						SAND, VERY CLAYEY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, MOIST
			22	5.4	2	
5			19	8.5	2	
					3	CLAY, VERY SANDY, LIGHT BROWN, MOIST
10			23	6.1	2	SAND, SILTY, FINE TO MEDIUM GRAINED, LIGHT BROWN, MEDIUM DENSE, MOIST
15			50/7"	10.2	4	CLAYSTONE, VERY SANDY, LIGHT BROWN, HARD, MOIST
20			50/3"		4	

TEST BORING NO. 32
DATE DRILLED 2/3/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

WATER @ 18.5', 2/10/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
					3	CLAY, SANDY, DARK BROWN
			22	23.4	3	CLAY, SILTY, SANDY, BROWN TO LIGHT BROWN, STIFF TO FIRM, MOIST
5			14	20.0	3	
10			15	11.2	3	
15			19	9.3	2	SAND, SILTY, FINE TO MEDIUM GRAINED, TAN TO BROWN, MEDIUM DENSE TO LOOSE, MOIST TO WET
20			6	50.1	3	CLAY, BROWN, SOFT, WET

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: B-16

TEST BORING NO. 33
DATE DRILLED 2/3/04
Job # 98104

REMARKS

WATER @ 19', 2/10/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			35	24.1	3	CLAY, SANDY, WITH ORGANICS, DARK BROWN, VERY STIFF, MOIST, CALCAREOUS
5			15	10.5	3	CLAY, VERY SANDY, LIGHT BROWN, STIFF, MOIST
10			8	8.1	2	SAND, VERY SILTY TO SILTY, FINE GRAINED, BROWN, LOOSE, MOIST TO WET
15			5	9.2	2	
20			8	32.0	2	

TEST BORING NO. 34
DATE DRILLED 2/3/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

WATER @ 9', 2/11/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			15	12.7	3	CLAY, VERY SANDY, BROWN, STIFF TO SOFT, MOIST, CALCAREOUS
5			8	14.7	3	
10			3	27.6	2	SAND, VERY SILTY, VERY FINE GRAINED, BROWN, VERY LOOSE, WET
15			5	23.6	3	CLAY, SANDY, BROWN, SOFT, WET
20			25	26.2	3	CLAY, GRAY, STIFF, MOIST

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: B-17

TEST BORING NO. 35
DATE DRILLED 2/4/04
Job # 98104

REMARKS

WATER @ 8.5', 2/7/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			17	17.6	3
5			5	22.9	3
10			1	32.3	3
15					
20			50 6"	14.6	4

CLAY, SANDY, DARK BROWN TO BROWN, STIFF TO VERY SOFT, MOIST TO WET

CLAYSTONE, SANDY, LIGHT BROWN, HARD, MOIST

TEST BORING NO. 36
DATE DRILLED 2/4/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

DRY TO 19', 2/11/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			19	12.8	3
5			34	13.9	3
10			50 6"	12.9	4
15			50 4"	11.4	4
20			50 4"	10.3	5

CLAY, VERY SILTY, SANDY, TAN, STIFF, MOIST

CLAY, SANDY, REDDISH BROWN, CALCAREOUS VERY STIFF, MOIST

CLAYSTONE WITH THIN INTERBEDDED SANDSTONE LENSES, LIGHT BROWN TO BROWN, HARD, MOIST, HEAVY IRON STAINING AND GYPSUM DEPOSITS

SHALE, SANDY, GRAY, HARD, MOIST

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		RLH	2/13/04

JOB NO.: 98104
FIG NO.: B-18

TEST BORING NO. 37
DATE DRILLED 2/4/04
Job # 98104

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 6.5', 2/7/04						
CLAY, SANDY, BROWN, VERY STIFF, MOIST, CALCAREOUS				38	16.3	3
CLAYSTONE, BROWN TO DARK BROWN, HARD, MOIST	5			50 10"	16.9	4
CLAYSTONE, BROWN-GRAY, HARD, MOIST	10			50 10"	17.9	4
	15			50 7"	17.1	4
CLAYSTONE, BROWN, HARD, MOIST	20			50 9"	16.1	4

TEST BORING NO. 38
DATE DRILLED 2/5/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 18', 2/7/04						
CLAY, SANDY, LIGHT BROWN						3
CLAYSTONE, BROWN TO BROWNISH GRAY, HARD, MOIST				50 9"	12.6	4
	5			50 11"	14.8	4
	10			50 9"	17.7	4
	15			50 8"	16.1	4
	20			50 8"	16.8	4

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: B-19

TEST BORING NO. 39
DATE DRILLED 2/4/04
Job # 98104

REMARKS

DRY TO 19', 2/10/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
					3	CLAY, VERY SILTY, SANDY, LIGHT BROWN, VERY STIFF TO HARD, MOIST
			50	6.6	4	
5			50/6"	3.4	4	CLAYSTONE, SILTY, VERY SANDY, LIGHT GRAY, HARD, MOIST
10			50/11"	13.4	4	CLAYSTONE, VERY SILTY, SANDY, LIGHT BROWN TO GRAY, RUST STAINS, HARD, MOIST
15			50/6"	16.0	4	CLAYSTONE WITH THIN INTERBEDDED SANDSTONE LENSES, LIGHT BROWN TO GRAY WITH RUST STAINS, HARD, MOIST
20			50/9"	24.0	4	

TEST BORING NO. 40
DATE DRILLED 2/4/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

DRY TO 19', 2/11/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
						SAND, VERY SILTY, FINE GRAINED, TAN, LOOSE TO MEDIUM DENSE, MOIST
			10	5.0	2	
5			19	5.1	2	
10			18	9.2	3	CLAY, SANDY, LIGHT BROWN, STIFF, MOIST
15			50/5"	9.6	4	CLAYSTONE, VERY SANDY, SILTY, LIGHT BROWN, HARD, MOIST
20			50/5"	10.3	4	

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: B-20

TEST BORING NO. 41
DATE DRILLED 2/5/04
Job # 98104

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 14', 2/10/04						
CLAY, SLIGHTLY SANDY, BROWN, CALCAREOUS, VERY STIFF, MOIST				35	15.3	3
WEATHERED CLAYSTONE, BROWN TO RUST, CALCAREOUS, VERY STIFF, MOIST	5			47	19.1	4
CLAYSTONE, BROWN TO GRAY, VERY STIFF TO HARD, MOIST	10			50	21.3	4
	15			50/7"	16.5	4
SHALE, DARK GRAY, HARD, MOIST	20			50/5"	15.0	5

TEST BORING NO. 42
DATE DRILLED 2/5/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 14', 2/10/04						
CLAY, VERY SILTY, SLIGHTLY SANDY, LIGHT BROWN						3
WEATHERED CLAYSTONE, BROWN, VERY STIFF, MOIST				43	21.3	4
CLAYSTONE, BROWN TO GRAY, HARD, MOIST	5			50/7"	15.8	4
	10			50/7"	16.8	4
SANDSTONE LENSES @ 13.5-14'						
CLAYSTONE, LIGHT BROWN TO RUSTY BROWN, HARD, MOIST	15			50/9"	17.6	4
	20			50/5"	15.8	4

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: B-21

TEST BORING NO. 43
DATE DRILLED 2/5/04
Job # 98104

REMARKS

WATER @ 19', 2/7/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			12	6.2	3	CLAY-SILT, SANDY, TAN, FIRM, MOIST
5			50 10"	13.1	4	CLAYSTONE, REDDISH BROWN TO BROWN, HARD, MOIST
10			50 6"	16.5	4	
15			50 5"	17.2	4	
20			50 8"	16.2	4	

TEST BORING NO. 44
DATE DRILLED 2/5/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

WATER @ 14.5', 2/10/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			27	7.2	3	CLAY-SILT, SANDY, TAN, STIFF, MOIST
5			12	16.6	3	CLAY, SANDY, BROWN, FIRM TO SOFT, MOIST TO VERY MOIST
10			9	22.3	3	
15			8	28.4	3	
20			10	31.5	3	CLAY, SILTY, BROWN, FIRM, WET

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: B-22

TEST BORING NO. 45
DATE DRILLED 2/5/04
Job # 98104

REMARKS

WATER @ 13', 2/10/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	CLAY, SANDY, LIGHT BROWN, VERY STIFF, MOIST		40	8.9	3
5	CLAYSTONE, LIGHT BROWN-BROWN, HARD, MOIST		50/11"	10.2	4
10			50/11"	17.8	4
15	CLAYSTONE, RUSTY GRAY TO BROWN, HARD, MOIST		50/9"	20.5	4
20			50/8"	18.8	4

TEST BORING NO. 46
DATE DRILLED 2/5/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

DRY TO 15', 2/7/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	CLAY, SANDY, LIGHT BROWN TO BROWN, VERY STIFF, MOIST		40	11.4	3
5	CLAYSTONE, SANDY, CALCAREOUS, BROWN, HARD, MOIST		50	11.7	4
10			50/5"	13.5	4
15			50/4"	13.7	4
20					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: B-23

TEST BORING NO. 47
DATE DRILLED 2/6/04
Job # 98104

REMARKS

DRY TO 20', 2/7/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			11	5.2	3
5			23	9.1	3
10			50/6"	12.2	4
15			50/7"	12.3	4
20			50/5"	12.5	4

CLAY, VERY SILTY, VERY SANDY, LIGHT BROWN, FIRM TO STIFF, DRY TO MOIST

CLAYSTONE, SANDY, LIGHT BROWN TO BROWN, HARD, MOIST

TEST BORING NO. 48
DATE DRILLED 2/6/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

DRY TO 14.5', 2/7/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
					3
			50/8"	5.3	4
5			50/5"	12.0	4
10			50/6"	12.0	4
15			50/3"	10.1	5
20					

CLAY, SANDY, LIGHT BROWN

CLAYSTONE, SANDY, LIGHT BROWN TO BROWN, HARD, MOIST

SHALE, SANDY, GRAY, HARD, MOIST

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		GH	2/13/04

JOB NO.: 98104
FIG NO.: B-24

TEST BORING NO. 49
DATE DRILLED 2/6/04
Job # 98104

REMARKS

WATER @ 17', 2/7/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			5	8.6	3
5			14	8.3	3
10			8	10.0	3
15			4	23.9	2
20			50/6"	11.5	4

CLAY, VERY SILTY, SANDY, BROWN, SOFT TO FIRM, MOIST

SAND, VERY SILTY, FINE TO MEDIUM GRAINED, BROWN, LOOSE, VERY MOIST TO WET

CLAYSTONE, VERY SANDY, LIGHT BROWN, HARD, MOIST

TEST BORING NO. 50
DATE DRILLED 2/6/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

WATER @ 14.5', 2/7/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			29	10.1	3
5			50/9"	13.6	4
10			50/5"	12.8	4
15			50/4"	10.9	5
20					

CLAY, SANDY, LIGHT BROWN, STIFF, MOIST

CLAYSTONE, SANDY, CALCAREOUS, LIGHT BROWN, HARD, MOIST

SHALE, GRAY, HARD, MOIST

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

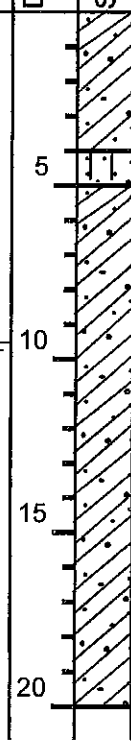
JOB NO.: 98104
FIG NO.: B-25

TEST BORING NO. 51
DATE DRILLED 2/16/04
Job # 98104

REMARKS

WATER @ 9.5', 2/16/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			20	12.4	3	CLAY, SANDY, BROWN, STIFF, MOIST
5			11	15.7	2	SAND, SILTY, FINE GRAINED, BROWN, MEDIUM DENSE, MOIST
10			3	34.3	3	CLAY, SANDY, BROWN, SOFT TO STIFF, WET ▼
15			10	25.5	3	
20			16	29.4	3	

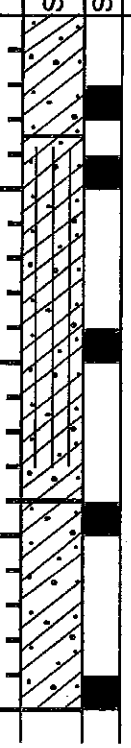


TEST BORING NO. 52
DATE DRILLED 2/16/04
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

WATER @ 19.5', 2/16/04

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			27	10.6	3	CLAY, SANDY, BROWN, STIFF, MOIST
5			21	9.9	3	CLAY, VERY SILTY, SLIGHTLY SANDY, LIGHT BROWN, STIFF, MOIST
10			21	15.2	3	
15			9	18.0	3	CLAY, WITH THIN SAND LENSES, BROWN, FIRM TO SOFT, MOIST TO WET
20			6	26.1	3	▼



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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/23/04

JOB NO.: 98104
FIG NO.: B-26

TEST BORING NO. 53
DATE DRILLED 2/16/04
Job # 98104

TEST BORING NO.
DATE DRILLED
CLIENT NORWOOD DEVELOPMENT
LOCATION CROSS CREEK @ MESA RIDGE

REMARKS

DRY TO 20', 2/16/04

REMARKS

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	Description
			23	8.8	3	CLAY, VERY SILTY, LIGHT BROWN, STIFF, MOIST
5			19	13.0	3	CLAY, SANDY, DARK BROWN TO BROWN, STIFF, MOIST
10			23	19.1	3	
15			12	22.6	3	CLAY, BROWN, FIRM TO STIFF, MOIST TO VERY MOIST
20			16	30.4	3	

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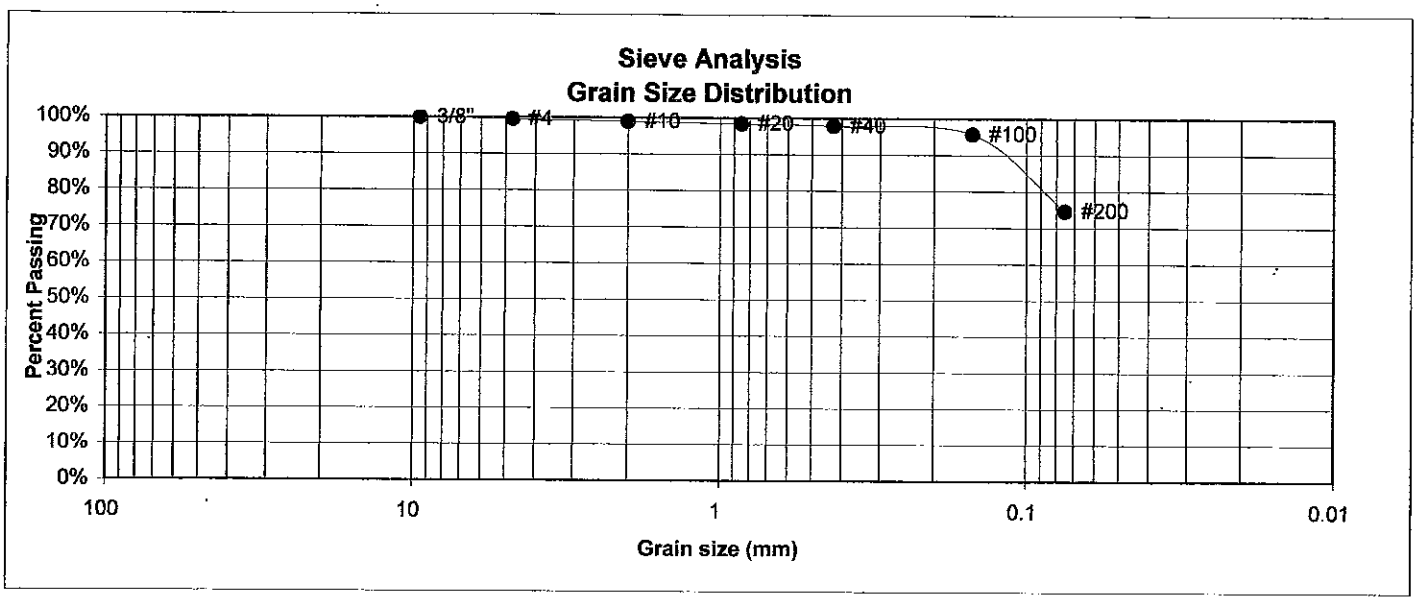
TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/23/04

JOB NO.: 98104
FIG NO.: B-27

APPENDIX C: Laboratory Test Results

UNIFIED CLASSIFICATION	CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	1	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-16	JOB NO.	98104
DEPTH	2-5'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.6%
10	98.9%
20	98.4%
40	97.9%
100	95.7%
200	74.6%

Atterberg Limits	
Plastic Limit	16
Liquid Limit	35
Plastic Index	19

Swell	
Moisture at start	13.1%
Moisture at finish	19.5%
Moisture increase	6.4%
Initial dry density (pcf)	108
Swell (psf)	1515

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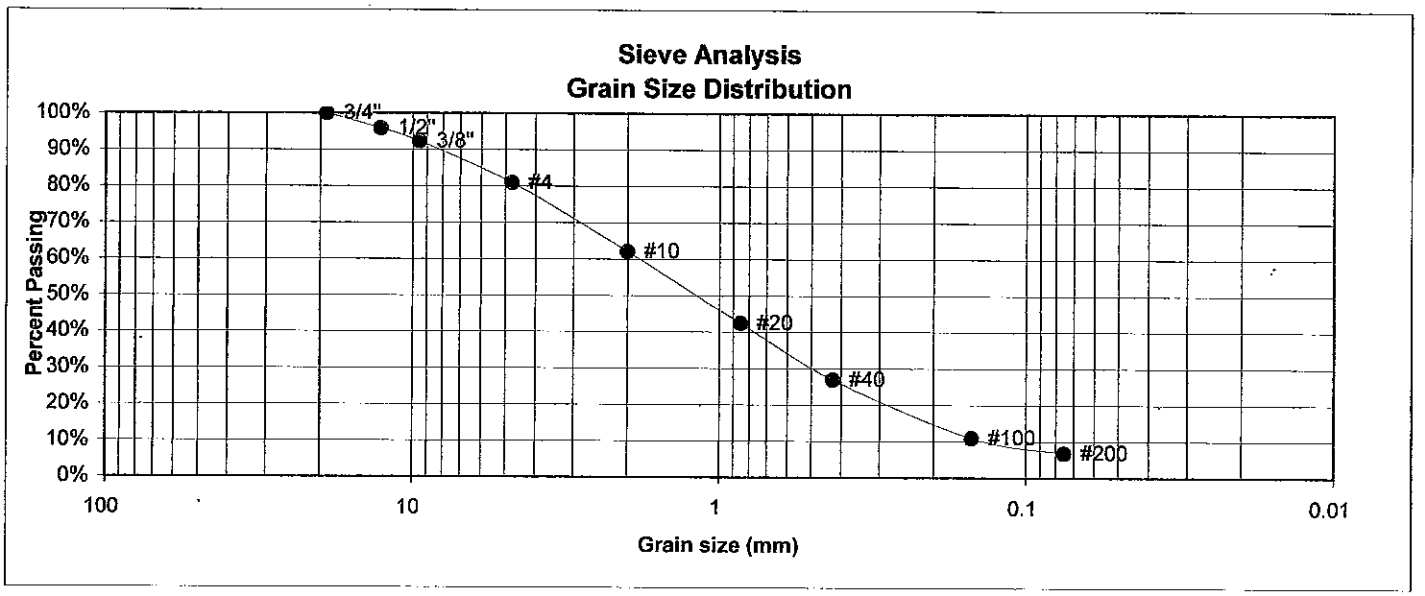
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KH	2/13/04

JOB NO.: 98104
FIG NO.: C-1

UNIFIED CLASSIFICATION	SP-SM	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	2	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-4	JOB NO.	98104
DEPTH	15-20'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	100.0%
1/2"	95.8%
3/8"	92.3%
4	80.9%
10	62.1%
20	42.4%
40	26.9%
100	10.9%
200	6.8%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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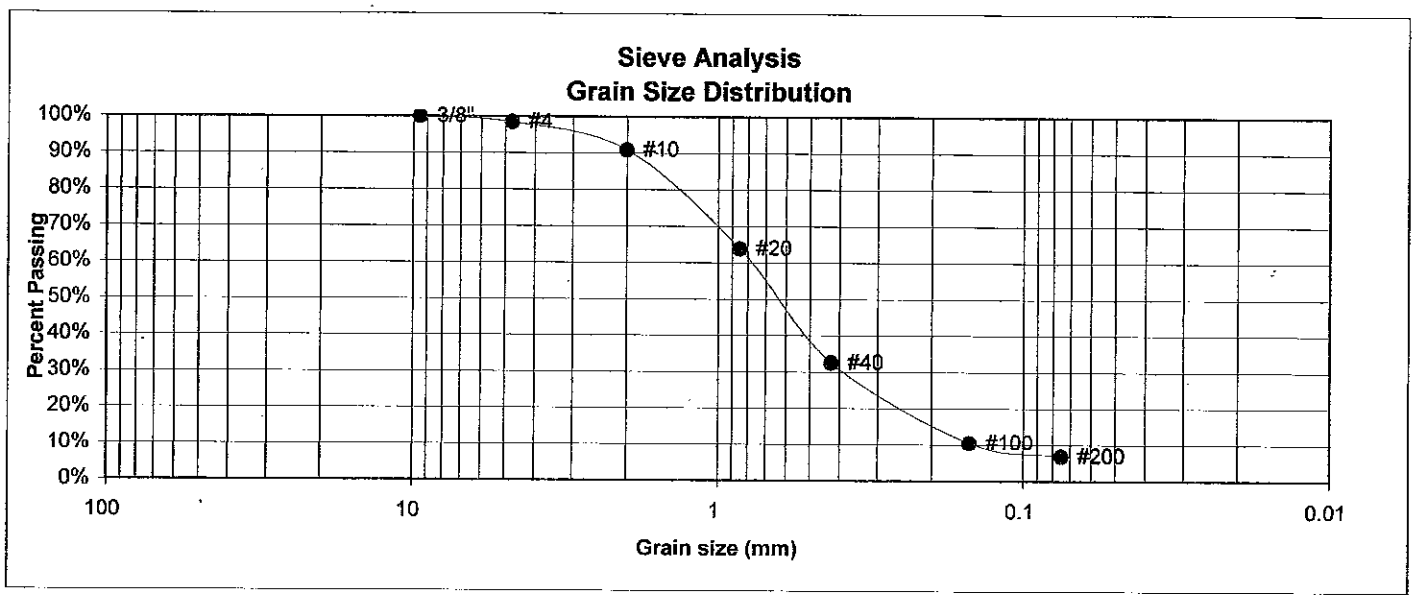
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		IC#	2/13/04

JOB NO.: 98104

FIG NO.: C-2

UNIFIED CLASSIFICATION	SW-SM	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	2	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-21	JOB NO.	98104
DEPTH	15-16'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.5%
10	90.9%
20	63.9%
40	32.6%
100	10.5%
200	6.9%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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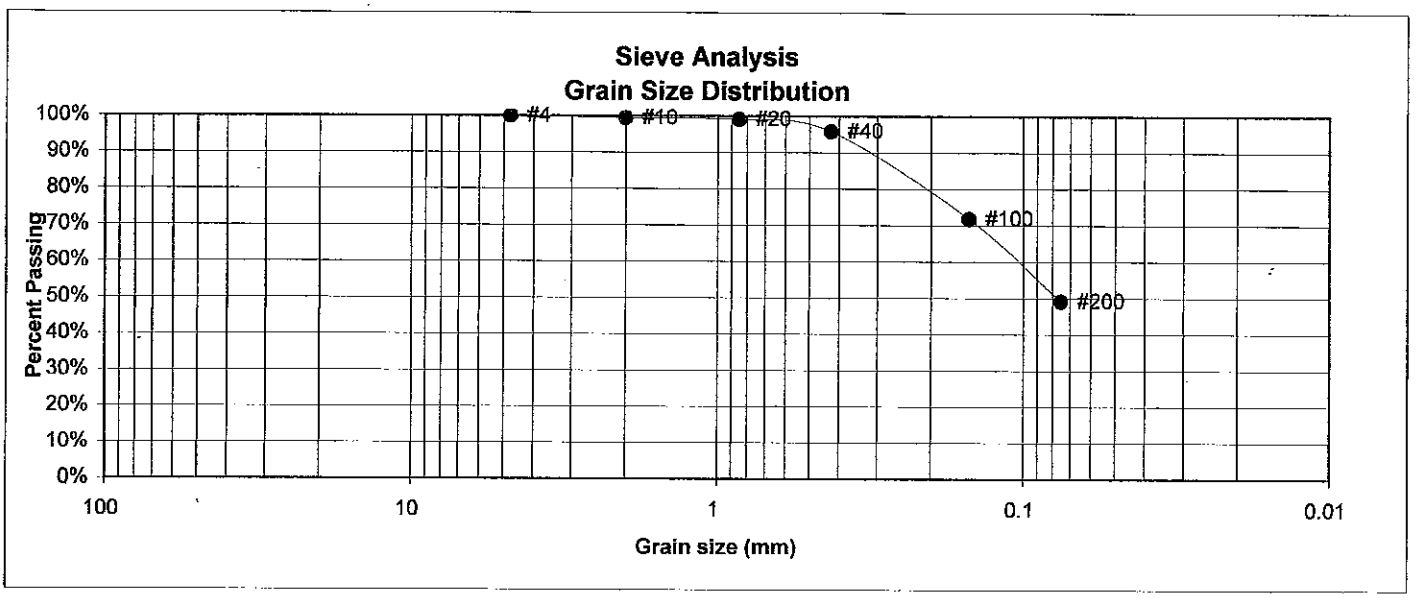
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-3

UNIFIED CLASSIFICATION	SC-CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	2	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-31	JOB NO.	98104
DEPTH	2-5'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.5%
20	99.1%
40	95.8%
100	71.8%
200	49.1%

Atterberg Limits	
Plastic Limit	15
Liquid Limit	25
Plastic Index	10

Swell	
Moisture at start	12.3%
Moisture at finish	17.5%
Moisture increase	5.1%
Initial dry density (pcf)	107
Swell (psf)	846

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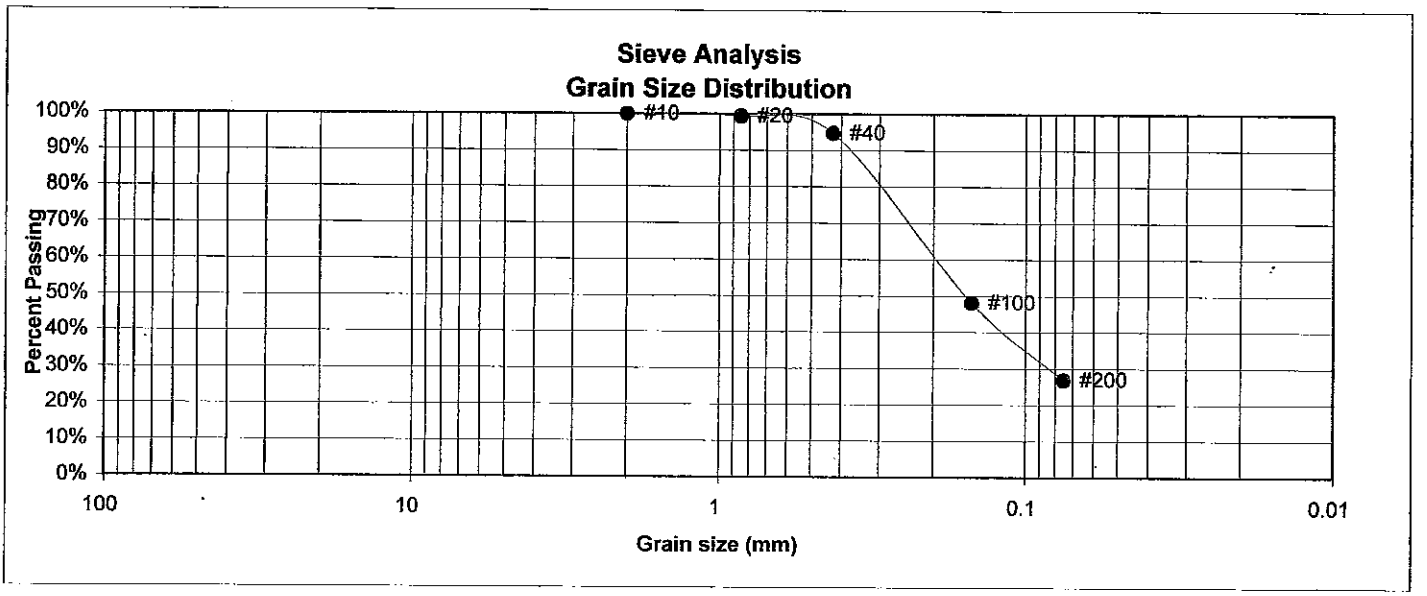
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LAH	2/13/04

JOB NO.: 98104
FIG NO.: C-4

UNIFIED CLASSIFICATION	SM	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	2	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-33	JOB NO.	98104
DEPTH	15-20'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	99.4%
40	94.8%
100	48.1%
200	26.8%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

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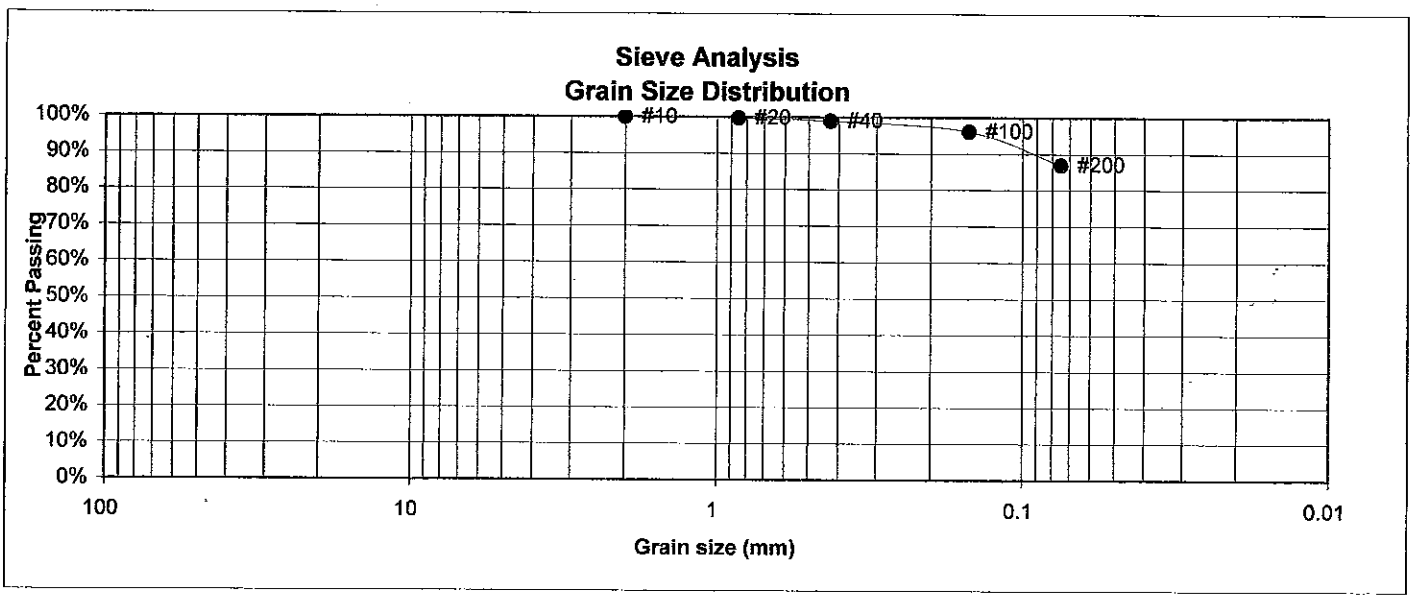
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		RAH	2/13/04

JOB NO.: 98104
FIG NO.: C-5

UNIFIED CLASSIFICATION	CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	3	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-1	JOB NO.	98104
DEPTH	2-5'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	99.8%
40	98.9%
100	96.2%
200	87.0%

Atterberg Limits

Plastic Limit	15
Liquid Limit	36
Plastic Index	21

Swell

Moisture at start	13.2%
Moisture at finish	20.9%
Moisture increase	7.7%
Initial dry density (pcf)	104
Swell (psf)	2182

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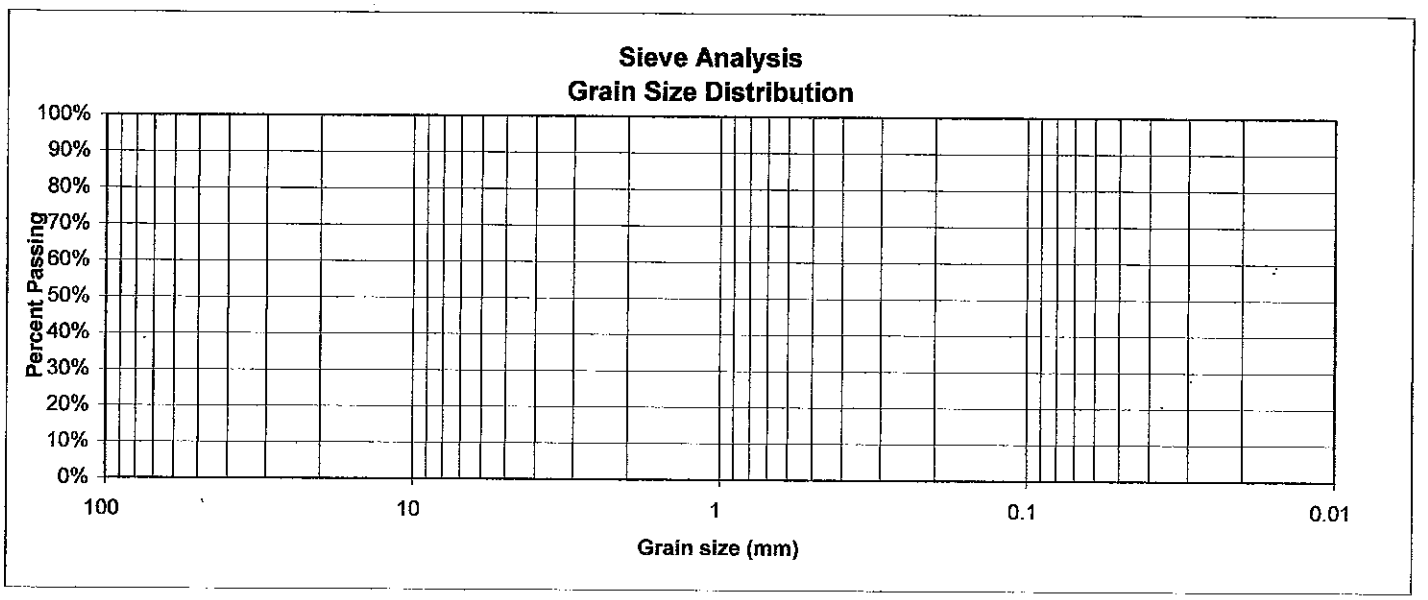
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KH	2/13/04

JOB NO.: 98104

FIG NO.: C-6

UNIFIED CLASSIFICATION	CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	3	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-4	JOB NO.	98104
DEPTH	2-3'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	
40	
100	
200	

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	
Swell	
Moisture at start	14.2%
Moisture at finish	22.9%
Moisture increase	8.7%
Initial dry density (pcf)	101
Swell (psf)	2213

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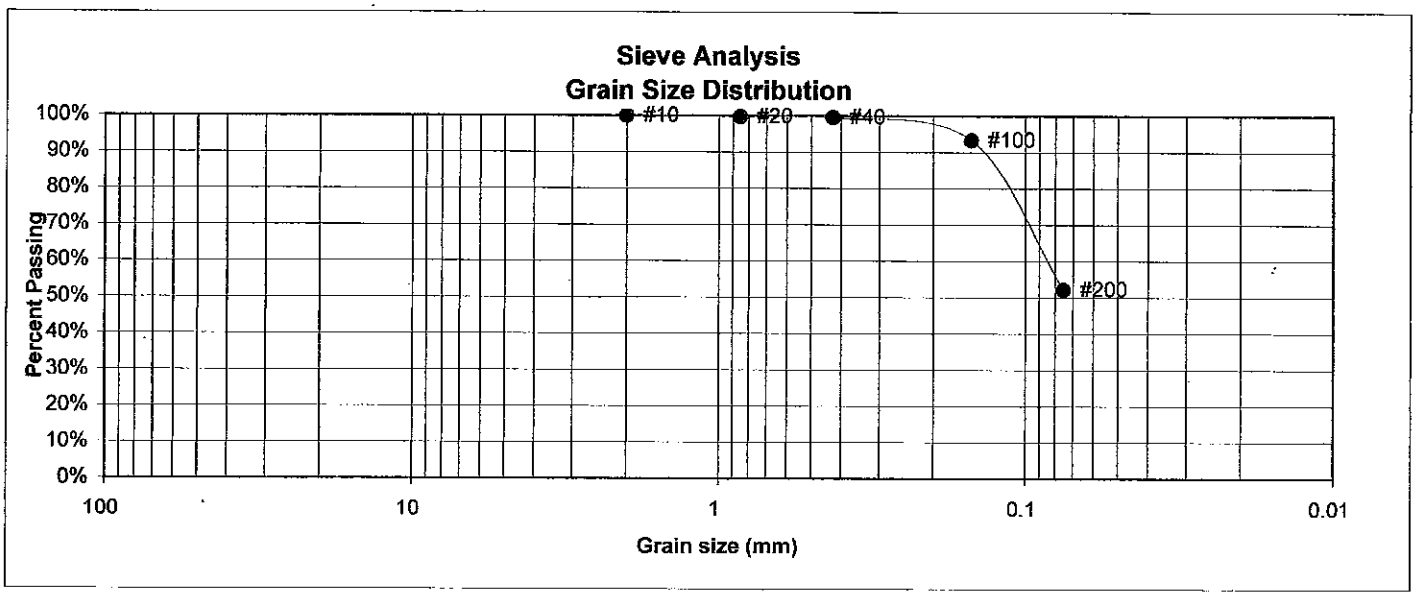
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-7

UNIFIED CLASSIFICATION	CL-ML	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	3	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-14	JOB NO.	98104
DEPTH	5-10'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	99.7%
40	99.5%
100	93.3%
200	52.1%

Atterberg Limits	
Plastic Limit	18
Liquid Limit	24
Plastic Index	6

Swell	
Moisture at start	10.1%
Moisture at finish	22.0%
Moisture increase	11.9%
Initial dry density (pcf)	102
Swell (psf)	738

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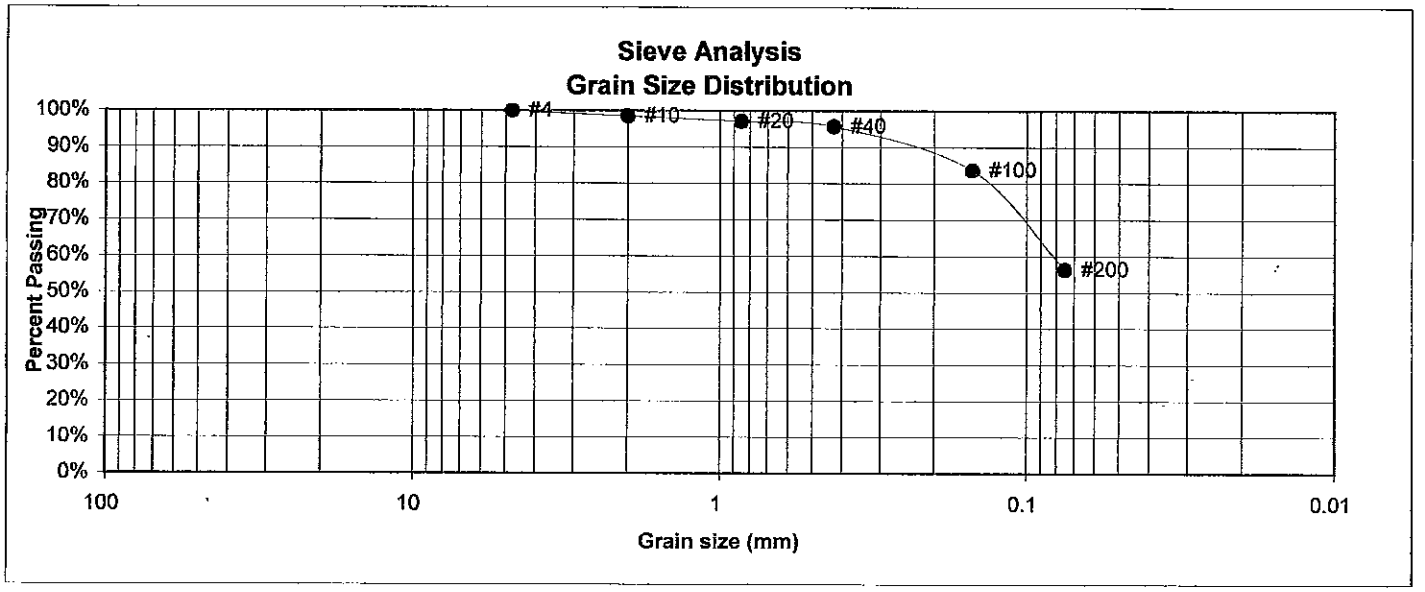
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-8

UNIFIED CLASSIFICATION	CL-ML	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	3	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-26	JOB NO.	98104
DEPTH	2-5'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.5%
20	97.1%
40	95.7%
100	83.7%
200	56.2%

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	
Swell	
Moisture at start	10.5%
Moisture at finish	19.5%
Moisture increase	9.0%
Initial dry density (pcf)	101
Swell (psf)	1000

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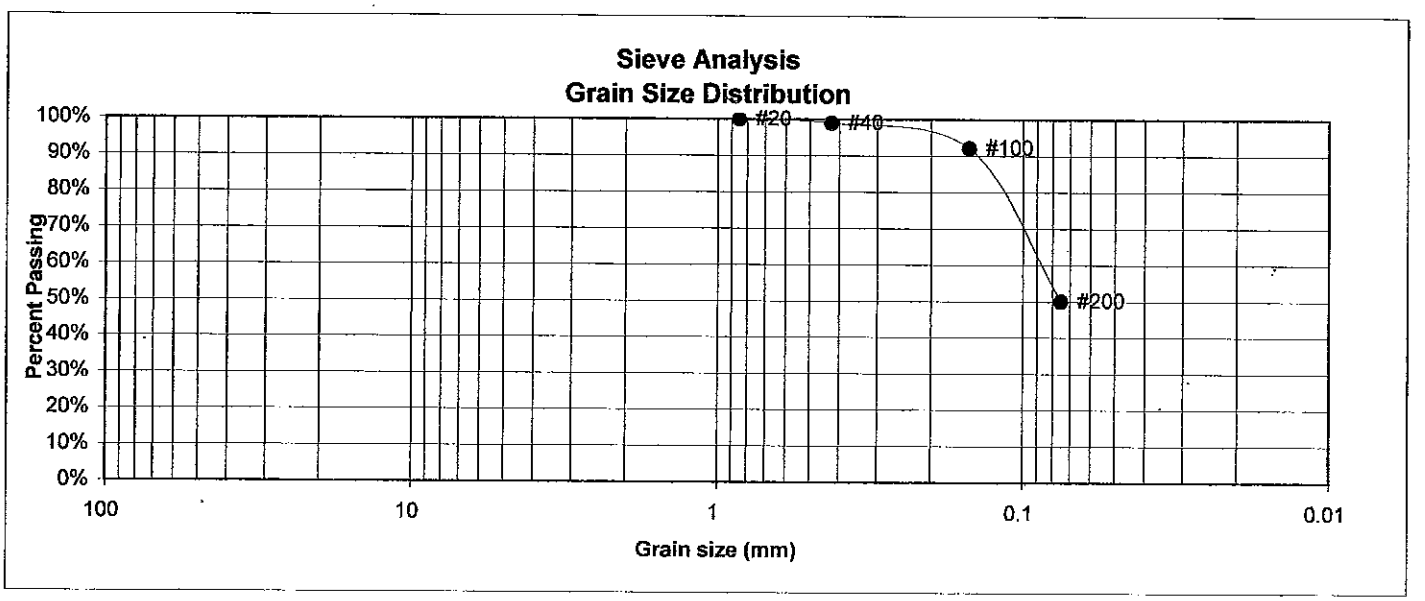
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104

FIG NO.: C-9

UNIFIED CLASSIFICATION	CL-ML	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	3	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-27	JOB NO.	98104
DEPTH	15'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	100.0%
40	99.0%
100	92.1%
200	50.1%

Atterberg Limits	
Plastic Limit	15
Liquid Limit	20
Plastic Index	5

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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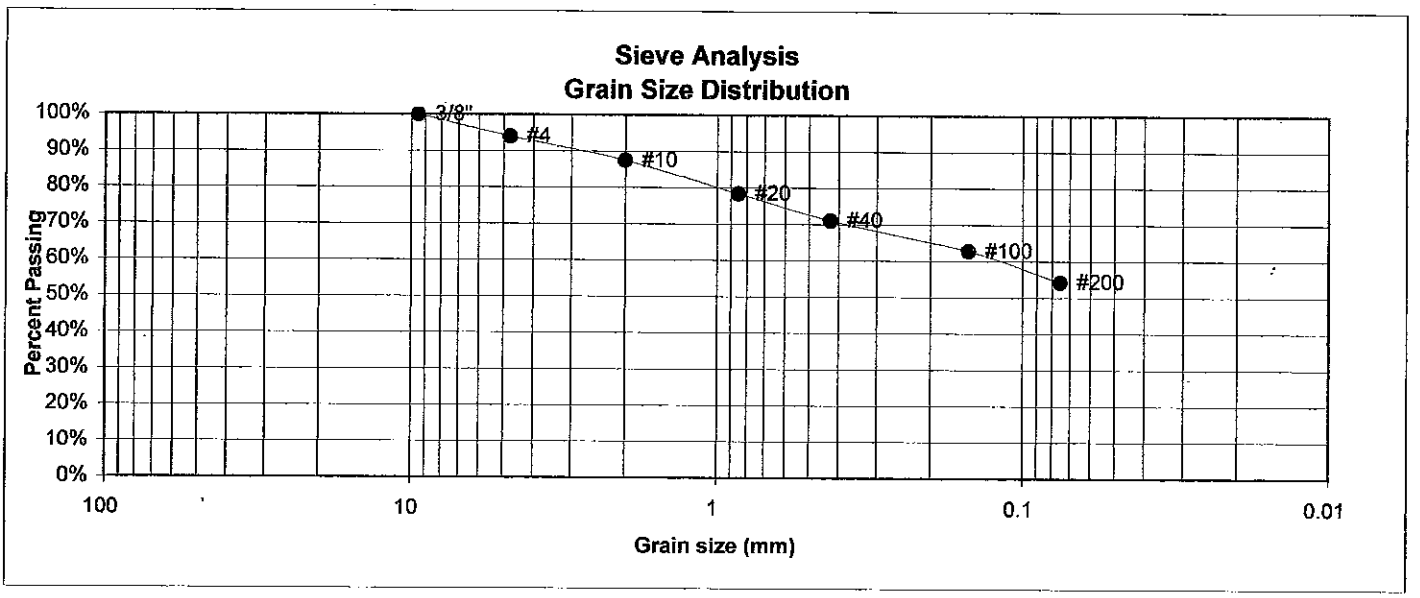
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104

FIG NO.: C-10

UNIFIED CLASSIFICATION	CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	3	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-34	JOB NO.	98104
DEPTH	5'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	94.1%
10	87.5%
20	78.4%
40	71.0%
100	62.7%
200	54.2%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

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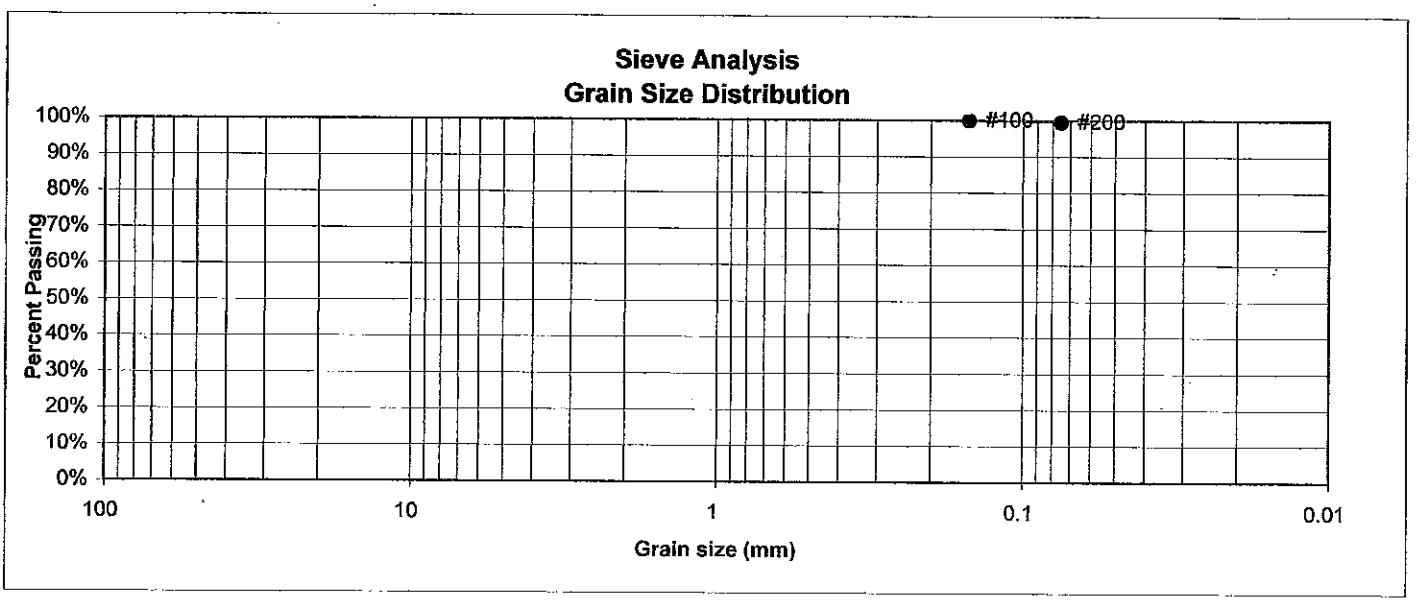
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-11

UNIFIED CLASSIFICATION	CH	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	3	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-34	JOB NO.	98104
DEPTH	20'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	
40	
100	100.0%
200	99.5%

Atterberg Limits	
Plastic Limit	28
Liquid Limit	63
Plastic Index	35

Swell	
Moisture at start	16.2%
Moisture at finish	28.0%
Moisture increase	11.8%
Initial dry density (pcf)	95
Swell (psf)	3924

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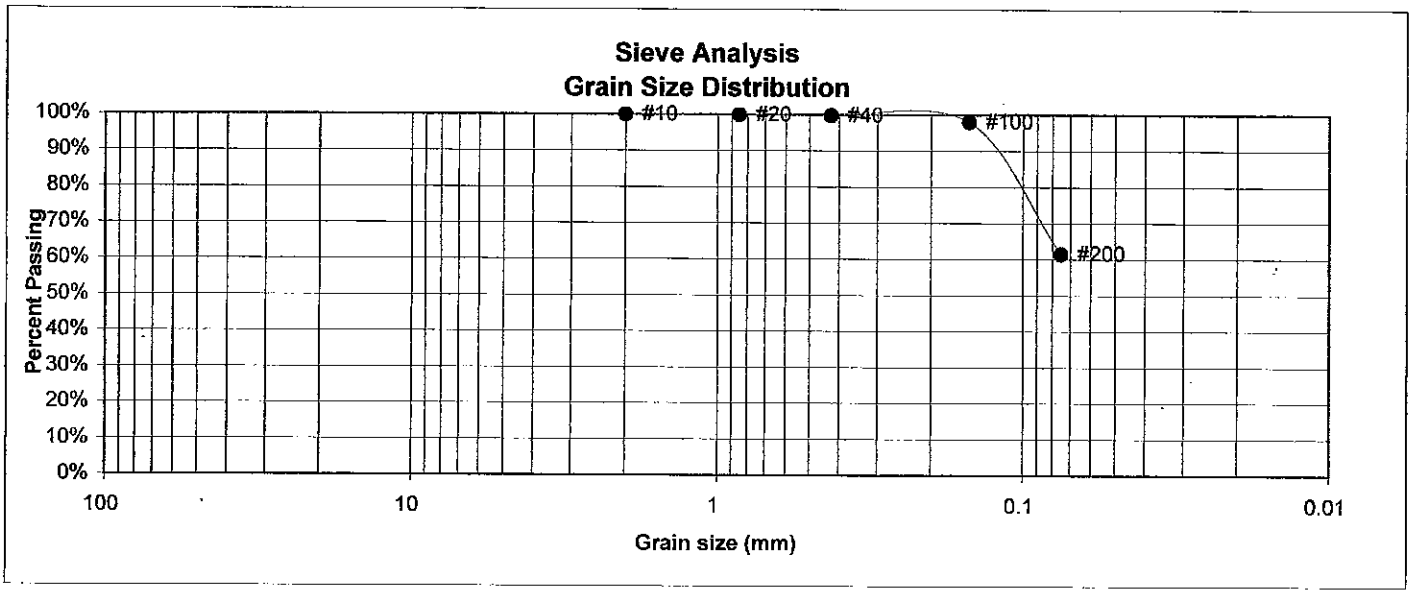
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-12

UNIFIED CLASSIFICATION	CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	3	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-39	JOB NO.	98104
DEPTH	2'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	99.9%
40	99.8%
100	98.0%
200	61.4%

Atterberg Limits	
Plastic Limit	15
Liquid Limit	29
Plastic Index	14

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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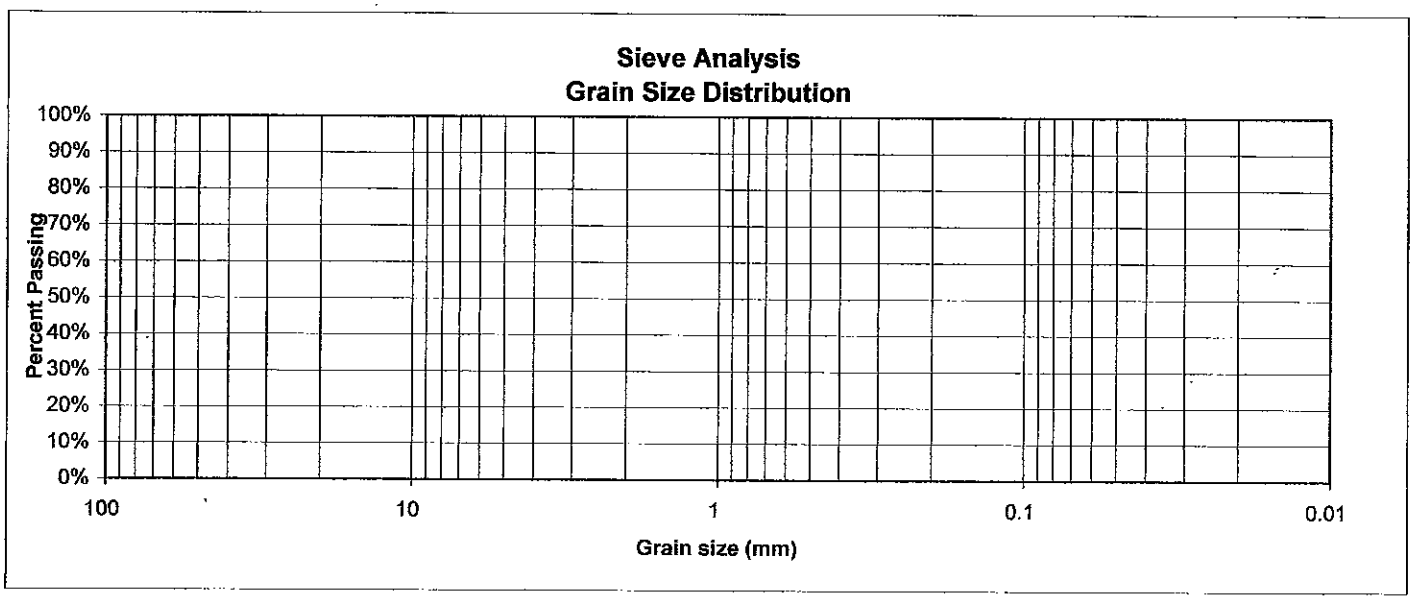
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAM	2/13/02

JOB NO.: 98104
FIG NO.: C-13

UNIFIED CLASSIFICATION	CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	3	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-40	JOB NO.	98104
DEPTH	10	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	
40	
100	
200	

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	
Swell	
Moisture at start	11.2%
Moisture at finish	19.0%
Moisture increase	7.8%
Initial dry density (pcf)	106
Swell (psf)	1303

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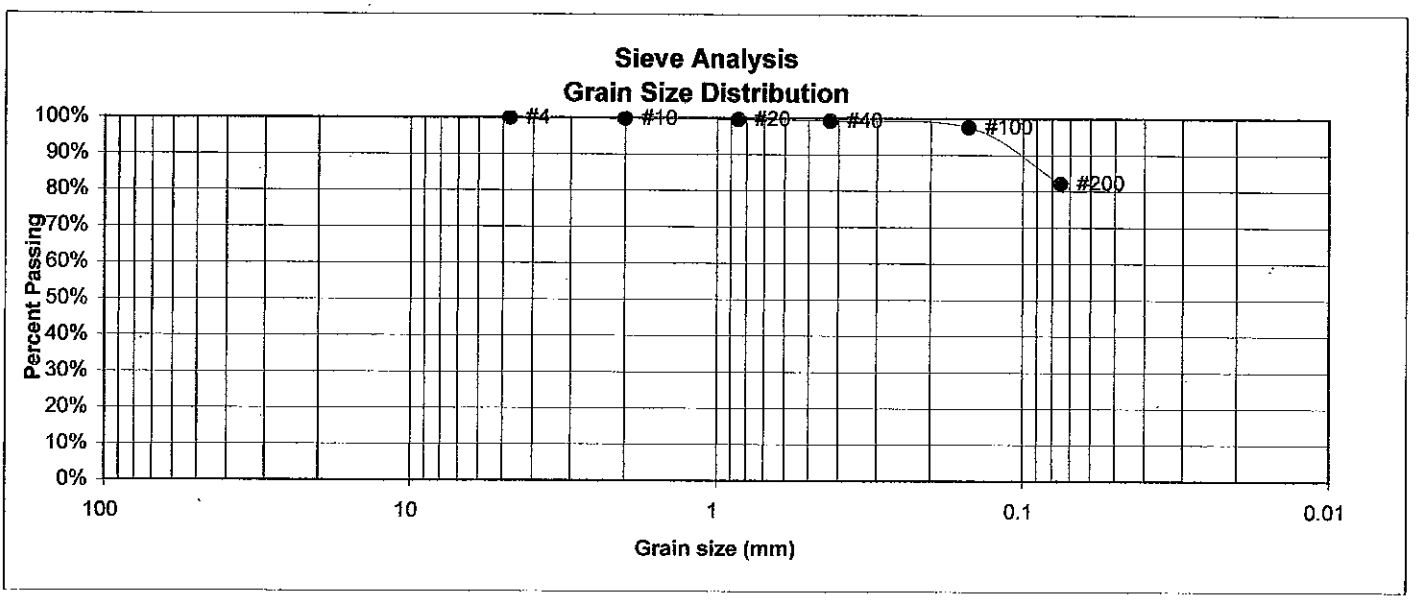
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		MH	2/13/04

JOB NO.: 98104
FIG NO.: C-14

UNIFIED CLASSIFICATION	CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	3	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-44	JOB NO.	98104
DEPTH	5-10'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.8%
20	99.6%
40	99.3%
100	97.6%
200	82.2%

Atterberg Limits	
Plastic Limit	15
Liquid Limit	31
Plastic Index	16

Swell	
Moisture at start	12.5%
Moisture at finish	19.8%
Moisture increase	7.3%
Initial dry density (pcf)	108
Swell (psf)	1970

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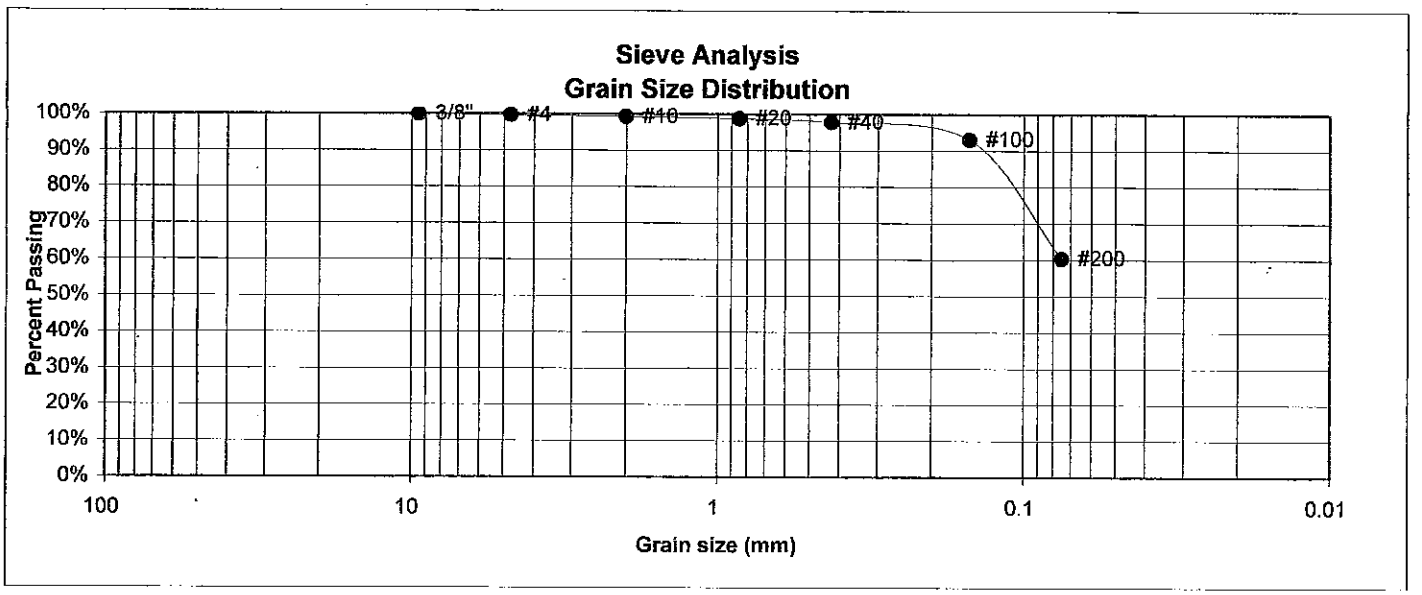
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		BAH	2/13/04

JOB NO.: 98104
FIG NO.: C-15

UNIFIED CLASSIFICATION	CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	3	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-47	JOB NO.	98104
DEPTH	2-5'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.7%
10	99.3%
20	98.8%
40	97.8%
100	93.1%
200	60.4%

Atterberg Limits	
Plastic Limit	16
Liquid Limit	29
Plastic Index	13

Swell	
Moisture at start	9.6%
Moisture at finish	19.7%
Moisture increase	10.1%
Initial dry density (pcf)	104
Swell (psf)	1341

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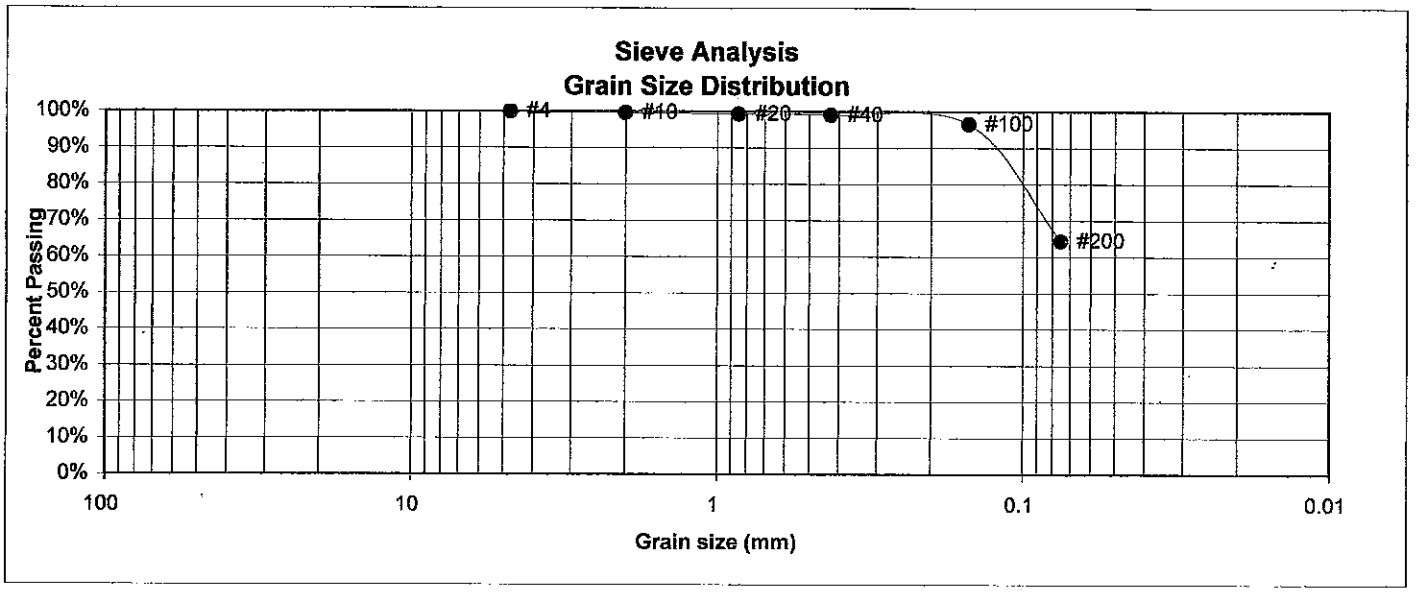
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAA	2/13/04

JOB NO.: 98104
FIG NO.: C-16

UNIFIED CLASSIFICATION	CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	3	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-49	JOB NO.	98104
DEPTH	5-10'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.7%
20	99.3%
40	99.0%
100	96.6%
200	64.4%

Atterberg Limits	
Plastic Limit	16
Liquid Limit	27
Plastic Index	11

Swell	
Moisture at start	11.1%
Moisture at finish	20.9%
Moisture increase	9.8%
Initial dry density (pcf)	102
Swell (psf)	1085

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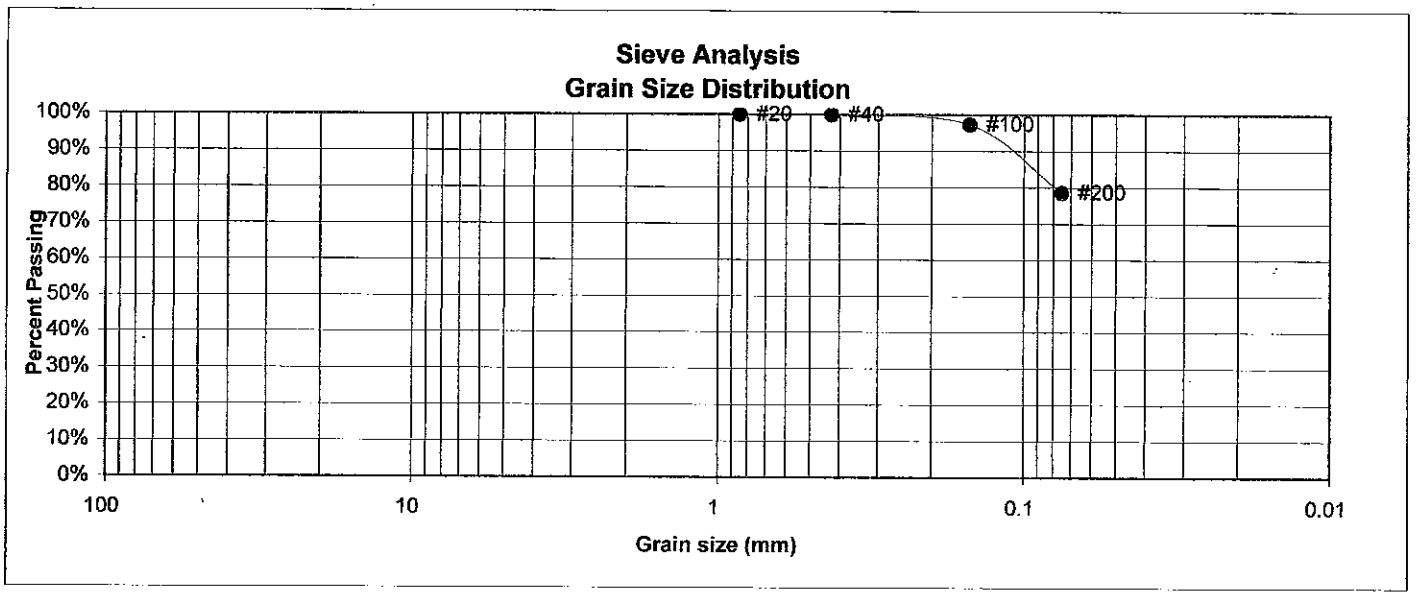
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-17

UNIFIED CLASSIFICATION	CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	3	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-51	JOB NO.	98104
DEPTH	2-3'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	100.0%
40	99.9%
100	97.2%
200	78.5%

Atterberg Limits	
Plastic Limit	14
Liquid Limit	35
Plastic Index	21

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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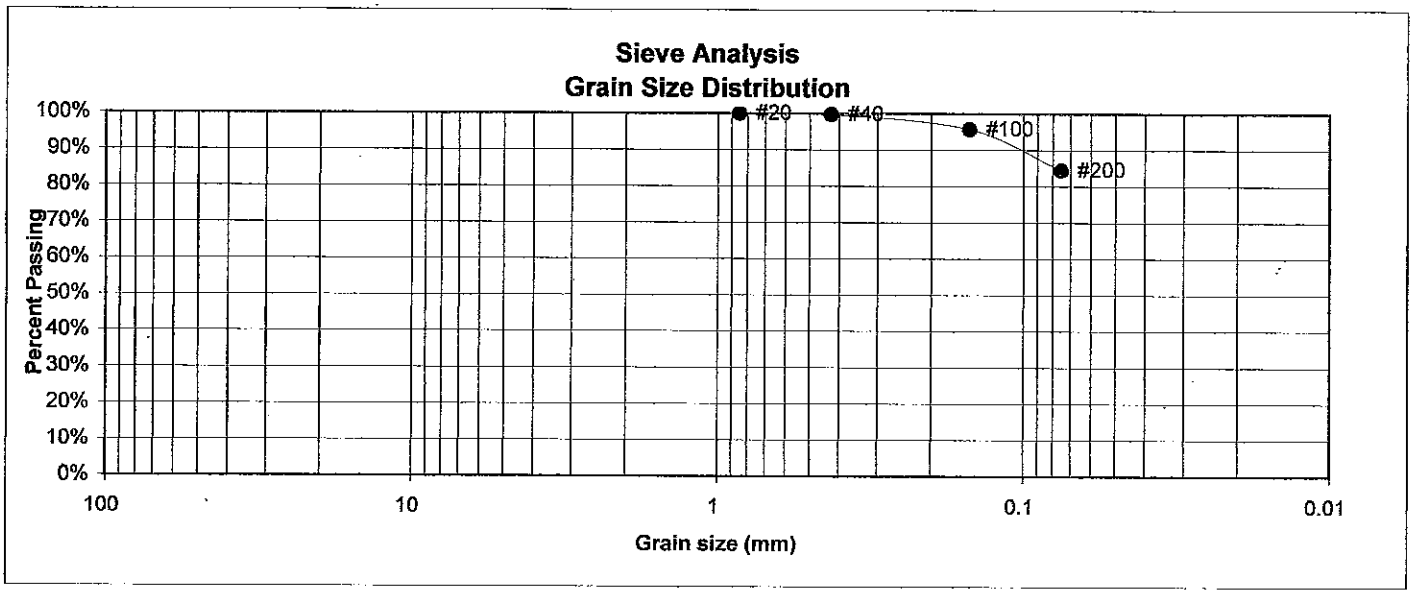
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/23/04

JOB NO.: 98104
FIG NO.: C-18

UNIFIED CLASSIFICATION	CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	3	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-53	JOB NO.	98104
DEPTH	5-10'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	100.0%
40	99.8%
100	95.7%
200	84.5%

Atterberg Limits	
Plastic Limit	17
Liquid Limit	45
Plastic Index	28

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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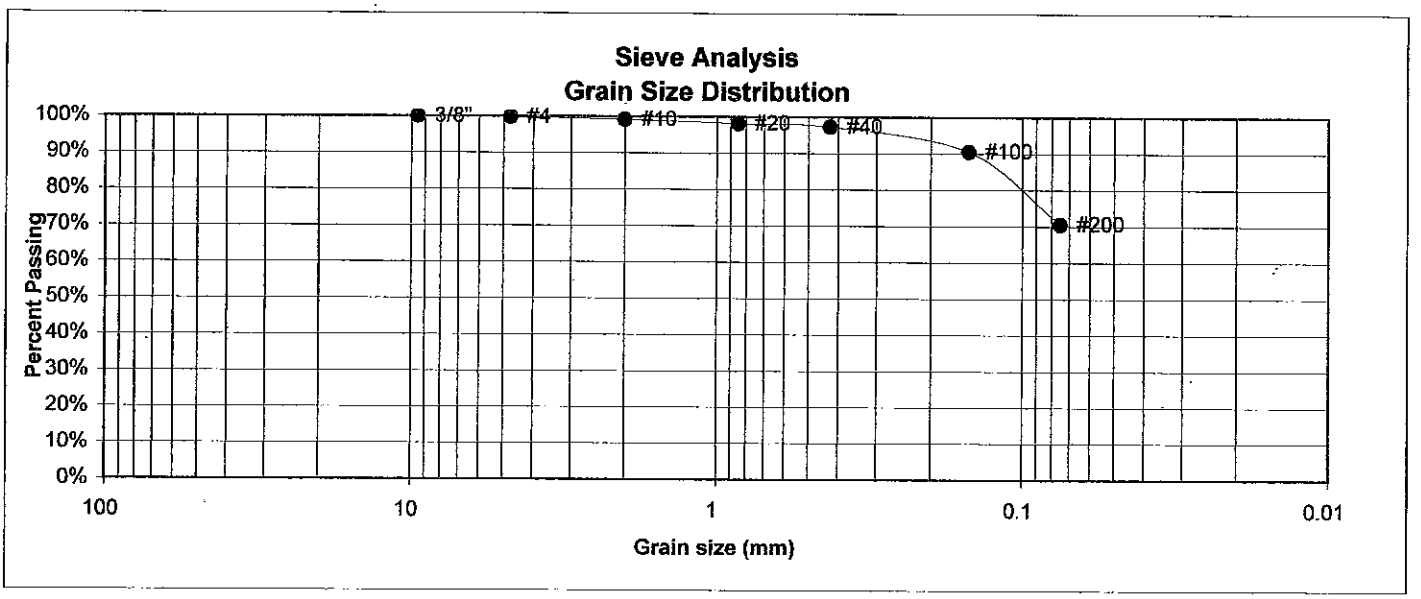
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KA	2/23/04

JOB NO.: 98104

FIG NO.: C-19

UNIFIED CLASSIFICATION	CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	4	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-3	JOB NO.	98104
DEPTH	20'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.8%
10	99.3%
20	98.2%
40	97.2%
100	90.5%
200	70.5%

Atterberg Limits

Plastic Limit	14
Liquid Limit	34
Plastic Index	20

Swell

Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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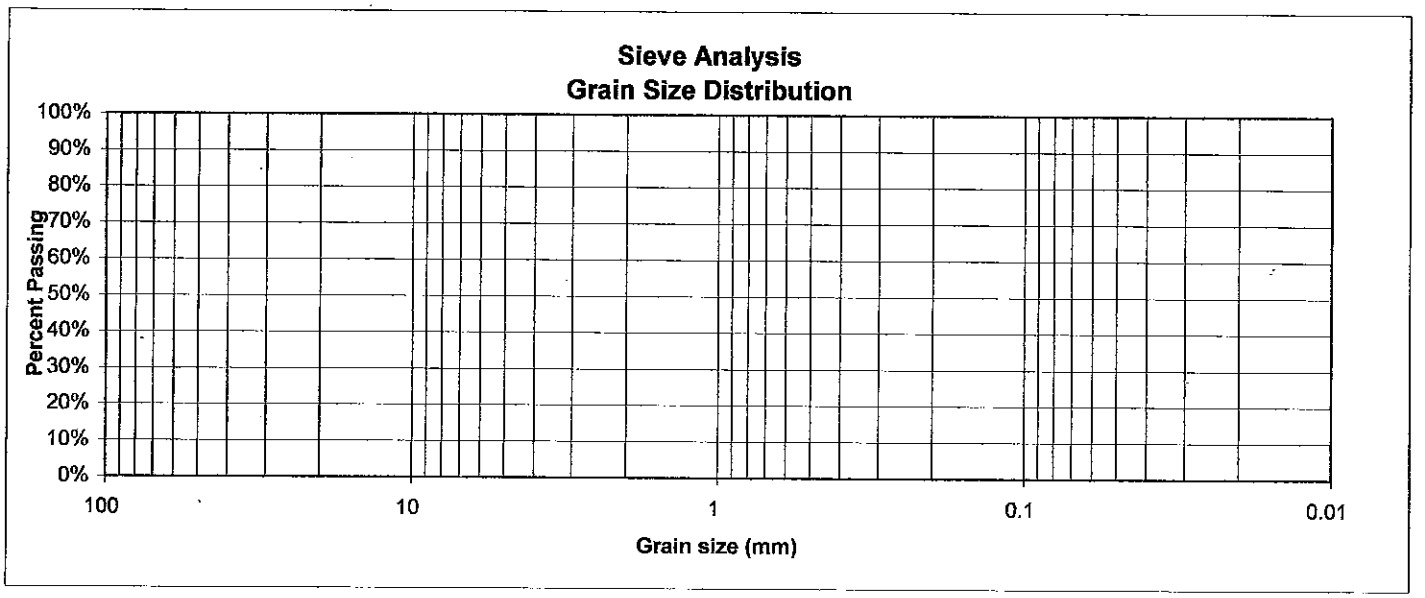
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		BAH	2/13/04

JOB NO.: 98104
FIG NO.: C-20

UNIFIED CLASSIFICATION	CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	4	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-6	JOB NO.	98104
DEPTH	10'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	
40	
100	
200	

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	

Swell	
Moisture at start	15.0%
Moisture at finish	25.5%
Moisture increase	10.6%
Initial dry density (pcf)	100
Swell (psf)	3466

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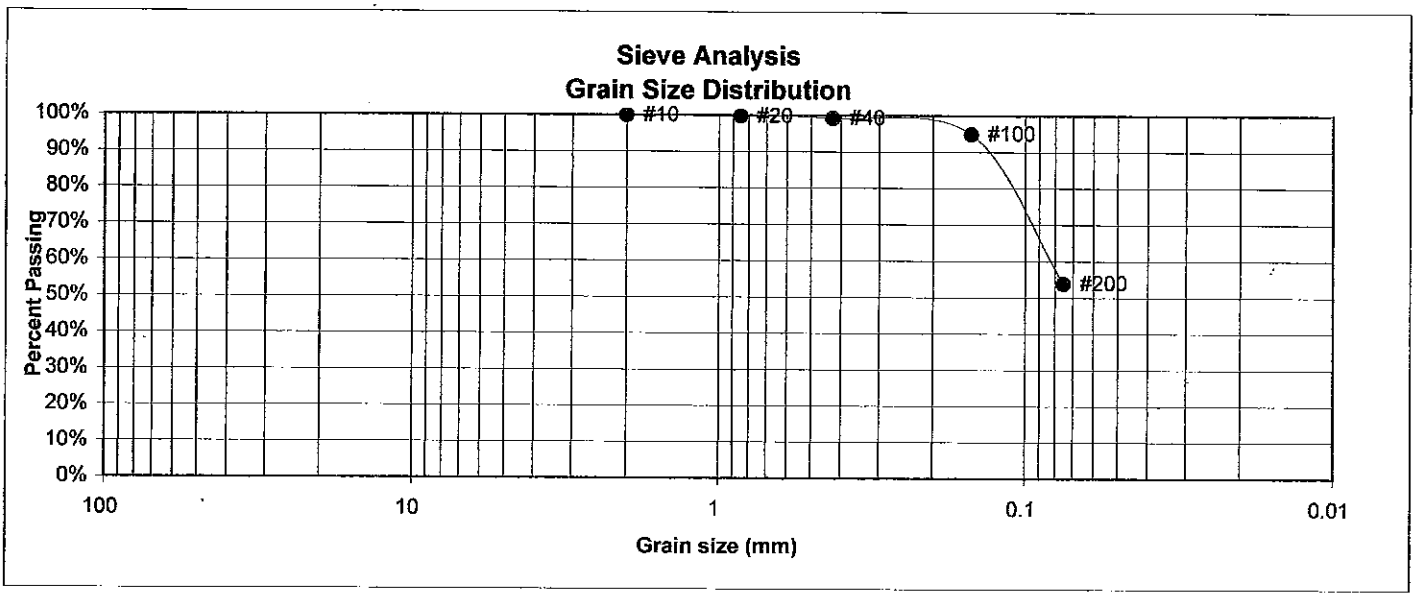
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-21

UNIFIED CLASSIFICATION	CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	4	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-19	JOB NO.	98104
DEPTH	15-20'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	99.7%
40	99.2%
100	95.0%
200	53.8%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

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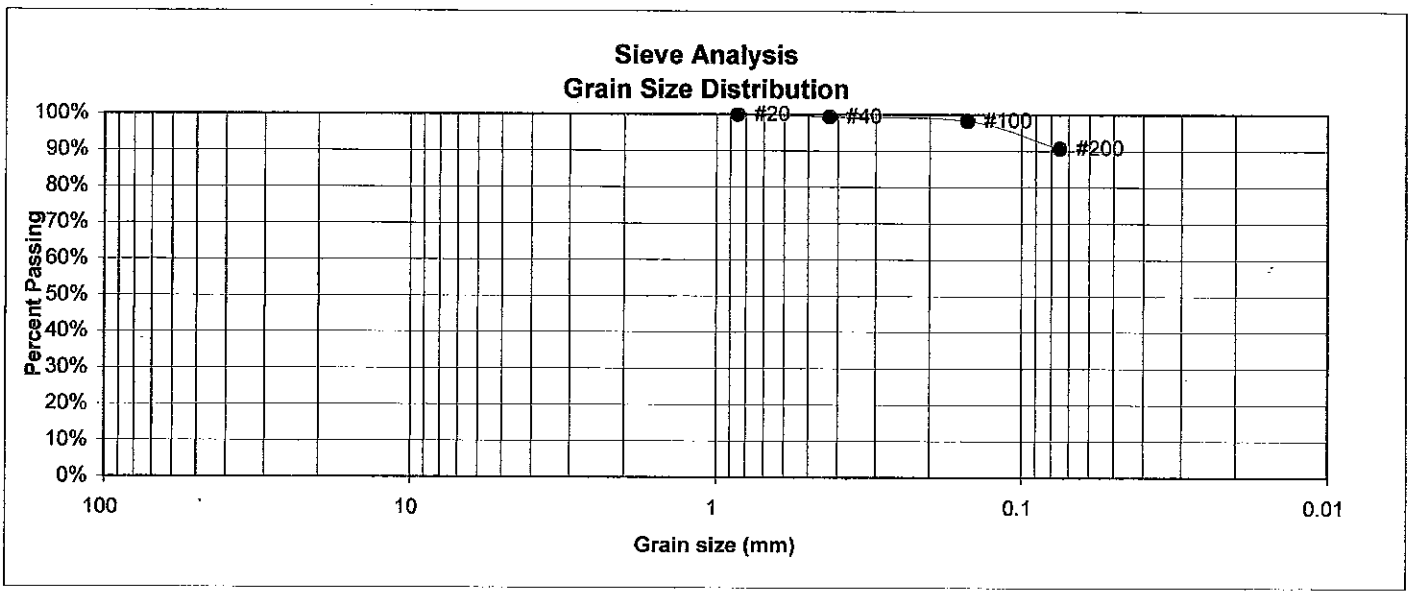
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		BH	2/13/04

JOB NO.: 98104
FIG NO.: C-22

UNIFIED CLASSIFICATION	CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	4	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-20	JOB NO.	98104
DEPTH	10-15'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	100.0%
40	99.4%
100	98.3%
200	90.7%

Atterberg Limits	
Plastic Limit	20
Liquid Limit	38
Plastic Index	18

Swell	
Moisture at start	14.3%
Moisture at finish	24.2%
Moisture increase	9.9%
Initial dry density (pcf)	101
Swell (psf)	1962

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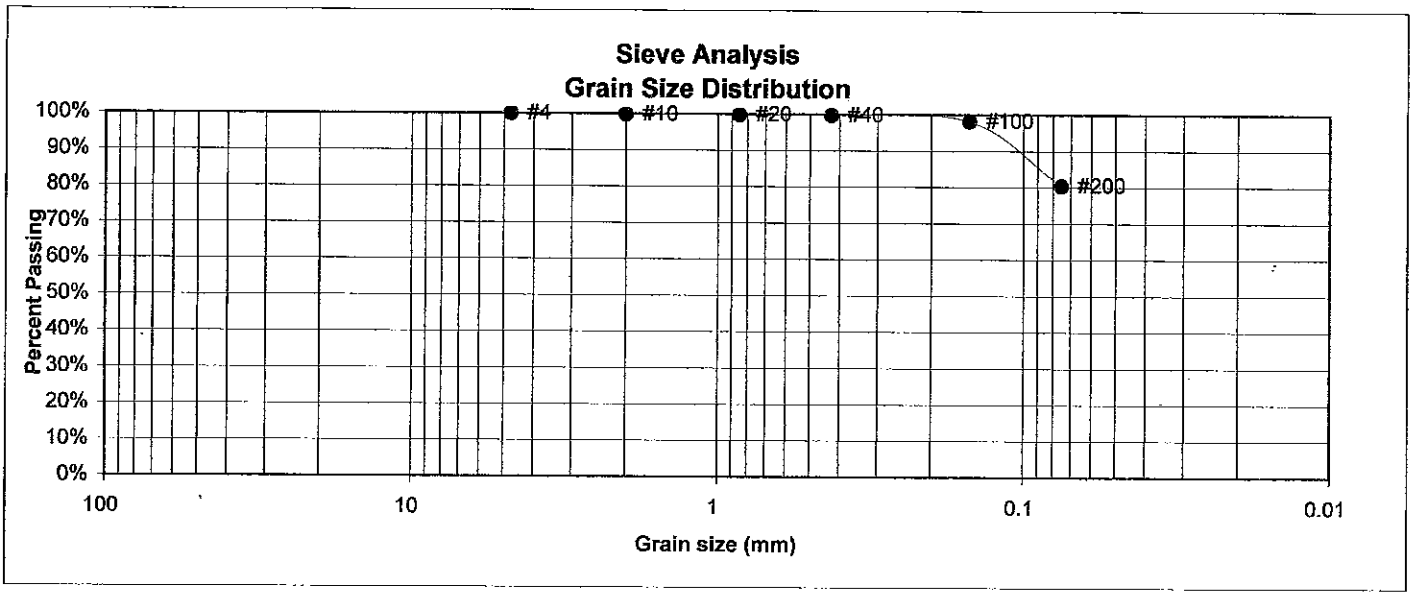
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/01

JOB NO.: 98104
FIG NO.: C-23

UNIFIED CLASSIFICATION	CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	4	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-30	JOB NO.	98104
DEPTH	10'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.9%
20	99.8%
40	99.8%
100	98.2%
200	80.3%

Atterberg Limits	
Plastic Limit	15
Liquid Limit	35
Plastic Index	20

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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LABORATORY TEST RESULTS

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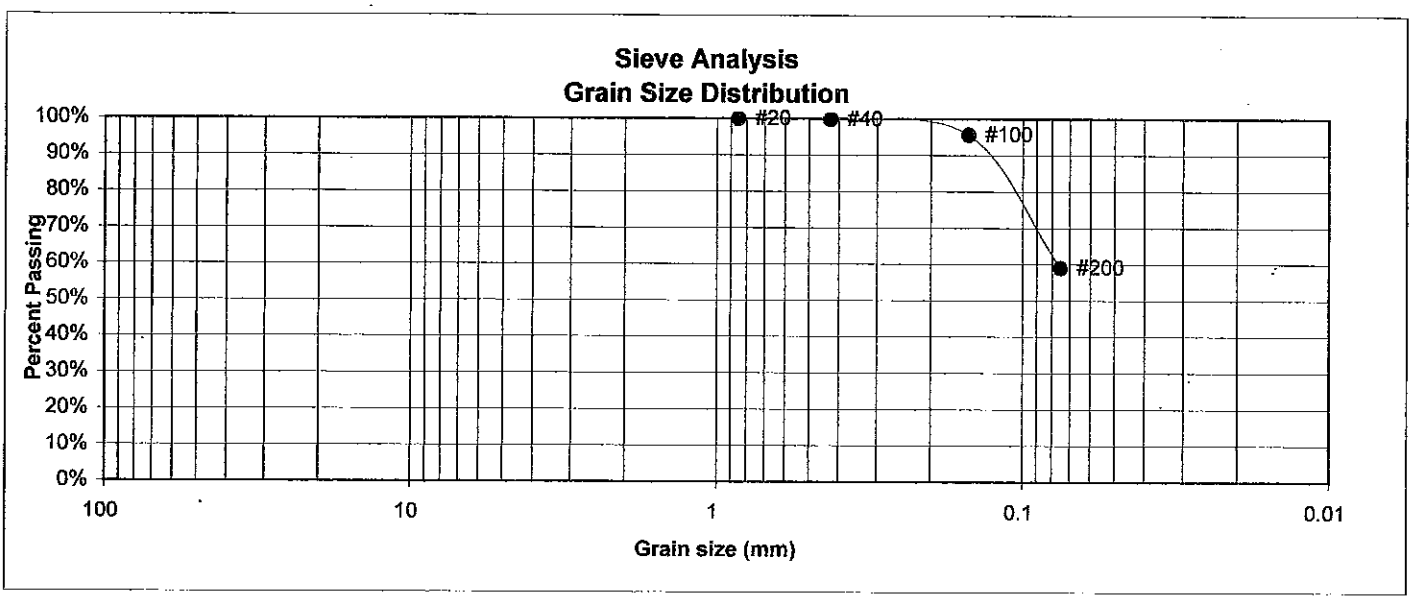
		KAH	2/13/04

JOB NO.: 98104

FIG NO.: C-24

UNIFIED CLASSIFICATION	CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	4	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-31	JOB NO.	98104
DEPTH	15'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	100.0%
40	99.8%
100	95.6%
200	59.0%

Atterberg Limits	
Plastic Limit	16
Liquid Limit	33
Plastic Index	17

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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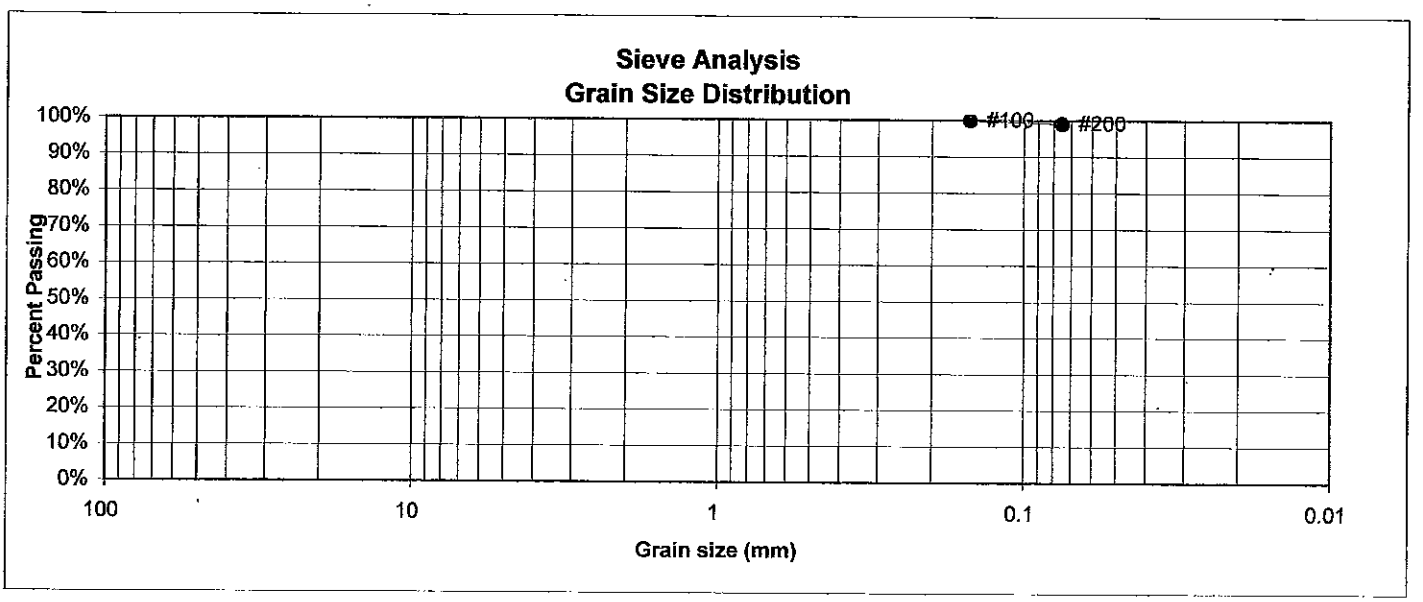
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		[illegible]	2/13/04

JOB NO.: 98104
FIG NO.: C-25

UNIFIED CLASSIFICATION	CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	4	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-41	JOB NO.	98104
DEPTH	5-10'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	
40	
100	100.0%
200	99.1%

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	
Swell	
Moisture at start	16.1%
Moisture at finish	27.5%
Moisture increase	11.4%
Initial dry density (pcf)	96
Swell (psf)	3597

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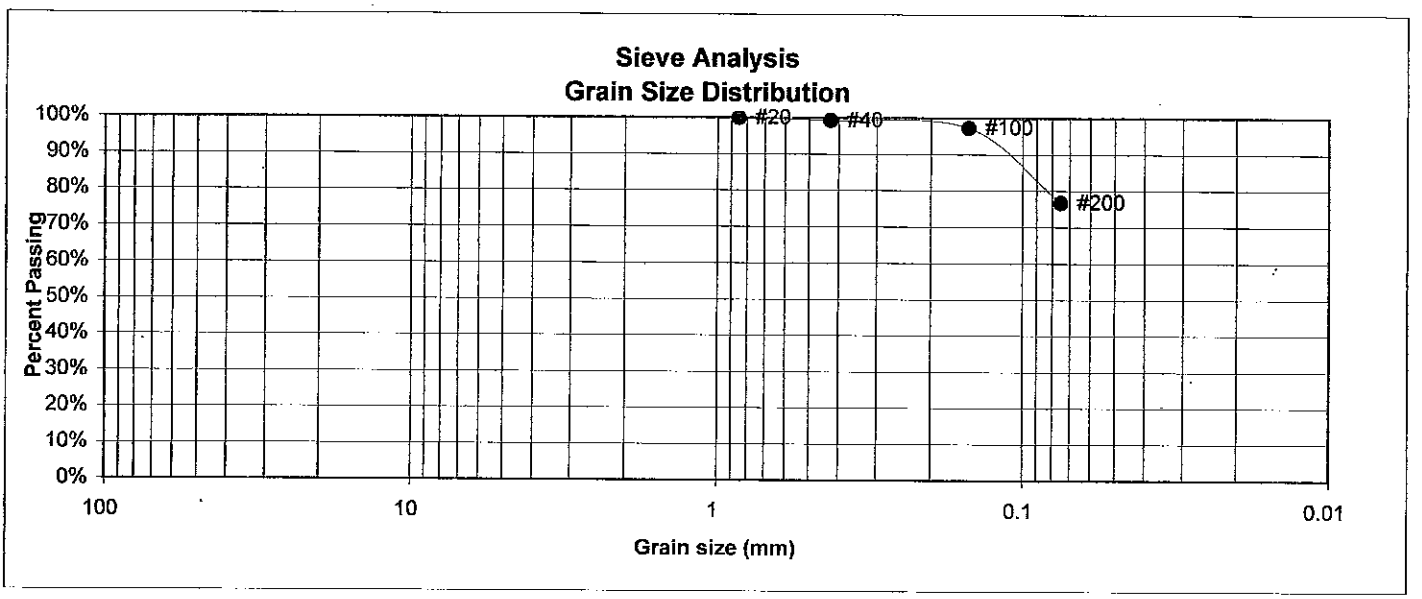
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAA	2/13/04

JOB NO.: 98104
FIG NO.: C-26

UNIFIED CLASSIFICATION	CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	5	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-12	JOB NO.	98104
DEPTH	20'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	100.0%
40	99.3%
100	97.3%
200	76.6%

Atterberg Limits	
Plastic Limit	12
Liquid Limit	34
Plastic Index	22

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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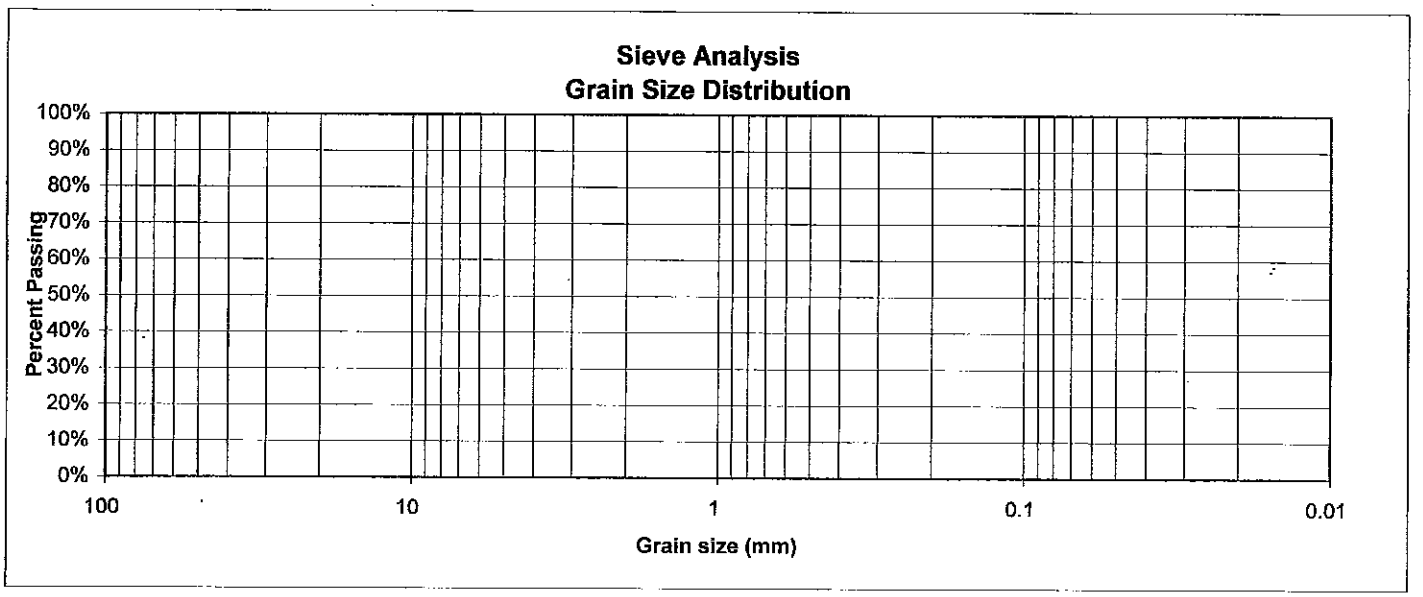
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LA H	2/13/04

JOB NO.: 98104
FIG NO.: C-27

UNIFIED CLASSIFICATION	CL	CLIENT	NORWOOD DEVELOPMENT
SOIL TYPE #	5	PROJECT	CROSS CREEK @ MESA RIDGE
TEST BORING #	TB-48	JOB NO.	98104
DEPTH	15'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	
40	
100	
200	

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	
Swell	
Moisture at start	10.1%
Moisture at finish	21.8%
Moisture increase	11.7%
Initial dry density (pcf)	104
Swell (psf)	1723

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LABORATORY TEST RESULTS

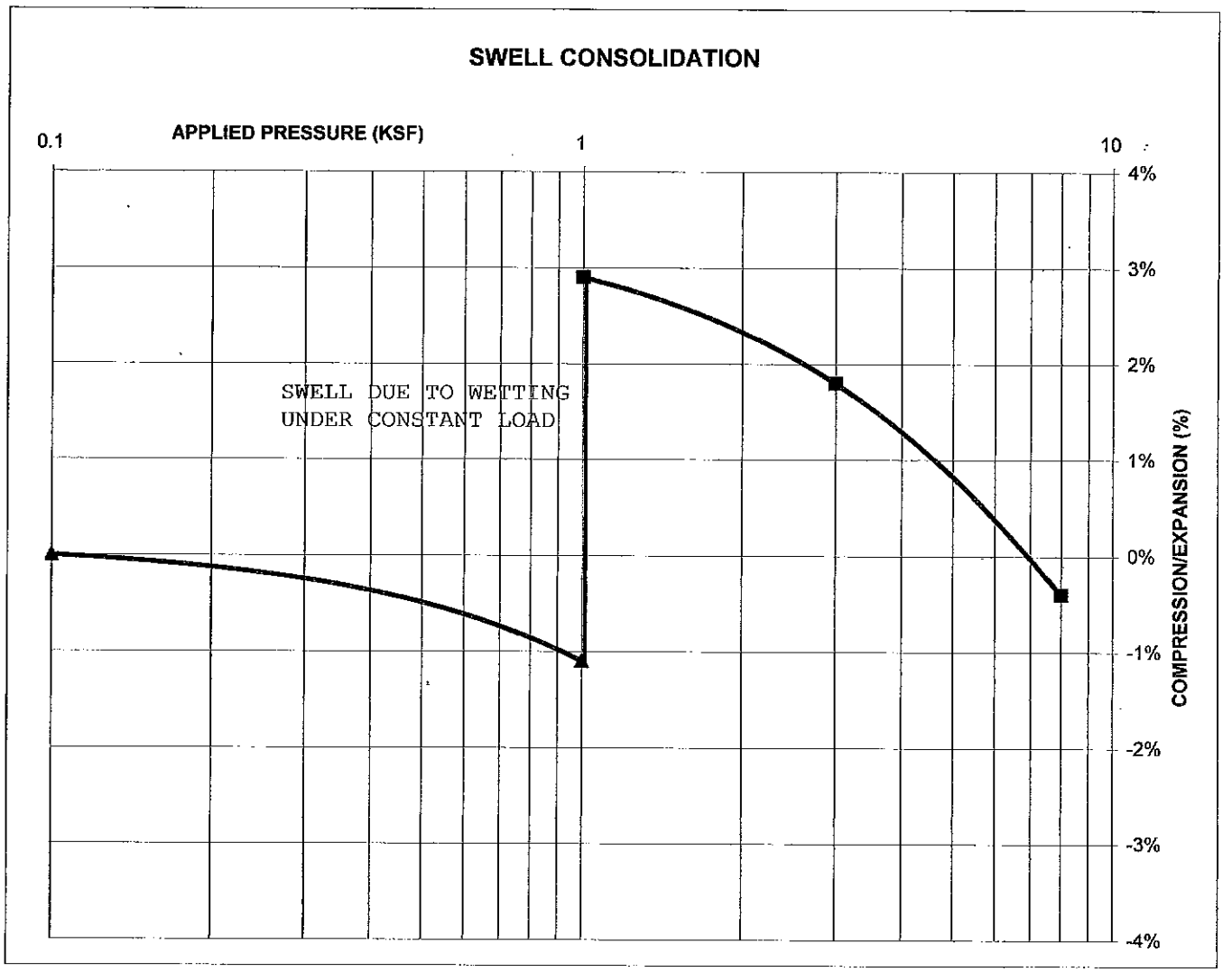
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-28

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-16	AT DEPTH	5'
DESCRIPTION	CL	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			113
NATURAL MOISTURE CONTENT			13.9%
SWELL/CONSOLIDATION (%)			4.0%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

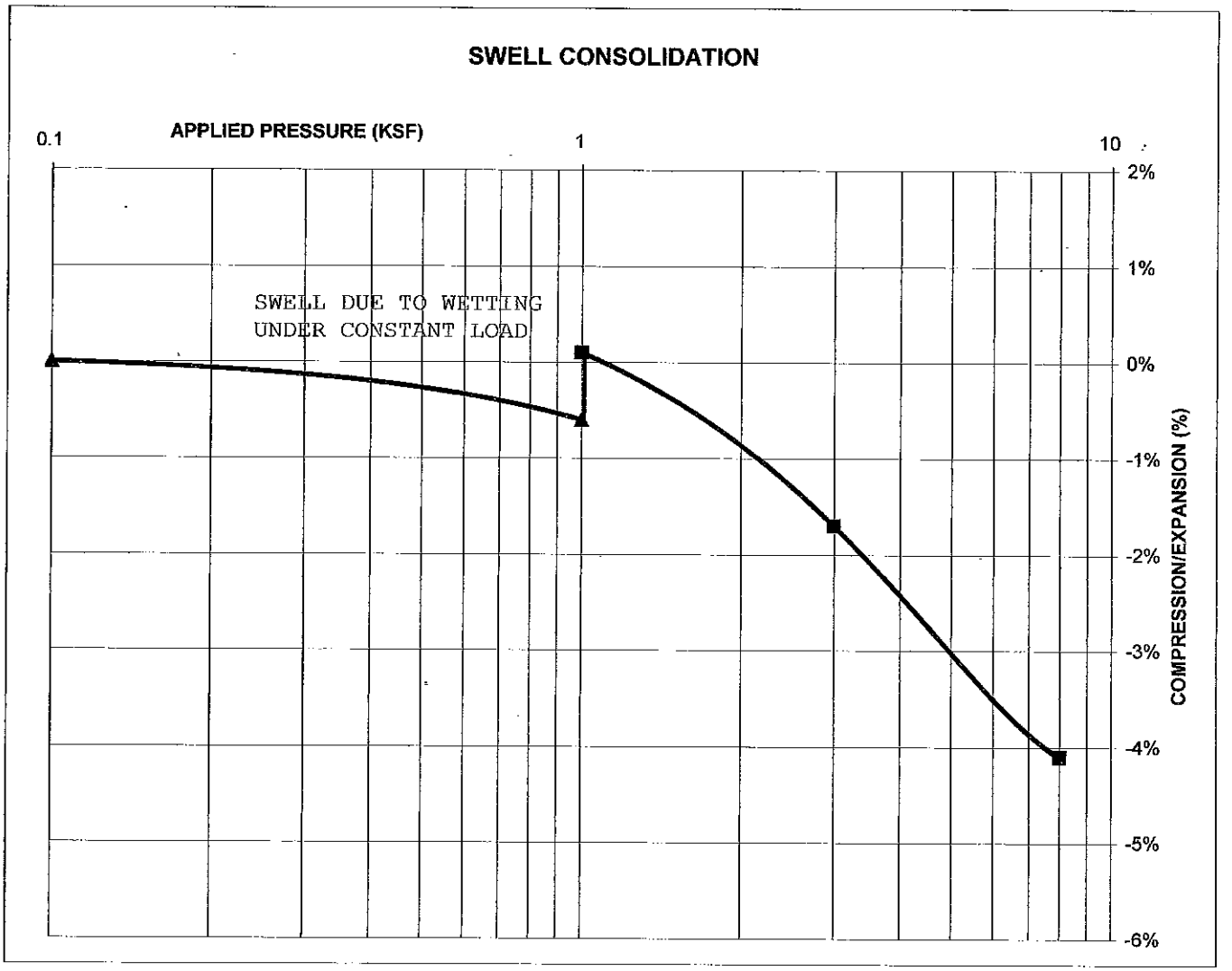
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-29

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-18	AT DEPTH	2-3'
DESCRIPTION	SM	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			110
NATURAL MOISTURE CONTENT			5.2%
SWELL/CONSOLIDATION (%)			0.7%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

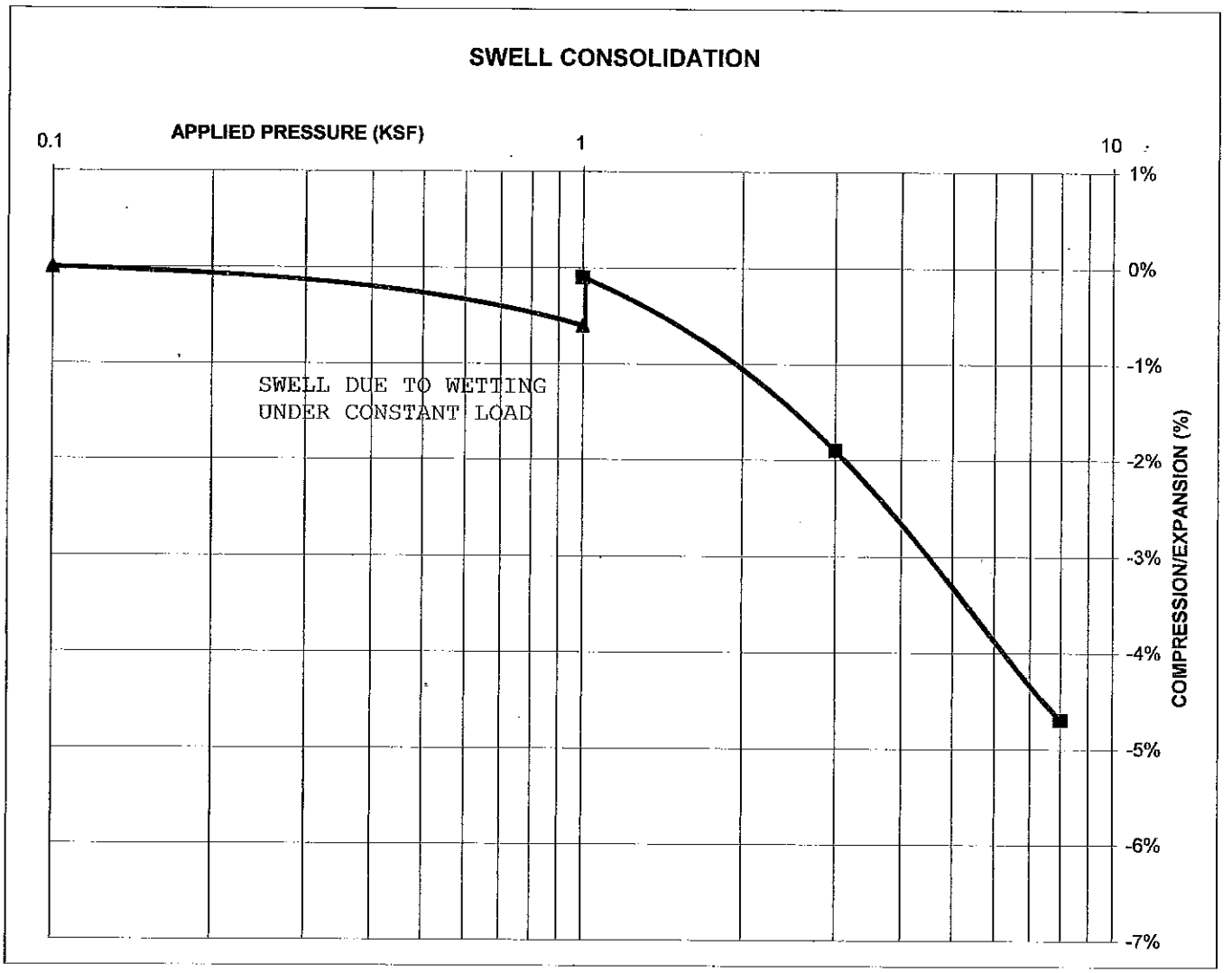
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-30

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-19	AT DEPTH	5'
DESCRIPTION	SM	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			105
NATURAL MOISTURE CONTENT			8.1%
SWELL/CONSOLIDATION (%)			0.5%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

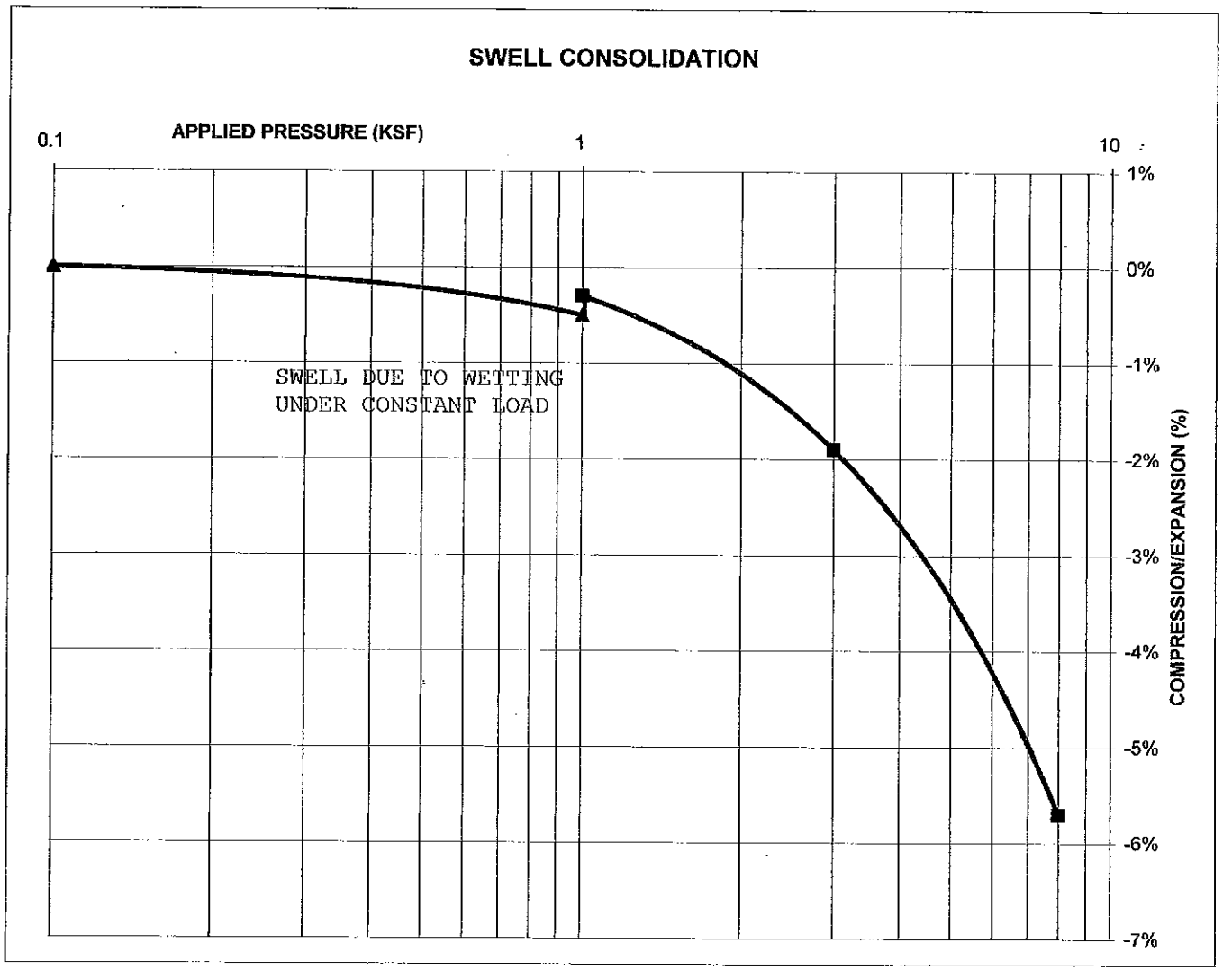
DRAWN:	DATE:	CHECKED:	DATE:
		BAH	2/13/04

JOB NO.: 98104
FIG NO.: C-31

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-31 AT DEPTH	5'
DESCRIPTION	SC-CL SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)		104
NATURAL MOISTURE CONTENT		7.1%
SWELL/CONSOLIDATION (%)		0.2%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

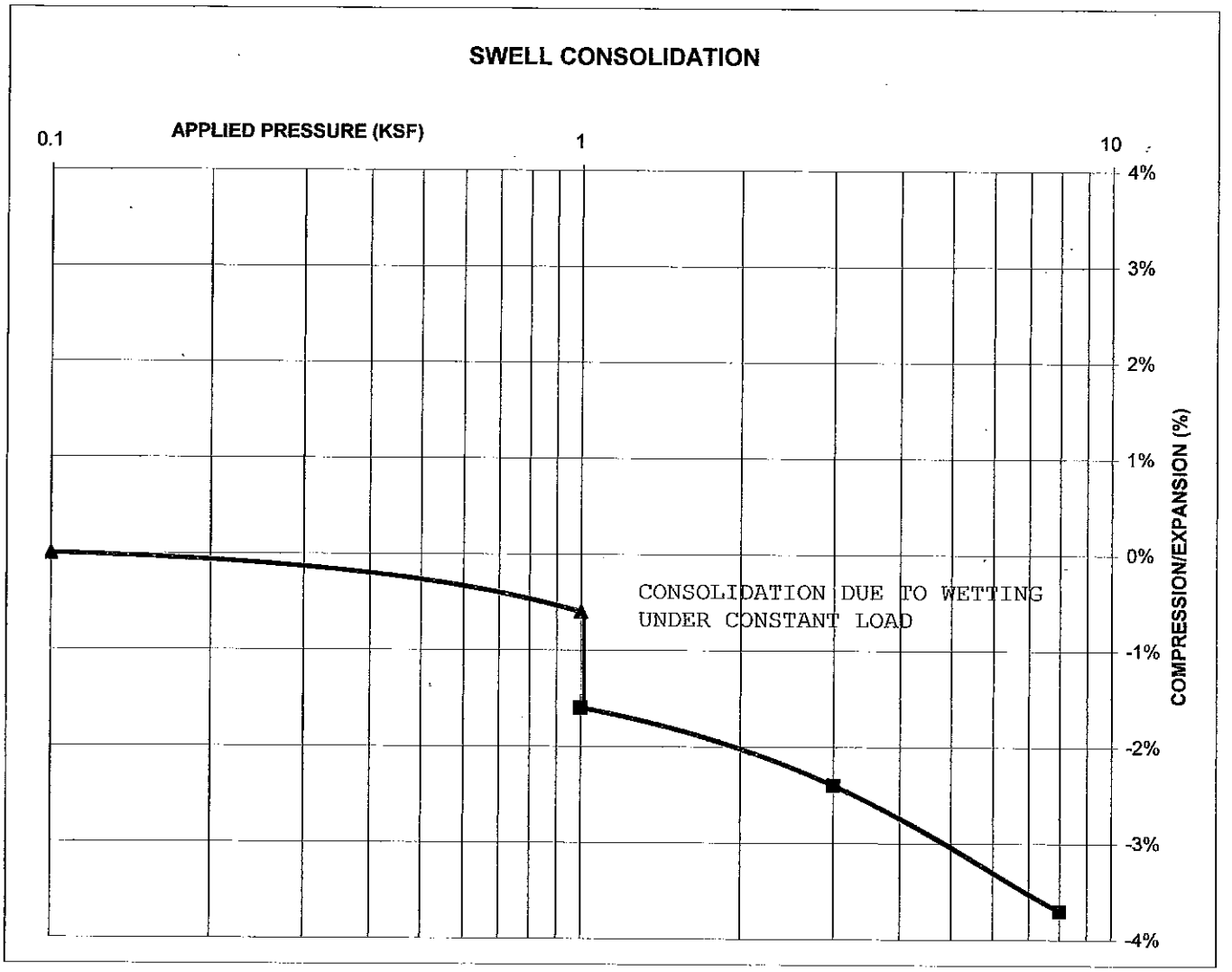
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-32

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-51	AT DEPTH	5'
DESCRIPTION	SM	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			106
NATURAL MOISTURE CONTENT			9.0%
SWELL/CONSOLIDATION (%)			-1.0%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

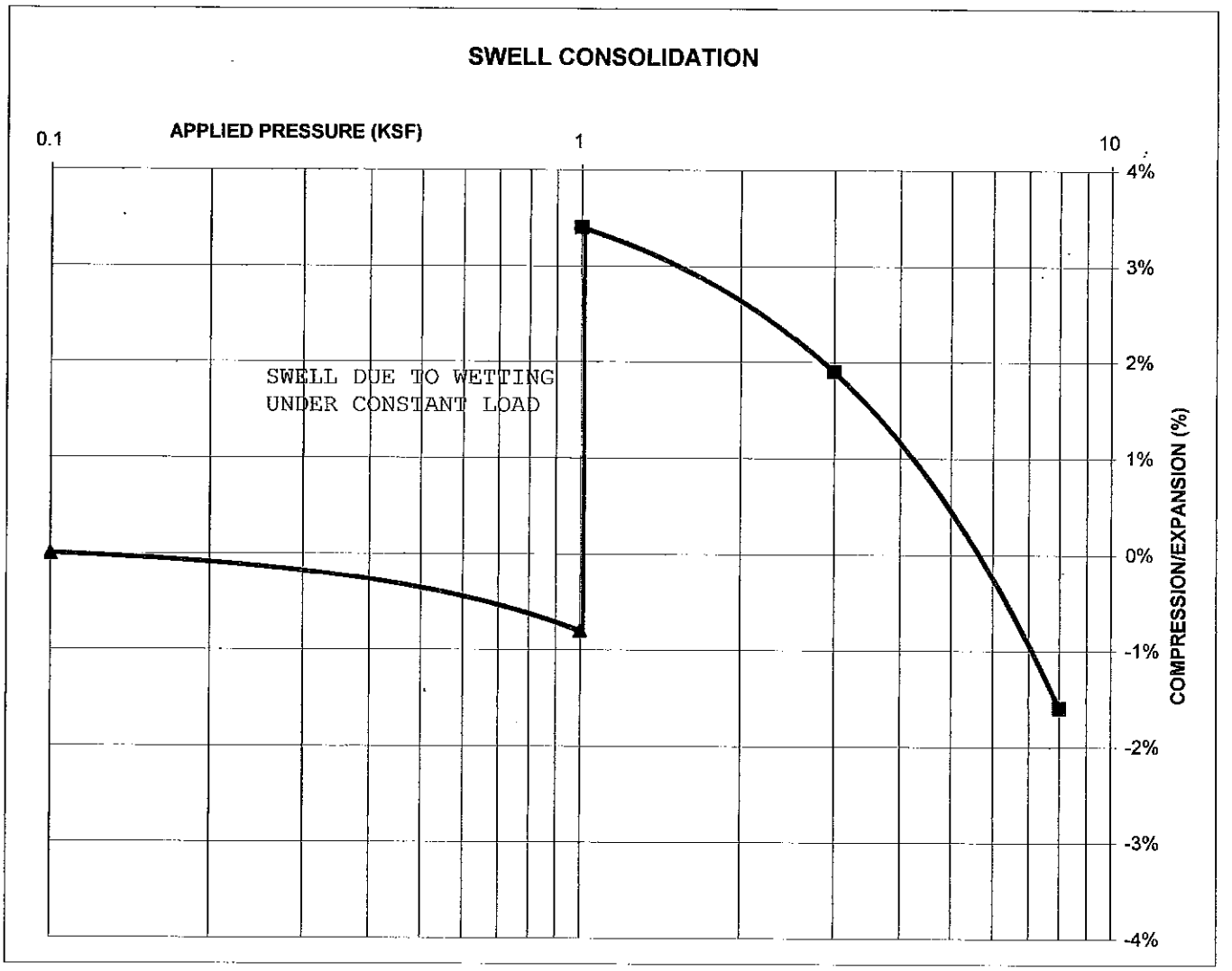
DRAWN:	DATE:	CHECKED:	DATE:
		KAA	2/23/04

JOB NO.: 98104
FIG NO.: C-33

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-1	AT DEPTH	5'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			109
NATURAL MOISTURE CONTENT			11.5%
SWELL/CONSOLIDATION (%)			4.2%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

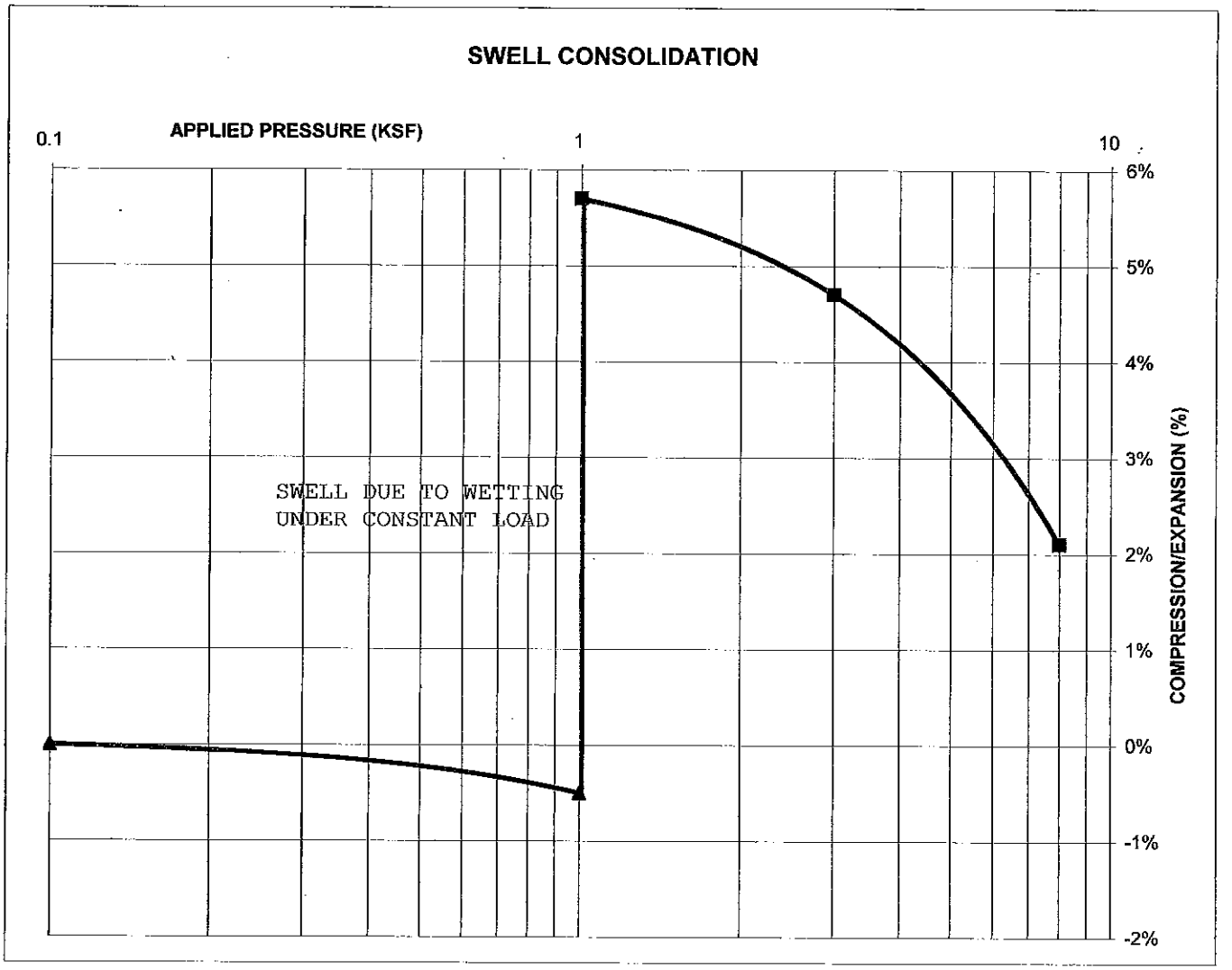
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-34

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-2	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			119
NATURAL MOISTURE CONTENT			11.4%
SWELL/CONSOLIDATION (%)			6.2%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

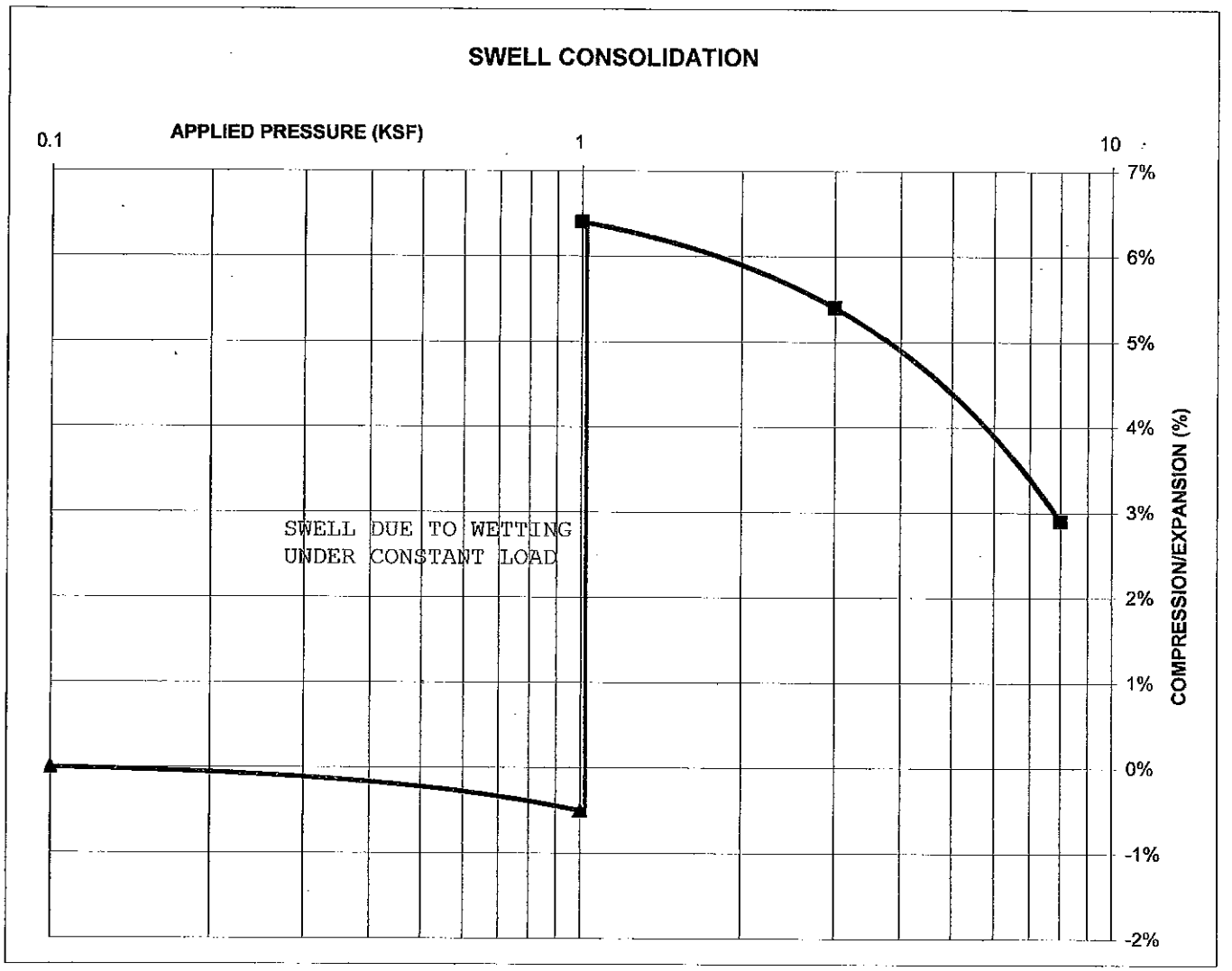
DRAWN:	DATE:	CHECKED:	DATE:
		KH	2/13/04

JOB NO.: 98104
FIG NO.: C-35

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-4	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			126
NATURAL MOISTURE CONTENT			10.5%
SWELL/CONSOLIDATION (%)			6.9%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

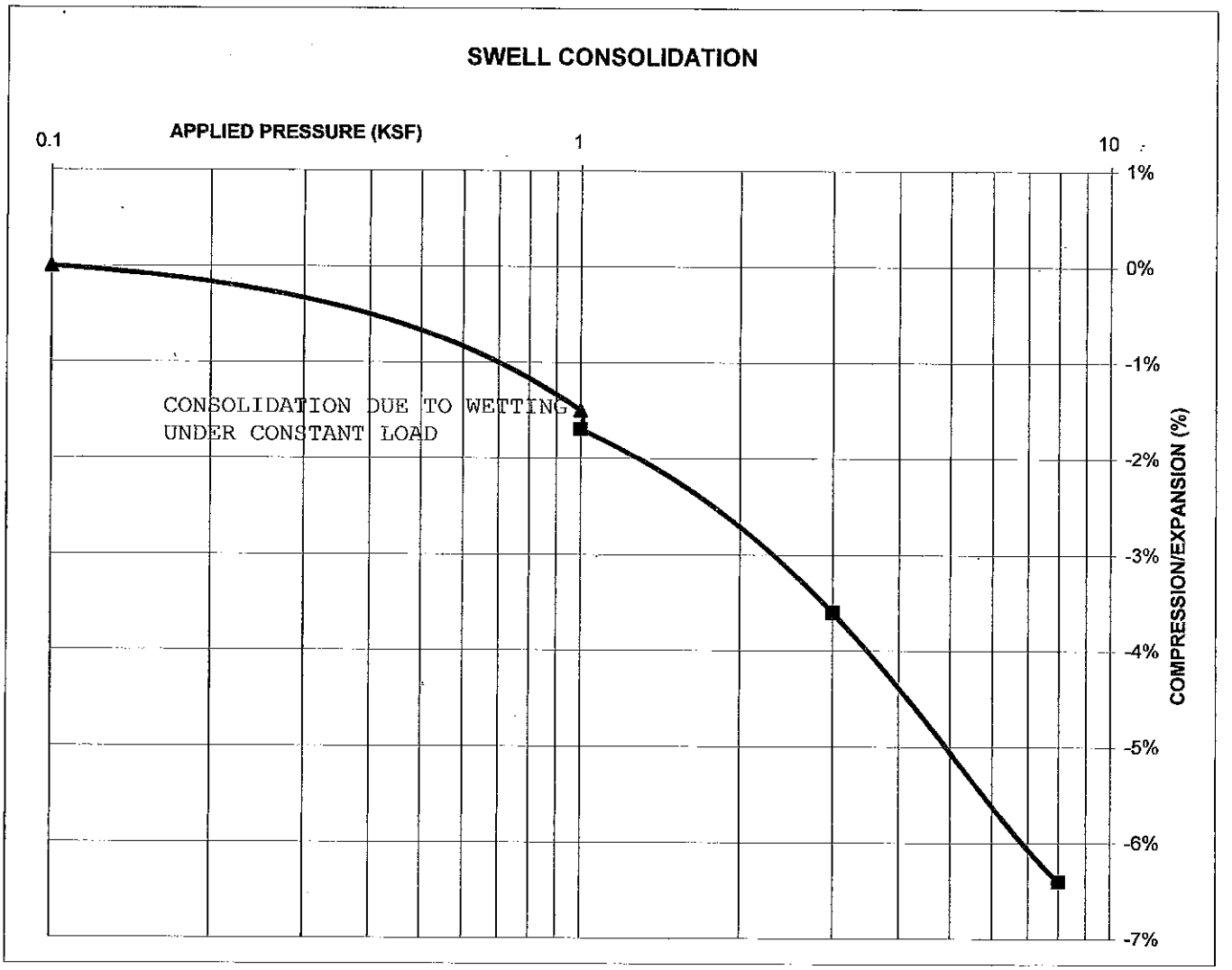
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-36

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-5	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			103
NATURAL MOISTURE CONTENT			21.3%
SWELL/CONSOLIDATION (%)			-0.2%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

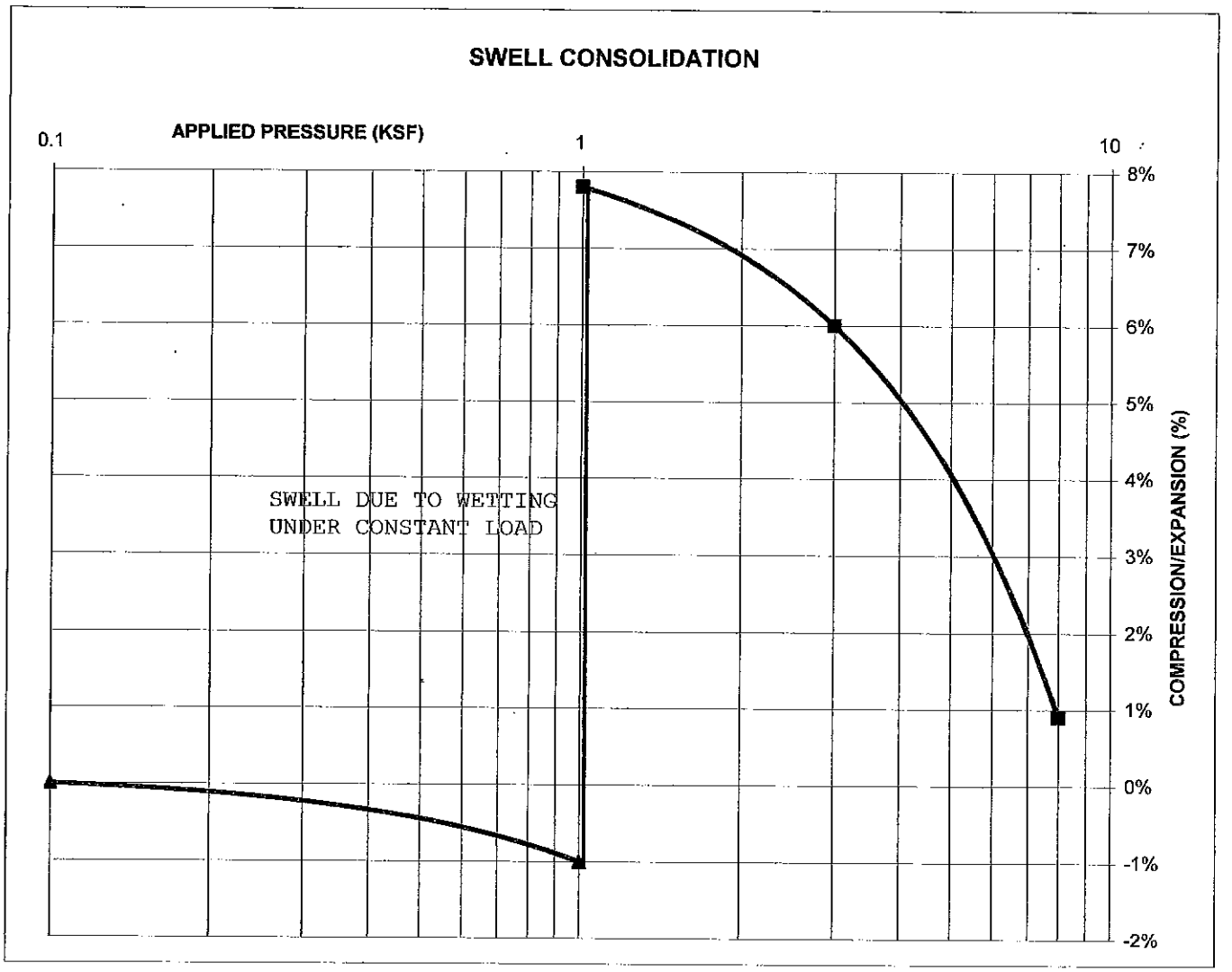
DRAWN:	DATE:	CHECKED:	DATE:
		BAH	2/13/04

JOB NO.: 98104
FIG NO.: C-37

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-6	AT DEPTH	2-3'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			106
NATURAL MOISTURE CONTENT			21.5%
SWELL/CONSOLIDATION (%)			8.8%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

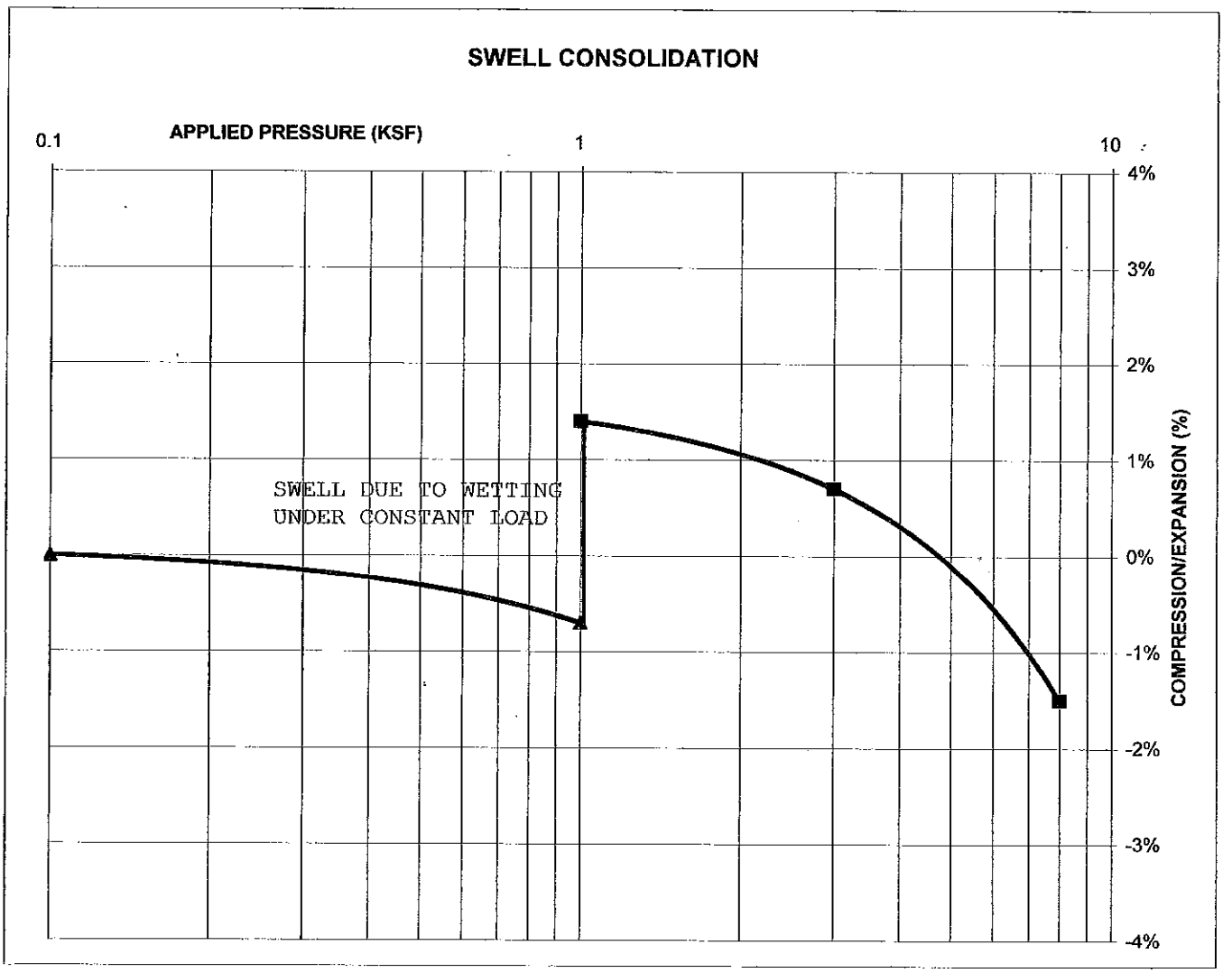
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-38

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-9	AT DEPTH	5'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			113
NATURAL MOISTURE CONTENT			15.1%
SWELL/CONSOLIDATION (%)			2.1%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

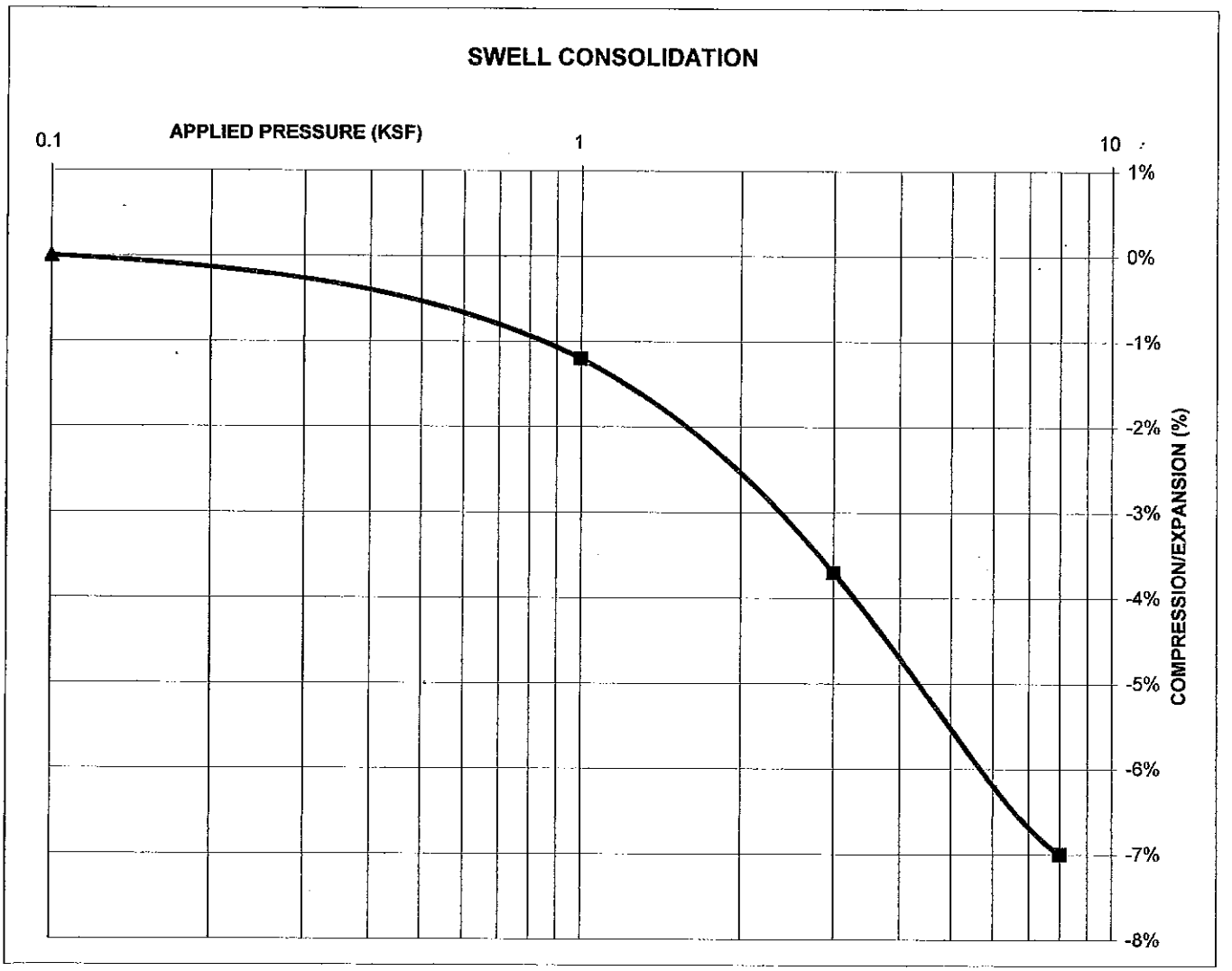
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-39

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-13	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			104
NATURAL MOISTURE CONTENT			18.1%
SWELL/CONSOLIDATION (%)			0.0%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

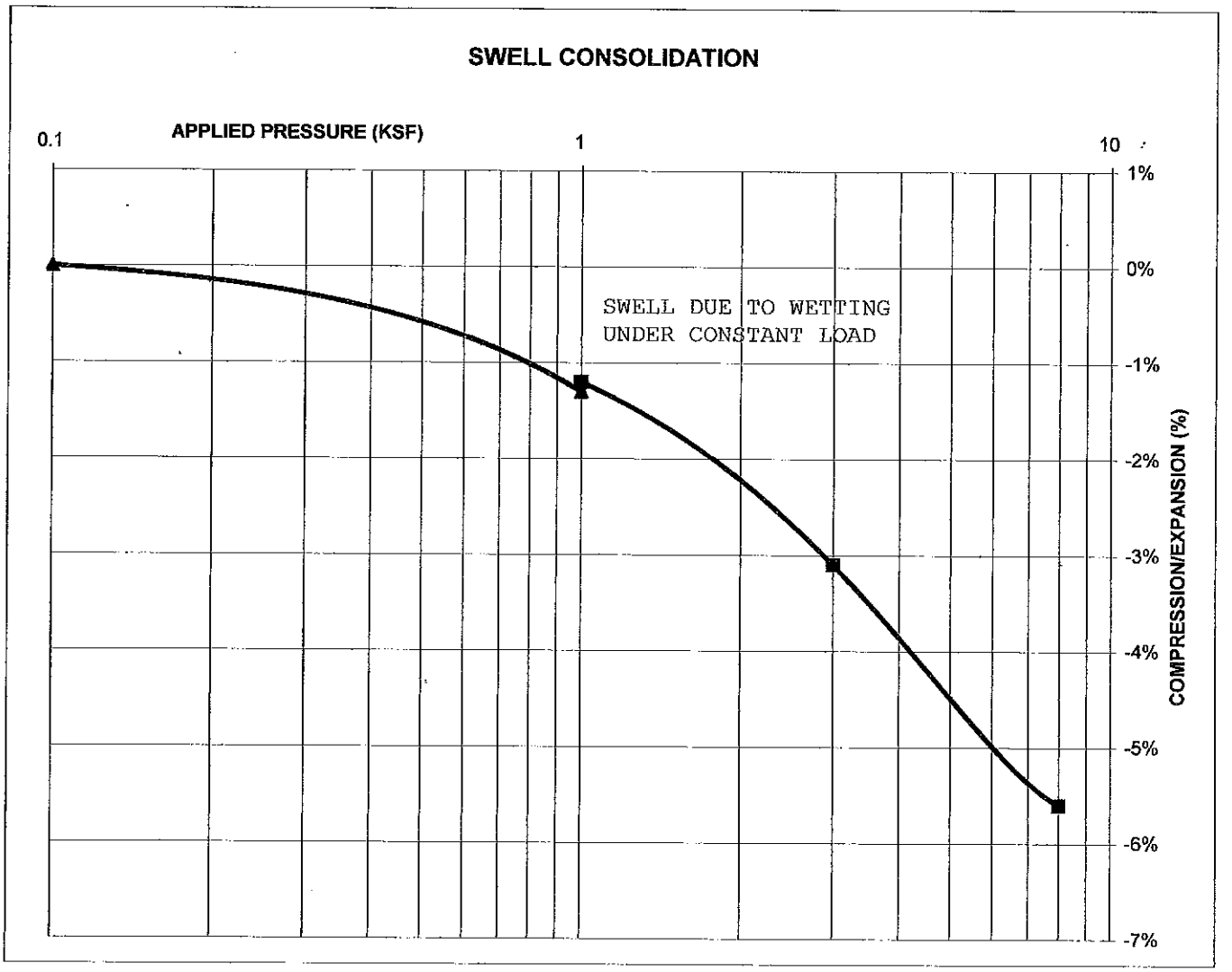
DRAWN:	DATE:	CHECKED:	DATE:
		LAH	2/13/04

JOB NO.: 98104
FIG NO.: C-40

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-14 AT DEPTH	10'
DESCRIPTION	CL-ML SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)		101
NATURAL MOISTURE CONTENT		21.1%
SWELL/CONSOLIDATION (%)		0.1%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

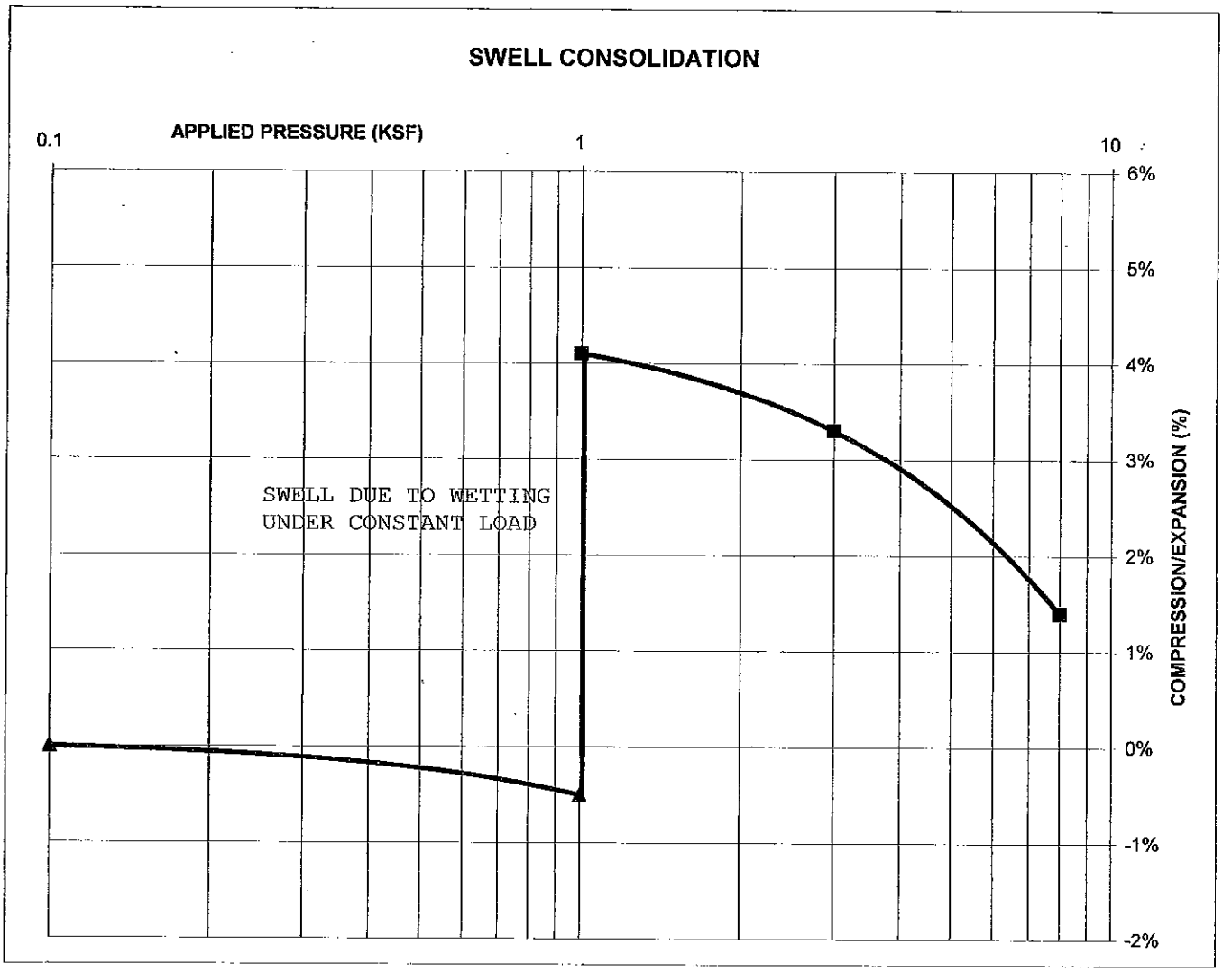
DRAWN:	DATE:	CHECKED:	DATE:
		BAH	2/13/04

JOB NO.: 98104
FIG NO.: C-41

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-15	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			120
NATURAL MOISTURE CONTENT			13.0%
SWELL/CONSOLIDATION (%)			4.6%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

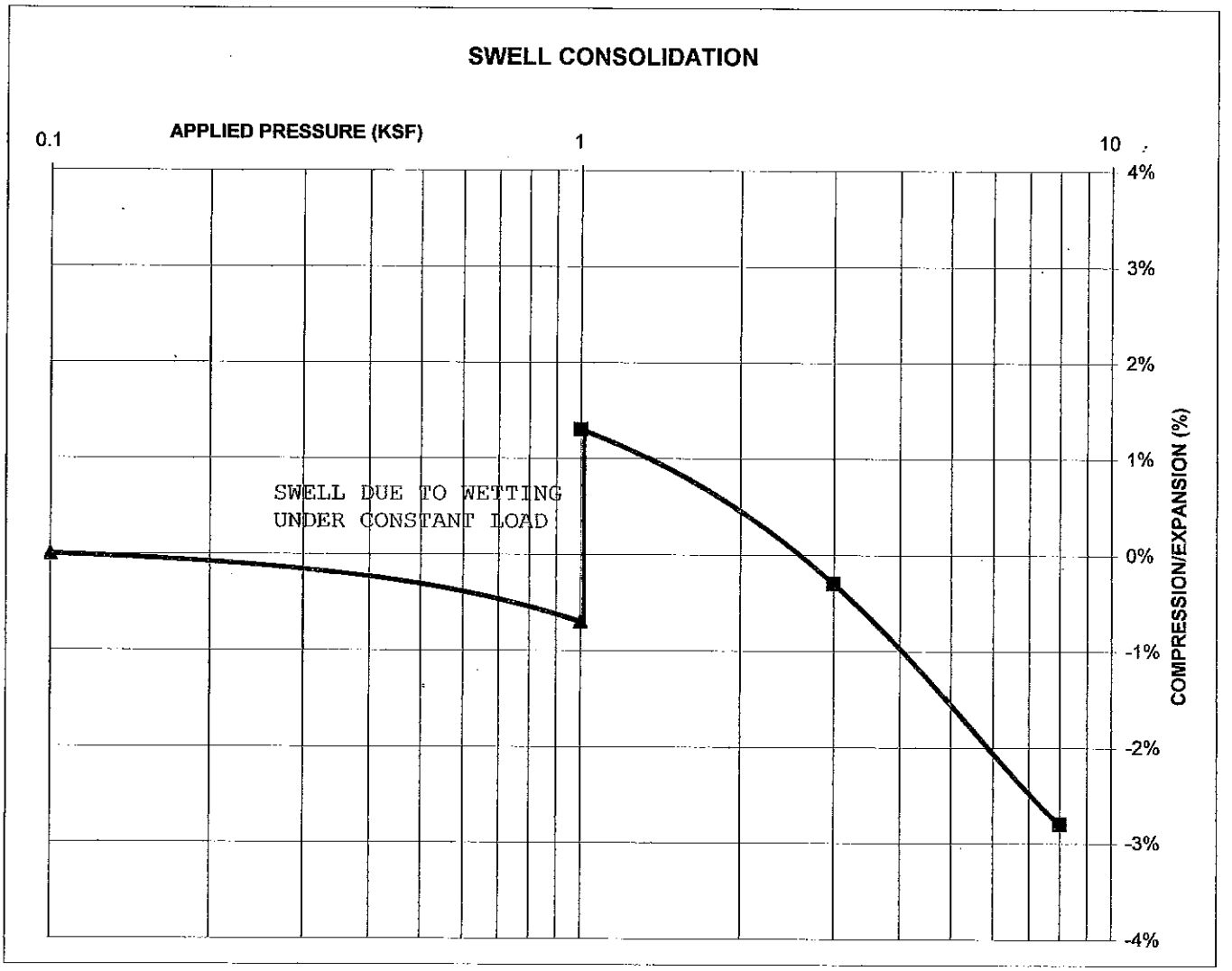
DRAWN:	DATE:	CHECKED:	DATE:
		LAH	2/13/04

JOB NO.: 98104
FIG NO.: C-42

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-21 AT DEPTH	2-3'
DESCRIPTION	CL-ML SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)		102
NATURAL MOISTURE CONTENT		11.7%
SWELL/CONSOLIDATION (%)		2.0%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

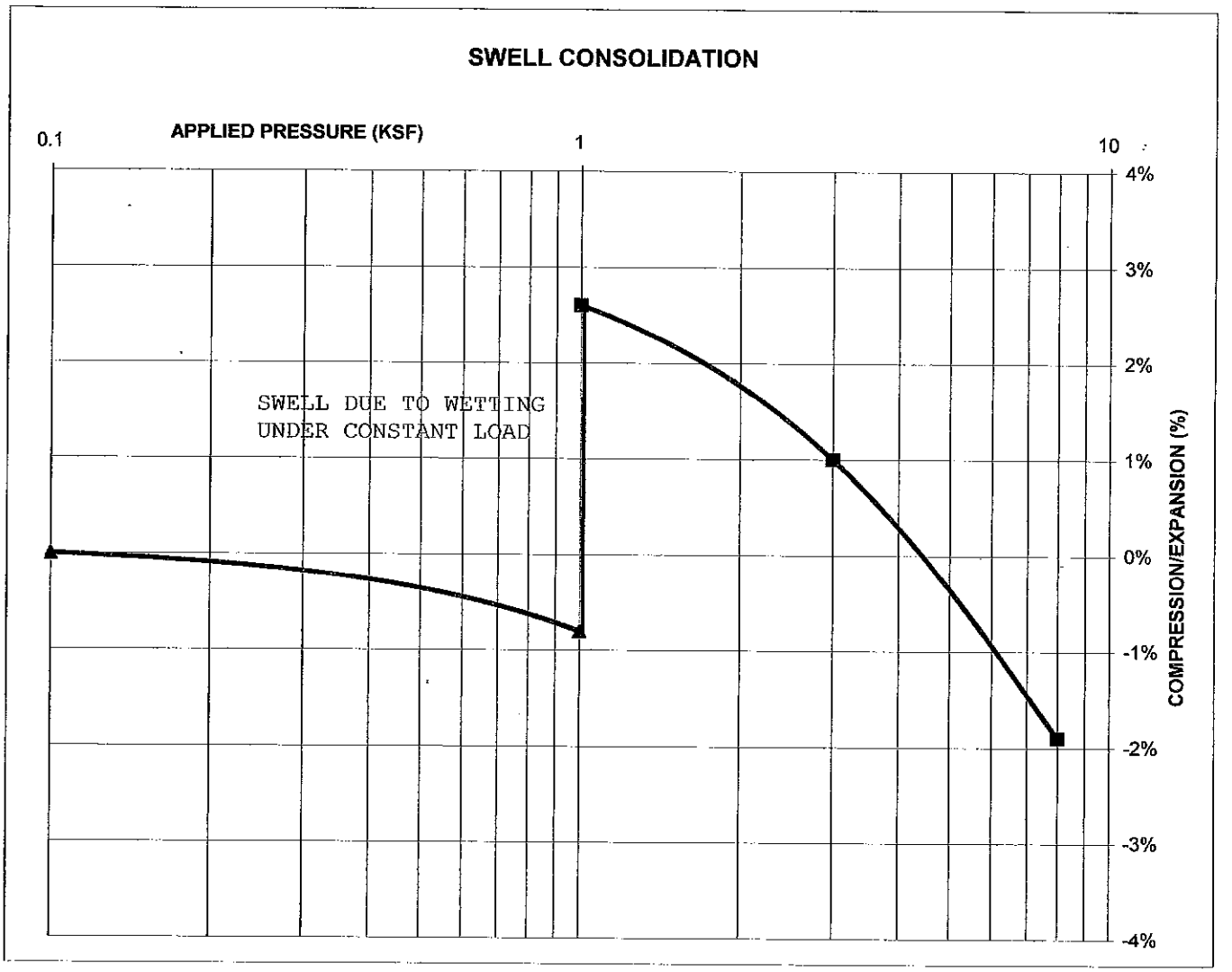
DRAWN:	DATE:	CHECKED:	DATE:
		KLH	2/13/04

JOB NO.: 98104
FIG NO.: C-43

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-22	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			114
NATURAL MOISTURE CONTENT			12.4%
SWELL/CONSOLIDATION (%)			3.4%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

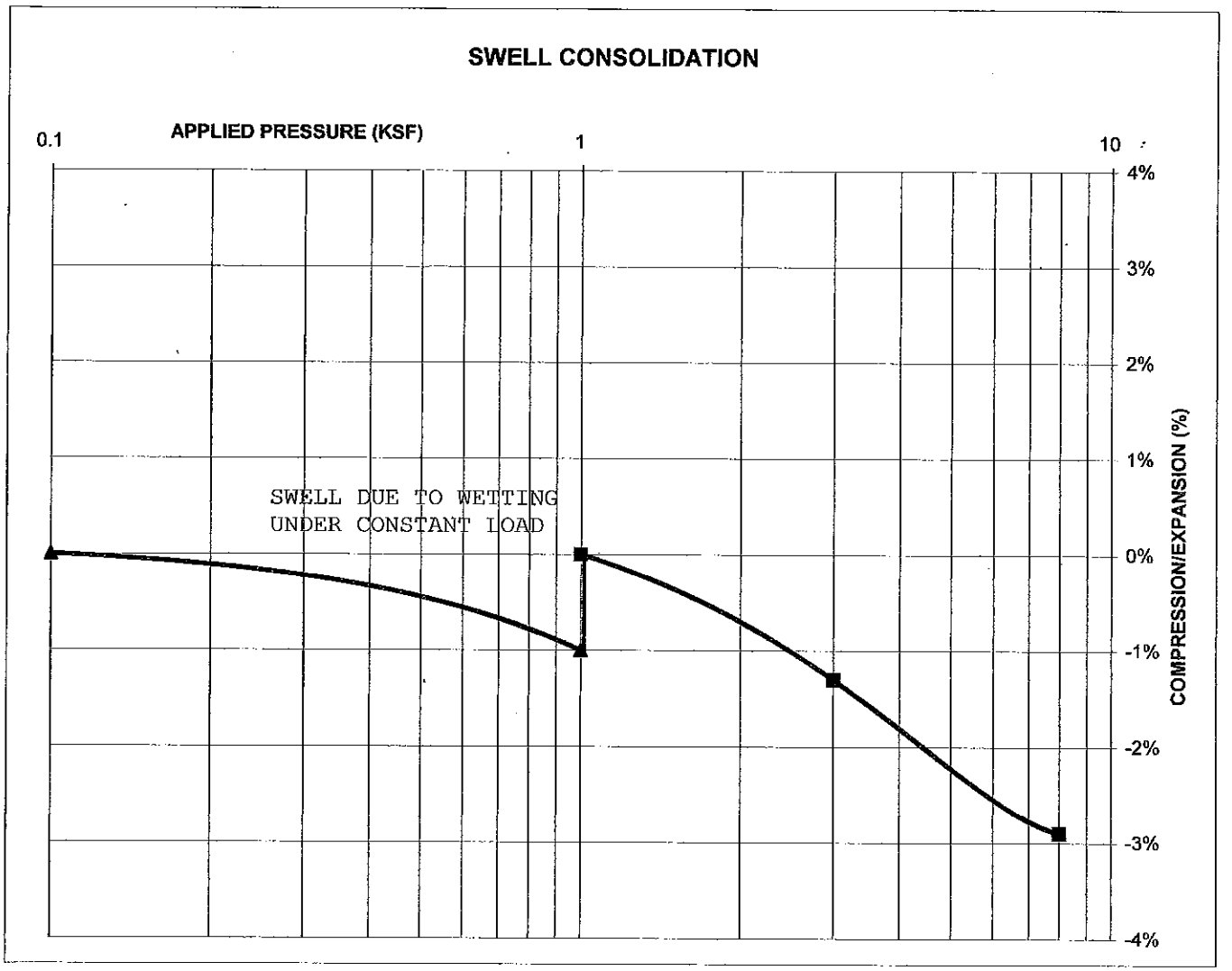
DRAWN:	DATE:	CHECKED:	DATE:
		MAH	2/13/04

JOB NO.: 98104
FIG NO.: C-44

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-23	AT DEPTH	5'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			110
NATURAL MOISTURE CONTENT			8.6%
SWELL/CONSOLIDATION (%)			1.0%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

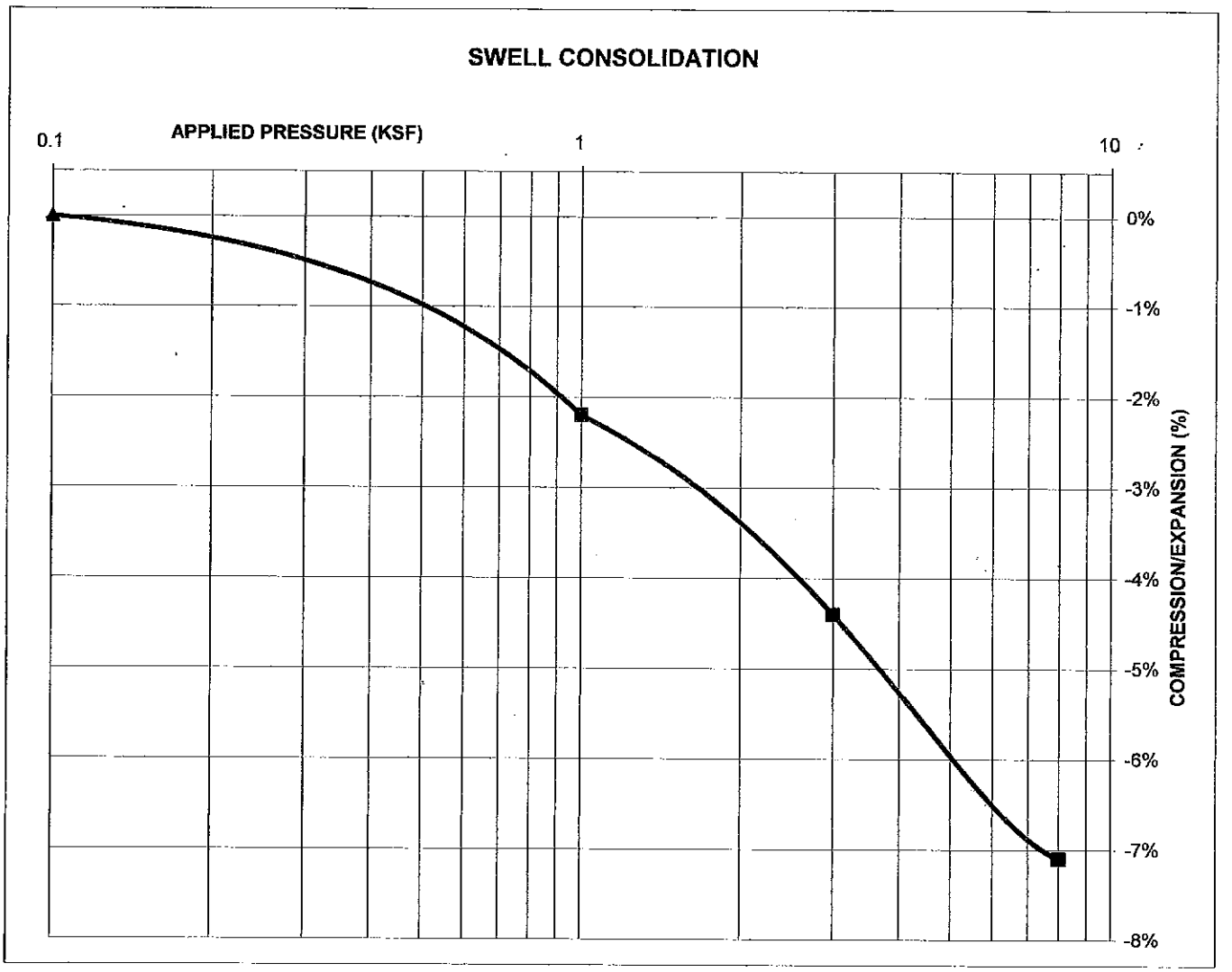
DRAWN:	DATE:	CHECKED:	DATE:
		LGH	2/13/04

JOB NO.: 98104
FIG NO.: C-45

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-24	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			101
NATURAL MOISTURE CONTENT			20.3%
SWELL/CONSOLIDATION (%)			0.0%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

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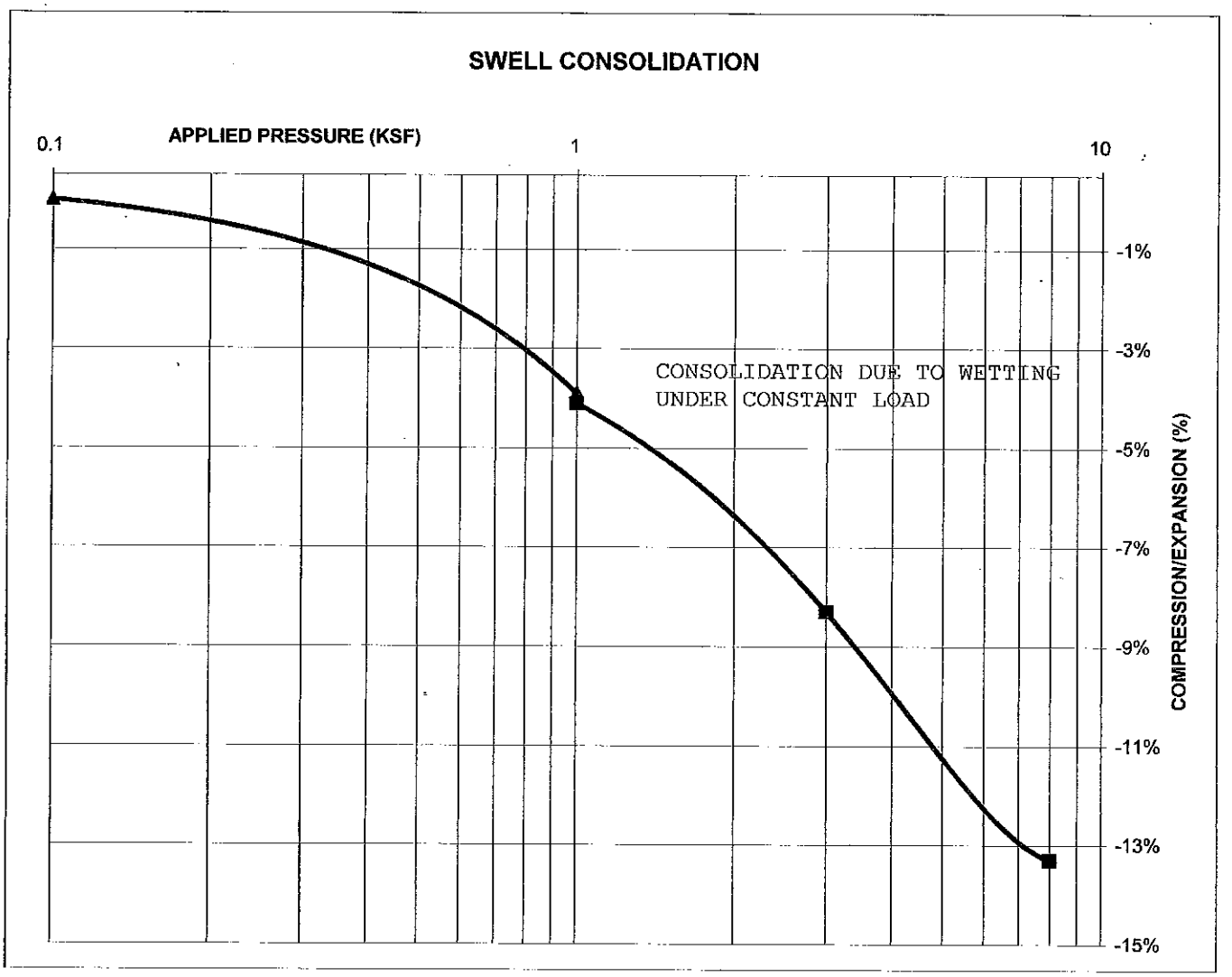
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-46

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-24	AT DEPTH	20'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			95
NATURAL MOISTURE CONTENT			28.9%
SWELL/CONSOLIDATION (%)			-0.2%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

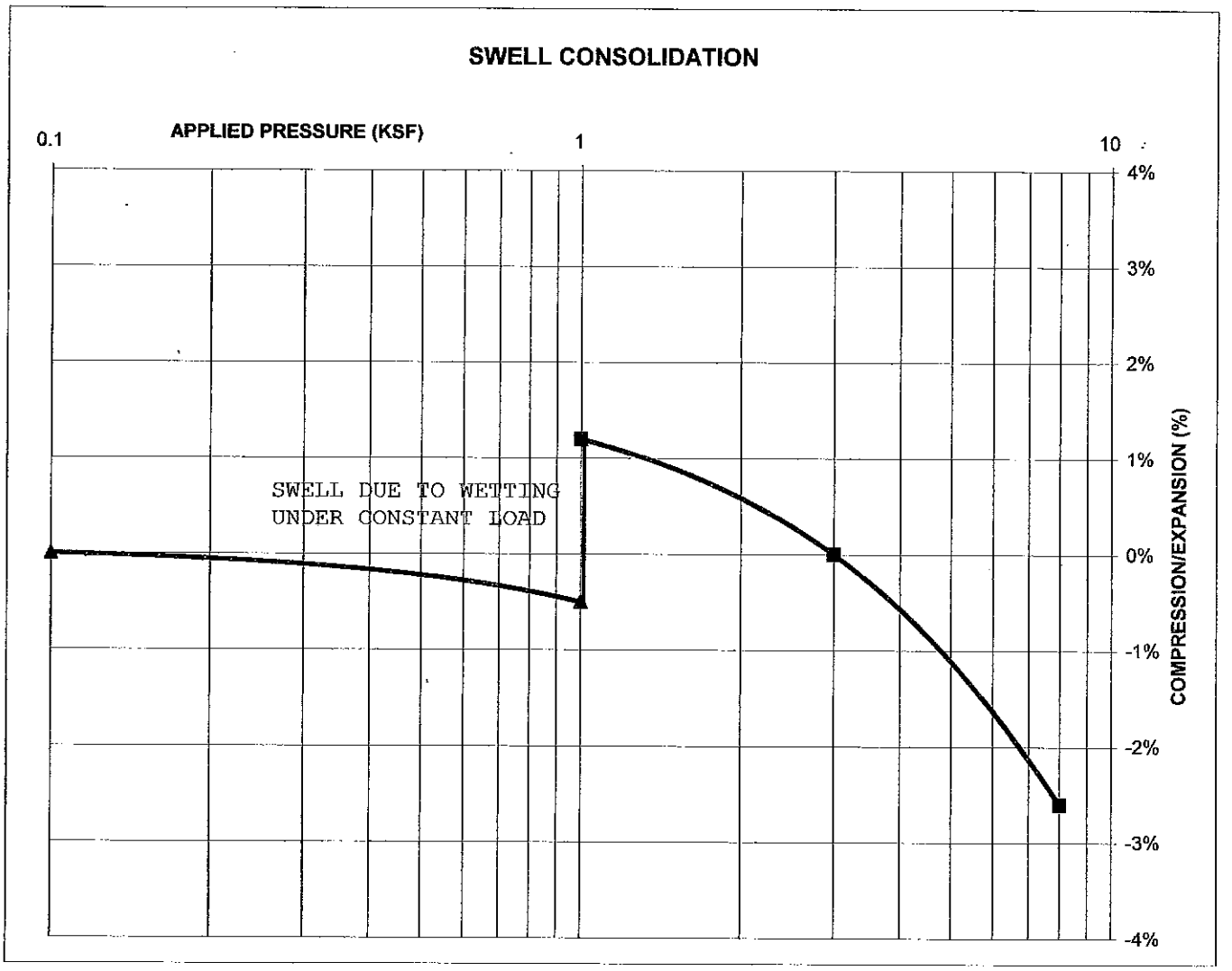
DRAWN:	DATE:	CHECKED:	DATE:
		KAA	2/23/04

JOB NO.: 98104
FIG NO.: C-47

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-25	AT DEPTH	5'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			107
NATURAL MOISTURE CONTENT			11.5%
SWELL/CONSOLIDATION (%)			1.7%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

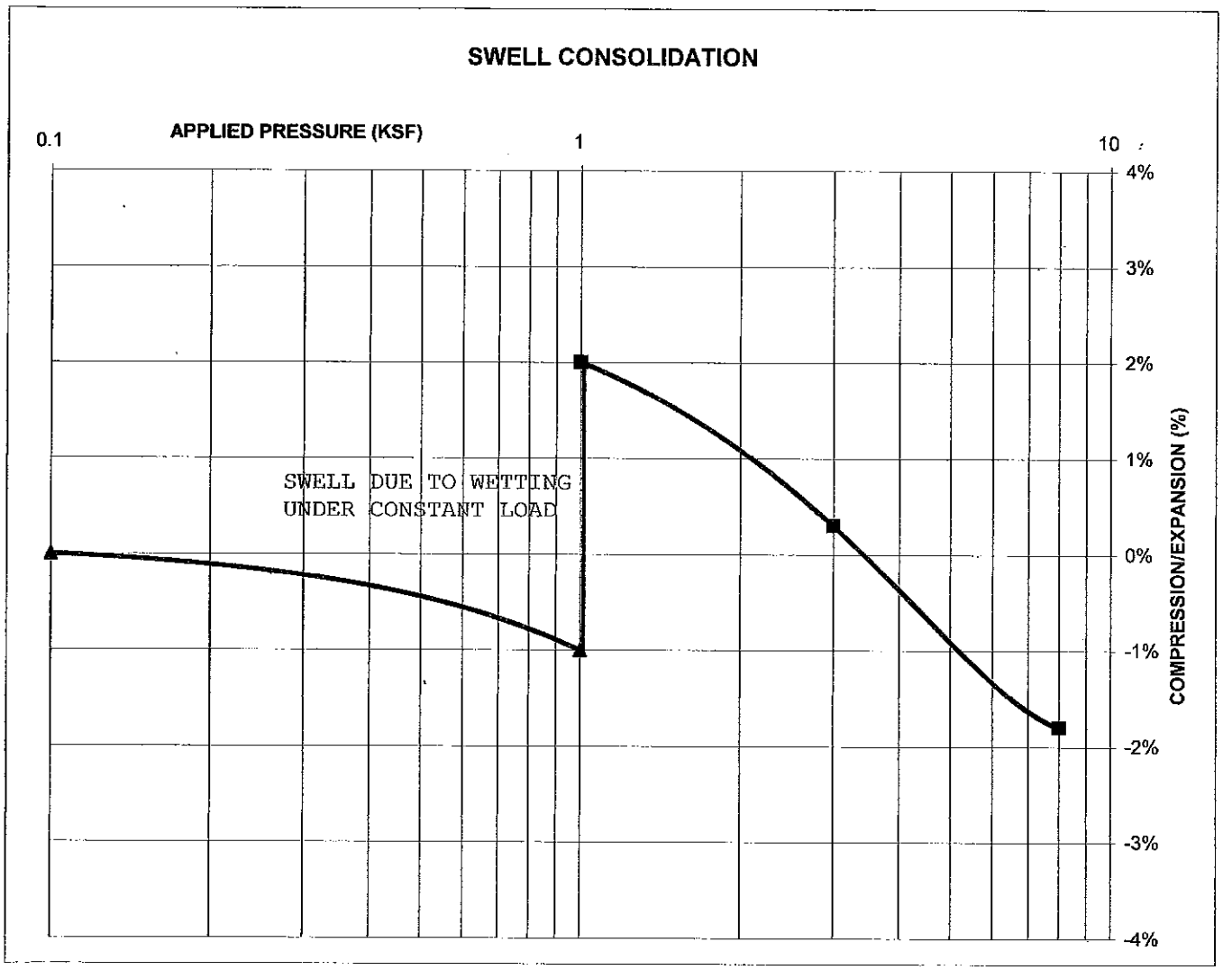
DRAWN:	DATE:	CHECKED:	DATE:
		KHH	2/13/04

JOB NO.: 98104
FIG NO.: C-48

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-26	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			105
NATURAL MOISTURE CONTENT			12.8%
SWELL/CONSOLIDATION (%)			3.0%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

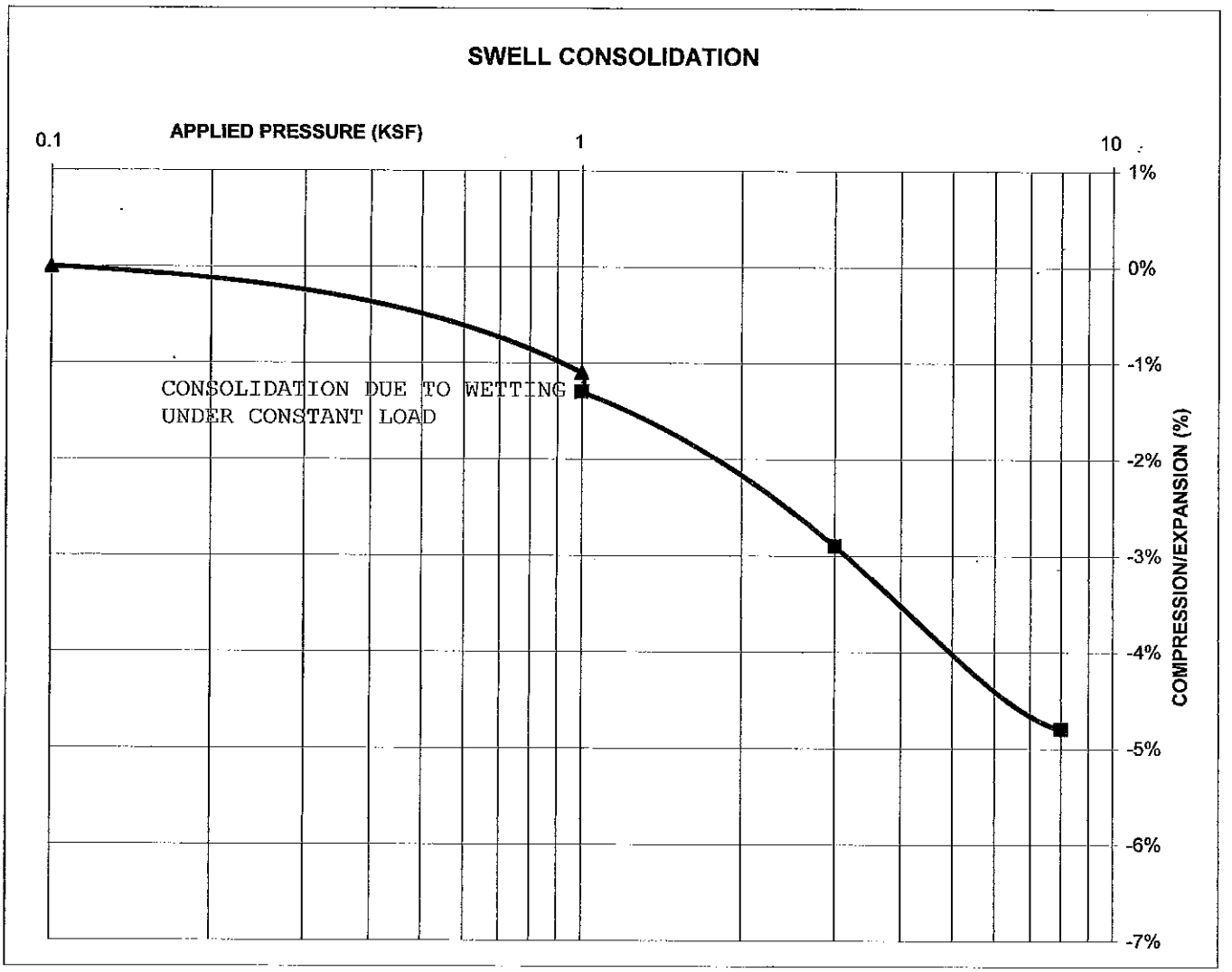
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-49

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-27 AT DEPTH	15'
DESCRIPTION	CL-ML SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)		100
NATURAL MOISTURE CONTENT		14.4%
SWELL/CONSOLIDATION (%)		-0.2%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

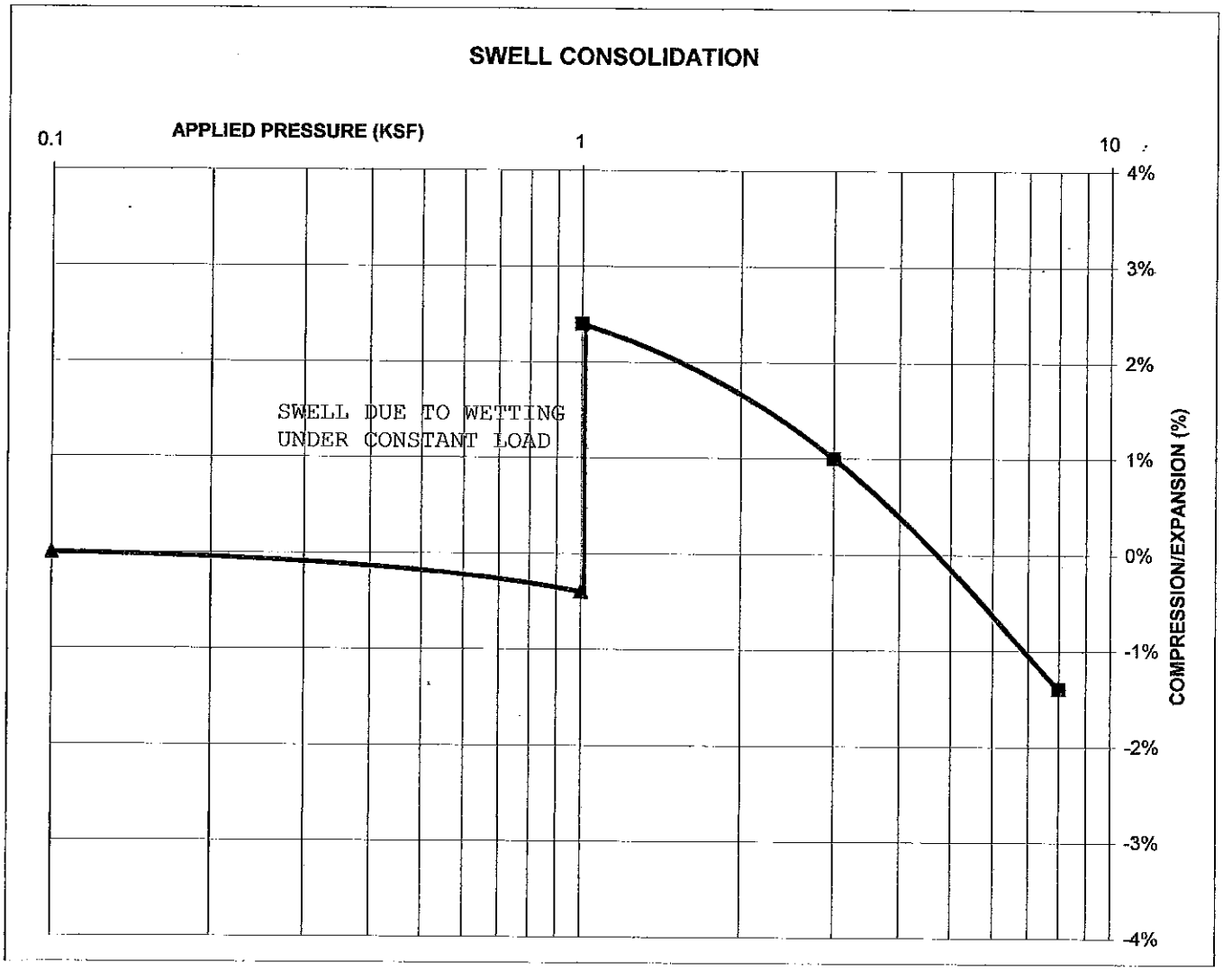
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-50

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-28 AT DEPTH	5'
DESCRIPTION	CL-ML SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)		115
NATURAL MOISTURE CONTENT		7.9%
SWELL/CONSOLIDATION (%)		2.8%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

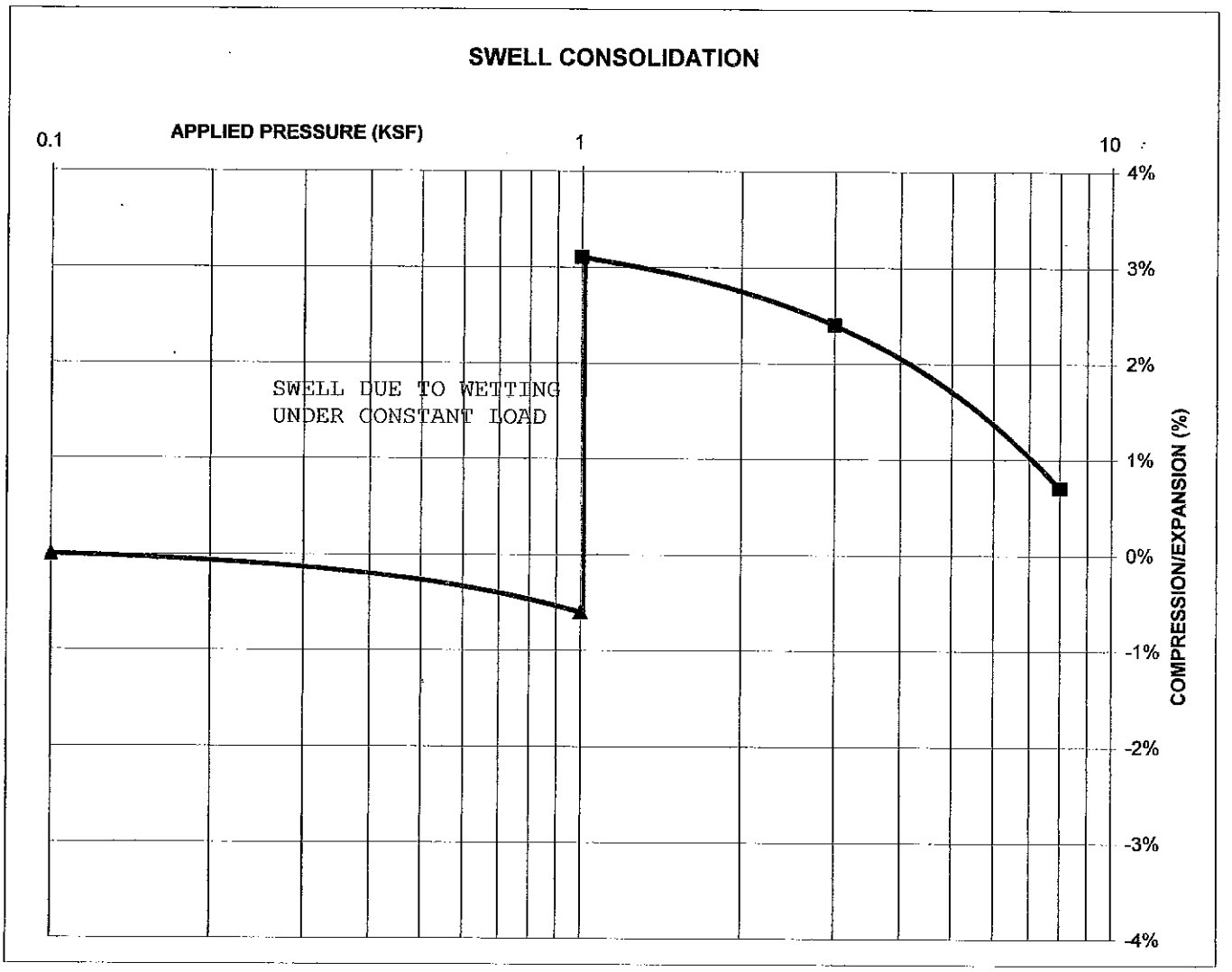
DRAWN:	DATE:	CHECKED:	DATE:
		NAH	2/13/04

JOB NO.: 98104
FIG NO.: C-51

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-32	AT DEPTH	2-3'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			99
NATURAL MOISTURE CONTENT			24.0%
SWELL/CONSOLIDATION (%)			3.7%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

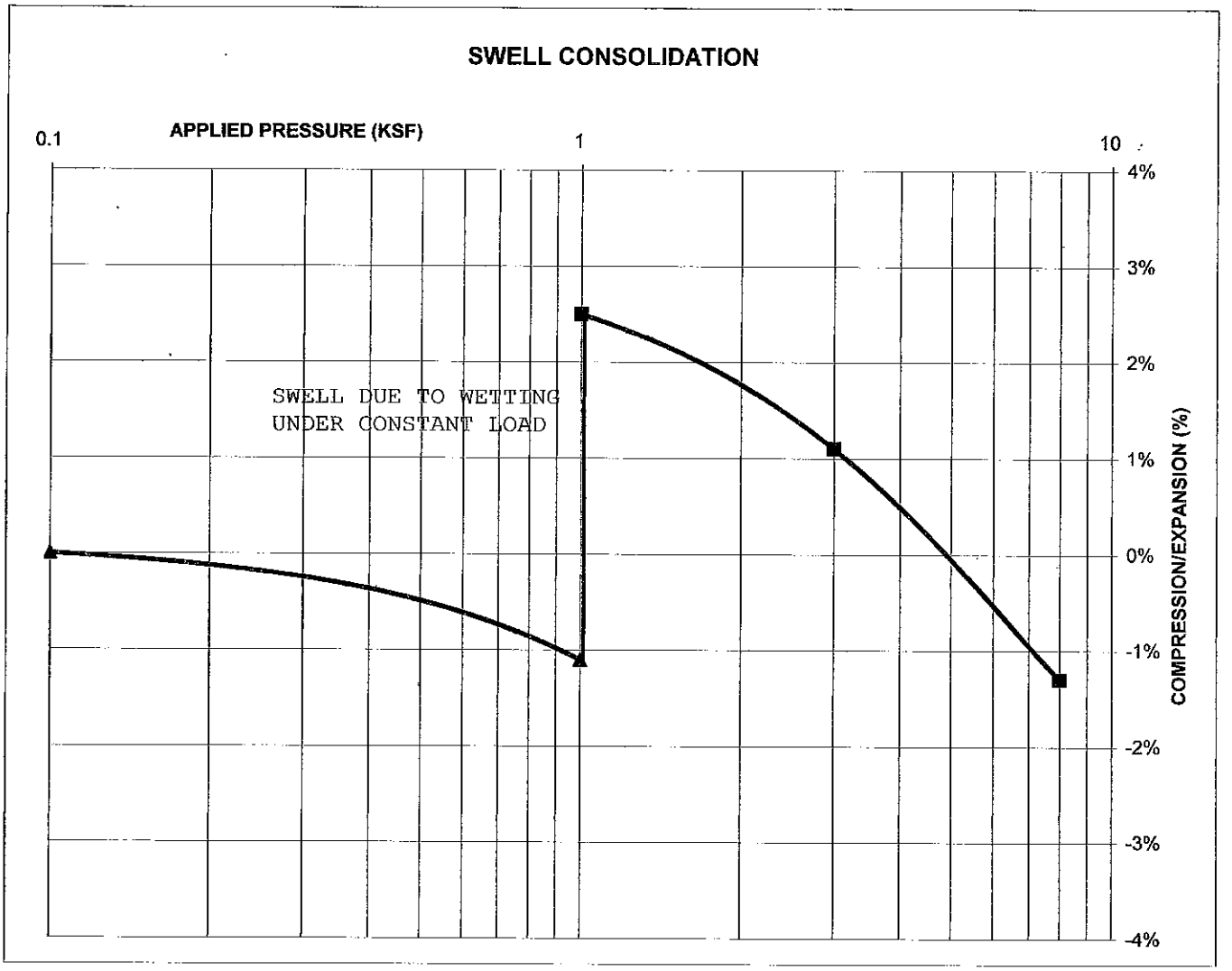
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-52

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-33	AT DEPTH	5'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			110
NATURAL MOISTURE CONTENT			14.0%
SWELL/CONSOLIDATION (%)			3.6%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

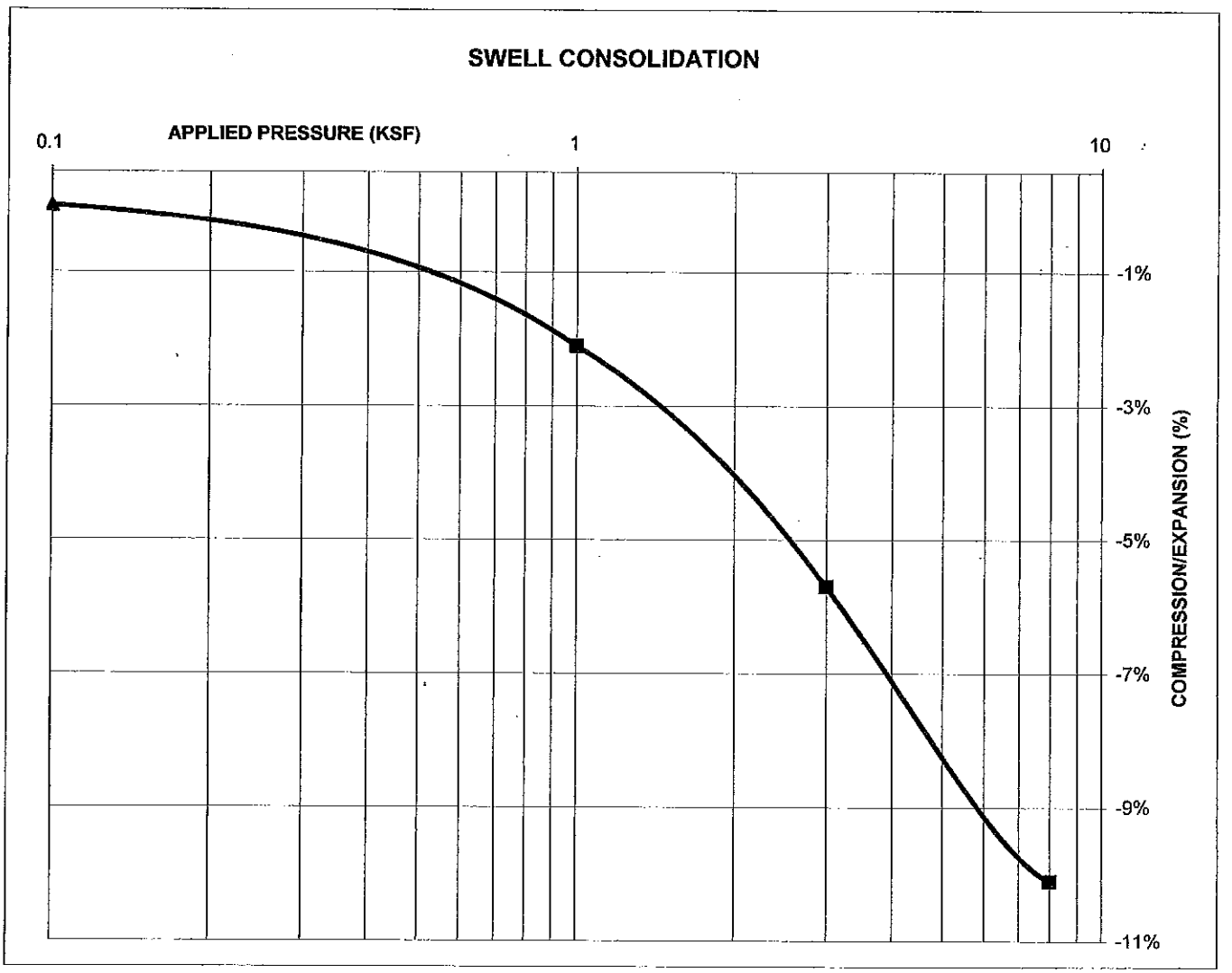
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-53

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-34	AT DEPTH	5'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			103
NATURAL MOISTURE CONTENT			21.3%
SWELL/CONSOLIDATION (%)			0.0%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

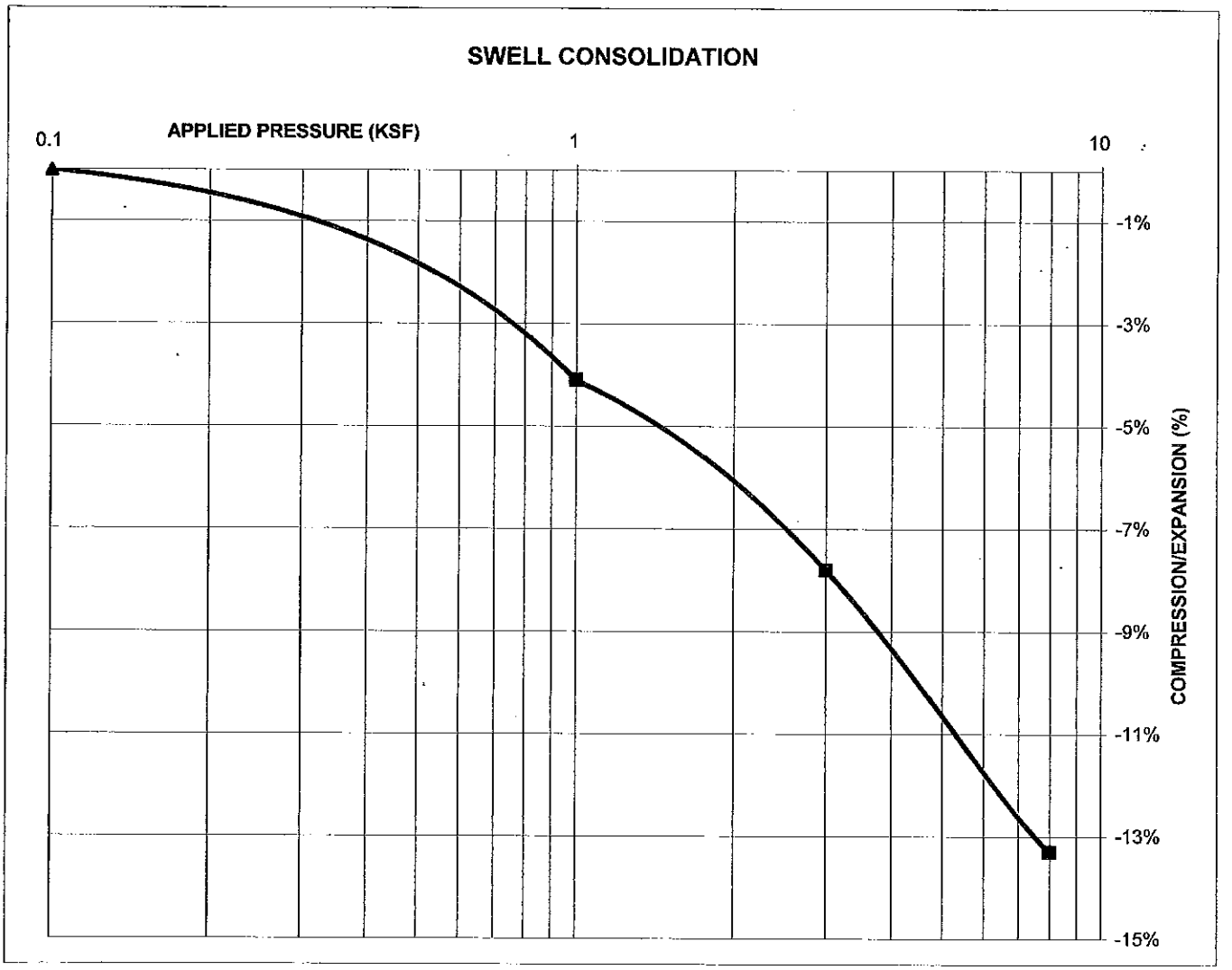
DRAWN:	DATE:	CHECKED:	DATE:
		GAH	2/13/04

JOB NO.: 98104
FIG NO.: C-54

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-35	AT DEPTH	5'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			96
NATURAL MOISTURE CONTENT			10.3%
SWELL/CONSOLIDATION (%)			0.0%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

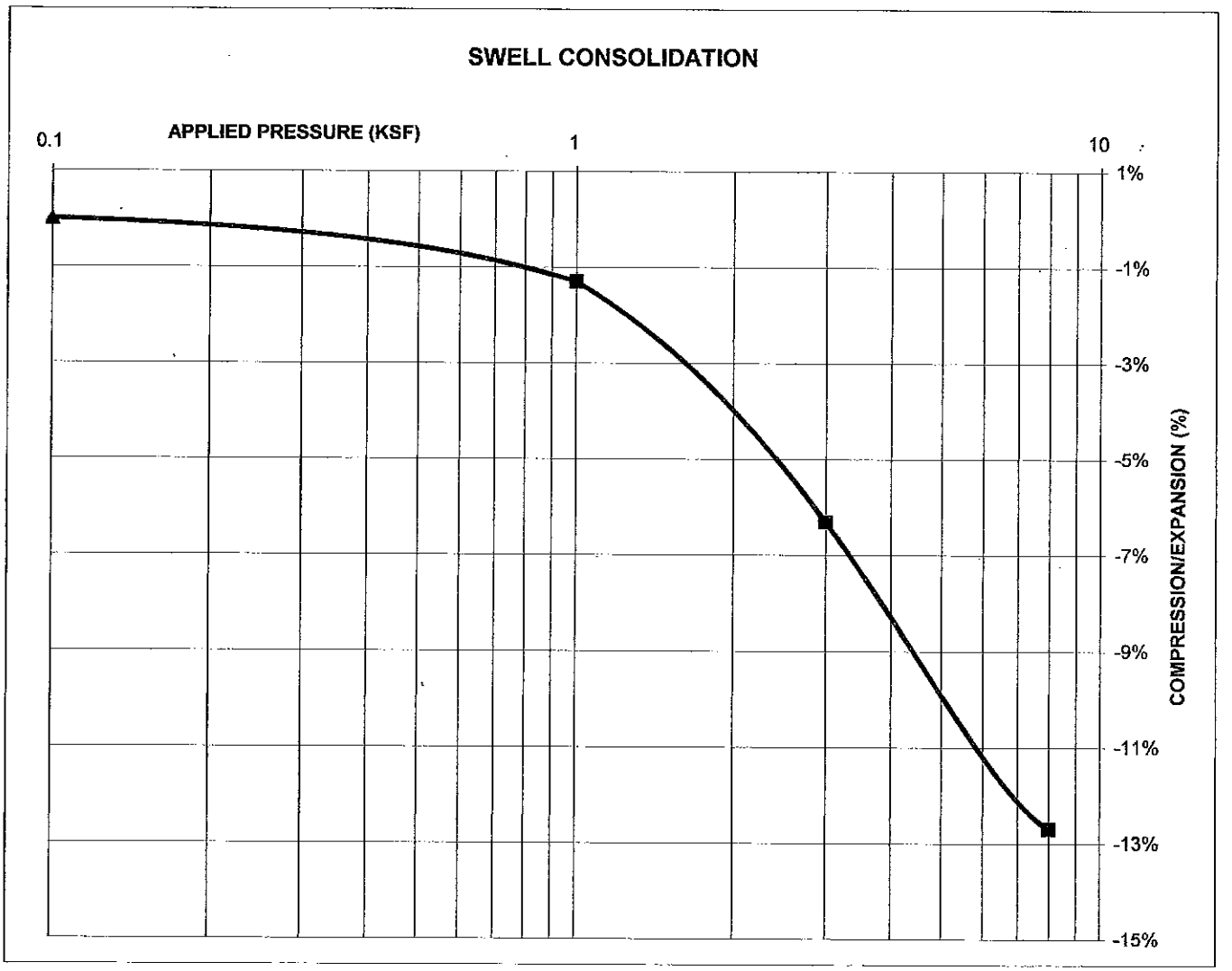
DRAWN:	DATE:	CHECKED:	DATE:
		DH	2/13/04

JOB NO.: 98104
FIG NO.: C-55

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-35	AT DEPTH	9-10'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			96
NATURAL MOISTURE CONTENT			31.1%
SWELL/CONSOLIDATION (%)			0.0%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

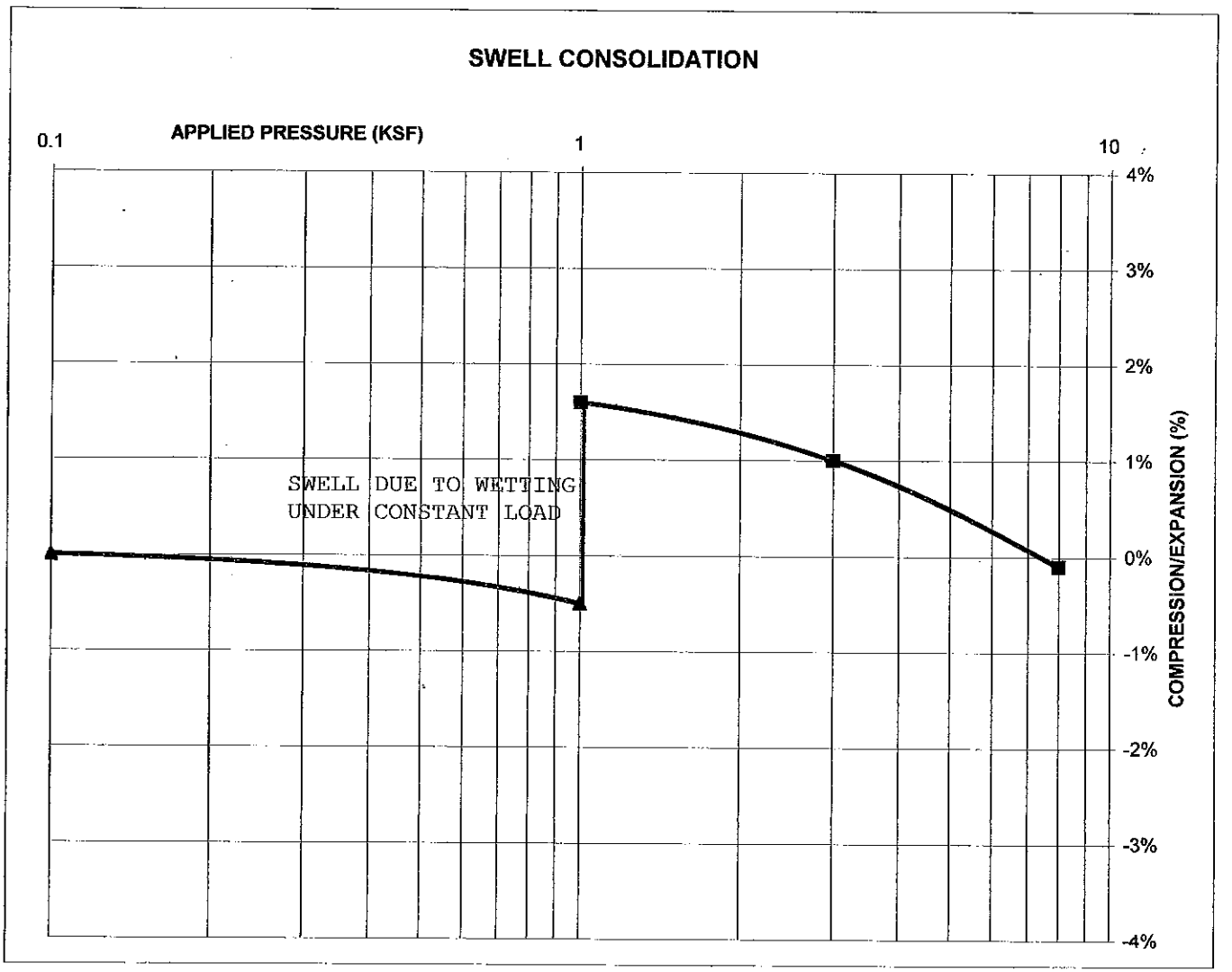
DRAWN:	DATE:	CHECKED:	DATE:
			2/23/04

JOB NO.: 98104
FIG NO.: C-56

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-39	AT DEPTH	2'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			122
NATURAL MOISTURE CONTENT			6.5%
SWELL/CONSOLIDATION (%)			2.1%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

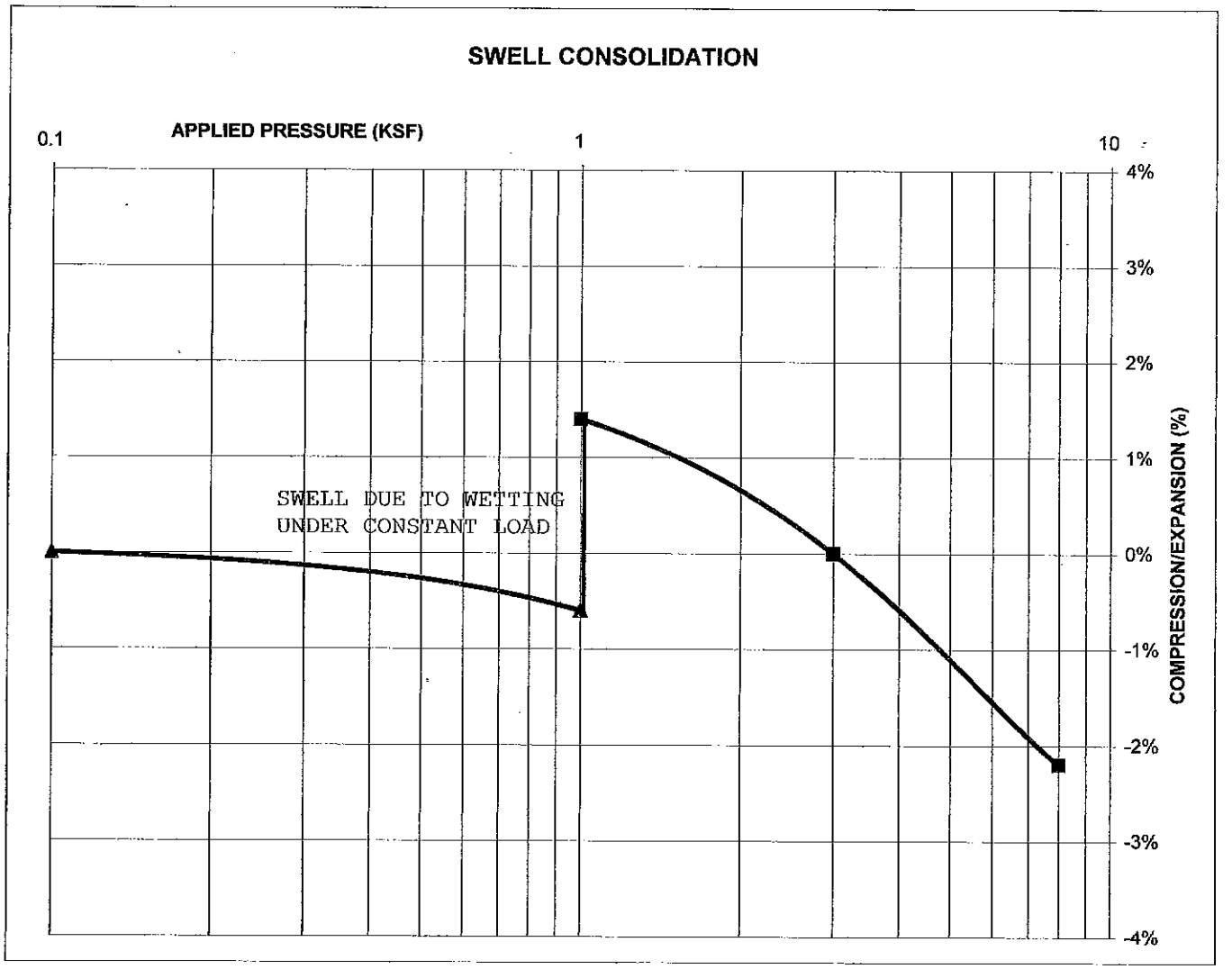
DRAWN:	DATE:	CHECKED:	DATE:
		KLH	2/13/04

JOB NO.: 98104
FIG NO.: C-57

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-40	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			115
NATURAL MOISTURE CONTENT			11.4%
SWELL/CONSOLIDATION (%)			2.0%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

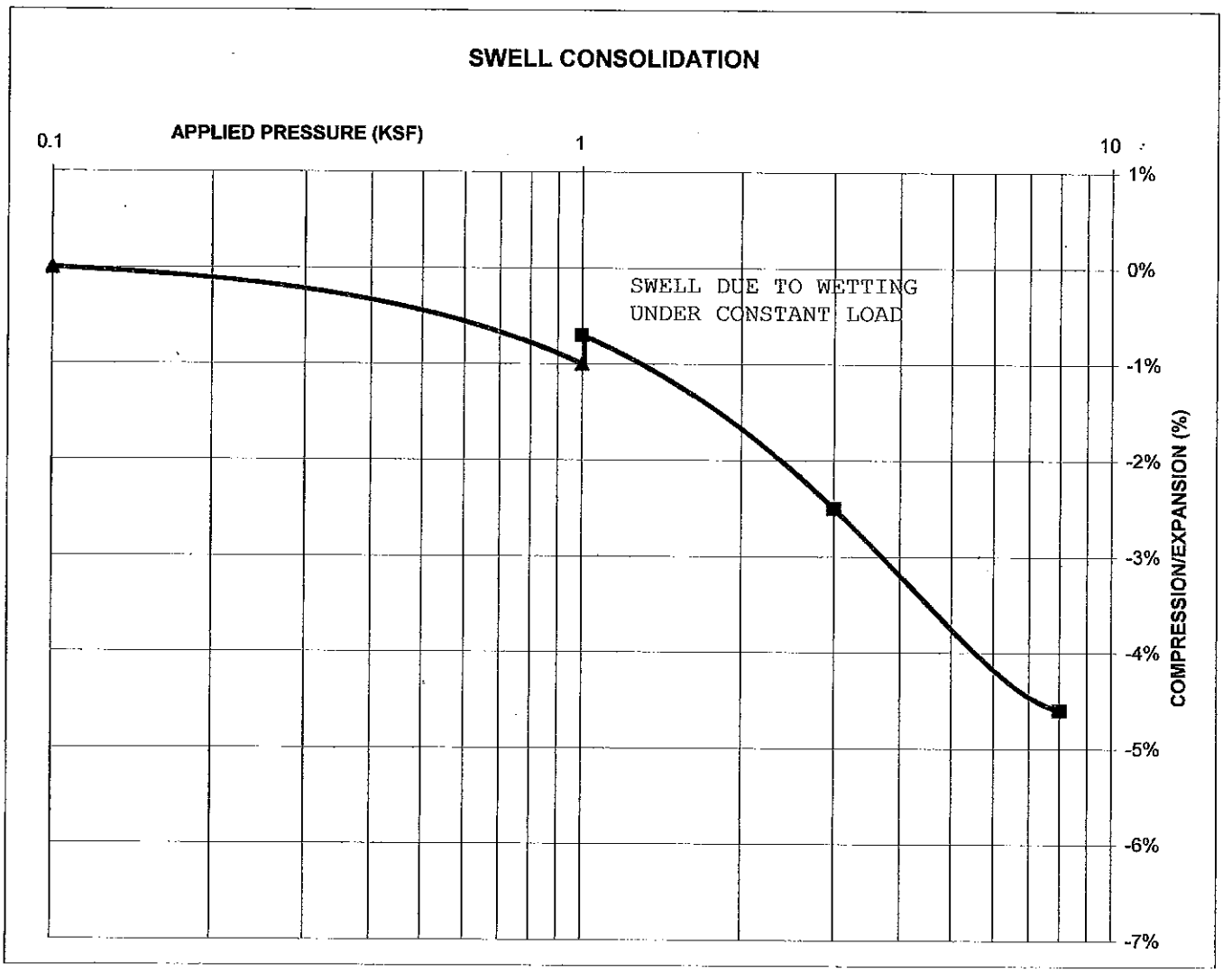
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-58

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-44	AT DEPTH	5'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			109
NATURAL MOISTURE CONTENT			15.7%
SWELL/CONSOLIDATION (%)			0.3%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

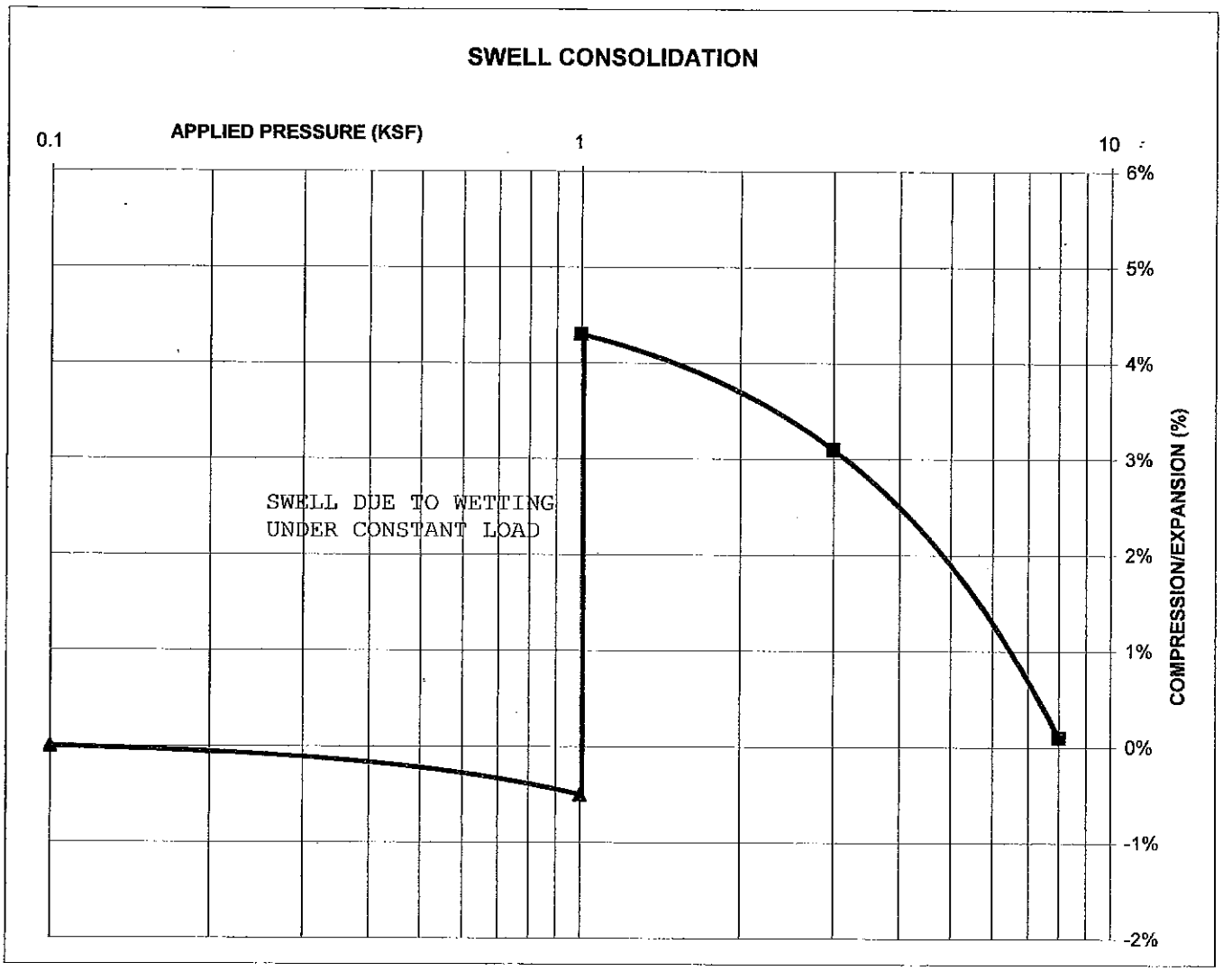
DRAWN:	DATE:	CHECKED:	DATE:
		KAM	2/13/04

JOB NO.: 98104
FIG NO.: C-59

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-45	AT DEPTH	2-3'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			113
NATURAL MOISTURE CONTENT			9.3%
SWELL/CONSOLIDATION (%)			4.8%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

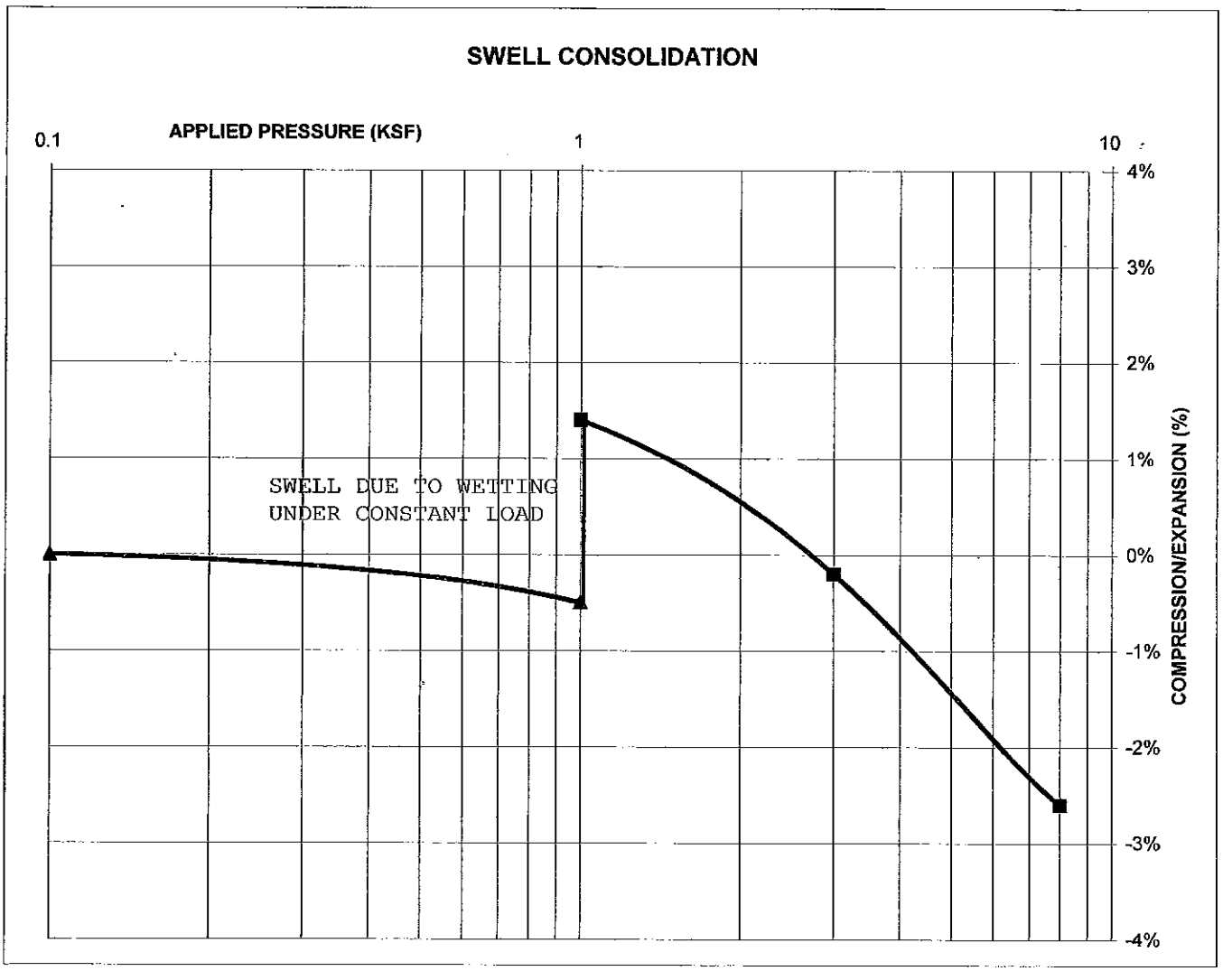
DRAWN:	DATE:	CHECKED:	DATE:
		LAH	2/13/04

JOB NO.: 98104
FIG NO.: C-60

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-47	AT DEPTH	5'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			110
NATURAL MOISTURE CONTENT			7.9%
SWELL/CONSOLIDATION (%)			1.9%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

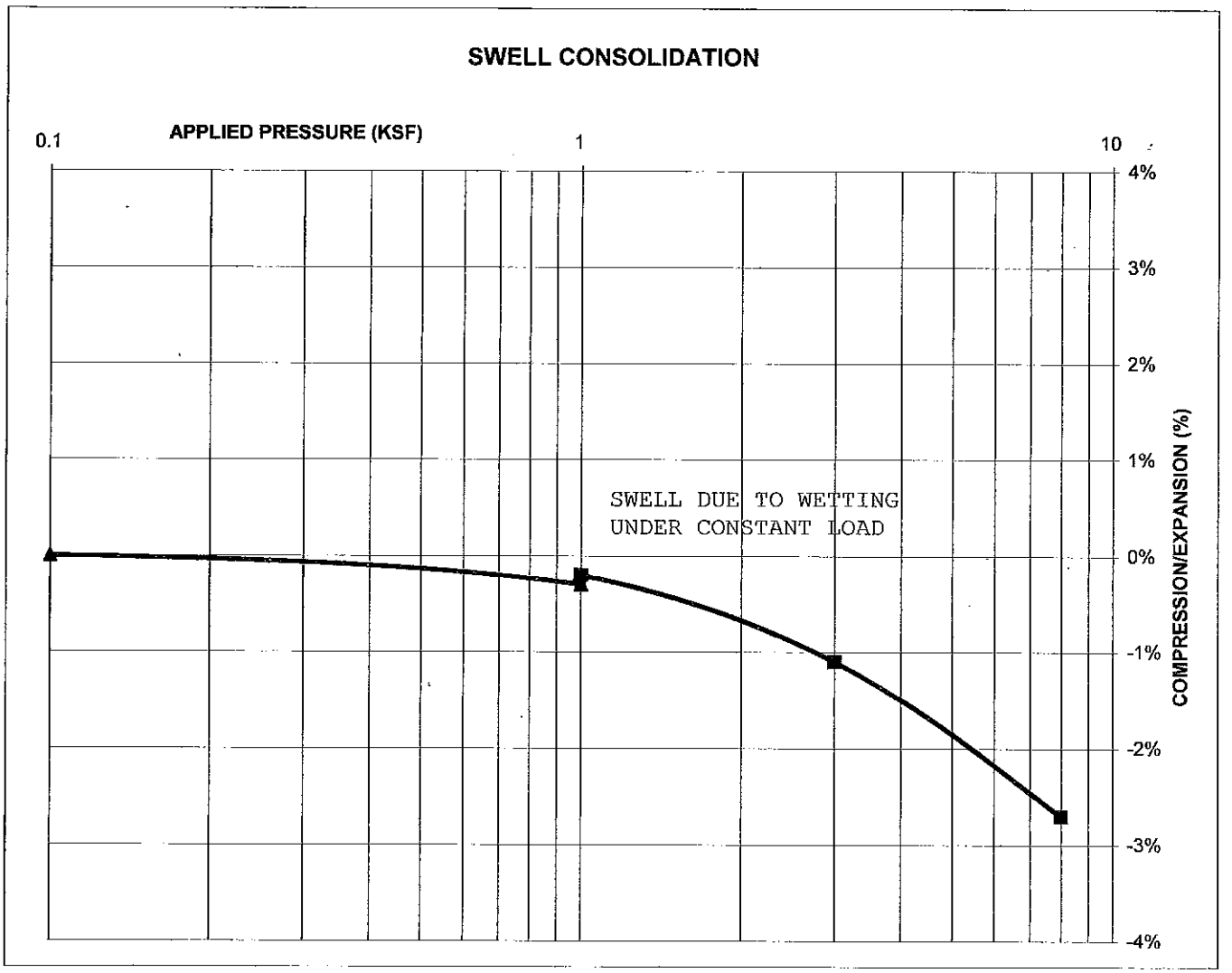
DRAWN:	DATE:	CHECKED:	DATE:
		MAA	2/13/04

JOB NO.: 98104
FIG NO.: C-61

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-49	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			110
NATURAL MOISTURE CONTENT			12.5%
SWELL/CONSOLIDATION (%)			0.1%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

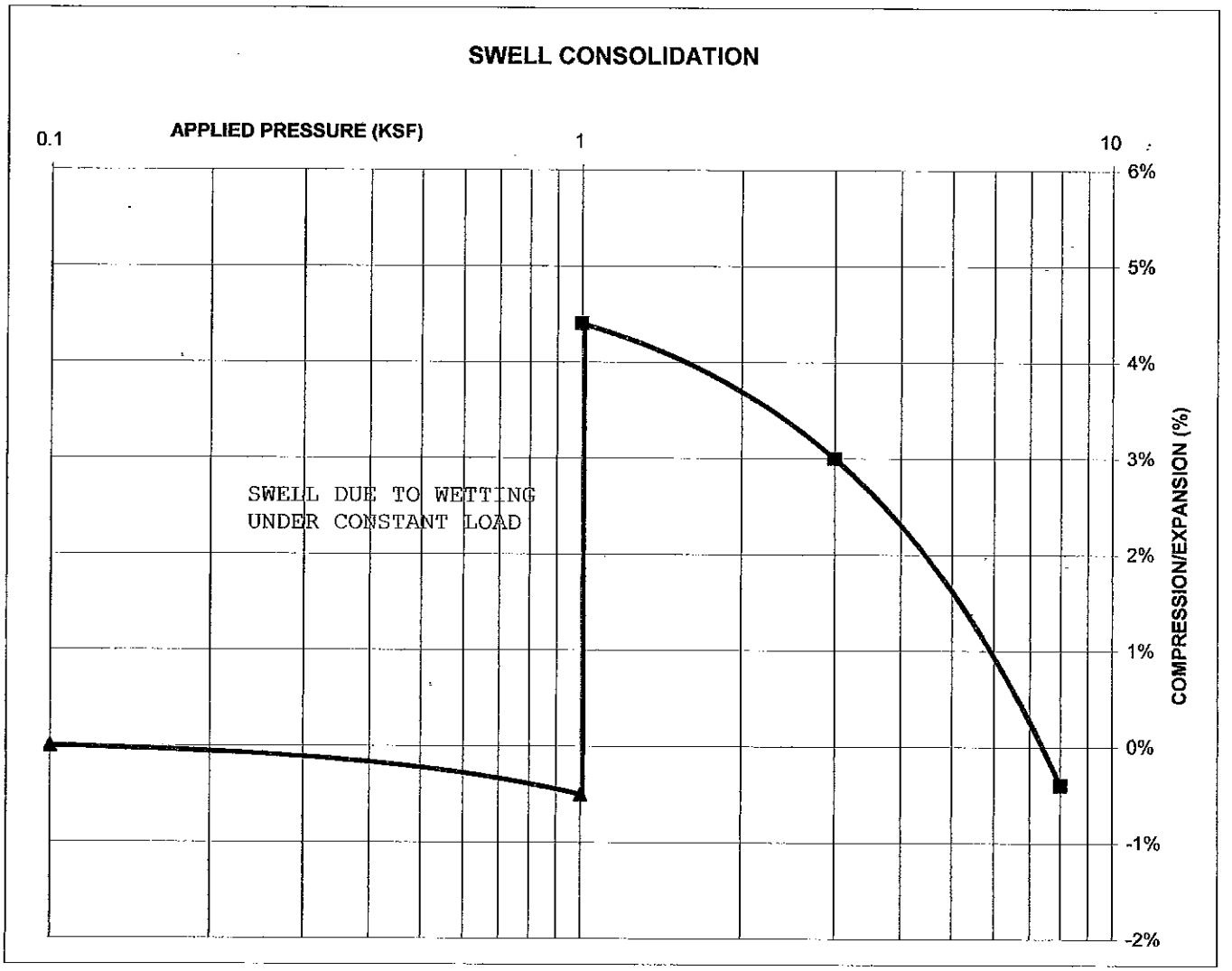
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-62

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-52	AT DEPTH	2-3'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			105
NATURAL MOISTURE CONTENT			14.2%
SWELL/CONSOLIDATION (%)			4.9%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

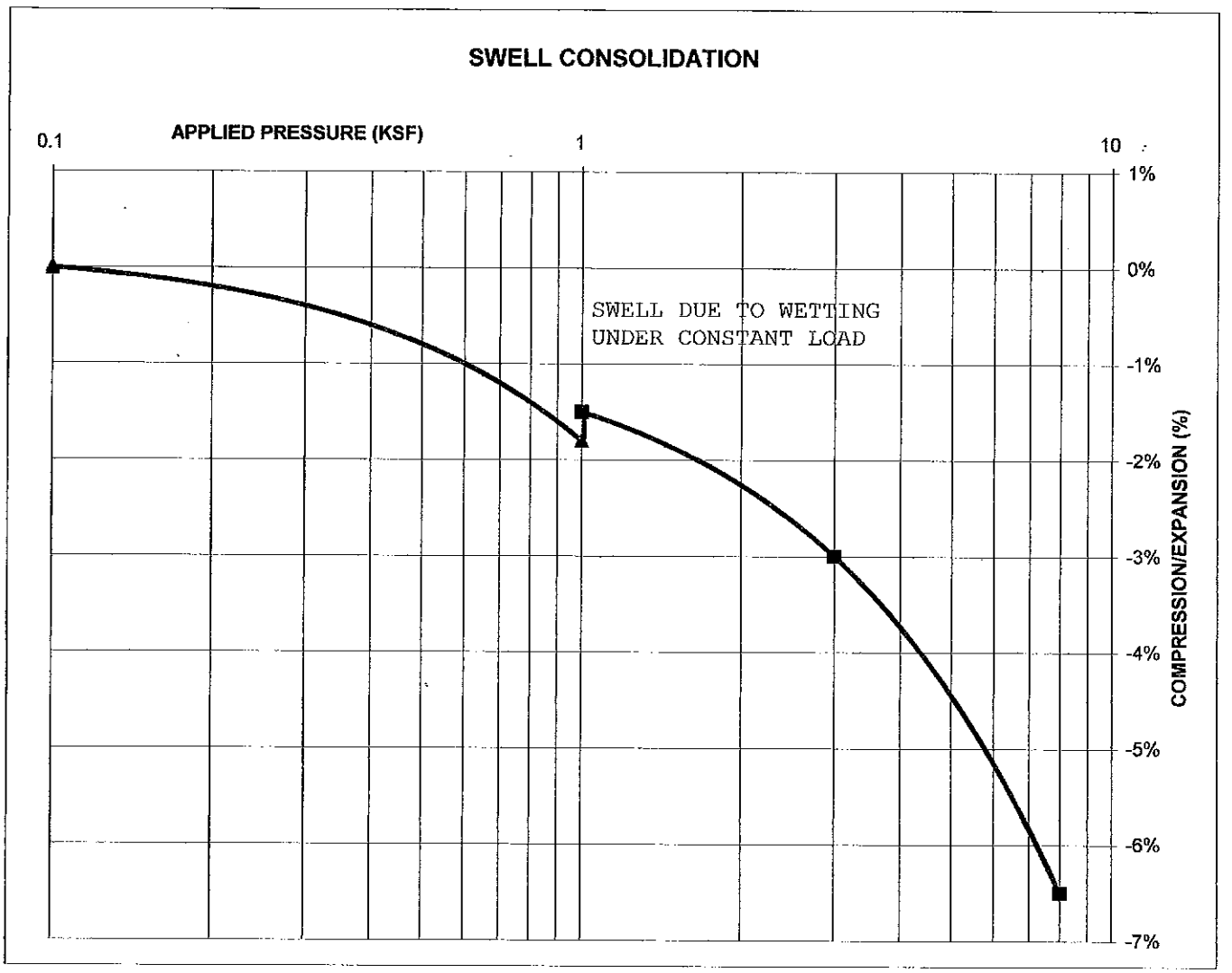
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/23/04

JOB NO.: 98104
FIG NO.: C-63

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-53	AT DEPTH	15'
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			101
NATURAL MOISTURE CONTENT			22.8%
SWELL/CONSOLIDATION (%)			0.3%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

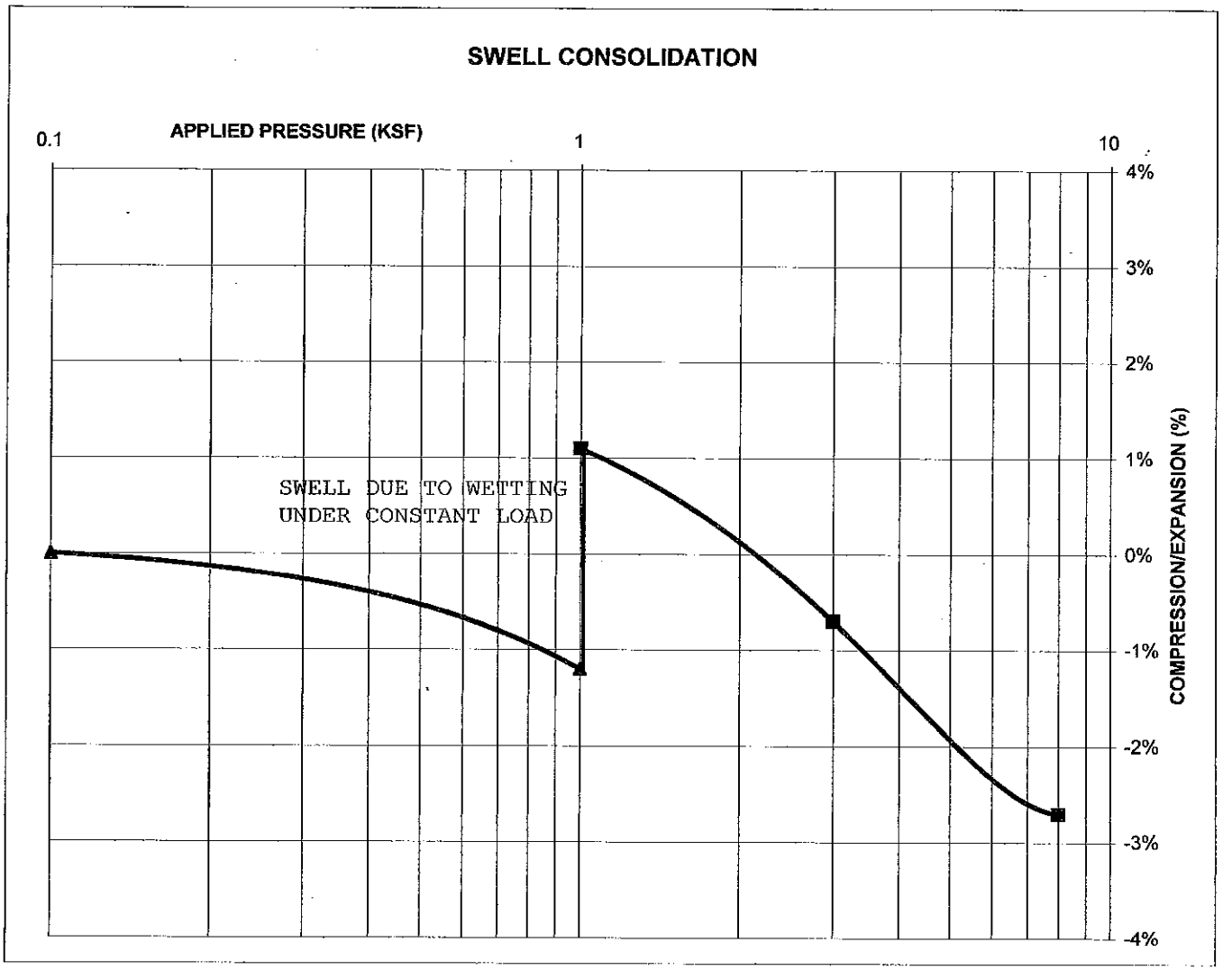
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/23/04

JOB NO.: 98104
FIG NO.: C-64

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-3	AT DEPTH	20'
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			126
NATURAL MOISTURE CONTENT			11.4%
SWELL/CONSOLIDATION (%)			2.3%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

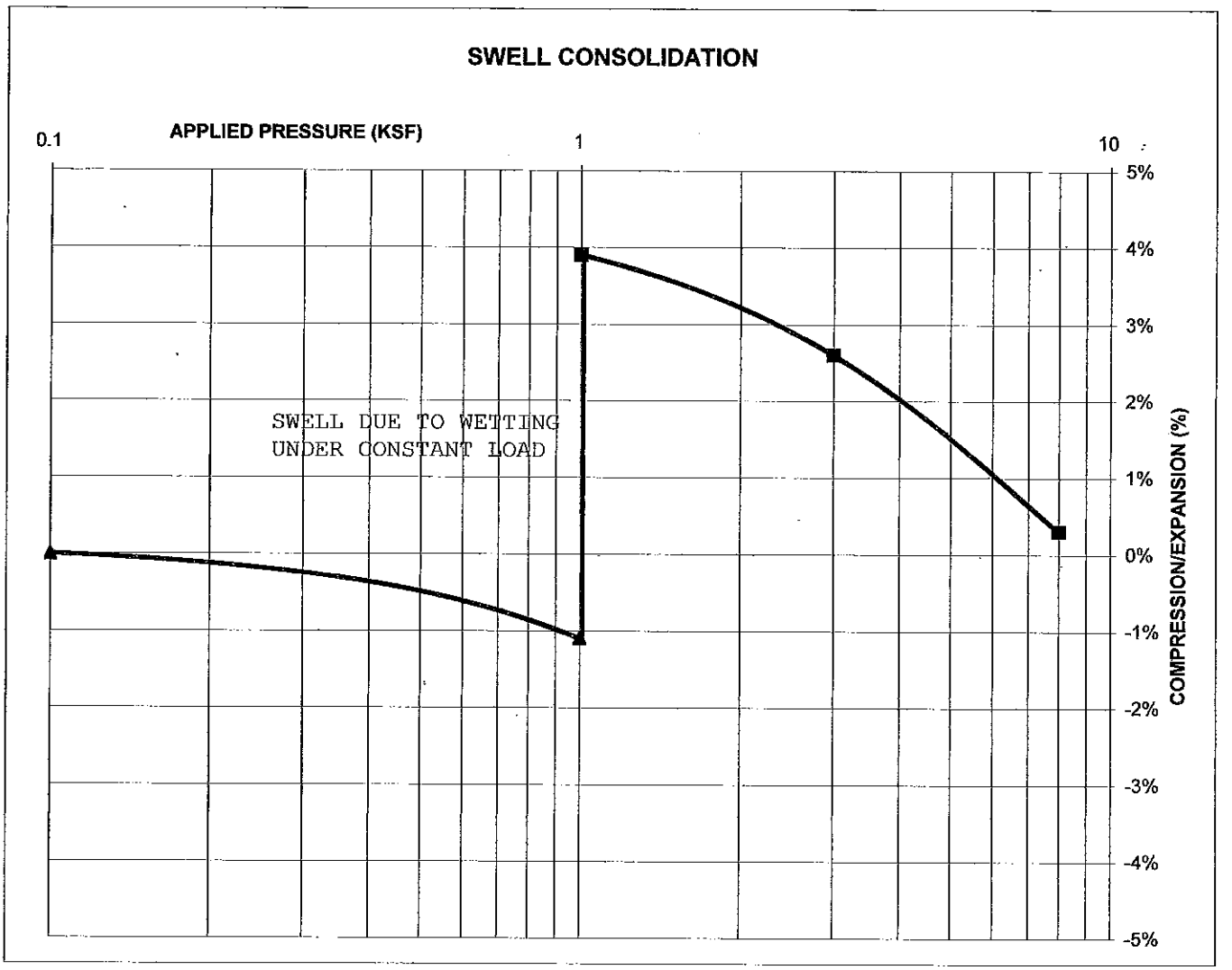
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-65

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-7	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			114
NATURAL MOISTURE CONTENT			17.8%
SWELL/CONSOLIDATION (%)			5.0%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

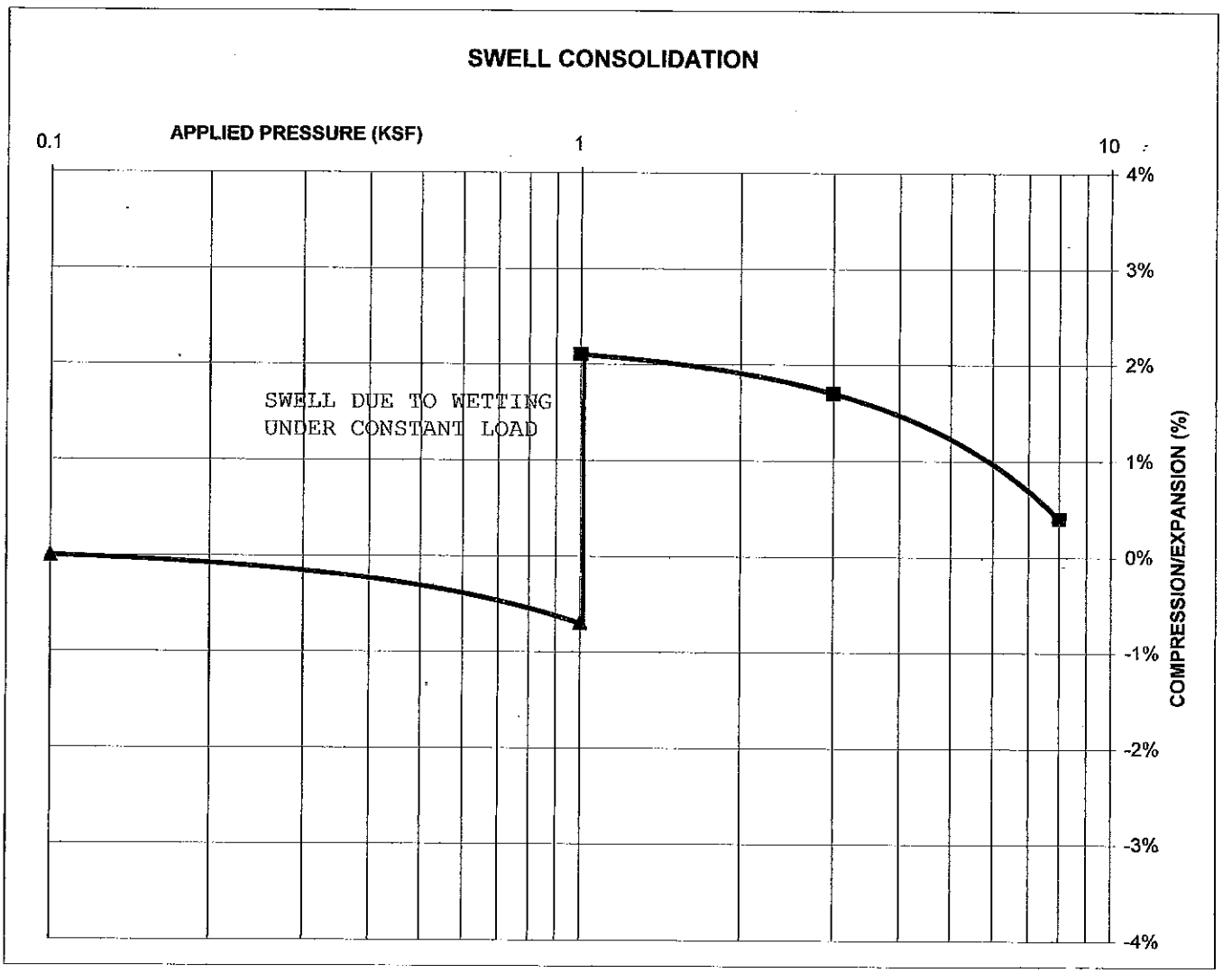
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/01

JOB NO.: 98104
FIG NO.: C-66

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-8	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			124
NATURAL MOISTURE CONTENT			11.1%
SWELL/CONSOLIDATION (%)			2.8%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

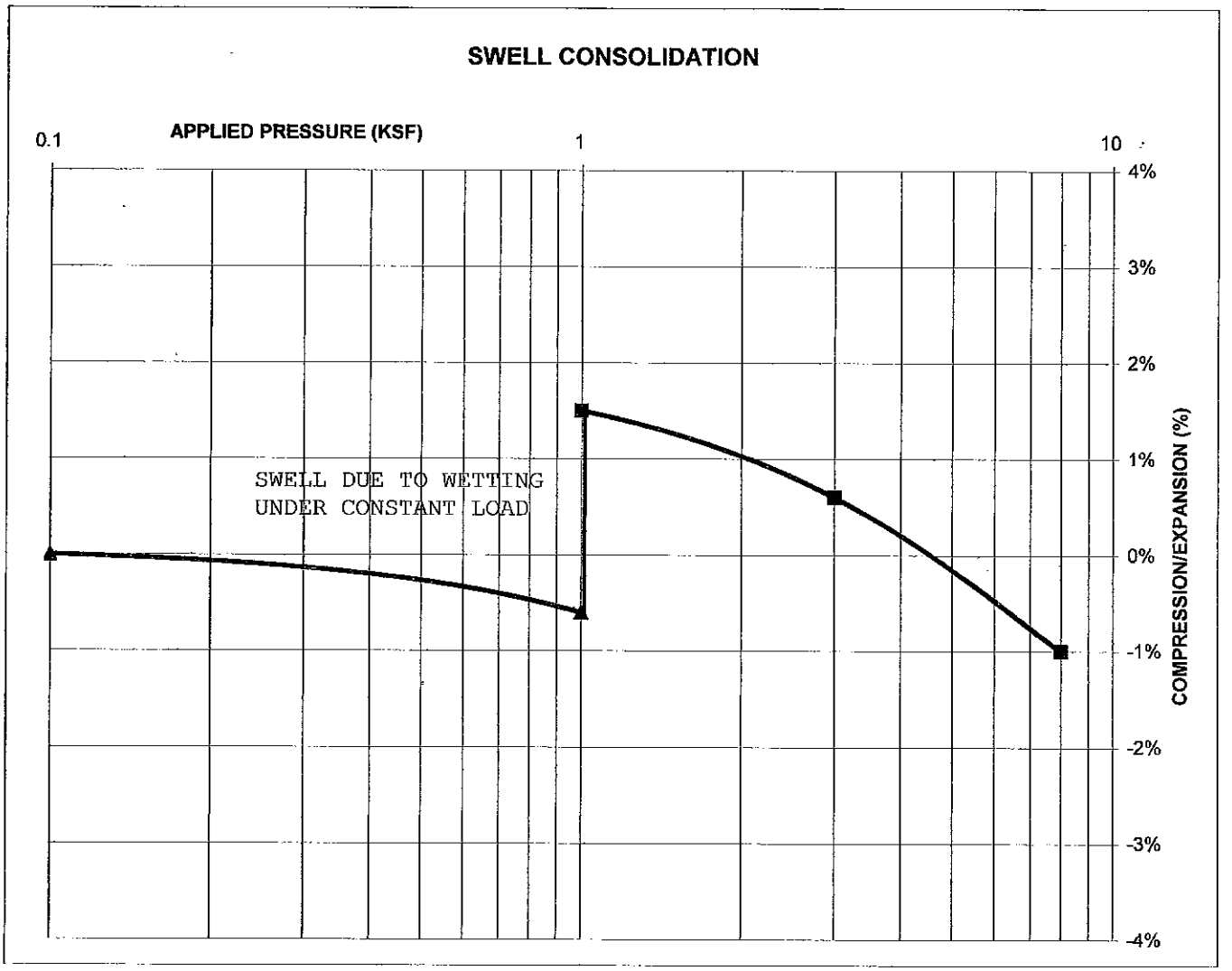
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-67

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-10	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			114
NATURAL MOISTURE CONTENT			17.7%
SWELL/CONSOLIDATION (%)			2.1%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

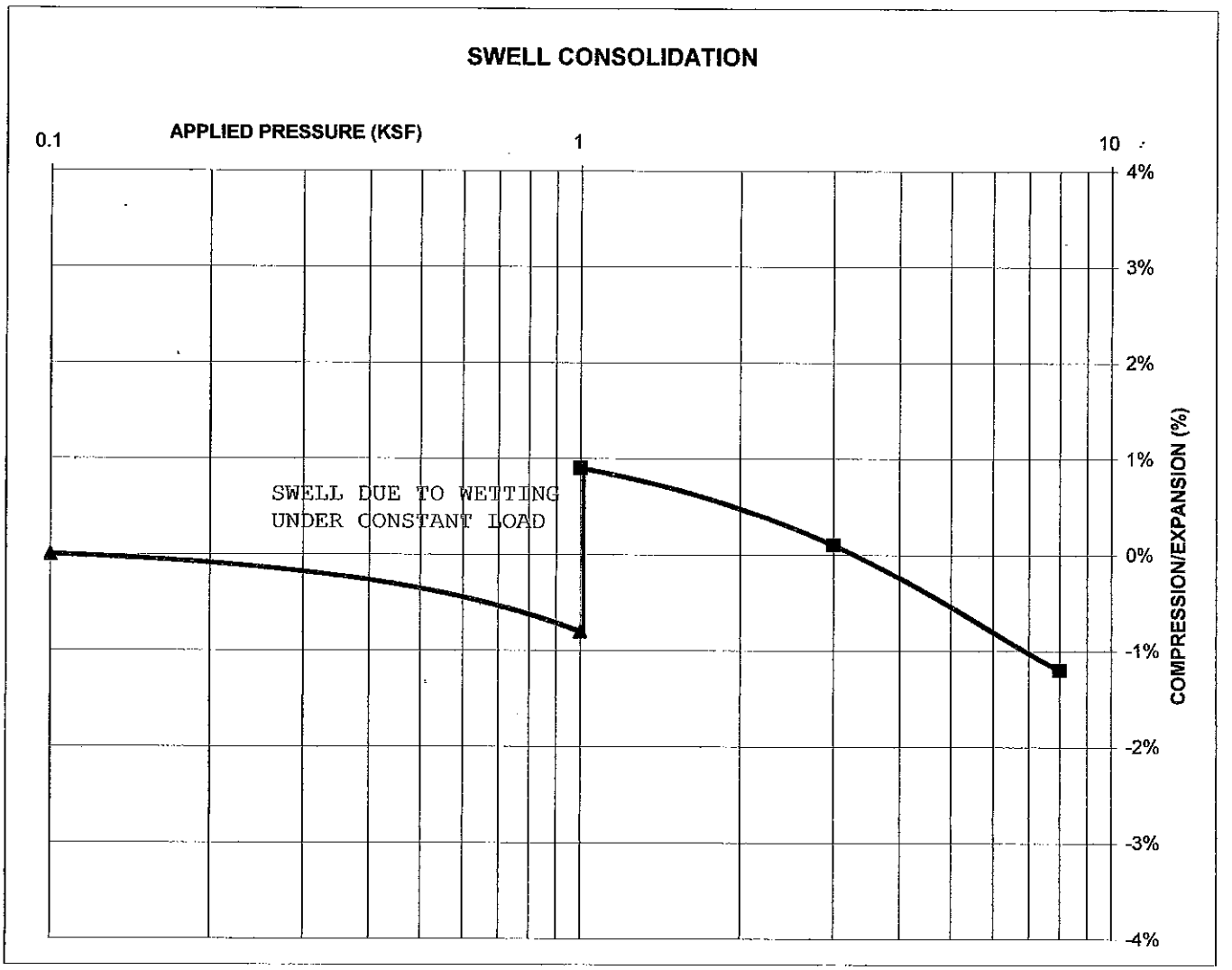
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-68

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-12	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			118
NATURAL MOISTURE CONTENT			15.2%
SWELL/CONSOLIDATION (%)			1.7%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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COLORADO SPRINGS, CO. 80907 (719) 531-5599

SWELL CONSOLIDATION TEST RESULTS

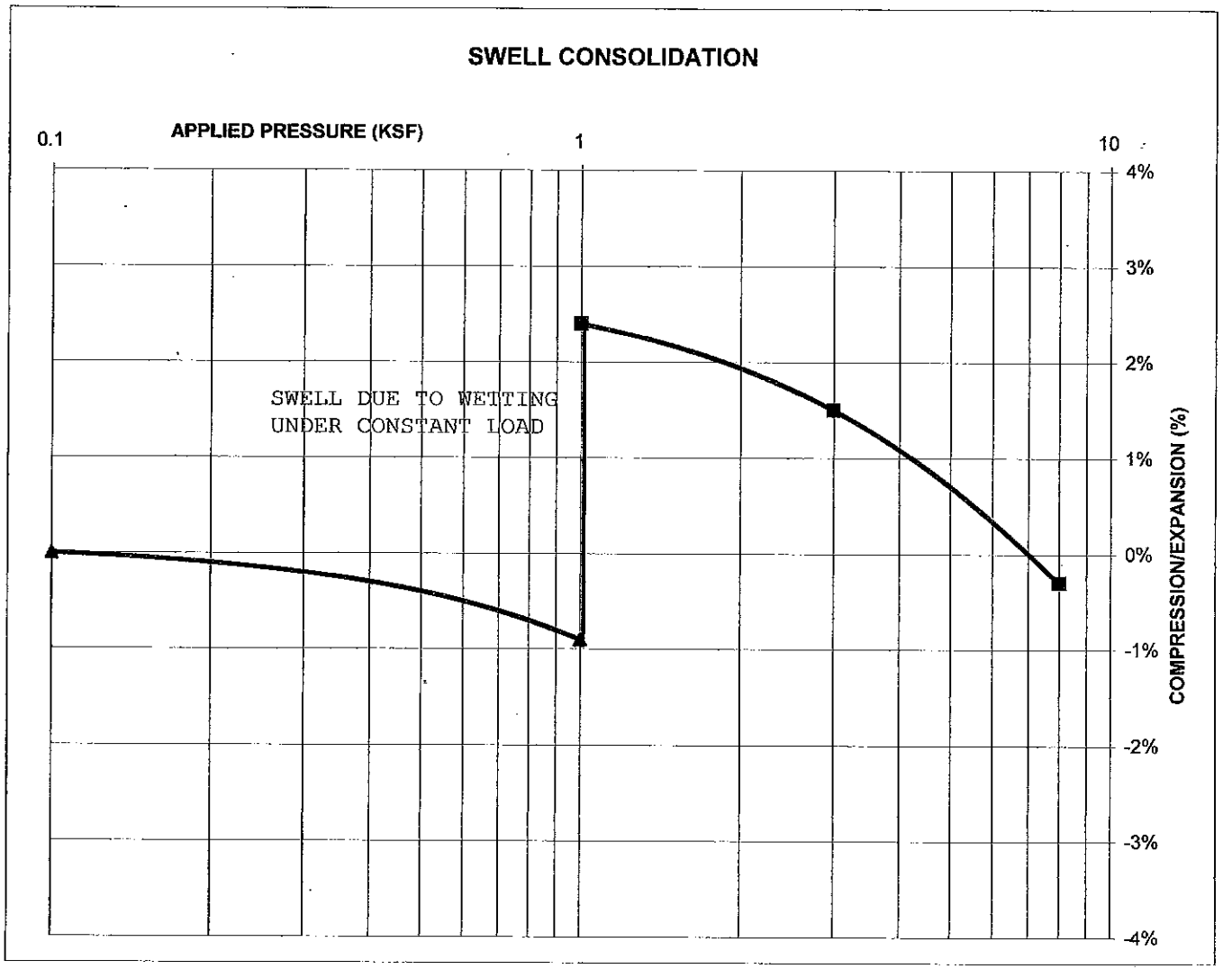
DRAWN:	DATE:	CHECKED:	DATE:
		KAM	2/13/04

JOB NO.: 98104
FIG NO.: C-69

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-17	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			115
NATURAL MOISTURE CONTENT			15.3%
SWELL/CONSOLIDATION (%)			3.3%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

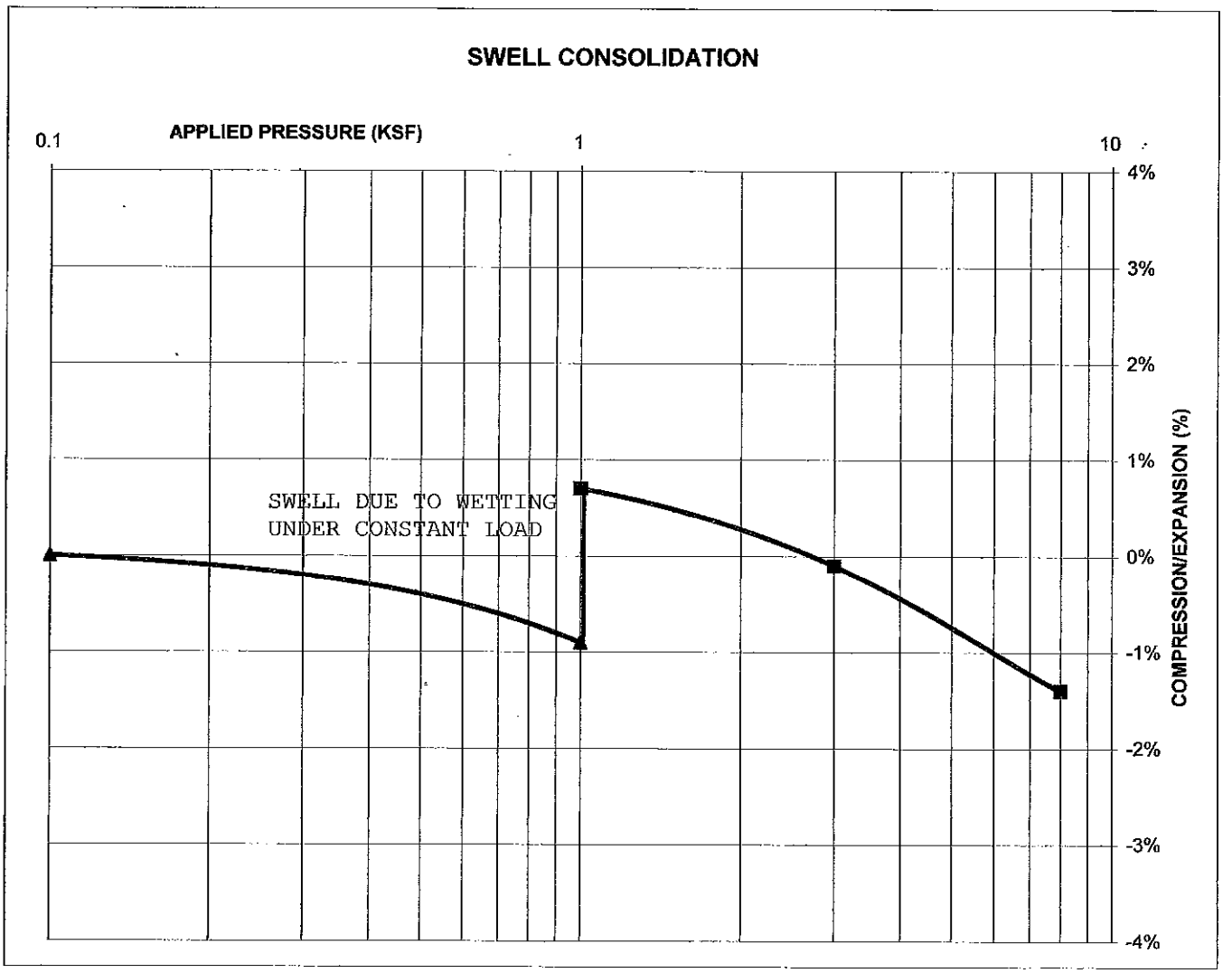
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-70

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-20	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			118
NATURAL MOISTURE CONTENT			14.8%
SWELL/CONSOLIDATION (%)			1.6%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

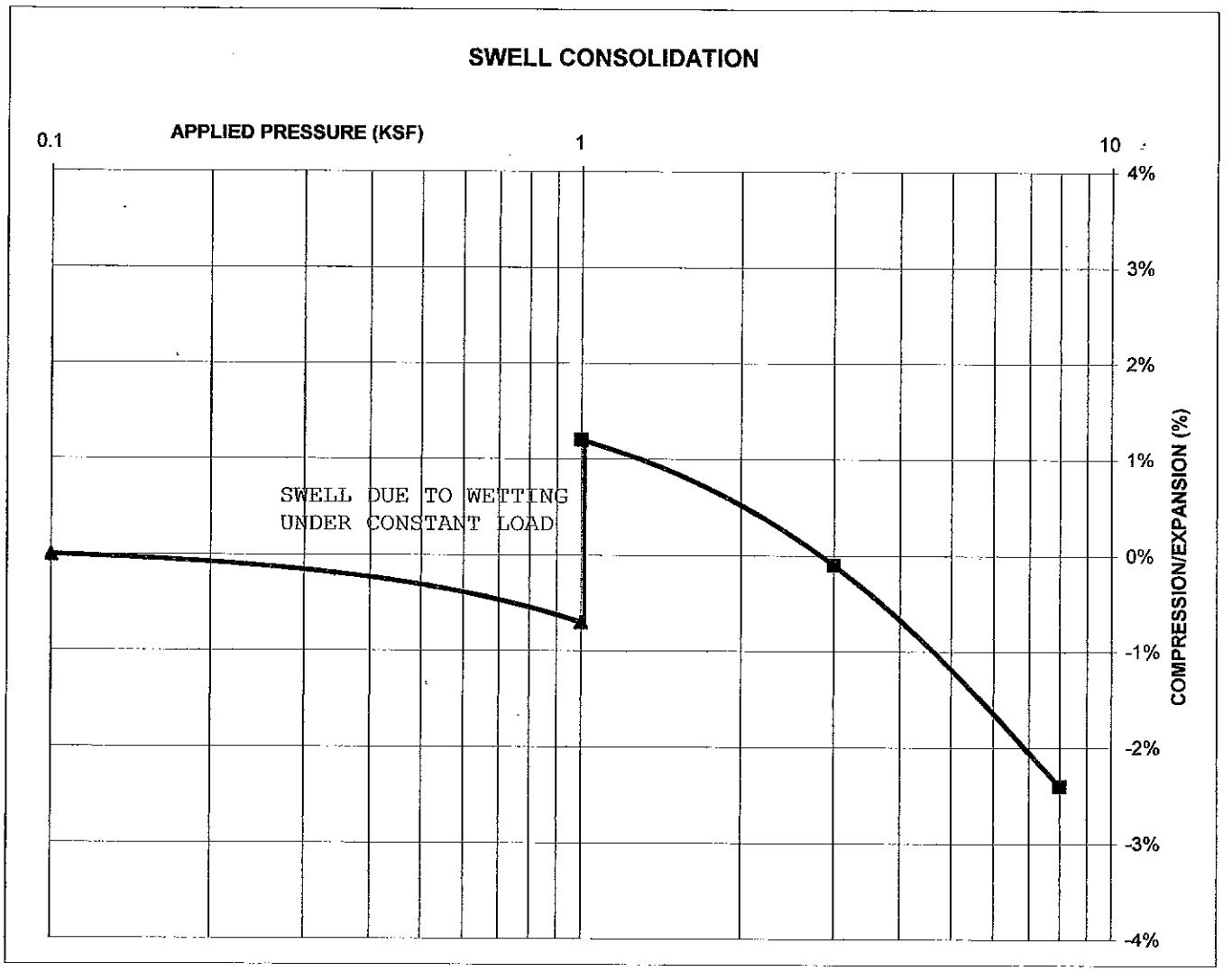
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-71

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-29	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			123
NATURAL MOISTURE CONTENT			10.6%
SWELL/CONSOLIDATION (%)			1.9%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

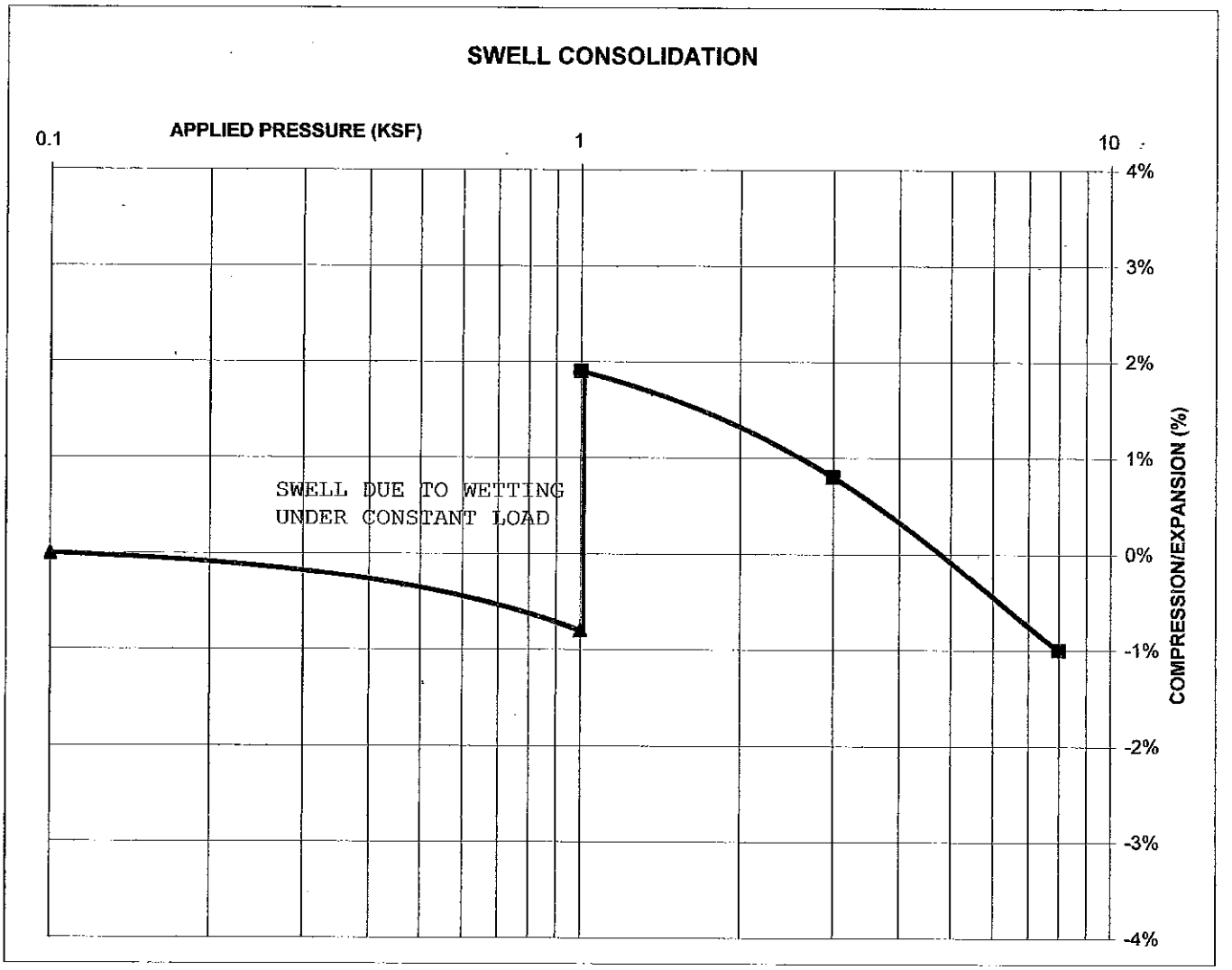
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-72

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-30	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			120
NATURAL MOISTURE CONTENT			11.8%
SWELL/CONSOLIDATION (%)			2.7%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

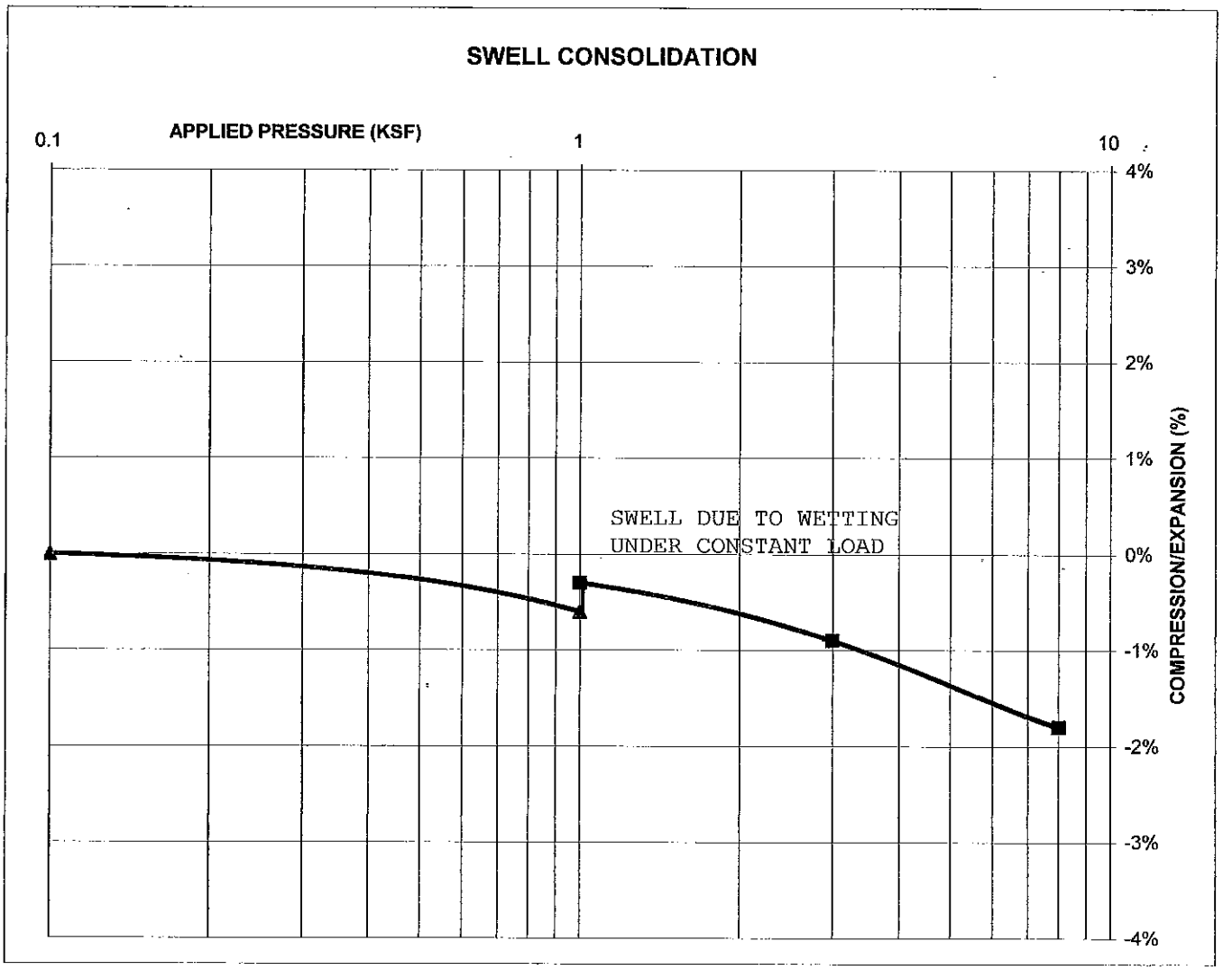
DRAWN:	DATE:	CHECKED:	DATE:
		KW	2/13/04

JOB NO.: 98104
FIG NO.: C-73

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-36	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			116
NATURAL MOISTURE CONTENT			13.9%
SWELL/CONSOLIDATION (%)			0.3%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

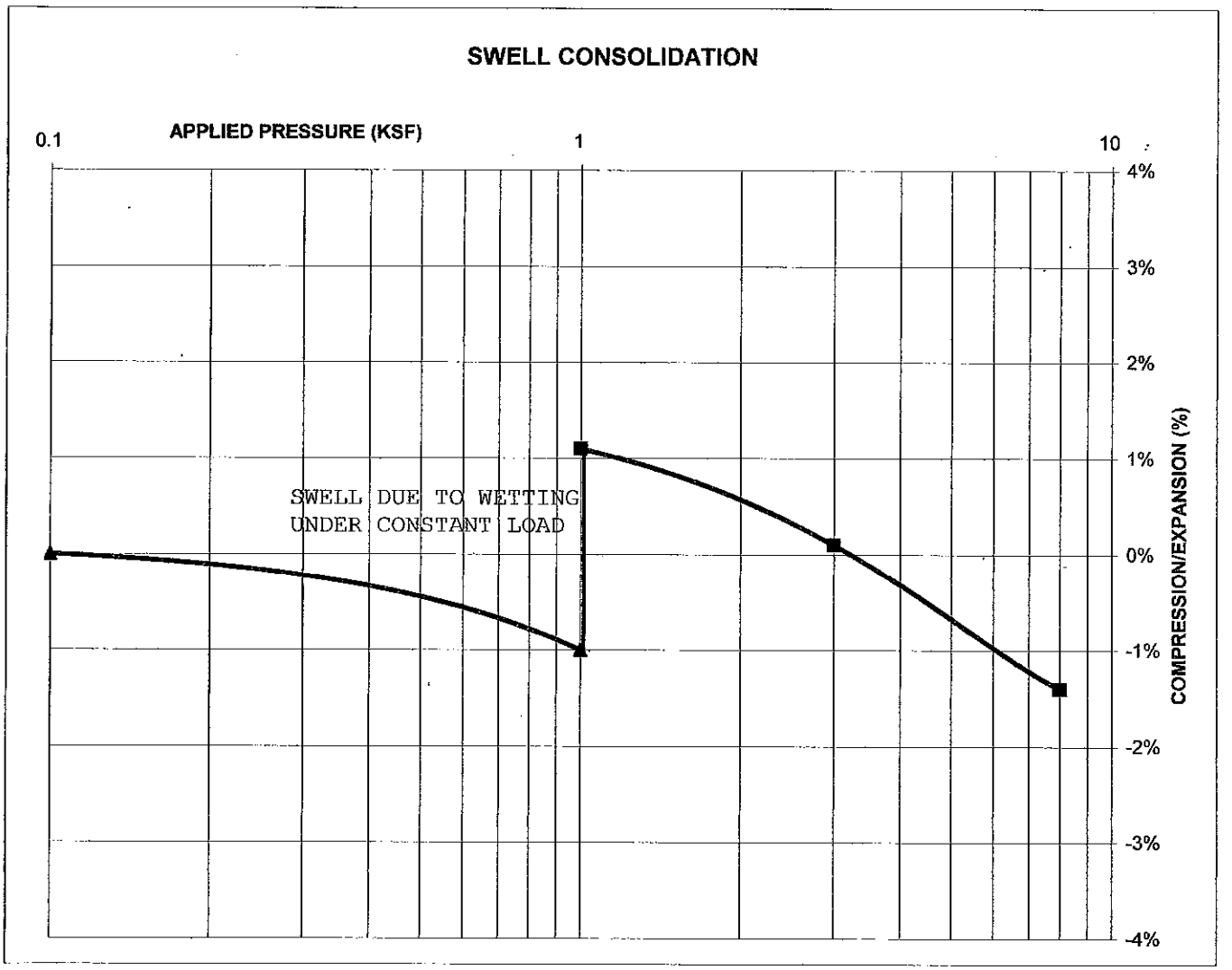
DRAWN:	DATE:	CHECKED:	DATE:
		GW	2/13/04

JOB NO.: 98104
FIG NO.: C-74

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-37	AT DEPTH	5'
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			114
NATURAL MOISTURE CONTENT			16.2%
SWELL/CONSOLIDATION (%)			2.1%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

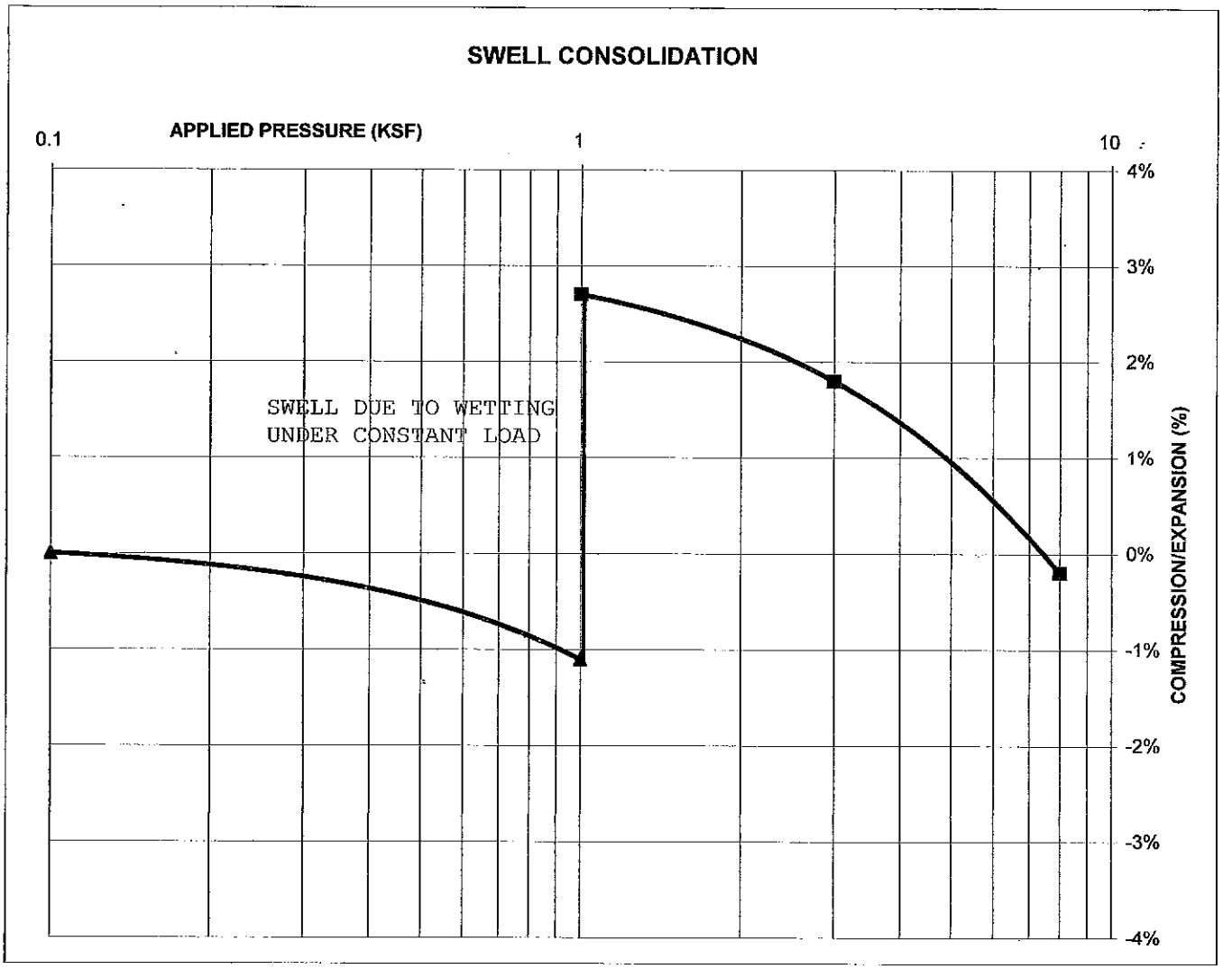
DRAWN:	DATE:	CHECKED:	DATE:
		GH	2/13/04

JOB NO.: 98104
FIG NO.: C-75

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-38	AT DEPTH	15'
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			117
NATURAL MOISTURE CONTENT			16.9%
SWELL/CONSOLIDATION (%)			3.8%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

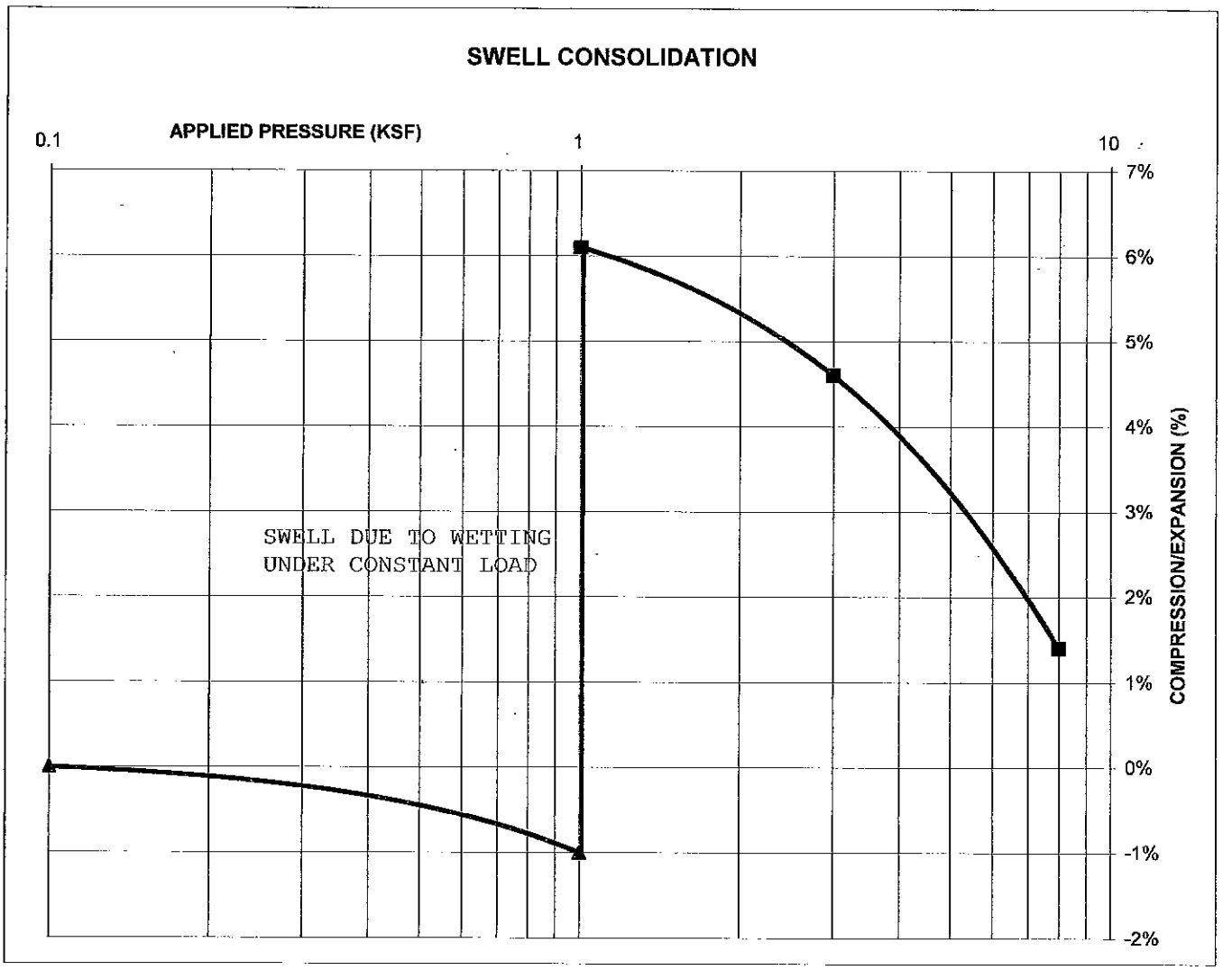
DRAWN:	DATE:	CHECKED:	DATE:
		LAM	2/13/04

JOB NO.: 98104
FIG NO.: C-76

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-41	AT DEPTH	5'
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			112
NATURAL MOISTURE CONTENT			18.7%
SWELL/CONSOLIDATION (%)			7.1%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

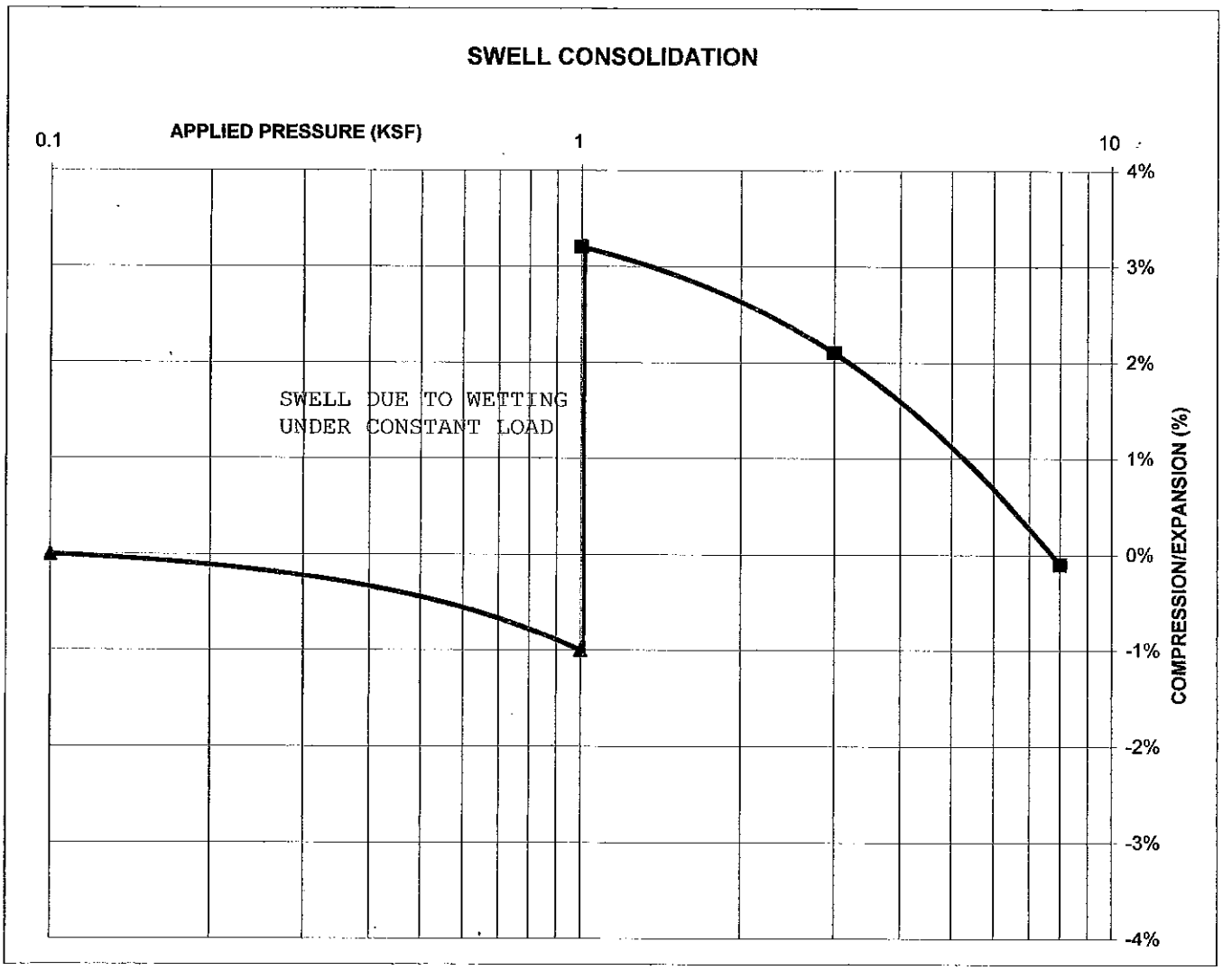
DRAWN:	DATE:	CHECKED:	DATE:
		LAH	2/13/04

JOB NO.: 98104
FIG NO.: C-77

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-42	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			116
NATURAL MOISTURE CONTENT			16.5%
SWELL/CONSOLIDATION (%)			4.2%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

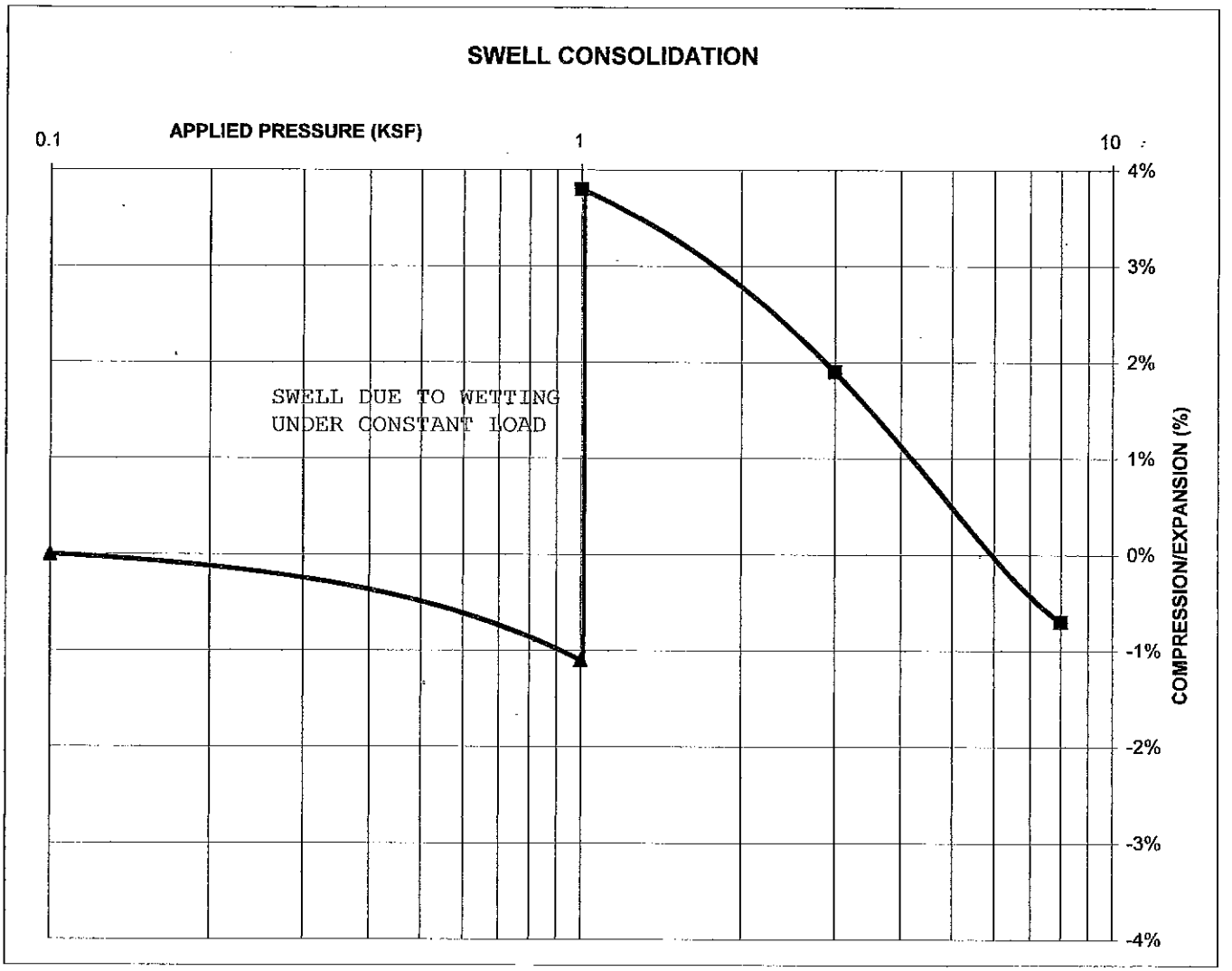
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	2/13/04

JOB NO.: 98104
FIG NO.: C-78

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-43	AT DEPTH	5'
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			117
NATURAL MOISTURE CONTENT			13.5%
SWELL/CONSOLIDATION (%)			4.9%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

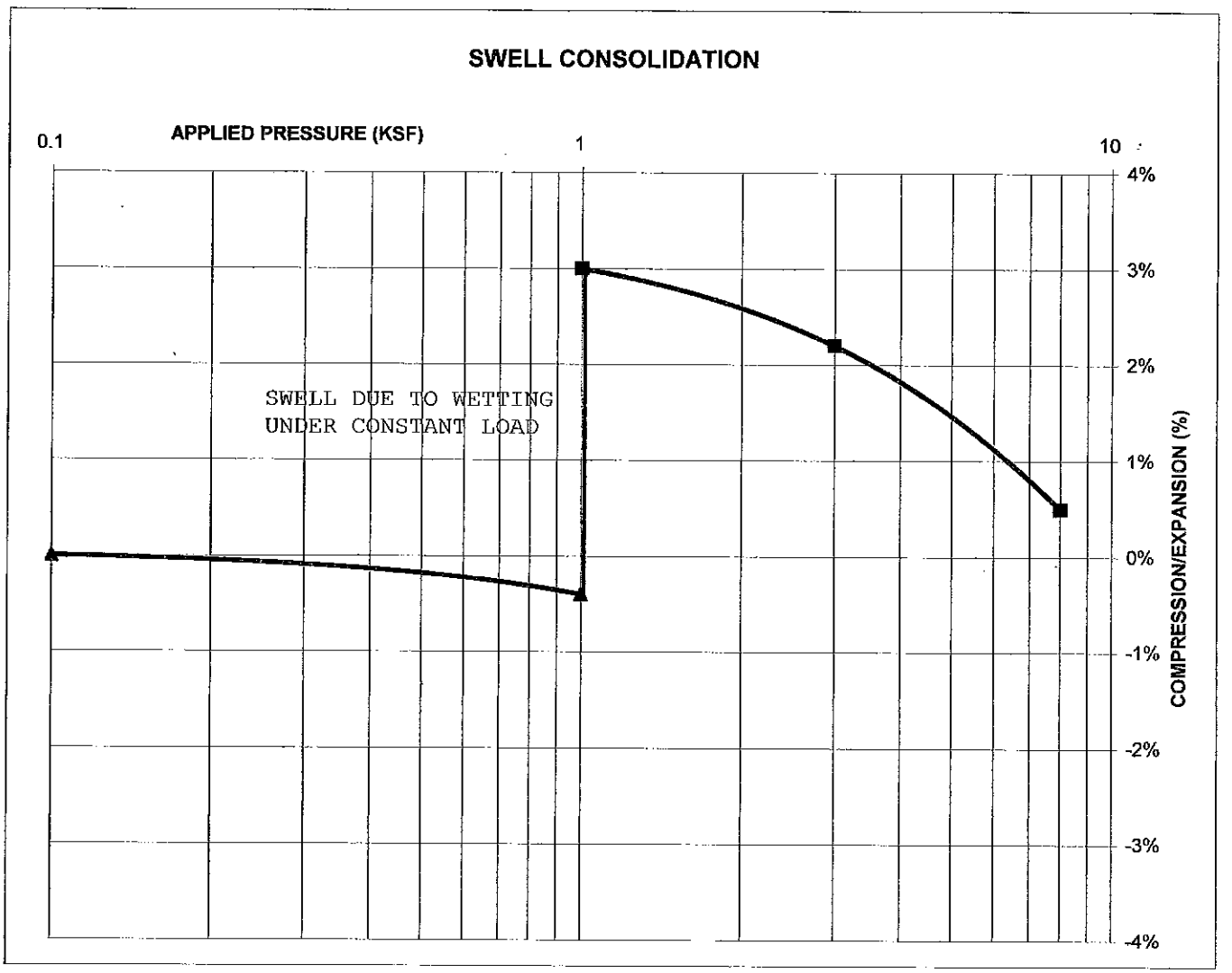
DRAWN:	DATE:	CHECKED:	DATE:
		CGH	2/13/04

JOB NO.: 98104
FIG NO.: C-79

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-46	AT DEPTH	15'
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			119
NATURAL MOISTURE CONTENT			16.0%
SWELL/CONSOLIDATION (%)			3.4%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

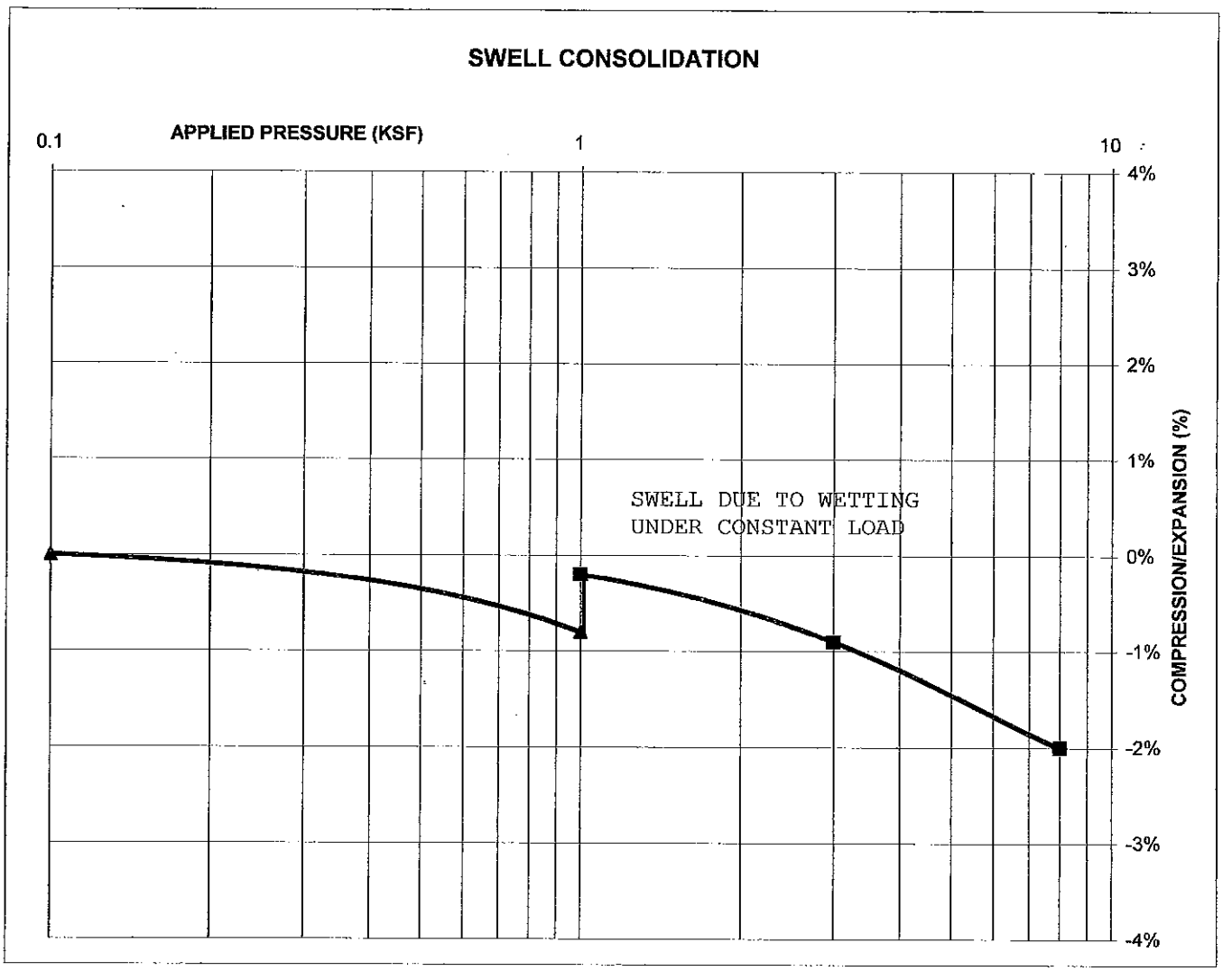
DRAWN:	DATE:	CHECKED:	DATE:
		KAA	2/13/04

JOB NO.: 98104
FIG NO.: C-80

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-48	AT DEPTH	5'
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			118
NATURAL MOISTURE CONTENT			11.4%
SWELL/CONSOLIDATION (%)			0.6%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

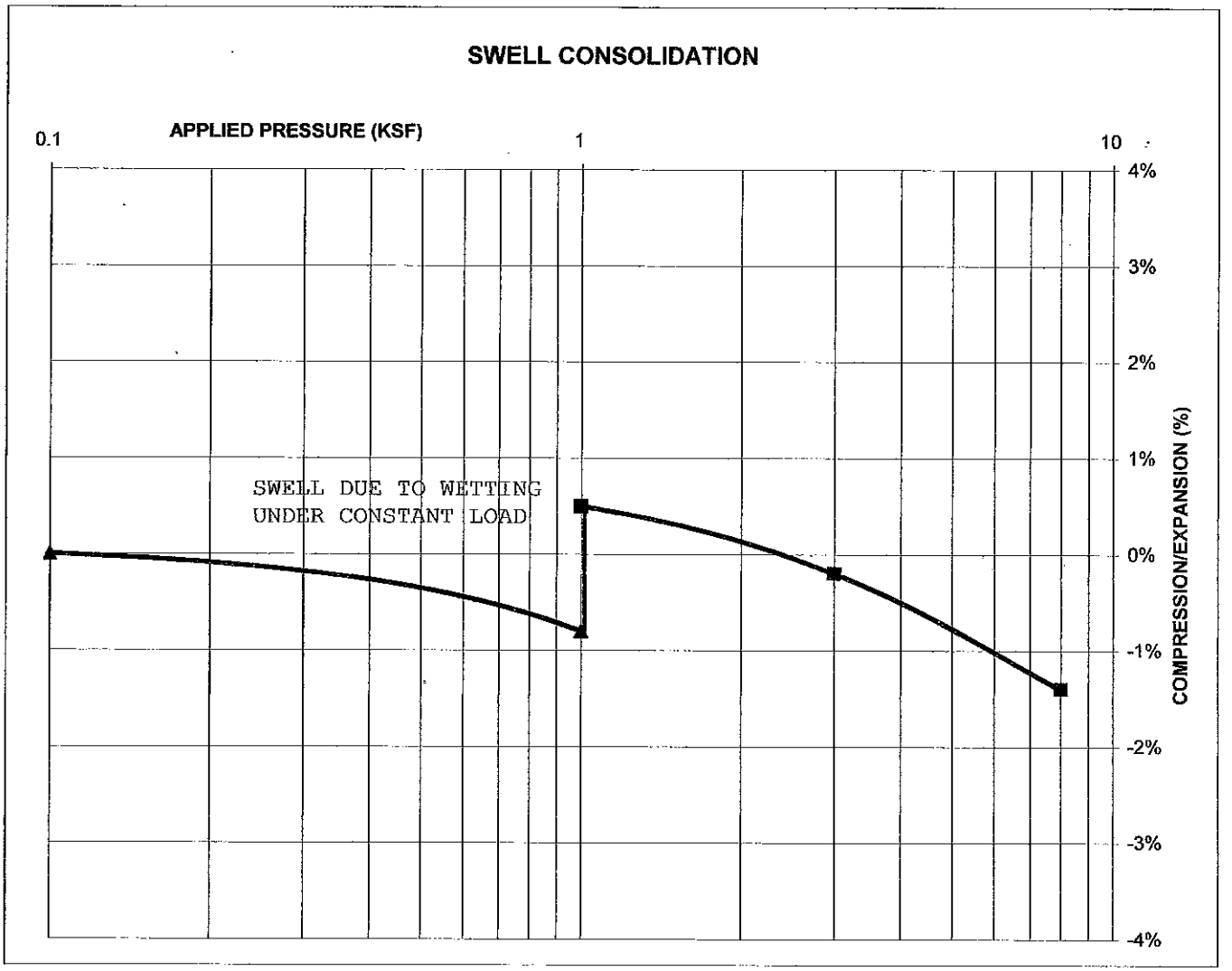
DRAWN:	DATE:	CHECKED:	DATE:
		GAH	2/13/04

JOB NO.: 98104
FIG NO.: C-81

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-50	AT DEPTH	10'
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			119
NATURAL MOISTURE CONTENT			13.9%
SWELL/CONSOLIDATION (%)			1.3%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION TEST RESULTS

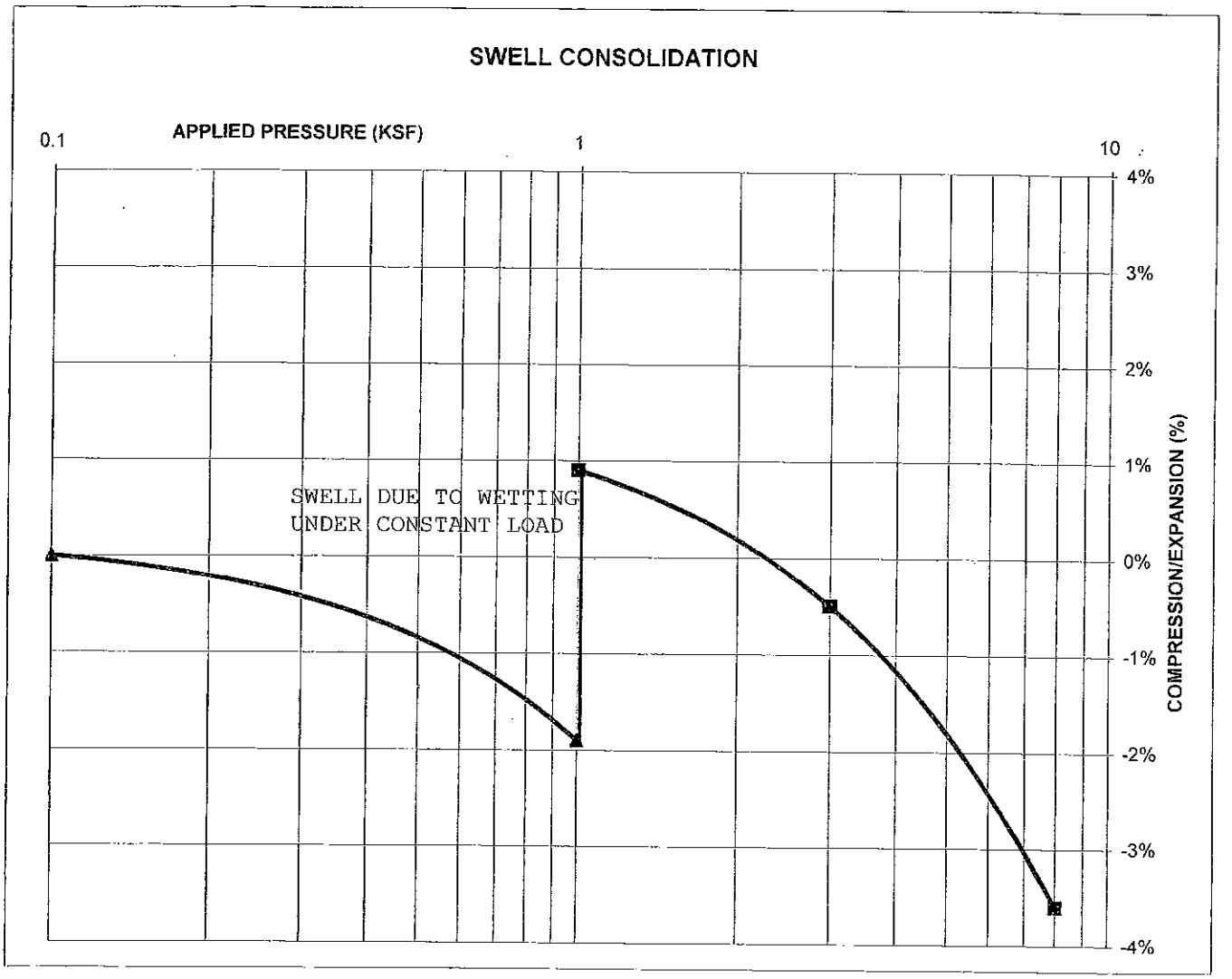
DRAWN:	DATE:	CHECKED:	DATE:
		KAA	2/13/04

JOB NO.: 98104
FIG NO.: C-82

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB-11	AT DEPTH	15'
DESCRIPTION	CL	SOIL TYPE	5
NATURAL UNIT DRY WEIGHT (PCF)			123
NATURAL MOISTURE CONTENT			10.2%
SWELL/CONSOLIDATION (%)			2.8%

JOB NO. 98104
CLIENT NORWOOD DEVELOPMENT
PROJECT CROSS CREEK @ MESA RIDGE



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SWELL CONSOLIDATION
TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KHB	2/13/04

JOB NO.: 98104
FIG NO.: C-83