FIVE RIDGES

SPECIAL USE PERMIT

PREPARED BY:

CHRISTY CORPORATION

APRIL 15, 2020

FIVE RIDGES

Special Use Permit

Prepared for:

QK, LLC

1 E. Liberty Street, Suite 444

Reno, Nevada 89501

Prepared by:

Christy Corporation, Ltd.

1000 Kiley Parkway

Sparks, Nevada 89436

(775) 502-8552

April 15, 2020

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Introduction

This application includes the following request:

- A **Special Use Permit** to allow for "major grading" per Section 110.438.35 of the Washoe County Development code and to allow for utility services within the Open Space (OS) zone.

Project Location

The Special Use Permit (SUP) included with this application proposes grading and improvements located on three individual parcels (APN #'s 508-340-01, 02, and 508-350-01). The parcels are located in the Highland Ranch area of Sun Valley. Specifically, the project site is located east of the current terminus of Warhol Drive, north of Apple Blossom Drive within the Sun Valley Area Plan. Figure 1 (below) depicts the parcels impacted by this SUP request.

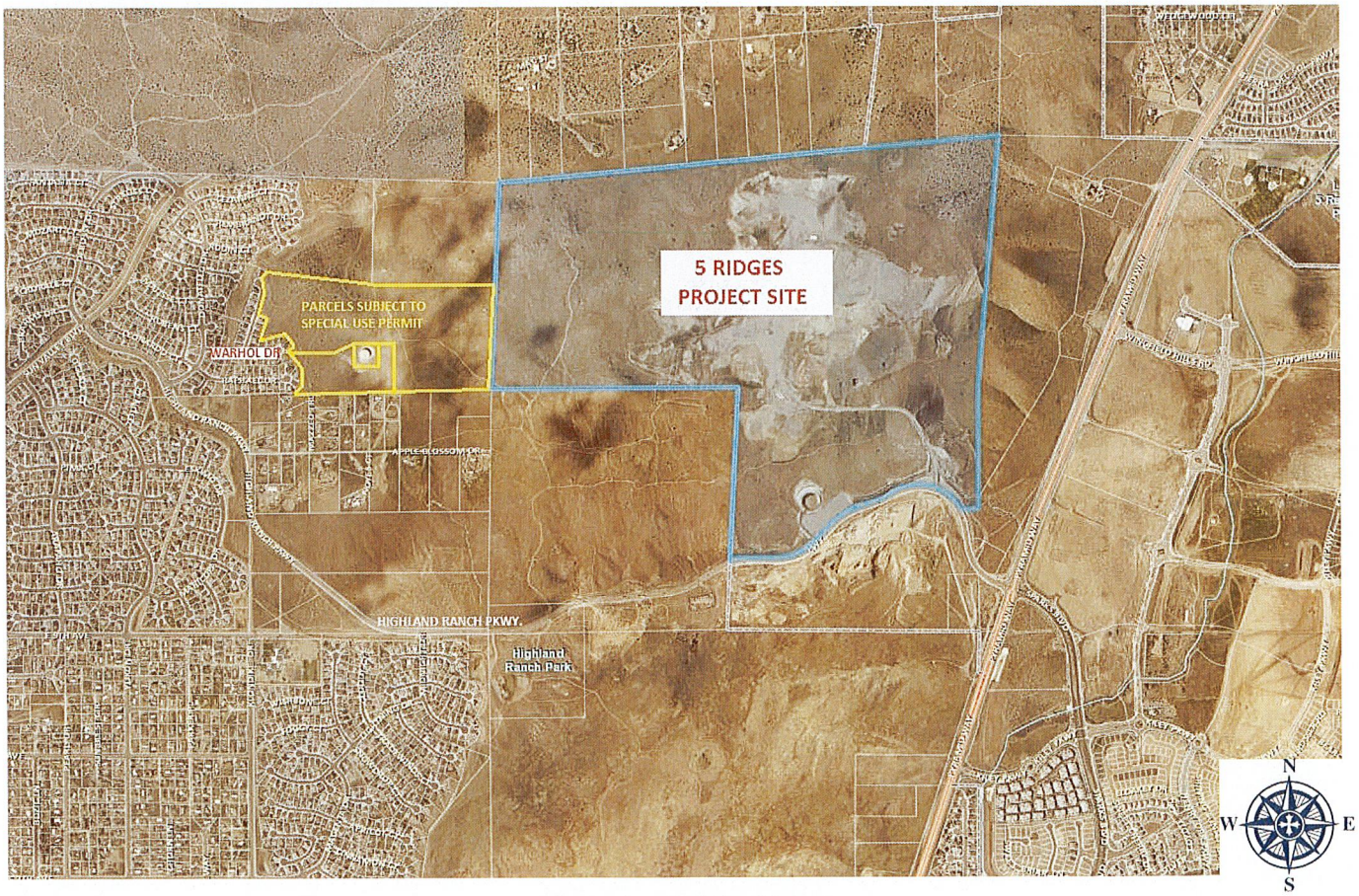

Figure 1 – Vicinity Map

Existing Conditions

Currently, two of the affected parcels are undeveloped (with the exception of an access road) and are owned and maintained by the Highland Ranch Homeowners Association (APN #'s 508-340-01 and 508-350-01). The third parcel (APN # 508-340-02) includes a water tank and is owned and operated by the Sun Valley General Improvement District (GID). Figure 2 (below) depicts the existing onsite conditions.

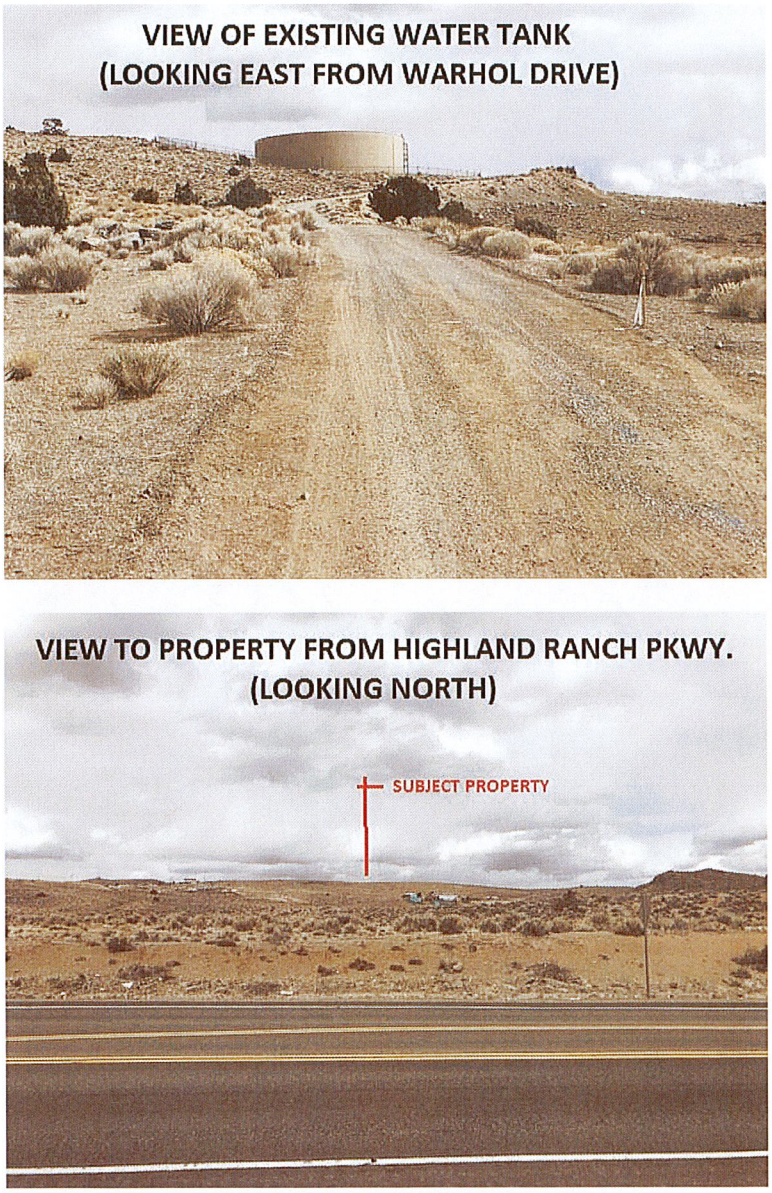

Figure 2 – Existing Conditions

The two parcels owned by the Highland Ranch HOA are zoned Open Space (OS) as they were included as common area with the adjoining final maps (Highland Ranch project). The "tank parcel" is zoned Public/Semi-Public Facility (PSP) reflective of the existing utility use. Figure 3 (below) depicts the existing site zoning and that of surrounding properties.

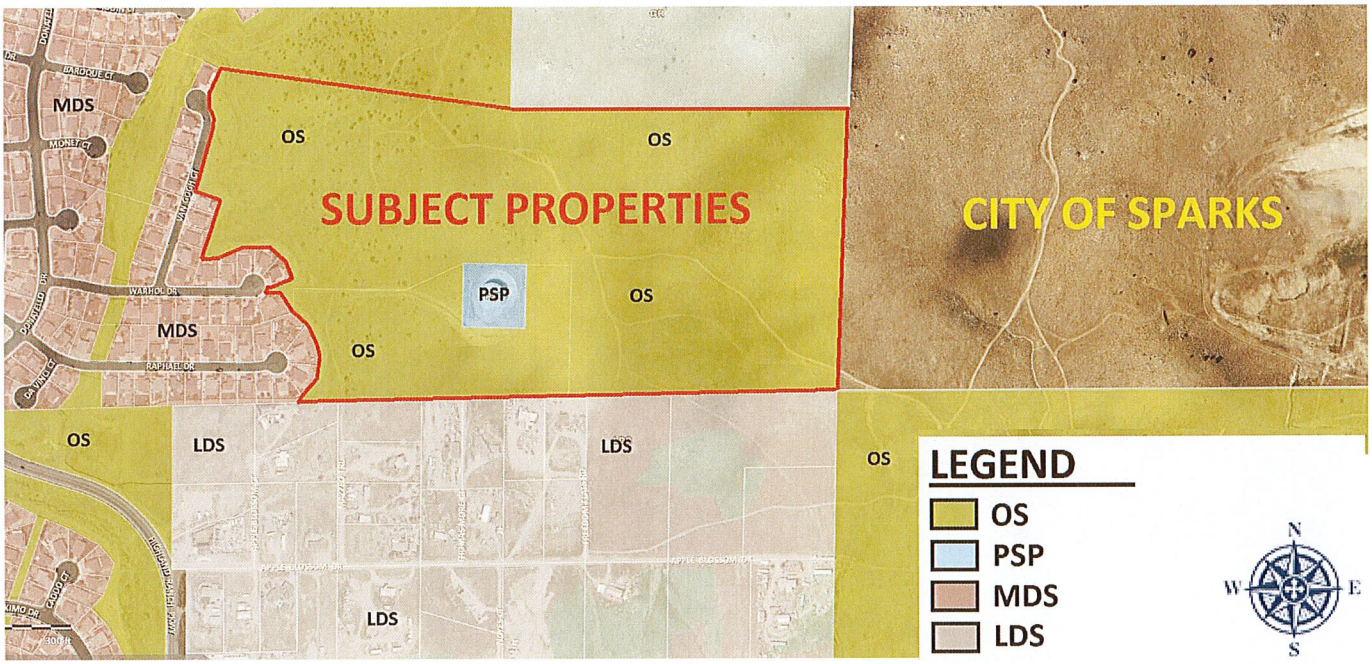

Figure 3 - Zoning

Project Request

The SUP requested with this application will allow for the construction of a 20-wide paved emergency access road that will provide for secondary emergency access to the Five Ridges project which is located directly east of the subject properties, within the City of Sparks. The access road will connect from Warhol Drive, past the existing water tank to a planned roadway within Village 8 of the Five Ridges project.

As part of the roadway construction, it is planned to extend a 16-inch water main from the existing tank into the Five Ridges project. Thus, the proposed access road will allow for secondary project access as well as access to water line infrastructure that will be dedicated to the Sun Valley GID.

Although the Five Ridges project has been reviewed and approved (conceptually) by the City of Sparks, the proposed secondary access connects through the HOA parcels which are located within unincorporated Washoe County and outside of the City of Sparks Sphere of Influence/jurisdiction. Additionally, the current OS zoning of the HOA parcels requires the approval of a SUP to allow for a new utility service to be constructed (16-inch water main). Each of these requests is described below:

- **Emergency/Secondary Access**

The first component of this SUP request is to allow for the construction of a secondary emergency access extending from Warhol Drive to the Five Ridges project. Grading of this road triggers a SUP based on the criteria included within Section 110.438.35 of the Washoe County Development Code. Specifically, the SUP is necessitated by the following code sections:

- Section 110.438.35(a)(1)(ii)(A)

The proposed grading will result in 10,582± cubic yards of cut and 10,267± cubic yards of fill. This exceeds the 5,000 cubic yard threshold established under Section 110.438.35(a)(1)(ii)(A).

- Section 110.438.35(a)(2)(i)(B)

As noted previously, grading will occur on two individual parcels owned by the Highland Ranch HOA. The first parcel (APN # 508-340-01) consists of 10.06± acres of which 1.35± acres are proposed to be disturbed. Therefore, per the provisions of Section 110.438.35(a)(2)(i)(B), more than 10 percent of the total parcel area is being disturbed, triggering a SUP threshold.

- Section 110.438-35(a)(2)(ii)(A)

Similar to Section 110.4385.35(a)(1)(ii)(A), Section (a)(2)(ii)(A) requires the approval of a SUP for disturbance of 1,000 cubic yards or more when grading in areas of slopes in excess of 15%. Both HOA-owned parcels include 15% or greater slopes of which a total of 2.55± acres are being disturbed including approximately 10,600 cubic yards of cut and 10,300 cubic yards of fill in order to accommodate the proposed roadway.

Figure 4 (below) depicts the overall land plan for the Five Ridges project. The proposed access road will connect within Village 8. Figure 5 (following page) depicts the proposed alignment of the access road from Warhol Drive to Five Ridges.

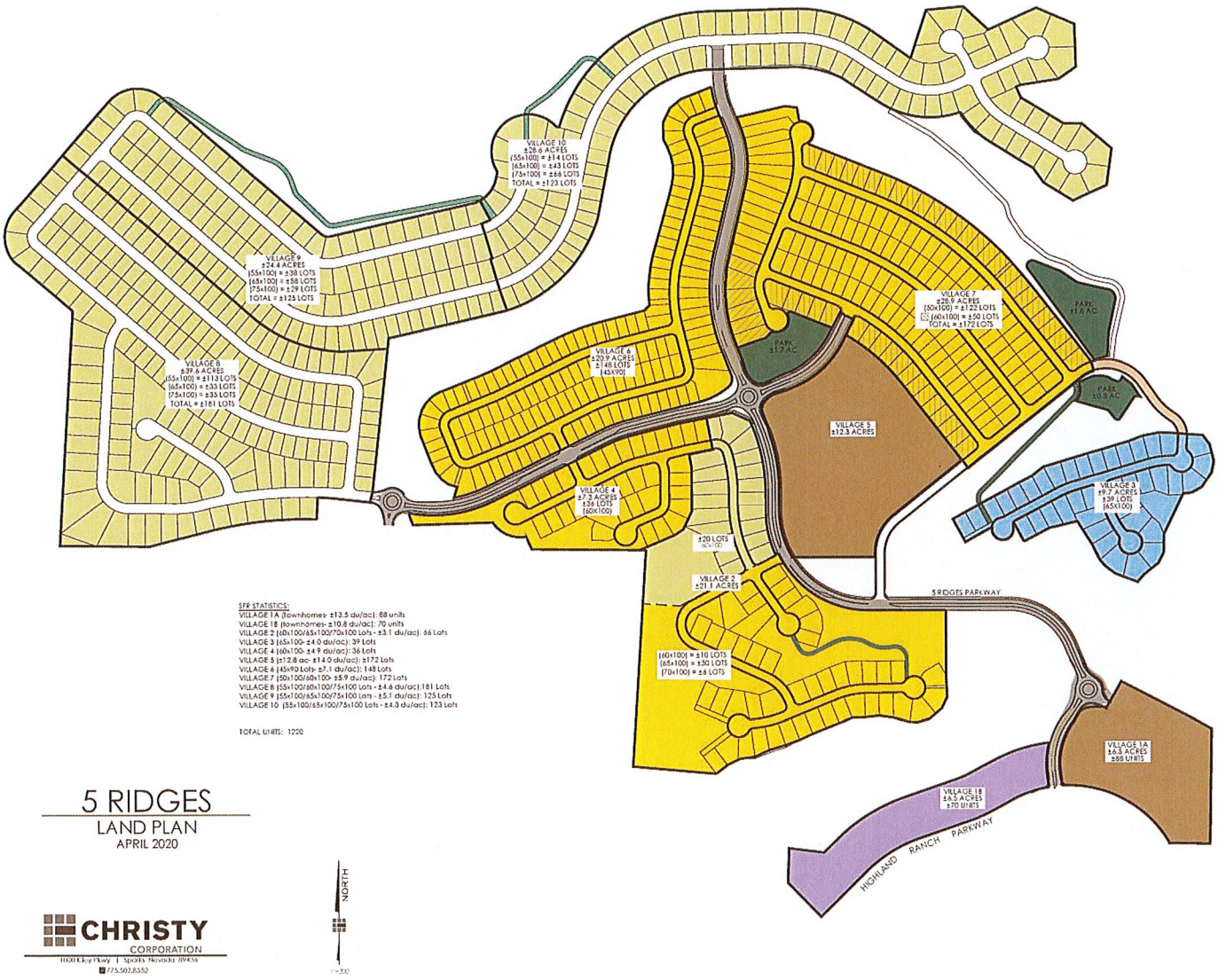

Figure 4 – Five Ridges Land Plan

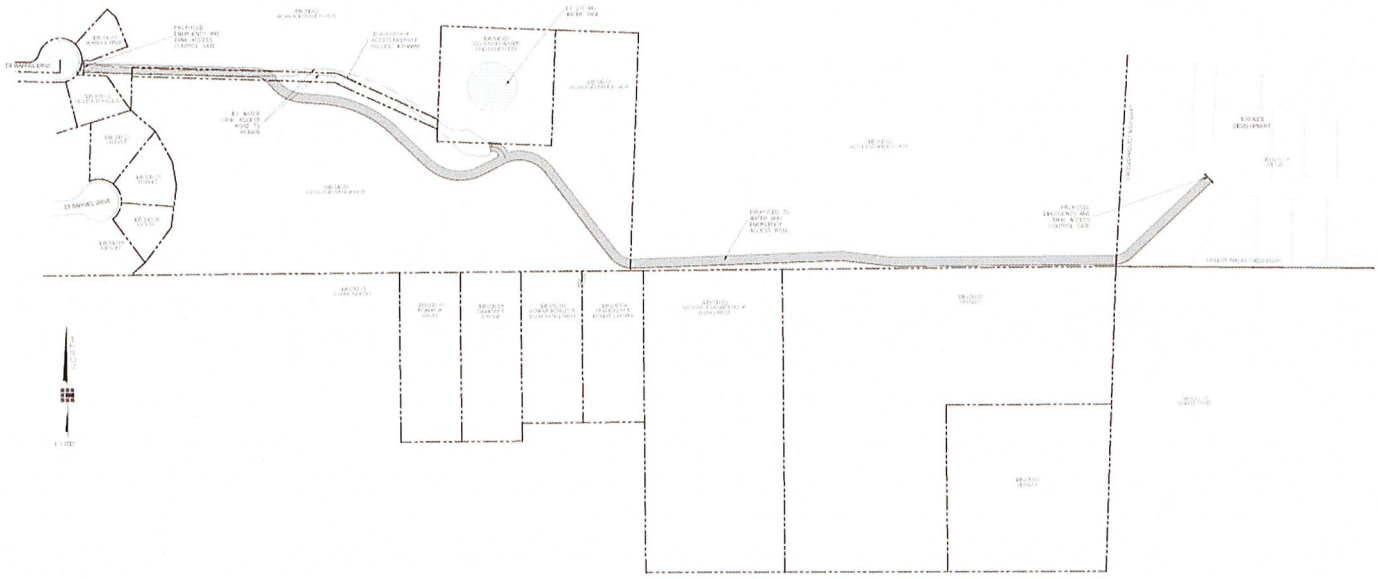

Figure 5 – Emergency Access/Water Line Alignment

As noted previously, for the purposes of this SUP, a total of 10,600± of cut and 10,300± square feet of fill are being proposed and is detailed on the attached engineering plans. The following table summarizes the disturbance within each individual parcel included within this SUP request.

Disturbance Summary

Parcel Number	Owner	Total Parcel Area	Proposed Disturbance
508-340-01	Highland Ranch HOA	10.06± acres	1.35± acres
508-340-02	Sun Valley GID	1.43± acres	0.01± acres
508-350-01	Highland Ranch HOA	51.16± acres	1.20± acres
TOTAL	-----	**62.65± acres**	**2.56± acres**

The proposed access road will be located within a grading, access, and water line easement granted to the developer of Five Ridges by the Highland Ranch HOA. The proposed access road will include a 20-foot paved width and will be gated at both ends. No public access to the road will be permitted. Only emergency responders and the Sun Valley GID will have access to the roadway. Traffic from Five Ridges will utilize Highland Ranch Parkway for primary access (as approved by the City of Sparks). Residents of Five Ridges would only be able to utilize the proposed road during an emergency event such as wildfire, etc.

As depicted in Figure 5, the proposed emergency access and water line retain the same alignment from Warhol Drive and then deviate south of the existing water tank access road which will remain. The road then traverses in a southerly direction to the southern property line where it then heads easterly, paralleling the southern property line of parcel # 508-350-01.

The Five Ridges Homeowners Association will be responsible for the maintenance and upkeep of the roadway and has been conditioned as such by the City of Sparks through an adopted Development Agreement. Additionally, the Washoe County Department of Engineering and Capital Projects has previously submitted a letter to the City of Sparks stating that Washoe County has no objections to a secondary access road that connects to a County street, serving a City of Sparks project (a copy is included in the appendices of this report for reference). Washoe County will have no maintenance obligations whatsoever for the proposed roadway and water line.

As the attached engineering plans depict, the topography of proposed alignment is varied. Grading has been designed to reduce overall visual impacts. Disturbed areas will be revegetated to create a natural post-development appearance. Walls are included as necessary in order to reduce cut slopes. As incorporated into the adjoining Five Ridges project, the geotechnical analysis concludes that the use of 1.5:1 slopes can be incorporated into the project grading. This will further reduce visual scarring and the over all impacts of the grading by reducing required disturbance. The road has been designed to meet City of Sparks secondary access standards and will not exceed 10% grade.

Included as attachments to this report are detailed grading and drainage plans, cross-sections, a cut/fill exhibit, and slope analysis that clearly depict the grading proposed. Additionally, a preliminary hydrology report and a copy of the geotechnical investigation are included for Washoe County review.

- **Utility Service**

The second component to this SUP request is to allow for a utility service to be located within the OS regulatory zone, per Section 110.302.05 and Table 110.302.05.1 of the Washoe County Development Code. In the case of Five Ridges, the utility service proposed is a 16-inch water main that will run from the existing Sun Valley GID water tank east of Warhol Drive to the Five Ridges project to the east.

The water line will follow the proposed secondary access road alignment and essentially creates no impact since it will be located underground. Thus, the grading associated with the access road will fully accommodate the proposed water infrastructure upgrades. As shown in Figure 5, a vehicular access connection from the new road to the tank site (connecting with the existing tank access road) is provided for maintenance purposes.

Special Use Permit Findings

The Washoe County Development Code includes findings that must be made in order to approve a Special Use Permit request. These findings are listed below and are addressed in **bold face** type.

1. Consistency. The granting of the Special Use permit is consistent with the policies and maps of the Comprehensive Plan Elements and the Area Plan in which the property is located.

The proposed secondary access road and water line are consistent with the land use and policies included in the Sun Valley Area Plan in terms of land use, allowed uses, etc. The project will have zero impact in terms of traffic, noise, congestion, etc. The road is strictly for emergency purposes only. As depicted on the attached plans, grading has been designed to blend with the surrounding area, reduce visual impacts, etc.

2. Adequate Public Facilities. Adequate utilities, roadway improvements, sanitation, water supply, drainage, and other necessary facilities must exist or will be provided.

In general, this finding is not applicable to the SUP request being considered. The new water line and access road will ensure that the Five Ridges project (located within the City of Sparks) has proper secondary emergency access as well as water infrastructure to allow service from the Sun Valley General Improvement District. A detailed drainage study is included as an attachment to this report demonstrating compliance with all applicable Washoe County standards and policies and ensures that drainage impacts to surrounding properties will not occur.

3. Site Suitability. The site must be physically suitable for the proposed use and for the intensity of development.

As noted previously, this SUP will allow for the construction a new access road and water line only. Although the roadway will traverse varying terrain, it has been designed to reduce the amount of required grading (as feasible) and includes design elements to reduce visual scarring and retain a natural post-development appearance.

4. Issuance Not Detrimental. Issuance of the permit may not be significantly detrimental to the public health, safety or welfare; have a detrimental impact on adjacent properties; or be detrimental to the character of the surrounding area.

The project is not anticipated to generate negative impacts and will not result in any intensification within the Sun Valley Area Plan in terms of traffic, density, noise, etc. The roadway will only be used for emergency access and utility maintenance and will be gated at both ends to restrict public access. It can be reasonable argued that the roadway will have a positive benefit by providing another means of fire access to access the wildland areas that abut the property to the north, benefiting parcels to the south. Revegetation and natural contouring of cut/fill slopes will ensure a natural post-development appearance.

APPENDICES

Washoe County Development Application

Your entire application is a public record. If you have a concern about releasing personal information, please contact Planning and Building staff at 775.328.6100.

Project Information	**Staff Assigned Case No.:** _____
Project Name: **Five Ridges**	
Project Description: A SUP to allow for "major grading" per Section 110.438.35 of the Development Code and for utility services within the OS zone.	
Project Address: Eastern terminus of Warhol Dr., north of Apple Blossom Dr.	
Project Area (acres or square feet): 62.56 acres	
Project Location (with point of reference to major cross streets **AND** area locator): East of Warhol Dr., North of Highland Ranch Pkwy. and Apple Blossom Dr. See attached vicinity map.	

Assessor's Parcel No.(s):	Parcel Acreage:	Assessor's Parcel No.(s):	Parcel Acreage:
508-340-01	10.06 acres	508-340-02	1.43 acres
508-350-01	51.16 acres		

Indicate any previous Washoe County approvals associated with this application:
Case No.(s).

Applicant Information (attach additional sheets if necessary)

Property Owner:		**Professional Consultant:**	
Name: See attached list		Name: Christy Corporation, Ltd.	
Address:		Address: 1000 Kiley Pkwy.	
	Zip:	Sparks, NV	Zip: 89436
Phone:	Fax:	Phone: (775) 502-8552	Fax:
Email:		Email: mike@christynv.com	
Cell:	Other:	Cell: (775) 250-3455	Other:
Contact Person:		Contact Person: Mike Railey	
Applicant/Developer:		**Other Persons to be Contacted:**	
Name: QK, LLC		Name:	
Address: 1 E. Liberty St., Suite 444		Address:	
Reno, NV	Zip: 89501		Zip:
Phone: (775) 323-1405	Fax:	Phone:	Fax:
Email: blake@s3devco.com		Email:	
Cell: (775) 772-9295	Other:	Cell:	Other:
Contact Person: Blake Smith		Contact Person:	

For Office Use Only

Date Received:	Initial:	Planning Area:	
County Commission District:		Master Plan Designation(s):	
CAB(s):		Regulatory Zoning(s):	

List of Property Owners:

APN #'s 508-340-01 and 508-350-01

Highland Ranch Homeowners Association

5860 Lighting Dr.

Sun Valley, NV 89433

(775) 673-0500

Contact: Tammy Leonard

APN # 508-340-02

Sun Valley Water and Sanitation (GID)

5000 Sun Valley Blvd.

Sun Valley, NV 89433

(775) 673-2220

Contact: Jon Combs

Property Owner Affidavit

Applicant Name: QK, LLC.

The receipt of this application at the time of submittal does not guarantee the application complies with all requirements of the Washoe County Development Code, the Washoe County Master Plan or the applicable area plan, the applicable regulatory zoning, or that the application is deemed complete and will be processed.

STATE OF NEVADA)
)
COUNTY OF WASHOE)

I, Tammy L. Leonard,
(please print name)

being duly sworn, depose and say that I am the owner* of the property or properties involved in this application as listed below and that the foregoing statements and answers herein contained and the information herewith submitted are in all respects complete, true, and correct to the best of my knowledge and belief. I understand that no assurance or guarantee can be given by members of Planning and Building.

(A separate Affidavit must be provided by each property owner named in the title report.)

Assessor Parcel Number(s): 508-340-01, 508-350-01

Printed Name Tammy L. Leonard

Signed Tammy Leonard

Address 5820 Lighting ct

Subscribed and sworn to before me this 9th day of April, 2020.

Notary Public in and for said county and state

My commission expires: 5-22-2023

(Notary Stamp)

Alexandra Joy Dewees
Notary Public, State of Nevada
Certificate No: 19-5473-02
My Comm. Expires 05-22-2023

*Owner refers to the following: (Please mark appropriate box.)

- ☐ Owner
- ■ Corporate Officer/Partner (Provide copy of record document indicating authority to sign.)
- ☐ Power of Attorney (Provide copy of Power of Attorney.)
- ☐ Owner Agent (Provide notarized letter from property owner giving legal authority to agent.)
- ☐ Property Agent (Provide copy of record document indicating authority to sign.)
- ☐ Letter from Government Agency with Stewardship

Property Owner Affidavit

Applicant Name: QK LLC

The receipt of this application at the time of submittal does not guarantee the application complies with all requirements of the Washoe County Development Code, the Washoe County Master Plan or the applicable area plan, the applicable regulatory zoning, or that the application is deemed complete and will be processed.

STATE OF NEVADA)
)
COUNTY OF WASHOE)

I, Jon Combs, General Manager,
(please print name)

being duly sworn, depose and say that I am the owner* of the property or properties involved in this application as listed below and that the foregoing statements and answers herein contained and the information herewith submitted are in all respects complete, true, and correct to the best of my knowledge and belief. I understand that no assurance or guarantee can be given by members of Planning and Building.

(A separate Affidavit must be provided by each property owner named in the title report.)

Assessor Parcel Number(s): 508-340-02

Printed Name Jon Combs

Signed Jon Combs

Address 5000 Sun Valley Blvd.

Jennifer Merritt

Subscribed and sworn to before me this 9th day of March, 2020.

(Notary Stamp)

Washoe County, Nevada
Notary Public in and for said county and state

My commission expires: January 13, 2022

JENNIFER MERRITT
Notary Public - State of Nevada
Appointment Recorded in Washoe County
No: 06-102225-2 - Expires Jan. 13, 2022

*Owner refers to the following: (Please mark appropriate box.)

- ❑ Owner
- ❑ Corporate Officer/Partner (Provide copy of record document indicating authority to sign.)
- ❑ Power of Attorney (Provide copy of Power of Attorney.)
- ❑ Owner Agent (Provide notarized letter from property owner giving legal authority to agent.)
- ❑ Property Agent (Provide copy of record document indicating authority to sign.)
- ❑ Letter from Government Agency with Stewardship

Special Use Permit Application
Supplemental Information

(All required information may be separately attached)

1. What is the project being requested?

   This SUP will allow for grading to accommodate an emergency access road for the Five Ridges project located within the City of Sparks, as well as allow for a new utility service (16" water line) to be located within the OS zone. Refer to attached report for a detailed description.

2. Provide a site plan with all existing and proposed structures (e.g. new structures, roadway improvements, utilities, sanitation, water supply, drainage, parking, signs, etc.)

   Refer to attached report, site plan, and engineering plans.

3. What is the intended phasing schedule for the construction and completion of the project?

   The project will be completed in a single phase.

4. What physical characteristics of your location and/or premises are especially suited to deal with the impacts and the intensity of your proposed use?

   The proposed roadway has been designed to reduce impacts to the extent possible. Cut/fill slopes will be blended with the natural topography and revegetation will occur in accordance with County requirements. Refer to attached report for details.

5. What are the anticipated beneficial aspects or affects your project will have on adjacent properties and the community?

   The new road will provide emergency access and water service to the Five Ridges project while enhancing wildfire protection for properties to the south by providing for additional access to wildland areas.

6. What are the anticipated negative impacts or affect your project will have on adjacent properties? How will you mitigate these impacts?

   The project is not anticipated to generate negative impacts. All visual impacts will be properly mitigated. Refer to attached report for a detailed analysis.

7. Provide specific information on landscaping, parking, type of signs and lighting, and all other code requirements pertinent to the type of use being purposed. Show and indicate these requirements on submitted drawings with the application.

   10,600 CY of cut and 10,300 CY of fill. Refer to attached cut/fill map and grading plan.

8. Are there any restrictive covenants, recorded conditions, or deed restrictions (CC&Rs) that apply to the area subject to the special use permit request? (If so, please attach a copy.)

☐ Yes	■ No

9. Utilities:

a. Sewer Service	City of Sparks
b. Electrical Service	NV Energy
c. Telephone Service	AT&T or Charter Communications
d. LPG or Natural Gas Service	NV Energy
e. Solid Waste Disposal Service	Waste Management
f. Cable Television Service	AT&T or Charter Communications
g. Water Service	Sun Valley GID

For most uses, Washoe County Code, Chapter 110, Article 422, Water and Sewer Resource Requirements, requires the dedication of water rights to Washoe County. Please indicate the type and quantity of water rights you have available should dedication be required.

h. Permit #		acre-feet per year	
i. Certificate #		acre-feet per year	
j. Surface Claim #		acre-feet per year	
k. Other #		acre-feet per year	

Title of those rights (as filed with the State Engineer in the Division of Water Resources of the Department of Conservation and Natural Resources).

Natural revegetation and recontouring will be used to blend disturbed areas with the natural environment.

10. Community Services (provided and nearest facility):

a. Fire Station	TMFPD Sun Valley Station/City of Sparks Station # 5
b. Health Care Facility	Renown Regional Medical Center
c. Elementary School	Sepulveda Elementary
d. Middle School	Shaw Middle
e. High School	Spanish Springs High
f. Parks	Lazy 5 Regional Park
g. Library	Washoe County Spanish Springs Branch
h. Citifare Bus Stop	Sun Valley Blvd.

Special Use Permit Application
for Grading
Supplemental Information

(All required information may be separately attached)

1. What is the purpose of the grading?

   The proposed grading will allow for a secondary/emergency access road for the Five Ridges project within the City of Sparks to the east, as well as a new 16" water main. Refer to attached report for a detailed description.

2. How many cubic yards of material are you proposing to excavate on site?

   10,600 CY of cut and 10,300 CY of fill. Refer to attached cut/fill map and grading plan.

3. How many square feet of surface of the property are you disturbing?

   Approximately 111,514 sq.ft. (2.56 acres)

4. How many cubic yards of material are you exporting or importing? If none, how are you managing to balance the work on-site?

   It is planned to balance the earthwork onsite, as detailed on the attached grading plan.

5. Is it possible to develop your property without surpassing the grading thresholds requiring a Special Use Permit? (Explain fully your answer.)

   No. Given the distance between Warhol Drive and the Five Ridges boundary, a grading SUP will be triggered regardless of how the road is designed/located.

6. Has any portion of the grading shown on the plan been done previously? (If yes, explain the circumstances, the year the work was done, and who completed the work.)

   A portion of the roadway leading from Warhol Drive to the Sun Valley GID water tank already exists. Refer to attached engineering plans.

7. Have you shown all areas on your site plan that are proposed to be disturbed by grading? (If no, explain your answer.)

   Yes. Refer to attached engineering plans.

8. Can the disturbed area be seen from off-site? If yes, from which directions and which properties or roadways?

Portions of the proposed roadway will be visible. Refer to attached plans and cross-sections for specifics.

9. Could neighboring properties also be served by the proposed access/grading requested (i.e. if you are creating a driveway, would it be used for access to additional neighboring properties)?

This proposed roadway will be for emergency access only. However, the road will enhance emergency access in general within the area to the benefit of adjoining properties.

10. What is the slope (horizontal/vertical) of the cut and fill areas proposed to be? What methods will be used to prevent erosion until the revegetation is established?

Refer to attached grading plan. Disturbed areas will be blended with natural terrain and revegetated. Walls will be used as necessary. Additioanlly, geotechnical conditions will allow for the use of 1.5:1 slopes in some areas.

11. Are you planning any berms?

Yes	NoXX	If yes, how tall is the berm at its highest?

12. If your property slopes and you are leveling a pad for a building, are retaining walls going to be required? If so, how high will the walls be and what is their construction (i.e. rockery, concrete, timber, manufactured block)?

Not applicable.

13. What are you proposing for visual mitigation of the work?

Natural revegetation and recontouring will be used to blend disturbed areas with the natural environment.

14. Will the grading proposed require removal of any trees? If so, what species, how many and of what size?

Not applicable.

15. What type of revegetation seed mix are you planning to use and how many pounds per acre do you intend to broadcast? Will you use mulch and, if so, what type?

Seed mix will be per Washoe County standards and best management practices.

16. How are you providing temporary irrigation to the disturbed area?

Temporary irrigation, if necessary, will be extended from the Five Ridges project to the east.

17. Have you reviewed the revegetation plan with the Washoe Storey Conservation District? If yes, have you incorporated their suggestions?

Not at this point. Any comments received can be conditioned, as appropriate.

18. Are there any restrictive covenants, recorded conditions, or deed restrictions (CC&Rs) that may prohibit the requested grading?

Yes	NoXX	If yes, please attach a copy.

Washoe County Treasurer
P.O. Box 30039, Reno, NV 89520-3039
ph: (775) 328-2510 fax: (775) 328-2500
Email: tax@washoecounty.us

Washoe County Treasurer
Tammi Davis

Account Detail

Back to Account Detail | Change of Address | Print this Page

CollectionCart

	Items	Total	
Collection Cart	0	$0.00	Checkout View

Pay Online

No payment due for this account.

Washoe County Parcel Information

Parcel ID	Status	Last Update
50834001	Active	4/14/2020 2:08:35 AM

Current Owner:
HIGHLAND RANCH HOA

5860 LIGHTNING DR
SUN VALLEY, NV 89433

SITUS:
0 RAPHAEL DR
WCTY NV

Taxing District
4020

Geo CD:

Legal Description

SubdivisionName STONE CREST PHASE 1 Range 20 Township 20

Tax Bill (Click on desired tax year for due dates and further details)

Tax Year	Net Tax	Total Paid	Penalty/Fees	Interest	Balance Due
2019	$0.00	$0.00	$0.00	$0.00	$0.00
2018	$0.00	$0.00	$0.00	$0.00	$0.00
2017	$0.00	$0.00	$0.00	$0.00	$0.00
2016	$0.00	$0.00	$0.00	$0.00	$0.00
2015	$0.00	$0.00	$0.00	$0.00	$0.00
				Total	$0.00

Disclaimer

- ALERTS: If your real property taxes are delinquent, the search results displayed may not reflect the correct amount owing. Please contact our office for the current amount due.
- For your convenience, online payment is available on this site. E-check payments are accepted without a fee. However, a service fee does apply for online credit card payments. See Payment Information for details.

Pay By Check

Please make checks payable to:
WASHOE COUNTY TREASURER

Mailing Address:
P.O. Box 30039
Reno, NV 89520-3039

Overnight Address:
1001 E. Ninth St., Ste D140
Reno, NV 89512-2845

Payment Information

Special Assessment District

Installment Date Information

Assessment Information

Washoe County Treasurer
P.O. Box 30039, Reno, NV 89520-3039
ph: (775) 328-2510 fax: (775) 328-2500
Email: tax@washoecounty.us

Washoe County Treasurer
Tammi Davis

Account Detail

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CollectionCart

	Items	Total	
Collection Cart	0	$0.00	Checkout View

Pay Online

No payment due for this account.

Washoe County Parcel Information

Parcel ID	Status	Last Update
50834002	Active	4/14/2020 2:08:35 AM

Current Owner:
SUN VALLEY WATER & SANITATION

5000 SUN VALLEY BLVD
SUN VALLEY, NV 89433

SITUS:
0 SUN VALLEY BLVD
WASHOE COUNTY NV

Taxing District
4020

Geo CD:

Legal Description

Range 20 Township 20 SubdivisionName _UNSPECIFIED Section 8 Block Lot

Tax Bill (Click on desired tax year for due dates and further details)

Tax Year	Net Tax	Total Paid	Penalty/Fees	Interest	Balance Due
2019	$0.00	$0.00	$0.00	$0.00	$0.00
2018	$0.00	$0.00	$0.00	$0.00	$0.00
2017	$0.00	$0.00	$0.00	$0.00	$0.00
2016	$0.00	$0.00	$0.00	$0.00	$0.00
2015	$0.00	$0.00	$0.00	$0.00	$0.00
				Total	$0.00

Disclaimer

- ALERTS: If your real property taxes are delinquent, the search results displayed may not reflect the correct amount owing. Please contact our office for the current amount due.
- For your convenience, online payment is available on this site. E-check payments are accepted without a fee. However, a service fee does apply for online credit card payments. See Payment Information for details.

Pay By Check

Please make checks payable to:
WASHOE COUNTY TREASURER

Mailing Address:
P.O. Box 30039
Reno, NV 89520-3039

Overnight Address:
1001 E. Ninth St., Ste D140
Reno, NV 89512-2845

Payment Information

Special Assessment District

Installment Date Information

Assessment Information

Washoe County Treasurer
P.O. Box 30039, Reno, NV 89520-3039
ph: (775) 328-2510 fax: (775) 328-2500
Email: tax@washoecounty.us

Washoe County Treasurer
Tammi Davis

Account Detail

Back to Account Detail | Change of Address | Print this Page

CollectionCart

	Items	Total	
Collection Cart	0	$0.00	Checkout View

Pay Online

No payment due for this account.

Washoe County Parcel Information

Parcel ID	Status	Last Update
50835001	Active	4/14/2020 2:08:35 AM

Current Owner:
HIGHLAND RANCH HOA

5860 LIGHTNING DR
SUN VALLEY, NV 89433

SITUS:
0 UNSPECIFIED
WCTY NV

Taxing District
4020

Geo CD:

Legal Description

SubdivisionName STONE CREST PHASE 2 Lot A Range 20 Township 20

Tax Bill (Click on desired tax year for due dates and further details)

Tax Year	Net Tax	Total Paid	Penalty/Fees	Interest	Balance Due
2019	$0.00	$0.00	$0.00	$0.00	$0.00
2018	$0.00	$0.00	$0.00	$0.00	$0.00
2017	$0.00	$0.00	$0.00	$0.00	$0.00
2016	$0.00	$0.00	$0.00	$0.00	$0.00
2015	$0.00	$0.00	$0.00	$0.00	$0.00
				Total	$0.00

Disclaimer

- ALERTS: If your real property taxes are delinquent, the search results displayed may not reflect the correct amount owing. Please contact our office for the current amount due.
- For your convenience, online payment is available on this site. E-check payments are accepted without a fee. However, a service fee does apply for online credit card payments. See Payment Information for details.

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Reno, NV 89520-3039

Overnight Address:
1001 E. Ninth St., Ste D140
Reno, NV 89512-2845

Payment Information

Special Assessment District

Installment Date Information

Assessment Information

WASHOE COUNTY
COMMUNITY SERVICES DEPARTMENT
Engineering & Capital Projects

1001 EAST 9TH STREET
PO BOX 11130
RENO, NEVADA 89520-0027
PHONE (775) 328.3600
FAX (775) 328.3699

March 10, 2020

Armando Ornelas
Assistant Community Services Director
City of Sparks
431 Prater Way
Sparks, Nevada 89431

RE: 5 Ridges Residential Development
Secondary Emergency Access to Cezanne Court.

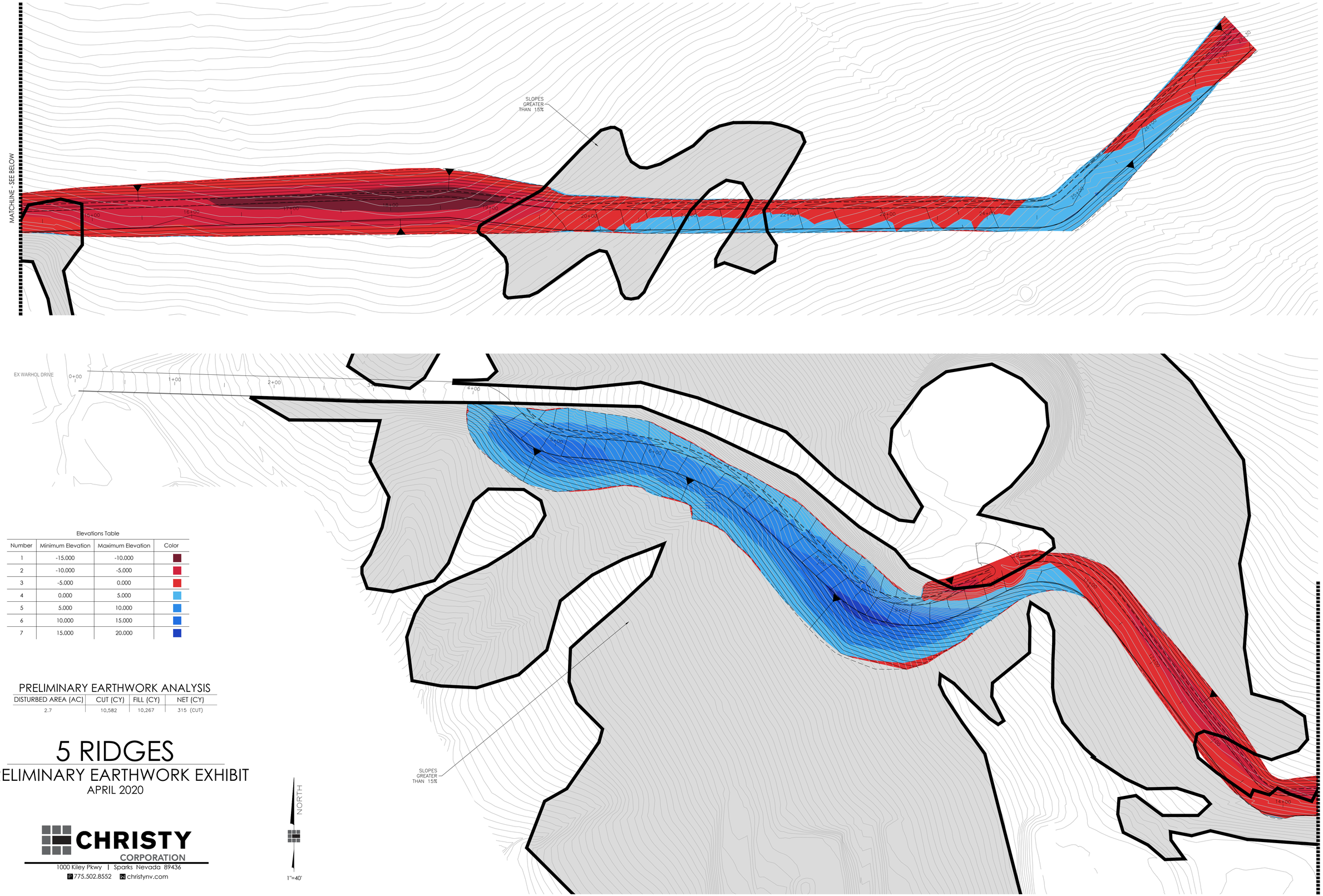
Washoe County understands that the proposed development has been designed to provide for a secondary emergency access onto Cezanne Court, an existing Washoe County roadway located to the west of the development. We further understand that the emergency access roadway will be designed to City of Sparks standards and will be gated at a location prior to its connection to Cezanne Court and that the connection will be for emergency use only. We also understand the roadway and gate will be owned and maintained by the 5 Ridges Development homeowners association. It is also understood that the Highland Ranch HOA, the underlying property owner for a portion of the emergency access roadway, has provided the required permissions for the use of their property.

With this understanding Washoe County has no objections with this gated secondary emergency access.

Respectfully,

Dwayne Smith, P.E.
Director of Engineering and Capital Projects Division/County Engineer

Cc: Jennifer Heeran, P.E., Washoe County
Mike Railey – Christy Corporation
file



Elevations Table

Number	Minimum Elevation	Maximum Elevation	Color
1	-15.000	-10.000	
2	-10.000	-5.000	
3	-5.000	0.000	
4	0.000	5.000	
5	5.000	10.000	
6	10.000	15.000	
7	15.000	20.000	

PRELIMINARY EARTHWORK ANALYSIS

DISTURBED AREA (AC)	CUT (CY)	FILL (CY)	NET (CY)
2.7	10,582	10,267	315 (CUT)

5 RIDGES

PRELIMINARY EARTHWORK EXHIBIT

APRIL 2020

CHRISTY CORPORATION
1000 Kiley Pkwy | Sparks Nevada 89436
P 775.502.8552 W christynv.com

NORTH

1"=40'

SPECIAL USE PERMIT FOR
5 RIDGES WATER MAIN & EMERGENCY ACCESS ROAD
WASHOE COUNTY, NEVADA
SECTION 9 TOWNSHIP 20 N RANGE 20 E

APRIL 2020

FIVE RIDGES

APPLICANT/DEVELOPER

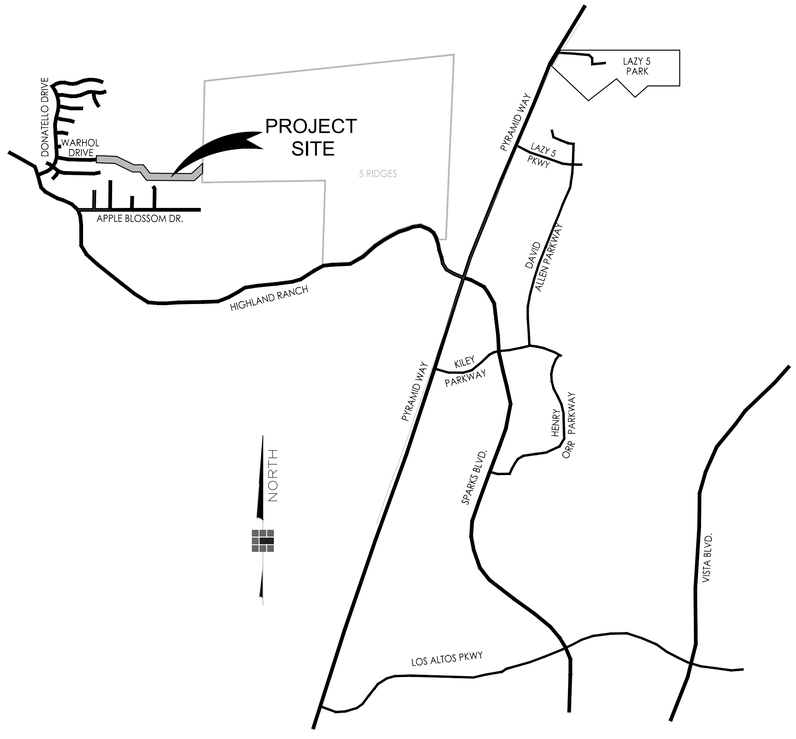
5 RIDGES DEVELOPMENT COMPANY, INC.
ATTN: BLAKE SMITH
EAST LIBERTY, SUITE 444
RENO, NV 89501
(775) 323-1405

CIVIL ENGINEER/PLANNER/SURVEYOR

CHRISTY CORPORATION
ATTN: DANIEL MANGUSO, P.E.
1000 KILEY PARKWAY
SPARKS, NV 89436
(775) 502-8552

GEOTECHNICAL ENGINEER

BLACK EAGLE CONSULTING, INC.
1345 CAPITAL BOULEVARD, SUITE A
RENO, NV 89502
(775) 359-6600



VICINITY MAP
NOT TO SCALE

ENGINEERS STATEMENT:

THESE PLANS, SHEETS T-1 THROUGH CS-2, HAVE BEEN PREPARED IN ACCORDANCE WITH ACCEPTED ENGINEERS PROCEDURES AND GUIDELINES, AND ARE IN SUBSTANTIAL COMPLIANCE WITH APPLICABLE STATUTES, COUNTY ORDINANCES AND STANDARDS. IN THE EVENT OF A CONFLICT BETWEEN ANY PORTION OF THESE PLANS AND WASHOE COUNTY STANDARDS, THE STANDARDS SHALL APPLY.

DANIEL L. MANGUSO, P.E. 23930
CHRISTY CORPORATION

BASIS OF ELEVATIONS

THE MONUMENT WW3023, AS PUBLISHED BY THE CITY OF SPARKS, PER RECORD OF SURVEY MAP NO. 3396, FILE NO. 2190787, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA. ELEVATION = 4714.25

BASIS OF BEARINGS

NEVADA STATE PLANE COORDINATE SYSTEM, WEST ZONE (NAD83), AS DETERMINED FROM THE RECORD POSITIONS OF THE MONUMENTS SHOWN AS "WW3020" AND "WW3023" USING THE COORDINATES AS PUBLISHED BY THE CITY OF SPARKS, PER RECORD OF SURVEY MAP NO. 3396, FILE NO. 2190787, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA. (I.E. N03°22'08"E)

SHEET INDEX

ISSUED FOR PERMIT

STATE OF NEVADA — DANIEL L. MANGUSO — No. 23930 — PROFESSIONAL ENGINEER — 04/15/2020

CHRISTY CORPORATION
1000 Kiley Pkwy | Sparks Nevada 89436
P 775.502.8552 | christynv.com

REV.	DATE	DESCRIPTION	BY

SPECIAL USE PERMIT PLANS FOR
5 RIDGES - WATER MAIN & ACCESS ROAD
TITLE SHEET
5 RIDGES DEVELOPMENT COMPANY, INC. WASHOE COUNTY, NEVADA

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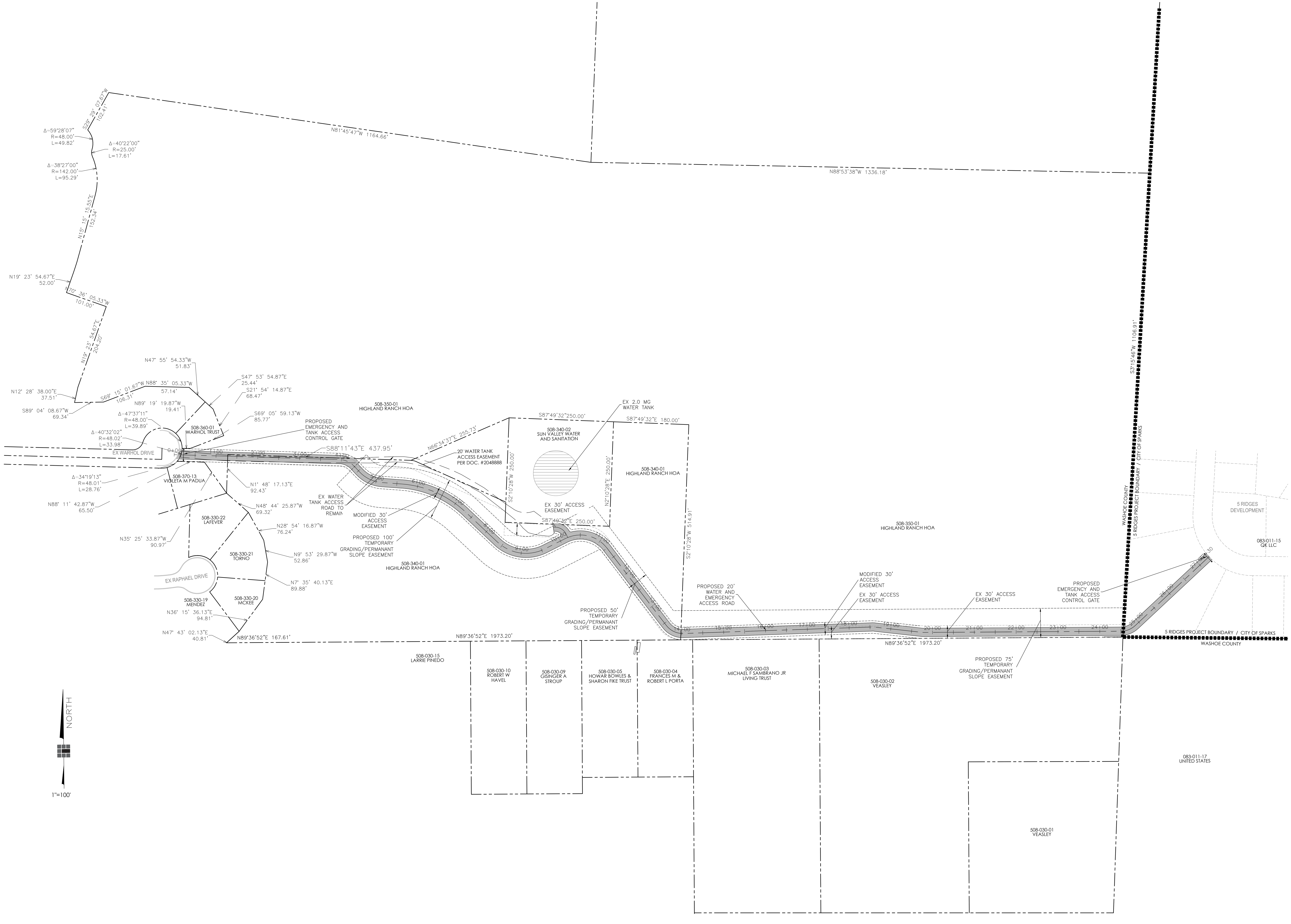
Date:	4/15/2020
Designed by:	DLM
Checked by:	DLM
Job No.	1532.007

DRAWING
T-1

SHEET 1 OF 9

\\cc-dc1\Profiles\dmanguso\Desktop\sup\03-SR-SUP - GRADING.dwg 4/14/20 5:52pm dmanguso



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ISSUED FOR PERMIT

DANIEL L. MANGUSO
Exp. 12-31-21
CIVIL
No. 23900
04/15/2020

CHRISTY CORPORATION

1000 Kiley Pkwy | Sparks Nevada 89436
775.502.8552 christynv.com

REV.	DATE	DESCRIPTION	BY

SPECIAL USE PERMIT PLANS FOR 5 RIDGES - WATER MAIN & ACCESS ROAD

SITE PLAN

5 RIDGES DEVELOPMENT COMPANY, INC. WASHOE COUNTY, NEVADA

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Date:	4/15/2020
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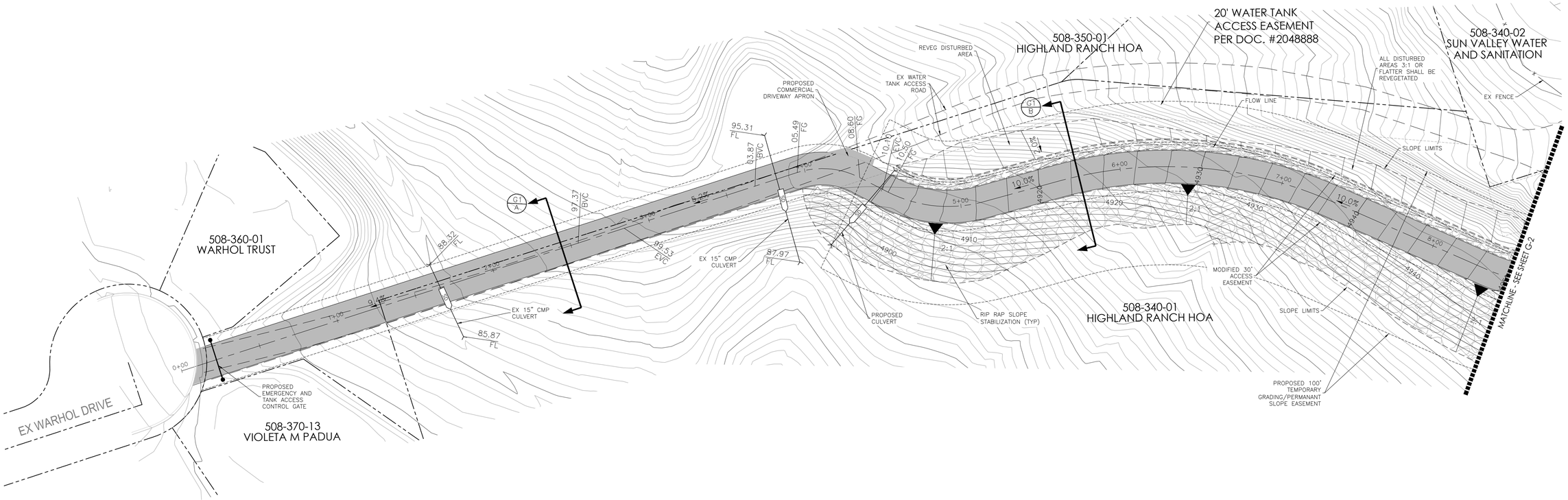
DRAWING

S-1



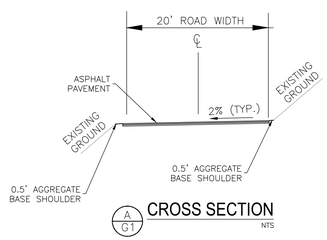
NORTH

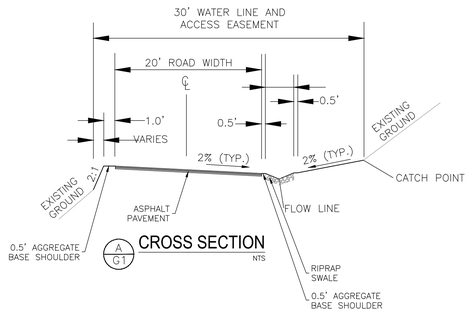
1"=30'

PRELIMINARY EARTHWORK ANALYSIS

DISTURBED AREA (AC)	CUT (CY)	FILL (CY)	NET (CY)
2.7	10,582	10,267	315 (CUT)

NOTE: EXPORT WILL BE TRANSPORTED TO 5 RIDGES APN 083-011-15





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ISSUED FOR PERMIT

DANIEL L. MANGUSO
STATE OF NEVADA
PROFESSIONAL ENGINEER
No. 23934
Exp. 12-31-21
CIVIL
04/15/2020

CHRISTY CORPORATION
1000 Kiley Pkwy | Sparks Nevada 89436
P 775.502.8552 | christynv.com

REV.	DATE	DESCRIPTION	BY

SPECIAL USE PERMIT PLANS FOR
5 RIDGES - WATER MAIN & ACCESS ROAD
GRADING PLAN
5 RIDGES DEVELOPMENT COMPANY, INC. WASHOE COUNTY, NEVADA

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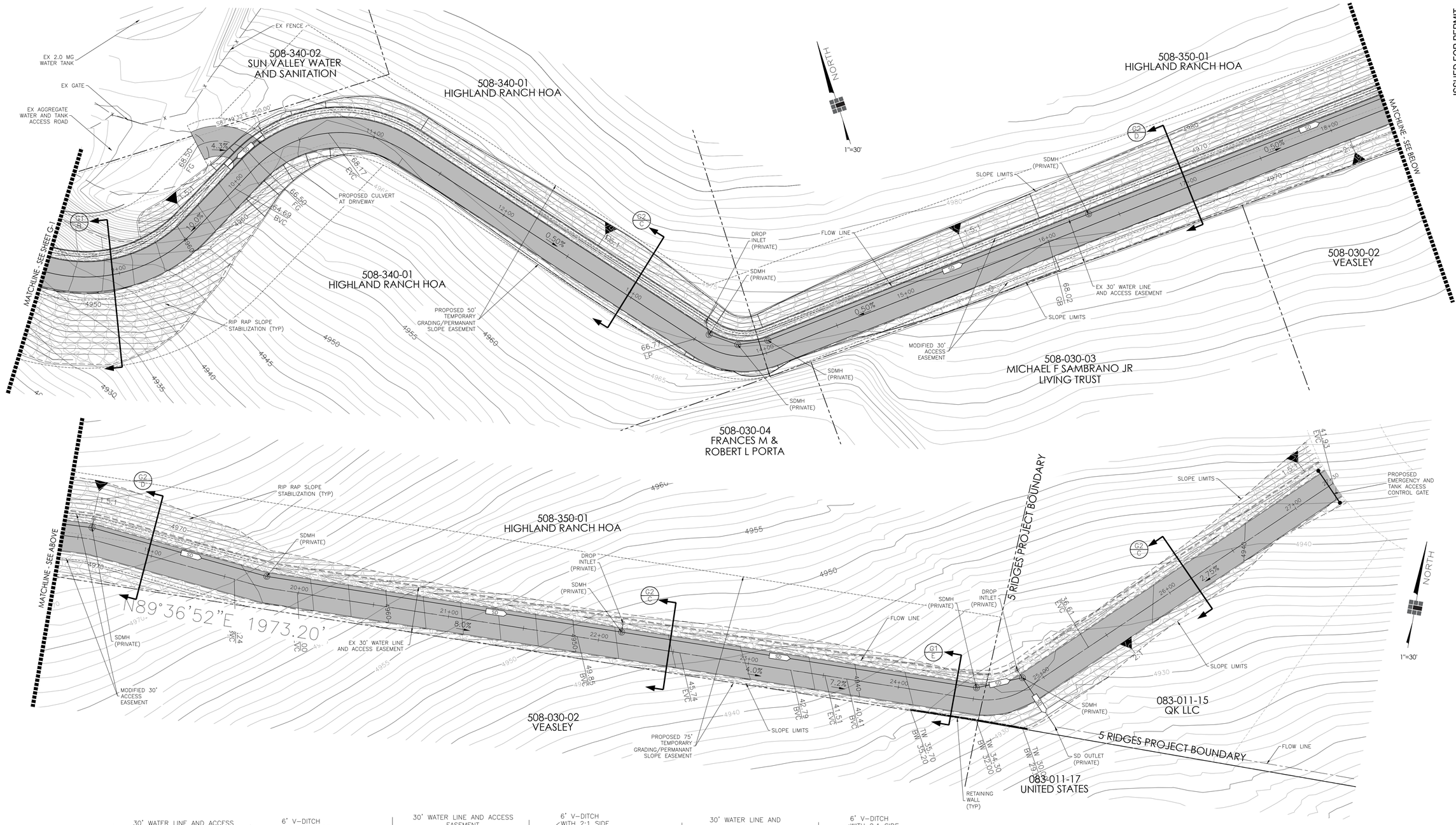
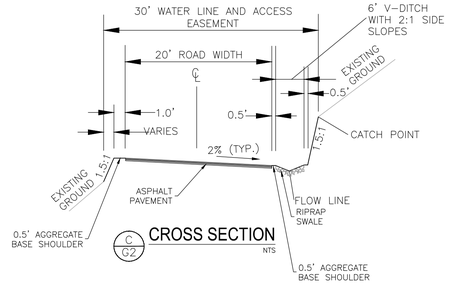
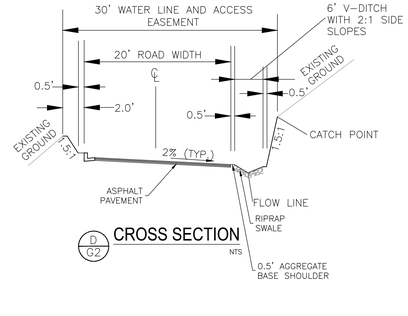
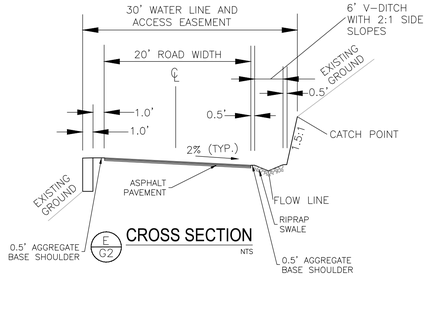
DRAWING
G-1
SHEET 3 OF 9









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REV.	DATE	DESCRIPTION	BY

SPECIAL USE PERMIT PLANS FOR 5 RIDGES - WATER MAIN & ACCESS ROAD

GRADING PLAN

5 RIDGES DEVELOPMENT COMPANY, INC. WASHOE COUNTY, NEVADA

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Job No.	1532.007

DRAWING

G-2

SHEET 4 OF 9

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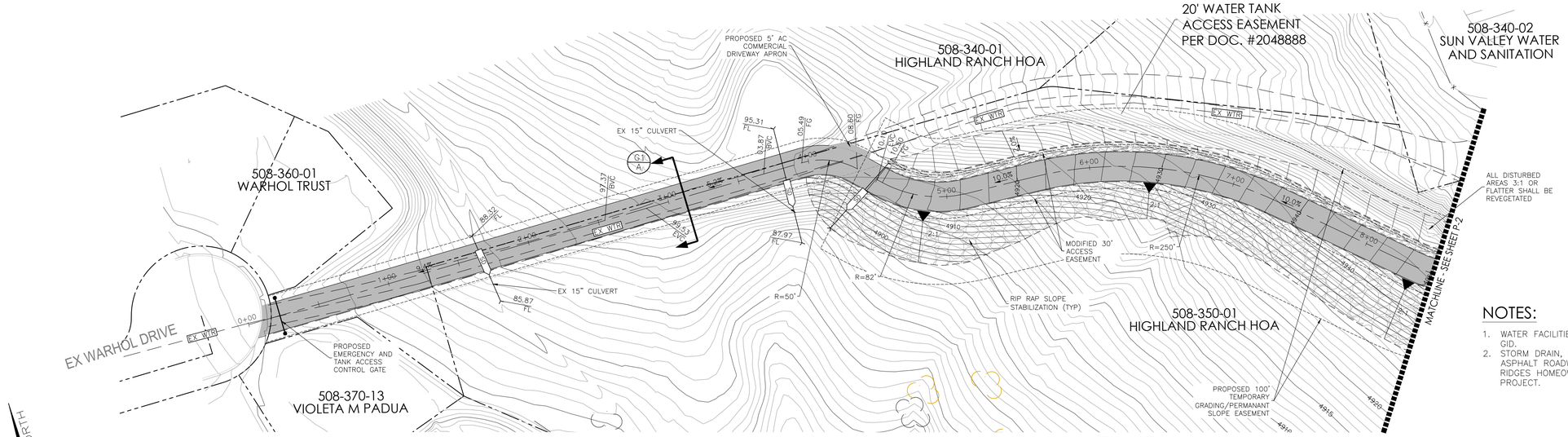
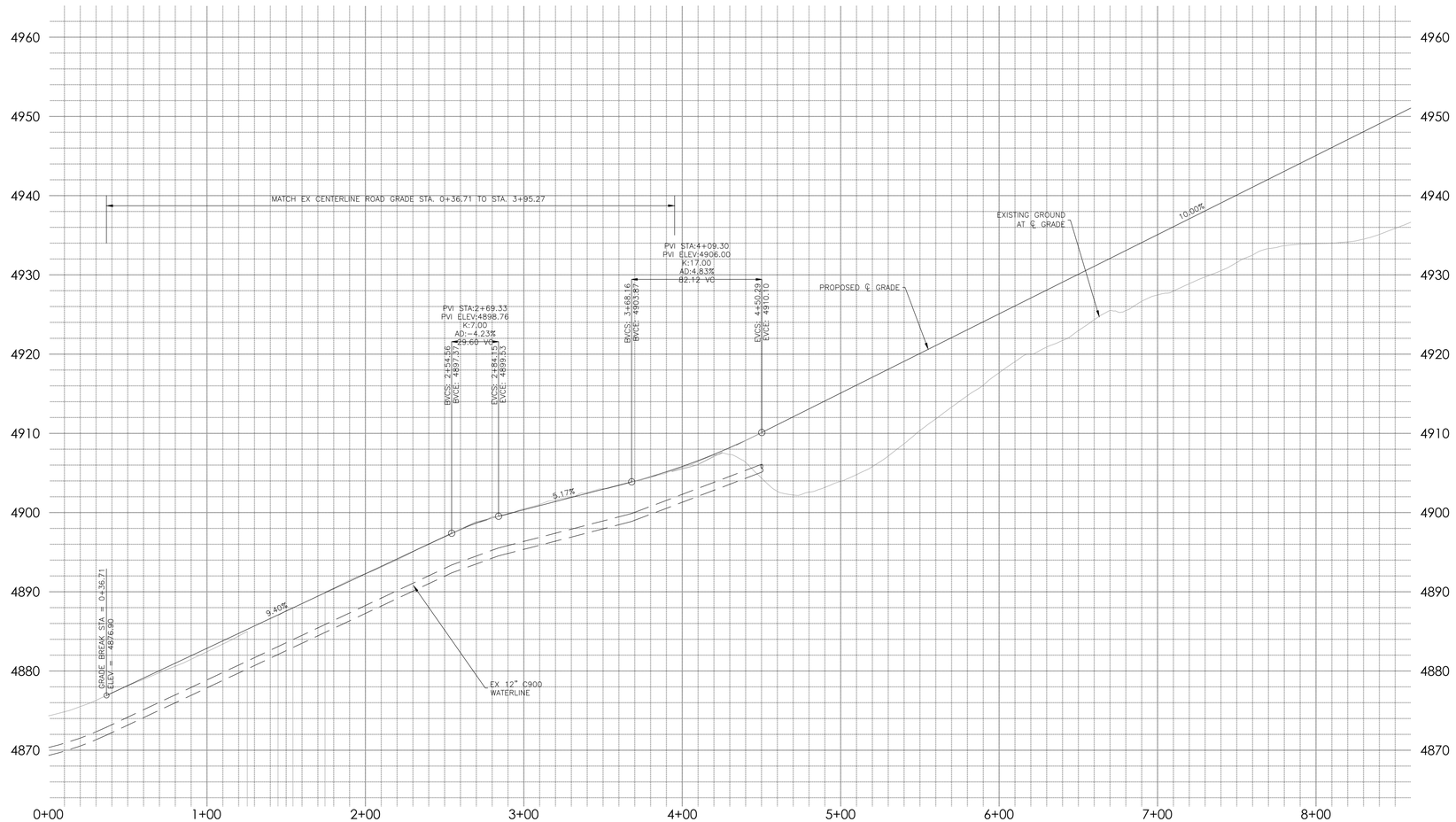


WATER MAIN & ACCESS ROAD

STA: 0+00 TO 8+50



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STATE OF NEVADA — DANIEL L. MANGUSO — No. 23930 — PROFESSIONAL ENGINEER — CIVIL — Exp. 12-31-21 — 04/15/2020

NOTES:

1. WATER FACILITIES SHALL BE MAINTAINED BY SUN VALLEY GID.
2. STORM DRAIN, DRAINAGE, SLOPE, REVEGETATION AND ASPHALT ROADWAYS SHALL BY MAINTAINED BY THE 5 RIDGES HOMEOWNERS ASSOCIATION FOR THE LIFE OF THE PROJECT.

REV.	DATE	DESCRIPTION	BY

SPECIAL USE PERMIT PLANS FOR

5 RIDGES - WATER MAIN & ACCESS ROAD

PLAN AND PROFILE

5 RIDGES DEVELOPMENT COMPANY, INC. WASHOE COUNTY, NEVADA

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Date:	4/15/2020
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Checked by:	DLM
Job No.	1532.007

DRAWING

P-1

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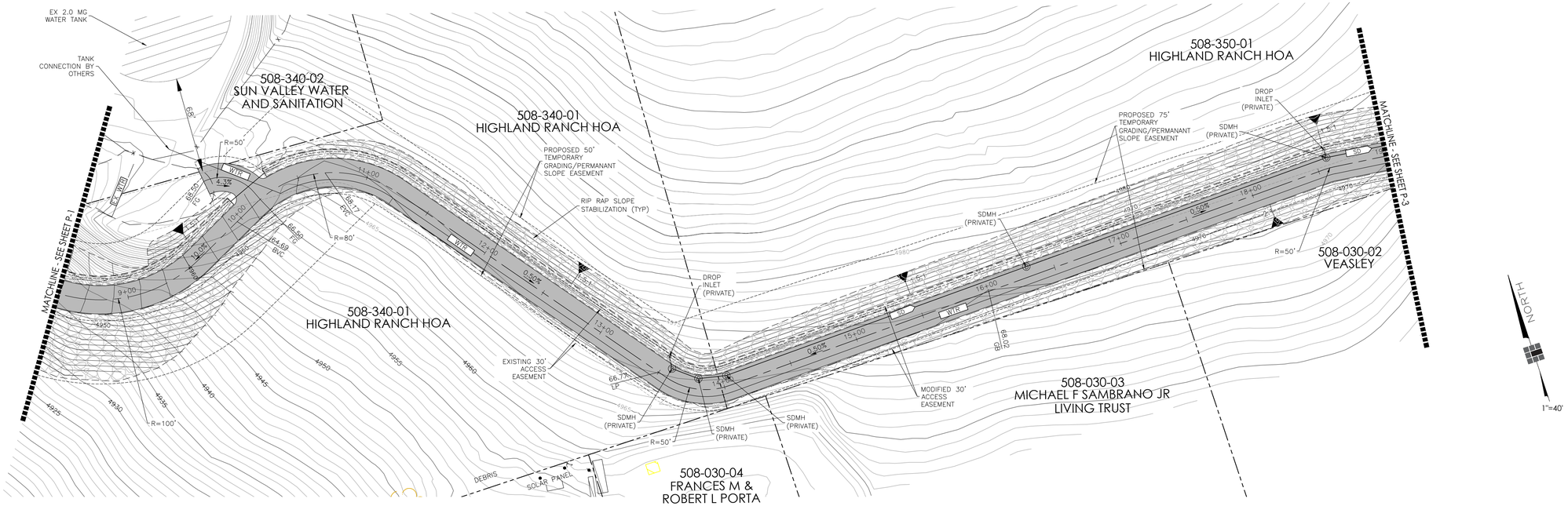
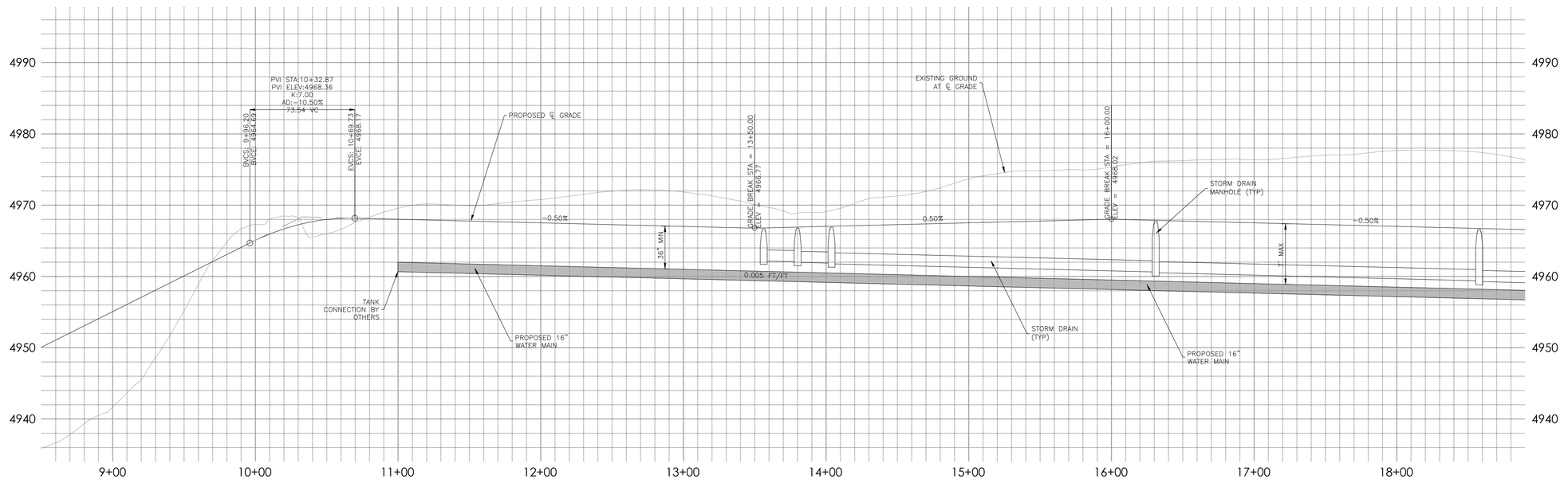


WATER MAIN & ACCESS ROAD

STA: 8+00 TO 19+00



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REV.	DATE	DESCRIPTION	BY

SPECIAL USE PERMIT PLANS FOR
5 RIDGES - WATER MAIN & ACCESS ROAD
PLAN AND PROFILE
5 RIDGES DEVELOPMENT COMPANY, INC. WASHOE COUNTY, NEVADA

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Checked by:	DLM
Job No.	1532.007

DRAWING
P-2
SHEET 6 OF 9

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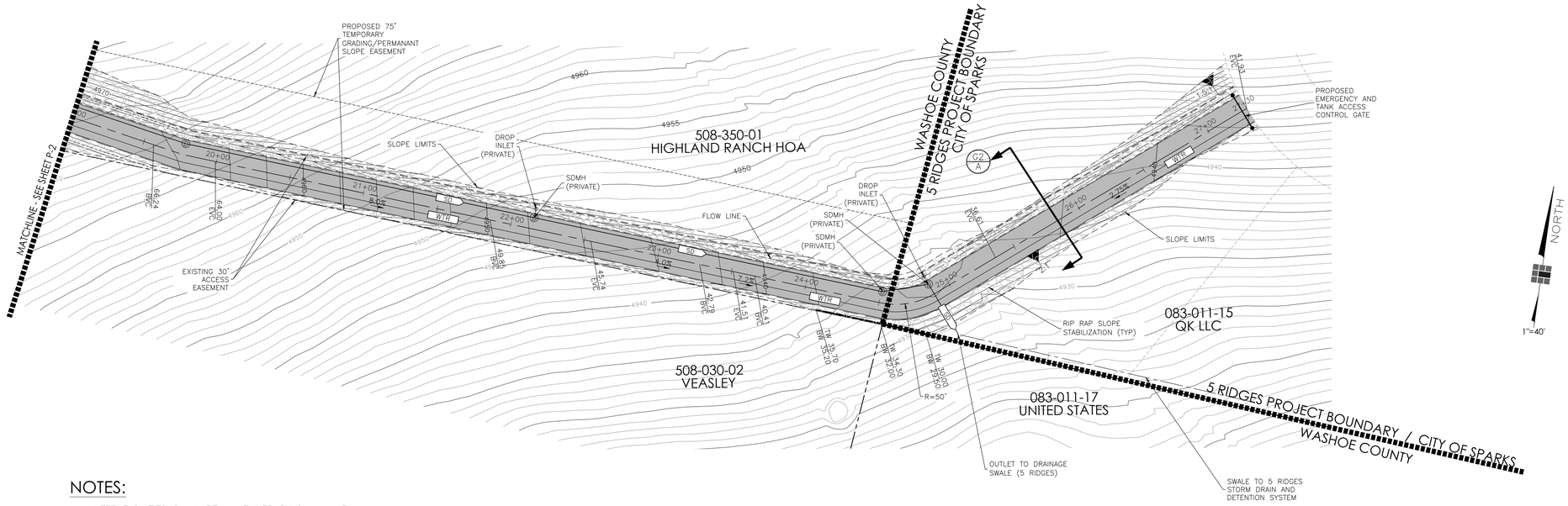

NOTES:

1. WATER FACILITIES SHALL BE MAINTAINED BY SUN VALLEY GID.
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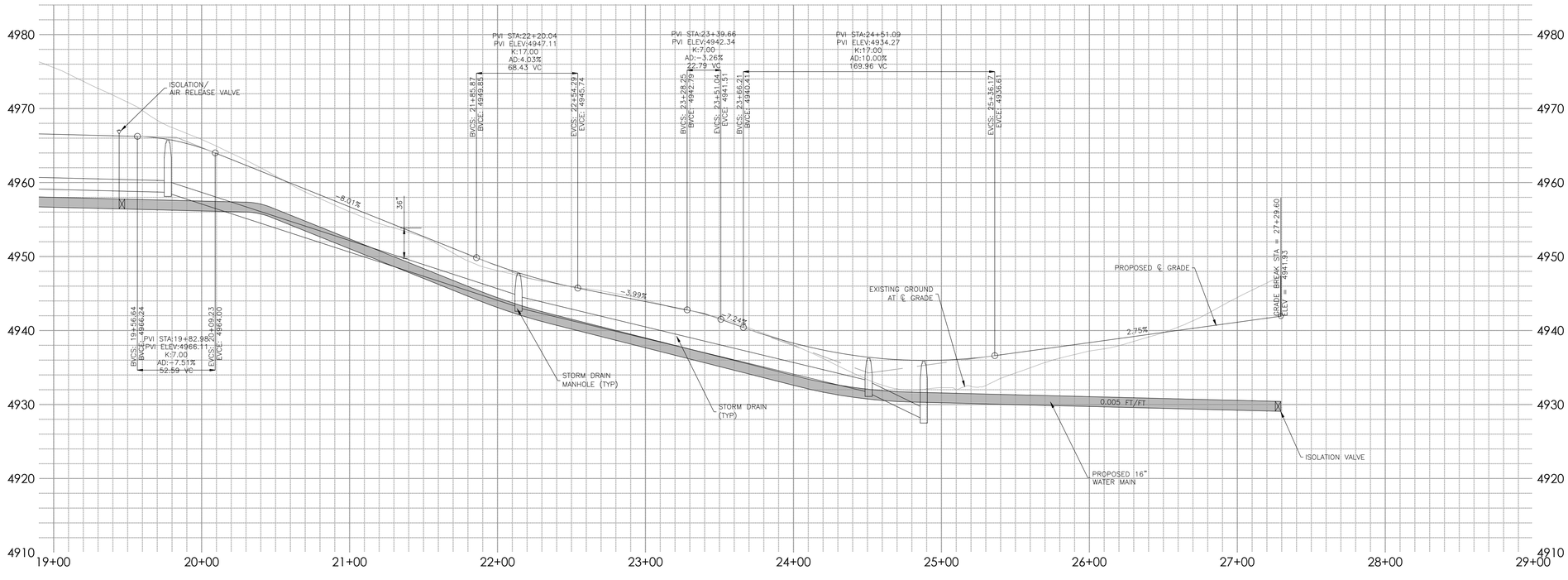
WATER MAIN & ACCESS ROAD

STA: 19+00 TO 27+30



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ISSUED FOR PERMIT

STATE OF NEVADA — DANIEL L. MANGUSO — No. 23932 — PROFESSIONAL ENGINEER — 04/15/2020

CHRISTY CORPORATION
1000 Kiley Pkwy | Sparks Nevada 89436
P 775.502.8552 | christynv.com

REV.	DATE	DESCRIPTION	BY

SPECIAL USE PERMIT PLANS FOR
5 RIDGES - WATER MAIN & ACCESS ROAD
PLAN AND PROFILE
5 RIDGES DEVELOPMENT COMPANY, INC. WASHOE COUNTY, NEVADA

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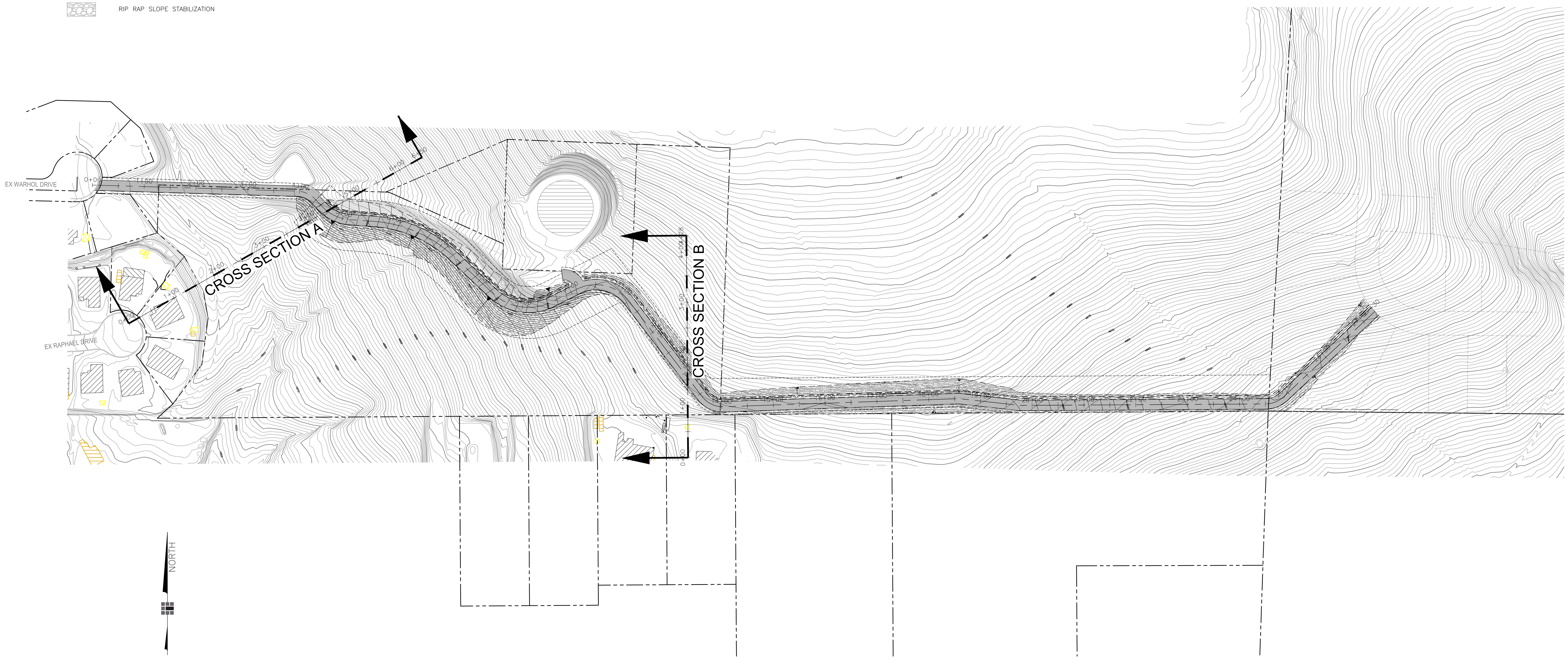
Date:	4/15/2020
Designed by:	DLM
Checked by:	DLM
Job No.	1532.007

DRAWING
P-3

SHEET 7 OF 9

LEGEND

- ASPHALT PAVEMENT
- RIP RAP SLOPE STABILIZATION



PRELIMINARY CROSS SECTION CUT LINES A & B

ISSUED FOR PERMIT

DANIEL L. MANGUSO
Exp. 12-31-21
CIVIL
No. 23930
PROFESSIONAL ENGINEER · STATE OF NEVADA
04/15/2020

CHRISTY CORPORATION
1000 Kiley Pkwy | Sparks Nevada 89436
P 775.502.8552 W christynv.com

REV.	DATE	DESCRIPTION	BY

SPECIAL USE PERMIT PLANS FOR
5 RIDGES - WATER MAIN & ACCESS ROAD
CROSS SECTIONS
5 RIDGES DEVELOPMENT COMPANY, INC. WASHOE COUNTY, NEVADA

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Designed by:	DLM
Checked by:	DLM
Job No.	1532.007

DRAWING
CS-1
SHEET 8 OF 9

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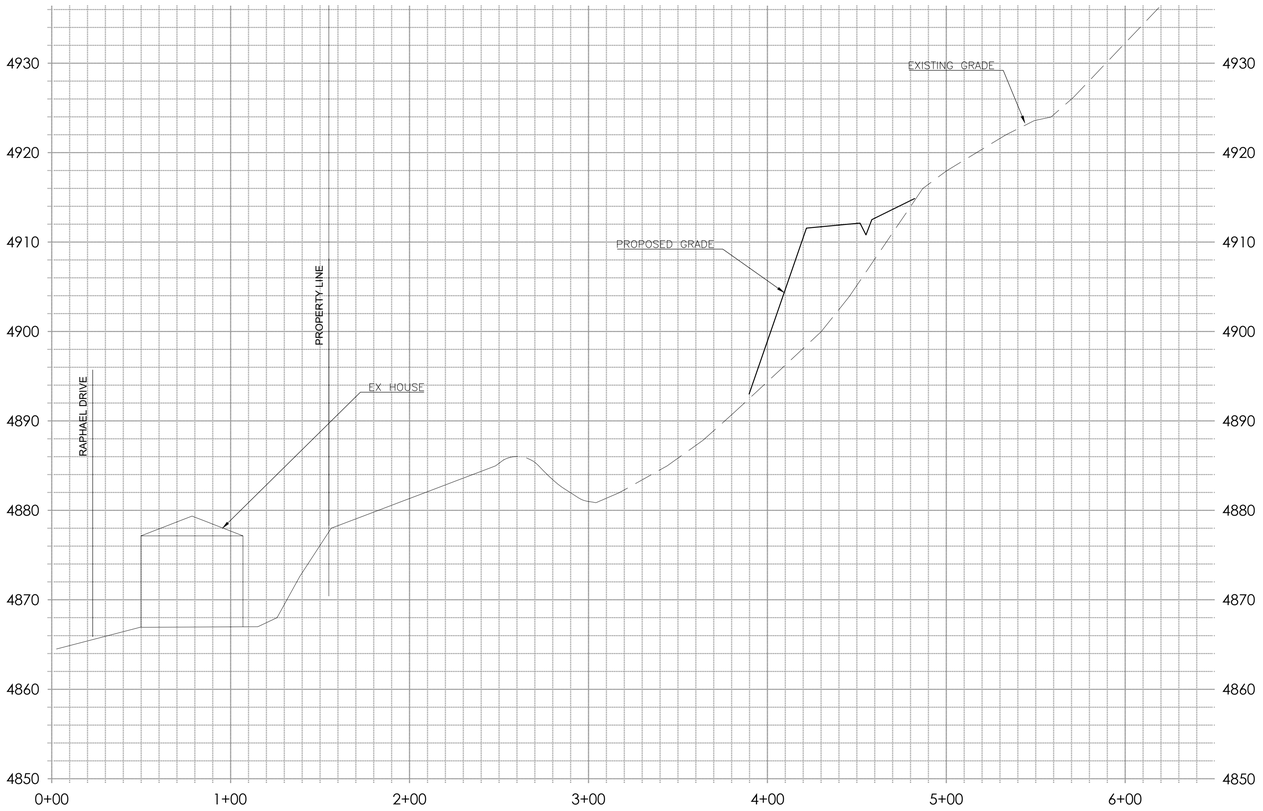
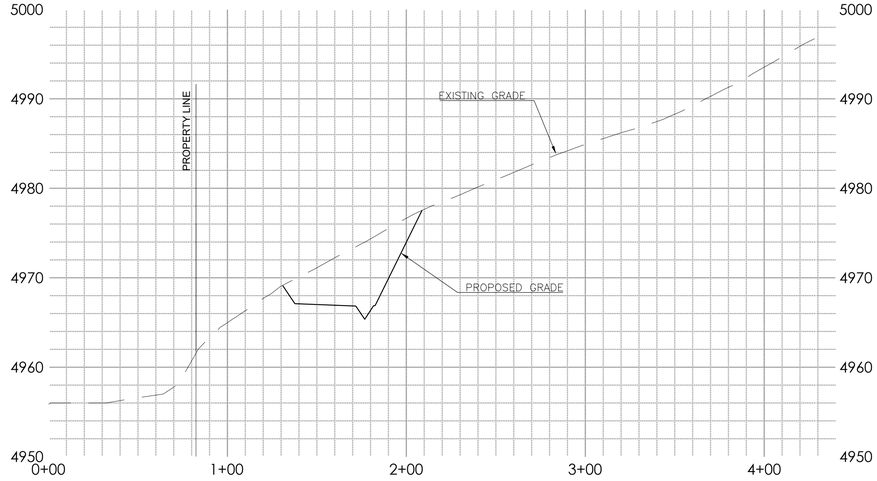


CROSS SECTION A

SCALE: 1"=100' HORIZ. / 1"=50 VERT.



CROSS SECTION B

SCALE: 1"=100' HORIZ. / 1"=50' VERT.

ISSUED FOR PERMIT

STATE OF NEVADA — PROFESSIONAL ENGINEER — DANIEL L. MANGUSO — No. 23592 — Exp. 12-31-21 — CIVIL — 04/15/2020

CHRISTY CORPORATION
1000 Kiley Pkwy | Sparks Nevada 89436
P 775.502.8552 christynv.com

REV.	DATE	DESCRIPTION	BY

SPECIAL USE PERMIT PLANS FOR
5 RIDGES - WATER MAIN & ACCESS ROAD
CROSS SECTIONS
5 RIDGES DEVELOPMENT COMPANY, INC. WASHOE COUNTY, NEVADA

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Date:	4/15/2020
Designed by:	DLM
Checked by:	DLM
Job No.	1532.007

DRAWING
CS-2

SHEET 9 OF 9

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CHRISTY
CORPORATION

PRELIMINARY DRAINAGE REPORT

FIVE RIDGES WATER & EMERGENCY ACCESS

Prepared for:
5 Ridges Development Company, Inc.
Attn: Blake Smith
East Liberty, Suite 444
Reno, Nevada 89436

Prepared by:
Christy Corporation
1000 Kiley Parkway
Sparks, NV 89436

April 15, 2020

Introduction

This report presents the results of a preliminary hydrology analysis for the 5 Ridges Emergency Access and Water Line in Washoe County, NV. The project site includes a portion of three individual parcels (APN#'s 508-340-01, 02, and 508-350-01) that total 63.11± Reference the attached vicinity map located in the appendix. This study identifies general drainage patterns and improvements that may be necessary to develop the project. A detailed final drainage report will be prepared with the improvement plans addressing channel and culvert design, detention, and onsite pipe and street flow hydraulics.

Design Standards

Truckee Meadows Regional Drainage Manual - April 2009 (TMRDM)
NOAA Atlas 14 Point Precipitation Estimates (2013)

References

NOAA Atlas 14 Point Precipitation Estimates (2013)

Methodology

Rational Method

Runoff intercepted by the proposed access road was determined using the Rational Method (Q=CiA). Rational C coefficients for were chosen from the TMRDM Table 701 (Appendix). For the offsite basins, values of 0.20 and 0.50 were used for the 5-year and 100-year storm events, respectively.

Times of concentration were determined using Standard Form 2 from the Truckee Meadows Regional Drainage Manual (Section 1500). Corresponding rainfall intensities were then determined using NOAA Atlas 14 (at www.nws.noaa.gov/ohd/hdsc/). Reference the Appendix for the times of concentration and rainfall intensities that were used to calculate the runoff. The NOAA precipitation data is also located in the Appendix.

Existing Conditions and Existing Onsite Hydrology

The watershed contributing to the site consists of 29.5± acres of mostly undeveloped land which drains north to south with slopes ranging from 8% to 18%. The vegetation is primarily annual grasses and sagebrush. A detailed soil analysis will be prepared with final design. The watershed generates an approximate existing total 5-year peak flow of 5.89 cfs and an existing total 100-year peak flow of 37.23 cfs. Reference Basins 1 through 4 on the "Hydraulic Basin Map" located in the Appendix, and Table 2 also located in the Appendix.

There is an existing access road which extends east of Warhol Drive to an existing water tank located approximately 900 feet east of Warhol Drive. There are two existing swales which flow north to south (Basin 1 and Basin 2) which are intercepted by two existing 15" CMP culverts within the existing access road that discharge to the south.

Proposed Onsite Hydrology

The site was divided into four basins to facilitate preliminary hydraulic analysis. Proposed flows will be similar to the historical drainage patterns.

Basins 1 and 2 will remain unaltered; proposed improvements in this area are limited to resurfacing of the existing access road and the existing swales and culverts mentioned above will remain.

A proposed emergency access road will be constructed south of the existing access road within basin 3. The proposed access road will have a 2% cross slope sloping south to north and a proposed v-ditch will be located on the north side of the road. The proposed ditch will flow east to west and a culvert will be located at the terminus which will transfer flows underneath the proposed access road into an existing swale. Runoff from Basin 3 is

collected by this existing swale in the existing condition and therefore a native drainage pattern is being maintained.

The proposed emergency access road and adjacent V-ditch continues through basin 4. Drop inlets will be placed at several locations within the V-ditch which will connect to storm drain within the proposed access road. The storm drain flows west to east and discharges into a proposed swale located at the east end of the access road. The swale flows to a proposed storm drain / detention network within the proposed 5 Ridges development where any necessary detention requirements will be met. A master drainage study for 5 Ridges which will include flows from the 5 Ridges Emergency Access and Water Line is currently being prepared by House Moran Consulting, Inc.

Conclusion

This report presents the findings of a preliminary drainage analysis for the 5 Ridges Emergency Access and Water line. The existing flows will be routed around and through the project site maintaining natural drainage patterns. The existing stormwater flows for the 5 and 100 year storm events have been analyzed. Detailed hydraulic calculations will be provided with the final hydrology report. The project can be developed without disturbing the integrity of the requirements outlined in the *Truckee Meadows Regional Drainage Manual*.

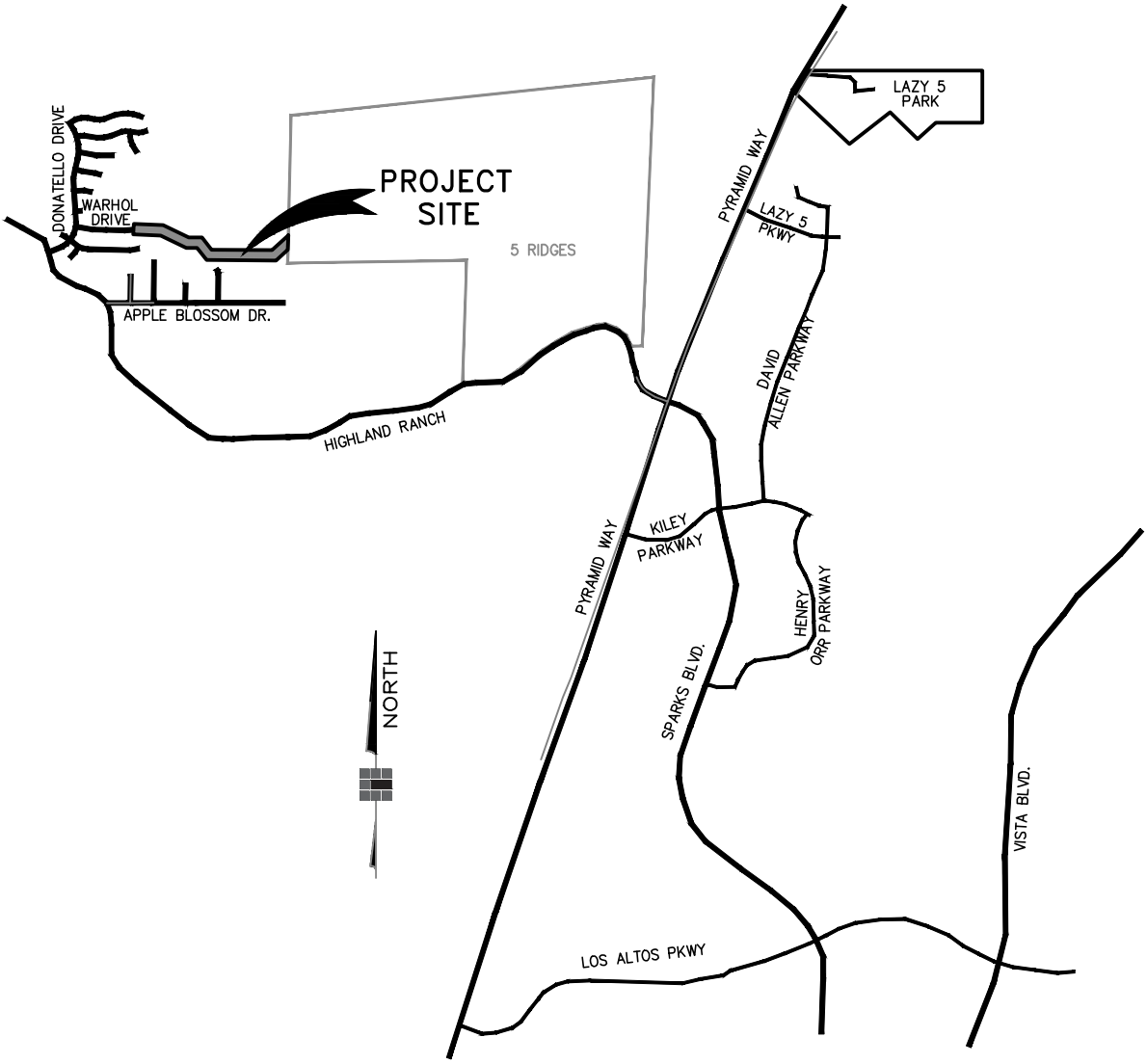
APPENDIX

VICINITY MAP

VICINITY MAP

5 RIDGES WATER MAIN & EMERGENCY ACCESS ROAD

APRIL 2020



CHRISTY CORPORATION
1000 Kiley Pkwy | Sparks Nevada 89436
P 775.502.8552

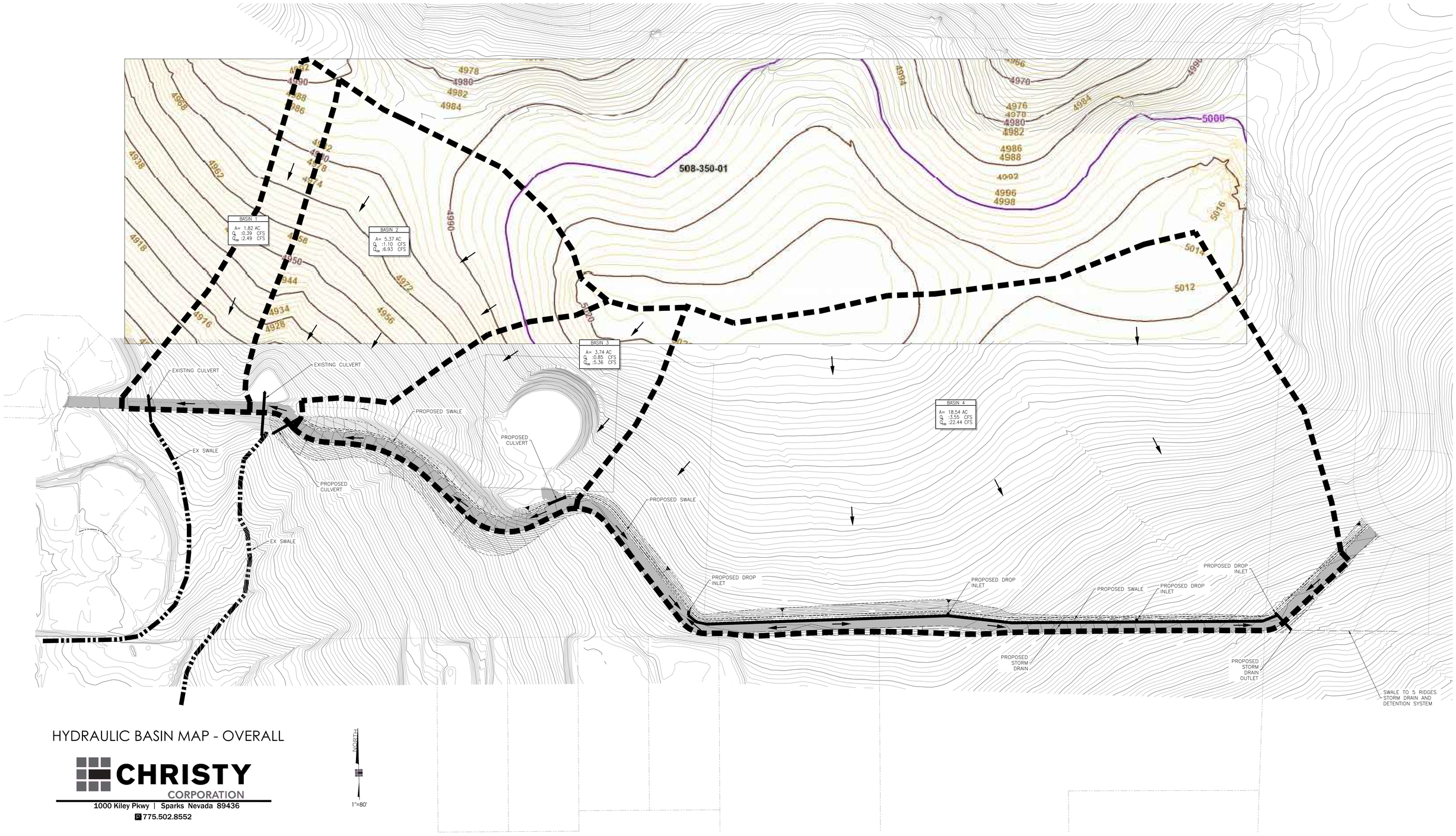
G:\Jobs\Quarry\Water Access SUP\Reports\Hydrology\Exh_Vicinity Map.dwg 4/14/20 7:58pm dmanguso

BASIN MAPS

HYDRAULIC BASIN MAP - OVERALL

5 RIDGES EMERGENCY ACCESS AND WATER LINE

APRIL 2020



HYDRAULIC BASIN MAP - OVERALL

CHRISTY CORPORATION

1000 Kiley Pkwy | Sparks Nevada 89436

P 775.502.8552

NOAA ATLAS 14
PRECIPITATION FREQUENCY ESTIMATES

NOAA Atlas 14, Volume 1, Version 5
Location name: Sun Valley, Nevada, USA*
Latitude: 39.6135°, Longitude: -119.7479°
Elevation: 4877.19 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**1.13** (0.948-1.31)	**1.42** (1.19-1.64)	**1.90** (1.60-2.23)	**2.36** (1.99-2.80)	**3.14** (2.60-3.79)	**3.89** (3.12-4.75)	**4.79** (3.72-5.94)	**5.87** (4.39-7.46)	**7.64** (5.41-10.1)	**9.28** (6.29-12.5)
10-min	**0.858** (0.726-0.996)	**1.07** (0.900-1.25)	**1.44** (1.22-1.70)	**1.79** (1.51-2.13)	**2.39** (1.98-2.89)	**2.96** (2.38-3.62)	**3.64** (2.83-4.52)	**4.47** (3.34-5.68)	**5.82** (4.12-7.66)	**7.06** (4.79-9.52)
15-min	**0.712** (0.596-0.820)	**0.884** (0.744-1.04)	**1.19** (1.01-1.40)	**1.48** (1.25-1.76)	**1.98** (1.64-2.39)	**2.45** (1.96-2.99)	**3.01** (2.34-3.74)	**3.69** (2.76-4.69)	**4.81** (3.40-6.33)	**5.84** (3.96-7.87)
30-min	**0.478** (0.404-0.552)	**0.598** (0.502-0.696)	**0.802** (0.678-0.946)	**0.998** (0.842-1.19)	**1.33** (1.10-1.61)	**1.65** (1.32-2.01)	**2.03** (1.57-2.52)	**2.49** (1.86-3.16)	**3.24** (2.29-4.26)	**3.93** (2.66-5.30)
60-min	**0.296** (0.249-0.342)	**0.369** (0.310-0.431)	**0.496** (0.419-0.585)	**0.618** (0.521-0.734)	**0.825** (0.682-0.994)	**1.02** (0.818-1.25)	**1.25** (0.974-1.56)	**1.54** (1.15-1.96)	**2.00** (1.42-2.64)	**2.43** (1.65-3.28)
2-hr	**0.196** (0.174-0.226)	**0.244** (0.216-0.282)	**0.314** (0.275-0.362)	**0.374** (0.325-0.434)	**0.470** (0.396-0.548)	**0.557** (0.458-0.658)	**0.659** (0.528-0.788)	**0.792** (0.612-0.988)	**1.05** (0.762-1.33)	**1.28** (0.896-1.66)
3-hr	**0.157** (0.141-0.178)	**0.195** (0.176-0.223)	**0.245** (0.219-0.279)	**0.286** (0.253-0.326)	**0.345** (0.300-0.394)	**0.396** (0.338-0.459)	**0.459** (0.384-0.538)	**0.546** (0.446-0.664)	**0.700** (0.555-0.896)	**0.858** (0.651-1.11)
6-hr	**0.112** (0.100-0.125)	**0.139** (0.125-0.157)	**0.173** (0.155-0.195)	**0.199** (0.176-0.224)	**0.232** (0.204-0.264)	**0.257** (0.223-0.294)	**0.283** (0.241-0.327)	**0.315** (0.264-0.369)	**0.378** (0.310-0.452)	**0.443** (0.357-0.564)
12-hr	**0.073** (0.066-0.082)	**0.092** (0.083-0.103)	**0.116** (0.104-0.130)	**0.134** (0.119-0.151)	**0.159** (0.140-0.179)	**0.178** (0.154-0.202)	**0.197** (0.168-0.227)	**0.216** (0.181-0.252)	**0.242** (0.198-0.288)	**0.265** (0.212-0.320)
24-hr	**0.046** (0.042-0.052)	**0.058** (0.052-0.065)	**0.074** (0.067-0.083)	**0.087** (0.078-0.098)	**0.106** (0.094-0.119)	**0.120** (0.106-0.135)	**0.135** (0.118-0.153)	**0.151** (0.131-0.172)	**0.174** (0.147-0.200)	**0.191** (0.160-0.222)
2-day	**0.028** (0.025-0.031)	**0.035** (0.031-0.040)	**0.045** (0.040-0.051)	**0.053** (0.047-0.060)	**0.065** (0.057-0.074)	**0.074** (0.064-0.085)	**0.084** (0.072-0.097)	**0.095** (0.080-0.110)	**0.110** (0.091-0.128)	**0.121** (0.099-0.144)
3-day	**0.020** (0.018-0.023)	**0.025** (0.023-0.029)	**0.033** (0.029-0.037)	**0.039** (0.035-0.044)	**0.048** (0.042-0.055)	**0.055** (0.048-0.063)	**0.063** (0.054-0.073)	**0.071** (0.060-0.083)	**0.083** (0.069-0.098)	**0.093** (0.075-0.110)
4-day	**0.016** (0.014-0.018)	**0.021** (0.018-0.023)	**0.027** (0.024-0.031)	**0.032** (0.028-0.037)	**0.040** (0.035-0.045)	**0.046** (0.040-0.053)	**0.053** (0.045-0.060)	**0.060** (0.050-0.069)	**0.070** (0.058-0.082)	**0.078** (0.063-0.093)
7-day	**0.011** (0.010-0.013)	**0.014** (0.012-0.016)	**0.018** (0.016-0.021)	**0.022** (0.019-0.025)	**0.027** (0.023-0.031)	**0.031** (0.027-0.036)	**0.036** (0.030-0.042)	**0.041** (0.034-0.048)	**0.048** (0.039-0.057)	**0.053** (0.043-0.064)
10-day	**0.009** (0.007-0.010)	**0.011** (0.010-0.013)	**0.014** (0.013-0.017)	**0.017** (0.015-0.020)	**0.021** (0.018-0.025)	**0.024** (0.021-0.028)	**0.028** (0.024-0.032)	**0.031** (0.026-0.037)	**0.036** (0.030-0.043)	**0.040** (0.033-0.048)
20-day	**0.005** (0.005-0.006)	**0.007** (0.006-0.008)	**0.009** (0.008-0.010)	**0.011** (0.009-0.012)	**0.013** (0.011-0.015)	**0.015** (0.013-0.017)	**0.016** (0.014-0.019)	**0.018** (0.016-0.021)	**0.021** (0.017-0.025)	**0.023** (0.019-0.027)
30-day	**0.004** (0.004-0.005)	**0.005** (0.005-0.006)	**0.007** (0.006-0.008)	**0.008** (0.007-0.009)	**0.010** (0.009-0.011)	**0.011** (0.010-0.013)	**0.013** (0.011-0.015)	**0.014** (0.012-0.016)	**0.016** (0.013-0.019)	**0.017** (0.014-0.021)
45-day	**0.003** (0.003-0.004)	**0.004** (0.004-0.005)	**0.005** (0.005-0.006)	**0.006** (0.006-0.007)	**0.008** (0.007-0.009)	**0.009** (0.008-0.010)	**0.010** (0.008-0.011)	**0.011** (0.009-0.012)	**0.012** (0.010-0.014)	**0.013** (0.011-0.015)
60-day	**0.003** (0.002-0.003)	**0.004** (0.003-0.004)	**0.005** (0.004-0.005)	**0.006** (0.005-0.006)	**0.007** (0.006-0.007)	**0.007** (0.006-0.008)	**0.008** (0.007-0.009)	**0.009** (0.007-0.010)	**0.010** (0.008-0.011)	**0.010** (0.009-0.012)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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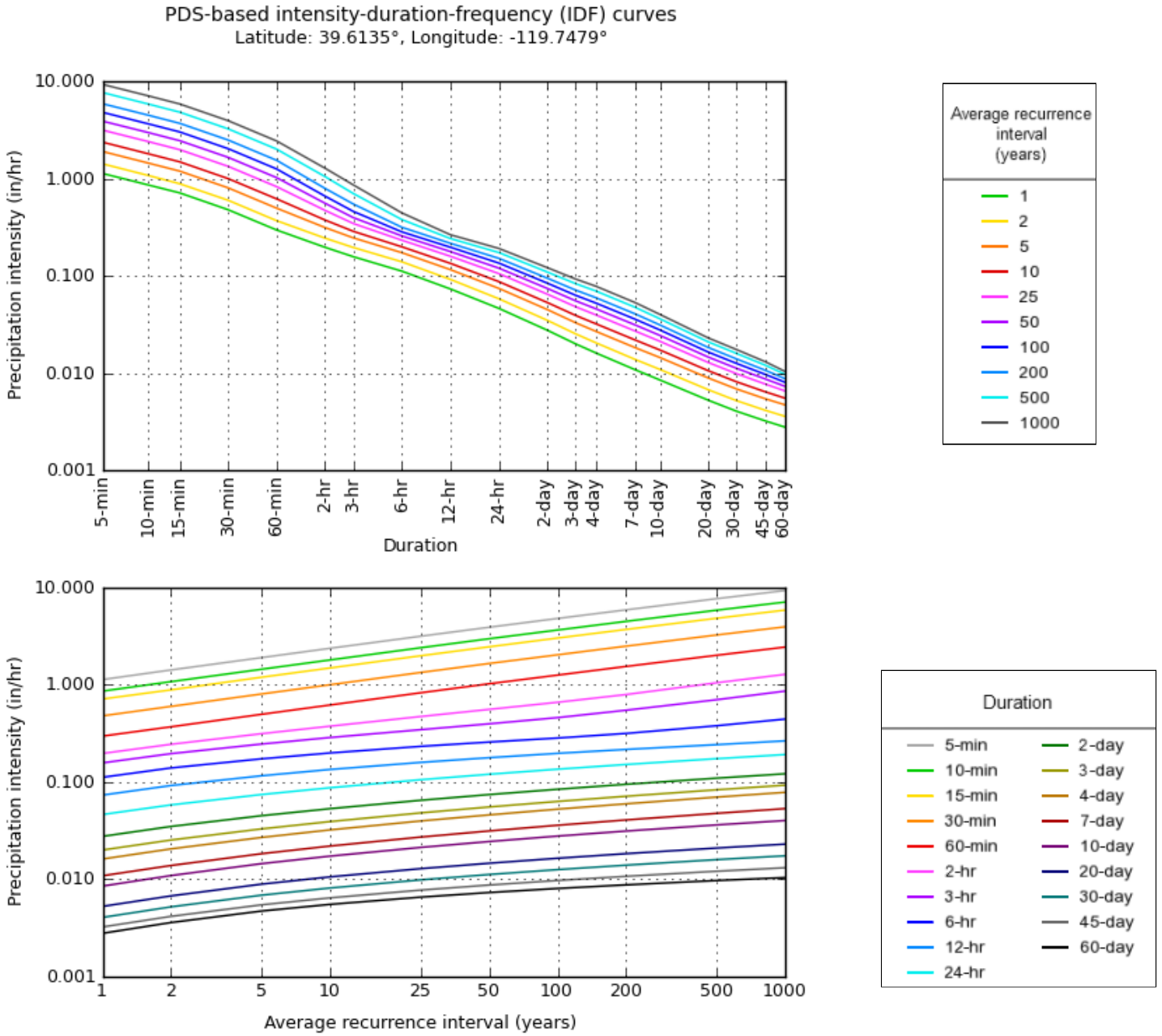
PF graphical



NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Wed Apr 15 13:57:46 2020

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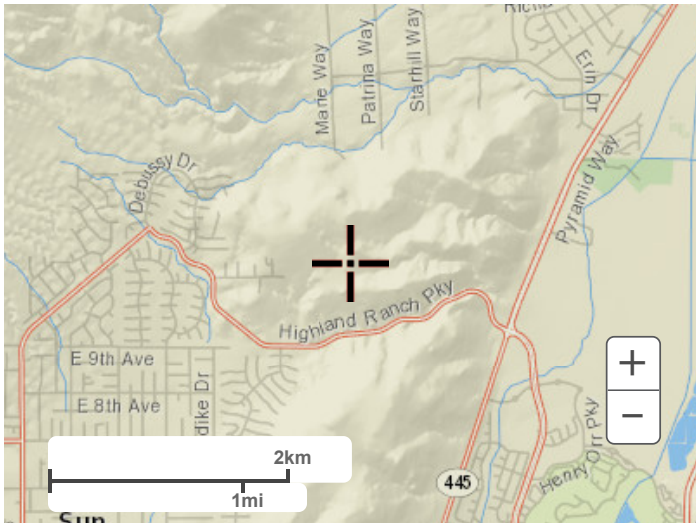
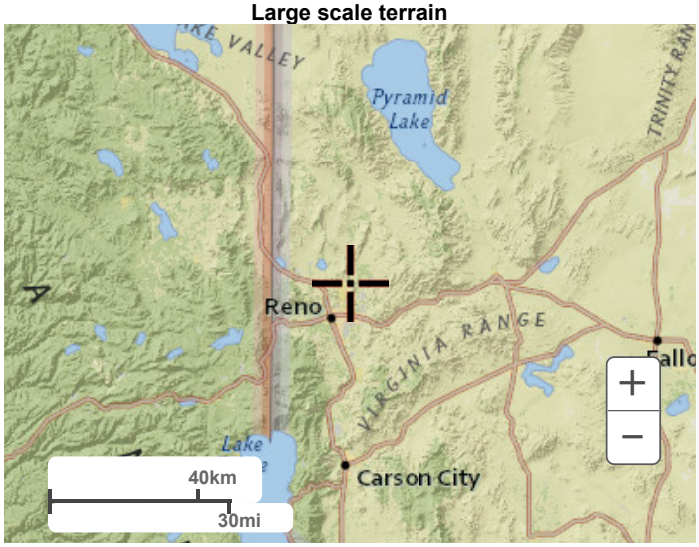
Maps & aerials

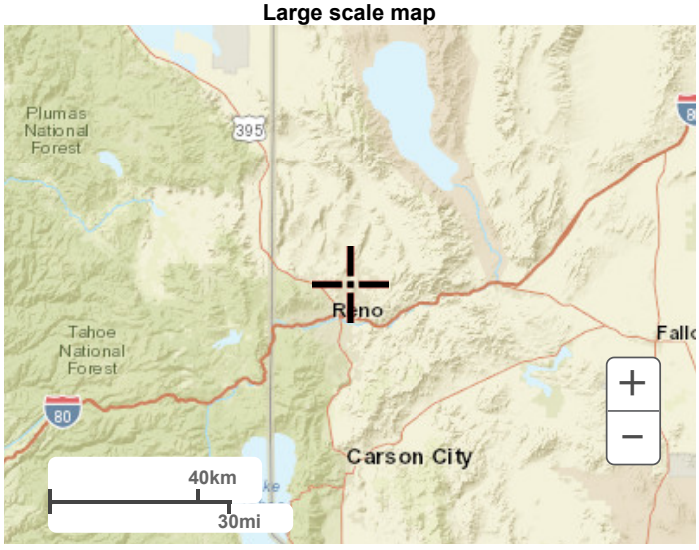
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

RATIONAL **METHOD**

CHRISTY CORPORATION

TABLE 1
TIME OF CONCENTRATION
5 RIDGES EMERGENCY ACCESS AND WATER LINE

SUB-BASIN DATA				INITIAL / OVERLAND TIME (t_i)			TRAVEL TIME (t_t)				t_c ($t_i + t_t$)	t_c URBANIZED BASINS CHECK		FINAL t_c	FINAL t_c	REMARKS
Desig:	R	Area Ac	Urban? Y / N	Length Ft	Slope %	t_i Min	Length Ft	Slope %	Vel. FPS	t_t Min	t_c Min	Len Ft	t_c (L/180) + 10 Min	Min	Hr	
(1)	(2)	(3)		(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)		
PROPOSED CONDITIONS																
1	0.20	1.82	N	700	15.0	17.4	250	3.0	1.7	2.4	19.8	950	15.3	15.3	0.25	
2	0.20	5.37	N	660	18.0	15.9	600	10.0	3.2	3.2	19.0	1260	17.0	17.0	0.28	
3	0.20	3.74	N	625	18.0	15.5	100	3.0	1.7	1.0	16.4	725	14.0	14.0	0.23	
4	0.20	18.54	N	750	8.0	22.2	900	0.5	0.7	21.2	43.4	1650	19.2	19.2	0.32	

STANDARD FO

CHRISTY CORPORATION

TABLE 2
RATIONAL METHOD HYDROLOGY - PROPOSED
5 RIDGES EMERGENCY ACCESS AND WATER LINE

ED CONDITIONS: INDIVIDUAL AREAS

DRAINAGE	AREA	WATERSHED	RUNOFF COEFF[2]		Tc	INTENSITY (in/hr)		PEAK RUNOFF (cfs)	
SUB-AREA	(acres)	LENGTH (ft)	5-YR	100-YR	(min)	5-YR	100-YR	**5-YR**	**100-YR**
1	1.82	950	0.20	0.50	15.3	1.08	2.74	**0.39**	**2.49**
2	5.37	1260	0.20	0.50	17.0	1.02	2.58	**1.10**	**6.93**
3	3.74	725	0.20	0.50	14.0	1.13	2.87	**0.85**	**5.36**
4	18.54	1650	0.20	0.50	19.2	0.96	2.42	**3.55**	**22.44**

Geotechnical Investigation

5 Ridges Subdivision

Sparks, Nevada

January 10, 2020

Prepared for
5 Ridges Development Company, Inc.

Black Eagle Consulting, Inc.
Geotechnical & Construction Services

Mr. G. Blake Smith
5 Ridges Development Company, Inc.
1 East Liberty Street, Ste 444
Reno, NV 89501

January 10, 2020
Project No.: 2314-01-1

L

RE: Geotechnical Investigation
5 Ridges Subdivision
Sparks, Nevada

Dear Mr. Smith:

Black Eagle Consulting, Inc. (BEC) is pleased to present the results of our geotechnical investigation for the above-referenced project. Our investigation consisted of research, field exploration, laboratory testing, and engineering analysis to allow formulation of geotechnical conclusions and recommendations for design and construction of the proposed residential development project. While full design recommendations are included in this report, when final design drawings are prepared for each village, BEC should review them and prepare a final geotechnical investigation update.

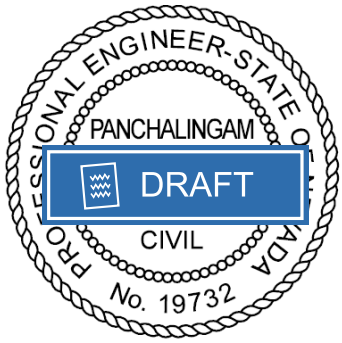
The 5 Ridges Subdivision will be a large residential development with approximately 1,200 single-family homes and about 88 multi-family residential units to be located within an approximately 387-acre site off of Highland Ranch Parkway in Sparks, Nevada. Associated street and utility infrastructure will also be constructed, including a backbone/parkway off of Highland Ranch Parkway.

The parcel hosts a large previous aggregate quarry which is now reclaimed. There are extensive quantities of uncontrolled fill materials within the previous quarry limits, and these fills will require reworking through their entire depth into engineered fills to support the improvements and to reduce settlement concerns. A majority of the existing fills can be reused as structural fill after exclusion of oversized particles and unsuitable soils. With the exception of a thin surficial clay layer, native materials within the site include granular alluvial soils underlain by granitic bedrock at shallow depths. Native granular soils and bedrock will provide excellent support in cuts, and the excavated materials can also be used as structural fills/rock fills after exclusion of oversized particles. Competent bedrock encountered at shallow depths will likely require blasting. Deep fills on the project will be subject to internal compression and associated fill settlement.

We appreciate having the opportunity to work with you on this project. If you have any questions regarding the content of the attached report, please do not hesitate to contact us.

Sincerely,

Black Eagle Consulting, Inc.



Vimal P. Vimalaraj, P.E.
Engineering Division Manager

Jonathan Payne
Project Geologist

Copies to: Addressee (1 copy and PDF)
Mr. Seth Padovan, P.E. Padovan Consulting, LLC. (2 copies and PDF)
Mr. Scott Christy, P.E., Christy Corporation, LTD (PDF)

JP:PV:LJJ:cjr

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Plates

Appendices

Introduction

Presented herein are the results of Black Eagle Consulting, Inc.'s (BEC's) geotechnical investigation, laboratory testing, and associated geotechnical design recommendations for the proposed 5 Ridges Subdivision to be located north of Highland Ranch Parkway in Sparks, Washoe County, Nevada. These recommendations are based on surface and subsurface conditions encountered in our explorations and on details of the proposed project as described in this report. The objectives of this study were to:

1. Determine general soil, bedrock, and groundwater conditions pertaining to design and construction of the proposed subdivision.

2. Provide recommendations for design and construction of the project as related to these geotechnical conditions.

The area covered by this report is shown on Plate 1 (Plot Plan). Our investigation included field exploration, laboratory testing, and engineering analysis to determine the physical and mechanical properties of the various onsite materials. Results of our field exploration and testing programs are included in this report and form the basis for all conclusions and recommendations. While full design recommendations are included in this report, when final design drawings are prepared for each village, BEC should review them and prepare a final geotechnical investigation update.

The services described above were conducted in accordance with the BEC Professional Geotechnical Agreement dated October 17, 2019, which was signed by Mr. G. Blake Smith of 5 Ridges Development Company, Inc.

As part of the overall geotechnical investigation scope, a separate geotechnical investigation report for the proposed backbone road that will provide access to the subdivision off of Highland Ranch Parkway was recently issued by BEC (BEC, 2019).

Project Description

The proposed 5 Ridges Subdivision site consists of an irregularly-shaped parcel of approximately 387 acres located in the City of Sparks, Washoe County, Nevada. The property has been assigned Assessor's Parcel Number 083-011-15 and is entirely contained in Section 9, Township 20 North, Range 20 East, Mount Diablo Meridian. The parcel is bordered to the north by ranch-style residential properties, to the east by steep terrain which slopes down to Pyramid Highway (State Route 445), to the south by Highland Ranch Parkway, and to the west by undeveloped land. The property was previously an aggregate quarry which was in operation during the mid-1990s through the 2000s; the quarry has been out of operation for the past several years and has been partially reclaimed (i.e., regrading, particularly filling). Access to the site is obtained by a gated, paved drive off of Highland Ranch Parkway.

Existing Geotechnical Data

Black Eagle Consulting, Inc. previously performed feasibility analysis with limited shallow exploration for a subdivision project within the site area and issued a report titled *Preliminary Geotechnical Investigation, Highland Ranch Residential Subdivision, Washoe County, Nevada,* dated September 30, 2016 (BEC, 2016). In May to June of 2018, BEC returned to the site and completed extensive exploration with the intent to complete a design-level geotechnical investigation for a subdivision project for a separate client; however, after completion of exploration and some laboratory testing, the project was cancelled and only a site exploration data report incorporating preliminary results of the exploration and completed lab testing was issued for this 2018 geotechnical work. The 2018 exploration included advancement of 33 borings to as deep as 75 feet below the existing ground surface, 90 excavator test pits to as deep as 23 feet below the existing ground surface, and 7 refraction microtremor (ReMi) shear wave velocity surveys throughout the 387-acre parcel. It is noted that the 2018 exploration was performed to reveal adequate subsurface information for the subdivision layout and preliminary grading details planned by the previous client. The pertinent existing geotechnical data obtained during BEC's 2016 and 2018 geotechnical work within the project site have been incorporated (with approval from the previous clients) with the newly obtained geotechnical subsurface information.

Development Information

The project will involve the design and construction of a residential development with approximately 1,200 single-family homes and about 88 multi-family residential units. The subdivision layout (land plan) prepared by Christy Corporation, LTD (Christy Corp) dated December 2019 shows 10 villages (Villages 1 through 10) each consisting of about 42 to 201 single-family lots/units located throughout the project parcel. Village 1, to be located at the southeastern corner of the site adjacent to Highland Ranch Parkway, will be a multi-family residential area with about 88 units. All other villages will include single-family lots of various sizes.

The residential homes are expected to be single- or multi-story, wood-framed structures supported by conventional shallow Portland cement concrete (PCC) footings. The single-family homes will have PCC slab-on-grade floors, wooden raised floors, or a combination of both (e.g., PCC slab-on-grade floors in garages or lower levels and raised wooden floors elsewhere). Portland cement concrete or paver driveways will be included in the single-family homes. The structures associated with the multi-family Village 1 are expected to be 2- to 3-story, wood-framed buildings supported on conventional PCC footings with PCC slab-on-grade floors.

A parkway or backbone road will be constructed as a collector street providing access from Highland Ranch Parkway to the new subdivision villages and ultimately reaching a ridgetop near the northern parcel boundary. As noted earlier, a separate geotechnical investigation report for the backbone road was recently issued by BEC. In addition to the backbone road, a network of asphalt concrete residential streets (and possibly 1 or more collector streets) with associated PCC curbs, gutters, and sidewalks will also be constructed. Utility infrastructure will be extended to the development from existing infrastructure located along Pyramid Highway. The street improvements will be designed and constructed per City of Sparks standards and will be dedicated to the City of Sparks. The multi-family Village 1 near Highland Ranch Parkway will include asphalt concrete paved driveways and parking spaces.

Grading Concepts

The preliminary grading plan prepared by the project civil engineer, Christy Corp of Sparks, shows that mass grading of the overall subdivision will include cuts as deep as 75 feet and fills as thick as 55 feet (Christy Corp, 2019). In addition, the previous quarry limits include existing undocumented fills which will require removal and replacement as compacted, engineered fills within the proposed structural improvements.

The size of the overall development precludes a detailed description of site grading for individual villages, but generalizations follow. The northern portion of Village 2, and Villages 4 – 7, lie within the reclaimed quarry areas which will require mitigation/reworking of the existing fills prior to placing new fills. Total fill depth, including mitigation and new grading, will be on the order of 80 feet within Village 5 and 60 feet within Village 7. The southern portion of Village 2, Village 3, and Villages 8 – 10 are generally located within undisturbed ridgeline areas of the parcel and will lie in cut. The deepest cut areas are generally within the northwestern portion of Village 6, the eastern portion of Village 9, and the western portion of Village 10. New deep fills up to about 55 feet thick will be placed within the northwestern and western limits of Villages 8 and 9 (extreme northwestern and western limits of the subdivision). The southern portion of Village 2 and the majority of Village 3 will be located in cuts except for some edges where fills will be placed along the sides of the ridges. In general, the villages on the ridges outside the reclaimed quarry limits will be graded via cutting down the ridges and filling on the edges along the sides of the ridges. Cut and fill slopes within the residential developments are proposed to be at a 2H:1V (horizontal to vertical) ratio or flatter.

Site Conditions

Existing Structures

No significant structures are present within the 5 Ridges Subdivision site with the exception of some PCC pads and potential utility lines associated with the now abandoned aggregate quarry; these are discussed under the **Aggregate Quarry** section on the next page.

Topography

The topography within the 5 Ridges Subdivision site is complex and includes several ridges and valleys within the undisturbed, native ground outside the reclaimed quarry limits and gently rolling terrain and steep fill slopes within the quarry limits.

Google Earth™ Isometric View of 5 Ridges Subdivision Site - Looking North
Highland Ranch Parkway on the South and Pyramid Highway on the East

The topography of the entire parcel prior to the start of mining operations associated with the quarry included multiple ridges with significant terrain variation. A main valley, with hills rising to the north and south, progressed through the middle of the future quarry limits, draining to the east. A second valley, located south of the main east-west valley, was used as the main access for the quarry. Outside the 2 valleys, ridges within the northwestern portion of the site slope north and west.

Topography throughout the reclaimed quarry and surrounding hills is steep and complex. The mining operation has resulted in a relatively large pit to the southeast of where the 2 previous natural ravines merged. The pit was excavated with relatively tall, steep walls. Verbal reports from quarry operators indicate the pit walls to the southeast were nearly vertical, with several benches to facilitate mining operations. Additionally, the northwestern slopes of the quarry were relatively steep (steeper than 0.5H:1V) and also included benches. These verbal reports were generally confirmed by exploration in spring of 2018.

The topography in the quarry area is roughly divided by an east-west ridgeline with moderate to steep slopes leading north and moderate slopes leading south. Overall topographic relief within the quarry/disturbed area is around 120 vertical feet along the southern side of the ridge and about 200 vertical feet to the north. Elevations within the undeveloped portion of the site range from about 4,800 feet to 5,000 feet above mean sea level.

Frequent outcroppings of the underlying bedrock exist throughout the undisturbed portion of the 5 Ridges Subdivision site.

Aggregate Quarry

The site to host the proposed 5 Ridges Subdivision includes a reclaimed aggregate quarry. The aggregate quarry was operated by Granite Construction Company, and at the end of their operations the site was reclaimed following the plans included within the aggregate mining project's original Washoe County special use permit. A review of historical aerial images from Google Earth™ indicates the quarry began mining sometime between 1994 and 1999. A quarry operation extending the working area of the pit eastward was initiated between December 2002 and November 2004. This project created a substantial wedge-shaped fill within the eastern drainage of the quarry site (this area is designated as a park in the land plan for the 5 Ridges Subdivision). The majority of mining activities within the quarry were completed by 2007, and operations ceased in late 2010. Reclamation of the pit slopes, ponds and benches occurred between mid-2013 and early-2014, creating the current topography of the site. Throughout the operations of the aggregate quarry, several detention/settling ponds were constructed (primarily within the northern portion of the facility).

Reclaimed Quarry Pit – Looking East from the Northwestern Pit Slope

Portland cement concrete pads are located within the northern and southern portions of the site; the southern portion of the site also includes remnants of the scales and scale house. Various underground utilities exist within the Highland Ranch Parkway right-of-way. A water line also reportedly enters the site from the east within the area of the previously discussed wedge-shaped fill; however, no evidence of this was observed during our investigation.

Reclamation of the aggregate quarry consisted of leveling the main quarry. The majority of fill materials consist of manufactured aggregates and raw or minimally processed aggregate materials that remained following aggregate production. The western quarry area was previously used to stockpile soil materials, likely off-haul from construction projects and/or overburden from the quarry, as shown by end-dumped piles in the Google Earth™ imagery. These materials had been graded into several relatively level pads at the time of our investigation. Throughout the northwestern and southeastern portions of the pit, extensive steep slopes exist. Extensive grading (filling) was performed as part of the site reclamation to create slopes of approximately 1.5H:1V to 2.5H:1V in these areas. Near the western portion of the pit, the areas surrounding several rock knobs that exist within the pit walls have been filled to create gently rolling terrain.

Our conversation with the original quarry operator indicated fills were not keyed into the pit slopes. Additionally, this fill was loosely placed without the use of compaction equipment.

Vegetation

Minimal weeds have regrown within the aggregate quarry. Most of these weeds are located within the eastern wedge-shaped fill, in the western portion of the quarry, and on isolated portions of reclaimed pit slopes.

Outside of the aggregate quarry, vegetation consists of sparse to moderate populations of desert grasses and sagebrush and shrubs up to 3 feet tall.

Exploration

The 5 Ridges Subdivision site has been previously explored through the excavation of test pits (excavator and backhoe), drilling exploratory borings (rock core and auger), and performing geophysical surveys as part of our previously indicated 2016 and 2018 investigation work within the site. Previous exploration, field testing and laboratory testing data are included in Appendix A (Previous Geotechnical Data), and the previous exploration locations are shown on Plate 1.

As discussed below, additional test pits, borings and geophysical surveys were completed to address changes to the project extent and grading concepts within the overall subdivision project.

Drilling

The 5 Ridges Subdivision site was explored in November 2019 by advancing 11 test borings into the subsurface soil/bedrock profile. The borings were advanced using HQ coring techniques and a track-mounted CME 55 drill rig. Solid-stem auger drilling was utilized within the near-surface soils (less than 5 feet depth) to allow for installation of casing. The HQ core barrels are 96 millimeter outside diameter and 63.5 millimeter inside diameter. Borings were advanced using HQ coring techniques to obtain continuous sampling of the bedrock. The maximum depth of drilling exploration was 80 feet below the existing ground surface. The locations of the test borings are shown on Plate 1.

Bedrock was continuously cored at most of the boring locations through the maximum depth of exploration. Rock cores were extracted from the HQ core barrels and placed in core boxes. Rock cores were sampled in accordance with ASTM D 2113 08 to identify various indicators regarding the geological, physical, and engineering nature of the bedrock. Photographs of cores are included as Appendix B (Rock Core Photo Log).

Test Pits

The 5 Ridges Subdivision site was also explored in November 2019 by excavating 27 test pits using a CAT® 330 track-mounted excavator. Locations of the test pits are shown on Plate 1. The maximum depth of exploration was 15.5 feet below the existing ground surface. Test pit depth was limited due to refusal in bedrock and also due to caving conditions in undocumented fills. Bulk samples for index testing were collected from the trench wall sides at specific depths in each soil horizon. The test pits were backfilled immediately after exploration. Backfill was loosely placed and the area re-graded to the extent possible with equipment on hand.

Refraction Survey

Three seismic refraction geophysical surveys were completed covering 3 deep cut areas for determination of compressional wave (P-wave) velocity and to evaluate geologic stratigraphy and rippability of the site bedrock

using seismic velocity charts developed by Caterpillar, Inc. (2012). Data was acquired using a Seismic Source DAQlink 4 utilizing a 12-geophone array with geophone spacing of 8 meters (25 feet) for a line length of 88 meters (272 feet). The surveys used a hammer and strike plate for source energy, and each shot location consisted of a stack of 7 hammer blows. Shots were acquired at 10 locations per line, including off end locations. Data was processed and analyzed by Optim Earth of Reno, Nevada, using the Seisopt @2D software package. The resulting 2-dimensional seismic velocity profiles modeled along the survey lines are shown on Appendix C (Seismic Refraction Modeling Results). The depth of investigation is approximately 20 to 30 percent of the line length, or 50 to 80 feet for our surveys. The approximate locations of the refraction survey lines are shown on Plate 1.

Shear Wave Velocity Survey

Six ReMi shear wave velocity surveys were performed to evaluate the average shear wave velocity within the upper 100 feet of subsurface materials and to determine the seismic soil profile classification per the *International Building Code* ([*IBC*] International Code Council [ICC], 2018a) and the *International Residential Code* ([*IRC*] ICC, 2018b). Previously, 7 micro-tremor surveys were performed. The first 3 survey lines utilized the same array as the refraction survey lines noted above. Average shear wave velocity is also used as an approximation in rippability analysis of site bedrock using seismic velocity charts developed by Caterpillar, Inc. (2012; Appendix D [Rippability Charts]). The compressional or seismic wave velocities can be estimated by multiplying shear wave velocities by a factor of 2.5. The methodology of shear wave velocity analysis and analysis results are included in Appendix E (Shear Wave Velocity Modeling Results). The approximate locations of the shear wave velocity survey lines are shown on Plate 1. Results below 75 feet depth are generally not very meaningful or reliable, but shear wave velocities are expected to increase with depth relative to the values measured at shallower depths.

Material Classification

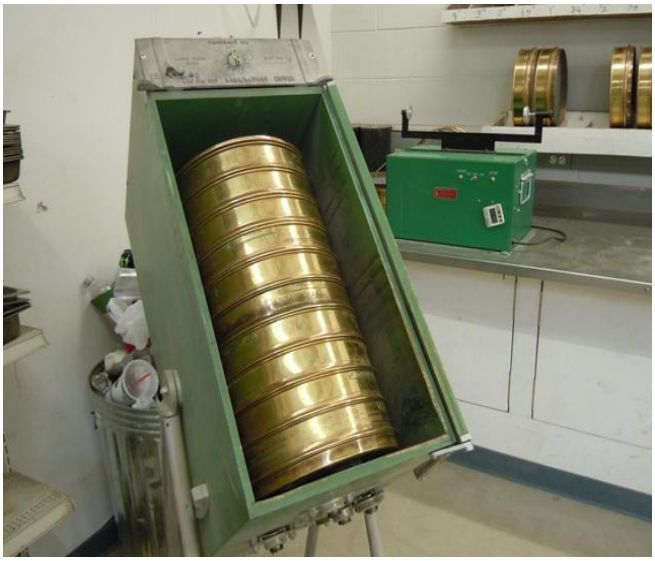
A geotechnical engineering technician or geologist examined and identified all soils in the field in accordance with American Society for Testing and Materials (ASTM) D 2488. During test pit exploration, representative bulk samples were placed in sealed plastic bags and returned to our Reno, Nevada, laboratory for testing. Recovered rock cores were handled in accordance with ASTM D 5079 and placed in cardboard core boxes and returned to our laboratory for testing and further analysis. During HQ coring, the sampled core in each core run was logged, describing percent recovered, weathering, fracturing, strength, and quality of the rock as measured by Rock Quality Designation. Rock Quality Designation is a scale describing the proportion of intact, durable rock within the formation. The scale, from 0 to 100 percent, is broken into the categories of Very Poor (0 to 25 percent), Poor (25 to 50 percent), Fair (50 to 75 percent), Good (75 to 90 percent), and Excellent (90 to 100 percent) Rock Quality.

Additional soil classification was subsequently performed in accordance with ASTM 2487 (Unified Soil Classification System [USCS]) upon completion of laboratory testing, as described in the **Laboratory Testing**

section. Logs of the test pits and borings are presented as Plate 2 (Exploration Logs), and a USCS chart has been included as Plate 3 (USCS Soil Classification Chart). Rock description and classification nomenclature is included at the bottom of the Core Boring Reports included in Plate 2.

Laboratory Testing

All soils testing performed in the BEC soils laboratory is conducted in general accordance with the standards and methodologies described in Volume 4.08 of the ASTM Standards.



Grain Size Analysis

Index Tests

Samples of each significant soil type were analyzed to determine their in-situ moisture content (ASTM D 2216), grain size distribution (ASTM D 422), and plasticity index (ASTM D 4318). The results of these tests are shown on Plate 4 (Index Test Results). Test results were used to classify the soils according to ASTM D 2487 and to verify field logs, which were then updated as appropriate. Classification in this manner provides an indication of the soil's mechanical properties and can be correlated with standard penetration testing and published charts (Bowles, 1996; Naval Facilities Engineering Command [NAVFAC], 1986a and b) to evaluate bearing capacity, lateral earth pressures, and settlement potential.

Direct Shear Tests

Two direct shear tests (ASTM D 3080) were performed on representative samples of decomposed granite and structural fill materials. The tests were run on remolded, inundated samples under various normal loads in order to develop a Mohr's strength envelope. For remolded samples, the sample were screened to remove particles larger than the number 4 sieve prior to testing. Results of these tests are shown on Plate 5 (Direct Shear Test Results) and were used in calculation of bearing capacities, friction factors, and lateral earth pressures and also in slope stability analyses.

R-Value Tests

Four resistance value (R-value) tests (ASTM D 2844) were performed on representative samples of subgrade soils and the materials that are expected to be utilized as structural fill. Resistance value testing is a measure of subgrade strength and expansion potential and is used in design of flexible pavements. Results of the R-value tests are shown on Plate 6 (R-Value Test Results).

Unconfined Compressive Strength Tests

Five intact rock cores, where present, were tested to determine their unconfined compressive strength. The cores were trimmed to exhibit a height to diameter ratio of 2:1. The unconfined compressive strength can be used to evaluate bearing capacity of intact in-place rock.

Unconfined compressive strength testing was performed in general accordance with ASTM D 2166 and D 7012. Test results are shown on Table 1 (Unconfined Compressive Strength Test Results).

TABLE 1 – UNCONFINED COMPRESSIVE STRENGTH TEST RESULTS

Sample Identification Boring (B) No. and Depth	B-19-04 @ 9 ft	B-19-04 @ 26 ft	B-19-05 @ 37 ft	B-19-06 @ 21 ft	B-19-09 @ 6 ft
Compressive Stress at Failure (psi[1])	12,020	6,220	7,840	18,050	11,850
Rock Type	Granite	Granite	Granite	Granite	Granite

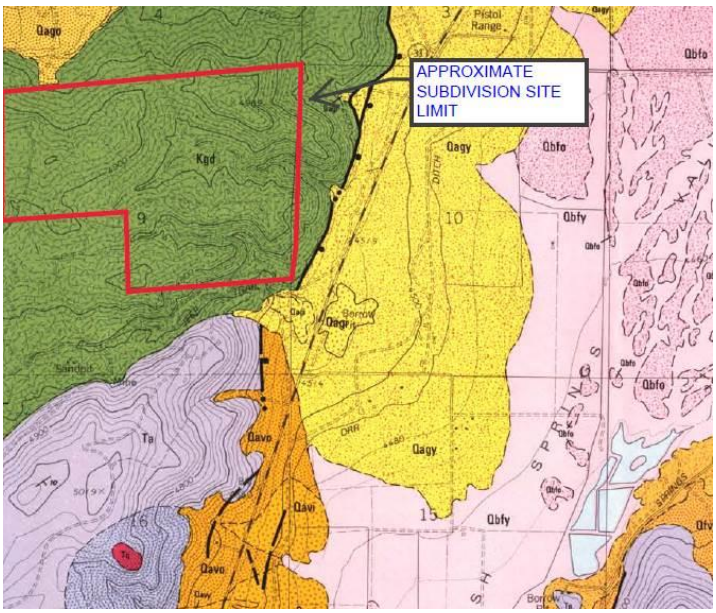
[1] Pounds per square inch

Chemical Tests

Chemical testing was performed on representative samples of native surficial clay soils, native bedrock materials, and existing quarry fill materials to evaluate the site materials' potential to corrode steel and PCC in contact with the ground. The samples were tested for pH, resistivity, redox potential, soluble sulfates, and sulfides. The results of the chemical tests are shown on Appendix F (Chemical Test Results). Chemical testing was performed by Silver State Analytical Laboratories of Reno, Nevada.

Geologic and General Soil Conditions

The site lies in the mountains west of Spanish Springs Valley in an area mapped by the Nevada Bureau of Mines and Geology (NBMG) as Cretaceous age *Granodiorite* (Bell and Bonham, 1987). The NBMG describes this unit (Kgd) as *medium to coarse-grained plutonic rock with sodic plagioclase, microcline, quartz, hornblende and biotite*… The undisturbed areas of the site exhibit native materials which generally conform to the NBMG geologic map.



Geologic Map

Within the undisturbed portions of the site are surficial clay-rich soils about 1 to 3 feet thick underlain by variable competency granitic bedrock. Generally, the bedrock areas exhibit shallow excavation refusal. Within the reclaimed quarry, there are generally 4 types of undocumented fill materials which are discussed in detail later. Overall fill thickness ranges to over 45 feet within ponds located in Village 5; 10 to 25 feet within Villages 4, 6 and 7; and over 70 feet east of Villages 5 and 7 where a natural ravine has been filled in.

Native Materials

Villages 1, 2, 3, 8, 9 and 10 include areas unaffected by mining and aggregate production or reclamation, exhibiting native ground. These areas are surfaced by a clay-rich, clayey sand to sandy fat clay soil layer up to 3 feet thick. The surficial clay-rich soils are underlain by granitic bedrock. Within the low elevation areas of the site (Village 1), the bedrock materials have weathered in-place to decomposed granite materials which exhibit the physical characteristics/composition of very dense, strongly cemented soils and which excavated in our test pits to result in sandy to gravelly soils. Within the southwestern and southeastern ridgelines of Villages 2 and 3 and the northwestern corner of Village 6, the granitic bedrock is strong to extremely strong with fresh to moderate weathering. The northern ridgeline running through Villages 9 and 10 includes variable competency bedrock with areas of moderate to completely weathered rock and fresh to moderately weathered rock.

The surficial clay-rich soils that exit throughout the native areas outside the reclaimed quarry consist of clayey sand to sandy fat clay described as reddish brown, moist, dense (hard), and as containing about 32 to 55 percent high plasticity fines and 2 to 23 percent gravel.

The decomposed granite materials in Village 1 break down to well-graded sand to silty sand, are described as gray, moderately to highly weathered and friable to moderately strong, and increase in hardness with depth. The excavated materials have a gradation of about 6 to 20 percent non-plastic fines and up to 10 percent gravel up to 2 inches in diameter.

Weathered bedrock materials, mainly located in Villages 9 and 10 and beneath existing fills within the quarry area, generally break down to poorly graded sand to silty gravel materials. These weathered rock materials are present through depths in excess of 20 feet along the ridgeline in borings B-19-01, -02, -03, -07. The broken down rock core samples contain 11 to 42 percent low plasticity fines and 9 to 39 percent gravel. These weathered rock materials will contain oversized cobbles and boulders when excavated, but are difficult to quantify from core borings. Oversized material can range up to about 30 percent of the total rock mass in these materials based on previous test pit exploration.

Relatively intact, competent bedrock is generally present in Villages 2, 3, 6, and at various depths/zones of Villages 8 through 10. The intact bedrock is described as light gray to gray, fresh to moderate weathering, close to moderate fracture spacing, and strong to extremely strong. The maximum fracture spacing ranges from 6 inches to over 30 inches and averages about 18 inches. Within borings B-19-04, -09, -10 the competent rock materials are relatively widespread, and in borings B-19-05, -06, -08 and -11 the competent rock materials are interspersed with weathered rock materials.

Photo of Rock Cores in B-19-09 at 7.5' to 31.5' Depth
Showing Widespread Competent Granitic Bedrock

Reclaimed Quarry Areas

The reclaimed quarry includes a variable thickness of undocumented fill. Overall, fill thickness increases from west to east from about 10 to 15 feet average within Villages 4 and 6; to 15 to 25 feet average within Village 7; and finally greater than 45 feet within Village 5. Additionally, the far east end of the overall quarry limit contains deep fill (greater than 70 feet thick) within an old drainage; this deep fill area is proposed to host a park in the 5 Ridges development. The fill materials present within the site can be generalized into 4 categories: 1) crushed rock

aggregates; 2) waste rock and overburden materials; 3) fine-grained soils from aggregate washings; and 4) imported/end dumped fill materials.

Crushed Rock Aggregates

The aggregate materials are similar to aggregate base, bedding sand, and drain rock materials and are classified as well-graded sand or gravel to silty, clayey sand with gravel. These materials are most prevalent as surficial fill within Villages 4, 6 and 7, and are present throughout the quarry site. These materials are described as gray to brown, slightly moist to moist, loose to very dense, and as consisting of approximately 10 to 24 percent non-plastic to medium plasticity fines and 20 to 50 percent angular gravel. The maximum particle size is generally ½ inch, but some areas exhibit a maximum particle size of 3 inches.

Waste Rock and Overburden

Waste rock and overburden include bulk materials that were likely feed for crushing aggregate production but included too much weathered rock or surface clays. These materials are present as fill materials most commonly in Villages 4, 6 and 7. These materials may also be present in the deep far east drainage fill materials, but material origin is not known. They generally range from clayey sand with gravel to poorly graded gravel and are described as gray to brown to reddish brown, moist to very moist, medium dense to dense, and as containing approximately 10 to 47 percent non-plastic to medium plasticity fines and 18 to 50 percent angular gravel up to 3 inches in diameter. A variable concentration of cobbles and boulders up to 18 inches in diameter was encountered in the test pits advanced into these fills, making up to 30 percent of the total excavated soil mass. Boulders up to 4 feet in diameter are also infrequently present in these materials.

Fine-Grained Soils

Fine-grained (silty sand to silt) and clay materials from aggregate washing operations are common within the old settling ponds and basins. Several smaller ponds have been encountered in Village 7 and extending east to the far east drainage fill area; in these areas, fine-grained soil fills are present from depths of 6 to 27 feet below the existing ground surface. Within Village 5, large ponds have been encountered with fine-grained fill from depths of 5 to 42 feet. Google Earth® historical aerial images document the approximate, incomplete extent of the major settling ponds. The fine-grained fills are described as light brown to brown, slightly moist to very moist, soft to very stiff (medium dense), and as containing about 40 to 59 percent low plasticity fines and 41 to 60 percent fine to medium sand.

Imported Fill Materials

Within the western portion of Village 6 and possibly the far eastern fill area, imported fill materials from several sources exist. The western fill area contains end-dumped materials consisting of clayey gravel or sand. These fill materials are described as light brown to brown, dry to slightly moist, loose, and as consisting of approximately 20

to 45 percent medium to high plasticity fines and 15 to 45 percent angular gravel up to 3 inches in diameter. In general, the imported fills are clay rich and include a variable to moderate proportion of oversized materials.

Reclaimed Pit Slopes

A major focus of the 2018 exploration program was to determine the gradient of the pre-existing pit slopes that have been reclaimed by buttress filling. Approximately 25 test pits (test pits TP-60 through TP-85) were excavated where possible to reveal the slope of the bedrock cut beneath the fill materials. Generally, the test pits revealed the underlying pit slopes were excavated at a near vertical configuration in competent bedrock materials. The fill materials encountered in these test pits excavated into the reclaimed pit slopes revealed various fills which are discussed above.

Groundwater

Groundwater was not encountered during exploration and is expected to lie at a depth well below that which would affect design or construction. Within old settling ponds, saturated, fine-grained soils exist that may result in perched water and/or very wet soils.

Geologic Hazards

Seismicity

Much of the western United States is a region of moderate to intense seismicity related to movement of crustal masses (plate tectonics). By far, the most seismically active regions, outside of Alaska, are in the vicinity of the San Andreas Fault system of western California. Other seismically active areas include the Wasatch Front in Salt Lake City, Utah, which forms the eastern boundary of the Basin and Range physiographic province, and the eastern front of the Sierra Nevada mountains, which is the western margin of the province. The Reno-Sparks area lies along the eastern base of the Sierra Nevadas, within the western extreme of the Basin and Range. It must be recognized that there are probably few regions in the United States not underlain at some depth by older bedrock faults. Even areas within the interior of North America have a history of strong seismic activity.

The Truckee Meadows lies within an area with a high potential for strong earthquake shaking. Seismicity within the Reno-Sparks area is considered about average for the western Basin and Range Province (Ryall and Douglas, 1976). It is generally accepted that a maximum credible earthquake in this area would be in the range of magnitude 7 to 7.5 along the frontal fault system of the eastern Sierra Nevadas. The most active segment of this fault system in the Reno area is located at the base of the mountains near Thomas Creek, Whites Creek, and Mt. Rose Highway, some 15 miles south of the project.

Faults

An earthquake hazards map is not available for the project area. The NBMG's *MyHazards* web-mapping tool (NBMG, 2019) shows a Holocene age fault approximately 1,200 feet east of the eastern boundary of the overall subdivision site at the transition between the mountainous terrain of the overall site and the moderately sloping alluvial fans within Spanish Springs Valley. Based on available mapping, no further fault investigation or mitigation will be necessary for the project.

Ground Motion and Liquefaction

The United States Geological Survey seismic design maps that have been incorporated with the American Society of Civil Engineers (ASCE) Online *ASCE 7 Hazard Tool* indicate that there is a 2 percent probability that a *bedrock* ground acceleration of 0.549 g will be exceeded in any 50-year interval (ASCE, 2020). Only localized amplification of ground motion would be expected during an earthquake.

Because the site area is underlain by dense granular soils followed by bedrock at shallow depths and groundwater is deep, liquefaction is not possible within the 5 Ridges Subdivision site.

Flood Plains

The Federal Emergency Management Agency (FEMA) has identified the site as lying in unshaded Zone X, or outside the limits of a 500-year flood plain (FEMA, 2009).

Other Geologic Hazards

A moderate to severe potential for dust generation is present if grading is performed in dry weather. Expansive clay soils are locally present at the surface within the undisturbed native ground and also as intermittent fill layers within the reclaimed quarry limits. No other geologic hazards were identified.

Discussion and Recommendations

General Information

The 5 Ridges Subdivision will be a large residential development with approximately 1,200 single-family homes and about 88 multi-family residential units. Associated street and utility infrastructure will also be constructed, including a backbone/parkway off of Highland Ranch Parkway.

The native materials at the site (bedrock and granular sand and gravel soils) will provide excellent support for the proposed improvements and will also provide adequate support as structural fill/rock fill. However, extensive quantities of uncontrolled fills associated with the previous, now reclaimed aggregate quarry are present within the central portion of the site where the quarry was in operation. These fills will require mitigation via reworking (removal and replacement as compacted, engineered fills) through their entire depth within all structural areas, as discussed under the **Site Preparation** section. A majority of the existing fills can be reused as structural fills, but the removal of existing fills also will result in significant quantities of clay and fine-grained soils that can only be used as fills in non-structural areas (refer to **Mass Grading**). The proposed deep cuts within the areas outside the quarry limits will generally result in high quality materials which can be reused as structural fill/rock fill on the project after exclusion of oversized particles. A thin clay soil layer exists within the undisturbed, native surface of the subdivision site. This clay layer is expansive and should be separated from improvements via structural fill per the recommendations contained in the **Site Preparation** section.

The onsite bedrock will pose difficulty to excavations and trenching, as discussed under the **Trenching, Excavation and Utility Backfill** section. It is expected blasting will likely be necessary for the deep cuts proposed within the ridges of the project site. It is possible to produce construction aggregates for use on the project from the competent granitic bedrock encountered from relatively shallow depths within the ridges (refer to the **Onsite Production of Construction Aggregates** section).

The project will include deep fills, and these fills will undergo internal compression as detailed under **Fill Settlement**. It is recommended the construction of homes to be located within deep fill areas observe a settlement waiting period.

The recommendations provided herein, and particularly under **Site Preparation, Mass Grading, Foundation,** and **Quality Control**, are intended to minimize risks of structural distress related to consolidation or expansion of native soils and/or structural fills. These recommendations, along with proper design and construction of the structure and associated improvements, work together as a system to improve overall performance. If any aspect of this

system is ignored or is poorly implemented, the performance of the project will suffer. Sufficient quality control should be performed to verify that the recommendations presented in this report are followed.

Structural areas referred to in this report include all areas of buildings, concrete slabs and asphalt pavements, as well as pads for any minor structures. The term engineer, as presented below, pertains to the civil or geological engineer that has prepared the geotechnical engineering report for the project or who serves as a qualified geotechnical professional on behalf of the owner.

All compaction requirements presented in this report are relative to ASTM D 1557. For the purposes of this project:

- Fine-grained soils are defined as those with more than 40 percent by weight passing the number 200 sieve and a plastic index lower than 15.
- Clay soils are defined as those with more than 30 percent passing the number 200 sieve and a plastic index greater than 15.
- Granular soils are those not defined by the above criteria.
- Rock fills are defined as granular soils exhibiting greater than 30 percent ¾-inch-plus size particles.

Any evaluation of the site for the presence of surface or subsurface hazardous substances is beyond the scope of this investigation. When suspected hazardous substances are encountered during routine geotechnical investigations, they are noted in the exploration logs and immediately reported to the client. No such substances were revealed during our exploration.

It is common practice in northern Nevada to place unsuitable soils, including expansive clays, oversized rock and organic strippings, in back, front and side yard areas. If the developer elects this alternate, as opposed to exporting such materials and importing/placing structural fills in yard areas, we recommend disclosure be included in the sales agreement. The buyer should be made aware that homeowner-added improvements, such as patios or swimming pools, will require geotechnical analysis.

Site Preparation

The area of the aggregate quarry exhibits minimal vegetation, such that stripping is not necessary. All vegetation beyond the limits of the quarry shall be stripped and grubbed from structural areas and stockpiled for use in areas to be revegetated. The areas beyond the aggregate quarry include sparse to moderate populations of desert grasses, sagebrush and shrubs, such that a stripping depth of 0.2 to 0.3 feet is anticipated.

The test pits were excavated by a track-mounted excavator or backhoe at the approximate locations shown on Plate 1. Locations were determined in the field by approximate means. All test pits were backfilled upon

completion of the field portion of our study, and the backfill was compacted to the extent possible with equipment on hand. However, the backfill was not compacted to the requirements presented herein under **Mass Grading**. If structures, concrete flatwork, pavement, utilities or other improvements are to be located in the vicinity of any of the test pits, the backfill should be removed and recompacted in accordance with the requirements contained in this report. Failure to properly compact backfill could result in excessive settlement of improvements located over test pits. The test pits located within the existing fill areas will readily be mitigated via the required fill mitigation measures discussed below.

Reworking of Existing Fill Materials and Loosened Bedrock

Fills exist throughout the limits of the aggregate quarry. In the areas of deep fill and extensive reclaimed slopes, the maximum depth of fill is on the order of 50 feet within the proposed subdivision lots and in excess of 70 feet within the far eastern fill area where a park is proposed. Though extensively explored, the complete extent and depth of the fills is unknown. Additional research, including quarry survey records, may be useful but were not available for us. All fill materials will require reworking through their full depth where they are located within areas to support structural fill or structural improvements. A significant portion of these fills are located within areas of the steep pit slopes. These fills include both high quality granular materials as well as fine-grained materials that are a byproduct of the aggregate production during quarry operations and also imported unsuitable and/or excess materials from other projects.

Our exploration encountered loose bedrock materials that most likely exist due to over-blasting or excessive ripping of the native bedrock during quarry operations within Village 5. These areas also exhibit potential for differential movement if left unmitigated and, as such, will require reworking.

Reworking of fill materials and loosened bedrock shall include the removal of these materials through their entire depth to expose undisturbed native ground, proper preparation of the native ground, and replacement with densified engineered fills to establish the design grades. The excavated fill materials can typically be used as fills subject to the discussion and recommendations included under **Mass Grading**. Depending on construction sequencing, as will be likely between separate villages/project phases, it will be necessary to key or bench the backfill into adjacent compacted structural fills. Where this occurs, keyways shall be 1 equipment wide and have vertical spacing of not more than 5 feet. Failure to completely mitigate fill materials will result in differential settlement and potential distress to the overlying improvements. Additionally, structural fill placed along slopes will need to be keyed into competent material, as discussed in the **Mass Grading** section.

The removal and reworking of fills should also include the reclaimed fill slopes of the quarry where additional fills will be placed to establish design grades/slopes for the villages located above/outside the quarry limits. Significant areas along the southern edges of Village 10 will be subject to this requirement. If not mitigated, the reclaimed fill slopes (which are not engineered) can result in settlement concerns to homes located in fills placed within these slopes.

The required mitigation of existing fills should be properly planned and phased to avoid leaving areas of existing fills unmitigated under structural fill improvements. Careful coordination between the earthwork contractor and onsite inspectors during mass grading work is essential in the performance of this project. Potholing throughout mass grading activities within the quarry limits and verification of materials by a qualified inspection professional working under direction of the engineer will likely be necessary to clearly define the fill mitigation limits.

Clay Material Mitigation

Clay soils were found across the surface of the undisturbed portions of the property outside the aggregate quarry. Clay and fine-grained soils also exist with the quarry limits as undocumented fill materials, but these soils are to be removed as part of the required mitigation of existing fills within structural improvement areas.

The clay soils were classified as moist, medium dense to dense (hard), and as exhibiting high to very high plasticity. Laboratory testing performed on these materials determined the clay soils exhibit plasticity indices on the order of 41 to 60, indicative of high expansion potential (Nelson and Miller, 1992).

Clay soils shall be separated from beneath structural areas unless grading is such that those soils will be covered by at least 3 feet of structural fill beneath footings and home floor slabs and 2 feet beneath pavements and exterior slabs. Thickness of aggregate base courses beneath slabs and pavements can be considered toward the structural fill separation. It must be emphasized that unless clay soils are adequately separated from structural improvements, some differential movement should be anticipated. The required separation may be achieved by any combination of site filling or over-excavation and replacement. Any over-excavation shall be backfilled with structural fill to footing grade, or subgrade for pavements and slabs. The width of over-excavation shall extend laterally from the edge of footings, concrete slabs or asphalt pavements at least one-half the depth of the over-excavation.

Failure to recognize and properly mitigate expansive clays will result in damage to improvements. Within native areas, it will be imperative within cut-fill transition areas (less than 3 feet of cut and less than 3 feet of fill) to identify and mitigate clay soils. The most prevalent cut-fill transition zones currently proposed are within Village 8, along with extensive portions of Villages 1, 2, 3, 9 and 10.

Clays to be left in place and covered with fill shall be moisture-conditioned to 2 to 4 percent over optimum for a minimum depth of 12 inches. This moisture level will significantly decrease the magnitude of shrink-swell movements in the upper foot of clay. The high moisture content must be maintained by periodic surface wetting, or other methods, until the surface is covered by at least 1 lift of fill. If allowed to dry out, subsequent expansion of clay soils beneath foundations and floor slabs could significantly exceed the design criteria set forth later in this report.

Subgrade Preparation and Stabilization

All soil areas to receive structural fill or structural loading (including the exposed grade after removal of existing fill materials) shall be densified to at least 90 percent relative compaction. Where less than 70 percent passes the ¾-inch sieve, soils are too coarse for standard density testing techniques. In this case, as will likely occur here, a proof rolling of a minimum 5 single passes with a minimum 10-ton roller in mass grading, or 5 complete passes with hand compactors in footing trenches, is recommended. This alternate has proved to provide adequate project performance as long as all other geotechnical recommendations are closely followed. In all cases, the final surface shall be smooth, firm, and exhibit no signs of deflection. Exposed bedrock surfaces shall be cleaned as much as practical and proof rolled with large compaction equipment to identify any soft/loose areas. These areas should be addressed via removal of soft/loose materials and backfilling the excavation with compacted structural fill.

If wet weather construction is anticipated, surface soils may be well above optimum moisture and impossible to compact. In some situations, moisture conditioning may be possible by scarifying the top 12 inches of subgrade and allowing it to air-dry to near-optimum moisture prior to compaction. Where this procedure is ineffective or where construction schedules preclude delays, mechanical stabilization will be necessary. Mechanical stabilization may be achieved by over-excavation and/or placement of an initial 12- to 18-inch-thick lift of 12-inch-minus, 3-inch-plus, well graded, angular rock fill. The more angular and well graded the rock is, the more effective it will be. This fill shall be densified with large equipment, such as a self-propelled sheeps-foot or a large loader, until no further deflection is noted. Additional lifts of rock may be necessary to achieve adequate stability. The use of a separator geotextile will prevent mud from pumping up between the rocks, thereby increasing rock-to-rock contact and decreasing the required thickness of stabilizing fill. The separator geotextile shall meet or exceed the following minimum properties presented in Table 2 (Minimum Required Properties for Separator Geotextile).

TABLE 2 - MINIMUM REQUIRED PROPERTIES FOR SEPARATOR GEOTEXTILE	
Trapezoid Strength (ASTM D 4533)	80 x 80 lbs.
Puncture Strength (ASTM D 4833)	500 lbs.
Grab Tensile Strength/Elongation (ASTM D 4632)	200 x 200 @ 50 %

As an alternate to rock fill, a geotextile/gravel system may be used for stabilization. Aggregate base (*Standard Specifications for Public Works Construction* [*SSPWC*], 2016), Class C or D drain rock (*SSPWC*, 2016), or pit run gravels shall be placed above the geotextile. Regardless of which alternate is selected, a test section is recommended to determine the required thickness of stabilization.

Trenching, Excavation and Utility Backfill

The project will include extensive deep bedrock cuts and an extensive network of underground utilities installed in bedrock areas. Bedrock of variable competency will be encountered in the excavation. The bedrock will generally

be rippable within shallow depths extending to about 15 feet below the existing ground surface. Within deeper zones, the bedrock will include marginally rippable to non-rippable material with possible areas/zones of rippable material. Black Eagle Consulting, Inc. has completed 3 refraction surveys and 6 ReMi shear wave velocity surveys to determine compressional (P-wave) and shear wave (S-wave) velocities to aid in determination of site bedrock rippability. Within the reclaimed quarry areas, existing fill materials will be excavatable by conventional equipment but will include areas of unstable trenches and slopes. The existing fills may slough and collapse during excavation.

Excavation Characteristics of Bedrock Materials

Bedrock within the site will exhibit varying excavation characteristics. In general, excavation in bedrock will be difficult with the exception of some localized areas within the southern limits where decomposed granite is present and portions of the northern ridgeline and southeastern portion of Village 9 where bedrock is moderately to highly weathered. The seismic velocity of the site bedrock based on our seismic refraction surveys is 2,500 to 8,000 feet per second (fps) within 50 feet of the ground surface (Appendix C). The estimated seismic velocity for the bedrock based on shear- wave velocity, within anticipated cut depths, varies between 3,500 and 7,400 fps. This seismic velocity was estimated by applying a factor of 2.5 to the measured average shear wave velocity developed from the micro-tremor surveys (Appendix E). The seismic velocity values can be correlated to published rippability charts (Caterpillar, 2012); rippability charts for CAT® D10 and CAT® D11 are included in Appendix D. The seismic velocity of the granitic bedrock suggests that it can generally be ripped through shallow to moderate cut depths using conventional large dozers such as a CAT® D10 or CAT® D11. Some areas of shallow competent rock will not be rippable. It must be understood that P-wave (compression wave) velocity is only one indicator of rippability and is less reliable when the P-wave velocity is estimated from measured shear wave velocity. Because much of the rock appears to have seismic velocities near the upper limit of rippability, the seismic data must be considered only in conjunction with all other data presented (including rock core logs, photos, lab testing on rock cores, detailed geophysical survey results, etc.) and additional verification testing by the contractor. The summary of the geophysical survey results and the estimated P-wave velocity values are presented in Table 3 (Summary of Geophysical Survey Results).

TABLE 3 – SUMMARY OF GEOPHYSICAL SURVEY RESULTS			
Line Number/Location	**P-Wave Velocity[1] (Refraction Survey)**	**Shear Wave Velocity (fps)[2]**	**Estimated P-Wave Velocity (fps)**
S1 (2019) – Village 3	6,000 – 8,000	2,710	6,775
S2 (2019) – Village 2	4,000 – 5,000	2,410	6,025
S3 (2019) – Village 10	2,500 – 3,000	1,610	4,025
S4 (2019) – Village 9-10 Boundary	NA[3]	2,000	5,000
S5 (2019) – Village 9	NA	1,540	3,850
S6 (2019) – Village 6-9 Boundary	NA	2,960	7,400
S1 (2018) – Village 4	NA	1,600	4,000
S3 (2018) – Village 8 SW	NA	2,475	6,190
S4 (2018) – Village 8-9 Boundary	NA	2,125	5,315
S5 (2018) – Village 9	NA	1,400	3,500
S6 (2018) – Village 9	NA	1,900	4,750
S7 (2018) – Village 10 W	NA	1,570	3,925
S10 (2018) – Village 10 E	NA	1,860	4,650

[1]Range of maximum velocity within 50 feet of the ground surface.
[2]Average shear wave velocity within 100 feet depth. Refer to Appendix E for detailed shear wave velocity analysis results.
[3] Not Applicable - no direct measurement of seismic velocity.

Our coring of the bedrock material revealed close to moderate fracture spacing within the competent bedrock zones. The moderately wide fracture patterns combined with the above-discussed rippability analysis indicate that significant areas of bedrock may not be ripped with large conventional equipment. Areas of lower seismic velocity and weathered rock will be rippable by large ripping dozers. However, isolated hard "core-stones" will be present which will likely require blasting. Blasting should be anticipated, at a minimum, within the hillside in the northwestern portion of Village 6 and the west ridge of Village 3 due to widely spaced fractures and competent rock. Again, the earthwork contractor must review all the subsurface information contained in this report to make a decision with respect to the need for blasting. Additional field verification, including the advancement of test pits using large excavators, can also be performed before a final decision on the need for blasting is made. Where necessary, blasting patterns should be implemented to generate particles that are small enough to be further processed and incorporated in structural fills.

Not all bedrock material will break down into soil-sized particles under the mechanics of excavation, loading, transportation, placement, and/or compaction. Large self-propelled sheeps-foot compactors such as CAT® 825 will be required to facilitate the breaking down of bedrock particles into smaller rock fragments more suitable for reuse in rock fills. Excavators mounted with pneumatic hammers or rock saws may also facilitate breaking down of these large particles. Depending on the project scheduling and the efforts required to break down ripped bedrock materials into smaller particles, blasting may be a more economical alternative in some areas because blasting can minimize the needed amount of additional particle size reduction.

Areas that receive blasting will typically impact (loosen) materials below the neat line of anticipated excavation. Therefore, the contractor shall pothole below the planned excavation limits in areas where blasting is performed to allow the engineer to verify that the material present is undisturbed. Where loosened material is encountered, it shall be reworked through its full depth to provide a firm and unyielding subgrade. Depending on the depth impacted by blasting, over-excavation of loose rock material may be necessary.

Temporary Excavations and Trenching

Trenching of bedrock materials will be very difficult and likely demand other aggressive trenching techniques such as a large excavator equipped with a narrow bucket and rock teeth, an impact hammer mounted on an excavator, use of rock saws, or even blasting in local areas, especially with the anticipated large utility trenches. Trenching within finished grades established via deep cuts into bedrock will exhibit competent bedrock that will cause extremely difficult conditions for trenching and will demand aggressive trenching techniques.

Neat-line utility trenches and footing excavations may be possible in bedrock and also in compacted fills. Where blasting is necessary and is to be implemented, it will be necessary to pothole adjacent locations to allow the engineer to verify materials present are undisturbed to support overlying improvements. Where blasting has impacted (loosened) adjacent materials, it shall be reworked and/or over-excavated and replaced with compacted structural fill to support overlying improvements. Where possible, alternative aggressive excavation techniques such as use of a rock saw or impact hammer shall be used in trenching activities and blasting shall only be selected as the last resort excavation technique.

Temporary trenches with near-vertical sidewalls should be stable to a depth of approximately 4 feet. Temporary trenches are defined as those that will be open for less than 24 hours. Excavations to greater depths will require shoring or laying back of sidewalls to maintain adequate stability. Regulations contained in Part 1926, Subpart P, of Title 29 of the Code of Federal Regulations (2010) require that temporary sidewall slopes be no greater than those presented in Table 4 (Maximum Allowable Temporary Slopes).

TABLE 4 - MAXIMUM ALLOWABLE TEMPORARY SLOPES	
Soil or Rock Type	**Maximum Allowable Slopes[1] for Deep Excavations less than 20 Feet Deep[2]**
Stable Rock	Vertical (90 degrees)
Type A[3]	3H:4V (53 degrees)
Type B	1H:1V (45 degrees)
Type C	3H:2V (34 degrees)
Notes:	
[1] Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off. [2] Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer. [3] A short-term (open 24 hours or less) maximum allowable slope of 1H:2V (63 degrees) is allowed in excavation in Type A soils that are 12 feet or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet in depth shall be 3H:4V (53 degrees).	

The State of Nevada, Department of Industrial Relations, Division of Occupational Safety and Health Administration (OSHA) has adopted and strictly enforces these regulations, including the classification system and the maximum slopes. In general, Type A soils are cohesive, non-fissured soils with an unconfined compressive strength of 1.5 tons per square foot (tsf) or greater. Type B are cohesive soils with an unconfined compressive strength between 0.5 and 1.5 tsf. Type C soils have an unconfined compressive strength below 0.5 tsf. Numerous additional factors and exclusions are included in the formal definitions. The client, owner, design engineer, and contractor shall refer to Appendix A and B of Subpart P of the previously referenced Federal Register for complete definitions and requirements on sloping and benching of trench sidewalls. Appendices C through F of Subpart P apply to requirements and methodologies for shoring.

On the basis of our exploration, the native surface clay soils are predominately Type B, the existing fill soils are Type C, and granitic bedrock can be considered stable rock. Any area in question shall be considered Type C unless specifically examined by the engineer during construction. All trenching shall be performed and stabilized in accordance with local, state, and OSHA standards. Trenching in fractured bedrock will have a tendency to ravel loosened fragments. Care should be exercised in these areas to protect workmen in the trench.

Utility Trench Backfill

The maximum particle size in trench backfill shall be 4 inches. Bedding and initial backfill 12 inches over the pipe will require import and shall conform to the requirements of the utility having jurisdiction. Bedding and initial backfill shall be densified to at least 90 percent relative compaction. Existing granular fill, native granular soils and materials excavated from bedrock will provide adequate final backfill as long as oversized particles are excluded. The final backfill shall be placed in maximum 8-inch-thick loose lifts that are compacted to a minimum of 90 percent relative compaction in all structural areas.

Mass Grading

The overall 5 Ridges Subdivision will include extensive cuts and fills and associated tall slopes. Maximum proposed cuts and fills are on the order of 75 and 50 feet, respectively. Cuts and fills on the order of 20 to 40 feet are typical throughout the project. Additionally, extensive fill within the quarry limits will require mitigation via reworking the fills through their entire depth and will add to additional fill thickness within the proposed subdivision. Based on the grading plans for the subdivision, the villages (mainly Villages 5 and 7) within the quarry limits will receive additional fills. As much as 40 feet of additional fills will be placed above existing ground elevations after required mitigation of existing fills.

Native clay soils and existing clay and fine-grained fill soils shall be placed as fill only in nonstructural areas. Onsite clay and fine-grained soils may also be incorporated within exterior fill slopes outside a 1.5H:1V downward line starting from the crest as long as the fill areas do not host residential structures. Native granular soils, existing granular fill materials, and excavated bedrock materials resulting in granular soils will be suitable for structural fill provided particles larger than 6 inches are removed. Asphalt concrete and PCC pieces within the existing fills can also be incorporated into fills provided maximum particle size requirements in this section are followed. Rock fills discussed below can consist of particles up to 12 inches in size. A vast majority of excavations into native ground on the project will result in granular soils that will be suitable reuse as structural fills/rock fills on this project after exclusion (or processing) of oversized particles. Oversized rocks can be stockpiled for later use as erosion protection or placed in the bottom of deep nonstructural fills, particularly within the toe of the fill slopes. In deep fills, oversized rocks must be scattered in such a manner as to preclude development of voids between the particles (nesting).

The existing fine-grained fill soils generally have relatively low expansion potential and could be blended/mixed with granular fill or bedrock to produce a material that meets the granular soils criteria defined under the **General Information** section of this report. A 4:1 granular soils to fine-grained fill soils blending ratio may be considered. The blending operation must be performed in a way so as to generate relatively uniform materials, and samples of the blended materials should be taken and tested to confirm proper blending and that the blended materials meet the granular soils criteria. Clay fill soils exhibiting elevated plasticity should be excluded from the blending process where practical. It must be noted that blending of clay fill soils with onsite granular soils may prolong the settlement waiting period discussed under the **Fill Settlement** section; as such, these blended materials may need to be reserved for use within fill slopes to minimize settlement concerns to overlying improvements. Any blending operation on the project should be carefully inspected because ineffective/unsatisfactory blending operations resulting in pockets of clays within the fills can cause settlement issues and underperformance of the project.

Imported structural fill is not anticipated on this project, but if necessary, it should satisfy the recommendations presented in Table 5 (Guideline Specification for Imported Structural Fill).

TABLE 5 - GUIDELINE SPECIFICATION FOR IMPORTED STRUCTURAL FILL		
Sieve Size	**Percent by Weight Passing**	
4 Inch	100	
3/4 Inch	70 – 100	
No. 40	15 – 70	
No. 200	5 – 30	
Percent Passing No. 200 Sieve	**Maximum Liquid Limit**	**Maximum Plastic Index**
5 – 10	50	20
11 – 20	40	15
21 – 30	35	10

These recommendations are intended as guidelines to specify a readily available, prequalified material. Adjustments to the recommended limits can be provided to allow the use of other granular, non-expansive material. Any such adjustments must be made and approved by the engineer, in writing, prior to importing fill to the site.

All fill placed on hillsides (including existing quarry sidewalls) steeper than 5H:1V shall be keyed into existing materials in equipment-wide benches. The maximum vertical separation between benches shall be 5 feet. Hillside fill is expected within all phases of the project. It is critical that fills are properly keyed into hillsides via benching to reduce vertical and horizontal movement of wedge-shaped fill masses which can cause settlement concerns to overlying improvements.

Where structural fill thickness is to exceed 8 feet, it shall be placed in maximum 8-inch-thick loose lifts each densified to at least 95 percent relative compaction. Structural fill less than 8 feet in depth can be placed in maximum 8-inch-thick loose lifts each densified to at least 90 percent relative compaction. It is also sufficient to densify clay and fine-grained soils that may be incorporated into the toe of fill slopes (outside the 1.5H:1V line noted above) to a minimum 90 percent relative compaction. Nonstructural fill shall be densified to at least 85 percent relative compaction to minimize consolidation and erosion. When non-structural fill is to exceed 12 feet in thickness, the compaction requirements should be increased to a minimum of 89 percent to reduce consolidation and depression which can cause water ponding issues.

The site materials will commonly have greater than 30 percent retained on the ¾-inch sieve, such that standard density testing is not valid. These materials will be treated as rock fills with a maximum lift thickness and maximum particle size of 12 inches. A proof rolling program of at least 5 single passes of a minimum CAT® 825 roller in

mass grading, or at least 5 complete passes with hand compactors in footing trenches, is recommended. With the contractor's proven performance in sufficiently densifying rock fills, the maximum lift thickness and maximum particle size allowed in the rock fills may be increased to 18 inches.

Properly constructed rock fills have a long history of excellent performance in northern Nevada. Several subdivisions and major commercial projects in Reno-Sparks and surrounding areas have been built using rock fills under inspection and testing by BEC and shows excellent performance. For this project, the maximum particle size contained in rock fill placed during mass grading to within 4 feet of finished subgrade elevation should be 12 inches, with a maximum lift height of 12 inches. Within 4 feet of subgrade elevations, the rock fill should exhibit a maximum particle size of 6 inches, with a maximum lift height of 12 inches to facilitate fine grading and trenching. Acceptance of this rock fill is based upon observation of particle size, lift thickness, moisture content, and applied compactive effort. Compaction must continue to the satisfaction of the engineer. Full-time inspection/observation by a qualified inspector (i.e., onsite representative of the engineer) should be included for compaction of rock fills that be will be involved on this project. In all cases, the finished surface shall be firm and show no signs of deflection.

Grading shall not be performed with or on frozen soils.

Fill Settlement

Including the required reworking of existing fills, the maximum thickness of fills on the subdivision project will approach about 80 feet. All deep fills settle through internal consolidation from the weight of overlying fill material. In general, the granular soils and rock fills on this project can consolidate about 0.5 percent of the fill height (about 5 inches for 80 feet of fill). The time for the substantial completion of internal compression of deep fills will depend on the thickness of fills, lift thickness, compactive efforts, and most importantly the characteristics of the fills. Rock fills and granular structural fills, as will be involved in this project, experience this internal compression rapidly upon receiving the surcharge weight of the overlying lifts of fill. No extensive time delays will be necessary before footing construction commences over these fills, but some settlement waiting period is prudent for adequate performance of homes. We recommend a minimum 30-day settlement waiting period after completion of filling to pad/lot elevations for fill areas receiving more than 15 feet but less than 40 feet of fills. This settlement waiting period should be increased to at least 60 days where the fill thickness is 40 feet or more. The construction of homes within the lots lying on deep fills should be delayed through the settlement waiting period. In all cases, the construction of the homes can commence once the internal compression of deep fill is substantially completed (equilibrium levels). Settlement monitoring benchmarks should be installed throughout deep fill areas and surveyed weekly; the number of monitoring points and survey frequency will need to depend on the expected phasing of the subdivision project. The internal compression of deep fill can be considered substantially complete when 3 consecutive weekly settlement monitoring records show no more than 0.02 feet of settlement between the records.

Differential fill thickness within the lots will add additional differential settlement concerns to homes due to internal compression of fills. Therefore, additional importance for delayed home construction should be given to lots showing 10 feet or more of differential fill thickness. These lots may be best left undeveloped for an extended period (3 months or more) from the completion of filling to lot/pad design grades. The project phasing and planning should be carefully implemented to minimize differential settlement to homes due to internal compression of deep fills and/or differential fill thickness. The street and utility improvements to be located within significant differential fill thickness (more than 10 feet of differential fill thickness over 40 feet distance) should also observe a settlement waiting period.

The substantial completion time for internal compression of fills can be longer for fills that will contain elevated percentages of plastic fines (e.g., fills resulting from blending of onsite clay soils with other suitable soils). Therefore, if blending is to be implemented to generate suitable fills (the resulting fill should always meet the granular soils criteria), the blended fills should not be placed within areas of deep fills. We recommend the thickness of blended fills within any portion of the project be limited to a maximum of 8 feet.

Seismic Design Parameters

The 2018 *IRC* (ICC, 2018b), adopted by the City of Sparks, requires a detailed soils evaluation to a depth of 100 feet to develop appropriate soils criteria or the use of a default Site Class D in determination of seismic design criteria. Site-specific shear wave velocity surveys have been performed for the site, and average shear wave velocity ranges from 1,540 to 2,710 fps for native grade exhibiting a thin soil cover underlain by bedrock at shallow depth. However, the project will also include substantial thicknesses of densified fills which will exhibit low shear wave velocity. Considering the thickness of the fills involves on this project and our shear wave velocity measurements on native grade, a Site Class D is appropriate for the site. The Site Class D soil profile is for stiff soils with a shear velocity between 600 and 1,200 fps, or with an N (Standard Penetration Test) value between 15 and 50, or an undrained shear strength between 1,000 and 2,000 pounds per square foot (psf). The recommended seismic design criteria are presented in Table 6 (Seismic Design Criteria Using 2018 *International Residential Code*).

TABLE 6 - SEISMIC DESIGN CRITERIA USING 2018 *INTERNATIONAL RESIDENTIAL CODE* (ASCE, 2020)	
Latitude	39.617
Longitude	-119.741
Spectral Response at Short Periods, S_s, percent of gravity	137.2
Site Class	D
Soil Factor for Site Class D	1.0
Risk Category	II
Residential Site Value, S_{DS}, percent of gravity	91.5
Residential Seismic Design Category	D_2

Foundation

The most economical method of foundation support lies in spread footings bearing on structural fill, properly prepared native granular soils, or bedrock. Individual column footings and continuous wall footings underlain by properly prepared native granular soils, bedrock, or a minimum 3 feet of densified structural fill/rock fill can be designed for a net maximum allowable bearing pressure of 2,000 psf and should have minimum footing widths of 24 and 12 inches, respectively. If necessary, the maximum net allowable bearing pressure for footings underlain by bedrock can be increased to 4,000 psf or more, but this will require carful categorization/designation of foundation design for lots lying in bedrock. The net allowable bearing pressure is the pressure at the base of the footing in excess of the adjacent overburden pressure. This allowable bearing value should be used for dead plus ordinary live loads. Ordinary live loads are that portion of the design live load that will be present during the majority of the life of the structure. Design live loads are loads that are produced by the use and occupancy of the building, such as by moveable objects, including people or equipment, as well as snow loads. These bearing values may be increased by one-third for total loads. Total loads are defined as the maximum load imposed by the required combinations of dead load, design live loads, snow loads, and wind or seismic loads.

With these allowable bearing pressures, total foundation movements of approximately 1 inch should be anticipated. Differential movement between footings with similar loads, dimensions, and base elevations should not exceed two-thirds of the values provided above for total movements. The total and differential settlement of footings lying on bedrock will be negligible. The majority of the anticipated movement will occur during the construction period as loads are applied. This settlement does not include any remaining internal settlement of deep fill, as discussed in the **Fill Settlement** section.

Lateral loads, such as wind or seismic, may be resisted by passive soil pressure and friction on the bottom of the footing. The recommended coefficient of base friction is 0.45 and has been reduced by a factor of 1.5 on the ultimate soil strength. Design values for active and passive equivalent fluid pressures are 35 and 400 psf per foot

of depth, respectively. These design values are based on spread footings bearing on and backfilled with structural fill.

All exterior footings should be placed a minimum 2 feet below adjacent finished grade for frost protection.

If loose, soft, wet, or disturbed soils are encountered at the foundation subgrade, these soils should be removed to expose stable soils and the resulting over-excavation backfilled with compacted structural fill. The base of all excavations should be dry and free of loose soils at the time of concrete placement.

Foundation Drainage Design Parameters

For homes with a raised floor and a crawl space, subsurface foundation drainage should be installed along the exterior perimeter foundations. This may be accomplished by placing a non-woven geotextile/gravel system with a network of perforated drain pipes below and along the outside base of the exterior footings. The geotextile shall meet or exceed the minimum properties presented in Table 7 (Minimum Required Properties for Drainage Geotextile).

TABLE 7 - MINIMUM REQUIRED PROPERTIES FOR DRAINAGE GEOTEXTILE	
Grab Tensile (ASTM D 4632)	90 lbs.
Puncture Strength (ASTM D 4833)	50 lbs.
Burst Strength (ASTM D 3786)	150 psi.
OR IF NATIVE SOILS HAVE SHARP, ANGULAR ROCKS:	
Grab Tensile (ASTM D 4632)	130 lbs.
Puncture Strength (ASTM D 4833)	75 lbs.
Burst Strength (ASTM D 3786)	250 psi.

A trench shall be excavated to a depth of at least 6 inches below the base and directly adjacent to the outside of the footings. A perforated, 4-inch-diameter drain pipe shall be placed in the bottom of the trench and graded to drain downslope of the residence. A minimum of 12 inches of Class C drain rock (*SSPWC*, 2016) shall be placed above the drain pipe and around the footing, then covered by the geotextile. The permeable material should extend up above the footing/stemwall cold joint.

Retaining Wall

The currently proposed grading for the subdivision appears to utilize slopes. However, as each village in the subdivision and grading plans are finalized, site retaining walls may be incorporated in the project. In addition, split

level homes will have interior basement retaining walls. It is possible some tight areas in the subdivision may utilize rockery retaining walls, and design considerations for rockery walls are provided later in this section.

Retaining Wall Design Parameters

Table 8 (Lateral Earth Pressure Values [Equivalent Fluid Density]) provides design parameters for fully drained retaining walls with vertical back faces, horizontal backfill, and no surcharge loads next to the top of the wall. Recommendations for retaining wall drainage are provided in the Retaining Wall Drainage Design section. Surcharge loads, including construction and traffic loads, should be added to the following values. While the recommendations here may be suitable for other conditions, the engineer should be consulted for retaining walls with unusual conditions such as sloping backfill, sloping retaining walls, or the presence of hydrostatic pressure. The engineer should also be consulted where retaining walls exceed 12 feet in height.

TABLE 8 - LATERAL EARTH PRESSURE VALUES (EQUIVALENT FLUID DENSITY), pcf[1]

Retained Slope & Materials	Static		Dynamic	
	Active*	Passive**	Active*	Passive**
Level Native Soils or Structural Fill	35	150	51	220
Level Native Bedrock	27	190	41	290

[1]Pounds per Cubic Foot
*For walls that are free to yield at least 0.2 percent of the wall height.
**The values presented have been reduced from the ultimate passive resistance values by 67 and 50 percent to limit deflection under static and dynamic conditions, respectively.

Restrained walls should be designed to resist an at-rest equivalent fluid density of 55 pounds per cubic foot (pcf).

Lateral loads will be resisted by friction along the base of retaining wall footings and by passive resistance against buried foundation walls. Foundation wall footings cast directly on properly prepared native granular soils or bedrock or densified structural fill may be designed using a coefficient of base friction of 0.45. This factor has been reduced by a factor of 1.5 on the ultimate soil strength.

Retaining Wall Drainage Design

Subsurface foundation drainage must be installed along the retaining wall foundations. This may be accomplished by placing a non-woven geotextile/gravel system with a network of perforated drain pipes below and along the outside base of the exterior footings. The geotextile shall meet or exceed the minimum properties presented earlier in Table 7.

A trench shall be excavated to a depth of at least 6 inches below the base and directly adjacent to the outside of the footings. A perforated, 4-inch-diameter drain pipe shall be placed in the bottom of the trench and graded to

drain downslope of the residence. A minimum of 12 inches of Class C drain rock (*SSPWC*, 2016) shall be placed above the drain pipe and around the footing, then covered by the geotextile. The permeable material should extend up above any soil/bedrock contact exposed in footing excavations and above the footing/stemwall cold joint.

Retaining wall drainage can be accomplished by installing granular backfill and a weep hole drain system at the bottom of the wall, or a prefabricated drain system that is hydraulically connected to the foundation drain system. The drain rock section shall be a minimum of 18 inches wide and extend to within 12 inches of finished grade. A drainage geotextile (Table 7) shall be placed between the drain rock backfill and the native soils to prevent migration of fines into the drain rock.

A prefabricated drain system consists of a three-dimensional mesh or waffle structure with a geotextile on one side, such as Mirafi® *Miradrain G100N,* that is fastened to the back side of the wall with the geotextile side facing the backfill. The prefabricated drain mat connects at the bottom of the wall either to a drain pipe or empties into drain rock backfill wrapped in a geotextile at the base of the wall that then drains through weep holes downslope of the structure. Where drain pipes are employed, the pipes shall outlet downslope from the end of the wall or through a weep hole at the end of the wall.

A concrete or rock-lined interceptor swale shall be included at the backfill surface to direct runoff away from site retaining walls.

Retaining Wall Backfill

Backfill behind retaining walls shall be compacted to 90 percent of the material's maximum dry density in accordance with ASTM D 1557, but it shall not be densified to more than approximately 92 percent relative density to minimize pressure against the walls. Care must be exercised when compacting backfill against retaining walls and foundations. To reduce temporary construction loads on the walls, heavy equipment shall not be used for placing and compacting fill within a region as determined by a 0.5H:1V line drawn upward from the bottom of the wall, or within 3 feet of the wall, whichever is greater. We recommend that hand-operated compaction equipment be used to compact soils adjacent to walls.

Sealing of Subsurface Walls

If planned in the subdivision, the split-level homes with a walkout basement may include basement retaining walls. A waterproof membrane must be applied to the back of basement walls to assure that seepage, excess dampness, or efflorescence is not a problem for the lower level. Any cold joints, such as between footings and walls, should be waterproofed with appropriate, highly durable sealant. Basement seepage is extremely difficult and costly to repair; therefore, the wall drainage and waterproofing systems must be well-designed and properly installed.

Rockery Walls

Rockery walls should be designed by a qualified design professional accounting for the retaining conditions as well as characteristics of subsurface materials included in this geotechnical report and shall also be subject to the requirements below. If requested, BEC can provide rockery wall design services as part of a separate scope of work once final grading plans and wall details become available.

The maximum height of any single rockery wall shall be 6 feet. Walls may be staggered in areas of greater retained heights. All terraced walls shall be constructed such that the base of the upper wall is at least as far horizontally from the bottom of the lower wall as 1.5 times the height of the lower wall to prevent surcharging of the lower wall and for overall/global stability of the wall system. If the bench between the terrace wall is to be sloped, additional setback between walls will be necessary. In all cases, the grade separation with terraced walls should result in slopes no steeper than 1.5H:1V. These terraced walls and walls retaining a slope will require global stability analyses to determine other requirements including the setback of homes and improvements within the lots from the wall alignments considering slope stability. No improvements shall extend over rockery wall backfill to prevent distress from differential settlement. In cut areas, tall rockery walls may be considered with specific analysis.

All rockery walls shall be constructed in a battered configuration by a qualified and experienced contractor. Walls may be staggered in areas of greater retained heights as long as the offset recommendations provided earlier are satisfied. If rockery walls retain fill slopes, the fill shall be overbuilt and then cut back to the back of wall construction.

Subsidence and Shrinkage

Due to the wide variety of materials present, earth quantity balances will be very challenging on this project. Existing granular fill materials and granular alluvial soils excavated and recompacted in structural fills should experience quantity shrinkage of approximately 10 to 20 percent, including removal of oversized particles, when densified as structural fills at 90 to 95 percent relative compaction. This range considers various qualities of existing fill materials encountered within the reclaimed quarry. In general, granular fill soils will shrink approximately 10 to 15 percent but the existing fine-grained and clay soils could shrink up to 20 percent. However, there are very loose to loose zones of existing fills, and the shrinkage of these fills when densified as structural fills will be significantly higher than the ranges provide above.

Excavated soft bedrock materials (decomposed granite) should have no to low swell (less than 5 percent swell) when placed as densified rock. Hard bedrock materials, where encountered in deep cut within ridgelines, will experience swell of about 15 to 30 percent if 100 percent of the material is utilized as fill (i.e., if any oversized material is crushed to appropriate sizes for use in structural fill/rock fill). For earthwork quantity estimation, it may be assumed cuts deeper than 10 feet below the existing ground surface will result in hard bedrock materials. The excavated bedrock materials reused as final utility backfill will experience additional swell unless the materials are

appropriately processed to result in 4-inch minus particles. It must be noted that quantity shrinkage of bedrock is difficult to estimate and will vary depending on the bedrock hardness, weathering conditions, and processing means by the contractor.

Slope Stability and Erosion Control

The grading associated with the 5 Ridges Subdivision will require relatively tall cut and fill slopes. Stability of cut and filled surfaces involves 2 separate aspects. The first concerns true slope stability related to mass wasting, landslides or the en masse downward movement of soil or rock. Stability of cut and fill slopes are dependent upon shear strength, unit weight, moisture content, and slope angle. The *IBC* (ICC, 2018a), adopted by the City of Sparks, allows cut and fill slopes up to 2H:1V in the type of soils present at this site. The exploration and testing program conducted during this investigation confirms 2H:1V soil slopes will be stable. Fill slopes should be constructed using compacted fill materials and should also adhere to all other recommendations of this report. Cuts in the onsite bedrock can be sloped at 1.5H:1V. However, the soil veneer overlying the bedrock shall be sloped at 2H:1V or flatter. The cut and fill slopes shall include benches every 30 feet in vertical height following the requirements of the 2018 *IBC* (ICC, 2018a). The benches are generally for maintenance purposes. If and when requested, BEC can perform evaluation of specific slopes proposed on the project to determine if the benches can be eliminated or be incorporated less frequently.

The second aspect of stability involves erosion potential and is dependent on numerous factors involving grain size distribution, cohesion, moisture content, slope angle, and the velocity of the water or wind on the ground surface. Soil cut and fill slopes that are 5H:1V or steeper shall be stabilized against erosion. Soil slopes between 3H:1V and 5H:1V can be stabilized by hydroseeding. Soil slopes steeper than 3H:1V require mechanical stabilization such as rip-rap. The City of Sparks may accept other methods of stabilization on soil slopes steeper than 3H:1V if they can be demonstrated to be as effective as mechanical stabilization. Mechanical stabilization of fill slopes to control surface erosion could include placement of 4-inch-minus, angular rock along the surface of the slope. In some cases the rock fills may suffice as their own rip-rap. Additionally, stockpiled stripping materials placed on soil fill slopes will help stimulate growth of vegetation. Stockpiled boulders could be embedded in the slope to further reduce erosion and provide a more natural appearance. Mechanical stabilization of bedrock slopes is unnecessary.

A simple brow ditch (interceptor drain) at the upper shoulder of the tall cut slopes is prudent. A collection swale is recommend at the toe of cut slopes, and this slope can also act as toe drain/channel at the base of the slope. The width of this buffer zone should be a minimum of 8 feet to collect particles dislodged from the slope (often by freeze-thaw action) and allow periodic removal by maintenance equipment. A short chain link fence or other protective measures (e.g., a wall with a freestanding top wall segment) should also be considered at the opposite edge of the collection swale on a case-by-case basis depending on the available setback from the toe of the cut slopes to improvements. The brow ditch and collection system may not be necessary for relatively short cut slopes that are 10 feet or less in vertical height.

Dust potential at this site will be moderate to severe during dry periods. Temporary (during construction) and permanent (after construction) erosion control will be required for all disturbed areas. The contractor shall prevent dust from being generated during construction in compliance with all applicable city, county, state, and federal regulations. The contractor shall submit an acceptable dust control plan to the Washoe County District Health Department prior to starting site preparation or earthwork. Project specifications should include an indemnification by the contractor of the owner and engineer for any dust generation during the construction period. The owner will be responsible for mitigation of dust after accepting the project.

In order to minimize erosion and downstream impacts to sedimentation from this site, best management practices with respect to stormwater discharge shall be implemented.

Site Drainage

Surface Drainage

Adequate surface drainage shall be provided so moisture is directed away from structures. A system of roof gutters and downspouts is recommended to collect roof drainage and direct it away from the foundations. If roof runoff is allowed directly over paver stones, especially where they will be subjected to vehicle loading, saturation of the subgrade materials could result in rutting of the paver stone system.

Stemwall backfill shall be thoroughly compacted to decrease permeability and reduce the potential for irrigation and stormwater to migrate below the floor slab and/or enter the crawl space.

The ponding of water on finished grade or at the edge of pavements shall be prevented by grading the site in accordance with *IBC* and/or *IRC* (ICC, 2018a and 2018b) requirements.

Crawl Space Drainage

Positive crawl space drainage shall be provided. This is most easily accomplished by grading the crawl space to drain to 1 or more localized areas and providing 3-inch-diameter pipes to daylight beneath the footings and tie into the exterior foundation drain. Often, design grades preclude adequate drainage by daylighting a direct drain. A less preferable alternate is to grade the crawl space to drain to the sewer lateral and gravel pack the lateral from the crawl space to the sewer main in the street.

It is our opinion that the systems described above meet Federal Housing Authority requirements for positive crawl space drainage. These systems are sufficient to drain water within a few days that may occasionally occur from large snowmelt, major storms, or broken pipes. These systems may not, however, be entirely sufficient to prevent all homeowner complaints. It has been our experience that most problems with wet crawl spaces are directly related to changes in site drainage or poor irrigation practices by the homeowner; it is usually difficult to convince the homeowner of his or her responsibility in these matters, however, and the problem can often become time consuming, resulting in ill-will and even lawsuits between the homeowner and developer. For these reasons,

some builders are using more positive drainage systems, such as pea gravel blankets, interior perimeter drains, or exterior subdrains. It shall be noted that certain lots may be prone to collect upslope irrigation and storm drainage through subsurface flow that daylights in the crawl space.

Crawl space drainage systems cannot be expected to be 100 percent effective against sporadic wetting caused by plumbing leaks, large storms, or unusually large and/or rapid snowmelt. The purpose of all forms of positive crawl space drainage is to minimize the amount of moisture that enters the crawl space under normal conditions and to drain the increased moisture volume from unusual conditions in a few days or even weeks. Positive crawl space drainage does not require that soils are dry, only that freestanding water is not normally present. Moist to wet soils are normal in crawl spaces, particularly around the perimeter footings. Any perceived, undesirable effects from this moisture are usually prevented by installation of a polyethylene vapor barrier over the crawl space surface. Crawl space vents might be opened all year to help control moisture. The homeowner's obligation is to maintain proper drainage, away from the home, and to not overwater landscaping.

Concrete Slabs

All concrete slabs shall be directly underlain by Type 2, Class B aggregate base (*SSPWC*, 2016). The thickness of base material beneath PCC flatwork shall be 6 inches beneath curbs and gutters and 4 inches beneath sidewalks, floor slabs and private flatwork. Aggregate base courses shall be densified to at least 95 percent relative compaction.

Final design of the floor slab (both thickness and reinforcement) shall be performed by the project structural engineer. Any interior concrete slab-on-grade floors shall be a minimum of 4 inches thick. Floor slab reinforcement, as a minimum, shall consist of No. 3 reinforcing steel placed on 24-inch centers in each direction, or flat sheets of 6x6, W4.0xW4.0 welded wire mesh (WWM). Rolls of WWM are not recommended for use because vertically centered placement of rolled WWM within a floor slab is difficult to achieve. All reinforcing steel and WWM shall be centered in the floor slab through the use of concrete dobies or an approved equivalent.

Northern Nevada is a region with exceptionally low relative humidity. As a consequence, concrete flatwork is prone to excessive shrinking and curling. Concrete mix proportions and construction techniques, including the addition of water and improper curing, can adversely affect the finished quality of concrete and result in cracking, curling, and the spalling of slabs. We recommend that all placement and curing be performed in accordance with procedures outlined by the American Concrete Institute (2011) and this report. Special considerations shall be given to concrete placed and cured during hot or cold weather temperatures, low humidity conditions, and windy conditions such as are common in the Truckee Meadows area.

Proper control joints and reinforcement shall be provided to minimize any damage resulting from shrinkage, as discussed below. In particular, crack-control joints shall be installed on maximum 10-foot centers and shall be installed to a minimum depth of 25 percent of the slab thickness. Saw-cuts, zip strips, and/or trowel joints are

acceptable; however, saw-cut joints must be installed as soon as initial set allows and prior to the development of internal stresses that will result in a random crack pattern. If trowel joints are used in the main living area floor slab, they will need to be grouted over prior to installation of floor coverings.

Concrete shall not be placed on frozen in-place soils.

Any interior concrete slab-on-grade floors will require a moisture barrier system. Installation shall conform to the specifications provided for a Class B vapor restraint (ASTM E 1745-97). The vapor barrier shall consist of placing a 10-mil-thick Stego® Wrap Vapor Barrier or an approved equal directly on a properly prepared subgrade surface. A 4-inch-thick layer of aggregate base shall be placed over the vapor barrier and compacted with a vibratory plate.

The base layer that overlies the moisture barrier membrane shall remain compacted and a uniform thickness maintained during the concrete pour, as its intended purpose is to facilitate even curing of the concrete and minimize curling of the slab. Extra attention shall be given during construction to ensure that rebar reinforcement and equipment do not damage the integrity of the vapor barrier. Care must be taken so that concrete discharge does not scour the base material from the vapor barrier. This can be accomplished by maintaining the discharge hose in the concrete and allowing the concrete to flow out over the base layer.

Asphalt Concrete

Asphalt Concrete Pavement Design

R-values of 19, 67, 74, and 76 were measured for the granular soils that will be exposed in the majority of cuts and will make up the bulk of the fill on this project. The samples included minor amounts of surface clays in order to reflect the difficulties that will be encountered in separating the onsite materials during site preparation and grading. For design purposes, a conservative R-value of 20 was used to accommodate minor variations in fill quality due to the complex mixture of onsite materials.

A detailed traffic study for the subdivision was not available to us at the time of this report. The backbone road that will extend off of Highland Ranch Parkway will carry all the traffic associated with the subdivision. Other streets will carry significantly less traffic. A conservative residential lot/unit of 1,300 was utilized in the analyses to allow for any future lot layout changes. Other streets on the project will be subject to less traffic loading compared to the backbone road. The Equivalent Single Axle Loading (ESAL) for the residential streets was estimated in a conservative manner using the procedure summarized in Table 9 (Traffic Analysis for Subdivision).

TABLE 9 - TRAFFIC ANALYSIS FOR SUBDIVISION	
Design Life	20 Years (7,300 Days)
Maximum Lots	1,300
10 Two-Way Trips per Day per Lot (Institute of Transportation Engineers, 2003)	
2 Percent Trucks with Truck Factor (T.F.) of 0.52 (Assumed)	
Construction Traffic + 20 Trucks per Lot at T.F. = 1.0 (Assumed)	
$ESAL_{20} = (7,300)(1,300)(5)(.02)(.52) + (1,300)(20)(1.0)$	
$ESAL_{20} = 493,480 + 26,000 = 519,480$	

Based on our analyses (American Association of State Highway and Transportation Officials, 1993), the City of Sparks minimum structural section for a residential street will be sufficient to support the calculated 20-year ESAL ($ESAL_{20}$) provided in Table 8 for the subgrade soil conditions. The analyses calculations are enclosed as Appendix G (Pavement Design Calculations). The backbone road and other main access roads leading to the subdivision villages are expected to be considered Collector Streets with roadway width and other conditions. The recommended structural sections based on street classification are provided in Table 10 (Recommended Structural Sections).

TABLE 10 - RECOMMENDED STRUCTURAL SECTIONS		
Classification	**Asphalt Concrete**	**Type 2, Class B Aggregate Base[1]**
Collector Street	4"	10"
Residential Street	4"	8"
[1] *SSPWC* (2016)		

If the traffic ultimately exceeds the anticipated levels, it may be necessary to reevaluate and overlay the pavement at some time in the future.

Aggregate base should be densified to at least 95 percent relative compaction.

Flexible pavement for the collector streets should consist of Type 2 asphalt concrete utilizing PG 64-28NV asphalt oil. Type 3 asphalt concrete is recommended for residential/local streets. The oil should be tested in a certified laboratory to demonstrate compliance with specific properties. A 50 blow (Marshall) mix design with 3 percent air voids should be sufficient for all the streets on the subdivision, including the backbone road.

Pavement Maintenance

Asphalt concrete pavements have been designed for a standard 20-year life expectancy as detailed above. Due to the local climate and available construction aggregates, a 20-year performance life requires diligent maintenance. Between 15 and 20 years after initial construction (average 17 years), major rehabilitation (structural overlay or reconstruction) is often necessary if maintenance has been lax. To achieve maximum performance life, maintenance must include regular crack filling, seal coats, and patching as needed. Crack filling is commonly necessary every year or at least every other year. Seal coats, typically with a Type II slurry seal, are generally needed every 3 to 6 years depending on surface wear. Failure to provide thorough maintenance will significantly reduce pavement design life and performance.

Corrosion Potential

Metal Pipe Design Parameters

Laboratory testing was performed to evaluate the corrosion potential of the soils with respect to metal pipe in contact with the ground. The results of the laboratory testing indicate that the site foundation soils exhibit low corrosion potential (American Water Works Association, 1999). As a result, metal pipe in contact with the ground will not require corrosion protection.

Portland Cement Concrete Mix Design Parameters

Soluble sulfate content has been determined for representative samples of the site foundation soils. The sulfate was extracted from the soil at a 10:1 water to soil ratio in order to assure that all soluble sodium sulfate was dissolved. The results are reported in milligrams of sulfate per kilogram of soil and can be directly converted to percent by dividing by 10,000. The percent sulfate in the soil is used to determine the sulfate exposure Class (S) from the information presented in Table 11 (Sulfate Exposure Class).

TABLE 11 - SULFATE EXPOSURE CLASS*			
			Water-Soluble Sulfate (SO_4) in Soil, Percent by Weight
S Sulfate	Not Applicable	S0	$SO_4 < 0.10$
	Moderate	S1	$0.10 \leq SO_4 < 0.20$
	Severe	S2	$0.20 \leq SO_4 \leq 2.00$
	Very Severe	S3	$SO_4 > 2.00$

*From Table 4.2.1 Exposure Categories and Classes. ACI 318, *Buildings Code and Comments.*

The results of the testing (Appendix F) indicate that concrete in contact with the site foundation soils should be designed for Class S0 Sulfate exposure. Therefore, Type II cement can be used for all concrete work.

Onsite Production of Construction Aggregates

Considering extensive cuts that are proposed within competent bedrock areas of the project, it is possible to produce construction aggregates onsite for use on the project. Relatively intact, competent bedrock is generally present in Villages 2, 3, 6, and at various depths/zones of Villages 8 through 10. The deep cut areas in these villages may be evaluated by the contractor for production of construction aggregates. In such evaluation, the contractor should review all information contained in this report with respect to onsite bedrock. For preliminary evaluation, we performed laboratory testing on selected representative samples of competent bedrock which were crushed to result in ¾-inch-minus aggregates. These test results are included in Appendix H (Construction Aggregate Test Results). Based on the test results, it is feasible to produce construction aggregates that should meet the *SSPWC* (2016) specifications for various products including Type 2, Class B aggregate base, drain rock, Class A backfill, rock rip-rap, etc.

Anticipated Construction Problems

Depending on the season of construction, soft, wet surface soils may make it difficult for construction equipment to travel and operate.

Extensive quantities of uncontrolled fills associated with the quarry reclamation exist within the site; the mitigation of these fill soils will require careful delineation to determine limits. Close coordination between the inspection/testing firm, the earthwork contractor, and the owner will be necessary for successful mitigation of the uncontrolled fills to minimize underperformance of improvements. Areas of existing fill slopes associated with the previous quarry reclamation will also require mitigation via removal and replacement of existing fills.

Bedrock along the ridgelines will be difficult to excavate, and blasting should be anticipated.

Quality Control

All plans and specifications should be reviewed for conformance with this geotechnical report and approved by the engineer prior to submitting them to the building department for review.

The recommendations presented in this report are based on the assumption that sufficient field testing and construction review will be provided during all phases of construction. We should review the final plans and specifications to check for conformance with the intent of our recommendations. Prior to construction, a pre-job conference should be scheduled to include, but not be limited to, the owner, architect, civil engineer, general contractor, earthwork and materials subcontractors, building official, and engineer. The conference will allow parties to review the project plans, specifications, and recommendations presented in this report and discuss applicable material quality and mix design requirements. All quality control reports should be submitted to and reviewed by the engineer.

During construction, we should have the opportunity to provide sufficient onsite observation of preparation and grading, over-excavation, fill placement, foundation installation, and paving. These observations would allow us to verify that the geotechnical conditions are as anticipated and that the contractor's work is in conformance with the approved plans and specifications.

Homeowner's Responsibilities

Nonstructural fill (i.e., clay, strippings) may be placed in backyards. In this case, the developer should include a disclosure statement indicating the presence of nonstructural fill within backyards so that any home owner added improvements can include specific geotechnical analysis to determine the appropriate mitigation.

The developer of this project will mitigate potentially expansive soils in driveways and exterior concrete walkways during construction. The homeowner is responsible to mitigate potentially expansive clay soils below any addition flatwork installed by the homeowner (e.g., concrete and/or paver stone walkways, concrete patios, etc.). Such mitigation would include over-excavating clay soils to a minimum depth of 2 ½ feet below the flatwork and backfilling the over-excavation with granular, non-expansive material.

The developer will finish grade the lots to prevent ponding of water adjacent to structural improvements and provide drainage away from the structures in accordance with local building codes. If the homeowner alters the drainage present at the time of sale, either by landscaping and/or making improvements on the lot, he/she must provide drainage away from the structure in accordance with local building codes. If positive drainage is not provided by the homeowner, differential movement of structural improvements could be experienced and result in cracking of interior walls and foundations.

The site is located in an area with active earthquakes in relatively close proximity. While the potential for ground rupture or liquefaction is minimal, the site does lie within a seismically active region with a high potential for ground shaking. The recurrence interval for earthquakes along the major active faults in the region is generally thought to be in the range of 1,000 years or more. The most recent earthquakes in northern Nevada, however, have occurred along lesser-known faults that seem to represent tectonic plate boundary motion. Approximately 85 percent of this motion is taken up along the San Andreas Fault in California, but as much as 15 percent of the plate motion appears to be occurring along numerous, smaller strike-slip faults in western Nevada. The realization that plate boundary faulting extends so far inland is relatively recent, such that the probable recurrence intervals and magnitudes of the consequent earthquakes are unknown. For this reason, and the general high potential for ground shaking in this area, homebuyers should be advised to consider purchasing earthquake insurance. Typically such insurance is of very low cost but has such a high deductible that it is only beneficial during a very large-scale seismic event.

Standard Limitations Clause

This report has been prepared in accordance with generally accepted geotechnical practices. The analyses and recommendations submitted are based on field exploration performed at the locations shown on Plate 1. This report does not reflect soils variations that may become evident during the construction period, at which time re-evaluation of the recommendations may be necessary. We recommend our firm be retained to perform construction observation in all phases of the project related to geotechnical factors to ensure compliance with our recommendations.

Equilibrium water level readings were made on the date shown on Plate 2. Fluctuations in the water table may occur due to rainfall, temperature, seasonal runoff, or adjacent irrigation practices. Construction planning should be based on assumptions of possible variations in the water table.

Single-family residential construction results in a complex composite of steel, PCC, lumber and soils. Each element responds differently to loading and, as a consequence, minor cracking and distortion can occur. Such cracking and distortion is not in and of itself evidence of the structure failing to meet a reasonable standard or level of performance, but rather is typical of new residential construction. Repair of such conditions is considered aesthetic in nature and not a structural defect.

The subdivision project will be graded cut to fill using onsite materials. As such, minor deviations from the recommendations and assessments presented in this report are anticipated. Fills are to be generated on site using cut-to-fill methods and will not be purchased from a commercial borrow source. Therefore, the potential exists for soils within the building pads to fall outside the material limits recommended in this report. Unless these deviations can be proven to be fundamental to any observed distress or performance issue, such deviations should not be considered a failure to adhere to the recommendations presented in this report or a design flaw, but should be considered an acceptable variation in mass grading when onsite materials are used as the fill source. Acceptable performance of such materials is formulated around the provisions and requirements of the *IBC* or *IRC*, as applicable.

This report has been produced to provide information allowing the architect or engineer to design the project. The owner is responsible for distributing this report to all designers and contractors whose work is affected by geotechnical aspects. In the event there are changes in the design, location, or ownership of the project from the time this report is issued, recommendations should be reviewed and possibly modified by the engineer. If the engineer is not granted the opportunity to make this recommended review, he or she can assume no responsibility for misinterpretation or misapplication of his or her recommendations or their validity in the event changes have been made in the original design concept without his or her prior review. The engineer makes no other warranties, either express or implied, as to the professional advice provided under the terms of this agreement and included in this report.

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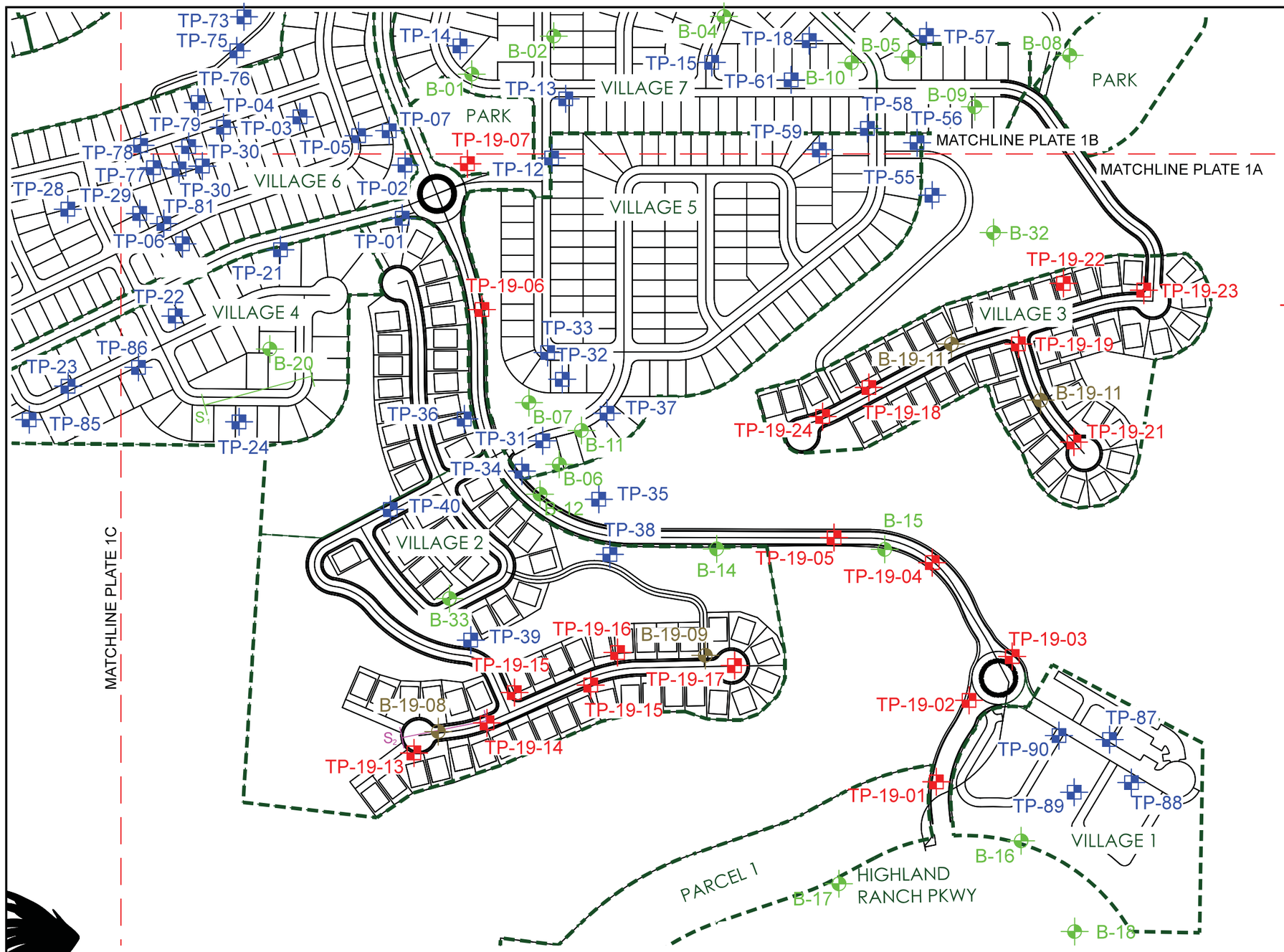
PLATES



N

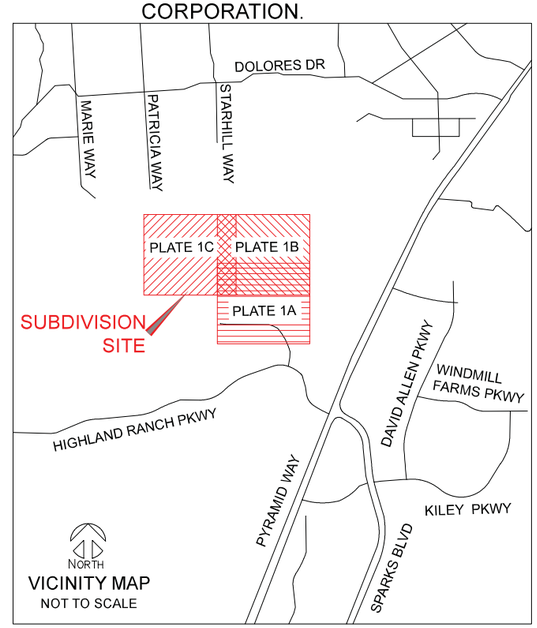
OVERALL SCALE: 1"=300'

LEGEND

- B-01 — APPROXIMATE BORING LOCATION (2018)
- TP-01 — APPROXIMATE TEST PIT LOCATION (2018)
- TP-19-01 — APPROXIMATE TEST PIT LOCATION (2019)
- B-19-01 — APPROXIMATE BORING LOCATION (2019)
- S_1 — APPROXIMATE SHEAR WAVE VELOCITY LOCATIONS (2018)
- S_1 — APPROXIMATE SHEAR WAVE VELOCITY LOCATIONS (2019)

NOTES

1. BASE MAP PROVIDED BY THE CHRISTY CORPORATION.



VICINITY MAP
NOT TO SCALE

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5 RIDGES DEVELOPMENT COMPANY, INC.

PLOT PLAN
5 RIDGES SUBDIVISION
SPARKS, NEVADA

Project No.
2314-01-1

Plate 1A

OVERALL SCALE: 1"=300'

LEGEND

- B-01 — APPROXIMATE BORING LOCATION (2018)
- TP-01 — APPROXIMATE TEST PIT LOCATION (2018)
- TP-19-01 — APPROXIMATE TEST PIT LOCATION (2019)
- B-19-01 — APPROXIMATE BORING LOCATION (2019)
- S_1 — APPROXIMATE SHEAR WAVE VELOCITY LOCATIONS (2018)
- S_1 — APPROXIMATE SHEAR WAVE VELOCITY LOCATIONS (2019)

NOTES

1. BASE MAP PROVIDED BY THE CHRISTY CORPORATION.

VICINITY MAP
NOT TO SCALE

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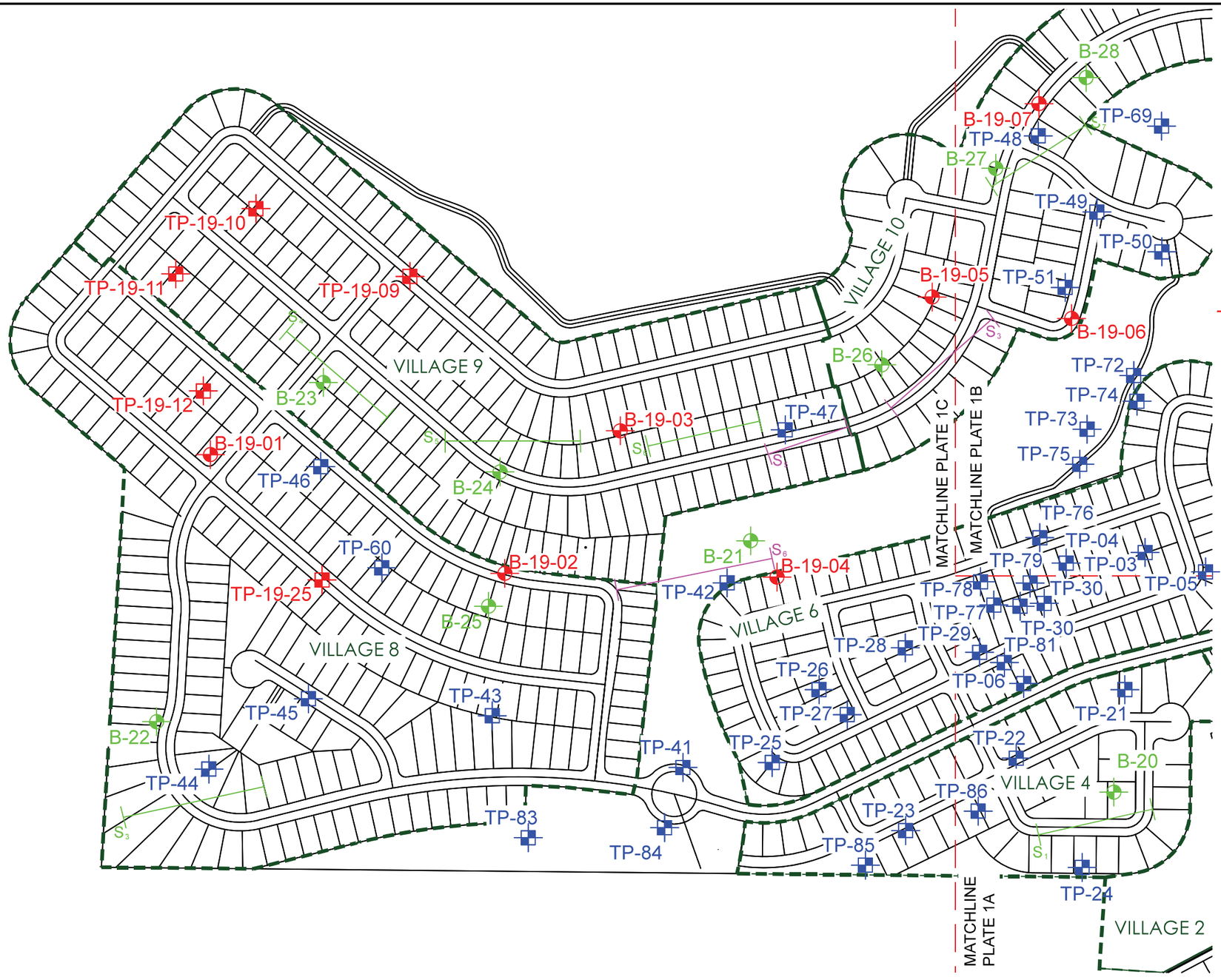
5 RIDGES DEVELOPMENT COMPANY, INC.

PLOT PLAN
5 RIDGES SUBDIVISION
SPARKS, NEVADA

Project No.
2314-01-1

Plate 1B



N

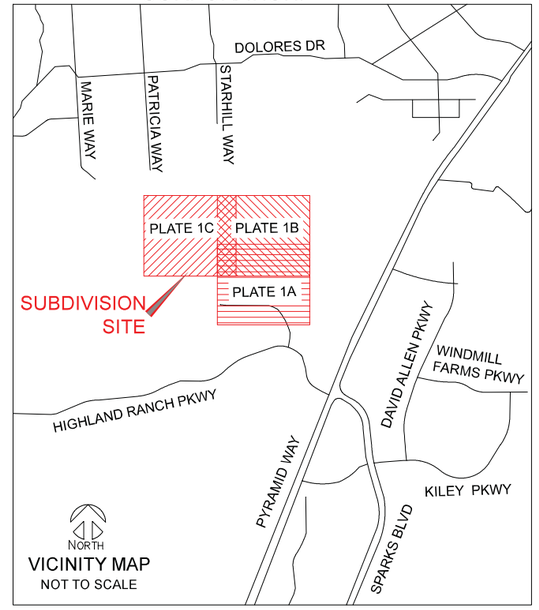
OVERALL SCALE: 1"=300'

LEGEND

- B-01 — APPROXIMATE BORING LOCATION (2018)
- TP-01 — APPROXIMATE TEST PIT LOCATION (2018)
- TP-19-01 — APPROXIMATE TEST PIT LOCATION (2019)
- B-19-01 — APPROXIMATE BORING LOCATION (2019)
- S_1 — APPROXIMATE SHEAR WAVE VELOCITY LOCATIONS (2018)
- S_1 — APPROXIMATE SHEAR WAVE VELOCITY LOCATIONS (2019)

NOTES

1. BASE MAP PROVIDED BY THE CHRISTY CORPORATION.



VICINITY MAP
NOT TO SCALE

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5 RIDGES DEVELOPMENT COMPANY, INC.

PLOT PLAN
5 RIDGES SUBDIVISION
SPARKS, NEVADA

Project No.
2314-01-1

Plate 1C

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CORE BORING REPORT

BORING NO. B-19-01

PROJECT: 5 Ridges Subdivision
CLIENT: 5 Ridges Development Company, Inc.
CONTRACTOR: Taber Drilling
EQUIPMENT USED: CME 55, diamond core bit, water with polymer.

JOB NO.: 2314-01-1
PAGE NO.: 1 of 2
ELEVATION: 0
DATE START: 11/20/2019
DATE FINISH: 11/20/2019
DRILLER: Bob
PREPARED BY: JP
LOCATION: Sparks, NV

GROUND WATER		DEPTH TO:			ORIENTATION		CORE BARREL	
DATE	HRS AFT COMP	WATER	BOT. OF CASING	BOT. OF HOLE	X	VERTICAL	TYPE	HQ
						HORIZONTAL	SIZE	3.78
20/11/19	0	NE	5	30		INCLINED	Bit (ft)	.5
						BEARING	Barrel (ft)	7.5
					0	ANG. FROM VERT.	Total (ft)	8

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
								Clayey Gravel with Sand Weathered bedrock. Reddish brown to gray, moist, very dense, with an estimated 20% medium to high plasticity fines, 30% fine to coarse sand, and 50% angular gravel.
								Granite Granitic bedrock, gray, slight to moderate weathing, very close to moderate fracture spacing, weak to moderately strong. Very Poor to Poor Rock Quality Designation (RQD). Maximum fracture spacing 9 inches.
5	2.6	3.5-8	B	3.4	76	31		
10	1.75	8-12	C	4.0	100	0		
15	1.8	12-17	D	4.2	84	32		
20	1.6	17-22	E	4.7	94	18		**Granite** Granitic bedrock, gray, slight to moderate weathing, close to moderate fracture spacing, very strong to extremely strong. Fair Rock Quality Designation (RQD). Maximum fracture spacing 18 inches. Maximum fracture spacing 18 inches.
		22-27	F	4.5	90	63		

(Continued)

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. **B-19-01**
PAGE 2 OF 2

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
	3.4							**Granite** Granitic bedrock, gray, slight to moderate weathing, close to moderate fracture spacing, very strong to extremely strong. Fair Rock Quality Designation (RQD). Maximum fracture spacing 18 inches. *(continued)*
		27-30	G	2.3	77	53		
	2.3							
30								Bottom of B-19-01 at 30
35								
40								
45								
50								
55								

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. B-19-02

PROJECT: 5 Ridges Subdivision
CLIENT: 5 Ridges Development Company, Inc.
CONTRACTOR: Taber Drilling
EQUIPMENT USED: CME 55, diamond core bit, water with polymer.

GROUND WATER		DEPTH TO:			ORIENTATION		CORE BARREL	
DATE	HRS AFT COMP	WATER	BOT. OF CASING	BOT. OF HOLE	X	VERTICAL	TYPE	HQ
						HORIZONTAL	SIZE	3.78
18/11/19	ATD	NE	3.5	41		INCLINED	Bit (ft)	.5
19/11/19	0	NE	3.5	80		BEARING	Barrel (ft)	7.5
					0	ANG. FROM VERT.	Total (ft)	8

JOB NO.:	2314-01-1
PAGE NO.:	1 of 3
ELEVATION:	0
DATE START:	11/18/2019
DATE FINISH:	11/19/2019
DRILLER:	Bob
PREPARED BY:	JP
LOCATION:	Sparks, NV

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
								Granite Granitic bedrock, brown to gray, very close to close fracture spacing, moderate to high weathering, friable to weak. Very Poor to Poor RQD. Maximum fracture spacing 8 inches.
5	2.9	3.5-7	B	2.0	57	0		
10	2.8	7-11	C	2.8	70	10		Core Sample D tested for index properties. **Poorly Graded Sand with Silt and Gravel** with 11% low plasticity fines, 51% fine to coarse sand, and 38% angular gravel up to 1.5 inches in diameter. Moisture content (MC) = 12.3%; Plasticity index (PI) = 1.
15	2.6	11-16	D	2.5	50	0		
20	1.8	16-21	E	3.2	64	18		
		21-26	F	4.7	94	0		

(Continued)

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. **B-19-02**
PAGE 2 OF 3

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
	1.8							**Granite** Granitic bedrock, brown to gray, very close to close fracture spacing, moderate to high weathering, friable to weak. Very Poor to Poor RQD. Maximum fracture spacing 8 inches.*(continued)*
		26-31	G	3.7	74	18		
30	3.0							
		31-36	H	4.7	94	10		
35	1.6							
		36-41	I	4.7	94	20		
40	1.2							
		41-46	J	4.6	92	30		Poor RQD, maximum fracture spacing 11 inches.
45	2.8							
		46-51	K	3.2	64	7		
50	2.2							
		51-56	L	4.1	82	17		
55								

(Continued)

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. **B-19-02**
PAGE 3 OF 3

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
	4.4							
60	2.2	56-61	M	3.5	70	15		**Granite** Granitic bedrock, brown to gray, very close fracture spacing, high weathering, friable. Very Poor to Poor RQD. Maximum fracture spacing 8 inches. Core Sample M tested for index properties. **Silty Sand with Gravel** with 20% low plasticity fines, 49% fine to coarse sand, and 31% angular gravel up to 3 inches in diameter. MC = 11.1%; PI = 5.
65	2.0	61-66	N	4.3	86	28		Poor RQD.
70	2.8	66-71	O	3.7	74	38		
75	1.8	71-76	P	4.5	90	17		
80	2.3	76-80	Q	2.9	73	0		Bottom of B-19-02 at 80
85								

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. B-19-03

PROJECT: 5 Ridges Subdivision
CLIENT: 5 Ridges Development Company, Inc.
CONTRACTOR: Taber Drilling
EQUIPMENT USED: CME 55, diamond core bit, water with polymer.

JOB NO.: 2314-01-1
PAGE NO.: 1 of 2
ELEVATION: 0
DATE START: 11/19/2019
DATE FINISH: 11/19/2019
DRILLER: Bob
PREPARED BY: JP
LOCATION: Sparks, NV

GROUND WATER		DEPTH TO:			ORIENTATION		CORE BARREL	
DATE	HRS AFT COMP	WATER	BOT. OF CASING	BOT. OF HOLE	X	VERTICAL	TYPE	HQ
						HORIZONTAL	SIZE	3.78
19/11/19	0	NE	3.5	50		INCLINED	Bit (ft)	.5
						BEARING	Barrel (ft)	7.5
					0	ANG. FROM VERT.	Total (ft)	8

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
								Granite Granitic bedrock, gray,moderate to high weathering, very close to close fracture spacing, weak to strong. Very Poor to Poor RQD. Maximum fracture spacing 9 inches.
5	2.5	3.5-7	B	3.1	89	0		
10	2.2	7-11	C	4.0	100	0		Core Sample C tested for index properties. **Silty Sand with Gravel** with 17% low plasticity fines, 67% fine to coarse sand, and 16% angular gravel up to 1 inch in diameter. MC = 11.0%, PI = 3.
15	1.0	11-16	D	4.8	96	0		
20	1.2	16-21	E	3.0	60	20		
		21-26	F	3.7	74	20		

(Continued)

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. **B-19-03**
PAGE 2 OF 2

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
	2.4							**Granite** Granitic bedrock, gray,moderate to high weathering, very close to close fracture spacing, weak to strong. Very Poor to Poor RQD. Maximum fracture spacing 9 inches. *(continued)*
		26-31	G	4.6	92	30		
30	1.0							
		31-36	H	4.2	84	25		
35	2.6							
		36-41	I	4.6	92	66		Fair RQD, maximum fracture spacing 14 inches.
40	1.8							
		41-46	J	5.0	100	0		Very close fracture spacing, weak to friable. Very Poor RQD.
45	1.4							
		46-50	K	3.7	93	0		
50	1.3							Bottom of B-19-03 at 50
55								

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. B-19-04

PROJECT: 5 Ridges Subdivision
CLIENT: 5 Ridges Development Company, Inc.
CONTRACTOR: Taber Drilling
EQUIPMENT USED: CME 55, diamond core bit, water with polymer.

GROUND WATER		DEPTH TO:			ORIENTATION		CORE BARREL	
DATE	HRS AFT COMP	WATER	BOT. OF CASING	BOT. OF HOLE	X	VERTICAL	TYPE	HQ
						HORIZONTAL	SIZE	3.78
18/11/19	0	NE	5	60		INCLINED	Bit (ft)	.5
						BEARING	Barrel (ft)	7.5
					0	ANG. FROM VERT.	Total (ft)	8

JOB NO.:	2314-01-1
PAGE NO.:	1 of 3
ELEVATION:	0
DATE START:	11/18/2019
DATE FINISH:	11/18/2019
DRILLER:	Bob
PREPARED BY:	JP
LOCATION:	Sparks, NV

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
								Granite Granitic bedrock, high to complete weathering, friable to weak.
5	3.3	4-7	B	1.0	33	14		
10	4.3	7-11	C	3.8	95	54		**Granite** Granitic bedrock, gray, slight to moderate weathering, very close to mod. close fracture spacing, moderately strong to very strong. Very Poor to Fair RQD. Maximum fracture spacing 11 inches. Rock sample at 9 feet bgs tested for unconfined compressive strength (UCS).
15	3.0	11-16	D	4.6	92	45		
20	2.4	16-21	E	4.6	92	18		
		21-26	F	4.8	96	65		Slight weathering, close to mod. close fracture spacing, very strong. Poor to Excellent RQD. Maximum fracture spacing 27 inches.

(Continued)

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. B-19-04

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
	3.0							**Granite** Granitic bedrock, gray, slight to moderate weathering, very close to mod. close fracture spacing, moderately strong to very strong. Very Poor to Fair RQD. Maximum fracture spacing 11 inches. *(continued)* Rock sample at 26 feet bgs tested for UCS.
		26-31	G	4.6	92	56		
30	2.2							
		31-36	H	4.4	88	27		
35	2.4							
		36-38	I	2.8	140	52		
	2.6							
40		38-44	J	5.0	83	93		
	2.8							
45		44-49	K	4.0	80	30		
	2.6							
50		49-54	L	5.0	100	88		
	2.6							
55								Maximum fracture spacing 8 inches. *(Continued)*

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. **B-19-04**
PAGE 3 OF 3

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
		54-57	M	2.5	83	44		**Granite** Granitic bedrock, gray, slight to moderate weathering, very close to mod. close fracture spacing, moderately strong to very strong. Very Poor to Fair RQD. Maximum fracture spacing 11 inches. *(continued)*
	2.0							
		57-60	N	3.0	100	53		
	2.0							
60								Bottom of B-19-04 at 60
65								
70								
75								
80								
85								

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. **B-19-05**

PROJECT: **5 Ridges Subdivision**
CLIENT: **5 Ridges Development Company, Inc.**
CONTRACTOR: **Taber Drilling**
EQUIPMENT USED: **CME 55, diamond core bit, water with polymer.**

GROUND WATER		DEPTH TO:			ORIENTATION		CORE BARREL	
DATE	HRS AFT COMP	WATER	BOT. OF CASING	BOT. OF HOLE	X	VERTICAL	TYPE	HQ
						HORIZONTAL	SIZE	3.78
14/11/19	0	NE	5.0	70		INCLINED	Bit (ft)	.5
						BEARING	Barrel (ft)	7.5
					0	ANG. FROM VERT.	Total (ft)	8

JOB NO.: **2314-01-1**
PAGE NO.: **1 of 3**
ELEVATION: **0**
DATE START: **11/14/2019**
DATE FINISH: **11/14/2019**
DRILLER: **Bob**
PREPARED BY: **JP**
LOCATION: **Sparks, NV**

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
5	2.5	5-7.5	B	2.0	80	27		**Granite** Granitic bedrock, gray, moderate weathering, very close to mod. close fracture spacing, weak to moderately strong. Very Poor to Fair RQD. Maximum fracture spacing 11 inches.
10	1.8	7.5-11.5	C	3.5	88	21		
15	2.0	11.5-16.5	D	4.4	88	65		
20	2.5	16.5-21.5	E	4.6	92	30		
		21.5-26.5	F	4.9	98	52		**Granite** Granitic bedrock, gray, slight to moderate weathering, very close to mod. close fracture spacing, strong. Poor to Fair RQD. Maximum fracture spacing 11 inches.

(Continued)

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. B-19-05

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
	2.4							**Granite** Granitic bedrock, gray, slight to moderate weathering, very close to mod. close fracture spacing, strong. Poor to Fair RQD. Maximum fracture spacing 11 inches. *(continued)*
		26.5-31.5	G	4.8	96	45		
30	3.2							
		31.5-36.5	H	3.9	78	53		
35	2.4							
		36.5-41.5	I	4.9	98	45		**Granite** Granitic bedrock, gray, moderate weathering, very close to mod. close fracture spacing, weak to moderately strong. Poor to Fair RQD. Maximum fracture spacing 20 inches. Includes some friable sections. Rock sample at 37 feet bgs tested for UCS.
40	2.6							
		41.5-46.5	J	4.7	94	60		Maximum fracture spacing 20 inches.
45	2.0							
		46.5-51.5	K	4.8	96	45		
50	1.8							
		51.5-56.5	L	4.8	96	63		
55								

(Continued)

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. **B-19-05**
PAGE 3 OF 3

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
	2.0							**Granite** Granitic bedrock, gray, moderate weathering, very close to mod. close fracture spacing, weak to moderately strong. Poor to Fair RQD. Maximum fracture spacing 20 inches. Includes some friable sections. *(continued)*
		56.5-61.5	M	4.8	96	55		
60	1.6							
		61.5-66.5	N	4.6	92	42		
65	1.8							
		66.5-71	O	4.3	96	65		
70	1.6							
								Bottom of B-19-05 at 71
75								
80								
85								

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. B-19-06

PROJECT: 5 Ridges Subdivision
CLIENT: 5 Ridges Development Company, Inc.
CONTRACTOR: Taber Drilling
EQUIPMENT USED: CME 55, diamond core bit, water with polymer.

JOB NO.:	2314-01-1
PAGE NO.:	1 of 2
ELEVATION:	0
DATE START:	11/14/2019
DATE FINISH:	11/15/2019
DRILLER:	Bob
PREPARED BY:	JP
LOCATION:	Sparks, NV

GROUND WATER		DEPTH TO:			ORIENTATION		CORE BARREL	
DATE	HRS AFT COMP	WATER	BOT. OF CASING	BOT. OF HOLE	X	VERTICAL	TYPE	HQ
						HORIZONTAL	SIZE	3.78
14/11/19	ATD	NE	2	16		INCLINED	Bit (ft)	.5
15/11/19	0	NE	2	49.5		BEARING	Barrel (ft)	7.5
					0	ANG. FROM VERT.	Total (ft)	8

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
								Granite Granitic bedrock, gray, slight to moderate weathering, very close to close fracture spacing, weak to strong. Very Poor to Poor RQD. Maximum fracture spacing 8 inches.
5	2.8	2-7	B	4.3	86	18		
10	2.3	7-11	C	3.8	95	29		
15	1.8	11-16	D	4.5	90	0		
20	2.4	16-21	E	4.8	96	0		Moderate weathering, close fracture spacing, strong to very strong. Poor to Fair RQD.
		21-26	F	4.7	94	40		

(Continued)

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. **B-19-06**
PAGE 2 OF 2

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
	2.6							Moderate weathering, close fracture spacing, strong to very strong. Poor to Fair RQD. *(continued)*
		26-31	G	4.4	88	65		Moderate to high weathering, close fracture spacing, friable to weak. Very Poor RQD.
30	NR							
	2.8	31-33.5	H	1.3	52	0		
		33.5-36	I	2.5	100	0		Core Sample I tested for index properties. **Silty Sand** with 42% low plasticity fines, 48% fine to coarse sand, and 9% angular gravel up to 1.5 inches in diameter. MC = 14.2%, PI = 6.
35	2.0							
		36-39.5	J	2.2	63	0		
40	2.0							
		39.5-44.5	K	4.2	84	0		
45	2.4							
		44.5-50	L	2.9	53	0		
50	2.6							Bottom of B-19-06 at 49.5
55								

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. B-19-07

PROJECT: 5 Ridges Subdivision
CLIENT: 5 Ridges Development Company, Inc.
CONTRACTOR: Taber Drilling
EQUIPMENT USED: CME 55, diamond core bit, water with polymer.

JOB NO.: 2314-01-1
PAGE NO.: 1 of 2
ELEVATION: 0
DATE START: 11/13/2019
DATE FINISH: 11/13/2019
DRILLER: Bob
PREPARED BY: JP
LOCATION: Sparks, NV

GROUND WATER		DEPTH TO:			ORIENTATION		CORE BARREL	
DATE	HRS AFT COMP	WATER	BOT. OF CASING	BOT. OF HOLE	X	VERTICAL	TYPE	HQ
						HORIZONTAL	SIZE	3.78
13/11/19	0	NE	5.0	50		INCLINED	Bit (ft)	.5
						BEARING	Barrel (ft)	7.5
					0	ANG. FROM VERT.	Total (ft)	8

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
5	5.3	5-6.5	B	1.3	87	28		**Granite** Granitie bedrock, grey, moderate weathering, very close to close fracture spacing, weak to moderately strong. Very Poor to Poor RQD. Maximum fracture spacing 8 inches.
		6.5-10.5	C	3.9	98	21		
10	2.5							
		10.5-15.5	D	4.5	90	19		
15	2.2							
		15.5-20.5	E	4.8	96	23		
20	1.6							
		20.5-25.5	F	4.7	94	0		
	1.4							

(Continued)

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. **B-19-07**
PAGE 2 OF 2

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
30	1.8	25.5-30.5	G	4.7	94	0		**Granite** Granitie bedrock, grey, moderate weathering, very close to close fracture spacing, weak to moderately strong. Very Poor to Poor RQD. Maximum fracture spacing 8 inches.*(continued)* Weak, Very Poor t RQD, maximum fracture spacing 6 inches.
35	1.6	30.5-35.5	H	4.9	98	0		
40	1.8	35.5-40.5	I	4.8	96	0		
45	1.2	40.5-45.5	J	4.0	80	0		
50	1.7	45.5-50	K	4.3	96	0		
								Bottom of B-19-07 at 50
55								

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. B-19-08

PROJECT: 5 Ridges Subdivision
CLIENT: 5 Ridges Development Company, Inc.
CONTRACTOR: Taber Drilling
EQUIPMENT USED: CME 55, diamond core bit, water with polymer.

JOB NO.: 2314-01-1
PAGE NO.: 1 of 2
ELEVATION: 0
DATE START: 11/20/2019
DATE FINISH: 11/21/2019
DRILLER: Bob
PREPARED BY: JP
LOCATION: Sparks, NV

GROUND WATER		DEPTH TO:			ORIENTATION		CORE BARREL	
DATE	HRS AFT COMP	WATER	BOT. OF CASING	BOT. OF HOLE	X	VERTICAL	TYPE	HQ
						HORIZONTAL	SIZE	3.78
21/11/19	0	NE	5	50		INCLINED	Bit (ft)	.5
						BEARING	Barrel (ft)	7.5
					0	ANG. FROM VERT.	Total (ft)	8

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
								Granite Granitic bedrock, gray, slight to moderate weathering, very close to moderate fracture spacing, strong to very strong. Very Poor to Good RQD, generally Fair RQD. Maximum fracture spacing 13 inches.
5	3.3	3.5-7.5	B	3.1	78	65		
10	1.8	7.5-11.5	C	3.7	93	52		
15	1.6	11.5-16.5	D	5.0	100	48		
20	1.4	16.5-21.5	E	4.9	98	20		
		21.5-26.5	F	4.8	96	58		

(Continued)

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. **B-19-08**
PAGE 2 OF 2

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
	1.2							**Granite** Granitic bedrock, gray, slight to moderate weathering, very close to moderate fracture spacing, strong to very strong. Very Poor to Good RQD, generally Fair RQD. Maximum fracture spacing 13 inches. *(continued)*
		26.5-31.5	G	4.8	96	37		
30	2.0							
		31.5-36.5	H	4.6	92	58		
35	2.2							
		36.5-39	I	1.8	72	0		Slight to moderate weathering, strong to very strong, Fair to Good RQD. Maximum fracture spacing 13 inches.
	3.2							
40	1.6	39-41.5	J	2.4	96	77		
		41.5-46.5	K	4.5	90	56		
45	2.8							
		46.5-50	L	3.3	94	83		
50	3.1							Bottom of B-19-08 at 50
55								

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. B-19-09

PROJECT: 5 Ridges Subdivision
CLIENT: 5 Ridges Development Company, Inc.
CONTRACTOR: Taber Drilling
EQUIPMENT USED: CME 55, diamond core bit, water with polymer.

JOB NO.: 2314-01-1
PAGE NO.: 1 of 2
ELEVATION: 0
DATE START: 11/21/2019
DATE FINISH: 11/21/2019
DRILLER: Bob
PREPARED BY: JP
LOCATION: Sparks, NV

GROUND WATER		DEPTH TO:			ORIENTATION		CORE BARREL	
DATE	HRS AFT COMP	WATER	BOT. OF CASING	BOT. OF HOLE	X	VERTICAL	TYPE	HQ
						HORIZONTAL	SIZE	3.78
21/11/19	0	NE	3.5	46.5		INCLINED	Bit (ft)	.5
						BEARING	Barrel (ft)	7.5
					0	ANG. FROM VERT.	Total (ft)	8

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
								Granite Granitic bedrock, gry, slight weathering, very close to mod. close fracture spacing, very strong to extremely strong. Poor to Good RQD. Maximum fracture spacing 23 inches.
5	3.8	3.5-7.5	B	3.2	80	65		Rock sample at 6 feet bgs tested for UCS.
10	2.0	7.5-11.5	C	3.7	93	48		
	2.6	11.5-14.5	D	2.9	97	27		
15	2.5	14.5-16.5	E	2.0	100	70		
20	2.8	16.5-21.5	F	5.0	100	82		
	3.6	21.5-24	G	2.2	88	60		

(Continued)

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. **B-19-09**
PAGE 2 OF 2

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
	4.4	24-26.5	H	2.0	80	60		**Granite** Granitic bedrock, gry, slight weathering, very close to mod. close fracture spacing, very strong to extremely strong. Poor to Good RQD. Maximum fracture spacing 23 inches. *(continued)*
30	1.8	26.5-31.5	I	1.7	34	22		Very Poor RQD.
35	3.0	31.5-36.5	J	5.0	100	80		
40	2.4	36.5-41.5	K	5.0	100	66		
45	3.0	41.5-46.5	L	2.8	56	0		Very Poor RQD.
50								Bottom of B-19-09 at 46.5
55								

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. B-19-10

PROJECT: 5 Ridges Subdivision
CLIENT: 5 Ridges Development Company, Inc.
CONTRACTOR: Taber Drilling
EQUIPMENT USED: CME 55, diamond core bit, water with polymer.

JOB NO.:	2314-01-1
PAGE NO.:	1 of 2
ELEVATION:	0
DATE START:	11/11/2019
DATE FINISH:	11/12/2019
DRILLER:	Bob
PREPARED BY:	JP
LOCATION:	Sparks, NV

GROUND WATER		DEPTH TO:			ORIENTATION		CORE BARREL	
DATE	HRS AFT COMP	WATER	BOT. OF CASING	BOT. OF HOLE	X	VERTICAL	TYPE	HQ
						HORIZONTAL	SIZE	3.78
11/11/19	ATD	NE	0	5		INCLINED	Bit (ft)	.5
12/11/19	0	NE	5.0	50		BEARING	Barrel (ft)	7.5
					0	ANG. FROM VERT.	Total (ft)	8

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
5	4.4	5-7.5	B	2.0	80	0		**Granite** Granitic bedrock, grey, slight weathering, very close to close fracture spacing, strong to very strong. Very Poor to Poor RQD. Maximum fracture spacing 12 inches.
10	3.8	7.5-11.5	C	3.8	95	8		
15	3.0	11.5-16.5	D	5.0	100	0		
20	2.8	16.5-21.5	E	3.6	72	0		
		21.5-26.5	F	3.2	64	0		

(Continued)

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. **B-19-10**
PAGE 2 OF 2

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
	3.4							**Granite** Granitic bedrock, grey, slight weathering, very close to close fracture spacing, strong to very strong. Very Poor to Poor RQD. Maximum fracture spacing 12 inches. *(continued)*
		26.5-31.5	G	5.0	100	22		
30	4.0							
		31.5-34.5	H	2.3	77	33		
	3.0							
35	3.5	34.5-36.5	I	1.4	70	22		
		36.5-41.5	J	3.1	62	20		
40	2.5							
		41.5-46.5	K	3.6	72	43		
45	3.2							
		46.5-50	L	2.2	63	10		
50	1.7							Bottom of B-19-10 at 50
55								

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. B-19-11

PROJECT: 5 Ridges Subdivision
CLIENT: 5 Ridges Development Company, Inc.
CONTRACTOR: Taber Drilling
EQUIPMENT USED: CME 55, diamond core bit, water with polymer.

JOB NO.: 2314-01-1
PAGE NO.: 1 of 2
ELEVATION: 0
DATE START: 11/12/2019
DATE FINISH: 11/12/2019
DRILLER: Bob
PREPARED BY: JP
LOCATION: Sparks, NV

GROUND WATER		DEPTH TO:			ORIENTATION		CORE BARREL	
DATE	HRS AFT COMP	WATER	BOT. OF CASING	BOT. OF HOLE	X	VERTICAL	TYPE	HQ
						HORIZONTAL	SIZE	3.78
12/11/19	ATD	NE	5.0	30		INCLINED	Bit (ft)	.5
13/11/19	0	NE	5.0	40		BEARING	Barrel (ft)	7.5
					0	ANG. FROM VERT.	Total (ft)	8

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
5	6.5	5-7	B	1.3	65	0		**Granite** Granitic bedrock, grey, slight to moderate weathering, very close to mod. close fracture spacing, weak to strong. Generally Poor to Fair RQD. Maximum fracture spacing 12 inches.
10	3.0	7-11	C	3.6	90	38		
15	2.4	11-16	D	4.7	94	60		
20	2.4	16-21	E	4.7	94	57		
		21-26	F	4.6	92	37		

(Continued)

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

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CORE BORING REPORT

BORING NO. **B-19-11**
PAGE 2 OF 2

DEPTH IN FEET	DRILL RATE MIN/FT	CORE NO. DEPTH RANGE	SAMPLE NUMBER	RECOVERY FT	RECOVERY %	RQD	GRAPHIC LOG	FIELD CLASSIFICATION AND REMARKS
	4.6							**Granite** Granitic bedrock, grey, slight to moderate weathering, very close to mod. close fracture spacing, weak to strong. Generally Poor to Fair RQD. Maximum fracture spacing 12 inches. *(continued)*
		26-30	G	3.8	95	13		
	4.2							
30	4.6	30-31.5	H	.8	53	18		
	7.3	31.5-33	J	1.4	93	72		
		33-38	K	3.2	64	15		
35	2.6							
		38-40	L	2.0	100	88		Good RQD.
	2.0							
40								Bottom of B-19-11 at 40
45								
50								
55								

FIELD HARDNESS		BEDDING		ATTITUDE AND ANGLE	JOINTS / SHEAR / FRACTURE		WEATHERING
EXTM. STRONG	- MANY HAMMER BLOWS	V. THIN	<2"	HORIZONTAL (0-5°)	V. CLOSE	<2"	FRESH
VERY STRONG	- SOME HAMMER BLOWS	THIN	2"-12"	SHALLOW OR LOW ANGLE (5-35°)	CLOSE	2"-12"	V. SLIGHT
STRONG	- CANNOT BE SCRAPED	MEDIUM	12"-36"	MODERATELY DIPPING (35-55°)	MOD. CLOSE	12"-36"	SLIGHT
MOD. STRONG	- CAN JUST BE SCRAPED	THICK	36"-120"	STEEP OR HIGH ANGLE (55-85°)	WIDE	36"-120"	MODERATE
WEAK	- HAMMER BLOW CRUMBLES	V. THICK	>120"	VERTICAL (85-90°)	V. WIDE	>120"	MOD. SEVERE
FRIABLE	- CRUMBLES IN HAND						V. SEVERE
							COMPLETE

TEST PIT LOG

TEST PIT NO.: TP-19-01

DATE: 11-05-19

EXCAVATOR TYPE: Cat 330

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB		5.7	41		SC		**Clayey Sand** Reddish brown, moist, dense, with 32% high plasticity fines, 65% fine to coarse sand, and 2% subangular gravel up to 0.38 inch in diameter. Surface contains cobbles up to approximately 10 inches in diameter.
								Granitic Bedrock Weathered to decomposed granite, moderately strong to friable. Sampled as **Silty Sand** Brown to grayish brown, slightly moist, dense to very dense, with an estimated 20% non-plastic fines, 70% fine to coarse sand, and 10% angular gravel up to 2 inches in diameter.
B	GRAB				5			Increasing hardness with depth.
						SM		
C	GRAB				10			
					15			Refusal at 15 feet beneath ground surface (bgs) in bedrock.

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Sparks, Nevada

PROJECT NO.: 2314-01-1

PLATE: 2

SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-02

DATE: 11-05-19

EXCAVATOR TYPE: Cat 330

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SC		**Clayey Sand** Reddish brown, moist, dense, with an estimated 35% medium to high plasticity fines, 60% fine to coarse sand, and 5% subrounded gravel up to 1 inch in diameter.
								Bedrock Highly to completely weathered, moderately strong to friable.
B	GRAB							Sampled as **Well-Graded Sand with Silt** Gray, slightly moist, dense to very dense, with 6% non-plastic fines, 84% fine to coarse sand, and 10% angular gravel up to 0.38 inch in diameter. Increasing hardness with depth.
					5			
						SW-SM		
C	GRAB		2.2	NP				
					10			
								Refusal at 13.5 feet bgs in bedrock.
					15			

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PROJECT NO.: 2314-01-1

PLATE: 2

SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-03 | DATE: 11-05-19

EXCAVATOR TYPE: Cat 330 | DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP | GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SC		**Clayey Sand with Gravel** Brown to dark brown, moist, medium dense to dense, with an estimated 35% medium to high plasticity fines, 60% fine to coarse sand, and 5% subangular gravel up to 1 inch in diameter. Cobbles and boulders up to approximately 14 inches in diameter make up 10% of the total soil mass (tsm).
B	GRAB				5	SW-SM		**Bedrock** Highly to completely weathered, moderately strong to friable. Sampled as **Well-Graded Sand with Silt** Yellowish brown, slightlymoist, dense to very dense, with an estimated 10% non-plastic to low plasticity fines, 85% fine to coarse sand, and 5% angular gravel up to 0.5 inch in diameter. Increasing hardness with depth.
C	GRAB				10			
					15			Refusal at 14 feet bgs in bedrock.

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PROJECT NO.: 2314-01-1

PLATE: 2

SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-04

DATE: 11-05-19

EXCAVATOR TYPE: Cat 330

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB		6.6	16		GP-GC		**Poorly Graded Gravel with Clay and Sand (Fill)** Brown, slightly moist to moist, medium dense, with 10% medium plasticity fines, 45% fine to coarse sand, and 45% angular to subangular gravel up to 2 inches in diameter. Cable wires encountered at 2 feet bgs.
					5			
					10			

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PROJECT NO.: 2314-01-1

PLATE: 2

SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-05 | DATE: 11-05-19

EXCAVATOR TYPE: Cat 330 | DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP | GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB		5.1	NP		SM		**Silty Sand (Fill)** Brown, slightly moist to moist, medium dense, with 15% non-plastic fines, 75% fine to coarse sand, and 10% subangular gravel up to 1.5 inches in diameter.
					5			
					10			

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PROJECT NO.: 2314-01-1

PLATE: 2

SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-06

DATE: 11-05-19

EXCAVATOR TYPE: Cat 330

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SC		**Clayey Sand with Gravel (Fill)** Brown to reddish brown, moist, medium dense, with an estimated 35% medium plasticity fines, 35% fine to coarse sand, and 30% angular to subangular gravel up to 0.75 inch in diameter.
								Silty Sand with Gravel (Fill) Yellowish brown, slightly moist, loose to medium dense, with an estimated 15% non-plastic fines, 45% fine to coarse sand, and 40% angular to subangular gravel up to 1 inch in diameter.
B	GRAB					SM		Contains concrete and asphalt concrete fragments up to 8 inch by 18 inch by 30 inch, and make up approximately 30% of the tsm.
					5			
								Clayey Sand with Gravel (Fill) Brown, moist, loose to medium dense, with an estimated 30% medium plasticity fines, 40% fine to coarse sand, and 30% subangular to rounded gravel up to 2 inched in diameter.
								Contains concrete and asphalt concrete fragments up to 10 inch by 24 inch by 40 inch, and make up approximately 40% of the tsm.
					10			
C	GRAB					SC		
					15			
								Test pit exploration terminated in fill material due to trench sidewalls caving.

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PROJECT NO.: 2314-01-1

PLATE: 2

SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-07 | DATE: 11-05-19

EXCAVATOR TYPE: Cat 330 | DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP | GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB		2.9	3		SM		**Silty Sand with Gravel (Fill)** Brown, slightly moist to moist, loose to medium dense, with 15% low plasticity fines, 54% fine to coarse sand, and 32% subangular gravel up to 1 inch in diameter.
B	GRAB					GP-GM		**Bedrock** Moderately weathered, moderately strong to friable. Sampled as **Poorly Graded Gravel with Silt and Sand** Gray, slightly moist, very dense, with an estimated 10% non-plastic fines, 35% fine to coarse sand, and 55% angular gravel up to 3 inches in diameter. Increasing hardness with depth.
					5			Refusal at 5 feet bgs in bedrock.
					10			

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PROJECT NO.: 2314-01-1

PLATE: 2

SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-08 | DATE: 11-05-19

EXCAVATOR TYPE: Cat 330 | DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP | GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SM		**Silty Sand with Gravel** Brown, slightly moist, medium dense, with an estimated 25% non-plastic fines, 60% fine to coarse sand, and 15% subrounded gravel up to 2 inches in diameter.
								Bedrock Highly to completely weathered, moderately strong to friable. Sampled as **Well-Graded Gravel with Sand** Gray, slightly moist, very dense, with 4% non-plastic fines, 32% fine to coarse sand, and 64% angular gravel up to 0.75 inch in diameter. Increasing hardness with depth.
B	GRAB		3.1	NP	5	GP-GM		
					10			Refusal at 9 feet bgs in bedrock.

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PROJECT NO.: 2314-01-1

PLATE: 2

SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-09

DATE: 11-06-19

EXCAVATOR TYPE: Cat 330

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SM		**Silty Sand with Gravel** Dark brown, slightly moist, dense, with an estimated 20% non-plastic to low plasticity fines, 60% fine to coarse sand, and 20% subangular gravel up to 2 inches in diameter. Surface contains cobbles and boulders up to approximately 48 inches in diameter.
								Bedrock Highly to completely weathered, moderately strong to friable.
B	GRAB					GM		Sampled as **Silty Gravel with Sand** Light brown, slightly moist, very dense, with an estimated 15% non-plastic fines, 35% fine to coarse sand, and 50% angular gravel up to 3 inches in diameter. Increasing hardness with depth.
					5			Refusal at 4.5 feet bgs in bedrock.
					10			

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Sparks, Nevada

PROJECT NO.: 2314-01-1

PLATE: 2

SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-10

DATE: 11-06-19

EXCAVATOR TYPE: Cat 330

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB	>4.5				CH		**Sandy Fat Clay with Gravel** Dark brown, slightly moist to moist, hard, with an estimated 60% medium to high plasticity fines, 25% fine to coarse sand, and 15% subangular gravel up to 0.5 inch in diameter. Surface contains cobbles and boulders up to approximately 30 inches in diameter.
								Bedrock Highly to completely weathered, moderately strong to friable. Sampled as **Silty Gravel with Sand** Light brown, slightly moist, very dense, with an estimated 15% non-plastic fines, 25% fine to coarse sand, and 60% angular gravel up to 3 inches in diameter. Increasing hardness with depth.
						GM		
B	GRAB				5			
								Refusal at 7.5 feet bgs in bedrock.
					10			

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PROJECT NO.: 2314-01-1

PLATE: 2

SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-11 | DATE: 11-06-19

EXCAVATOR TYPE: Cat 330 | DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP | GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB	>4.5				CH		**Sandy Fat Clay** Dark brown, slightly moist to moist, hard, with an estimated 65% medium to high plasticity fines, 30% fine to coarse sand, and 5% subangular gravel up to 0.5 inch in diameter. Surface contains cobbles and boulders up to approximately 18 inches in diameter.
B	GRAB				5	GM		**Bedrock** Highly to completely weathered, moderately strong to friable. Sampled as **Silty Gravel with Sand** Light brown, slightly moist, very dense, with an estimated 15% non-plastic fines, 35% fine to coarse sand, and 50% angular gravel up to 3 inches in diameter. Increasing hardness with depth.
					10			Refusal at 7 feet bgs in bedrock.

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PLATE: 2

SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-12

DATE: 11-06-19

EXCAVATOR TYPE: Cat 330

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB	>4.5	12.2	41		CH		**Sandy Fat Clay** Dark brown, slightly moist to moist, hard, with 55% high plasticity fines, 43% fine to coarse sand, and 2% subangular gravel up to 0.38 inch in diameter. Surface contains cobbles and boulders up to approximately 18 inches in diameter.
								Bedrock Highly to completely weathered, moderately strong to friable. Sampled as **Silty Sand** Light brown, slightly moist, very dense, with 17% non-plastic fines, 74% fine to coarse sand, and 9% angular gravel up to 2 inches in diameter. Increasing hardness with depth.
B	GRAB		11.6	NP		SM		
					5			Refusal at 5 feet bgs in bedrock.
					10			

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PROJECT NO.: 2314-01-1

PLATE: 2

SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-13 | DATE: 11-05-19

EXCAVATOR TYPE: Cat 330 | DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP | GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SP-SM		**Bedrock** Highly to completely weathered, moderately strong to friable. Sampled as **Poorly Graded Sand with Silt and Gravel** Brown, slightly moist, dense, with an estimated 10% non-plastic fines, 50% fine to coarse sand, and 40% angular gravel up to 1 inch in diameter.
B	GRAB					GP-GM		**Bedrock** Highly to completely weathered, moderately strong to friable. Sampled as **Poorly Graded Gravel with Silt and Sand** Gray, slightly moist, dense, with an estimated 10% non-plastic fines, 30% fine to coarse sand, and 60% angular gravel up to 3 inches in diameter. Increasing hardness with depth.
					5			Refusal at 4.5 feet bgs in bedrock.
					10			

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SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-14

DATE: 11-05-19

EXCAVATOR TYPE: Cat 330

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB		4.5	20		SC		**Clayey Sand** Reddish brown, slightly moist, medium dense, with 29% medium plasticity fines, 67% fine to coarse sand, and 4% subangular to subrounded gravel up to 0.75 inch in diameter. Surface contains cobbles and boulders up to approximately 15 inches in diameter.
B	GRAB				5	GM		**Bedrock** Highly to completely weathered, moderately strong to friable. Sampled as **Silty Gravel with Sand** Grayish brown, slightly moist, very dense, with an estimated 15% non-plastic fines, 30% fine to coarse sand, and 55% angular gravel up to 3 inches in diameter. Increasing hardness with depth.
					10			Refusal at 6 feet bgs in bedrock.

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PLATE: 2

SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-15 | DATE: 11-06-19

EXCAVATOR TYPE: Cat 330 | DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP | GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SM		**Silty Sand with Gravel** Dark brown, slightly moist, dense, with an estimated 20% non-plastic to low plasticity fines, 50% fine to coarse sand, and 30% subangular gravel up to 3 inches in diameter. Surface contains cobbles and boulders up to approximately 18 inches in diameter.
B	GRAB					GM		**Bedrock** Highly to completely weathered, moderately strong to friable. Sampled as **Silty Gravel with Sand** Light brown, slightly moist, very dense, with an estimated 15% non-plastic fines, 25% fine to coarse sand, and 60% angular gravel up to 3 inches in diameter. Increasing hardness with depth.
					5			Refusal at 4 feet bgs in bedrock.
					10			

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SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-16

DATE: 11-05-19

EXCAVATOR TYPE: Cat 330

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SM		**Bedrock** Highly to completely weathered, moderately strong to friable. Sampled as **Silty Sand** Reddish brown to grayish brown, slightly moist, very dense, with an estimated 15% non-plastic fines, 75% fine to coarse sand, and 10% angular gravel up to 1 inch in diameter. Increasing hardness with depth.
								Refusal at 3 feet bgs in bedrock.
					5			
					10			

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PLATE: 2

SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-17 | DATE: 11-05-19

EXCAVATOR TYPE: Cat 330 | DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP | GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SM		**Silty Sand** Brown, slightly moist, dense, with an estimated 15% non-plastic fines, 80% fine to coarse sand, and 5% subangular gravel up to 1 inch in diameter.
B	GRAB		1.8	NP	5	SW		**Bedrock** Highly to completely weathered, moderately strong to friable. Sampled as **Well-Graded Sand with Gravel** Light brown, slightly moist, very dense, with 4% non-plastic fines, 49% fine to coarse sand, and 47% angular gravel up to 1.5 inches in diameter. Increasing hardness with depth.
					10			Refusal at 8 feet bgs in bedrock.

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TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-18

DATE: 11-05-19

EXCAVATOR TYPE: Cat 330

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SM		**Bedrock** Highly to completely weathered, moderately strong to friable. Sampled as **Silty Sand with Gravel** Brown, slightly moist, very dense, with an estimated 20% non-plastic fines, 60% fine to coarse sand, and 20% subangular gravel up to 3 inches in diameter. Surface contains cobbles and boulders up to approximately 20 inches in diameter.
					5			Refusal at 3 feet bgs in bedrock.
					10			

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TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-19 | DATE: 11-05-19

EXCAVATOR TYPE: Cat 330 | DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP | GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SC		**Clayey Sand** Brown, slightly moist, medium dense, with an estimated 25% medium plasticity fines, 70% fine to coarse sand, and 5% subrounded gravel up to 0.75 inch in diameter.
								Bedrock Highly to completely weathered, moderately strong to friable. Sampled as **Silty Gravel with Sand** Grayish brown, slightly moist, dense to very dense, with an estimated 15% non-plastic fines, 35% fine to coarse sand, and 50% angular gravel up to 3 inches in diameter. Increasing hardness with depth.
B	GRAB					GM		
					5			
								Refusal at 8 feet bgs in bedrock.
					10			

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TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-20 | DATE: 11-05-19

EXCAVATOR TYPE: Cat 330 | DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP | GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SM		**Silty Sand (Fill)** Brown, slightly moist, loose, with an estimated 30% non-plastic fines, 65% fine to coarse sand, and 5% subangular gravel up to 0.75 inch in diameter.
B	GRAB					SC		**Clayey Sand** Reddish brown, moist, dense, with an estimated 20% medium plasticity fines, 70% fine to coarse sand, and 10% subangular gravel up to 1 inch in diameter.
C	GRAB				5	GM		**Bedrock** Highly to completely weathered, moderately strong to friable. Sampled as **Silty Gravel with Sand** Grayish brown, slightly moist, dense to very dense, with an estimated 15% non-plastic fines, 25% fine to coarse sand, and 60% angular gravel up to 3 inches in diameter. Increasing hardness with depth.
					10			Refusal at 6 feet bgs in bedrock.

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SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-21 | DATE: 11-05-19

EXCAVATOR TYPE: Cat 330 | DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP | GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SC		**Clayey Sand** Reddish dark brown, slightly moist, medium dense, with an estimated 30% medium plasticity fines, 65% fine to coarse sand, and 5% subangular gravel up to 0.75 inch in diameter.
								Bedrock Highly to completely weathered, moderately strong to friable. Sampled as **Poorly Graded Gravel with Silt and Sand** Reddish brown, slightly moist, very dense, with an estimated 10% non-plastic fines, 30% fine to coarse sand, and 60% angular gravel up to 3 inches in diameter. Increasing hardness with depth.
B	GRAB				5	GP-GM		
					10			Refusal at 9 feet bgs in bedrock.

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TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-22 | DATE: 11-05-19

EXCAVATOR TYPE: Cat 330 | DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP | GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					GC		**Clayey Gravel with Sand (Fill)** Reddish brown, moist, loose, with an estimated 30% medium plasticity fines, 30% fine to coarse sand, and 40% angular gravel up to 3 inches in diameter. Cobbles and boulders up to 14 inches in diameter make up approximately 50% of the tsm.
								Bedrock Highly to completely weathered, moderately strong to friable. Sampled as **Poorly Graded Gravel with Silt and Sand** Grayish brown, slightly moist, very dense, with an estimated 10% non-plastic fines, 30% fine to coarse sand, and 60% angular gravel up to 3 inches in diameter. Increasing hardness with depth.
B	GRAB				5	GP-GM		
								Refusal at 6 feet bgs in bedrock.
					10			

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SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-23

DATE: 11-05-19

EXCAVATOR TYPE: Cat 330

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB		9.5	60		SC		**Clayey Sand with Gravel** Reddish brown, moist, dense, with 27% very high plasticity fines, 50% fine to coarse sand, and 23% subangular gravel up to 1 inch in diameter. Surface contains cobbles and boulders up to approximately 14 inches in diameter.
B	GRAB				5	SM		**Bedrock** Highly to completely weathered, moderately strong to friable. Sampled as **Silty Sand with Gravel** Light brown, slightly moist, very dense, with an estimated 15% non-plastic to low plasticity fines, 50% fine to coarse sand, and 35% angular to subangular gravel up to 3 inches in diameter. Increasing hardness with depth.
					10			Refusal at 8 feet bgs in bedrock.

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SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-24

DATE: 11-05-19

EXCAVATOR TYPE: Cat 330

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				5	SM		**Silty Sand with Gravel** Light brown, slightly moist, dense, with an estimated 25% non-plastic fines, 55% fine to coarse sand, and 20% subangular gravel up to 1 inch in diameter. Surface contains cobbles and boulders up to approximately 13 inches in diameter.
B	GRAB				10	GM		**Bedrock** Highly to completely weathered, moderately strong to friable. Sampled as **Silty Gravel with Sand** Gray, slightly moist, very dense, with an estimated 15% non-plastic fines, 40% fine to coarse sand, and 45% angular gravel up to 3 inches in diameter. Increasing hardness with depth.
					15			Refusal at 14 feet bgs in bedrock.

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SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-25 | DATE: 11-06-19

EXCAVATOR TYPE: Cat 330 | DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP | GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB	>4.5	16.1	55		SC		**Clayey Sand with Gravel** Dark brown, slightly moist to moist, dense, with 44% very high plasticity fines, 33% fine to coarse sand, and 23% subangular gravel up to 0.75 inch in diameter. Surface contains cobbles and boulders up to approximately 18 inches in diameter.
								Bedrock Highly to completely weathered, moderately strong to friable. Sampled as **Silty Gravel with Sand** Light reddish brown, slightly moist, very dense, with an estimated 15% non-plastic fines, 35% fine to coarse sand, and 50% angular to subangular gravel up to 3 inches in diameter. Increasing hardness with depth.
B	GRAB					GM		
					5			
								Refusal at 8 feet bgs in bedrock.
					10			

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SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-26

DATE: 11-05-19

EXCAVATOR TYPE: Cat 330

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SM		**Silty Sand** Reddish brown, slightly moist, dense, with an estimated 20% non-plastic to low plasticity fines and 80% fine to coarse sand. Surface contains cobbles and boulders up to approximately 20 inches in diameter.
								Bedrock Highly to completely weathered, moderately strong to friable. Sampled as **Silty Sand with Gravel** Grayish brown, slightly moist, very dense, with an estimated 15% non-plastic fines, 55% fine to coarse sand, and 30% angular gravel up to 1 inch in diameter. Increasing hardness with depth.
B	GRAB				5	SM		
								Refusal at 8 feet bgs in bedrock.
					10			

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TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-27 | DATE: 11-06-19

EXCAVATOR TYPE: Cat 330 | DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP | GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SC		**Clayey Sand with Gravel** Dark brown, slightly moist, medium dense, with an estimated 30% low to medium plasticity fines, 50% fine to coarse sand, and 20% subangular gravel up to 2 inches in diameter. Surface contains cobbles and boulders up to approximately 18 inches in diameter.
B	GRAB				5	GP-GM		**Bedrock** Highly to completely weathered, moderately strong to friable. Sampled as **Poorly Graded Gravel with Silt and Sand** Reddish brown, moist, very dense, with an estimated 10% non-plastic fines, 40% fine to coarse sand, and 50% angular gravel up to 0.5 inch in diameter. Increasing hardness with depth.
					10			Refusal at 7 feet bgs in bedrock.

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TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-28 | DATE: 11-06-19

EXCAVATOR TYPE: Cat 330 | DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP | GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SM		**Silty Sand with Gravel** Dark brown, slightly moist, dense, with an estimated 20% non-plastic fines, 45% fine to coarse sand, and 35% subangular gravel up to 2 inches in diameter. Surface contains cobbles and boulders up to approximately 20 inches in diameter.
B	GRAB					GM		**Bedrock** Highly to completely weathered, moderately strong to friable. Sampled as **Silty Gravel with Sand** Light brown, slightly moist, very dense, with an estimated 15% non-plastic to low plasticity fines, 35% fine to coarse sand, and 50% angular gravel up to 3 inches in diameter. Increasing hardness with depth. Refusal at 3.25 feet bgs in bedrock.
					5			
					10			

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PLATE: 2

SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-29

DATE: 11-06-19

EXCAVATOR TYPE: Cat 330

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SC		**Clayey Sand** Reddish brown, slightly moist to moist, dense, with an estimated 30% medium plasticity fines, 60% fine to coarse sand, and 10% subangular gravel up to 0.5 inch in diameter. Surface contains cobbles and boulders up to approximately 30 inches in diameter.
B	GRAB					SP-SM		**Bedrock** Highly to completely weathered, moderately strong to friable. Sampled as **Poorly Graded Sand with Silt** Reddish brown, slightly moist, very dense, with an estimated 10% non-plastic fines, 85% fine to coarse sand, and 5% angular gravel up to 0.5 inch in diameter. Increasing hardness with depth.
					5			Refusal at 4.5 feet bgs in bedrock.
					10			

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SHEET 1 OF 1

TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

TEST PIT LOG

TEST PIT NO.: TP-19-30

DATE: 11-06-19

EXCAVATOR TYPE: Cat 330

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					SC		**Clayey Sand with Gravel** Dark reddish brown, slightly moist to moist, dense, with an estimated 40% high to very high plasticity fines, 40% fine to coarse sand, and 20% subangular gravel up to 0.75 inch in diameter. Surface contains cobbles and boulders up to approximately 20 inches in diameter.
B	GRAB					GP		**Bedrock** Highly to completely weathered, moderately strong to friable. Sampled as **Poorly Graded Gravel with Sand** Light brown, slightly moist, very dense, with an estimated 5% non-plastic fines, 30% fine to coarse sand, and 65% angular gravel up to 3 inches in diameter. Increasing hardness with depth.
					5			Refusal at 5 feet bgs in bedrock.
					10			

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5 Ridges Development Company, Inc.

5 Ridges Subdivision

Sparks, Nevada

PROJECT NO.: 2314-01-1

PLATE: 2

SHEET 1 OF 1

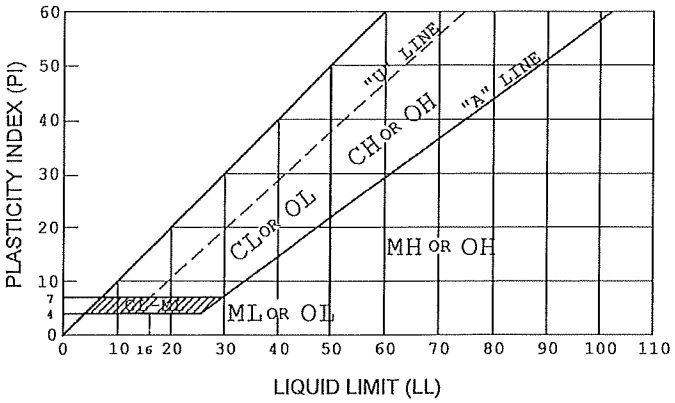
TEST_PIT 2314011.GPJ BLACKEAGLE.GDT 1/9/20

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE)	GRAVEL AND GRAVELLY SOILS (MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE)	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS (MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE)	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE)	SILTS AND CLAYS (LIQUID LIMIT LESS THAN 50)			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (LIQUID LIMIT GREATER THAN 50)			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS
FILL MATERIAL				---	FILL MATERIAL, NON-NATIVE

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.

PLASTICITY CHART



FOR CLASSIFICATION OF FINE-GRAINED SOILS AND FINE-GRAINED FRACTION OF COARSE-GRAINED SOILS

EXPLORATION SAMPLE TERMINOLOGY

Sample Type	Sample Symbol	Sample Code
Auger Cuttings		Auger
Bulk (Grab) Sample		Grab
Modified California Sampler		MC
Shelby Tube		SH or ST
Standard Penetration Test		SPT
Split Spoon		SS
No Sample		

GRAIN SIZE TERMINOLOGY

Component of Sample	Size Range
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75mm)
Sand	# 4 to #200 sieve (4.75mm to 0.074mm)
Silt or Clay	Passing #200 sieve (0.074mm)

RELATIVE DENSITY OF GRANULAR SOILS

N - Blows/ft	Relative Density
0 - 4	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
greater than 50	Very Dense

CONSISTENCY OF COHESIVE SOILS

Unconfined Compressive Strength, psf	N - Blows/ft	Consistency
less than 500	0 - 1	Very Soft
500 - 1,000	2 - 4	Soft
1,000 - 2,000	5 - 8	Firm
2,000 - 4,000	9 - 15	Stiff
4,000 - 8,000	16 - 30	Very Stiff
8,000 - 16,000	31 - 60	Hard
greater than 16,000	greater than 60	Very Hard

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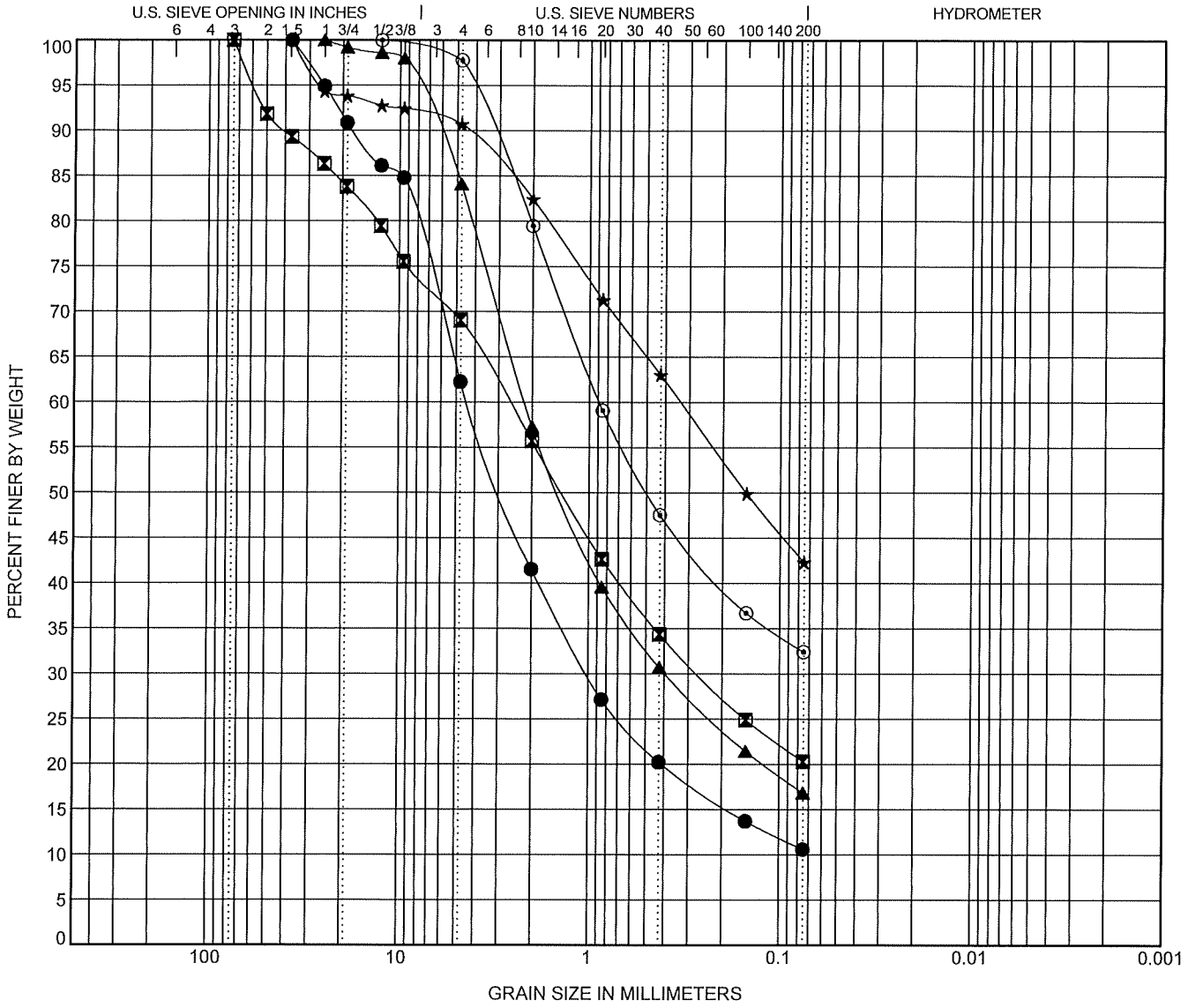
USCS Soil Classification Chart

Project: 5 Ridges Subdivision
Location: Sparks, Nevada
Project Number: 2314-01-1 Plate: 3



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-19-02	7.0	POORLY GRADED SAND with SILT and GRAVEL(SP-SM)	30	29	1	3.57	65.94
⊠	B-19-02	56.0	SILTY SAND with GRAVEL(SM)	28	23	5		
▲	B-19-03	7.0	SILTY SAND with GRAVEL(SM)	28	25	3		
★	B-19-06	33.5	SILTY SAND(SM)	31	25	6		
⊙	TP-19-01	0.5	CLAYEY SAND(SC)	62	21	41		

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-19-02	7.0	37	4.325	1.006		37.8	51.6	10.6	
⊠	B-19-02	56.0	75	2.642	0.262		31.0	48.7	20.3	
▲	B-19-03	7.0	25	2.184	0.393		15.9	67.3	16.8	
★	B-19-06	33.5	37	0.334			9.3	48.4	42.3	
⊙	TP-19-01	0.5	12.5	0.883			2.2	65.4	32.4	

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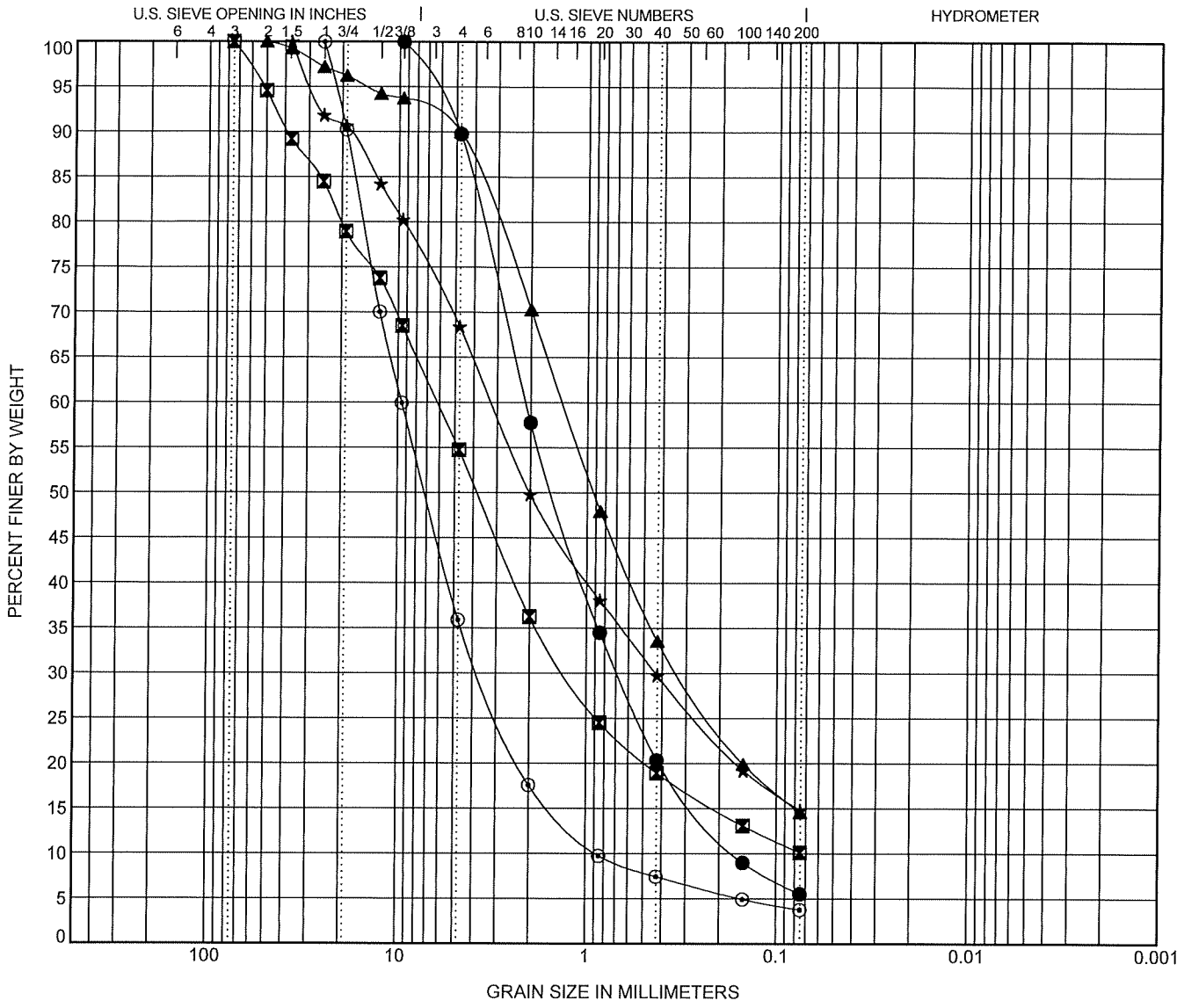
GRAIN SIZE DISTRIBUTION

Project: 5 Ridges Subdivision
Loction: Sparks, Nevada
Project Number: 2314-01-1

PLATE: 4a

GRAIN SIZE 2314011.GPJ GINT STD US LAB.GDT 1/9/20



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	TP-19-02	9.0	WELL-GRADED SAND with SILT(SW-SM)	NP	NP	NP	1.33	12.91
⊠	TP-19-04	0.0	POORLY GRADED GRAVEL with CLAY and SAND(GP-GC)	36	20	16	3.56	84.80
▲	TP-19-05	0.0	SILTY SAND(SM)	NP	NP	NP		
★	TP-19-07	0.5	SILTY SAND with GRAVEL(SM)	21	18	3		
⊙	TP-19-08	5.0	WELL-GRADED GRAVEL with SAND(GW)	NP	NP	NP	1.55	10.89

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP-19-02	9.0	9.5	2.124	0.681	0.164	10.2	84.2	5.5	
⊠	TP-19-04	0.0	75	6.189	1.268		45.3	44.6	10.1	
▲	TP-19-05	0.0	50	1.349	0.324		10.0	75.4	14.6	
★	TP-19-07	0.5	37	3.212	0.433		31.6	53.6	14.8	
⊙	TP-19-08	5.0	25	9.513	3.594	0.873	64.1	32.1	3.8	

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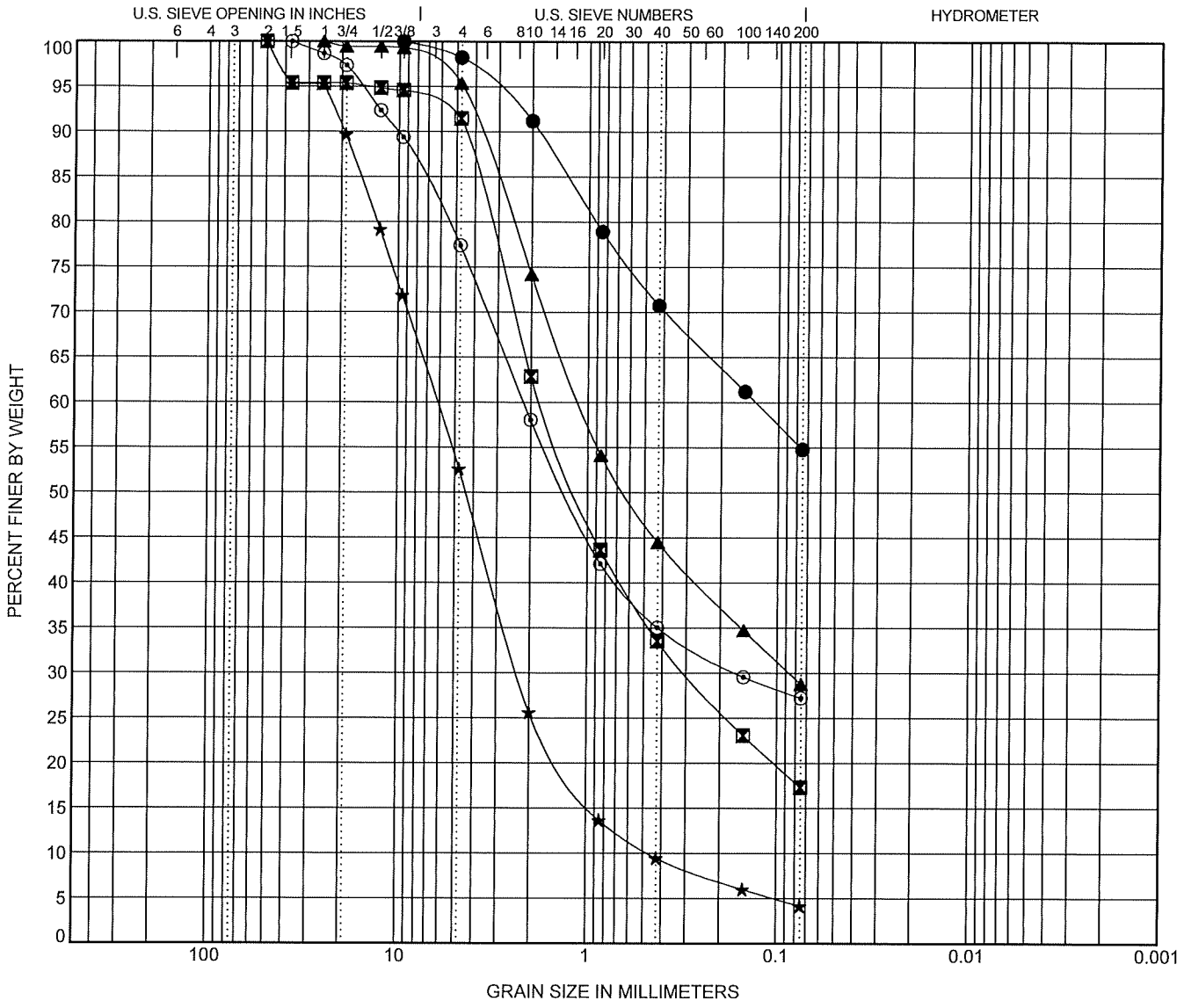
GRAIN SIZE DISTRIBUTION

Project: 5 Ridges Subdivision
Loction: Sparks, Nevada
Project Number: 2314-01-1

PLATE: 4b

GRAIN SIZE 2314011.GPJ GINT STD US LAB.GDT 1/9/20



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	TP-19-12	0.0	SANDY FAT CLAY(CH)	59	18	41		
⊠	TP-19-12	3.0	SILTY SAND(SM)	NP	NP	NP		
▲	TP-19-14	0.8	CLAYEY SAND(SC)	40	20	20		
★	TP-19-17	4.5	WELL-GRADED SAND with GRAVEL(SW)	NP	NP	NP	1.85	13.38
⊙	TP-19-23	0.8	CLAYEY SAND with GRAVEL(SC)	86	26	60		

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP-19-12	0.0	9.5	0.132			1.8	43.5	54.8	
⊠	TP-19-12	3.0	50	1.759	0.298		8.5	74.1	17.3	
▲	TP-19-14	0.8	25	1.092	0.087		4.6	66.6	28.8	
★	TP-19-17	4.5	50	6.195	2.301	0.463	47.4	48.5	4.2	
⊙	TP-19-23	0.8	37	2.18	0.163		22.6	50.2	27.2	

GRAIN SIZE 2314011.GPJ GINT STD US LAB.GDT 1/9/20

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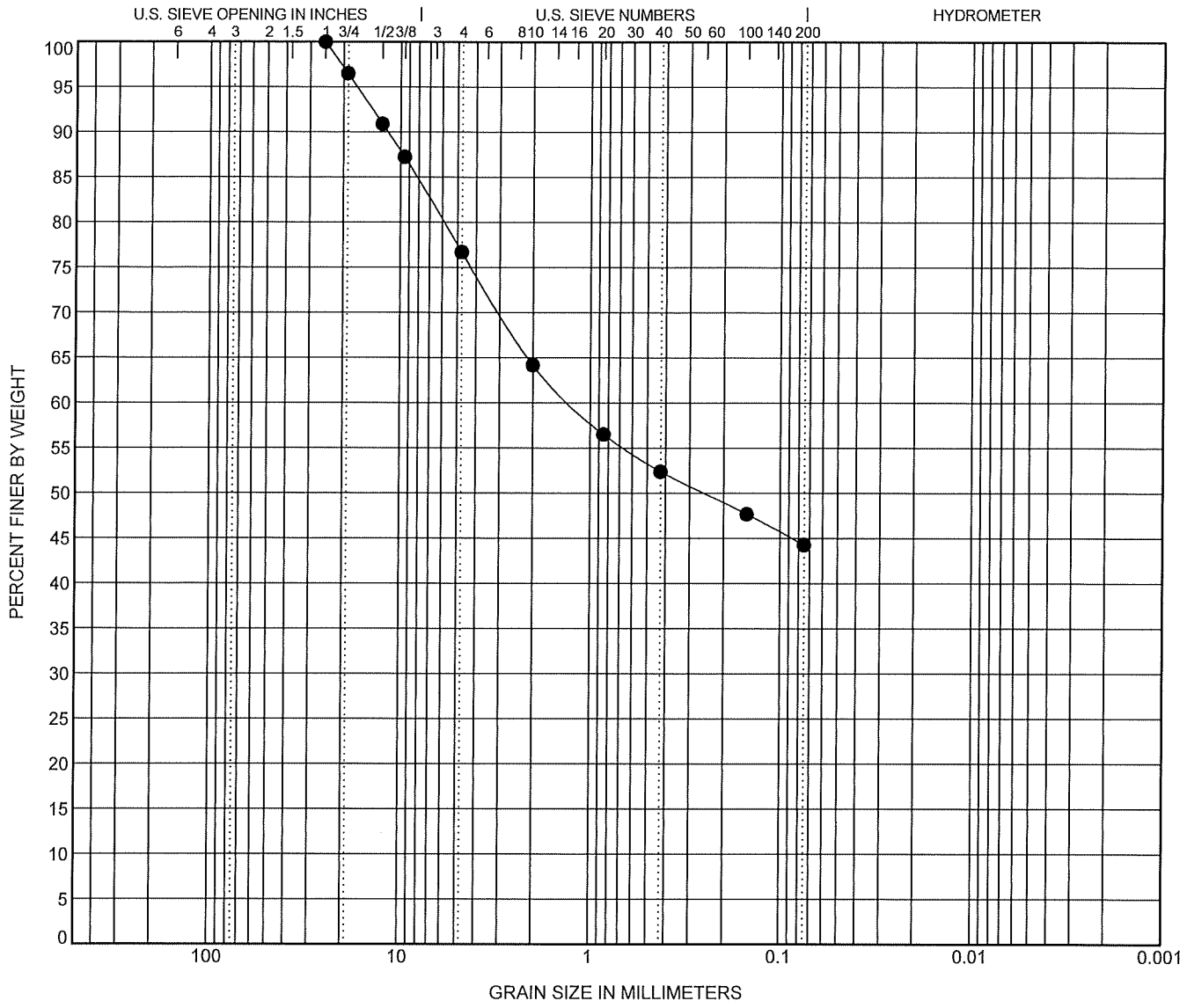
GRAIN SIZE DISTRIBUTION

Project: 5 Ridges Subdivision
Loction: Sparks, Nevada
Project Number: 2314-01-1

PLATE: 4c



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**TP-19-25**	**0.0**	**CLAYEY SAND with GRAVEL(SC)**	**74**	**19**	**55**		

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-19-25**	**0.0**	**25**	**1.252**			**23.3**	**32.4**	**44.3**	

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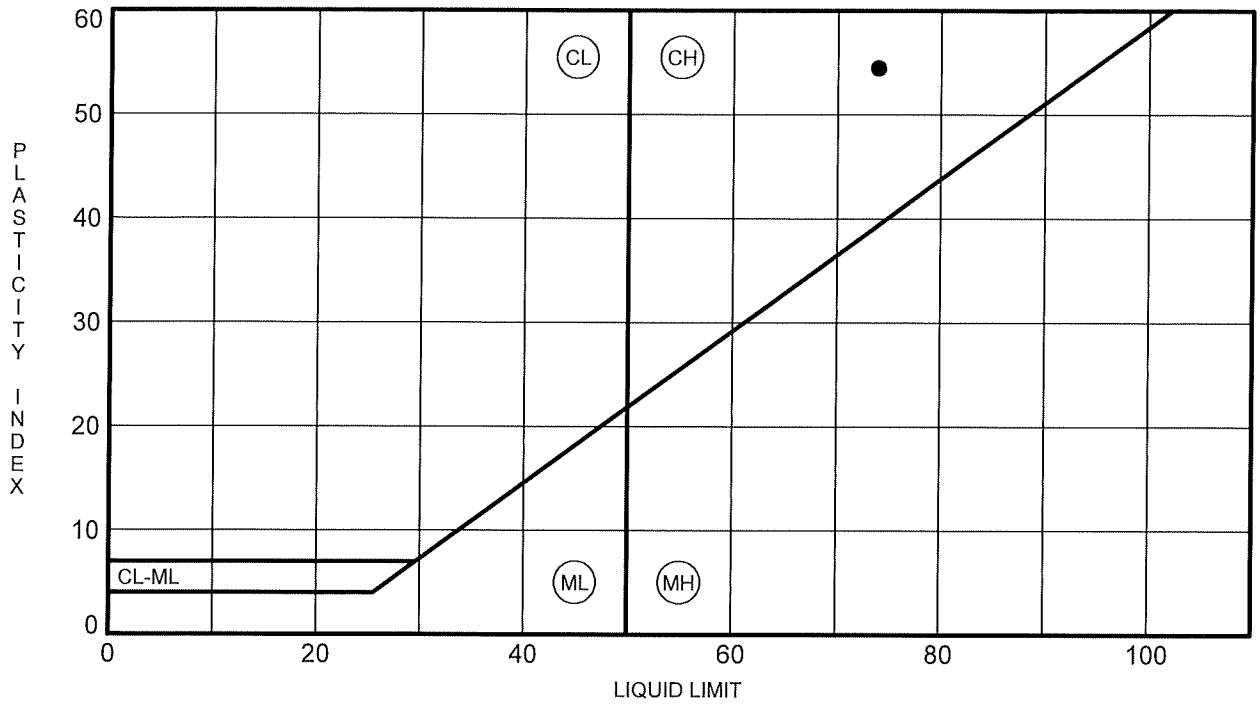
GRAIN SIZE DISTRIBUTION

Project: 5 Ridges Subdivision
Loction: Sparks, Nevada
Project Number: 2314-01-1

PLATE: 4d

GRAIN SIZE 2314011.GPJ GINT STD US LAB.GDT 1/9/20



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**TP-19-25**	**0.0**	**74**	**19**	**55**	**44**	**CLAYEY SAND with GRAVEL(SC)**

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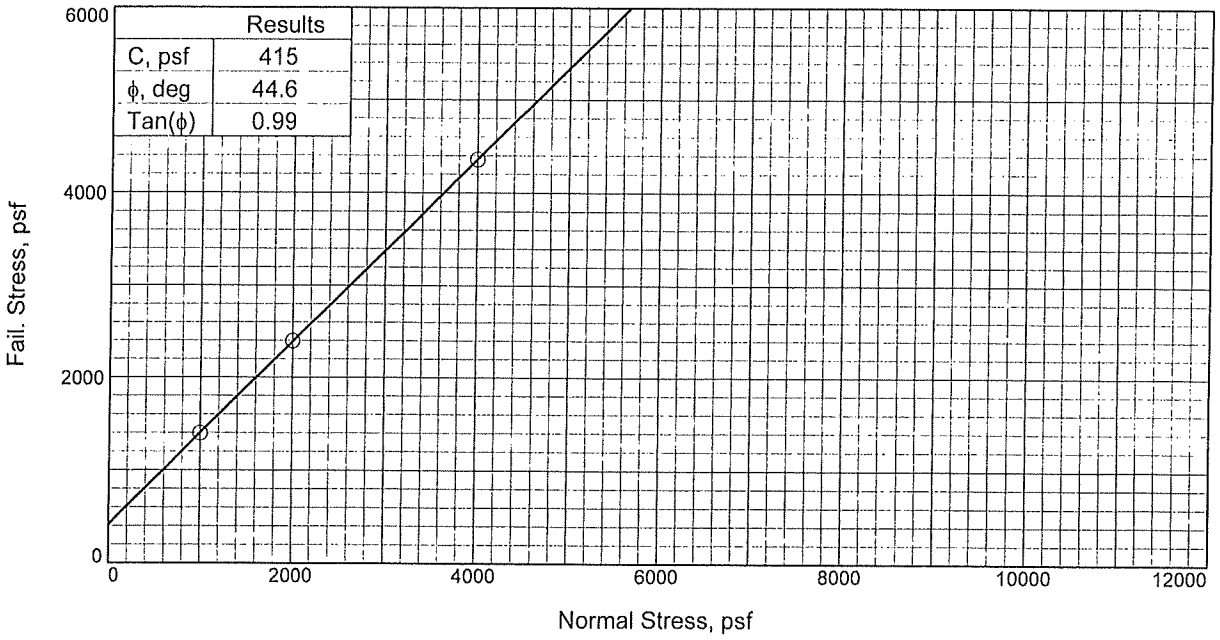
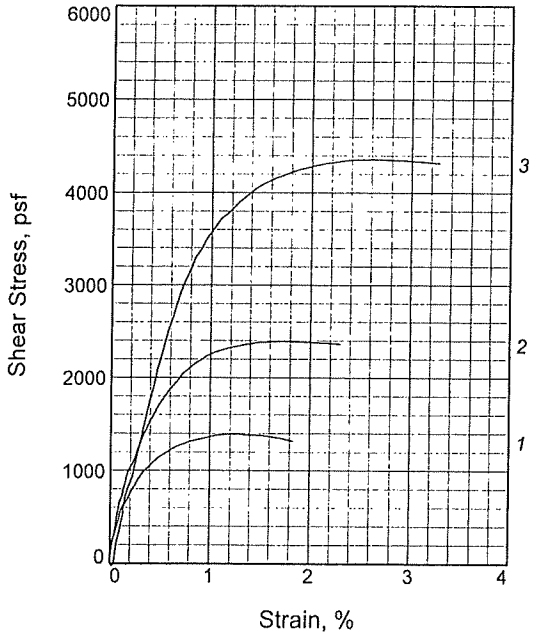
ATTERBERG LIMITS RESULTS

Project: 5 Ridges Subdivision
Loction: Sparks, Nevada
Project Number: 2314-01-1

PLATE: 4e

ATTERBERG LIMITS 2314011.GPJ GINT STD US LAB.GDT 1/9/20





Sample No.		1	2	3
Initial	Water Content, %	16.1	16.1	16.1
	Dry Density, pcf	104.2	104.2	104.2
	Saturation, %	70.5	70.5	70.5
	Void Ratio	0.6174	0.6174	0.6174
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	22.7	23.6	22.1
	Dry Density, pcf	104.6	103.0	105.7
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6119	0.6368	0.5954
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.01	0.99
Normal Stress, psf		1000	2000	4000
Fail. Stress, psf		1396	2395	4358
Strain, %		1.2	1.7	2.6
Ult. Stress, psf				
Strain, %				
Strain rate, in./min.		0.002	0.002	0.002

Sample Type: Remolded to Dense
Description: Silty Sand

LL= 0 **PI=** NP
Assumed Specific Gravity= 2.7
Remarks: Laboratory Log 7816

Client: 5 Ridges Development Company, Inc.

Project: 5 Ridges Subdivision

Source of Sample: TP-19-12 **Depth:** 3
Sample Number: B
Proj. No.: 2314-01-1 **Date Sampled:** 11/06/19

DIRECT SHEAR TEST REPORT
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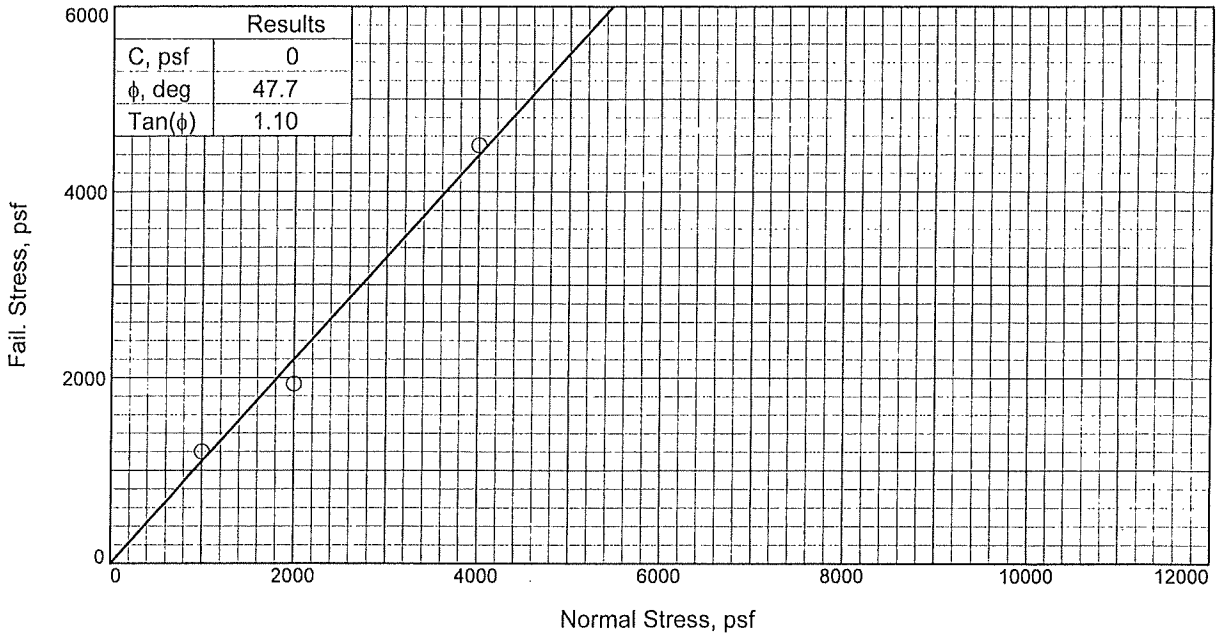
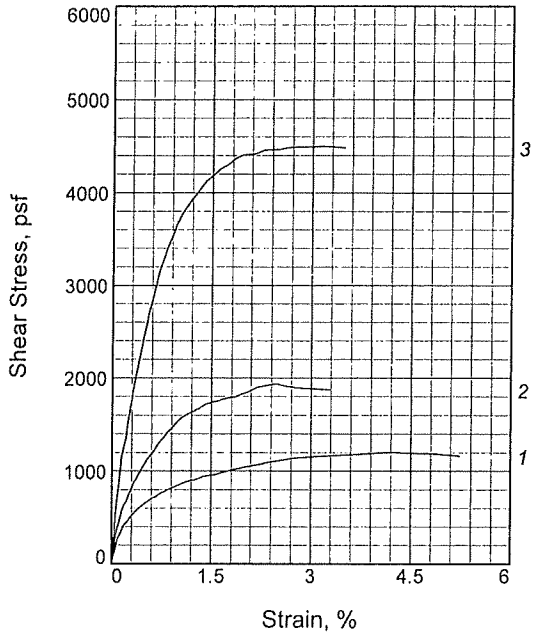
Reno, Nevada

Figure 5a

Tested By: GLO





Sample No.		1	2	3
Initial	Water Content, %	6.5	6.5	6.5
	Dry Density, pcf	118.4	118.4	118.5
	Saturation, %	41.8	41.8	41.7
	Void Ratio	0.4231	0.4231	0.4229
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	15.7	14.8	14.6
	Dry Density, pcf	118.3	120.5	120.8
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4247	0.3986	0.3953
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	0.98	0.98
Normal Stress, psf		1000	2000	4000
Fail. Stress, psf		1202	1935	4499
Strain, %		4.3	2.5	3.2
Ult. Stress, psf				
Strain, %				
Strain rate, in./min.		0.002	0.002	0.002

Sample Type: Remolded to Dense
Description: Well-Graded Sand with Silt

LL= 0 **PI=** NP
Assumed Specific Gravity= 2.7
Remarks: Laboratory Log 7816

Client: 5 Ridges Development Company, Inc.

Project: 5 Ridges Subdivision

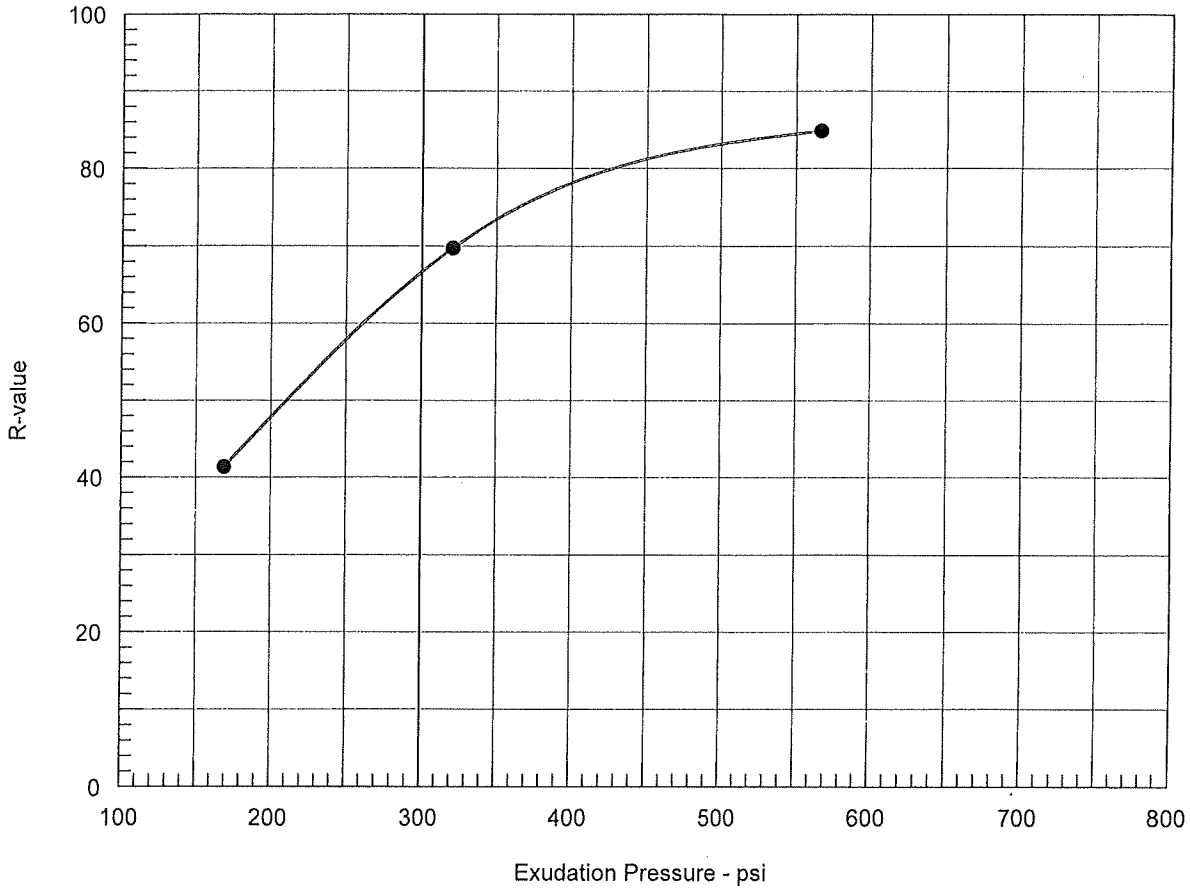
Source of Sample: TP-19-02 **Depth:** 9
Sample Number: C
Proj. No.: 2314-01-1 **Date Sampled:** 11/05/19

DIRECT SHEAR TEST REPORT
BLACK EAGLE CONSULTING, INC.
Reno, Nevada

Figure 5b

Tested By: GLO

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - ASTM D2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	170	129.6	10.2	0.09	78	2.49	169	41	41
2	350	131.7	8.3	0.09	17	2.50	567	85	85
3	250	131.7	9.1	0.00	36	2.46	321	70	70

Test Results	Material Description
R-value at 300 psi exudation pressure = 67	Poorly Graded Gravel with Clay and Sand

Project No.: 2314-01-1
Project: 5 Ridges Subdivision
Source of Sample: TP-19-04 **Depth:** 0
Sample Number: A
Date: 12/20/2019

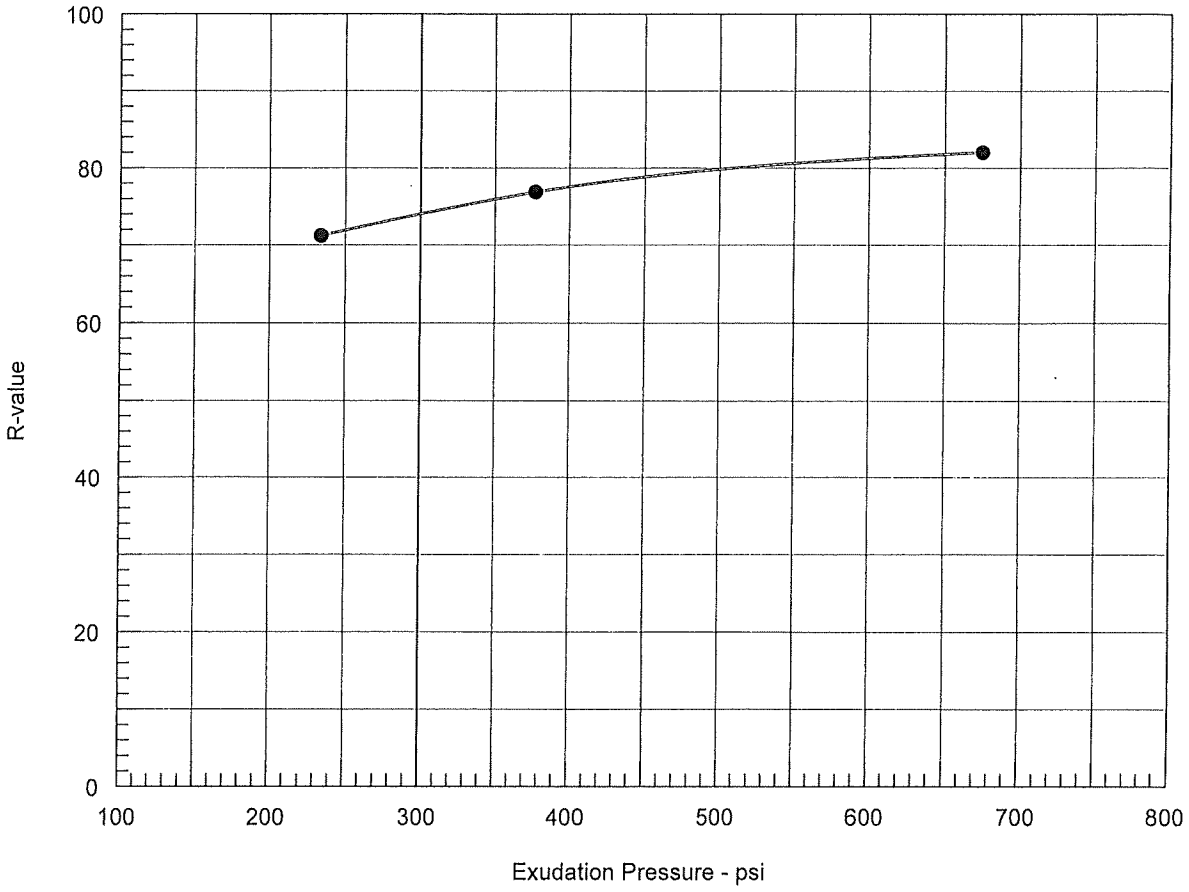
Tested by: GLO
Checked by: LO
Remarks:
Laboratory Log 7816

R-VALUE TEST REPORT

BLACK EAGLE CONSULTING, INC.

Figure 6a

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - ASTM D2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	350	130.6	7.8	0.00	22	2.46	675	82	82
2	350	130.1	9.0	0.00	35	2.47	234	71	71
3	350	130.9	8.4	0.06	28	2.51	377	77	77

Test Results	Material Description
R-value at 300 psi exudation pressure = 74	Silty Sand

Project No.: 2314-01-1
Project: 5 Ridges Subdivision
Source of Sample: TP-19-05 **Depth:** 0
Sample Number: A
Date: 12/20/2019

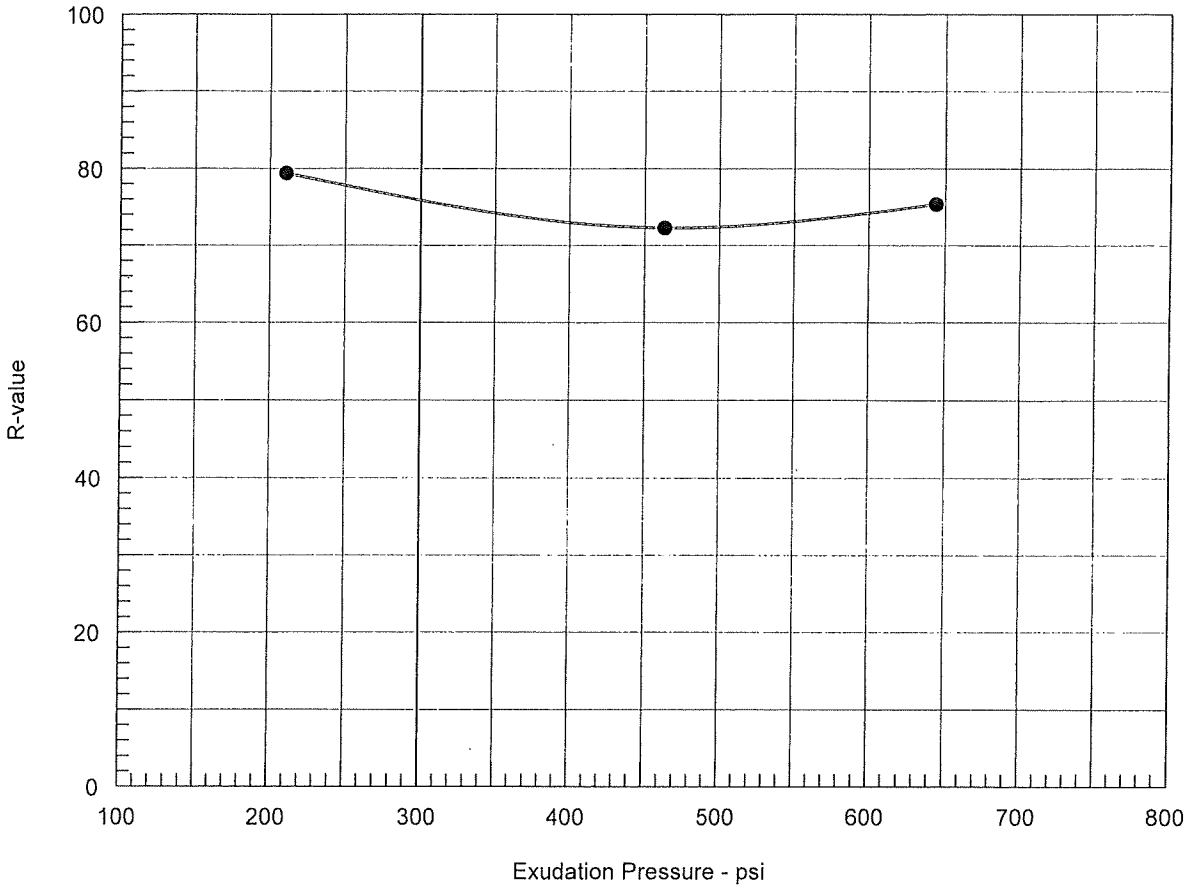
Tested by: GLO
Checked by: LO
Remarks:
Laboratory Log 7816

R-VALUE TEST REPORT

BLACK EAGLE CONSULTING, INC.

Figure 6b

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - ASTM D2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	180	131.1	9.4	0.00	21	2.41	211	81	79
2	220	131.0	8.2	0.00	28	2.46	644	75	75
3	200	130.2	8.7	0.00	28	2.46	463	72	72

Test Results	Material Description
R-value at 300 psi exudation pressure = 76	Combined Sample

Project No.: 2314-01-1
Project: 5 Ridges Subdivision
Source of Sample: Combined TP-19-13, TP-19-14, TP-19-15
Sample Number: Bulk
Date: 12/20/2019

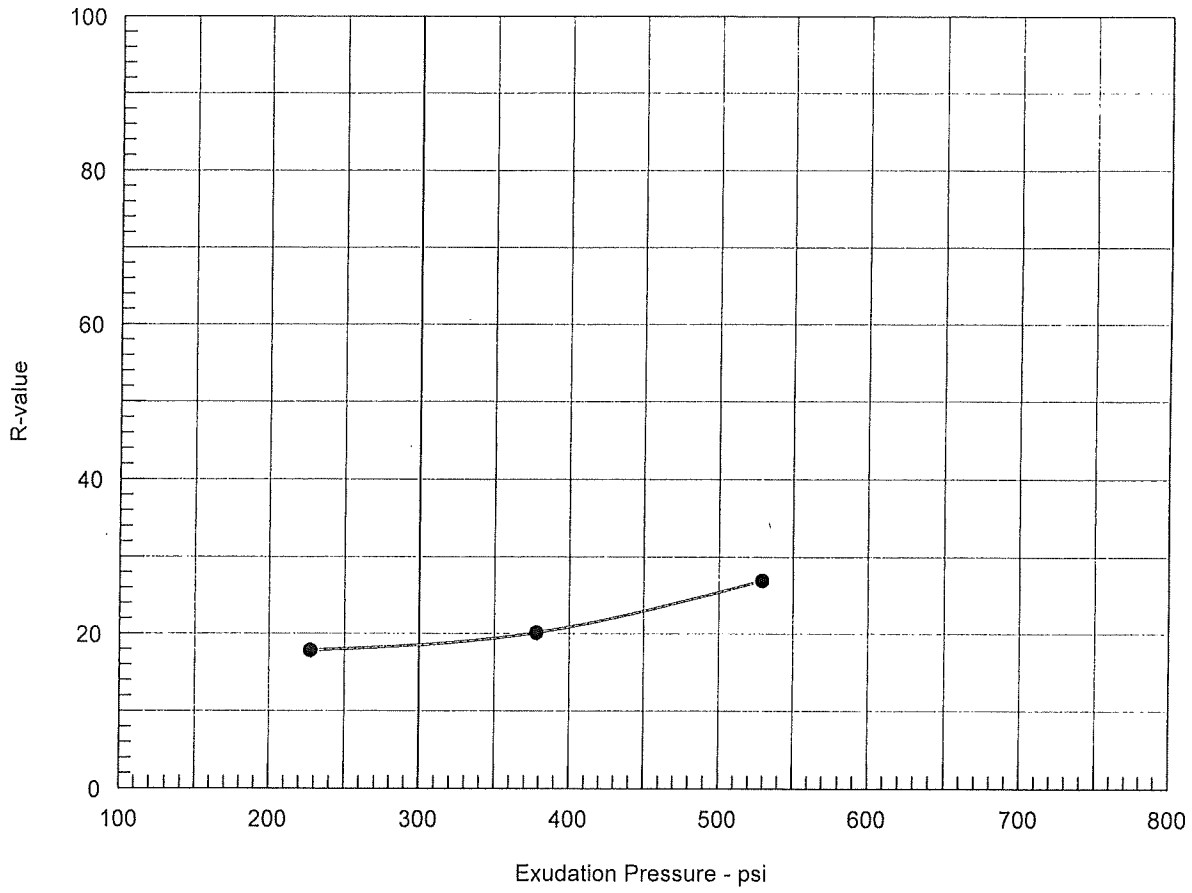
Tested by: GLO
Checked by: LO
Remarks:
Laboratory Log 7816

R-VALUE TEST REPORT

BLACK EAGLE CONSULTING, INC.

Figure 6c

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - ASTM D2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	140	118.5	15.1	0.06	110	2.47	529	27	27
2	80	115.9	16.6	0.06	121	2.52	227	18	18
3	80	116.0	15.4	0.00	118	2.54	378	20	20

Test Results	Material Description
R-value at 300 psi exudation pressure = 19	Combined Sample

Project No.: 2314-01-1
Project: 5 Ridges Subdivision
Source of Sample: TP-19-06 **Depth:** 0
Sample Number: Bulk
Date: 12/20/2019

Tested by: GLO
Checked by: LO
Remarks:
Laboratory Log 7816

R-VALUE TEST REPORT

BLACK EAGLE CONSULTING, INC.

Figure 6d