FIVE RIDGES

TENTATIVE SUBDIVISION MAP
CONDITIONAL USE PERMIT

PREPARED BY:

CHRISTY CORPORATION

MARCH 25, 2020

Table of Contents

Introduction 1
Project Location 1
Existing Conditions 2
Project Background 5
Project Request 7
Conditional Use Permit 10
Request Findings 12
Tentative Map 12
Conditional Use Permit 14

List of Figures:

Figure 1 – Vicinity Map 1
Figure 2 – Existing Conditions 2
Figure 3 – Existing Conditions 3
Figure 4 – Comprehensive Plan Land Use 4
Figure 5 – Zoning 5
Figure 6 – Development Agreement Conceptual Plan 6
Figure 7 – Tentative Map Area 8
Figure 8 – Slope Analysis 10

Appendices:

City of Sparks Development Application
Owner Affidavit
Ownership Documentation
Residential Project Data Sheet
Data Sheet Calculations
Street Name Documentation
Property Tax Documentation

Attachments:

Preliminary Title Report
Conceptual Drainage Report
Preliminary Sewer Report
Preliminary Geotechnical Investigation

Map Pocket:

Preliminary Civil Plans
Preliminary Landscape Plans

Introduction

This application includes the following requests:

- A **Tentative Subdivision Map** to allow for the creation of 460 single family lots within the SF-6 zone.
- A **Conditional Use Permit** to allow for grading in accordance with Section 20.04.011 of the Sparks Municipal Code.

Project Location

Five Ridges (APN 083-011-15), consists of 386.87± acres located north of Highland Ranch Parkway just west of Pyramid Way. The Washoe County Assessor's office lists the site address as 555 Highland Ranch Parkway. Figure 1 (below) depicts the project location.

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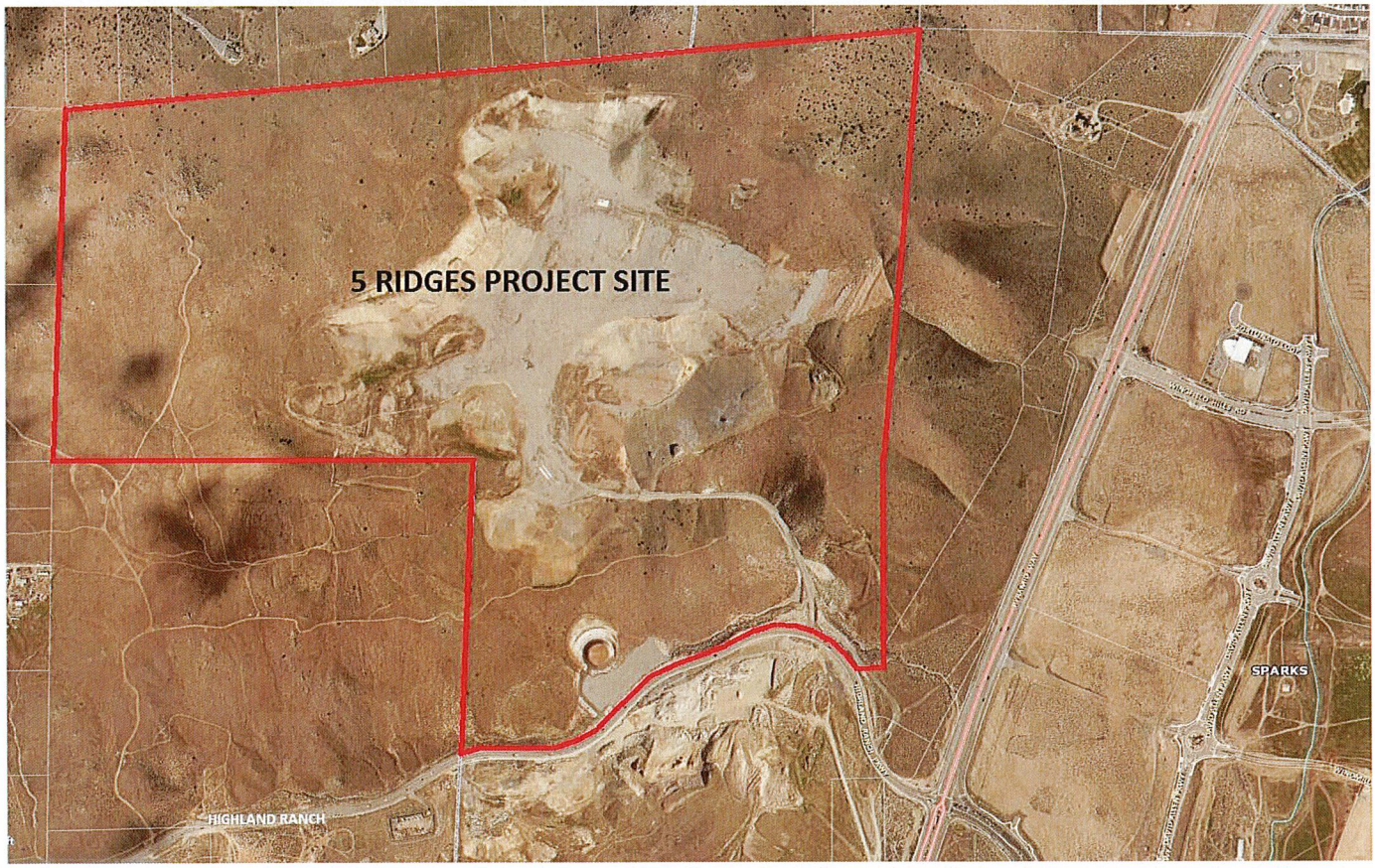
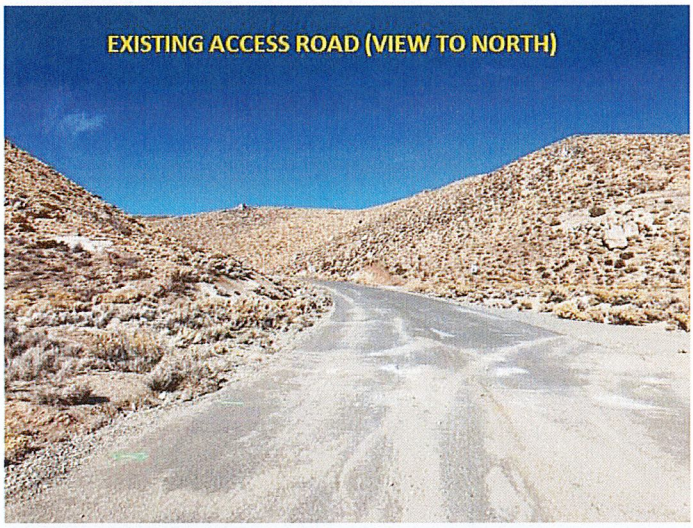


Figure 1 – Vicinity Map

Existing Conditions

The Five Ridges project site is currently vacant with the exception of an onsite Truckee Meadows Water Authority (TMWA) water tank, which is located just north of Highland Ranch Parkway at the southwest portion of the property. Five Ridges is the former site of an aggregate quarry, operations of which occurred central to the site. Due to the surrounding slopes on the property, the aggregate operation is not visible from either Highland Ranch Parkway or Pyramid Highway. The quarry area remains and is now graded flat for the most part. A paved access road connects the quarry area to Highland Ranch Parkway.

Figures 2 (below) and 3 (following page) depict the existing onsite conditions.



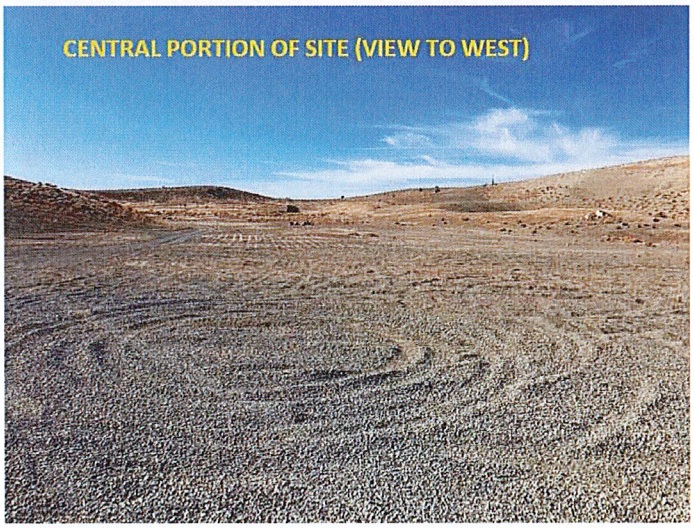


Figure 2 – Existing Conditions



Figure 3 – Existing Conditions

The majority of the Five Ridges site is designated as Intermediate Density Residential (IDR) in the City of Sparks Comprehensive Plan, with approximately 13.39± acres of Commercial land use located at the southeastern portion of the property, adjacent to Highland Ranch Parkway. Consistent with the Comprehensive Plan, site zoning is primarily SF-6 with C-2 at the southern portion of the site.

Figure 4 (below) depicts the Comprehensive Plan designations adopted for the Five Ridges site while Figure 5 (following page) depicts the existing zoning.

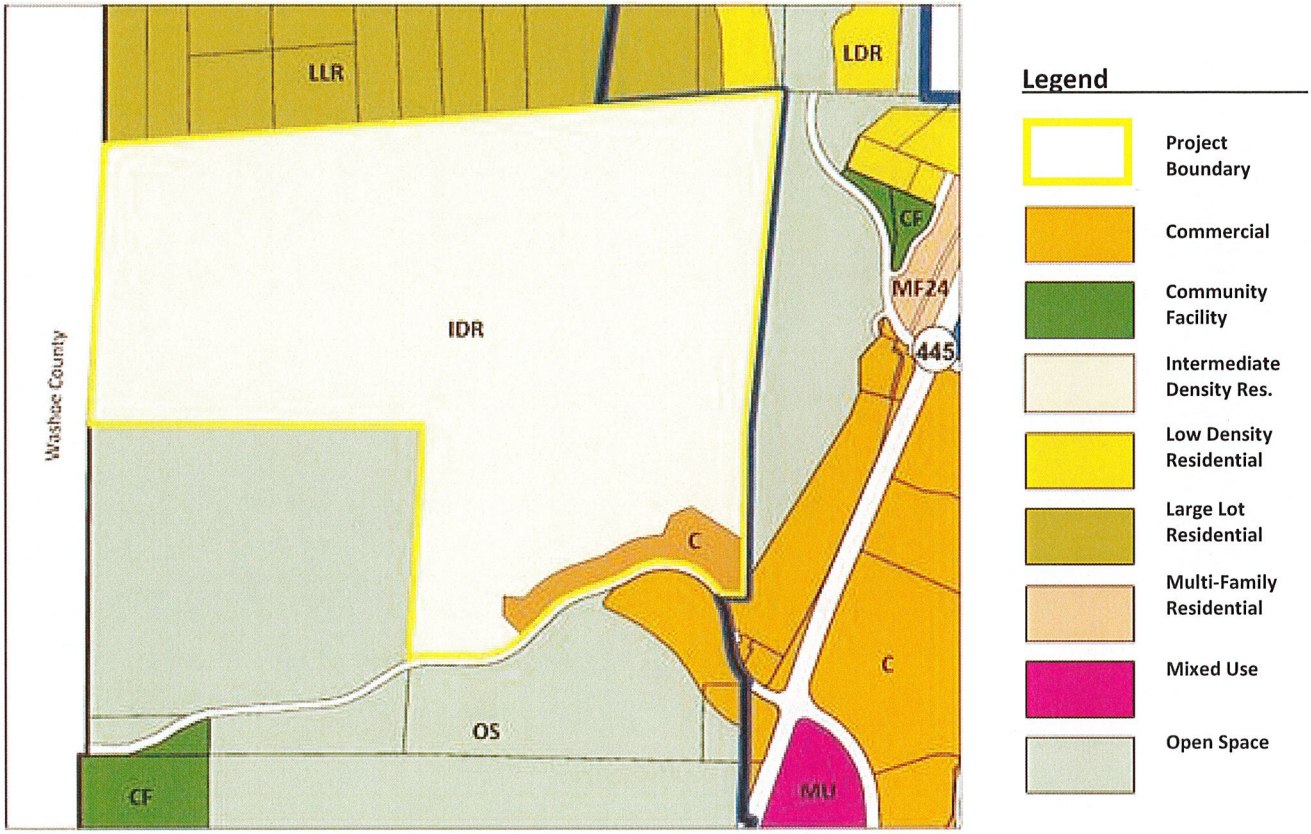


Figure 4 – Comprehensive Plan Land Use

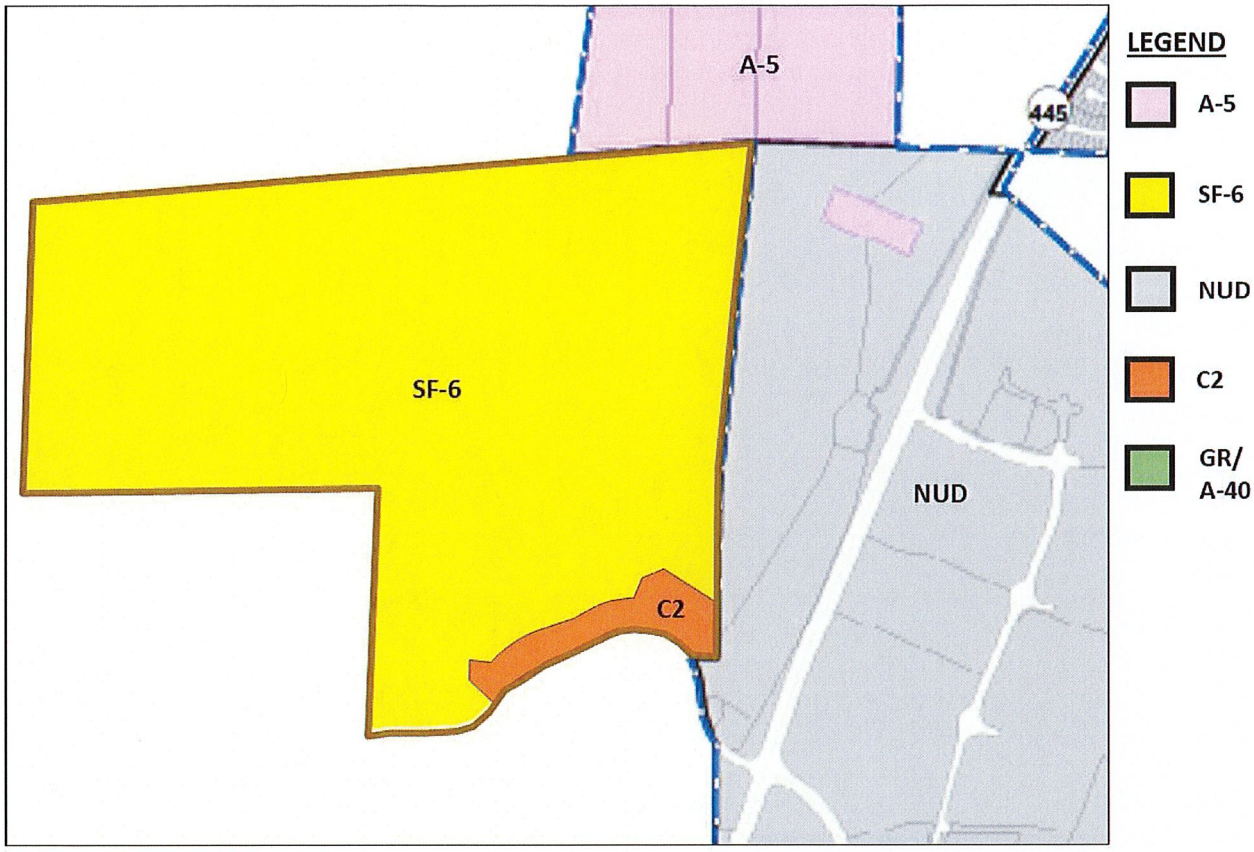


Figure 5 - Zoning

Project Background

In June of 2018, the City of Sparks entered into a Development Agreement with the Five Ridges Master Developer. The Development Agreement was the result of a lengthy and thorough entitlement process that included annexation of the property into the City of Sparks, a Comprehensive Plan Amendment, and Zone Change which established the Comprehensive Plan and zoning designations previously identified.

As part of the Development Agreement/entitlement process, an in depth traffic impact analysis was completed by Solaegui Engineers. The traffic study identified mitigation measures to the roadway network, including Highland Ranch Parkway and Pyramid Way, as well as triggers/timing for the identified improvements/mitigation. This was then formalized within the final Development Agreement.

A comprehensive fiscal impact analysis was also completed with the Comprehensive Plan Amendment that accompanied the Development Agreement. This included an in-depth analysis of the project impacts to the City's operating fund as well as contributions to the City from new development. The analysis concluded that Five Ridges would result in a fiscally positive position to the City of Sparks.

The Development Agreement establishes project density, allowed disturbance, and allowed uses within the Five Ridges site. In 2019, an update to the Development Agreement occurred which was largely "housekeeping" in nature. The update reflected ownership changes with the Master Developer, revised emergency access based on available secondary routes, clarification on allowed disturbance/hillside analysis, updated land use plan, etc.

As adopted, the Development Agreement calls for a minimum of 1,200 and a maximum of 1,800 residential units and permits single family, duplex, and/or townhome units within the SF-6 zone. For the C-2 zoned portion of the site, a variety of commercial and residential uses types are permitted, as outlined in Title 20 of the Sparks Municipal Code. Multi-family residential units are permitted in the C-2 zone but count towards the overall cap of 1,800 residential units. Minimum density within Five Ridges must be 3.1 dwelling units per acre with a maximum density of 4.6 dwelling units per acre.

Five Ridges will be phased over time in a series of Villages. As part of the Development Agreement, a conceptual land use plan was included. The latest updated plan is depicted below in Figure 6.

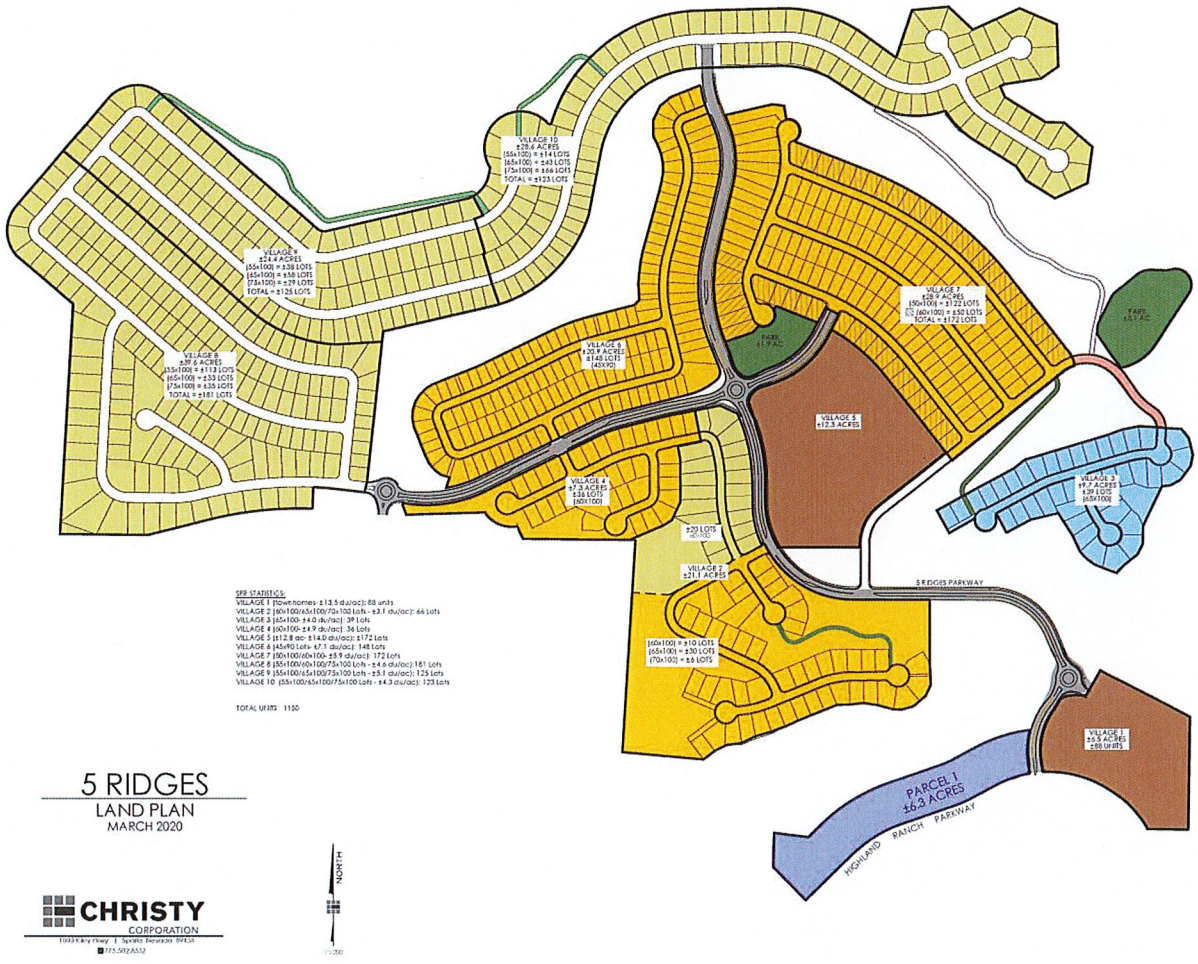


Figure 6 – Overall Conceptual Plan

As depicted in Figure 6, a total of 10 residential Villages are envisioned within Five Ridges. Additionally, the plan includes provisions for developed parks as well as significant open space. The adopted Development Agreement requires a minimum of 100 acres of open space and a maximum disturbance area of 267± acres. The disturbance area considers the City of Sparks Hillside Ordinance as well as disturbance that has occurred onsite with prior aggregate operations. Thus, the required open space and maximum disturbance area ensures compliance with City regulations related to the development of hillsides/slopes, as included within section 20.04.011 of the Sparks Municipal Code.

The Development Agreement included standards for infrastructure including roadways, drainage, sewer/water, etc. This included providing "backbone" infrastructure exhibits within the Development Agreement for which subsequent tentative maps are reviewed.

Project Request

This application includes the first tentative map for Five Ridges and includes a total of 460 single family units. The Phase 1 tentative map includes five single family Villages, as identified on the conceptual plan included within the Development Agreement. These include Villages 2, 3, 4, 6, and 7, totaling 88.3± acres. Figure 7 (following page) depicts the Villages included within this tentative map request.

The five individual Villages included with this tentative map range in size from 36 lots to 172 lots with homesites from 4,050± square feet to just over 15,000 square feet. The following table provides a breakdown on the individual Villages included within this tentative map:

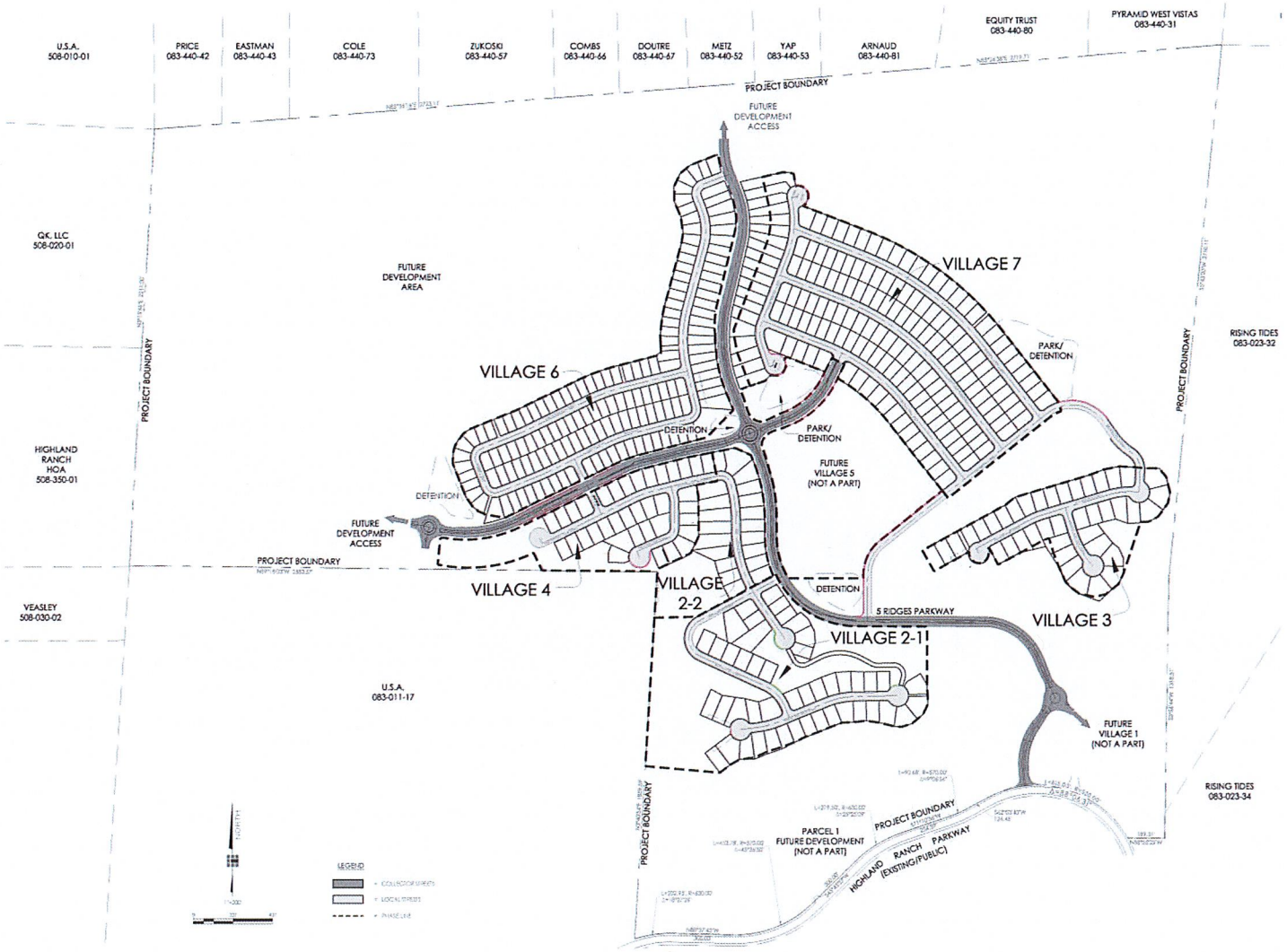
Village	Area	Total Lots	Smallest Lot	Largest Lot	Average Lot Size
Village 2	21.1± acres	66 lots	6,000± sq.ft.	15,016± sq.ft.	8,123± sq.ft.
Village 3	9.7± acres	39 lots	6,297± sq.ft.	10,651± sq.ft.	7,696± sq.ft.
Village 4	10.5± acres	36 lots	5,999± sq.ft.	9,825± sq.ft.	6,489± sq.ft.
Village 6	18.2± acres	147 lots	4,050± sq.ft.	9,418± sq.ft.	4,741± sq.ft.
Village 7	28.8± acres	172 lots	5,000± sq.ft.	14,364± sq.ft.	6,020± sq.ft.
TOTAL	**88.3± acres**	**460 lots**	-----	-----	-----

The 88.3± acres included within the five Villages includes lot and right-of-way areas only, with the exception of Villages 2 and 6 which include internal common areas. This includes 2,212± square feet of common area within Village 2 and 3,737± square feet within Village 6. Essentially, all areas outside of the 88.3± acres identified within the Village boundaries will remain as open space/common areas (exclusive of future development areas, as identified in the Development Agreement). This tentative map is also consistent with the disturbance restrictions included within the Development Agreement. The agreement allows for a total disturbance of 267 acres. Total disturbance within the tentative map area included with this application is 159.2± acres. Total disturbance areas will be updated with a subsequent tentative map(s) for the remaining Villages.

TENTATIVE MAP FOR

5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.



OVERALL SITE PLAN

SHEET 2 OF 29

Figure 7 – Tentative Map Area

As part of this first tentative map, the development of Five Ridges Parkway, the primary project access, will provide access into the project from Highland Ranch Parkway. Per the Development Agreement, Five Ridges Parkway is designed as a two-lane divided collector roadway. Three roundabouts are included within the tentative map area. The first roundabout is located at the southern portion of the site, providing access to Village 1 (future) with the second roundabout located central to the project site at the Five Ridges Parkway/Antelope Ridge Parkway intersection. This opens access to Villages 4 and 6 to the west and Villages 3 and 7 on the east. Primary access to Village 2 is directly from Five Ridges Parkway. The third roundabout is at the current terminus of Antelope Ridge Parkway on the west (to be extended with future Villages 8 and 9). A secondary emergency access extends west from this roundabout and connects with roadways that serve the existing water tank and Sun Valley to the west.

Included as an attachment to this report are detailed engineering studies and plans that provide specifics on site infrastructure, extension of utilities and services to the site, etc. This includes a preliminary sewer repot, preliminary geotechnical report, and a comprehensive drainage/hydrology report. All infrastructure and services have been designed to consistent with the requirements and exhibits of the adopted Development Agreement.

Areas outside individual lots and public right-of-way disturbed as a result of project grading will be revegetated to ensure proper slope stabilization and reduce visual impacts. Revegetation areas are included on the attached preliminary landscape plan and will be consistent with City of Sparks standards.

As noted previously, a comprehensive traffic impact analysis for the entire Five Ridges project (including all Villages) has previously been completed. Mitigation measures and improvement triggers identified in this analysis were adopted as provisions of the Development Agreement. The Villages within this first tentative map are consistent with the traffic mitigation/improvement requirements spelled out in the Development Agreement. Utilizing Institute of Transportation Engineers (ITE) trip generation data, the total average daily trips (ADT) for Phase 1 is 4,379 with 345 am peak and 460 pm peak trips.

Five Ridges is proposing the use of "dark skies" standards in order to cut down on ambient lighting within the project, protecting views of the night sky. This has been implemented successfully in other large scale master-planned communities with similar characteristics to Five Ridges, including Somersett in northwest Reno. Street lighting will be provided at major intersections to ensure pedestrian and vehicle safety but will be minimized within neighborhoods.

Conditional Use Permit

Section 3.3(a) of the approved Development Agreement requires that the Master Developer obtain a Conditional Use Permit "prior to any clearing, grading, or other disturbance of the soils on the property and prior to the approval of a tentative map as required by Sparks Municipal Code Section 20.04.011."

Significant analysis related to slopes and hillsides was completed in context with Section 20.04.011, as part of the Development Agreement process. A slope analysis of the entire 386.87± acre site was completed and reviewed in context with the allowed disturbance standards included in Section 20.04.011(c). Based on this analysis and considering previous disturbance associated with prior mining activities, the Development Agreement limits the overall disturbance within 5 Ridges to 267 acres and requires that a minimum of 100 acres be retained as open space within the overall project boundaries.

The Development Agreement includes a slope analysis exhibit that defines the previously disturbed site area that is not subject to the provisions of Section 20.04.011. Thus, Figure 8 (below) provides an overlay of the tentative map area onto the Development Agreement exhibit. This allows for the new disturbance areas to be analyzed in context with Section 20.04.011.

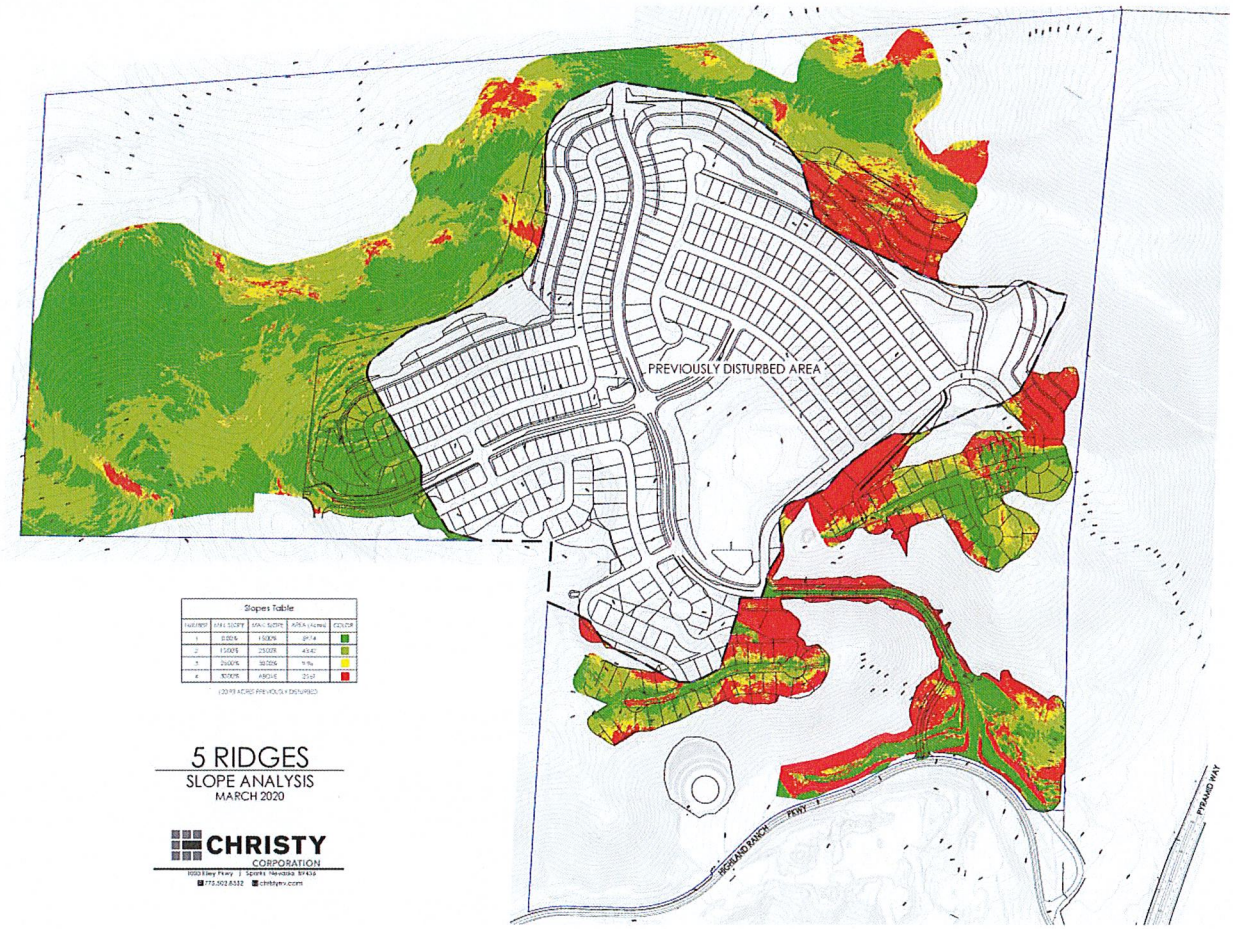


Figure 8 – Slope Analysis

It important to note that the analysis depicted in Figure 8 extends beyond the Village boundaries. Since mass grading of the site will occur, the analysis accounts for all areas proposed for disturbance, even those beyond the tentative map boundary, that will be disturbed in order to implement the proposed grading for Villages 2, 3, 4, 6, and 7. This eliminates the need for an additional CUP with mass grading of the site. A new/updated CUP will be submitted concurrently with future phases to ensure compliance with the Development Agreement is maintained as each future Village is approved, providing the City of Sparks with a "running total" of total disturbed area and open space.

The following table depicts the total disturbance proposed with this CUP and excludes the previously disturbed site area, as outlined in the Development Agreement.

Slopes Table				
NUMBER	MIN. SLOPE	MAX. SLOPE	AREA (Acres)	COLOR
1	0.00%	15.00%	59.14	
2	15.00%	25.00%	43.42	
3	25.00%	30.00%	9.96	
4	30.00%	ABOVE	25.61	

120.93 ACRES PREVIOUSLY DISTURBED

There is a total of 138.13± acres of disturbed area proposed outside of the previously disturbed area (as defined in the Development Agreement). Of this, 43% is area less than 15% slope. Areas in excess if 30% make up approximately 19% of the total disturbed area (25.61± acres), requiring the dedication of 51.22± acres of open space per Section 20.04.011(c).

As the tables and calculations illustrate, the proposed tentative map, including areas outside of the tentative map boundary that will be mass graded, are well within the allowed disturbance area of 267 acres. With this tentative map, a total of 227.67± acres will remain as open space/undeveloped area. This complies with the 100-acre minimum defined in the Development Agreement and includes the 51.22 acres required per Section 20.04.011(c) based on disturbance to 30% or greater slopes. The Development Agreement does not preclude this area from being included within the required 100 acre minimum open space minimum. These calculations will be updated with each tentative map request in order to demonstrate compliance with the Development Agreement.

Request Findings

- **Tentative Map**

The City of Sparks Municipal Code includes findings that the Planning Commission and City Council must make in order to approve a tentative subdivision map. These findings are listed below and addressed in **bold face** type.

FINDING TM1: The request conforms to the Master Plan and zoning ordinances.

The tentative map, as designed, is in direct compliance with the existing Intermediate Density Residential land use designation in the City of Sparks Comprehensive Plan. The existing SF-6 zoning allows for the lot sizes proposed (with small lot standards applied) and the proposed plan conforms to the provisions and requirements of the adopted Development Agreement.

FINDING TM2: General conformity with the City's master plan of streets and highways has been considered.

Roadways within the project boundary conform with the standards adopted in the Five Ridges Development Agreement. Additionally, the project plan conforms with the applicable traffic mitigation requirements adopted with the Development Agreement based on the comprehensive study completed by Solaegui Engineers.

FINDING TM3: Environmental and health laws and regulations concerning water and air pollution, the disposal of solid waste, facilities to supply water, community or public sewage disposal and, where applicable, individual systems for sewage disposal were considered.

The tentative map, as proposed, complies with all regulations and standards specified in the Development Agreement and Sparks Municipal Code, as well as applicable State and County regulations/requirements.

FINDING TM4: The availability of water which meets applicable health standards and is sufficient in quantity for the reasonably foreseeable needs of the subdivision has been considered.

Water will be provided through the Truckee Meadows Water Authority. All necessary water rights needed to serve the project are in place or will be dedicated with final map.

FINDING TM5: The availability and accessibility of utilities has been considered.

All necessary utilities needed to serve the project will be extended to serve the proposed units. The attached engineering plans provide detail on utility extensions, etc.

FINDING TM6: The availability and accessibility of public services such as schools, police protection, transportation, recreation and parks has been considered.

As part of the Development Agreement process, all public service considerations were accounted for. The tentative map includes provisions for pedestrian access, open space, future parks, etc. as well as for access to municipal facilities.

FINDING TM7: The effect of the proposed subdivision on existing public streets and the need for new streets or highways to serve the subdivision has been considered.

The proposed tentative map conforms with the traffic mitigation requirements of the Development Agreement which were developed based on a comprehensive traffic impact analysis completed for the Five Ridges project as a whole.

FINDING TM8: The physical characteristics of the land such as flood plain, slope and soil has been considered.

The project site is well suited to the type and intensity of development proposed. Proposed grading is consistent with the Development Agreement, City of Sparks standards, and onsite soil conditions. Lost are located in areas most suitable for development and disturbed areas will be revegetated per City standards.

FINDING TM9: The recommendations and comments of those entities reviewing the tentative map pursuant to NRS 278.330 to 278.348, inclusive, have been considered.

Comments and conditions from reviewing agencies can be added as final conditions to this tentative map and incorporated into final design of the project.

FINDING TM10: The availability and accessibility of fire protection, including, but not limited to, the availability and accessibility of water and services for the prevention and containment of fires, including fires in wild lands has been considered.

The tentative map meets the requirements of the Development Agreement by providing emergency "bump outs" along Five Ridges Parkway, as well as secondary emergency access to the west. Additionally, fire hydrants will be located per City of Sparks standards and new homes will include fire sprinklers per the adopted Development Agreement.

FINDING TM11: The application, as submitted and conditioned, will address identified impacts.

The project meets or exceeds all standards and requirements of the adopted Five Ridges Development Agreement. As part of the Development Agreement process, a comprehensive impact analysis was completed. Mitigation measures for project impacts were adopted within the agreement and have been incorporated into the project design.

FINDING TM12: Public notice was given and a public hearing held per the requirements of the Sparks Municipal Code and Nevada Revised Statutes.

This tentative map will be reviewed at a public hearing(s), ensuring compliance with this finding.

- **Conditional Use Permit**

Like the previous Tentative Map findings, Conditional Use Permit findings taken from Section 20.05.008(E) of the Sparks Municipal Code are listed below and addressed in **bold face** type.

1. The approving agency must make findings that the proposed conditional use will be in compliance with the Comprehensive Plan;

The project, including densities proposed are in direct compliance with the existing IDR Comprehensive Plan designation as well as the SF-6 zoning. Furthermore, the proposed units, open space, and overall project disturbance complies with the provisions outlined in the adopted Development Agreement.

2. The conditional use will be compatible with the existing or permitted uses of adjacent properties;

The CUP requested ensures compliance with Section 20.04.011. Through the preservation of open space, revegetation of disturbed areas, and new landscaping, proper transitions between developed areas and surrounding uses will occur.

3. The potential impairment of natural resources and the total population which the available natural resources will support without unreasonable impairment;

This proposed project plan will not result in the impairment of natural resources that are beneficial to the population. Areas of disturbance on slopes greater than 30% have been offset with the provision of open space per Code and Development Agreement standards.

4. The Conditional Use Permits impacts have been conditioned to address identified impacts; and

The purpose of Section 20.04.011 is to ensure that impacts related to grading in areas of steeper slopes are properly mitigated. As proposed, 5 Ridges is in full compliance with City code and policies, as well as the adopted Development Agreement.

5. Public notice has been given and a public hearing held per the requirements of the Sparks Municipal Code and the Nevada Revised Statutes.

As part of this Conditional Use Permit review, a noticed public hearing before the Sparks Planning Commission will occur, ensuring compliance with this finding.

APPENDICES

DEVELOPMENT APPLICATION

ACTION REQUESTED:

___ Administrative Review
___ Administrative Review MME
___ Annexation
___ Conditional Use Permit
___ Comprehensive Plan Amendment
___ Major Deviation
___ Minor Deviation
___ Planned Development
___ Rezoning

City of Sparks

X Tentative Subdivision Map
___ Variance

CASE NUMBER:	FEE:
_____	$_____
Noticing Fee	$_____
District Health Fee	$_____
TOTAL FEES	$_____

Rec'd by: _____ Date: _____
(For Planning Department Use Only)

DATE: December 23, 2019

PROJECT NAME: Five Ridges

PROJECT DESCRIPTION: A tentative subdivision map to create 465 single family lots within 5 Villages.

(Mark one box to indicate responsible party and mailing address)

☐ **PROPERTY OWNER***

Name: QK, LLC

Address: 4785 Caughlin Pkwy.

City Reno State NV ZipCode 89519

Phone: (775) 323-1405 Fax: _____

Contact Person: Blake Smith

E-mail Address: blake@s3devco.com

☐ **APPLICANT***

Name: 5 Ridges Development Co., Inc.

Address: 1 E. Liberty St., Suite 444

City Reno State NV ZipCode 89501

Phone: (775) 323-1405 Fax: _____

Contact Person: Blake Smith

E-mail Address: blake@s3devco.com

☐ **PERSON / FIRM PREPARING PLANS**

Name: Christy Corporation, Ltd.

Address: 1000 Kiley Parkway

City Sparks State NV ZipCode 89436

Phone: (775) 502-8552 Fax: _____

Contact Person: Doug Buck, P.E./Mike Railey

E-mail Address: doug@christynv.com/mike@christynv.com

PROJECT ADDRESS:

555 Highland Ranch Parkway

PARCEL NO. (APN): 083-011-15

PROPERTY SIZE: 386.87 acres

EXISTING ZONING: SF-6 and C-2

PROPOSED ZONING: SF-6 and C-2

MASTER PLANNED LAND USE: Intermediate Density Residential

EXISTING USE: Vacant (with exception of a TMWA water tank)

SURROUNDING USES:

North Single Family

East Kiley Ranch North Planned Development (currently vacant)

South Vacant

West Single Family

If a corporation please attach a list of corporate officers.

If a partnership please list all general partners.

NOTE: Affidavits must be signed by both the property owner and the developer/lessee and notarized before the application is submitted.

TENTATIVE MAP
APPLICATION CHECKLIST
City of Sparks, Nevada

The following items shall be submitted as a part of the Tentative Map application:

☒ 1. **Health Department, Division of Water Resources, and Division of Environmental Protection Application Fees:** Additional fees are assessed by the District Health Department, Division of Water Resources, and Division of Environmental Protection for review of your application. Please include separate checks and/or money orders payable to each of the separate entities with your application. See **FEE SCHEDULE** for correct amount. **Please note that District Health fees are payable to the "City of Sparks" and can be added to the application fees and paid by one check.**

☒ 2. **Application Fee:** A check or money order payable to the "City of Sparks" for the application fee. **The application fee is due at the time of the application submittal.** See **FEE SCHEDULE** for correct amount.

☒ 4. **Proof of Ownership:** If the person signing the owner's affidavit is not listed as the property owner in the most recent records of the Washoe County Assessor, proof of ownership acceptable to the administrator must be submitted with the application. If the signer is an agent of the owner, written documentation of that fact acceptable to the administrator must be submitted. If in Corporate ownership, a list of all Corporate Officers must be provided.

N/A☐ 5. **Traffic Study:** Four (4) copies of a complete traffic study as required by the City Engineer.

☒ 6. **Review Packets:** Fifteen (15), each containing the following:

- ☒ a. Completed Development Application form
- ☒ b. Completed Residential or Non-Residential Project Data Sheet
- ☒ c. A Tentative Subdivision Map prepared to the attached specifications
- ☒ d. **If drawings larger than 8½" x 11" are included with the application, one 8½" x 11" or 11" x 17" MUST be provided.**
- ☒ e. Vicinity Map depicting the respective site and including surrounding roadways.
- ☒ f. A letter of approval from the Regional Street Naming Committee listing all street names shown on the Tentative Map
- ☒ g. A copy of a preliminary Title Report, prepared within 30 days of application submittal, which includes the names and addresses of all property owners; a legal description of the property, and a description of all liens, easements, and deed restrictions.
- ☒ h. A preliminary hydrology and drainage report prepared by a Nevada registered Civil Engineer, addressing the 5-year and 100-year return frequency storms and the 5-year and 100-year flows entering and leaving the site.
- ☒ i. A preliminary sewer report prepared by a Nevada registered Civil Engineer.
- ☒ j. Demonstrate that city services can be provided at an acceptable service level.
- ☐ k. Is the project site 20 or more acres in size?
  - ☐ No
  - ☒ Yes, all 20 or more acre development projects must demonstrate the project is fiscally positive to the city for a period of at least 20 years. Previously provided and accepted,
- ☒ l. Proof of property tax payment.
- ☒ m. One packet containing the original signed owners affidavit shall be provided and shall be clearly labeled "Community Services Department Original"

NOTE: ▫ **The Community Services Department may request that additional application materials be submitted depending on the specific project request. The application materials required above shall serve as the minimum requirements necessary to make application submittal to the Community Services Department.**

DEAR APPLICANT:

THE CITY OF SPARKS APPLICATION PROCESS REQUIRES THAT THE PROPERTY OWNER AUTHORIZE THE APPLICANT TO REQUEST DEVELOPMENT RELATED APPLICATIONS. DEVELOPMENT APPROVALS REMAIN WITH THE LAND; THEREFORE, THE PROPERTY OWNER IS ALWAYS RESPONSIBLE FOR ANY ACTIVITY ON THE PROPERTY.

OWNER AFFIDAVIT

STATE OF NEVADA)
) SS.
COUNTY OF WASHOE)

I, G. Blake Smith being duly sworn, depose and say that I am an owner of property/authorized agent involved in this petition and that I authorize Christy Coporation to request development related applications on my property. I also give permission for site visitation by the Planning Commission, City Council and City Staff.

Name: G. Blake Smith

Title: Manager

Signed

Subscribed and sworn to before me this 14th Day of November, 2019.

Crystal M. grayot
Notary Public in and for said County and State

CRYSTAL M. GRAYOT
NOTARY PUBLIC, STATE OF NEVADA
My Commission Expires: 01-14-2023
Certificate No: 15-2261-2

My commission expires: January 14, 2023

APPLICANT AFFIDAVIT

STATE OF NEVADA)
) SS.
COUNTY OF WASHOE)

I, G. Blake Smith being duly sworn, depose and say that I am the applicant involved in this petition 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 also give permission for site visitation by the Planning Commission, City Council and City Staff.

Name: G. Blake Smith

Title: Manager

Signed:

Subscribed and sworn to before me this 14th Day of November, 2019.

Crystal M. grayot
Notary Public in and for said County and State

CRYSTAL M. GRAYOT
NOTARY PUBLIC, STATE OF NEVADA
My Commission Expires: 01-14-2023
Certificate No: 15-2261-2

My commission expires: January 14, 2023

DEAR APPLICANT:

THE CITY OF SPARKS APPLICATION PROCESS REQUIRES THAT THE PROPERTY OWNER AUTHORIZE THE APPLICANT TO REQUEST DEVELOPMENT RELATED APPLICATIONS. DEVELOPMENT APPROVALS REMAIN WITH THE LAND; THEREFORE, THE PROPERTY OWNER IS ALWAYS RESPONSIBLE FOR ANY ACTIVITY ON THE PROPERTY.

OWNER AFFIDAVIT

STATE OF NEVADA)
) SS.
COUNTY OF WASHOE)

I, Scott Christy being duly sworn, depose and say that I am an owner of property/authorized agent involved in this petition and that I authorize Christy Corporation to request development related applications on my property. I also give permission for site visitation by the Planning Commission, City Council and City Staff.

Name: Scott Christy

Title: Manager

Signed

Subscribed and sworn to before me this 23 Day of Dec, 2019.

Notary Public in and for said County and State

My commission expires: Aug 8, 2020

TONYA CATE
Notary Public - State of Nevada
Appointment Recorded in Washoe County
No: 04-89954-2 - Expires August 8, 2020

APPLICANT AFFIDAVIT

STATE OF NEVADA)
) SS.
COUNTY OF WASHOE)

I, _____ being duly sworn, depose and say that I am the applicant involved in this petition 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 also give permission for site visitation by the Planning Commission, City Council and City Staff.

Name: _____

Title: _____

Signed: _____

Subscribed and sworn to before me this _____ Day of _____, 20_____.

Notary Public in and for said County and State

My commission expires: _____

ENTITY INFORMATION

ENTITY INFORMATION

Entity Name:

QK, LLC

Entity Number:

E0262562016-4

Entity Type:

Domestic Limited-Liability Company (86)

Entity Status:

Active

Formation Date:

06/10/2016

NV Business ID:

NV20161342550

Termination Date:

Perpetual

Annual Report Due Date:

6/30/2020

Series LLC:

Restricted LLC:

REGISTERED AGENT INFORMATION

Name of Individual or Legal Entity:

SIERRA CORPORATE SERVICES - RENO

Status:

Active

CRA Agent Entity Type:

Registered Agent Type:

Commercial Registered Agent

NV Business ID:

Office or Position:

Jurisdiction:

NEVADA

Street Address:

100 WEST LIBERTY STREET 10TH FLOOR, Reno, NV, 89501, USA

Email Address:

smelendez@mcdonaldcarano.com

Mailing Address:

Individual with Authority to Act:

Contact Phone Number:

Fictitious Website or Domain Name:

PRINCIPAL OFFICE ADDRESS

Address:

Mailing Address:

OFFICER INFORMATION

☐ VIEW HISTORICAL DATA

Title	Name	Address	Last Updated	Status
Manager	SCOTT CHRISTY	5760 NORDEND WAY, RENO, NV, 89511, USA	06/18/2019	Active

Page 1 of 1, records 1 to 1 of 1

Filing History Name History Mergers/Conversions

Return to Search Return to Results

TENTATIVE MAP
RESIDENTIAL PROJECT DATA SHEET
City of Sparks, Nevada

1. Number of Dwelling Units
Single Family Detached 460
Duplexes _____
Multi-Family Attached _____

2. Site Area Breakdown

Lots or Buildings	64.77 Ac.	17 %
Public Right-of-Way	25.87 Ac.	6.7 %
Common Area	TBD* Ac.	TBD* %
TOTAL	386.87 Ac.	100 %

*To be determined with future Villages. Must comply with Development Agreement and Sparks Municipal Code requirements.

3. Gross Density

460 / 386.87 = 1.19 (excludes future Villages)
Total # of Dwellings | Total Area | Gross Density in Acres (DU/AC)

4. Schools Serving Project
Elementary School Sepulveda
Middle School Shaw
High School Spanish Springs

5. Estimated Sewage to be Generated

414,000 GPD
(Attach Calculations)

6. Traffic
Average Daily Trips 4,379 Trips
Peak Hour Trips 345/460 Trips
(Attach Calculations)

7. Flood Hazard
Portion of site subject to inundation
By 100 year flood:

0 Ac. 0 %

8. Estimated Water Demand (Attach Calculations)
Domestic 149.1 AFY
Irrigation 6.48 AFY
TOTAL 155.58 AFY
Source of water supply: SVGID

9. Lot Sizes
4,050 Sq. Ft. minimum (corner)
4,000 Sq. Ft. minimum (interior)
15,016 Sq. Ft. maximum
6,092 Sq. Ft. average

10. Minimum Building Setbacks
15 Feet (Front Property Line to Dwelling)
20 Feet (Front Property Line to Garage)
10 Feet (Exterior Side Property Line to Dwelling)
5 Feet (Interior Side Property Line to Dwelling)
20 Feet (Rear Property Line to Dwelling)

11. Portion of Site within the Following Slope Categories:
0% - 10% 80.84 Ac. 21 %
10% + 306 Ac. 79 %

12. Unit Sizes To be determined.
_____ Sq. Ft. _____ Bedrooms
_____ Sq. Ft. _____ Bedrooms

13. Maximum Building Height
35 Feet 2 Stories

14. Coverage of Lot by Structure
Maximum 50 %

15. Single Family & Two-Family Parking
SF detached ____ x 1 per bedrm = ____
2 dwelling (duplex) ____ x 1 per bedrm = ____
To be determined.

16. Multi-Family Parking Not applicable.
Multi-Family ____ x 1 per dwelling unit = ____
Live/work ____ x 1 per dwelling unit = ____
Boarding/rooming house ____ x 0.5 per bdrm = ____
Group home ____ square footage / 400 sf = ____

17. Life Care Housing
_____ square footage / 400 sf = _____
Not applicable.

Data Sheet Calculations

Traffic:

ITE Trip Generation Manual (Land Use Code 210 – Single Family Homes)

ADT = 9.52 trips per unit x 460 units = 4,379 ADT

AM Peak = 0.75 trips per unit x 460 units = 345 trips

PM Peak = 1.00 trips per unit x 460 units = 460 trips.

Water Demand:

422± lots x 0.32 AF/lot = 135.04 AF

38± lots x0.37 AF/lot = 14.06 AF

Landscape/Common Area (estimated at 1.9 acres) = 6.48 AF

Sewer Generation:

460 units x 300 gal/unit/day x 3 occupancy = 414,000 gpd = 0.4140414, peak flow (MGD)

Reserved Street Name Recipients:

These street name(s) have been **accepted** and reserved into the Washoe County Master Street Directory Reservation table:

City of Sparks: APN 083-011-15

Reservations

Date Submitted	Fullname	Description
12/4/2019	ADEN RIDGE	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	ANNAMITE	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	ANTELOPE RIDGE	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	ARAKAN	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	BALE MOUNTAIN	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	BALKAN MOUNTAIN	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	BEARTOOTH PEAK	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	BEN NEVIS	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	BIGHORN PEAK	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	BOBCAT RIDGE	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	CAPITOL PEAK	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	CASCADE RANGE	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	DALTON PEAK	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	DRAKENSBERG	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	DURANGO RIDGE	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	EAGLE POINT	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	ELK MOUNTAIN	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	EQUINOX PEAK	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	FANSIPAN	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	FIVE RIDGES	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	GOAT PEAK	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	GOLIS MOUNTAIN	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	GORE POINT	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	GRAPEVINE PEAK	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	GRIZZLY PEAK	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	GYDAN	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	HORSE RIDGE	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	KILIMANJARO	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	KINSMAN PEAK	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	LOOKOUT POINT	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	MAROON PEAK	5 Ridges (Christy Corporation - Steve Maynard)

Reservations

Date Submitted	Fullname	Description
12/4/2019	MOUNT CAMEROON	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	MOUNT CHURCHILL	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	MOUNT HAGGIN	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	MOUNT HUBBARD	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	MOUNT NIMBA	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	MOUNT TAYLOR	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	MOUNT THOR	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	MOUNT WILSON	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	PAMIR	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	PARKER PEAK	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	PILGRIM PEAK	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	PILOT PEAK	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	QUEEN PEAK	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	QUIGG PEAK	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	RAINY RIDGE	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	REVEILLE PEAK	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	RONDANE	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	SALT RIDGE	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	SAWTOOTH PEAK	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	SIERRA BLANCA	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	SMILEY MOUNTAIN	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	SNAKE RIDGE	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	SNOWDON RAZOR	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	SODA MOUNTAIN	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	SPEARHEAD PEAK	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	SPLIT RIDGE	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	SUNLIGHT PEAK	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	TROUT PEAK	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	TURRET PEAK	5 Ridges (Christy Corporation - Steve Maynard)
12/4/2019	VALHALLA RIDGE	5 Ridges (Christy Corporation - Steve Maynard)

**Note: Washoe County GIS reserves the right to rescind any reserved street name before recordation, in accordance with public safety concerns.

**Note: A street name reservation is valid for one year after it is ACCEPTED. If the name does not appear on a recorded document within one year of acceptance, then there is no obligation to honor the reservation. Notify GIS for renewal.

Attention: All future street name requests:

1. Download the form from: https://www.washoecounty.us/csd/engineering_capitalprojects/files-engineering-capital-projects/mapping_streets_roads/New%20street_reservation.pdf
2. Fill out *Request to Reserve New Street Name(s).* Do NOT include USPS suffix types (e.g. AVE, ST, RD, CT, DR, LN, WAY, CIR, PL, TRL, etc.); that comes later.
3. Do not embedded a suffix into the root street name (e.g. CANYON TRAIL DR, KING COURT DR, RYAN ROAD ST, etc)
4. No more than 14 letters, 15 if there is an "i" in the name (spaces count as a character).
5. Special characters are NOT allowed (', ", `, ~, /, \, -, *, #, &, @, %, +).
6. Abbreviations for MOUNT (MT) and SAINT (ST) are NOT allowed.
7. E-mail form to: StreetNames@Washoecounty.us Do NOT fax or e-mail a photo-copy.

For the purposes of Emergency Management, street names will **reject** if the street name already exists or sounds similar, phonetically, to an existing street name. For street names that already exist or reserved in the Washoe County Master Street Directory click:
https://www.washoecounty.us/csd/engineering_capitalprojects/street_directory_naming.php

1. Existing streets: Click 11X17 Regional Street Directory
2. Reserved streets: Click Reservation Street Name Listing

Bradley Kaneyuki
GIS | Tech Services
bkaneyuki@washoecounty.us | Office: 775.328.2344 | Fax: 775.328.6133
1001 E 9th St, Reno, NV 89512

Washoe County Treasurer
Tammi Davis

Account Detail

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

CollectionCart

Collection Cart	Items	Total	Checkout	View
	0	$0.00		

Pay Online

This item has been paid.

Washoe County Parcel Information

Parcel ID	Status	Last Update
08301115	Active	12/23/2019 2:10:53 AM

Current Owner:
QK LLC

1 E LIBERTY ST STE 444
RENO, NV 89501

SITUS:
555 HIGHLAND RANCH PKWY
SPARKS NV

Taxing District
2000

Geo CD:

Legal Description

Township 20 Section 9 Lot Block Range 20 SubdivisionName _UNSPECIFIED

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	$12,733.90	$6,490.39	$0.00	$0.00	$6,366.88
2018	$379.14	$379.14	$0.00	$0.00	$0.00
2018	$11,771.69	$11,771.69	$0.00	$0.00	$0.00
2017	$9,652.54	$9,652.54	$0.00	$0.00	$0.00
2016	$9,652.40	$9,652.40	$0.00	$0.00	$0.00
2015	$9,652.25	$9,652.25	$0.00	$0.00	$0.00
				Total	$6,366.88

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
Tammi Davis

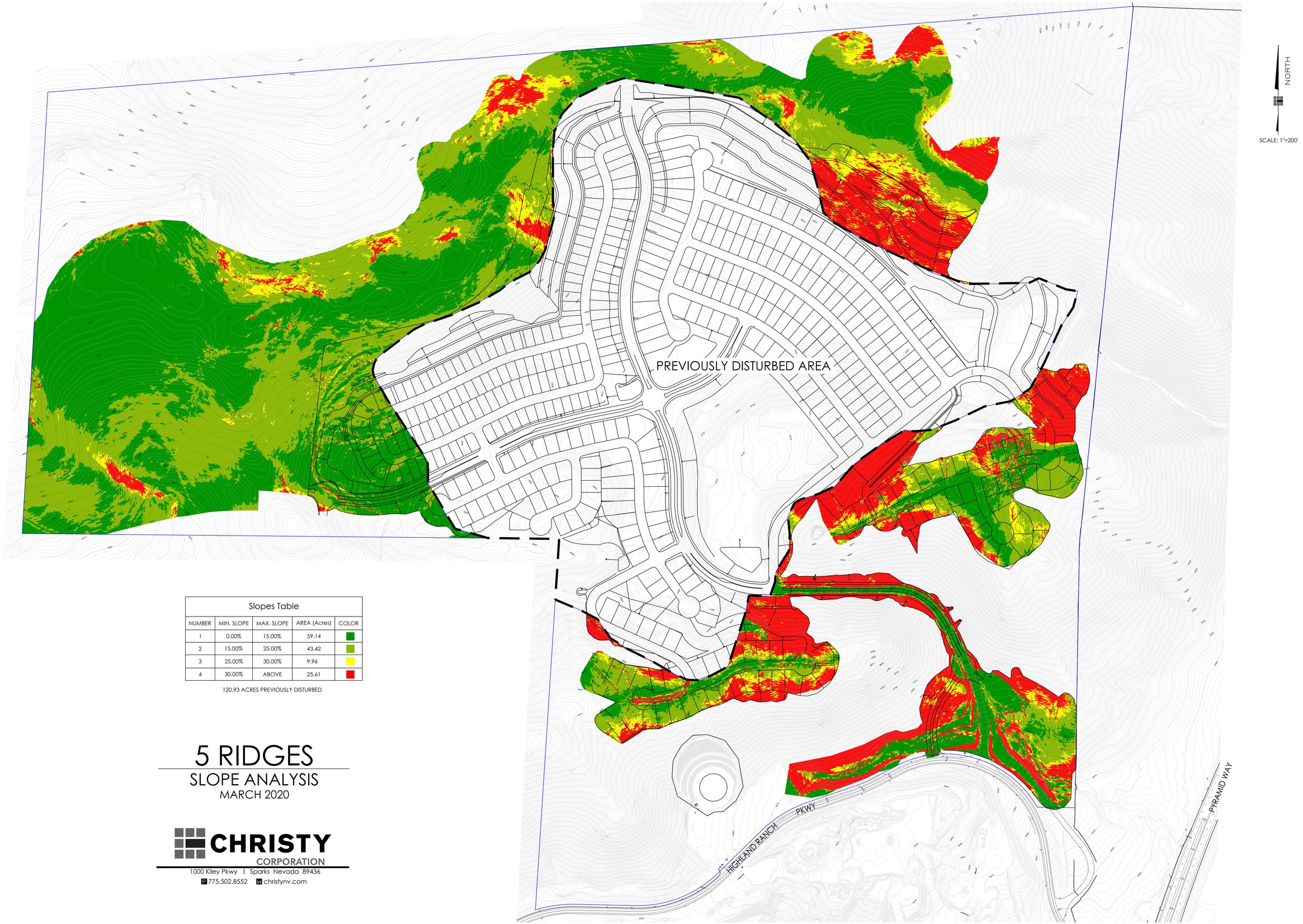
Washoe County Treasurer
P.O. Box 30039, Reno, NV 89520-3039
ph: (775) 328-2510 fax: (775) 328-2500
Email: tax@washoecounty.us

CollectionReceipt

Checkout Receipt		
Date:	12/23/2019 10:16:54 AM	
Approval:	28307374	
Account:	*****5271	
Payment Type:	eCheck	
Description		Amount Paid
Tax Payment - 08301115		$6,366.88
		$6,366.88
Service Fee		$0.00
Total Paid		$6,366.88

NOTE: To print a copy of this receipt, please right-click anywhere on this webpage and select Print from the pull-down menu.

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Slopes Table				
NUMBER	MIN. SLOPE	MAX. SLOPE	AREA (Acres)	COLOR
1	0.00%	15.00%	59.14	
2	15.00%	25.00%	43.42	
3	25.00%	30.00%	9.96	
4	30.00%	ABOVE	25.61	

120.93 ACRES PREVIOUSLY DISTURBED

5 RIDGES

SLOPE ANALYSIS

MARCH 2020

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

CHRISTY CORPORATION

MEMO

Date: March 27, 2020

To: Ian Crittenden/Armando Ornelas

From: Mike Railey

Regarding: 5 Ridges Supplemental Slope/Hillside Analysis

As discussed, the purpose of this memo is to present the slope analysis data associated with the 5 Ridges Conditional Use Permit request in a more clear and concise format. The following table provides an overall breakdown of the slopes within the project site and the disturbance being proposed with the CUP:

Total Site Allowed Disturbance (excluding areas disturbed by aggregate operations)

SLOPE CATEGORY	AREA	MAX. DISTURBED AREA	ALLOWED DISTURBANCE	PROPOSED WITH CUP	% OF DISTURBANCE
0-15%	80.84± acres	Unlimited	80.84± acres	59.14± acres	73%
15-25%	76.67± acres	3/4 of Category	57.50± acres	43.42± acres	57%
25-30%	21.80± acres	1/3 of Category	7.27± acres	9.96± acres	46%
30% +	86.63± acres	----[1]	----	25.61± acres[1]	30%
Area Not Subject to Ordinance	120.93± acres[2]	Unlimited	120.93± acres	N/A	N/A
TOTAL	**386.87± acres**	**----**	**266.54± acres**	**138.13± acres**	**----**

1 – When developing on natural slopes over 30%, project design shall be enhanced to create a 2:1 ratio of non-constrained area being preserved as open space for every portion of area with slopes over 30% that is developed.

2 – Consists of man-made topographic conditions resulting from previous aggregate mining operations.

Overall allowed site disturbance is 267 acres per the approved Development Agreement. The area of total disturbance proposed with the CUP is 259.06± acres (assumes all 120.93 acres within previous disturbance area + 138.13 acres outside of the previous disturbance area). As a result, the disturbance proposed is in compliance with both the Development Agreement and Section 20.04.011 standards. The total disturbed area is an aggregate calculation. Thus, it is possible to disturb more area within a given category as long as it is offset within another (excluding 30% slope areas which require open space provisions).

Section 20.04.011(c) requires that open space be provided in a 2:1 ratio for ant slopes over 30% that are disturbed. A total of 25.61± acres are proposed for disturbance, resulting in an open space requirement of 51.22 acres of open space. As proposed with the submitted tentative map, total open space/undeveloped area equals 227.67± acres. The Development Agreement requires that 100 acres of open space be provided which may include 30% slope penalty areas. Thus, the CUP proposal is well within compliance of the Development Agreement and code requirements, allowing for additional disturbance with future phases.

Additionally, staff has requested additional analysis on how the 5 Ridges project complies with Section 20.04.011(B). Specifically, additional analysis of Design Policies 1 and 4 have been requested as they relate to Villages 2 and 3. These policies are listed below and are addressed in **bold face** type:

1. The site of the proposed development shall be analyzed to identify the design constraints imposed by hydrological and geological conditions, soils, slopes and other natural topographic conditions. In order to secure a conditional use permit, the project shall respect the natural constraints in the design of the development.

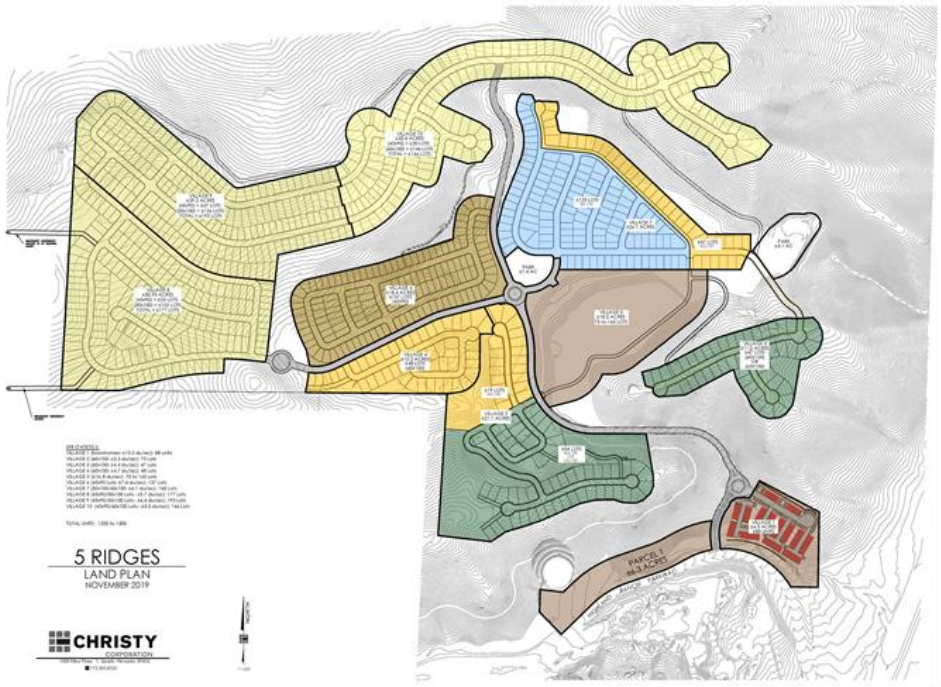
As noted in the submitted application, a comprehensive site analysis was completed with the entitlement review that accompanied the previous Development Agreement approval which also established the Comprehensive Plan designation and underlying zoning for the site. At that time, an overall slope analysis of the entire site was provided, and detailed analysis occurred to clearly identify the limits of the previous site disturbance. This established, as part of the Development Agreement, the allowed site disturbance and provided a system of checks and balances in terms of requiring that the provisions of Section 20.04.011 still be met.

As submitted and depicted in the previous table and analysis, the project plan fully complies with the requirements of 20.04.011 in terms of allowed disturbance, provided open space, etc. and also complies with the additional provisions of the adopted Development Agreement.

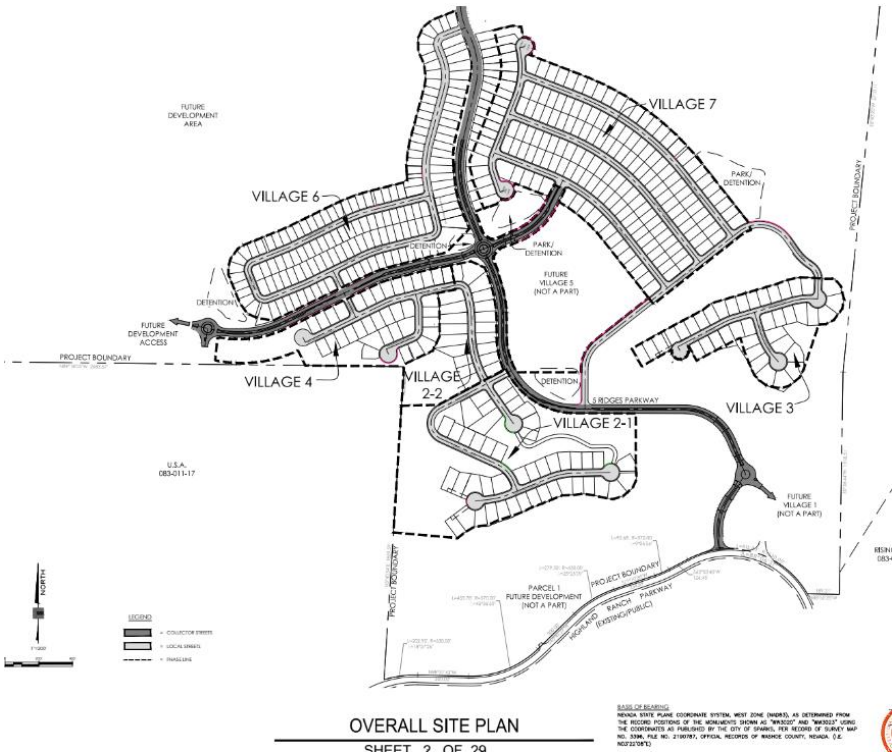
The City of Sparks required the inclusion of a preliminary development plan as part of the Development Agreement approval. This plan went through several iterations based on staff and agency input. Ultimately, the plan was memorialized as an exhibit in the Development Agreement. As proposed, the 5 Ridges Phase 1 Tentative Map is nearly identical to the conceptual plan included in the Development Agreement as it relates to the Villages 2 and 3. In fact, Village 2 has been refined to reduce grading while Village 3 remains unchanged. Thus, grading and disturbance above and beyond what was already contemplated is not proposed.

To the extent possible, grading has been designed to result in the least amount of visual disturbance. However, the 5 Ridges site is quite unique in that significant disturbance has already occurred with past mining operations. This has resulted in awkward transitions from natural areas of the site to disturbed portions of the property. Many of the slopes currently have an unnatural appearance. The intent of the 5 Ridges plan is to recontour these areas in order to achieve a natural appearance. In areas where grading does occur on natural slopes/landforms, proper slope transitions and revegetation will be provided to ensure a natural appearance in the post development condition. In some instances, walls will be constructed to fully ensure this is achieved.

A side by side of the tentative map plan and approved conceptual plan from the Development Agreement is depicted below. It is important to note that Village 2 only includes minor changes and Village 3 is identical.



Conceptual Plan from Development Agreement



Tentative Map Overall Site Plan

4. Buildings should be designed and placed on the site so as to visually complement each other and the natural landforms of the site. The placement of buildings on or near hilltops or ridges must show a high degree of sensitivity to the terrain and its visual impact. Definitive plans shall be prepared that clearly demonstrate this sensitivity for project approval.

As noted previously, the 5 Ridges plan has been designed to locate new homes while respecting the natural landforms that occur onsite. The majority of the tentative map area has already been disturbed as a result of previous mining activity. As a result of this previous disturbance, slope transitions from disturbed to natural areas are often times steep and highly unnatural in appearance. An example of this is at the southern portion of Village 2. This area is essentially wedged between existing disturbance and the existing access road. Grading in this area will allow for a proper transition between the previously mined area and the proposed units within the northern portion of Village 2. It is proposed to disturb a portion of 30% slope in this area. However, the post development condition will provide for proper slope transitions, revegetation, and walls (as necessary) that will result in a natural appearance. This will allow homes to be located in order to blend with the natural terrain while maximizing views. Much of the proposed disturbance is actually hidden within the project itself and will not be visible from outside of the neighborhood, as shown on the submitted grading plans. The resulting condition will not be visually obtrusive to the surrounding area and will ultimately "flow" with the natural terrain of the site.

Similarly, Village 3 also lies directly adjacent to previously disturbed areas. Although the majority of Village 3 is relatively flat, it is proposed to disturb 30% slopes in order to access the proposed lots. Once again, the grading plan submitted with the tentative map requests illustrates that the majority of this grading is internal to the site and will not be visible from outside of the project boundaries. Regardless, proper slope transitions and contouring of the manmade slopes, in conjunction with revegetation and landscaping, will ensure that a natural post-development condition exists.

What Villages 2 and 3 clearly demonstrate is that additional grading is necessary at the "fringes" of the previously mined areas in order to provide for proper transitions to other areas of the site. Ironically, in some cases, additional grading and disturbance is required in order to meet the intent and provisions of Section 20.04.011.

Thank you for your ongoing assistance with the 5 Ridges project. Please feel free to contact me at mike@christynv.com or (775) 250-3455 with any further questions or concerns.

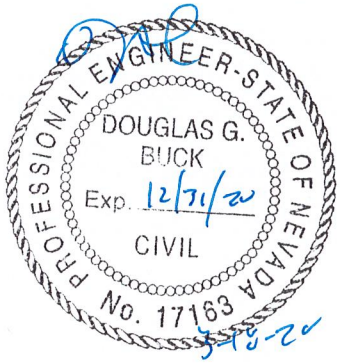
CHRISTY
CORPORATION

PRELIMINARY SANITARY SEWER REPORT

5 Ridges
Villages 2, 3, 4, 6 and 7

Prepared for:

5 Ridges Development Company, Inc.
1 East Liberty, Suite 444
Reno, NV 89501



Prepared by:

Christy Corporation, Ltd.
1000 Kiley Parkway
Sparks, Nevada 89436

March 2020

Introduction

This report summarizes estimated wastewater generation and preliminary sanitary sewer system analysis for the development of the proposed Villages 2, 3, 4, 6, and 7 of the 5 Ridges project. The purpose of this report is to analyze the proposed sanitary sewer lines for the 5 Ridges project site to determine direction of flow, sizing of the sewer lines and the maximum sewage contribution to the Spanish Springs Sewer Interceptor.

The project is located in the foothills on the west side of Spanish Springs Valley, Section 9, Township 20 North, Range 20 East, within the Northern Sparks Sphere of influence (NSSOI), Sparks, Nevada. The proposed development site is north of Highland Ranch Parkway and west of Pyramid Highway. Please reference the attached vicinity map in the appendix.

The 5 Ridges project is a single family and townhome development that will be developed in multiple phases. There are 10 villages and a remainder parcel currently envisioned for the buildout of 5 Ridges. This preliminary sewer report accompanies a Tentative Map for the initial five villages, Villages 2, 3, 4, 6, and 7, all of which are single-family residential subdivisions. Please reference the preliminary land plan in the appendix. The five villages in this analysis contain a total of 460 lots.

There is a potential for additional buildout of 842 residences in the 5 Ridges development for a total of 1,302 units in the 5 Ridges contributory area. 88 of the 1,302 units are currently envisioned as townhomes. Additionally, there is a 6+/- acre parcel on Highland Ranch Parkway that is currently envisioned for commercial use. The buildout development of 5 Ridges is outside of the scope of this study but is being considered in preliminary infrastructure planning for the project.

Previous Studies

Sewer Model Update for the City of Sparks, by Atkins, In Progress

Methodology

The City of Sparks does not have an official design criteria requirement for sanitary sewer design flow determination. The method proposed is to use the peak flow rates and occupancy rates, below. Sewer mains are analyzed at 50% flow depth. The following design criteria were used for the preparation of this report:

Manning's Equation: $Q=(1.49/n)AR^{2/3}S^{1/2}$	
Manning's Roughness Coefficient (n value)	0.014
Depth of flow pipe (d/D)	0.50
Main sewer lines (8" and 10")	300 gal/day/capita
Single Family Residential occupancy rate	3.0 capita/du
Multi-Family Residential occupancy rate	2.0 capita/du

The total sewer contribution in (gal/day) was converted to (MGD). Using this quantity sewer lines will be sized using the following Bentley Flow Master output:

8" diameter pipe at 0.4% minimum slope:	½ Full Pipe Discharge – 0.23 MGD
8" diameter pipe at 1%:	½ Full Pipe Discharge – 0.36 MGD
8" diameter pipe at 2%:	½ Full Pipe Discharge – 0.51 MGD
8" diameter pipe at 4%:	½ Full Pipe Discharge – 0.73 MGD
8" diameter pipe at 6%:	½ Full Pipe Discharge – 0.89 MGD
8" diameter pipe at 8%:	½ Full Pipe Discharge – 1.03 MGD
8" diameter pipe at 10%:	½ Full Pipe Discharge – 1.15 MGD
10" diameter pipe at 0.3% minimum slope:	½ Full Pipe Discharge – 0.36 MGD
10" diameter pipe at 1%:	½ Full Pipe Discharge – 0.66 MGD

10" diameter pipe at 2%:	½ Full Pipe Discharge – 0.93 MGD
10" diameter pipe at 4%:	½ Full Pipe Discharge – 1.31 MGD
10" diameter pipe at 6%:	½ Full Pipe Discharge – 1.61 MGD
10" diameter pipe at 8%:	½ Full Pipe Discharge – 1.86 MGD
10" diameter pipe at 10%:	½ Full Pipe Discharge – 2.08 MGD

Reference the appendix for all applicable calculations

Existing Sanitary Sewer System

The proposed site is located north and west of the existing 36" Spanish Springs Sewer Interceptor. The existing interceptor traverses the eastern boundary of the Kiley Ranch North development and will serve as the sewage disposal system for the project, delivering wastewater for treatment at the Truckee Meadows Water Reclamation Facility (TMWRF). The existing sewer network within Kiley Ranch extends from the interceptor through Kiley Ranch, and up Sparks Boulevard to the intersection of Sparks Boulevard, Pyramid Highway, and Highland Ranch Parkway. The capacity of this infrastructure is discussed in the Proposed Sewer System section on following pages.

Wastewater Generation

The proposed 460 units within this Tentative Map for 5 Ridges produce a peak flow of 414,000 gallons per day (gpd) or 0.414 million gallons per day (MGD). Sewer mains within the development will be sized to collect anticipated flows from both the units in this Tentative Map as well as potential future buildout of the 5 Ridges development. Project wastewater generation flows were calculated and are shown in the table below.

Table 1. 5 Ridges – Wastewater Generation

Land Use	Number of Units	Unit Flow (gal/unit/day)	Occupancy	Peak Flow (gpd)	Peak Flow (MGD)
Single Family Residential Villages 2, 3, 4, 6, & 7	460	300	3	414,000	0.414

Proposed Sanitary Sewer System

The proposed sanitary sewer system will consist of 8" and 10" PVC mains with minimum velocities of 2 fps and maximum velocities of 15 fps. Minimum anticipated 8" pipe slopes will be 0.4% to maintain minimum velocities. Sewer mains of 8" and 10" diameter will be utilized to convey buildout flows from the project. The primary sewer main will be contained in the north-south backbone road proposed with the project. Sewer mains will be constructed in this roadway to convey wastewater to Highland Ranch Parkway. New sewer will be required in Highland Ranch Parkway from the new backbone road to Sparks Boulevard where the sewer main will connect to existing sewer on the east side of Pyramid Highway.

Atkins is currently preparing an update to the City of Sparks Sewer Model. The sewer model addresses existing and buildout flows and pipe capacities for Sparks' existing public sewer system. The 5 Ridges development is identified in the buildout condition model being prepared by Atkins. Atkins has provided preliminary results of the sewer model that are included in the appendix to this report.

Atkins' Figure 1 (reference the appendix) presents the existing sewer pipe network that 5 Ridges will connect to. This system consists of 8" to 12" sewer mains in Sparks Boulevard. The main then turns and travels east on Kiley Parkway as a 15" main and is upsized to an 18" sewer interceptor at the intersection of David Allen Parkway and Kiley Parkway where it continues to Henry Orr Parkway where it turns south. The 18" interceptor terminates at the 36" Spanish Springs sewer interceptor.

Atkins' Figure 2 identifies contributory areas to buildout flows referenced in the appendix. These future flows incorporate groundwater infiltration in wet weather conditions as well as provide modeling of dry weather condition flows. In the analysis of new development, pipe capacity requirements for sewer mains and trunk mains (8" to 12") is typically limited to 50% full pipe flow and to 70% full pipe flow for sewer interceptors (pipe >15"). There is a single segment of 8" sewer main in Sparks Boulevard that is identified to be greater than 50% flow at buildout conditions during wet weather conditions. This section of 8" main is modeled to be at 37.9% full during dry weather conditions and 52.5% full during wet weather conditions. The slight exceedance of the 50% full design limit is relatively negligible in the wet weather peak flow condition and does not warrant upsizing of the existing sewer main for the development. As such all sewer mains, trunk mains, and interceptors identified in the model identify existing capacity for buildout of the 5 Ridges development.

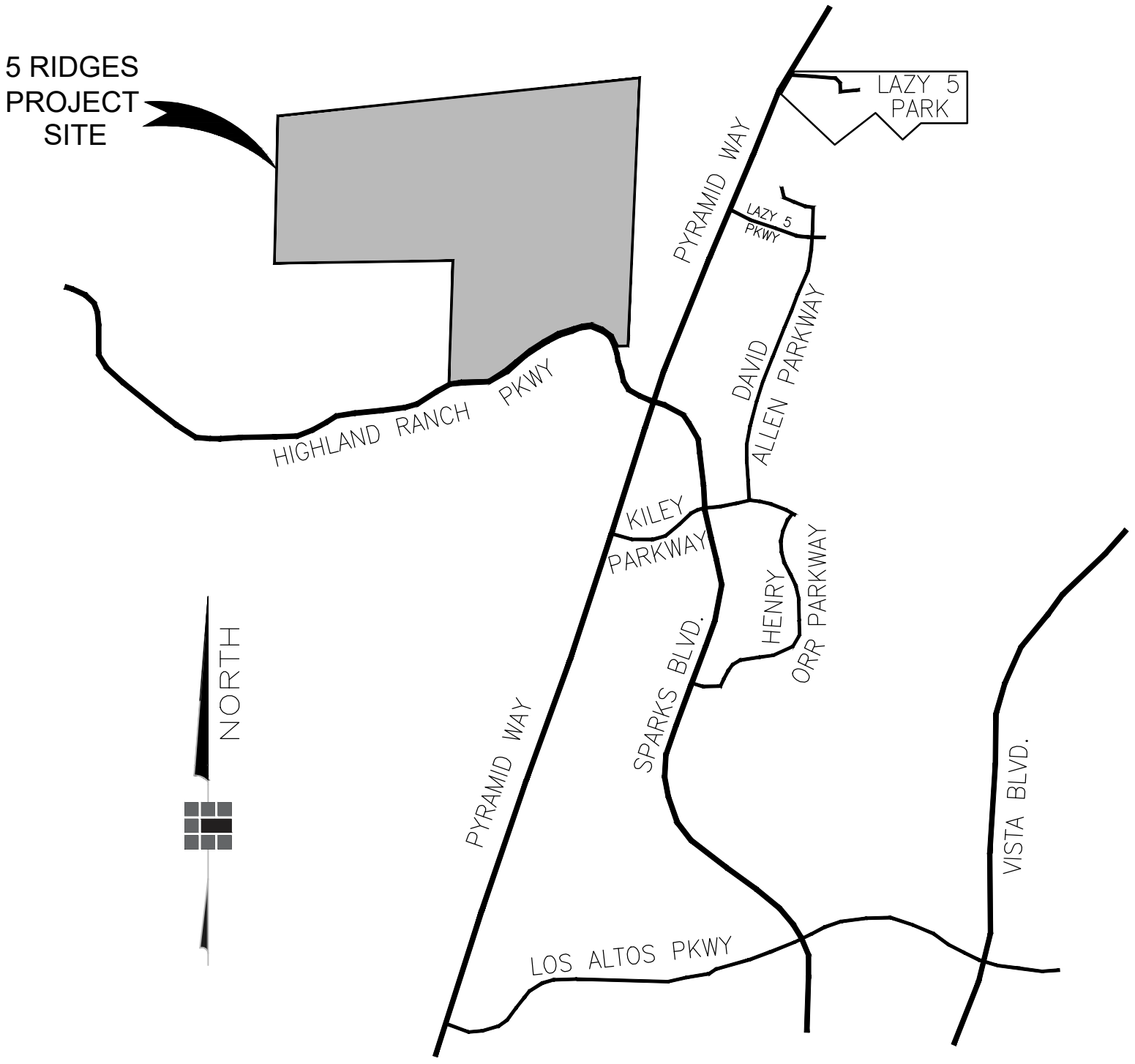
A master final sanitary sewer report will be prepared with the first final map or an individual village final sanitary sewer report will be prepared with each final map. Sewer main sizes and slopes will be determined with final design and presented in the final report(s).

Conclusion

The proposed tentative map for 5 Ridges has been designed in compliance with the existing Sparks sewer modeling and standard engineering practices. New sewer infrastructure will be required with the development of the project to deliver wastewater to the existing sewer infrastructure in Sparks Boulevard. The project will not have a negative impact on existing sewer system conveyance capacities. A final Master Sewer Study will be prepared for the 5 Ridges development or a series of individual studies may be prepared for each final map. As the site sewers to the Truckee Meadows Wastewater Reclamation Facility (TMWRF), each final map will be required to obtain sewer will serve letters from the City of Sparks to reserve treatment capacity prior to recordation or the creation of residential lots.

Appendices

Vicinity Map
5 Ridges Land Use Plan
Variable Slope Pipe Capacities
City of Sparks Sewer Model (Preliminary), Atkins
- Figure 1, Kiley Ranch Area Sewer Network – Vicinity Map
- Figure 2, Kiley Ranch Area Parcels Map (Buildout Condition)
- Sparks Sewer Infrastructure Buildout Capacities



VICINITY MAP

NOT TO SCALE

VILLAGE 10
±28.6 ACRES
(55x100) = ±14 LOTS
(65x100) = ±43 LOTS
(75x100) = ±66 LOTS
TOTAL = ±123 LOTS

VILLAGE 9
±24.4 ACRES
(55x100) = ±38 LOTS
(65x100) = ±58 LOTS
(75x100) = ±29 LOTS
TOTAL = ±125 LOTS

VILLAGE 8
±39.6 ACRES
(55x100) = ±113 LOTS
(65x100) = ±33 LOTS
(75x100) = ±35 LOTS
TOTAL = ±181 LOTS

VILLAGE 6
±20.9 ACRES
±148 LOTS
(45X90)

PARK
±1.9 AC

VILLAGE 7
±28.9 ACRES
(50x100) = ±122 LOTS
(60x100) = ±50 LOTS
TOTAL = ±172 LOTS

PARK
±3.1 AC

VILLAGE 5
±12.3 ACRES

VILLAGE 4
±7.3 ACRES
±36 LOTS
(60X100)

VILLAGE 3
±9.7 ACRES
±39 LOTS
(65X100)

±20 LOTS
60x100

VILLAGE 2
±21.1 ACRES

5 RIDGES PARKWAY

(60x100) = ±10 LOTS
(65x100) = ±30 LOTS
(70x100) = ±6 LOTS

VILLAGE 1
±6.5 ACRES
±88 UNITS

PARCEL 1
±6.3 ACRES

HIGHLAND RANCH PARKWAY

SFR STATISTICS:
VILLAGE 1 (townhomes- ±13.5 du/ac): 88 units
VILLAGE 2 (60x100/65x100/70x100 Lots - ±3.1 du/ac): 66 Lots
VILLAGE 3 (65x100- ±4.0 du/ac): 39 Lots
VILLAGE 4 (60x100- ±4.9 du/ac): 36 Lots
VILLAGE 5 (±12.8 ac- ±14.0 du/ac): ±172 Lots
VILLAGE 6 (45x90 Lots- ±7.1 du/ac): 148 Lots
VILLAGE 7 (50x100/60x100- ±5.9 du/ac): 172 Lots
VILLAGE 8 (55x100/60x100/75x100 Lots - ±4.6 du/ac):181 Lots
VILLAGE 9 (55x100/65x100/75x100 Lots - ±5.1 du/ac): 125 Lots
VILLAGE 10 (55x100/65x100/75x100 Lots - ±4.3 du/ac): 123 Lots

TOTAL UNITS: 1150

5 RIDGES

LAND PLAN

MARCH 2020

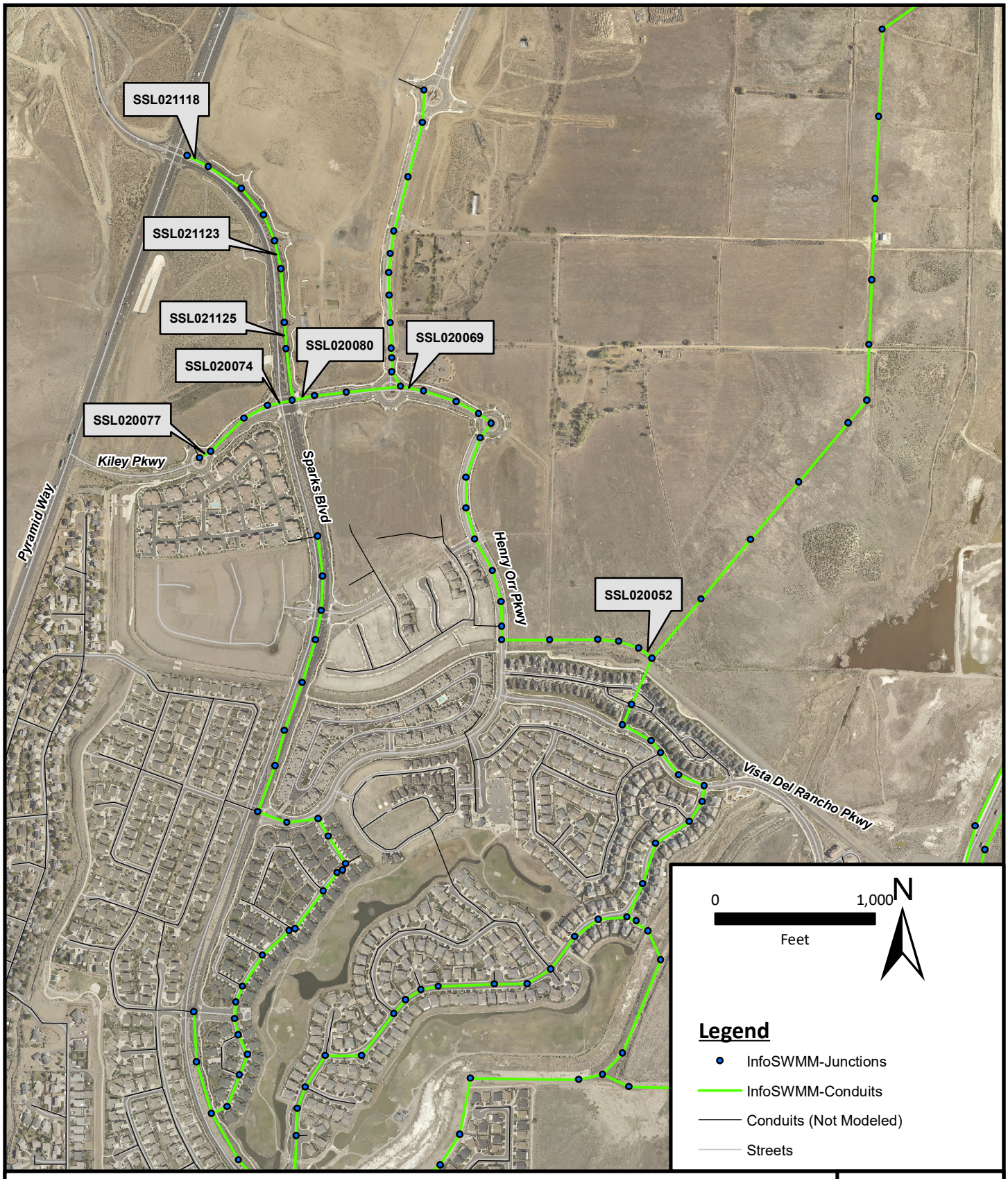
CHRISTY CORPORATION
1000 Kiley Pkwy | Sparks Nevada 89436
P 775.502.8552

NORTH

1"=200'

5 Ridges SS Analysis - Variable Pipe Size and Slope Report

Label	Roughness Coefficient	Channel Slope (ft/ft)	Normal Depth (in)	Diameter (in)	Discharge (gal/day)	Percent Full (%)	Velocity (ft/s)
8in SS Main @ 10%	0.014	0.10000	4	8	1146628	50.0	10.16
8in SS Main @ 8%	0.014	0.08000	4	8	1025575	50.0	9.09
8in SS Main @ 6%	0.014	0.06000	4	8	888174	50.0	7.87
8in SS Main @ 4%	0.014	0.04000	4	8	725191	50.0	6.43
8in SS Main @ 2%	0.014	0.02000	4	8	512788	50.0	4.55
8in SS Main @ 1%	0.014	0.01000	4	8	362596	50.0	3.21
8in SS Main @ 0.40% Minimum Slope	0.014	0.00400	4	8	229326	50.0	2.03
10in SS Main @ 10%	0.014	0.10000	5	10	2078974	50.0	11.80
10in SS Main @ 8%	0.014	0.08000	5	10	1859491	50.0	10.55
10in SS Main @ 6%	0.014	0.06000	5	10	1610367	50.0	9.14
10in SS Main @ 4%	0.014	0.04000	5	10	1314859	50.0	7.46
10in SS Main @ 2%	0.014	0.02000	5	10	929746	50.0	5.27
10in SS Main @ 1%	0.014	0.01000	5	10	657429	50.0	3.73
10in SS Main @ 0.30% Minimum Slope	0.014	0.00300	5	10	360089	50.0	2.04



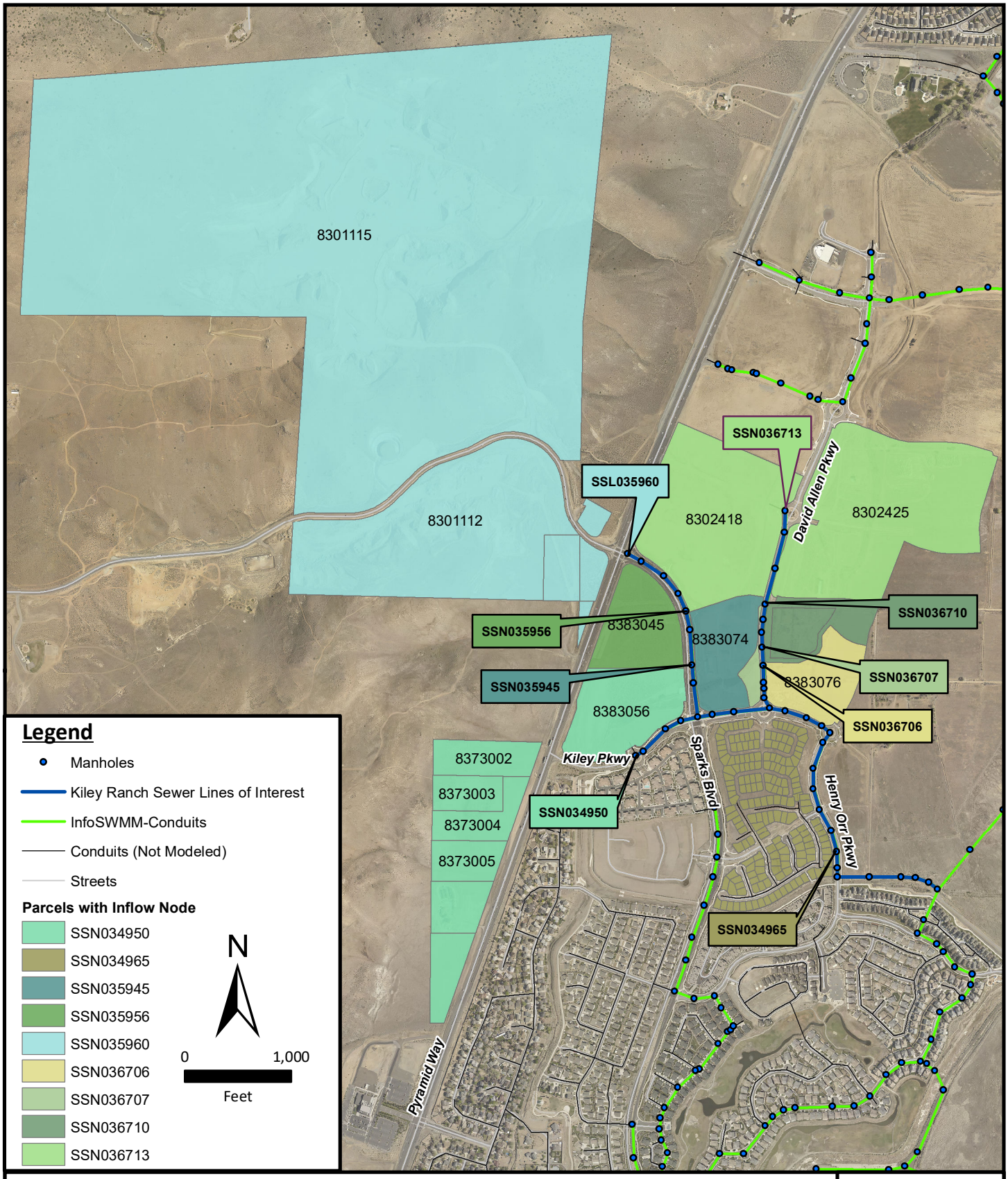
ATKINS

City of Sparks

Sewer Model Update

Kiley Ranch Area Sewer Network - Vicinity Map

Figure 1



ATKINS

City of Sparks

Sewer Model Update

Kiley Ranch Area Sewer Parcels Map (Buildout Condition)

Figure 2

2016 SSMP d/D Values

Kiley Ranch Area

			d/D Values			
MOID	Pipe Size (ft)	Slope	EX_DWF	EX_WWF	FUT_DWF	FUT_WWF
From SSL021118 to SSL020052						
SSL021118	0.67	0.022	0.000	0.055	0.321	0.432
SSL021119	0.67	0.026	0.000	0.070	0.315	0.426
SSL021120	0.67	0.027	0.000	0.077	0.297	0.403
SSL021121	0.67	0.041	0.000	0.110	0.379	0.525
SSL021123	0.83	0.006	0.000	0.096	0.310	0.428
SSL021124	0.83	0.027	0.000	0.087	0.257	0.350
SSL021125	1.00	0.016	0.000	0.071	0.201	0.273
SSL021126	1.00	0.046	0.000	0.097	0.230	0.320
SSL020080	1.25	0.005	0.000	0.105	0.229	0.325
SSL020073	1.25	0.005	0.000	0.108	0.226	0.321
SSL020072	1.25	0.004	0.015	0.124	0.270	0.359
SSL020069	1.50	0.005	0.026	0.118	0.270	0.342
SSL020068	1.50	0.004	0.027	0.125	0.286	0.363
SSL020067	1.50	0.005	0.024	0.111	0.248	0.314
SSL020066	1.50	0.013	0.023	0.110	0.239	0.303
SSL020065	1.50	0.005	0.026	0.124	0.268	0.341
SSL020064	1.50	0.005	0.025	0.123	0.263	0.337
SSL020063	1.50	0.007	0.021	0.103	0.216	0.276
SSL020062	1.50	0.030	0.022	0.108	0.220	0.281
SSL020061	1.50	0.004	0.026	0.134	0.273	0.352
SSL020060	1.50	0.004	0.026	0.135	0.273	0.352
SSL020059	1.50	0.005	0.028	0.134	0.271	0.352
SSL020058	1.50	0.005	0.032	0.142	0.287	0.373
SSL020056	1.50	0.003	0.034	0.151	0.299	0.388
SSL020055	1.50	0.003	0.035	0.159	0.314	0.409
SSL020054	1.50	0.004	0.028	0.129	0.254	0.331
SSL020053	1.50	0.035	0.019	0.085	0.161	0.207
SSL020052	1.50	0.056	0.148	0.263	0.451	0.594
From SSL020077 to SSL020074 (SSL020078 not modeled)						
SSL020077	0.83	0.005	0.000	0.061	0.093	0.165
SSL020076	0.83	0.004	0.000	0.080	0.094	0.175
SSL020075	0.83	0.005	0.000	0.094	0.094	0.182
SSL020074	0.83	0.004	0.000	0.129	0.223	0.342

Notes:

EX_DWF: Existing Condition Dry Weather Flow Scenario

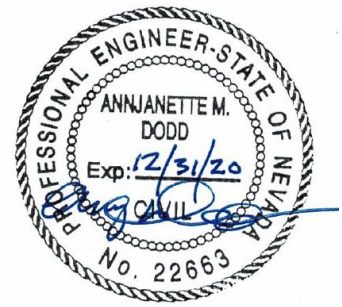
EX_DWF: Existing Condition Wet Weather Flow Scenario

FUT_DWF: Buildout Condition Dry Weather Flow Scenario

FUT_WWF: Buildout Condition Wet Weather Flow Scenario

SSL020078 was not modeled in the 2016 SSMP

5 RIDGES
CONCEPTUAL DRAINAGE REPORT



Prepared For:

FIVE RIDGES

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Revised February 2020

TABLE OF CONTENTS

1 Introduction 4
1.1 5 Ridges Conceptual Drainage Report Purpose 4
1.2 Proposed Project Location and Description 4
1.3 Existing Site Conditions 4
1.4 Previous Studies and Summary of Revisions 4
1.5 Design Criteria 5
2 Existing and Proposed Hydrologic and Hydraulic Conditions 7
2.1 Methods 7
2.2 Existing Hydrologic and Hydraulic Model 7
2.2.1 Subbasin Characterization 7
2.2.2 Precipitation 7
2.2.3 Green and Ampt Parameters 7
2.2.4 Impervious Area and Depression Storage 8
2.2.5 SCS Unit Hydrograph 9
2.2.6 Existing Ditches and Culverts 9
2.2.7 Existing Conditions Model Results 9
2.2.8 Existing Drainage Problems 10
2.3 Proposed Hydrologic and Hydraulic Modeling 10
2.3.1 Subbasin Characterization 10
2.3.2 Precipitation 10
2.3.1 Green and Ampt Parameters 10
2.3.1 Impervious Area and Depression Storage 10
2.3.1 SCS Unit Hydrograph 10
2.3.2 Proposed Ditches and Culverts 11
2.3.3 Proposed Conceptual Drainage Plan 11
2.4 Sediment Retention Basins 13
3 Summary And Notes 14
4 Conclusion 15
5 References 16

APPENDICES

Appendix A – Exhibits
Appendix B – Model Inputs
Appendix C – Existing Conditions Results
Appendix D – Proposed Conditions Results
Appendix E – Geotechnical Reports

TABLES

Table 1. Green and Ampt Parameters
Table 2. Percent Impervious, Directly Connected Impervious Area, and Depression Storage
Table 3. Typical Peak Rate Factors SCS Unit Hydrograph Method (Source: PCSWMM)
Table 4. Existing Peak Flows
Table 5. Summary of Manholes with Drops
Table 6. Existing and Proposed Peak Flows
Table 7. Proposed Conceptual Detention Basin Details
Table 8. Soils Summary Table
Table 9. Estimated Maximum Sediment Yield, per acre, for Undeveloped Shrub/Scrub and Quarry Land Uses near the 5 Ridges Development*

FIGURES

Figure 1. 5 Ridges Proposed Land Use Plan

EXHIBITS

Exhibit 1. Location Map
Exhibit 2. Existing Model Schematic
Exhibit 3. Existing Soil Texture
Exhibit 4. Existing Land Use
Exhibit 5. Proposed Land Use
Exhibit 6. Proposed Model Schematic
Exhibit 7. Conceptual Drainage Plan

1 INTRODUCTION

The 5 Ridges Conceptual Drainage Report has been prepared at the request of 5 Ridges Development, Inc. pursuant to the requirements found in the current Truckee Meadows Regional Drainage Manual (TMRDM), Section 500 - Drainage Planning and Submittal, §504 – Conceptual Drainage Report.

1.1 5 Ridges Conceptual Drainage Report Purpose

The purpose of this 5 Ridges Conceptual Drainage Report is to provide hydrologic and hydraulic analysis to evaluate the adequacy of the proposed storm drainage system concept. The key objectives are to develop a conceptual-level backbone drainage master plan for the proposed 5 Ridges development and determine impacts the new development would have on existing infrastructure. Since this is a planning level analysis, only conceptual-level designs for pipes, channels, and detention facilities are provided. Final design will be conducted at a later date as each phase of the development moves forward in the design process.

1.2 Proposed Project Location and Description

The proposed project is an approximately 387-acre development located in the City of Sparks (City), north of Highland Ranch Parkway and just west of Pyramid Highway (Exhibit 1). The proposed project is defined by ten (10) Villages and is comprised of 1,135 single- and multi-family units (Figure 1).

1.3 Existing Site Conditions

The project area is comprised of a former quarry and open space areas. Approximately 815 acres of offsite drainage area enters the site at two locations from the west (Exhibit 2). The northern section of the project area drains north and the central section drains to the east. The southern portion drains to southeast towards the intersection of Highland Ranch Parkway and Pyramid Highway, where it passes under Highland Ranch Parkway into a ditch that drains into a detention basin on the eastern side of Pyramid Highway.

As shown on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) numbers 32031C3051G and 32031C3032G, the site is in unshaded flood Zone X, area of minimal flood hazard. Base Flood Elevations (BFEs) or flood depths are not provided in Zone X areas.

1.4 Previous Studies and Summary of Revisions

No previous studies are known to exist of this area. A Conceptual Drainage Report of the site was submitted to the City in December 2019, however, modifications to the proposed site layout necessitated revisions be made to the December 2019 Conceptual Drainage Report. The significant revisions are summarized below:

- The detention basin within the park just southwest of Village 7 has been removed.

- The detention basins southwest and southeast of Village 6 and south of Village 5 were increased in size to reduce the peak flow leaving the site. This allowed for the reduction in pipe size and number of drops required to slow the velocity within the pipes to less than 20 feet per second (fps) down the entrance road.
- Consideration for sediment retention has been included in this report.

1.5 Design Criteria

At a minimum, detention should be provided to maintain pre-development conditions for the 5- and 100-year storm events.

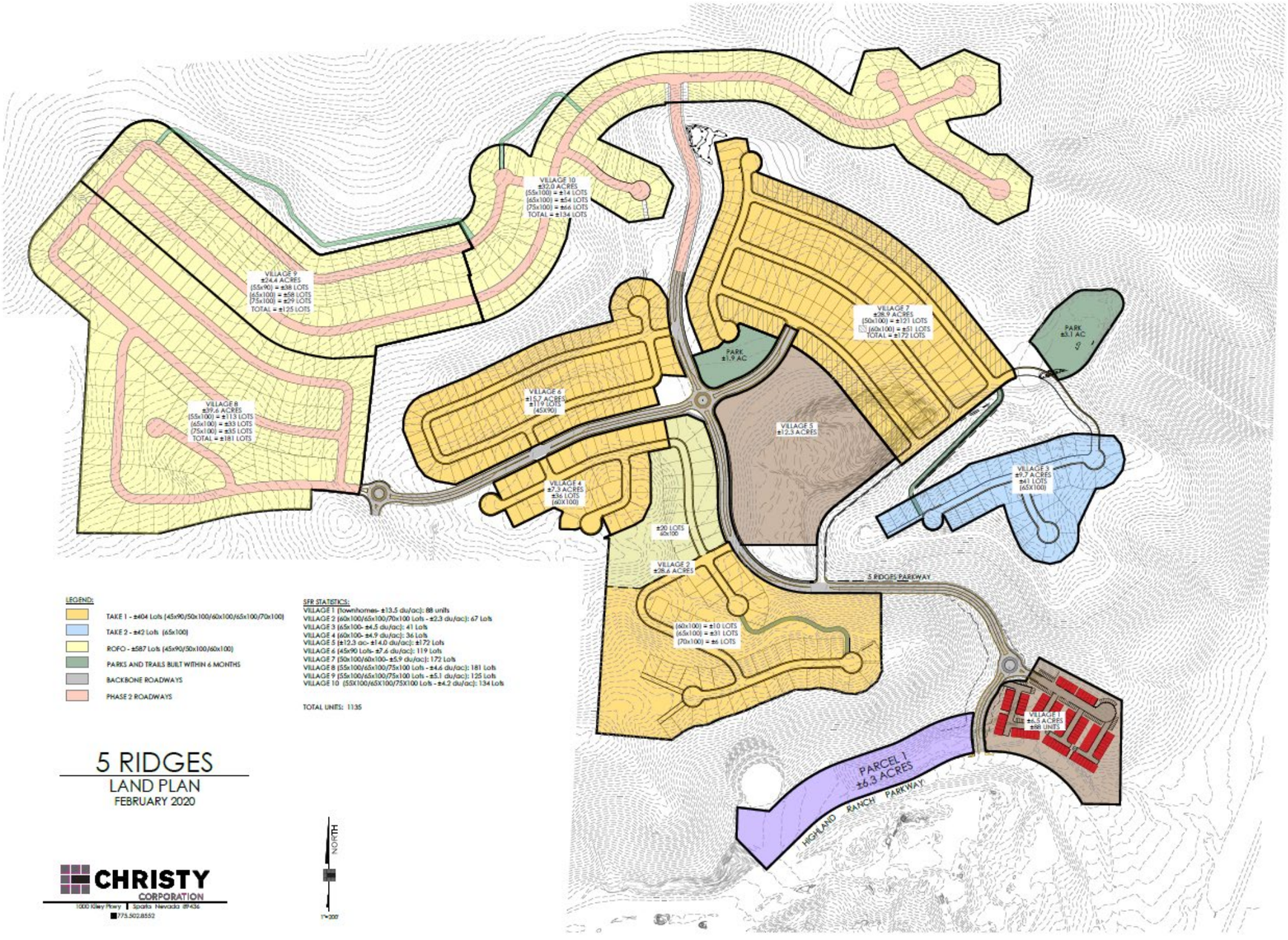


Figure 1. 5 Ridges Proposed Land Use Plan

2 EXISTING AND PROPOSED HYDROLOGIC AND HYDRAULIC CONDITIONS

2.1 Methods

Hydrologic and hydraulic modelling for the proposed project site was conducted using Computational Hydraulics, Inc's (CHI) PCSWMM version 7.2. PCSWMM is an interface used to set up and run the U.S. Environmental Protection Agency (USEPA) Stormwater Management Model (SWMM). SWMM5 is a lumped-parameter, dynamic rainfall-runoff simulation model used for single event (design storms) or long-term (continuous) simulations and has the ability to accurately produce stormwater runoff hydrographs and route them through open and closed stormwater systems. The runoff component of SWMM operates on a collection of subcatchment areas, treated as non-linear reservoirs, that receive precipitation and generate runoff. The routing portion of SWMM transports this runoff through a system of pipes, channels, and detention facilities. SWMM utilizes the dynamic wave method, which solves the one-dimensional Saint-Venant equations for continuity and momentum for model conduits. Dynamic wave routing accounts for channel storage, backwater, entrance/exit losses, flow reversal, and pressurized flow. The models produced for this study utilizes detailed hydrologic methods appropriate for dry, urban regions, such as the City of Sparks in Nevada and includes Green and Ampt Parameter (Suction Head, Conductivity, Initial Deficit) and SCS Unit Hydrographs.

2.2 Existing Hydrologic and Hydraulic Model

Offsite drainage from the west drains onto the site at two locations as shown in Exhibit 2.

2.2.1 Subbasin Characterization

The existing drainage areas are illustrated in Exhibit 2. A total of 16 subbasins were delineated using 2017 Washoe County LiDAR data and aerial imagery. GIS software was used to aid in the basin delineation and development of model input parameters, such as subbasin area, Green and Ampt infiltration parameters, and directly connected impervious area. GIS layers representing subbasin boundaries, soil data, and land use data were used to calculate area-weighted averages for each desired parameter for each subbasin.

2.2.2 Precipitation

The model was used to estimate the 5-, 10-, 25-, 50-, and 100-year, 24-hour storm events. Rainfall for the storm events was developed using NOAA Atlas 14 precipitation (Appendix B). A balanced storm rainfall hydrograph was generated using PCSWMM.

2.2.3 Green and Ampt Parameters

Soil data was obtained from the Natural Resources Conservation Service (NRCS) Soil Survey Geographic (SSURGO) Database. GIS shapefiles for soils were compiled from the soil surveys for the project area. There are four (4) soil textures within the study area. The dominant soil texture is sandy loam. Soil Textures and associated Green and Ampt parameters are summarized in Exhibit 3 and Table 1.

Table 1. Green and Ampt Parameters

Soil Texture	Conductivity Ksat (in/hr)	Initial Deficit	Suction Head (in)
Clay	0.306	0.385	12.50
Loam	0.26	0.27	3.5
Loamy coarse sand	1.18	0.13	2.41
Sandy loam	0.43	0.21	4.33

2.2.4 Impervious Area and Depression Storage

Adjustments were made to alter the percent impervious to only account for directly connected impervious area (DCIA). Empirical formulas developed by Sutherland (2000) and reported in the Small MS4 Permit Technical Support Document (EPA, 2014) were used to convert the percent impervious to DCIA. This adjustment was made for industrial and residential land uses

Directly connected impervious area and depression storage values were estimated based on the land use (Exhibit 4) and average directly connected impervious area provided in the NRCS Technical Release 55 (NRCS, 1986). The directly connected impervious area impervious and depression storage values are summarized in Table 2.

Table 2. Percent Impervious, Directly Connected Impervious Area, and Depression Storage

Land Use	% Impervious	% Directly Connected Impervious Area	Depression Storage (in)
Desert Shrub Poor	0	0	0.20
1/8 acre or less Residential	65	60	0.05
1/6 acre Residential	50	44	0.08
1/4 acre Residential	38	23	0.10
1/3 acre Residential	30	16	0.10
1 acre Residential	20	3	0.15
2 acre Residential	12	7	0.15
Open Space	0	0	0.20
Quarry	0	0	0.20
Industrial	72	61	0.10
Impervious	98	98	0.05
Detention Pond	98	98	0.05
Park	0	0	0.20

2.2.5 SCS Unit Hydrograph

Time of concentration was calculated using USDA's TR-55 for sheet flow (or overland flow), shallow concentrated, and channel flow. Time of concentration calculations can be found in Appendix B. PCSWMM provides a table of values (Table 3) for the SCS Unit Hydrograph peak rate factor, a value of 300 is recommended for rural areas with rolling hills and was used here to represent existing conditions hydrology for natural areas and slopes less than 10%.

Table 3. Typical Peak Rate Factors SCS Unit Hydrograph Method (Source: PCSWMM)

General Description	Peak Rate Factor
Urban areas; steep slopes	550-600
Typical SCS	484
Mixed urban/rural	400
Quarry/Undeveloped Slopes > 10%	350
Rural, rolling hills	300
Rural, slight slopes	200
Rural, very flat	100

2.2.6 Existing Ditches and Culverts

Invert and rim elevations of the existing culverts were surveyed by Christy Corporation, LTD. Existing ditch cross sections were estimated from the LiDAR data. A Manning's *n* value of 0.04, 0.024, and 0.013 was used for ditches, CMPs, and RCPs, respectively.

2.2.7 Existing Conditions Model Results

Existing flows were determined for the 5-, 10-, 25-, 50-, and 100-year, 24-hour storm events. The peak flows for these events are summarized in Table 4 at each location where flows leave the project area as shown on Exhibit 2. Model results are provided in Appendix C.

Table 4. Existing Peak Flows

Outfall	Peak Flows (cfs)				
	5-year	10-year	25-year	50-year	100-year
OFon-A	8	12	18	25	32
OFon-B	15	21	33	45	58
OFon-C	6	8	13	18	23
OFon-D	8	11	18	24	31
OFon-G	22	34	56	78	105
Joff-D1	104	153	240	329	431

2.2.8 Existing Drainage Problems

Offsite flows from the west (subbasins Boff-A and Boff-C2) flow towards the northeast, via an existing ditch and 52-inch RCP along the northside of Highland Ranch Parkway, towards the existing entrance road to the old quarry. There are three (3) 12-inch CMPs under the existing entrance road. The CMPs are undersized. The model shows the flows overtopping the existing entrance road during the 5- through 100-year storm events.

The flow travels towards the five (5) existing 30-inch RCPs under Highland Ranch Parkway at the intersection with Pyramid Highway, under Highland Ranch Parkway into a ditch and then into an existing detention basin, via a 42-inch CMP, on the eastern side of Pyramid Highway (Exhibit 2). The model shows that Highland Ranch Parkway overtops during the 50- and 100-year storm events and the 42-inch CMP is undersized.

2.3 Proposed Hydrologic and Hydraulic Modeling

2.3.1 Subbasin Characterization

The proposed drainage areas and model layout of the backbone system were designed based on proposed grading and land use provided by Christy Corporation, LTD (Exhibits 6 and 7). The proposed drainage system has been designed to mimic existing flow directions where possible. Under proposed conditions, the drainage generally flows south and east into detention ponds throughout the site. The purpose of the detention ponds is to detain the proposed flows to mitigate increases in runoff due to the development.

Under proposed conditions, the developed portions of subbasins Bon-A, Bon-B, Bon-C, and Bon-D (Exhibit 2) will be graded so that runoff no longer flows offsite to the north and will be directed to the east and south into the detention basin located to the northeast of Village 7 (Exhibit 7). Thus, the peak flows leaving these subbasins will be less under proposed conditions for all storm events. The majority of Bon-E will be graded so that runoff no longer flows offsite to the south and will be directed to the east into the detention basin located to the west of Village 6 (Exhibit 7). Thus, the peak flows leaving Bon-E will be less under proposed conditions for all storm events.

2.3.2 Precipitation

See section 2.2.2.

2.3.1 Green and Ampt Parameters

See section 2.2.3.

2.3.1 Impervious Area and Depression Storage

See Section 2.2.4. Proposed land uses are summarized in Exhibit 5.

2.3.1 SCS Unit Hydrograph

Time of concentration was calculated using USDA's TR-55 for sheet flow (or overland flow), shallow concentrated, and channel flow. A minimum time of concentration of 15 minutes was

used for all proposed developed subbasins. A peak rate factor of 450 was used to represent the developed areas, on rolling hill type slopes.

2.3.2 Proposed Ditches and Culverts

Ditches were modeled with trapezoid cross sections, bottom widths of 4 and 4.5-feet, 2:1 side slopes, and depths ranging between 2- and 5-feet. To minimize the potential for erosion, rip-rap lining is recommended for all proposed ditches.

The majority of the proposed culverts were modeled as RCPs ranging between 18- and 48-inches in diameter, with a minimum diameter of 18-inches. Two locations were modeled using rectangular culverts, from Village 3 and Village 7 to Detention Basin #4 and from Detention Basin #6, routing flows under the entrance road.

Manning's *n* value of 0.013 was used for RCPs and 0.045 for all proposed, rip-rap lined ditches.

2.3.3 Proposed Conceptual Drainage Plan

The majority of flows within the site are routed through proposed detention basins as discussed below. Open ditches were designed to allow for 1-foot of freeboard during the 100-year event. The conceptual system was designed such that the maximum velocity within proposed culverts does not exceed 20 feet per second (fps). This is accomplished with a series of drop (or "step down") manholes. A summary of the manholes with drops is provided in Table 5. Refer to Appendix D for model results and Junction locations.

Table 5. Summary of Manholes with Drops

Junction ID	Inflow Pipe Diameter (in)	Drop from Inver of Inflow to Outflow (ft)	Outflow Pipe Diameter (in)	Manhole Height (ft)	Maximum Inflow Velocity (fps)
J-0417	42	2	42	8	14.4
	24	4			12.4
J-0414	48	1	48	8	17.6
J-0411	24	2	24	6	14.7
J-0407	24	2	24	6	18.4
J-0403	24	4	24	8	19.1
J-0402	24	4	24	8	19.1
J-0601	24	7	24	11	12.1
J-0811	48	6.5	42	15	15.4
J-0810	42	9.5	42	15	17.9
J-0809	42	9	42	15	18.5
Jon-I2	52 (existing pipe)	4	60	12.33	20.3*

*The existing conditions 100-year velocity in this pipe is 21.2 fps

The proposed system will outlet at three locations: at the existing outlet east of Village 7 (OFon-G, Exhibit 7a), at the outlet on Highland Ranch Parkway (J-0303, Exhibit 7c), and at the southern corner of Village 1 (J-0302, Exhibit 7c). The existing and proposed peak flows at these locations and at the culverts located to the north of the intersection of Highland Ranch Parkway and Pyramid Highway (Joff-D1) are summarized in Table 6.

Since the project will be constructed in phases and Phase I excludes Village 8, the site was modeled to verify that Detention Basin #5 has the ability to detain the undeveloped portion of Village 8, which currently routes through Boff-B. Under full buildout, runoff from Village 8 will be routed through Detention Basin #1, located to the east of Village 8. Runoff from Village 6 and a small portion of Village 10 will be routed through Detention Basin #2, located to the southeast of Village 6. Village 3, Village 7, Village 9, and most of Village 10 will be routed through Detention Basin #4, located to the east of Village 7. Runoff from Villages 2, 4, and 5 will be routed through Detention Basin #3, located to the south of Village 5. Detention basin details are summarized in Table 7 The conceptual drainage plan is summarized on Exhibits 6 through 7d. Model results are provided in Appendix D.

Runoff is routed in a combination of RCPs and trapezoidal ditches. Due to the site soils and slopes, rip-rap, or similar, is recommended in the ditches when velocities exceed 2.0 fps. Rip-rap sizing should follow Section 805.5.5 of the Truckee Meadows Regional Drainage Manual.

For conservativeness, it is assumed that the detention basin infiltration rates will be limited. A Soils Site Exploration was conducted by Black Eagle Consulting, Inc on July 5, 2018 which covered the area within the property boundary. The results of the exploration indicate shallow bedrock over the majority of the site. See Table 8 for a summary of soil exploration findings near proposed detention pond locations. The location for Detention Basin #5 is outside the property boundary, the soil exploration data is unavailable. Infiltration tests are recommended to estimate actual infiltration rates at each detention basin location.

Table 6. Existing and Proposed Peak Flows

Existing Peak			Proposed Peak [Phase I Peak]		
Location	**5-Year (cfs)**	**100-Year (cfs)**	**Location (cfs)**	**5-Year (cfs)**	**100-Year (cfs)**
OFon-G	22	105	OFon-G	10 [10]	28 [28]
J3	102	418	J-0303	100 [100]	312 [312]
N/A	N/A	N/A	J-0302	101 [101]	313 [314]
Joff-D1	104	431	Joff-D1	104 [103]	321 [321]

Table 7. Proposed Conceptual Detention Basin Details

Detention Basin	Invert Elev. (ft)	Depth (ft)	Bottom Area (ft^2)	Surface Area (ft^2)	Approximate Available Volume (acre-ft)	Maximum % Full (100-Year Event)	100-Year Freeboard (ft)
Det-1	4874	4	31,500	38,500	3.2	71	1.1
Det-2	4806	10	5,370	12,400	2.0	84	1.2
Det-3	4738	16	17,100	38,200	10.0	83	2.0
Det-4	4780	10	62,290	85,420	17.1	58	3.8
Det-5	4620	10	3,200	9,356	1.4	76	1.7

Table 8. Soils Summary Table

Test Pit ID	Surface Soil Type[1]	Majority Soil[1]	Depth to Bedrock (ft)[1]	Associated Detention Pond
TP-01	Poorly Graded Sand with Silt and Gravel	Poorly Graded Sand with Silt and Gravel	5	Detention Basin 1
TP-07	Silty Sand with Gravel	Silty Sand with Gravel	3	Detention Basin 2
TP-09	Poorly Graded Sand with Silt and Gravel	Poorly Graded Sand with Silt and Gravel	14	Detention Basin 2
TP-15	Poorly Graded Sand with Gravel	Silt with Sand	>20	Detention Basin 3
TP-36	Clayey Sand with Gravel	Clayey Sand with Gravel	>20	Detention Basin 4
TP-37	Poorly Graded Sand with Gravel	Poorly Graded Sand with Gravel	>20	Detention Basin 4

[1]Data Summarized from Site Exploration Data Highland Ranch Subdivision (the Quarry)

2.4 Sediment Retention Basins

The City has had problems with sediment accumulation along Highland Ranch Parkway and Pyramid Highway and has requested sediment retention be addressed in this report. The undeveloped areas contributing to sediment are represented by shrub/scrub and former quarry areas with unvegetated surfaces; with the majority contribution being from previously disturbed quarry areas (House Moran, 2020).

Sediment retention basins are recommended to control sediment erosion during construction. Developed areas with established landscape tend to have low sediment yields. Thus, the potential sediment yield is expected to decrease as the development is completed and landscape has been established.

During construction, temporary sediment detention basins, located down gradient of all proposed grading activities, are recommended to capture and detain sediment laden runoff, for a sufficient length of time to allow it to settle out in the basin. The exact location and size of the temporary sediment detention basins will be dependent on the grading schedule. However, permanent

Detention Basins #1 through #4 are recommended as temporary sediment basins as long as the outlets are protected, since, the outlet inverts are set at the bottom of each basin.

The Truckee Meadows Regional Storm Water Quality Management program Construction Site Best Management Practices Handbook (Handbook) provides design and maintenance requirements for sediment retention basins to retain sediment during construction. The NRCS Conservation Practice Standard #350 – Sediment Basin provides additional guidance (NRCS Nevada, 2016). Per the Handbook, the construction sediment retention basin should provide storage for either the calculated volume of runoff from the 2-year, 24-hour storm event for each disturbed acre drained, or 3,600 ft^3/acre drained.

As part of a pilot study conducted for the City, House Moran estimated sediment yield to the detention basin on Pyramid Highway (House Moran, 2020). The maximum potential sediment yield, for undeveloped quarry conditions, is summarized in Table 9 for the 2- through 100-year events. The sediment yields in Table 9 represent the maximum estimated using the results of the pilot study to account for disturbed soil during grading activities. The estimated maximum onsite runoff volume for the 2-year event, using the Existing Conditions PCSWMM model, is approximately 600 ft^3/acre.

Table 9. Estimated Maximum Sediment Yield, per acre, for Undeveloped Shrub/Scrub and Quarry Land Uses near the 5 Ridges Development*

Sediment Yield (ft^3/acre)				
2-Year	**10-Year**	**25-Year**	**50-Year**	**100-Year**
230	330	470	611	779

3 SUMMARY AND NOTES

- Under existing conditions, flow overtops the existing quarry entrance road during the 5- through 100-year storm events.
- Detention has been provided such that the post-development flows do not exceed the pre-development flows for the 5-year and 100-year events (Table 6). The 100-year post-development flow at Highland Ranch Parkway and Pyramid Highway (Joff-D1) is about 100 cfs less than the 100-year pre-development flow at this location.
- All proposed detention basins have a minimum freeboard of 1-foot. During the 100-year event, the basins are between 74% and 81% full.
- To achieve a velocity of less than 20 fps within the proposed RCPs with steep slopes, drops are required along the entrance road both upstream and downstream of Detention Basin #4 and to connect the runoff from Villages 9 and 10 to the ditch northeast of Village 7.
- The slope of the outflow pipe from Detention Basin #2 has been set to optimize the detention of this basin while still maintaining freeboard requirements.

- An orifice outlet of 1-foot was used to increase the detention in Detention Basin #4.
- Ditches have been sized to allow for 1-foot of freeboard. 100-year velocities in the ditches range between 5.4 fps and 11.5 fps. Rip-rap protection is required in all open ditches to protect from erosion.
- During construction, temporary sediment detention basins, located down gradient of all proposed grading activities, are recommended to capture and detain sediment. It is recommended that the proposed detention basins be used as temporary sediment retention basins to retain from disturbed areas and then converted to permanent detention basins following construction. The Truckee Meadows Regional Storm Water Quality Management program Construction Site Best Management Practices Handbook (Handbook) provides design and maintenance requirements for sediment retention basins to retain sediment during construction.

4 CONCLUSION

The 5 Ridges Conceptual Drainage Report has been developed to support the 5 Ridges Development, Inc. pursuant to the requirements found in the current Truckee Meadows Regional Drainage Manual (TMRDM), Section 500 - Drainage Planning and Submittal, §504 – Conceptual Drainage Report. Onsite and offsite hydrologic and hydraulic modeling has been conducted to develop a conceptual level drainage system and evaluate the impacts the proposed project has on existing infrastructure.

It has been demonstrated that the project can be developed in accordance with the requirements of the Truckee Meadows Regional Drainage Manual (TMRDM). The conceptual drainage system is designed to convey and detain the storm flows per the TMRDM.

Note, since this is a conceptual level analysis, only planning level pipe, inlet geometry, and storage basin design is provided here. Final design will be conducted at a later date as each development moves forward in the design process.

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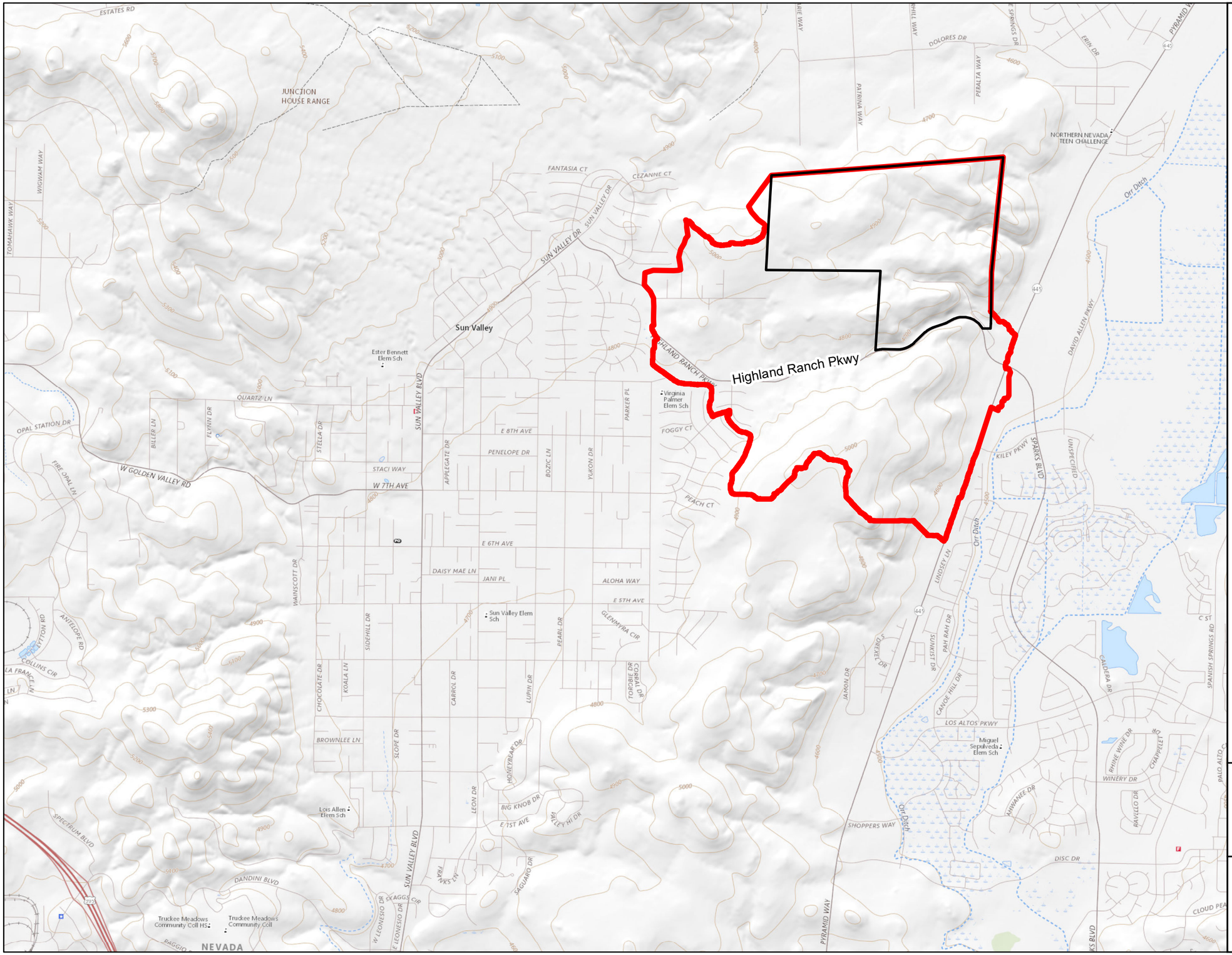
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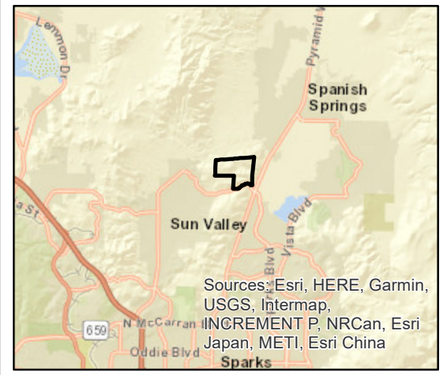
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Appendix A – Exhibits





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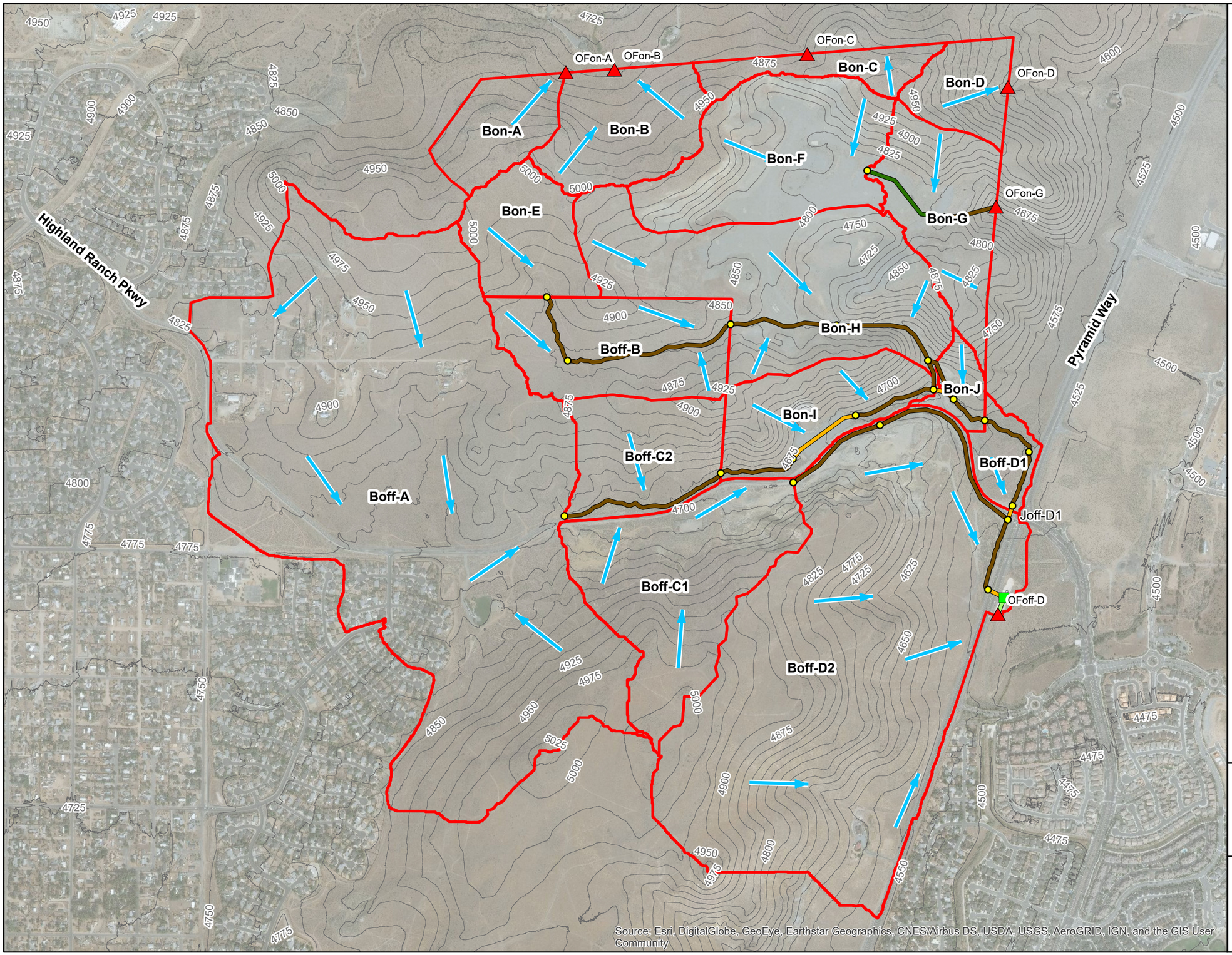
- Property Boundary
- Model Area

0 875 1,750 3,500 Feet

Exhibit 1
5 Ridges
Location Map

Prepared By:
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Reno, NV 89521
Office: (775) 293-4000

Prepared On: 12/18/2019



Legend

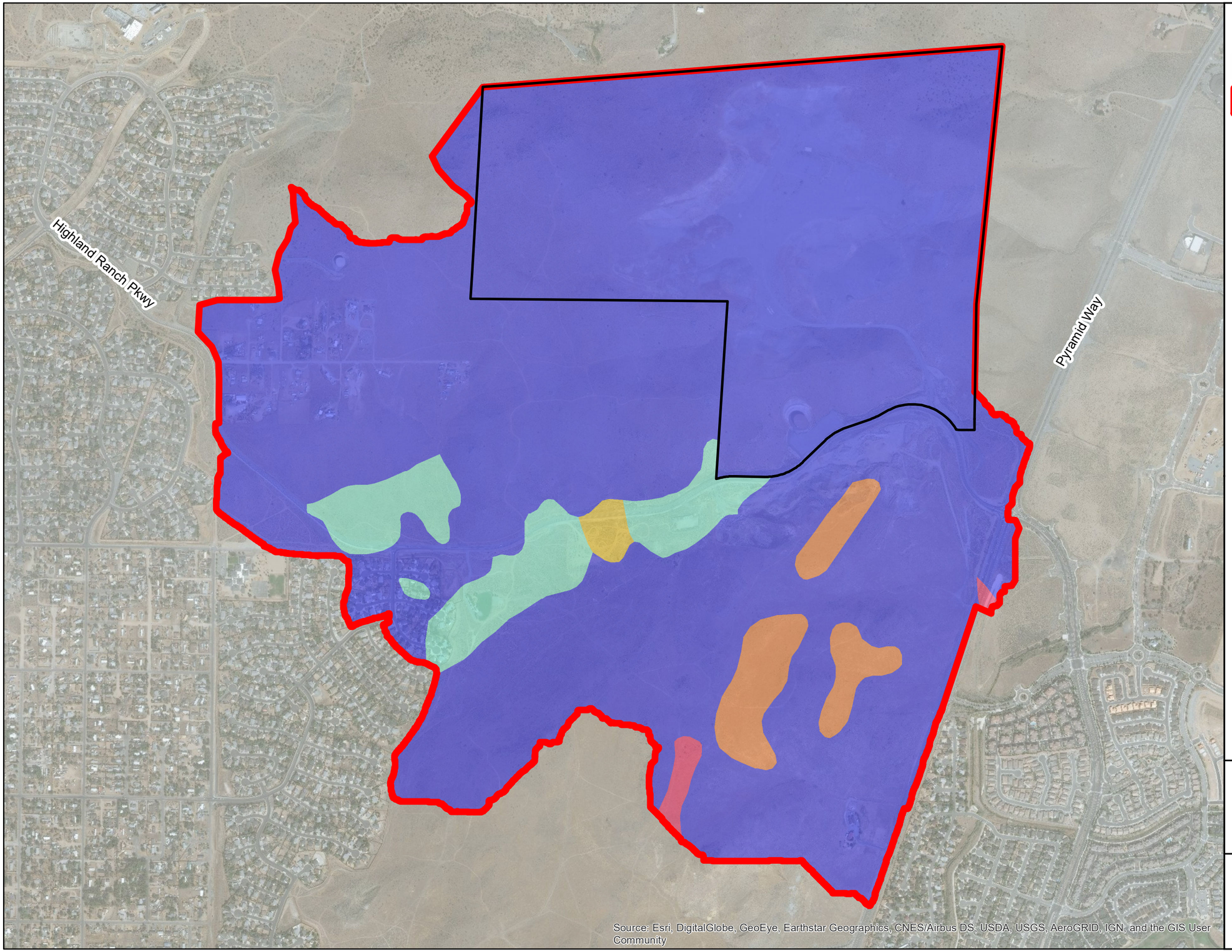
- Junctions
- Outfalls
- Detention Basins
- Flow Direction
- Circular Pipe
- Rectangular Pipe
- Trapezoidal Ditch
- Irregular Ditch

0 375 750 1,500 Feet

Exhibit 2
5 Ridges
Existing Model Schematic

Prepared By:
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Office: (775) 293-4000

Prepared On: 2/26/2020



Legend

- Property Boundary
- Model Area

Soil Texture

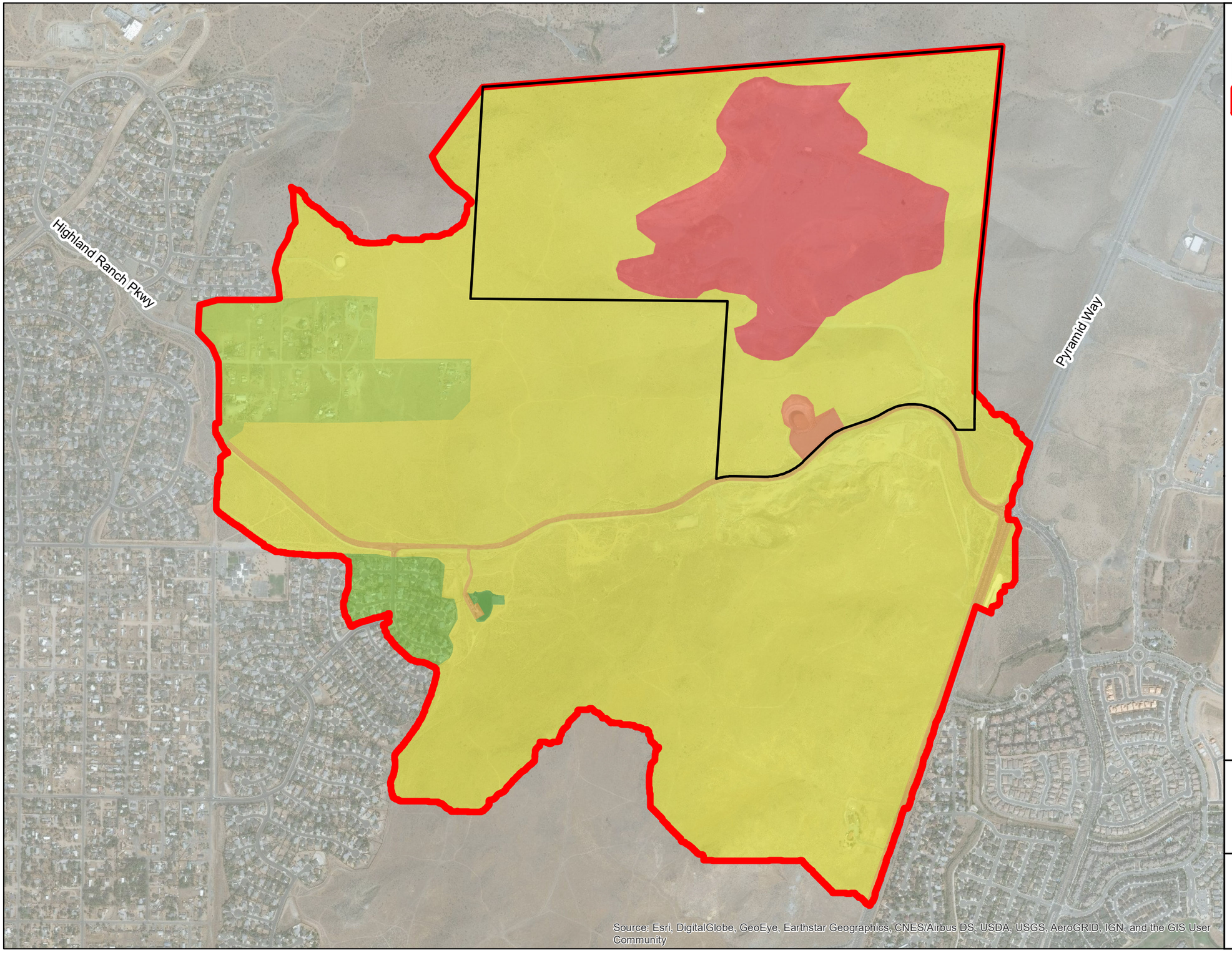
- No Data
- Clay
- Loam
- Loamy coarse sand
- Sandy loam

0 375 750 1,500
Feet

Exhibit 3
5 Ridges
Soil Texture

Prepared By:
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10399 Double R Boulevard Suite 110
Reno, NV 89521
Office: (775) 293-4000

Prepared On: 12/22/2019



Legend

- Property Boundary
- Model Area

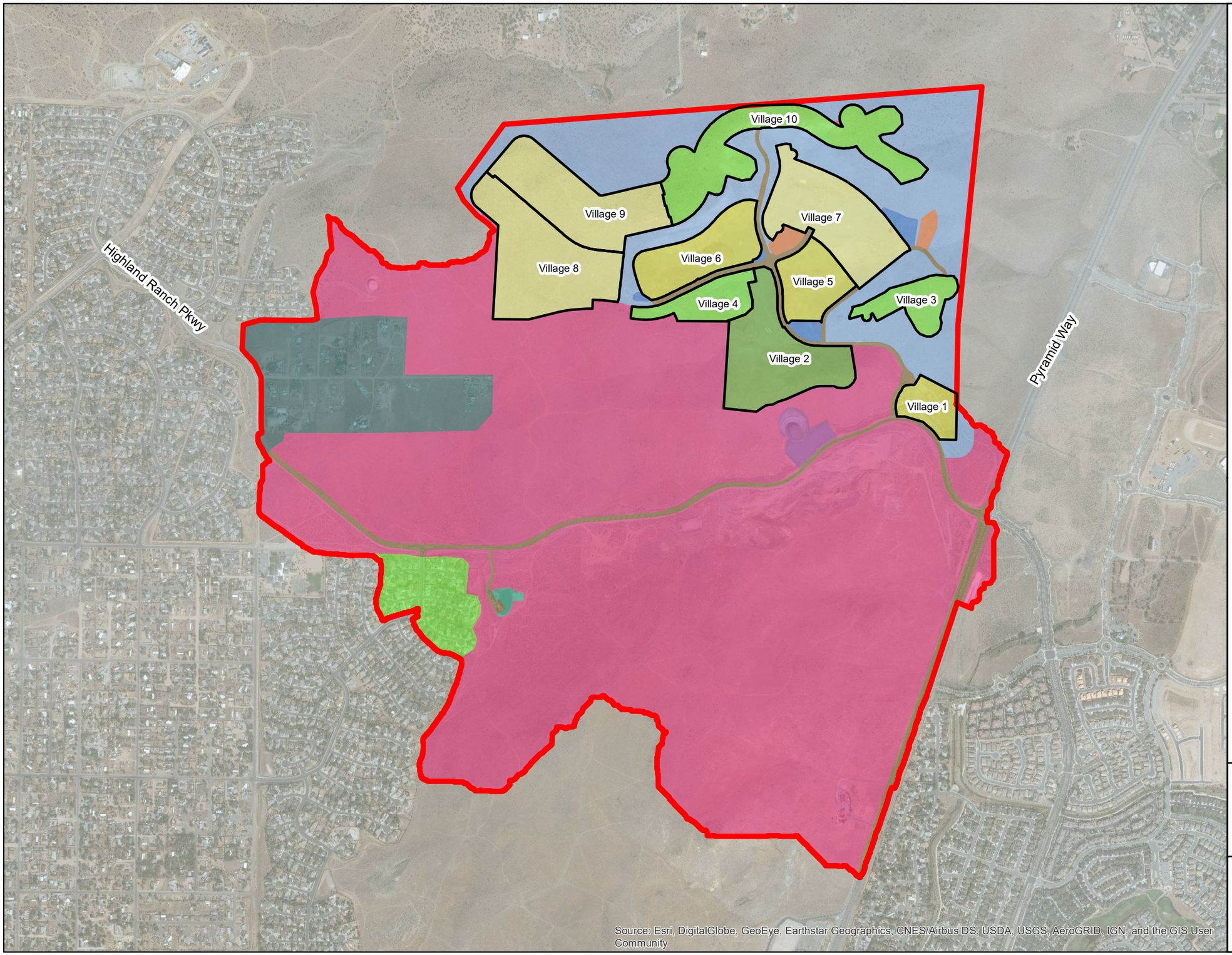
Land Use

- 1 acre Residential
- 1/4 acre Residential
- 2 acre Residential
- Desert Schrub Poor
- Impervious
- Industrial
- Quarry

0 375 750 1,500
Feet

Exhibit 4
5 Ridges
Existing Land Use

Prepared By:
House Moran Consulting, Inc.
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Reno, NV 89521
Office: (775) 293-4000
Prepared On: 12/22/2019



Legend

- Village Boundary
- Model Area

Land Use

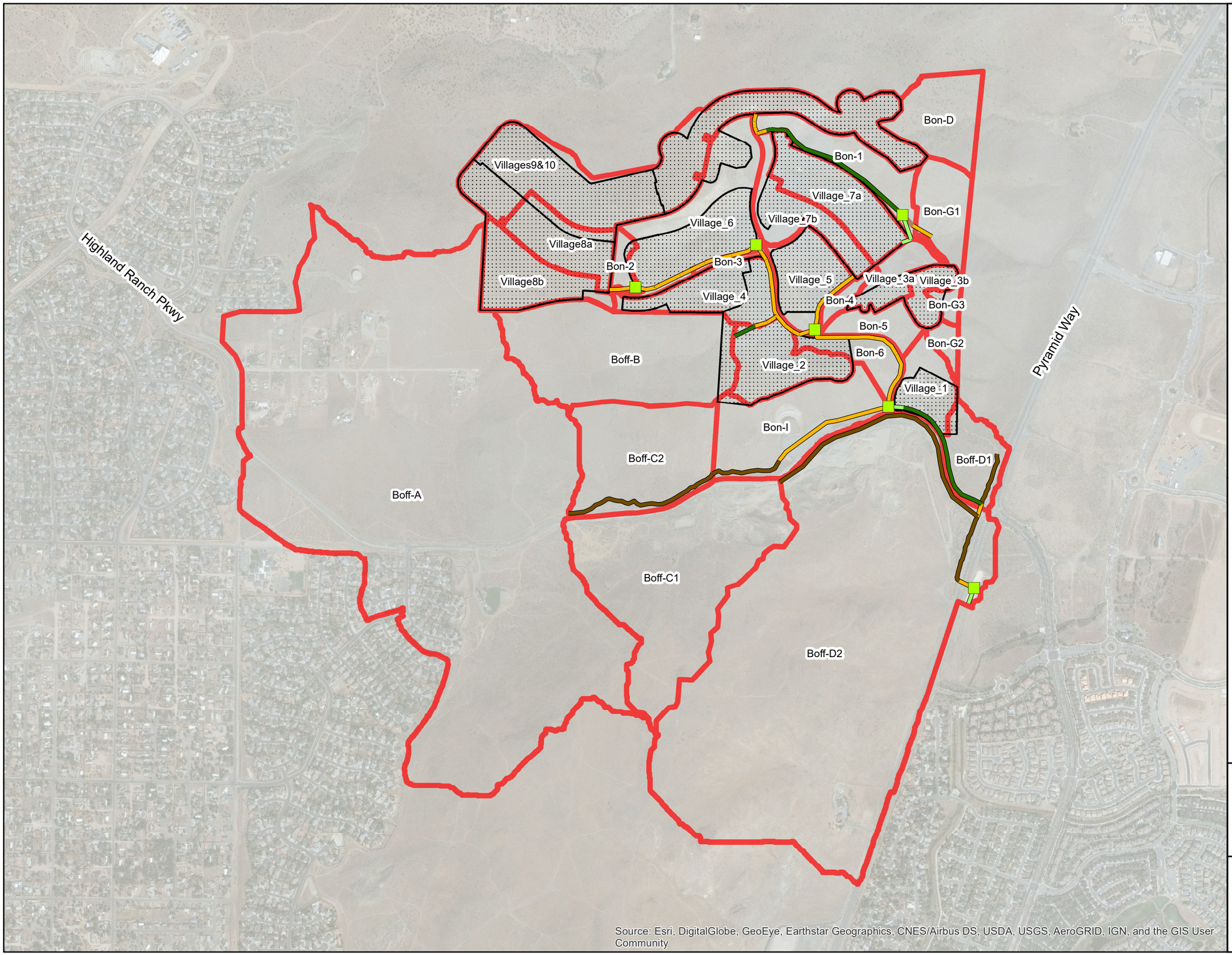
- 2 acre Residential
- 1 acre Residential
- 1/3 acre Residential
- 1/4 acre Residential
- 1/6 acre Residential
- 1/8 acre Residential
- Industrial
- Impervious
- Desert Schrub Poor
- Open Space Good
- Detention Basin
- Park

0 375 750 1,500 Feet

Exhibit 5
5 Ridges
Proposed Land Use

Prepared By:
House Moran Consulting, Inc.
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Prepared On: 12/18/2019



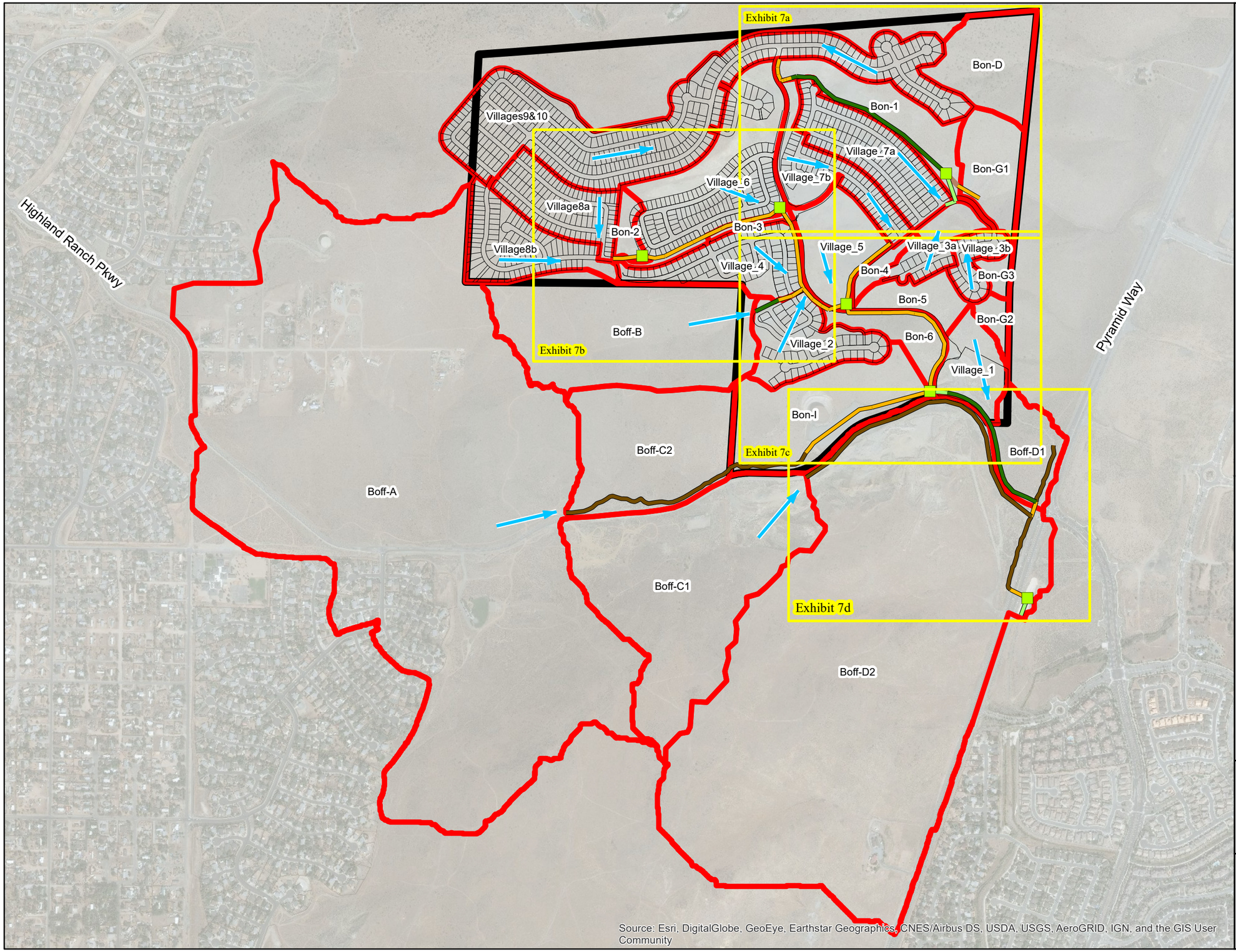
Legend

- Detention Basins
- Proposed Circular Pipe
- Rectangular Pipe
- Proposed Trapezoidal Ditch
- Irregular Channel
- Orifices
- Village Boundary
- Subcatchments

0 295 590 1,180
Feet

Exhibit 6
5 Ridges
Proposed Model Schematic

Prepared By:
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Prepared On: 2/26/2020



Legend

- Detention Basins
- Flow Direction
- Proposed Circular Pipe
- Rectangular Pipe
- Proposed Trapezoidal Ditch
- Irregular Channel
- Orifices
- Proposed Development
- Subcatchments
- Property Boundary
- Page Index

0 300 600 1,200 Feet

Exhibit 7
5 Ridges
Conceptual Drainage Improvements

Prepared By:
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Prepared On: 2/26/2020

Legend

- Detention Basins
- Flow Direction
- Junctions
- Outfalls
- Proposed Development
- Orifices
- Proposed Contour
- Proposed Circular Pipe - Diameter Labeled
- Rectangular Pipe - Dimensions Labeled
- Proposed Trapezoidal Ditch - Depth; Bottom Width Labeled
- Property Boundary
- Subcatchments

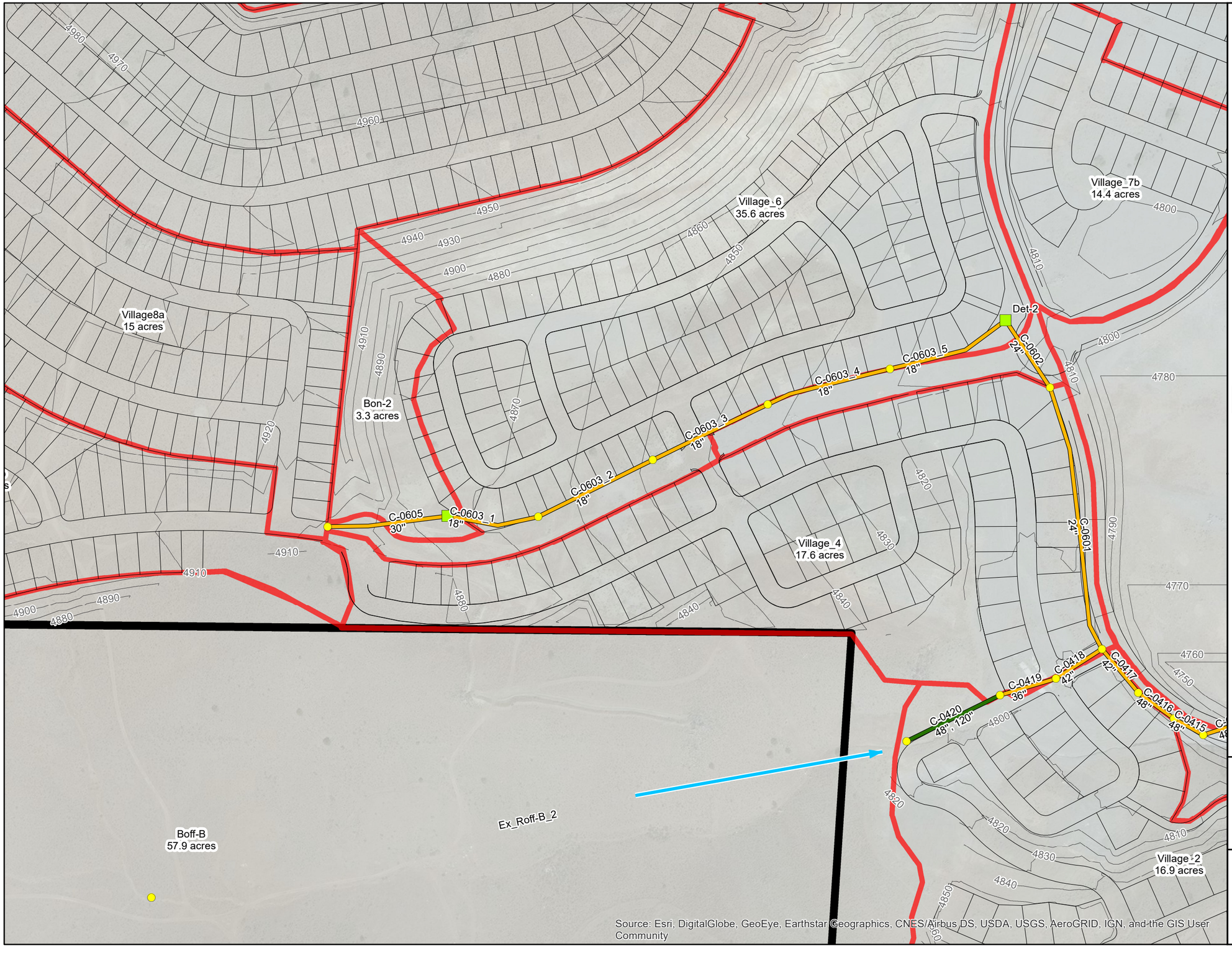
0 75 150 300 Feet

Exhibit 7a
5 Ridges
Conceptual Drainage Plan

Prepared By:
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Prepared On: 2/26/2020

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

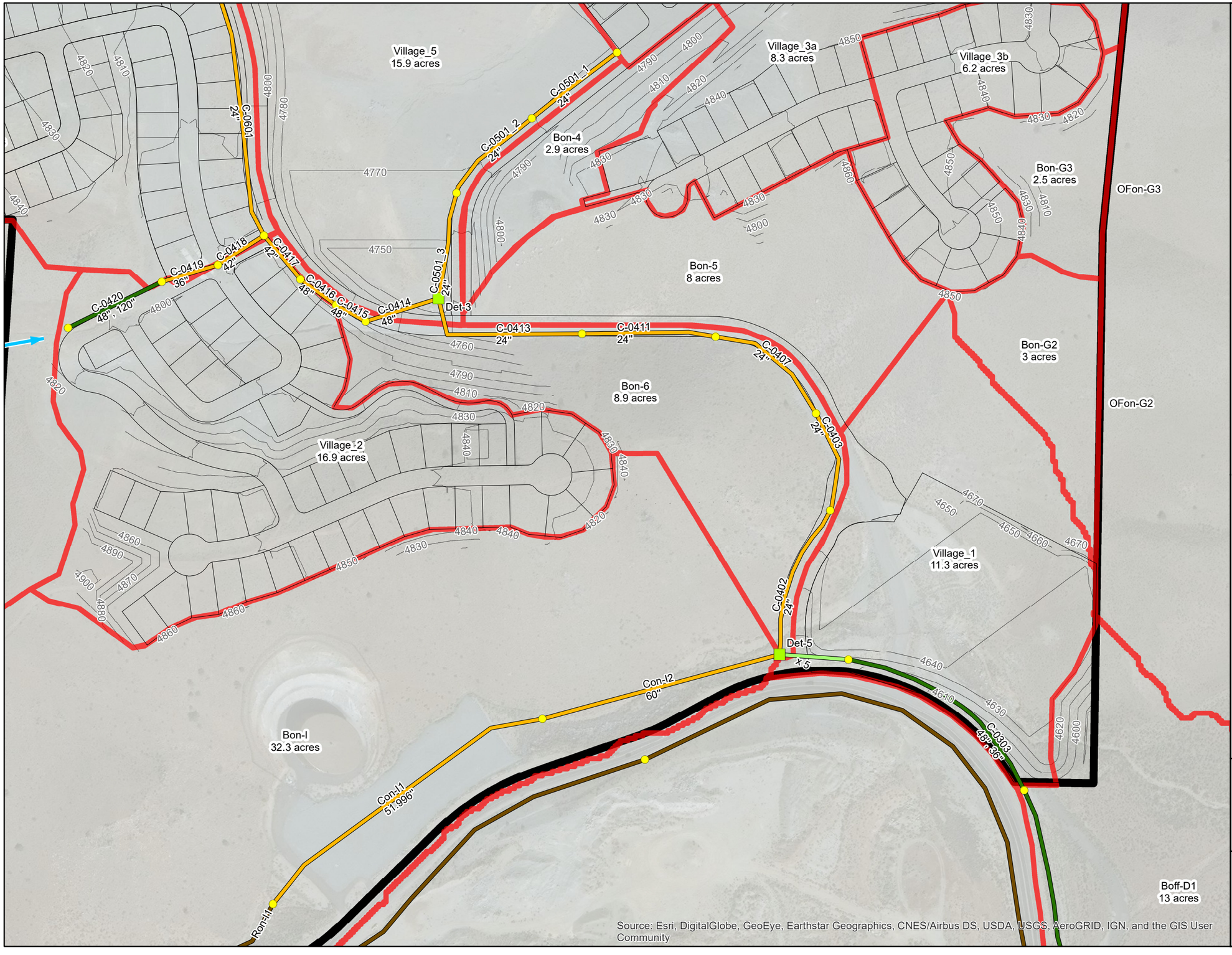
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- Flow Direction
- Junctions
- Outfalls
- Proposed Development
- Proposed Contour
- Proposed Circular Pipe - Diameter Labeled
- Proposed Trapezoidal Ditch - Depth; Bottom Width Labeled
- Property Boundary
- Subcatchments

0 75 150 300
Feet

Exhibit 7b
5 Ridges
Conceptual Drainage Plan

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Prepared On: 2/26/2020



Legend

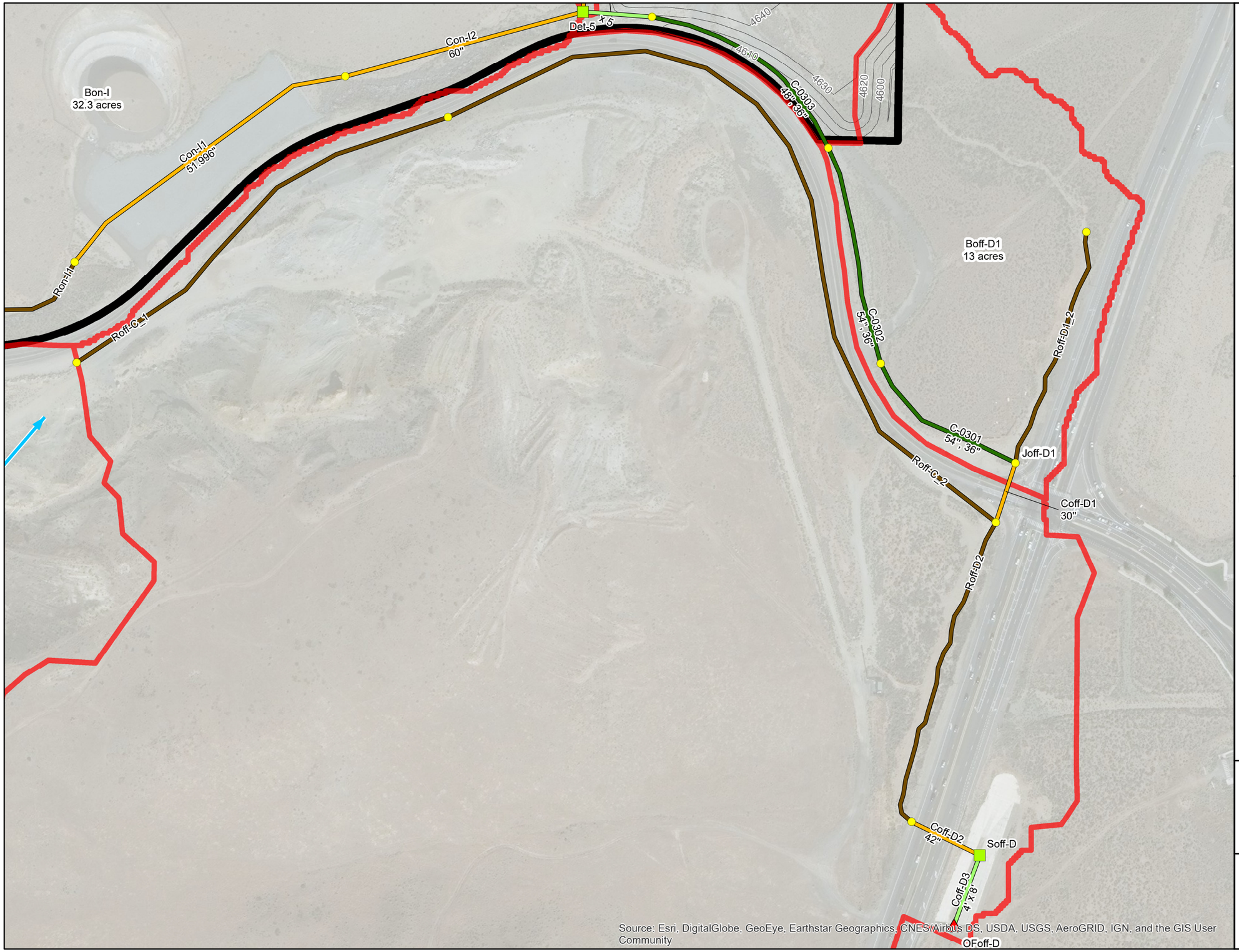
- Detention Basins
- Flow Direction
- Junctions
- Outfalls
- Proposed Development
- Proposed Contour
- Proposed Circular Pipe - Diameter Labeled
- Rectangular Pipe - Dimensions Labeled
- Proposed Trapezoidal Ditch - Depth; Bottom Width Labeled
- Irregular Channel
- Property Boundary
- Subcatchments

0 75 150 300 Feet

Exhibit 7c
5 Ridges
Conceptual Drainage Plan

Prepared By:
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Prepared On: 2/26/2020



Legend

- Detention Basins
- Flow Direction
- Junctions
- Outfalls
- Proposed Development
- Proposed Contour
- Proposed Circular Pipe - Diameter Labeled
- Rectangular Pipe - Dimensions Labeled
- Proposed Trapezoidal Ditch - Depth; Bottom Width Labeled
- Irregular Channel
- Property Boundary
- Subcatchments

0 75 150 300
Feet

Exhibit 7d
5 Ridges
Conceptual Drainage Plan

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Prepared On: 2/26/2020

Appendix B – Model Inputs

Link Emailed to City February 28, 2020

Appendix C – Existing Conditions Results

Link Emailed to City February 28, 2020

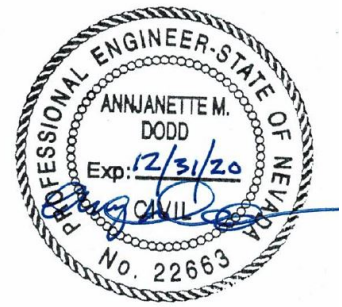
Appendix D – Proposed Conditions Results

Link Emailed to City February 28, 2020

Appendix E – Geotechnical Reports

Link Emailed to City February 28, 2020

5 RIDGES
CONCEPTUAL DRAINAGE REPORT



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FIVE RIDGES

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Revised February 2020

TABLE OF CONTENTS

1 Introduction 4
1.1 5 Ridges Conceptual Drainage Report Purpose 4
1.2 Proposed Project Location and Description 4
1.3 Existing Site Conditions 4
1.4 Previous Studies and Summary of Revisions 4
1.5 Design Criteria 5
2 Existing and Proposed Hydrologic and Hydraulic Conditions 7
2.1 Methods 7
2.2 Existing Hydrologic and Hydraulic Model 7
2.2.1 Subbasin Characterization 7
2.2.2 Precipitation 7
2.2.3 Green and Ampt Parameters 7
2.2.4 Impervious Area and Depression Storage 8
2.2.5 SCS Unit Hydrograph 9
2.2.6 Existing Ditches and Culverts 9
2.2.7 Existing Conditions Model Results 9
2.2.8 Existing Drainage Problems 10
2.3 Proposed Hydrologic and Hydraulic Modeling 10
2.3.1 Subbasin Characterization 10
2.3.2 Precipitation 10
2.3.1 Green and Ampt Parameters 10
2.3.1 Impervious Area and Depression Storage 10
2.3.1 SCS Unit Hydrograph 10
2.3.2 Proposed Ditches and Culverts 11
2.3.3 Proposed Conceptual Drainage Plan 11
2.4 Sediment Retention Basins 13
3 Summary And Notes 14
4 Conclusion 15
5 References 16

APPENDICES

Appendix A – Exhibits
Appendix B – Model Inputs
Appendix C – Existing Conditions Results
Appendix D – Proposed Conditions Results
Appendix E – Geotechnical Reports

TABLES

Table 1. Green and Ampt Parameters
Table 2. Percent Impervious, Directly Connected Impervious Area, and Depression Storage
Table 3. Typical Peak Rate Factors SCS Unit Hydrograph Method (Source: PCSWMM)
Table 4. Existing Peak Flows
Table 5. Summary of Manholes with Drops
Table 6. Existing and Proposed Peak Flows
Table 7. Proposed Conceptual Detention Basin Details
Table 8. Soils Summary Table
Table 9. Estimated Maximum Sediment Yield, per acre, for Undeveloped Shrub/Scrub and Quarry Land Uses near the 5 Ridges Development*

FIGURES

Figure 1. 5 Ridges Proposed Land Use Plan

EXHIBITS

Exhibit 1. Location Map
Exhibit 2. Existing Model Schematic
Exhibit 3. Existing Soil Texture
Exhibit 4. Existing Land Use
Exhibit 5. Proposed Land Use
Exhibit 6. Proposed Model Schematic
Exhibit 7. Conceptual Drainage Plan

1 INTRODUCTION

The 5 Ridges Conceptual Drainage Report has been prepared at the request of 5 Ridges Development, Inc. pursuant to the requirements found in the current Truckee Meadows Regional Drainage Manual (TMRDM), Section 500 - Drainage Planning and Submittal, §504 – Conceptual Drainage Report.

1.1 5 Ridges Conceptual Drainage Report Purpose

The purpose of this 5 Ridges Conceptual Drainage Report is to provide hydrologic and hydraulic analysis to evaluate the adequacy of the proposed storm drainage system concept. The key objectives are to develop a conceptual-level backbone drainage master plan for the proposed 5 Ridges development and determine impacts the new development would have on existing infrastructure. Since this is a planning level analysis, only conceptual-level designs for pipes, channels, and detention facilities are provided. Final design will be conducted at a later date as each phase of the development moves forward in the design process.

1.2 Proposed Project Location and Description

The proposed project is an approximately 387-acre development located in the City of Sparks (City), north of Highland Ranch Parkway and just west of Pyramid Highway (Exhibit 1). The proposed project is defined by ten (10) Villages and is comprised of 1,135 single- and multi-family units (Figure 1).

1.3 Existing Site Conditions

The project area is comprised of a former quarry and open space areas. Approximately 815 acres of offsite drainage area enters the site at two locations from the west (Exhibit 2). The northern section of the project area drains north and the central section drains to the east. The southern portion drains to southeast towards the intersection of Highland Ranch Parkway and Pyramid Highway, where it passes under Highland Ranch Parkway into a ditch that drains into a detention basin on the eastern side of Pyramid Highway.

As shown on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) numbers 32031C3051G and 32031C3032G, the site is in unshaded flood Zone X, area of minimal flood hazard. Base Flood Elevations (BFEs) or flood depths are not provided in Zone X areas.

1.4 Previous Studies and Summary of Revisions

No previous studies are known to exist of this area. A Conceptual Drainage Report of the site was submitted to the City in December 2019, however, modifications to the proposed site layout necessitated revisions be made to the December 2019 Conceptual Drainage Report. The significant revisions are summarized below:

- The detention basin within the park just southwest of Village 7 has been removed.

- The detention basins southwest and southeast of Village 6 and south of Village 5 were increased in size to reduce the peak flow leaving the site. This allowed for the reduction in pipe size and number of drops required to slow the velocity within the pipes to less than 20 feet per second (fps) down the entrance road.
- Consideration for sediment retention has been included in this report.

1.5 Design Criteria

At a minimum, detention should be provided to maintain pre-development conditions for the 5- and 100-year storm events.

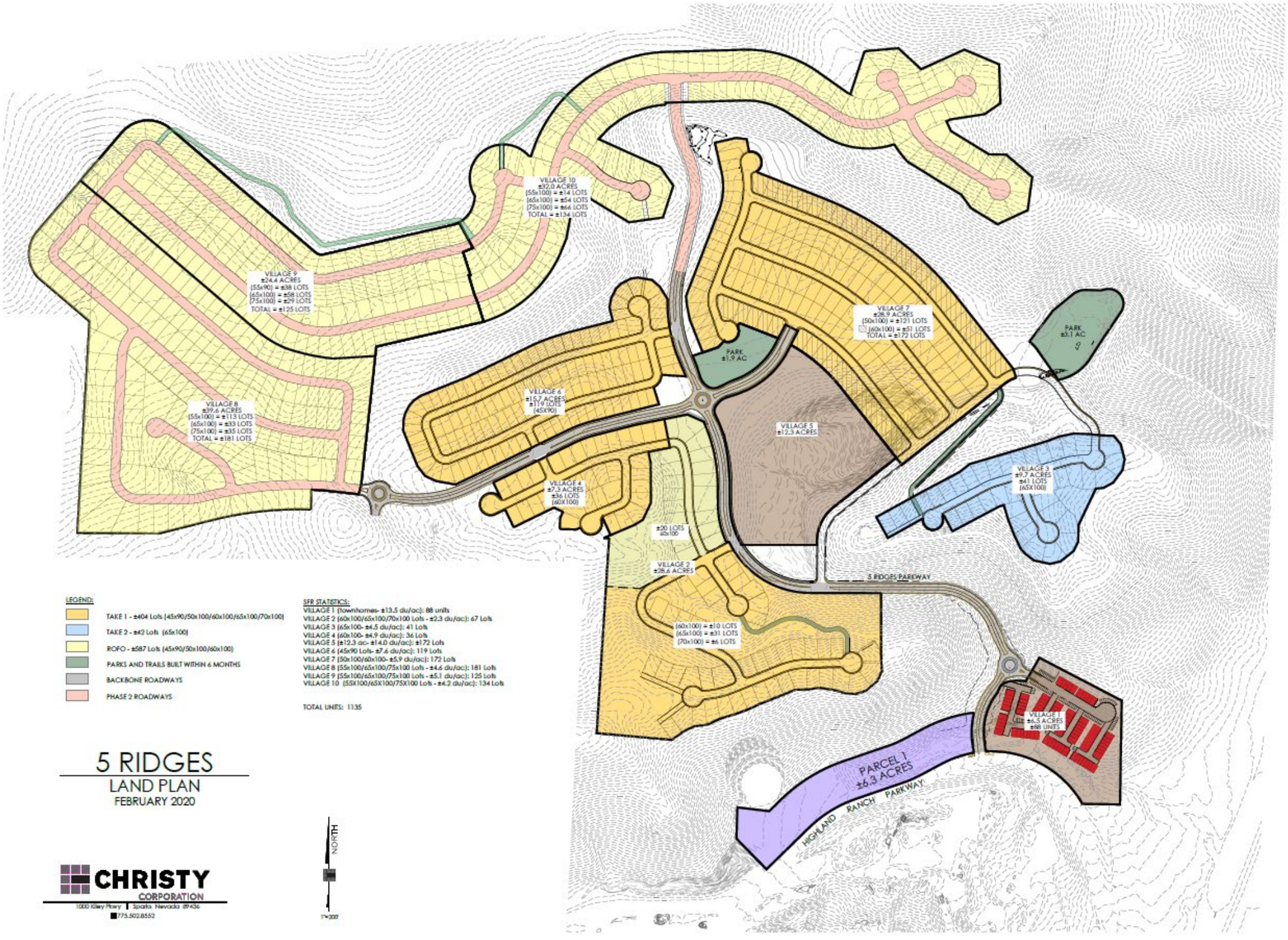


Figure 1. 5 Ridges Proposed Land Use Plan

2 EXISTING AND PROPOSED HYDROLOGIC AND HYDRAULIC CONDITIONS

2.1 Methods

Hydrologic and hydraulic modelling for the proposed project site was conducted using Computational Hydraulics, Inc's (CHI) PCSWMM version 7.2. PCSWMM is an interface used to set up and run the U.S. Environmental Protection Agency (USEPA) Stormwater Management Model (SWMM). SWMM5 is a lumped-parameter, dynamic rainfall-runoff simulation model used for single event (design storms) or long-term (continuous) simulations and has the ability to accurately produce stormwater runoff hydrographs and route them through open and closed stormwater systems. The runoff component of SWMM operates on a collection of subcatchment areas, treated as non-linear reservoirs, that receive precipitation and generate runoff. The routing portion of SWMM transports this runoff through a system of pipes, channels, and detention facilities. SWMM utilizes the dynamic wave method, which solves the one-dimensional Saint-Venant equations for continuity and momentum for model conduits. Dynamic wave routing accounts for channel storage, backwater, entrance/exit losses, flow reversal, and pressurized flow. The models produced for this study utilizes detailed hydrologic methods appropriate for dry, urban regions, such as the City of Sparks in Nevada and includes Green and Ampt Parameter (Suction Head, Conductivity, Initial Deficit) and SCS Unit Hydrographs.

2.2 Existing Hydrologic and Hydraulic Model

Offsite drainage from the west drains onto the site at two locations as shown in Exhibit 2.

2.2.1 Subbasin Characterization

The existing drainage areas are illustrated in Exhibit 2. A total of 16 subbasins were delineated using 2017 Washoe County LiDAR data and aerial imagery. GIS software was used to aid in the basin delineation and development of model input parameters, such as subbasin area, Green and Ampt infiltration parameters, and directly connected impervious area. GIS layers representing subbasin boundaries, soil data, and land use data were used to calculate area-weighted averages for each desired parameter for each subbasin.

2.2.2 Precipitation

The model was used to estimate the 5-, 10-, 25-, 50-, and 100-year, 24-hour storm events. Rainfall for the storm events was developed using NOAA Atlas 14 precipitation (Appendix B). A balanced storm rainfall hydrograph was generated using PCSWMM.

2.2.3 Green and Ampt Parameters

Soil data was obtained from the Natural Resources Conservation Service (NRCS) Soil Survey Geographic (SSURGO) Database. GIS shapefiles for soils were compiled from the soil surveys for the project area. There are four (4) soil textures within the study area. The dominant soil texture is sandy loam. Soil Textures and associated Green and Ampt parameters are summarized in Exhibit 3 and Table 1.

Table 1. Green and Ampt Parameters

Soil Texture	Conductivity Ksat (in/hr)	Initial Deficit	Suction Head (in)
Clay	0.306	0.385	12.50
Loam	0.26	0.27	3.5
Loamy coarse sand	1.18	0.13	2.41
Sandy loam	0.43	0.21	4.33

2.2.4 Impervious Area and Depression Storage

Adjustments were made to alter the percent impervious to only account for directly connected impervious area (DCIA). Empirical formulas developed by Sutherland (2000) and reported in the Small MS4 Permit Technical Support Document (EPA, 2014) were used to convert the percent impervious to DCIA. This adjustment was made for industrial and residential land uses

Directly connected impervious area and depression storage values were estimated based on the land use (Exhibit 4) and average directly connected impervious area provided in the NRCS Technical Release 55 (NRCS, 1986). The directly connected impervious area impervious and depression storage values are summarized in Table 2.

Table 2. Percent Impervious, Directly Connected Impervious Area, and Depression Storage

Land Use	% Impervious	% Directly Connected Impervious Area	Depression Storage (in)
Desert Shrub Poor	0	0	0.20
1/8 acre or less Residential	65	60	0.05
1/6 acre Residential	50	44	0.08
1/4 acre Residential	38	23	0.10
1/3 acre Residential	30	16	0.10
1 acre Residential	20	3	0.15
2 acre Residential	12	7	0.15
Open Space	0	0	0.20
Quarry	0	0	0.20
Industrial	72	61	0.10
Impervious	98	98	0.05
Detention Pond	98	98	0.05
Park	0	0	0.20

2.2.5 SCS Unit Hydrograph

Time of concentration was calculated using USDA's TR-55 for sheet flow (or overland flow), shallow concentrated, and channel flow. Time of concentration calculations can be found in Appendix B. PCSWMM provides a table of values (Table 3) for the SCS Unit Hydrograph peak rate factor, a value of 300 is recommended for rural areas with rolling hills and was used here to represent existing conditions hydrology for natural areas and slopes less than 10%.

Table 3. Typical Peak Rate Factors SCS Unit Hydrograph Method (Source: PCSWMM)

General Description	Peak Rate Factor
Urban areas; steep slopes	550-600
Typical SCS	484
Mixed urban/rural	400
Quarry/Undeveloped Slopes > 10%	350
Rural, rolling hills	300
Rural, slight slopes	200
Rural, very flat	100

2.2.6 Existing Ditches and Culverts

Invert and rim elevations of the existing culverts were surveyed by Christy Corporation, LTD. Existing ditch cross sections were estimated from the LiDAR data. A Manning's *n* value of 0.04, 0.024, and 0.013 was used for ditches, CMPs, and RCPs, respectively.

2.2.7 Existing Conditions Model Results

Existing flows were determined for the 5-, 10-, 25-, 50-, and 100-year, 24-hour storm events. The peak flows for these events are summarized in Table 4 at each location where flows leave the project area as shown on Exhibit 2. Model results are provided in Appendix C.

Table 4. Existing Peak Flows

Outfall	Peak Flows (cfs)				
	5-year	10-year	25-year	50-year	100-year
OFon-A	8	12	18	25	32
OFon-B	15	21	33	45	58
OFon-C	6	8	13	18	23
OFon-D	8	11	18	24	31
OFon-G	22	34	56	78	105
Joff-D1	104	153	240	329	431

2.2.8 Existing Drainage Problems

Offsite flows from the west (subbasins Boff-A and Boff-C2) flow towards the northeast, via an existing ditch and 52-inch RCP along the northside of Highland Ranch Parkway, towards the existing entrance road to the old quarry. There are three (3) 12-inch CMPs under the existing entrance road. The CMPs are undersized. The model shows the flows overtopping the existing entrance road during the 5- through 100-year storm events.

The flow travels towards the five (5) existing 30-inch RCPs under Highland Ranch Parkway at the intersection with Pyramid Highway, under Highland Ranch Parkway into a ditch and then into an existing detention basin, via a 42-inch CMP, on the eastern side of Pyramid Highway (Exhibit 2). The model shows that Highland Ranch Parkway overtops during the 50- and 100-year storm events and the 42-inch CMP is undersized.

2.3 Proposed Hydrologic and Hydraulic Modeling

2.3.1 Subbasin Characterization

The proposed drainage areas and model layout of the backbone system were designed based on proposed grading and land use provided by Christy Corporation, LTD (Exhibits 6 and 7). The proposed drainage system has been designed to mimic existing flow directions where possible. Under proposed conditions, the drainage generally flows south and east into detention ponds throughout the site. The purpose of the detention ponds is to detain the proposed flows to mitigate increases in runoff due to the development.

Under proposed conditions, the developed portions of subbasins Bon-A, Bon-B, Bon-C, and Bon-D (Exhibit 2) will be graded so that runoff no longer flows offsite to the north and will be directed to the east and south into the detention basin located to the northeast of Village 7 (Exhibit 7). Thus, the peak flows leaving these subbasins will be less under proposed conditions for all storm events. The majority of Bon-E will be graded so that runoff no longer flows offsite to the south and will be directed to the east into the detention basin located to the west of Village 6 (Exhibit 7). Thus, the peak flows leaving Bon-E will be less under proposed conditions for all storm events.

2.3.2 Precipitation

See section 2.2.2.

2.3.1 Green and Ampt Parameters

See section 2.2.3.

2.3.1 Impervious Area and Depression Storage

See Section 2.2.4. Proposed land uses are summarized in Exhibit 5.

2.3.1 SCS Unit Hydrograph

Time of concentration was calculated using USDA's TR-55 for sheet flow (or overland flow), shallow concentrated, and channel flow. A minimum time of concentration of 15 minutes was

used for all proposed developed subbasins. A peak rate factor of 450 was used to represent the developed areas, on rolling hill type slopes.

2.3.2 Proposed Ditches and Culverts

Ditches were modeled with trapezoid cross sections, bottom widths of 4 and 4.5-feet, 2:1 side slopes, and depths ranging between 2- and 5-feet. To minimize the potential for erosion, rip-rap lining is recommended for all proposed ditches.

The majority of the proposed culverts were modeled as RCPs ranging between 18- and 48-inches in diameter, with a minimum diameter of 18-inches. Two locations were modeled using rectangular culverts, from Village 3 and Village 7 to Detention Basin #4 and from Detention Basin #6, routing flows under the entrance road.

Manning's *n* value of 0.013 was used for RCPs and 0.045 for all proposed, rip-rap lined ditches.

2.3.3 Proposed Conceptual Drainage Plan

The majority of flows within the site are routed through proposed detention basins as discussed below. Open ditches were designed to allow for 1-foot of freeboard during the 100-year event. The conceptual system was designed such that the maximum velocity within proposed culverts does not exceed 20 feet per second (fps). This is accomplished with a series of drop (or "step down") manholes. A summary of the manholes with drops is provided in Table 5. Refer to Appendix D for model results and Junction locations.

Table 5. Summary of Manholes with Drops

Junction ID	Inflow Pipe Diameter (in)	Drop from Inver of Inflow to Outflow (ft)	Outflow Pipe Diameter (in)	Manhole Height (ft)	Maximum Inflow Velocity (fps)
J-0417	42	2	42	8	14.4
	24	4			12.4
J-0414	48	1	48	8	17.6
J-0411	24	2	24	6	14.7
J-0407	24	2	24	6	18.4
J-0403	24	4	24	8	19.1
J-0402	24	4	24	8	19.1
J-0601	24	7	24	11	12.1
J-0811	48	6.5	42	15	15.4
J-0810	42	9.5	42	15	17.9
J-0809	42	9	42	15	18.5
Jon-I2	52 (existing pipe)	4	60	12.33	20.3*

*The existing conditions 100-year velocity in this pipe is 21.2 fps

The proposed system will outlet at three locations: at the existing outlet east of Village 7 (OFon-G, Exhibit 7a), at the outlet on Highland Ranch Parkway (J-0303, Exhibit 7c), and at the southern corner of Village 1 (J-0302, Exhibit 7c). The existing and proposed peak flows at these locations and at the culverts located to the north of the intersection of Highland Ranch Parkway and Pyramid Highway (Joff-D1) are summarized in Table 6.

Since the project will be constructed in phases and Phase I excludes Village 8, the site was modeled to verify that Detention Basin #5 has the ability to detain the undeveloped portion of Village 8, which currently routes through Boff-B. Under full buildout, runoff from Village 8 will be routed through Detention Basin #1, located to the east of Village 8. Runoff from Village 6 and a small portion of Village 10 will be routed through Detention Basin #2, located to the southeast of Village 6. Village 3, Village 7, Village 9, and most of Village 10 will be routed through Detention Basin #4, located to the east of Village 7. Runoff from Villages 2, 4, and 5 will be routed through Detention Basin #3, located to the south of Village 5. Detention basin details are summarized in Table 7 The conceptual drainage plan is summarized on Exhibits 6 through 7d. Model results are provided in Appendix D.

Runoff is routed in a combination of RCPs and trapezoidal ditches. Due to the site soils and slopes, rip-rap, or similar, is recommended in the ditches when velocities exceed 2.0 fps. Rip-rap sizing should follow Section 805.5.5 of the Truckee Meadows Regional Drainage Manual.

For conservativeness, it is assumed that the detention basin infiltration rates will be limited. A Soils Site Exploration was conducted by Black Eagle Consulting, Inc on July 5, 2018 which covered the area within the property boundary. The results of the exploration indicate shallow bedrock over the majority of the site. See Table 8 for a summary of soil exploration findings near proposed detention pond locations. The location for Detention Basin #5 is outside the property boundary, the soil exploration data is unavailable. Infiltration tests are recommended to estimate actual infiltration rates at each detention basin location.

Table 6. Existing and Proposed Peak Flows

Existing Peak			Proposed Peak [Phase I Peak]		
Location	**5-Year (cfs)**	**100-Year (cfs)**	**Location (cfs)**	**5-Year (cfs)**	**100-Year (cfs)**
OFon-G	22	105	OFon-G	10 [10]	28 [28]
J3	102	418	J-0303	100 [100]	312 [312]
N/A	N/A	N/A	J-0302	101 [101]	313 [314]
Joff-D1	104	431	Joff-D1	104 [103]	321 [321]

Table 7. Proposed Conceptual Detention Basin Details

Detention Basin	Invert Elev. (ft)	Depth (ft)	Bottom Area (ft^2)	Surface Area (ft^2)	Approximate Available Volume (acre-ft)	Maximum % Full (100-Year Event)	100-Year Freeboard (ft)
Det-1	4874	4	31,500	38,500	3.2	71	1.1
Det-2	4806	10	5,370	12,400	2.0	84	1.2
Det-3	4738	16	17,100	38,200	10.0	83	2.0
Det-4	4780	10	62,290	85,420	17.1	58	3.8
Det-5	4620	10	3,200	9,356	1.4	76	1.7

Table 8. Soils Summary Table

Test Pit ID	Surface Soil Type[1]	Majority Soil[1]	Depth to Bedrock (ft)[1]	Associated Detention Pond
TP-01	Poorly Graded Sand with Silt and Gravel	Poorly Graded Sand with Silt and Gravel	5	Detention Basin 1
TP-07	Silty Sand with Gravel	Silty Sand with Gravel	3	Detention Basin 2
TP-09	Poorly Graded Sand with Silt and Gravel	Poorly Graded Sand with Silt and Gravel	14	Detention Basin 2
TP-15	Poorly Graded Sand with Gravel	Silt with Sand	>20	Detention Basin 3
TP-36	Clayey Sand with Gravel	Clayey Sand with Gravel	>20	Detention Basin 4
TP-37	Poorly Graded Sand with Gravel	Poorly Graded Sand with Gravel	>20	Detention Basin 4

[1]Data Summarized from Site Exploration Data Highland Ranch Subdivision (the Quarry)

2.4 Sediment Retention Basins

The City has had problems with sediment accumulation along Highland Ranch Parkway and Pyramid Highway and has requested sediment retention be addressed in this report. The undeveloped areas contributing to sediment are represented by shrub/scrub and former quarry areas with unvegetated surfaces; with the majority contribution being from previously disturbed quarry areas (House Moran, 2020).

Sediment retention basins are recommended to control sediment erosion during construction. Developed areas with established landscape tend to have low sediment yields. Thus, the potential sediment yield is expected to decrease as the development is completed and landscape has been established.

During construction, temporary sediment detention basins, located down gradient of all proposed grading activities, are recommended to capture and detain sediment laden runoff, for a sufficient length of time to allow it to settle out in the basin. The exact location and size of the temporary sediment detention basins will be dependent on the grading schedule. However, permanent

Detention Basins #1 through #4 are recommended as temporary sediment basins as long as the outlets are protected, since, the outlet inverts are set at the bottom of each basin.

The Truckee Meadows Regional Storm Water Quality Management program Construction Site Best Management Practices Handbook (Handbook) provides design and maintenance requirements for sediment retention basins to retain sediment during construction. The NRCS Conservation Practice Standard #350 – Sediment Basin provides additional guidance (NRCS Nevada, 2016). Per the Handbook, the construction sediment retention basin should provide storage for either the calculated volume of runoff from the 2-year, 24-hour storm event for each disturbed acre drained, or 3,600 ft^3/acre drained.

As part of a pilot study conducted for the City, House Moran estimated sediment yield to the detention basin on Pyramid Highway (House Moran, 2020). The maximum potential sediment yield, for undeveloped quarry conditions, is summarized in Table 9 for the 2- through 100-year events. The sediment yields in Table 9 represent the maximum estimated using the results of the pilot study to account for disturbed soil during grading activities. The estimated maximum onsite runoff volume for the 2-year event, using the Existing Conditions PCSWMM model, is approximately 600 ft^3/acre.

Table 9. Estimated Maximum Sediment Yield, per acre, for Undeveloped Shrub/Scrub and Quarry Land Uses near the 5 Ridges Development*

Sediment Yield (ft^3/acre)				
2-Year	**10-Year**	**25-Year**	**50-Year**	**100-Year**
230	330	470	611	779

3 SUMMARY AND NOTES

- Under existing conditions, flow overtops the existing quarry entrance road during the 5- through 100-year storm events.
- Detention has been provided such that the post-development flows do not exceed the pre-development flows for the 5-year and 100-year events (Table 6). The 100-year post-development flow at Highland Ranch Parkway and Pyramid Highway (Joff-D1) is about 100 cfs less than the 100-year pre-development flow at this location.
- All proposed detention basins have a minimum freeboard of 1-foot. During the 100-year event, the basins are between 74% and 81% full.
- To achieve a velocity of less than 20 fps within the proposed RCPs with steep slopes, drops are required along the entrance road both upstream and downstream of Detention Basin #4 and to connect the runoff from Villages 9 and 10 to the ditch northeast of Village 7.
- The slope of the outflow pipe from Detention Basin #2 has been set to optimize the detention of this basin while still maintaining freeboard requirements.

- An orifice outlet of 1-foot was used to increase the detention in Detention Basin #4.
- Ditches have been sized to allow for 1-foot of freeboard. 100-year velocities in the ditches range between 5.4 fps and 11.5 fps. Rip-rap protection is required in all open ditches to protect from erosion.
- During construction, temporary sediment detention basins, located down gradient of all proposed grading activities, are recommended to capture and detain sediment. It is recommended that the proposed detention basins be used as temporary sediment retention basins to retain from disturbed areas and then converted to permanent detention basins following construction. The Truckee Meadows Regional Storm Water Quality Management program Construction Site Best Management Practices Handbook (Handbook) provides design and maintenance requirements for sediment retention basins to retain sediment during construction.

4 CONCLUSION

The 5 Ridges Conceptual Drainage Report has been developed to support the 5 Ridges Development, Inc. pursuant to the requirements found in the current Truckee Meadows Regional Drainage Manual (TMRDM), Section 500 - Drainage Planning and Submittal, §504 – Conceptual Drainage Report. Onsite and offsite hydrologic and hydraulic modeling has been conducted to develop a conceptual level drainage system and evaluate the impacts the proposed project has on existing infrastructure.

It has been demonstrated that the project can be developed in accordance with the requirements of the Truckee Meadows Regional Drainage Manual (TMRDM). The conceptual drainage system is designed to convey and detain the storm flows per the TMRDM.

Note, since this is a conceptual level analysis, only planning level pipe, inlet geometry, and storage basin design is provided here. Final design will be conducted at a later date as each development moves forward in the design process.

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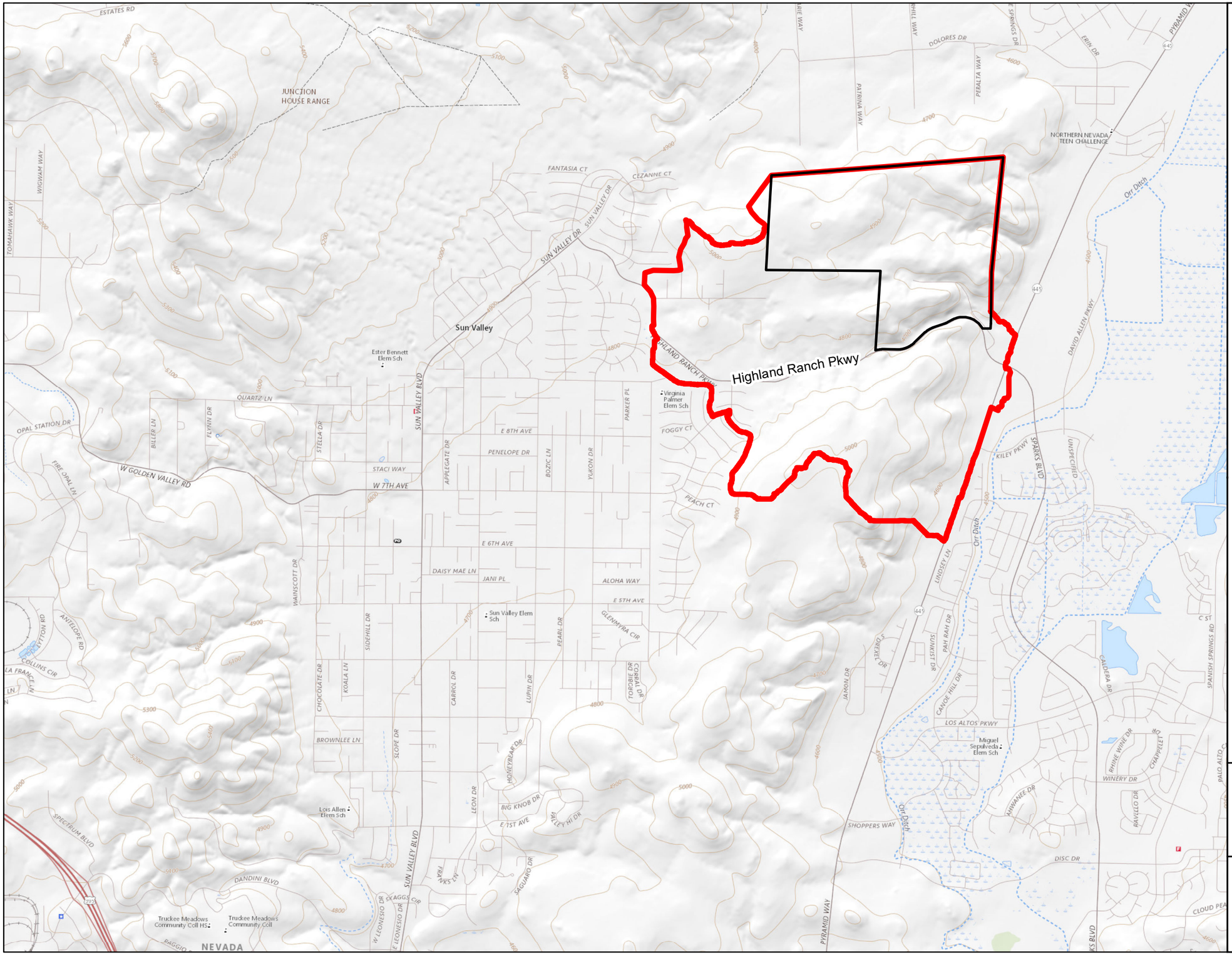
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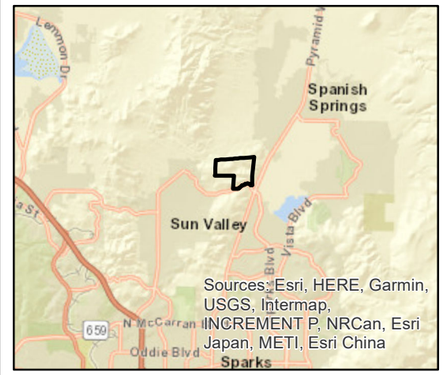
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Appendix A – Exhibits





Legend

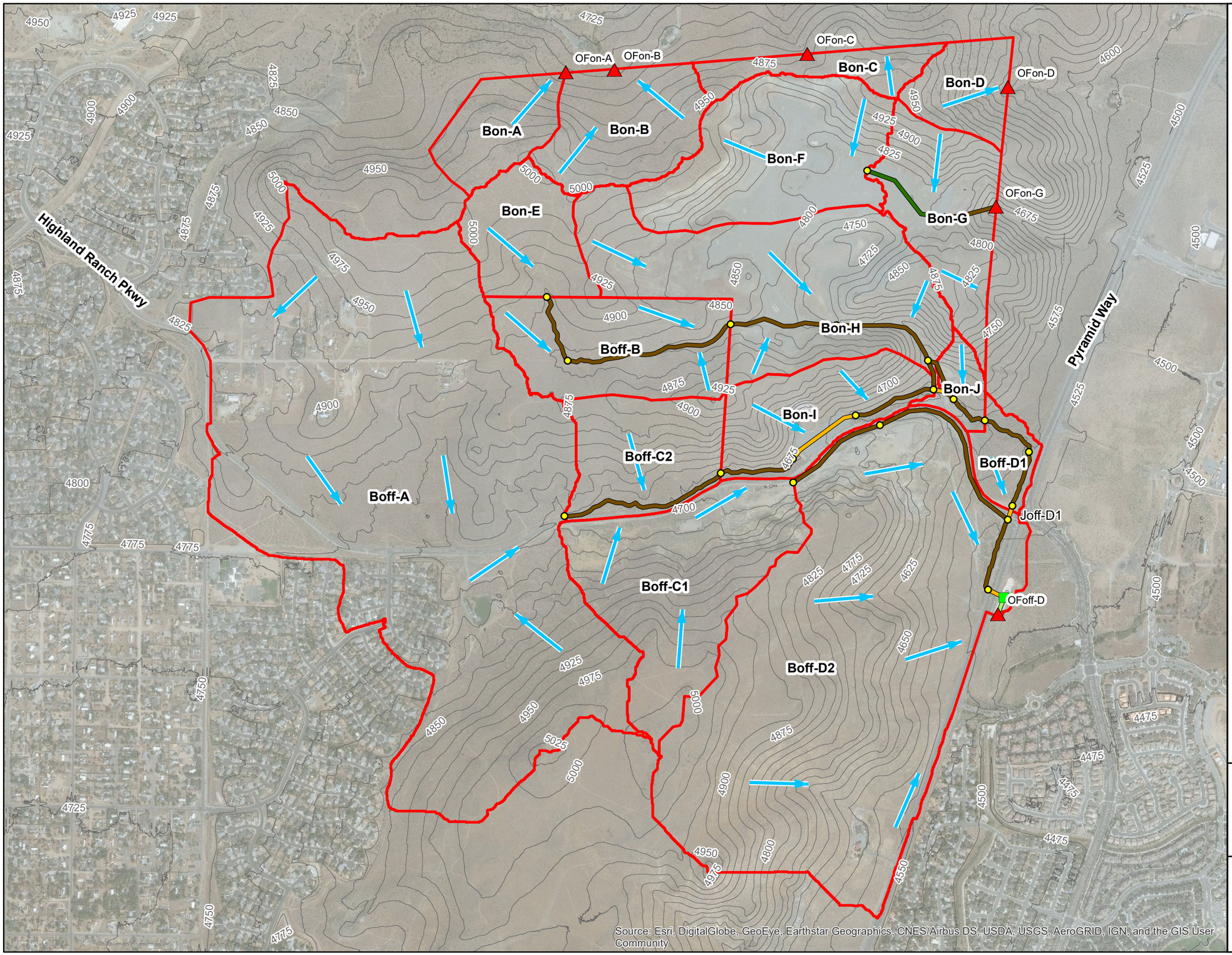
- Property Boundary
- Model Area

0 875 1,750 3,500 Feet

Exhibit 1
5 Ridges
Location Map

Prepared By:
House Moran Consulting, Inc.
10399 Double R Boulevard Suite 110
Reno, NV 89521
Office: (775) 293-4000

Prepared On: 12/18/2019



Legend

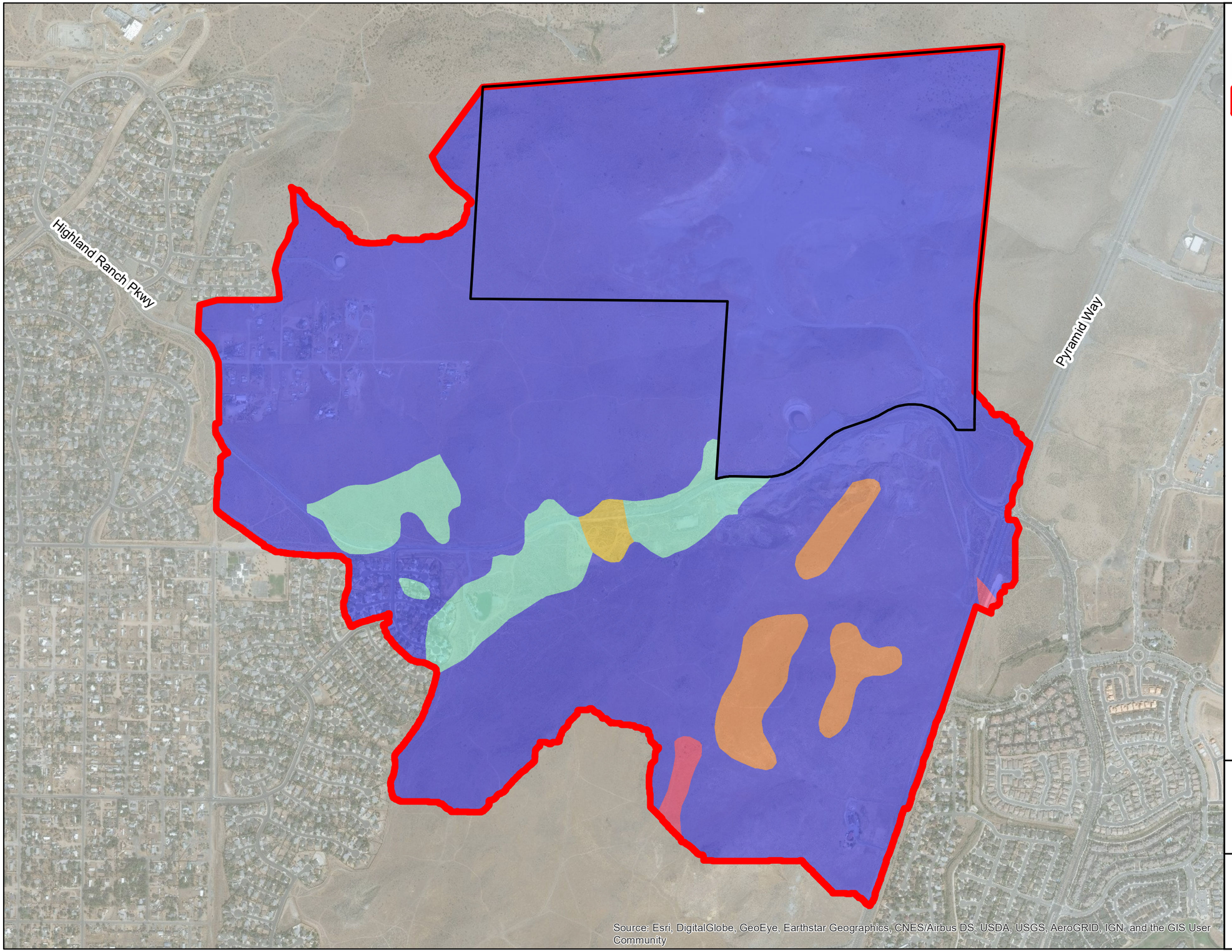
- Junctions
- Outfalls
- Detention Basins
- Flow Direction
- Circular Pipe
- Rectangular Pipe
- Trapezoidal Ditch
- Irregular Ditch

0 375 750 1,500 Feet

Exhibit 2
5 Ridges
Existing Model Schematic

Prepared By:
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10399 Double R Boulevard Suite 110
Reno, NV 89521
Office: (775) 293-4000

Prepared On: 2/26/2020



Legend

- Property Boundary
- Model Area

Soil Texture

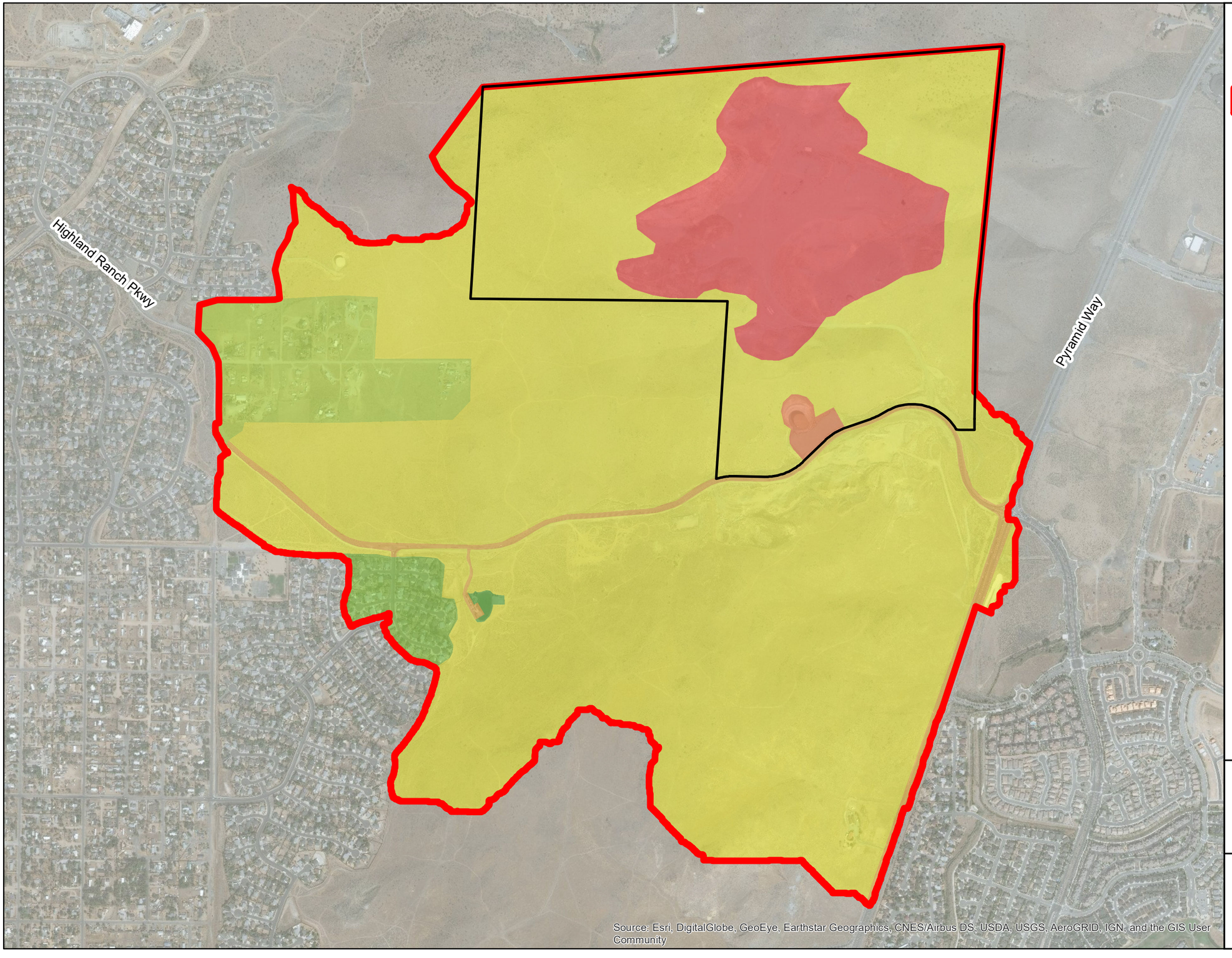
- No Data
- Clay
- Loam
- Loamy coarse sand
- Sandy loam

0 375 750 1,500
Feet

Exhibit 3
5 Ridges
Soil Texture

Prepared By:
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Office: (775) 293-4000

Prepared On: 12/22/2019



Legend

- Property Boundary
- Model Area

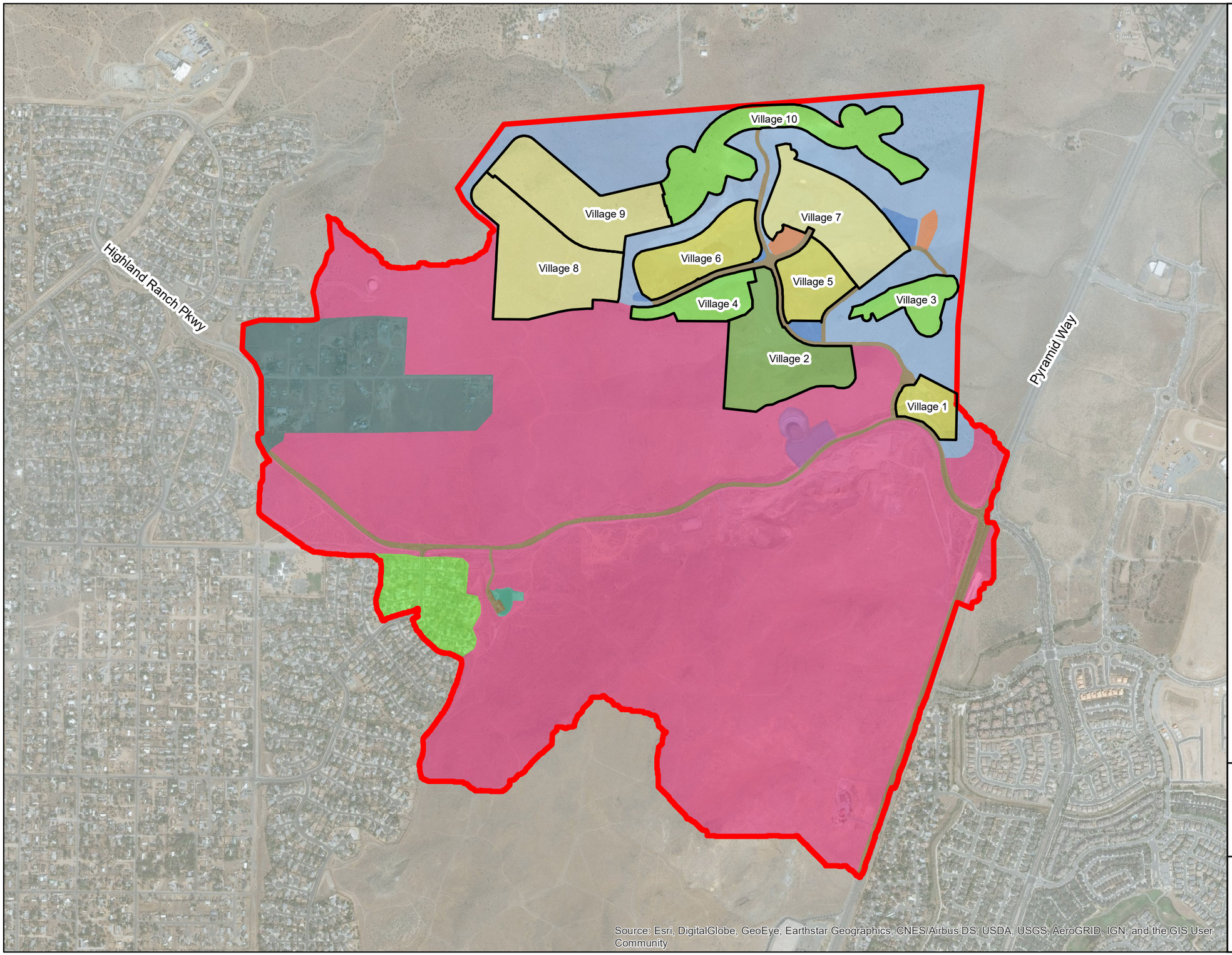
Land Use

- 1 acre Residential
- 1/4 acre Residential
- 2 acre Residential
- Desert Schrub Poor
- Impervious
- Industrial
- Quarry

0 375 750 1,500
Feet

Exhibit 4
5 Ridges
Existing Land Use

Prepared By:
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Prepared On: 12/22/2019



Legend

- Village Boundary
- Model Area

Land Use

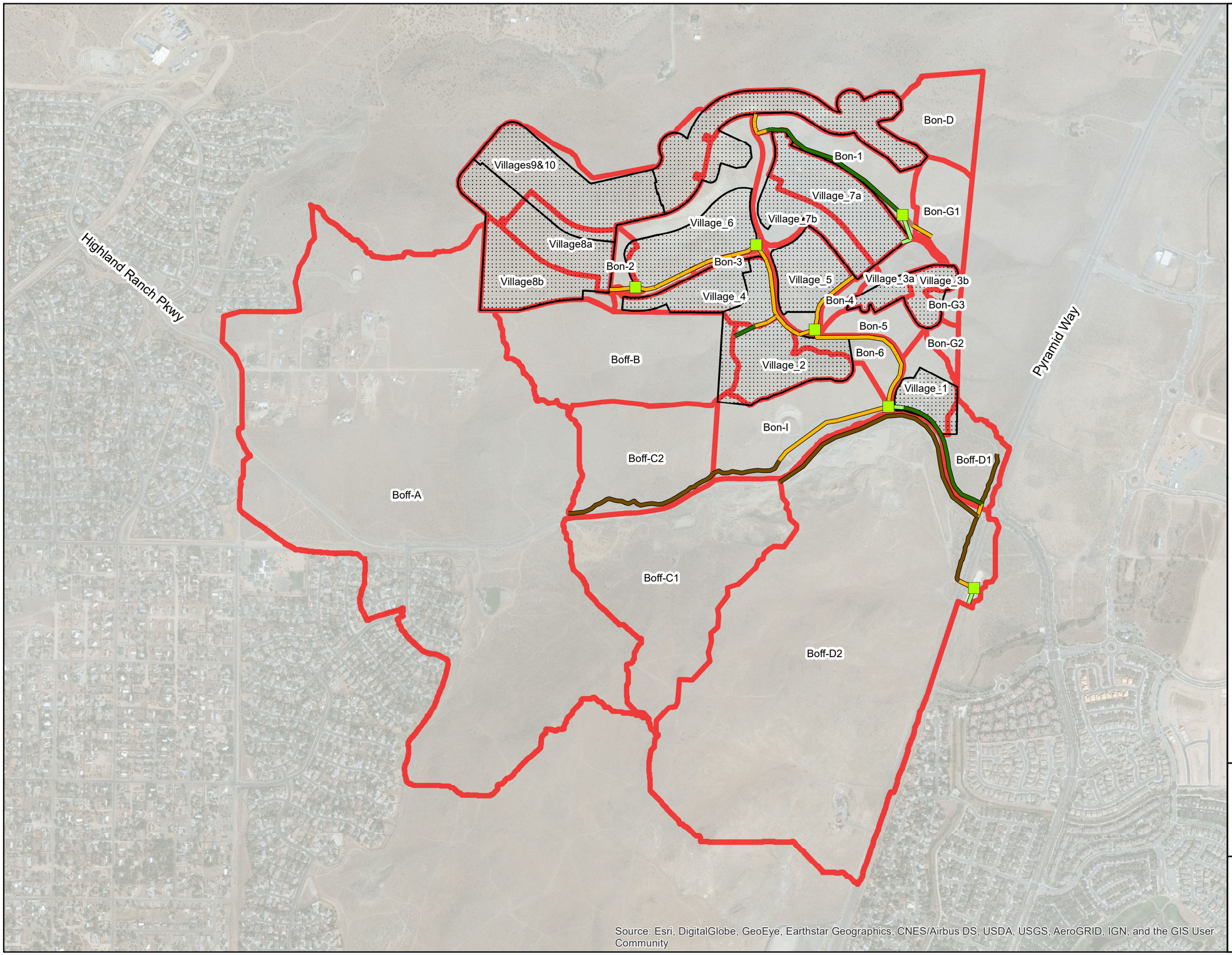
- 2 acre Residential
- 1 acre Residential
- 1/3 acre Residential
- 1/4 acre Residential
- 1/6 acre Residential
- 1/8 acre Residential
- Industrial
- Impervious
- Desert Schrub Poor
- Open Space Good
- Detention Basin
- Park

0 375 750 1,500 Feet

Exhibit 5
5 Ridges
Proposed Land Use

Prepared By:
House Moran Consulting, Inc.
10399 Double R Boulevard Suite 110
Reno, NV 89521
Office: (775) 293-4000

Prepared On: 12/18/2019



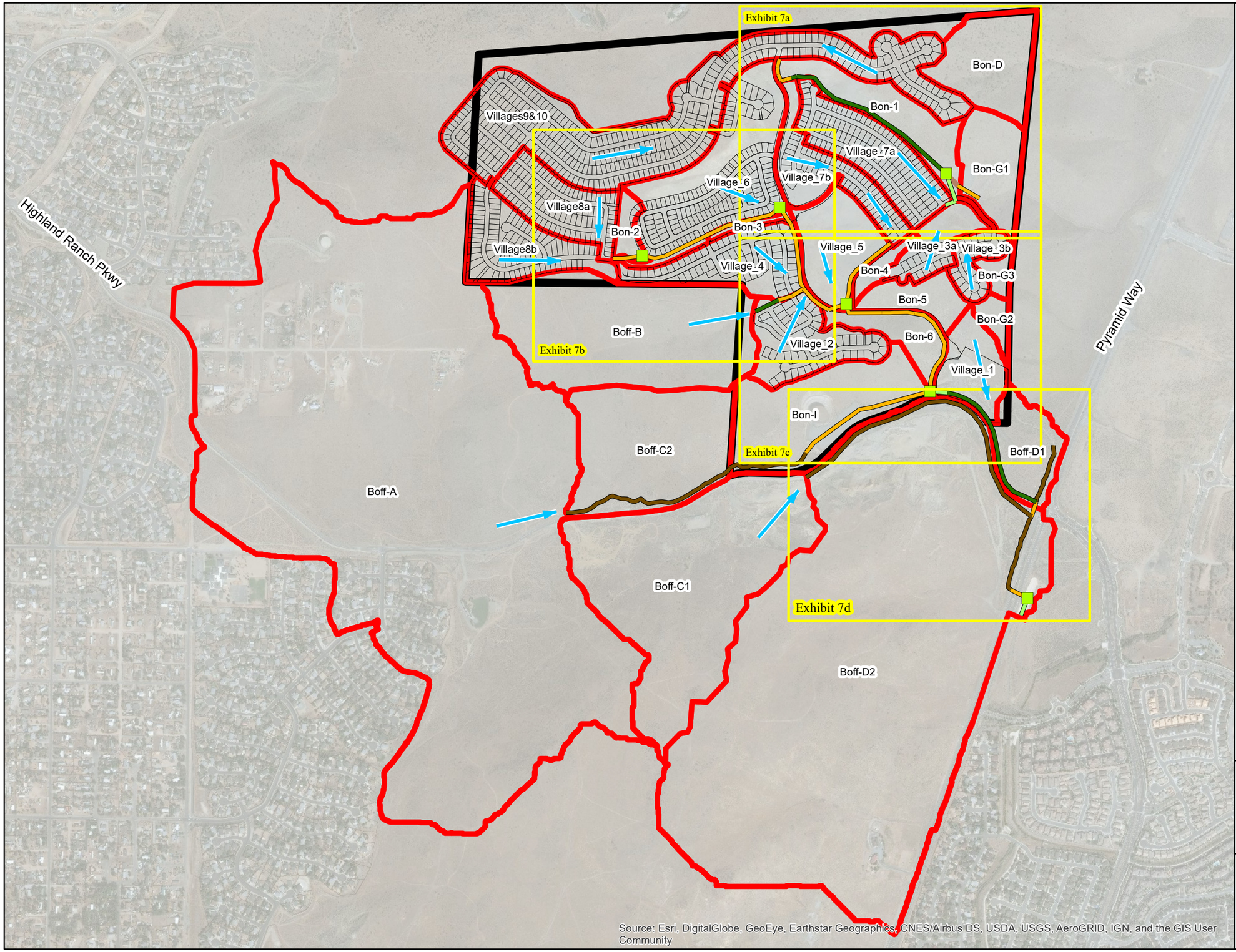
Legend

- Detention Basins
- Proposed Circular Pipe
- Rectangular Pipe
- Proposed Trapezoidal Ditch
- Irregular Channel
- Orifices
- Village Boundary
- Subcatchments

0 295 590 1,180
Feet

Exhibit 6
5 Ridges
Proposed Model Schematic

Prepared By:
House Moran Consulting, Inc.
10399 Double R Boulevard Suite 110
Reno, NV 89521
Office: (775) 293-4000
Prepared On: 2/26/2020



Legend

- Detention Basins
- Flow Direction
- Proposed Circular Pipe
- Rectangular Pipe
- Proposed Trapezoidal Ditch
- Irregular Channel
- Orifices
- Proposed Development
- Subcatchments
- Property Boundary
- Page Index

0 300 600 1,200 Feet

Exhibit 7
5 Ridges
Conceptual Drainage Improvements

Prepared By:
House Moran Consulting, Inc.
10399 Double R Boulevard Suite 110
Reno, NV 89521
Office: (775) 293-4000

Prepared On: 2/26/2020

Legend

- Detention Basins
- Flow Direction
- Junctions
- Outfalls
- Proposed Development
- Orifices
- Proposed Contour
- Proposed Circular Pipe - Diameter Labeled
- Rectangular Pipe - Dimensions Labeled
- Proposed Trapezoidal Ditch - Depth; Bottom Width Labeled
- Property Boundary
- Subcatchments

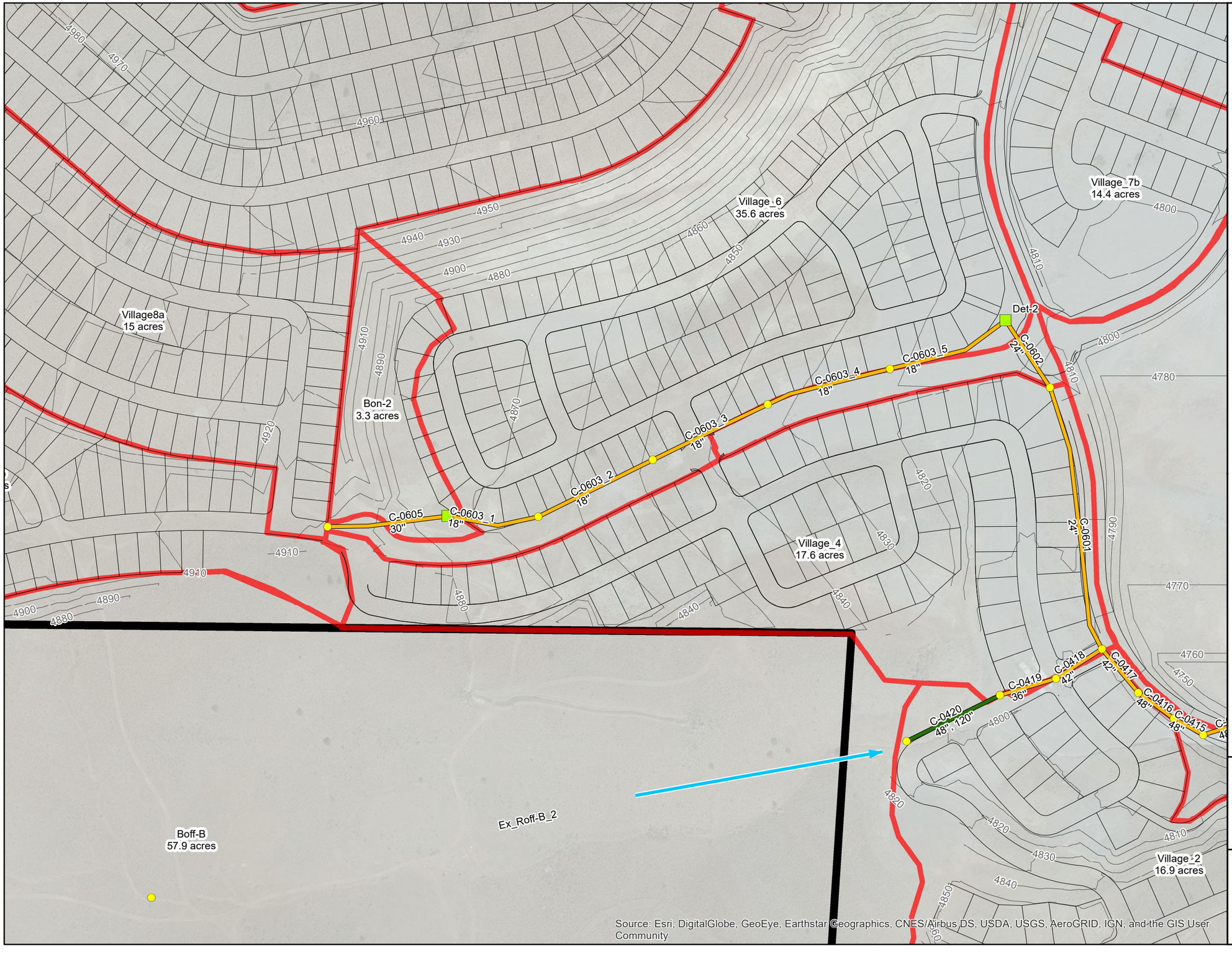
0 75 150 300 Feet

Exhibit 7a
5 Ridges
Conceptual Drainage Plan

Prepared By:
House Moran Consulting, Inc.
10399 Double R Boulevard Suite 110
Reno, NV 89521
Office: (775) 293-4000

Prepared On: 2/26/2020

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

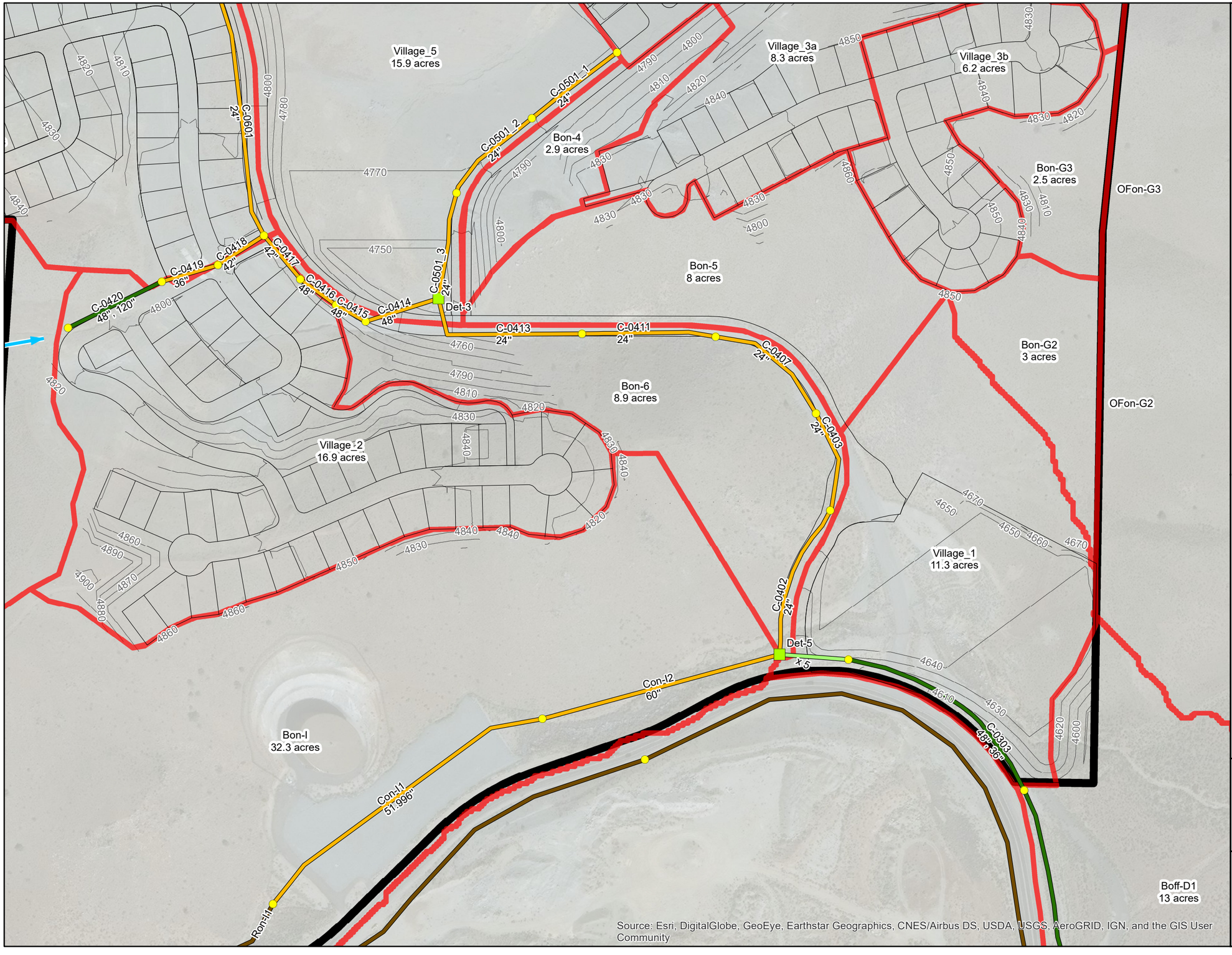
- Detention Basins
- Flow Direction
- Junctions
- Outfalls
- Proposed Development
- Proposed Contour
- Proposed Circular Pipe - Diameter Labeled
- Proposed Trapezoidal Ditch - Depth; Bottom Width Labeled
- Property Boundary
- Subcatchments

0 75 150 300
Feet

Exhibit 7b
5 Ridges
Conceptual Drainage Plan

Prepared By:
House Moran Consulting, Inc.
10399 Double R Boulevard Suite 110
Reno, NV 89521
Office: (775) 293-4000

Prepared On: 2/26/2020



Legend

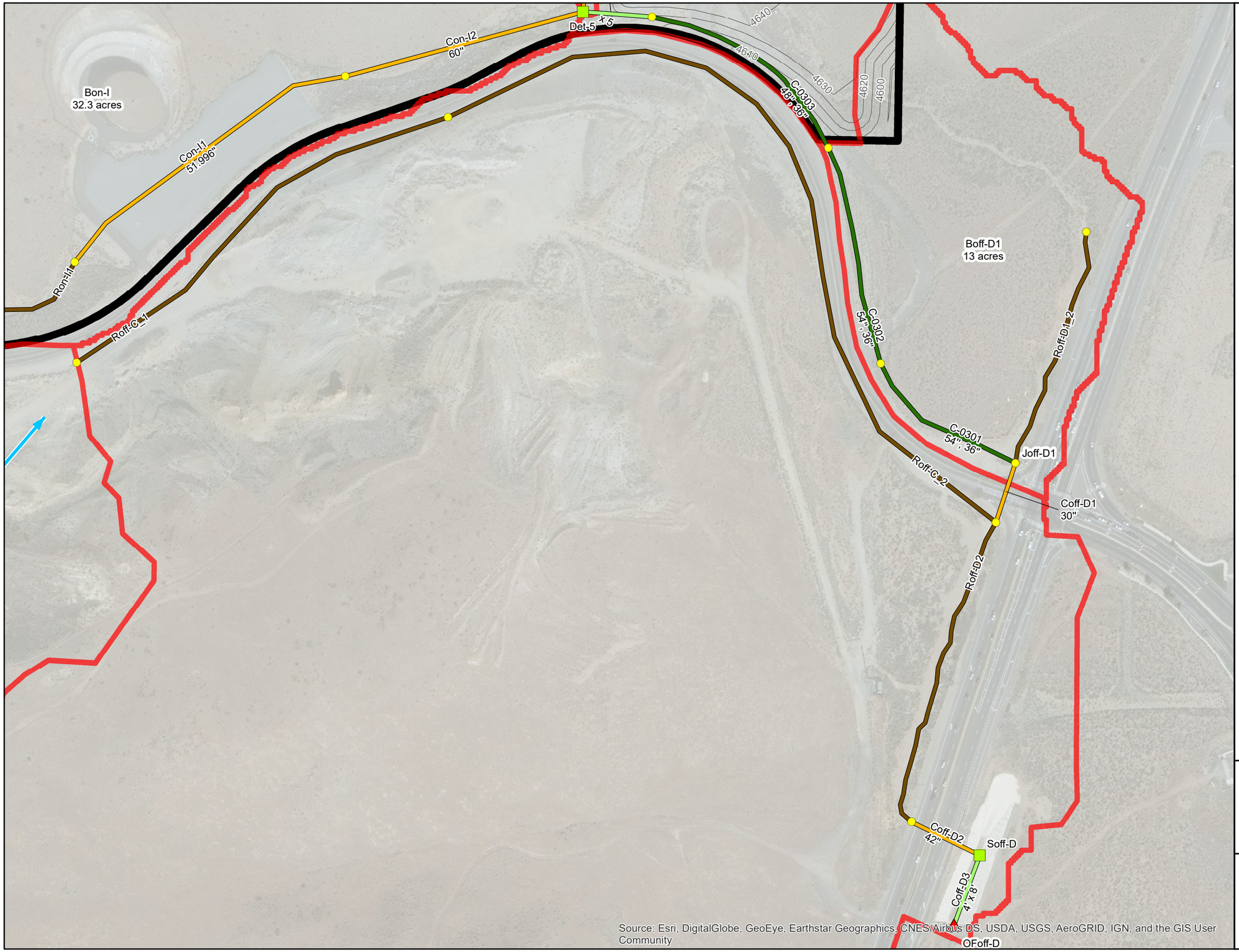
- Detention Basins
- Flow Direction
- Junctions
- Outfalls
- Proposed Development
- Proposed Contour
- Proposed Circular Pipe - Diameter Labeled
- Rectangular Pipe - Dimensions Labeled
- Proposed Trapezoidal Ditch - Depth; Bottom Width Labeled
- Irregular Channel
- Property Boundary
- Subcatchments

0 75 150 300 Feet

Exhibit 7c
5 Ridges
Conceptual Drainage Plan

Prepared By:
House Moran Consulting, Inc.
10399 Double R Boulevard Suite 110
Reno, NV 89521
Office: (775) 293-4000

Prepared On: 2/26/2020



Legend

- Detention Basins
- Flow Direction
- Junctions
- Outfalls
- Proposed Development
- Proposed Contour
- Proposed Circular Pipe - Diameter Labeled
- Rectangular Pipe - Dimensions Labeled
- Proposed Trapezoidal Ditch - Depth; Bottom Width Labeled
- Irregular Channel
- Property Boundary
- Subcatchments

0 75 150 300
Feet

Exhibit 7d
5 Ridges
Conceptual Drainage Plan

Prepared By:
House Moran Consulting, Inc.
10399 Double R Boulevard Suite 110
Reno, NV 89521
Office: (775) 293-4000

Prepared On: 2/26/2020

Appendix B – Model Inputs



NOAA Atlas Precipitation

NOAA Atlas 14, Volume 1, Version 5
Location name: Sun Valley, Nevada, USA*
Latitude: 39.6175°, Longitude: -119.7387°
Elevation: m/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	**1.12** (0.948-1.30)	**1.40** (1.18-1.63)	**1.88** (1.60-2.22)	**2.35** (1.98-2.80)	**3.13** (2.58-3.77)	**3.88** (3.10-4.73)	**4.76** (3.70-5.92)	**5.84** (4.36-7.43)	**7.61** (5.36-10.0)	**9.23** (6.24-12.4)
10-min	**0.852** (0.720-0.990)	**1.07** (0.894-1.25)	**1.43** (1.21-1.69)	**1.79** (1.51-2.12)	**2.38** (1.97-2.87)	**2.95** (2.36-3.60)	**3.62** (2.81-4.50)	**4.45** (3.32-5.65)	**5.79** (4.09-7.62)	**7.03** (4.75-9.47)
15-min	**0.704** (0.592-0.816)	**0.880** (0.740-1.03)	**1.18** (1.00-1.40)	**1.48** (1.24-1.76)	**1.97** (1.62-2.38)	**2.44** (1.95-2.98)	**3.00** (2.32-3.72)	**3.68** (2.74-4.67)	**4.79** (3.38-6.30)	**5.81** (3.93-7.82)
30-min	**0.476** (0.400-0.548)	**0.594** (0.496-0.692)	**0.798** (0.674-0.940)	**0.994** (0.838-1.18)	**1.33** (1.09-1.60)	**1.64** (1.31-2.00)	**2.02** (1.56-2.51)	**2.48** (1.85-3.15)	**3.22** (2.27-4.24)	**3.91** (2.64-5.27)
60-min	**0.294** (0.247-0.340)	**0.367** (0.308-0.429)	**0.493** (0.416-0.582)	**0.615** (0.518-0.731)	**0.821** (0.677-0.990)	**1.02** (0.813-1.24)	**1.25** (0.968-1.55)	**1.53** (1.14-1.95)	**2.00** (1.41-2.62)	**2.42** (1.64-3.26)
2-hr	**0.195** (0.172-0.225)	**0.242** (0.214-0.280)	**0.312** (0.273-0.361)	**0.372** (0.322-0.432)	**0.468** (0.394-0.547)	**0.554** (0.455-0.656)	**0.656** (0.524-0.785)	**0.788** (0.609-0.983)	**1.04** (0.758-1.33)	**1.27** (0.891-1.65)
3-hr	**0.156** (0.139-0.177)	**0.194** (0.174-0.221)	**0.243** (0.217-0.277)	**0.284** (0.251-0.324)	**0.342** (0.297-0.392)	**0.394** (0.335-0.456)	**0.456** (0.381-0.536)	**0.543** (0.443-0.661)	**0.697** (0.551-0.891)	**0.853** (0.647-1.11)
6-hr	**0.110** (0.099-0.124)	**0.138** (0.123-0.155)	**0.171** (0.152-0.193)	**0.196** (0.174-0.222)	**0.230** (0.201-0.261)	**0.255** (0.220-0.292)	**0.280** (0.239-0.324)	**0.313** (0.261-0.367)	**0.375** (0.307-0.450)	**0.440** (0.354-0.561)
12-hr	**0.072** (0.064-0.080)	**0.090** (0.081-0.101)	**0.114** (0.102-0.128)	**0.132** (0.117-0.148)	**0.156** (0.137-0.177)	**0.175** (0.152-0.199)	**0.194** (0.166-0.224)	**0.213** (0.178-0.248)	**0.238** (0.195-0.284)	**0.261** (0.208-0.316)
24-hr	**0.045** (0.041-0.051)	**0.057** (0.051-0.064)	**0.072** (0.065-0.081)	**0.085** (0.076-0.095)	**0.103** (0.091-0.115)	**0.117** (0.103-0.131)	**0.131** (0.115-0.149)	**0.147** (0.127-0.167)	**0.168** (0.143-0.193)	**0.186** (0.155-0.215)
2-day	**0.027** (0.024-0.030)	**0.034** (0.030-0.038)	**0.044** (0.039-0.049)	**0.051** (0.046-0.058)	**0.063** (0.055-0.071)	**0.072** (0.062-0.082)	**0.081** (0.070-0.093)	**0.091** (0.077-0.105)	**0.105** (0.087-0.123)	**0.117** (0.095-0.139)
3-day	**0.019** (0.017-0.022)	**0.025** (0.022-0.028)	**0.032** (0.028-0.036)	**0.038** (0.033-0.043)	**0.046** (0.041-0.053)	**0.053** (0.046-0.061)	**0.061** (0.052-0.070)	**0.069** (0.058-0.079)	**0.080** (0.066-0.094)	**0.089** (0.072-0.106)
4-day	**0.016** (0.014-0.018)	**0.020** (0.018-0.023)	**0.026** (0.023-0.030)	**0.031** (0.027-0.035)	**0.038** (0.034-0.044)	**0.044** (0.038-0.051)	**0.051** (0.043-0.058)	**0.057** (0.048-0.066)	**0.067** (0.055-0.079)	**0.075** (0.061-0.089)
7-day	**0.011** (0.009-0.012)	**0.013** (0.012-0.015)	**0.018** (0.015-0.020)	**0.021** (0.018-0.024)	**0.026** (0.023-0.030)	**0.030** (0.026-0.035)	**0.035** (0.029-0.040)	**0.039** (0.033-0.046)	**0.046** (0.037-0.054)	**0.051** (0.041-0.062)
10-day	**0.008** (0.007-0.009)	**0.011** (0.009-0.012)	**0.014** (0.012-0.016)	**0.017** (0.015-0.019)	**0.020** (0.018-0.024)	**0.023** (0.020-0.027)	**0.027** (0.023-0.031)	**0.030** (0.025-0.035)	**0.035** (0.029-0.041)	**0.038** (0.031-0.046)
20-day	**0.005** (0.004-0.006)	**0.006** (0.006-0.007)	**0.009** (0.007-0.010)	**0.010** (0.009-0.012)	**0.012** (0.011-0.014)	**0.014** (0.012-0.016)	**0.016** (0.013-0.018)	**0.017** (0.015-0.020)	**0.020** (0.017-0.024)	**0.022** (0.018-0.026)
30-day	**0.004** (0.003-0.004)	**0.005** (0.004-0.006)	**0.007** (0.006-0.007)	**0.008** (0.007-0.009)	**0.009** (0.008-0.011)	**0.011** (0.009-0.012)	**0.012** (0.010-0.014)	**0.013** (0.011-0.015)	**0.015** (0.013-0.018)	**0.016** (0.014-0.020)
45-day	**0.003** (0.003-0.003)	**0.004** (0.003-0.004)	**0.005** (0.005-0.006)	**0.006** (0.005-0.007)	**0.007** (0.006-0.008)	**0.008** (0.007-0.009)	**0.009** (0.008-0.010)	**0.010** (0.009-0.012)	**0.011** (0.010-0.013)	**0.012** (0.010-0.014)
60-day	**0.003** (0.002-0.003)	**0.003** (0.003-0.004)	**0.004** (0.004-0.005)	**0.005** (0.005-0.006)	**0.006** (0.005-0.007)	**0.007** (0.006-0.008)	**0.008** (0.007-0.009)	**0.008** (0.007-0.009)	**0.009** (0.008-0.011)	**0.010** (0.008-0.011)

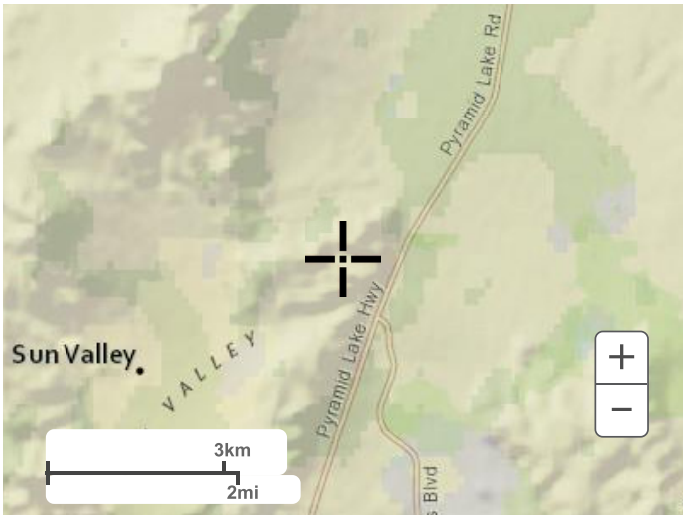
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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.

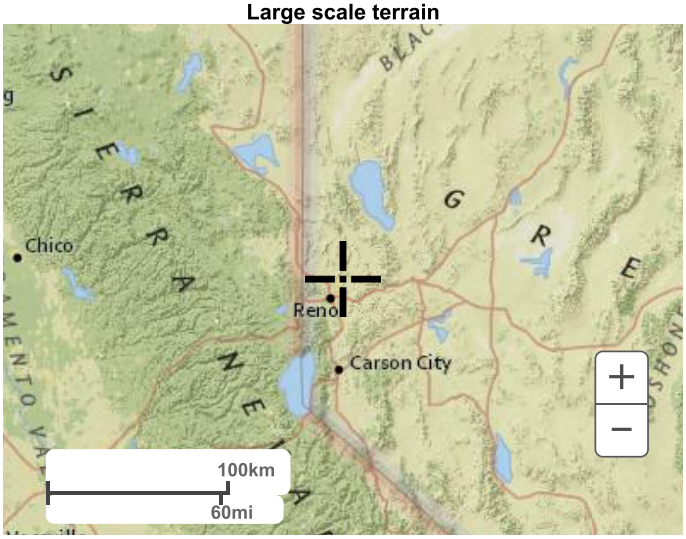
Please refer to NOAA Atlas 14 document for more information.

Back to Top

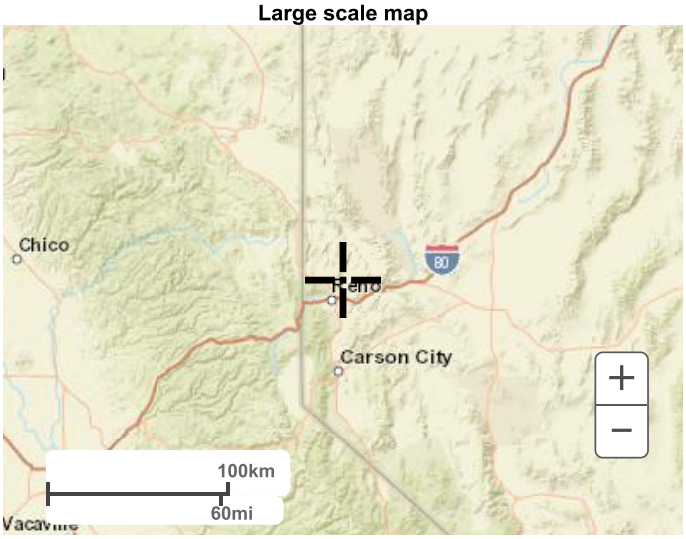
PF graphical



Large scale terrain



Large scale map



Large scale aerial

Existing Conditions Time of Concentration Calculations

LAG TIME CALCULATION

Project:	**5 Ridges**			
Analysis:	**Existing Conditions**			
Prepared By:	BLJ	**Date:**	11/14/2019	
Checked By:	AMD	**Date:**	11/15/2019	
Basin:	Bon-A	**Tc:**	**0.39**	**hr**
		Lag Time:	**0.24**	**hr**
		Lag Time:	**14.11**	**min**

Overland Flow:

Eq:

P_2 =	1.36				
Surface =	Short Grass Prairie				
n =	0.15	Manning's roughness coefficient			
Elev Up =	5,002.33	ft	L =	300	Length, ft
Elev Down =	4,965.81	ft	S =	0.122	Slope, ft/ft

T = **0.29** Travel time, (hr)

Shallow Concentrated Flow:

Eq:

n = 0.073
Coef. = 6.962

Surface =	Short Grass Prairie				
Elev Up =	4,965.81	ft	L =	961.09	Length, ft
Elev Down =	4,829.60	ft	S =	0.142	Slope, ft/ft

V = 2.62 Velocity, fps (from Figure 15-4 NEH-Chapter 15)

T = **0.10** Travel time, (hr)

LAG TIME CALCULATION

Project:	**5 Ridges**			
Analysis:	**Existing Conditions**			
Prepared By:	BLJ	**Date:**	11/14/2019	
Checked By:	AMD	**Date:**	11/15/2019	
Basin:	Bon-B	**Tc:**	**0.36**	**hr**
		Lag Time:	**0.21**	**hr**
		Lag Time:	**12.83**	**min**

Overland Flow:

Eq:

P_2 =	1.36				
Surface =	Short Grass Prairie				
n =	0.15	Manning's roughness coefficient			
Elev Up =	5,005.79	ft	L =	300	Length, ft
Elev Down =	4,951.32	ft	S =	0.182	Slope, ft/ft

T = **0.25** Travel time, (hr)

Shallow Concentrated Flow:

Eq:

n = 0.073
Coef. = 6.962

Surface =	Short Grass Prairie				
Elev Up =	4,951.32	ft	L =	1,053.02	Length, ft
Elev Down =	4,786.79	ft	S =	0.156	Slope, ft/ft

V = 2.75 Velocity, fps (from Figure 15-4 NEH-Chapter 15)

T = **0.11** Travel time, (hr)

LAG TIME CALCULATION

Project:	**5 Ridges**			
Analysis:	**Existing Conditions**			
Prepared By:	BLJ	**Date:**	11/14/2019	
Checked By:	AMD	**Date:**	11/15/2019	
Basin:	Bon-C	**Tc:**	**0.37**	**hr**
		Lag Time:	**0.22**	**hr**
		Lag Time:	**13.43**	**min**

Overland Flow:

Eq:

P_2 =	1.36				
Surface =	Short Grass Prairie				
n =	0.15	Manning's roughness coefficient			
Elev Up =	4,973.17	ft	L =	300	Length, ft
Elev Down =	4,947.38	ft	S =	0.086	Slope, ft/ft

T = **0.34** Travel time, (hr)

Shallow Concentrated Flow:

Eq:

n = 0.073
Coef. = 6.962

Surface =	Short Grass Prairie				
Elev Up =	4,947.38	ft	L =	377.32	Length, ft
Elev Down =	4,868.84	ft	S =	0.208	Slope, ft/ft

V = 3.18 Velocity, fps (from Figure 15-4 NEH-Chapter 15)

T = **0.03** Travel time, (hr)

LAG TIME CALCULATION

Project:	**5 Ridges**			
Analysis:	**Existing Conditions**			
Prepared By:	BLJ	**Date:**	11/14/2019	
Checked By:	AMD	**Date:**	11/15/2019	
Basin:	Bon-D	**Tc:**	**0.32**	**hr**
		Lag Time:	**0.19**	**hr**
		Lag Time:	**11.55**	**min**

Overland Flow:

Eq:

P_2 =	1.36				
Surface =	Short Grass Prairie				
n =	0.15	Manning's roughness coefficient			
Elev Up =	4,973.17	ft	L =	300	Length, ft
Elev Down =	4,920.83	ft	S =	0.174	Slope, ft/ft

T = **0.25** Travel time, (hr)

Shallow Concentrated Flow:

Eq:

n = 0.073
Coef. = 6.962

Surface =	Short Grass Prairie				
Elev Up =	4,920.83	ft	L =	908.30	Length, ft
Elev Down =	4,682.68	ft	S =	0.262	Slope, ft/ft

V = 3.56 Velocity, fps (from Figure 15-4 NEH-Chapter 15)

T = **0.07** Travel time, (hr)

LAG TIME CALCULATION

Project:	**5 Ridges**			
Analysis:	**Existing Conditions**			
Prepared By:	BLJ	**Date:**	11/14/2019	
Checked By:	AMD	**Date:**	11/15/2019	
Basin:	Bon-E	**Tc:**	**0.58**	**hr**
		Lag Time:	**0.35**	**hr**
		Lag Time:	**20.80**	**min**

Overland Flow:

Eq:

P_2 =	1.36				
Surface =	Short Grass Prairie				
n =	0.15	Manning's roughness coefficient			
Elev Up =	5,002.02	ft	L =	300	Length, ft
Elev Down =	4,989.28	ft	S =	0.042	Slope, ft/ft

T = **0.45** Travel time, (hr)

Shallow Concentrated Flow:

Eq:

n = 0.073
Coef. = 6.962

Surface =	Short Grass Prairie				
Elev Up =	4,989.28	ft	L =	750.21	Length, ft
Elev Down =	4,931.28	ft	S =	0.077	Slope, ft/ft

V = 1.94 Velocity, fps (from Figure 15-4 NEH-Chapter 15)
T = **0.11** Travel time, (hr)

Channel Flow Segment: **1**

Eq:

Material =	Ditch		Shape =	Trapezoidal	
n =	0.06	Manning's n	Width =	20	ft
Elev Up =	4,931.28	ft	Height =	2	ft
Elev Down =	4,873.40	ft	z =	20	Side slope, 1:z
L =	568.80	Length, ft			
S =	0.102	Slope, ft/ft	P_w =	100.10	Wetted Perimeter, ft
A =	120	Area, ft^2	R_h =	1.2	Hydraulic Radius, ft

V = 8.95 Velocity, fps
T = **0.02** Travel time, (hr)

LAG TIME CALCULATION

Project:	**5 Ridges**			
Analysis:	**Existing Conditions**			
Prepared By:	BLJ	**Date:**	11/14/2019	
Checked By:	AMD	**Date:**	11/15/2019	
Basin:	Bon-F	**Tc:**	**0.75**	**hr**
		Lag Time:	**0.45**	**hr**
		Lag Time:	**26.84**	**min**

Overland Flow:

Eq:

P_2 =	1.36				
Surface =	Short Grass Prairie				
n =	0.15	Manning's roughness coefficient			
Elev Up =	4,981.84	ft	L =	300	Length, ft
Elev Down =	4,949.31	ft	S =	0.108	Slope, ft/ft

T = **0.31** Travel time, (hr)

Shallow Concentrated Flow:

Eq:

n = 0.073
Coef. = 6.962

Surface =	Short Grass Prairie				
Elev Up =	4,949.31	ft	L =	581.00	Length, ft
Elev Down =	4,830.57	ft	S =	0.204	Slope, ft/ft

V = 3.15 Velocity, fps (from Figure 15-4 NEH-Chapter 15)
T = **0.05** Travel time, (hr)

Shallow Concentrated Flow:

Eq:

n = 0.051
Coef. = 9.965

Surface =	Nearly Bare and Untilled and Alluvial Fans in Western Mountain Regions				
Elev Up =	4,830.57	ft	L =	2,072.23	Length, ft
Elev Down =	4,783.74	ft	S =	0.023	Slope, ft/ft

V = 1.50 Velocity, fps (from Figure 15-4 NEH-Chapter 15)
T = **0.38** Travel time, (hr)

LAG TIME CALCULATION

Project:	**5 Ridges**			
Analysis:	**Existing Conditions**			
Prepared By:	BLJ	**Date:**	11/14/2019	
Checked By:	AMD	**Date:**	11/15/2019	
Basin:	Bon-G	**Tc:**	**0.32**	**hr**
		Lag Time:	**0.19**	**hr**
		Lag Time:	**11.68**	**min**

Overland Flow:

Eq:

P_2 =	1.36				
Surface =	Short Grass Prairie				
n =	0.15	Manning's roughness coefficient			
Elev Up =	4,973.18	ft	L =	300	Length, ft
Elev Down =	4,902.54	ft	S =	0.235	Slope, ft/ft

T = **0.22** Travel time, (hr)

Shallow Concentrated Flow:

Eq:

n = 0.051
Coef. = 9.965

Surface =	Nearly Bare and Untilled and Alluvial Fans in Western Mountain Regions				
Elev Up =	4,902.54	ft	L =	1,180.60	Length, ft
Elev Down =	4,759.58	ft	S =	0.121	Slope, ft/ft

V = 3.47 Velocity, fps (from Figure 15-4 NEH-Chapter 15)
T = **0.09** Travel time, (hr)

Channel Flow Segment: **1**

Eq:

Material =	Ditch		Shape =	Trapezoidal	
n =	0.06	Manning's n	Width =	20	ft
Elev Up =	4,759.58	ft	Height =	0.5	ft
Elev Down =	4,649.33	ft	z =	5	Side slope, 1:z
L =	559.00	Length, ft			
S =	0.197	Slope, ft/ft	P_w =	25.10	Wetted Perimeter, ft
A =	45	Area, ft^2	R_h =	1.79	Hydraulic Radius, ft

V = 16.26 Velocity, fps
T = **0.01** Travel time, (hr)

LAG TIME CALCULATION

Project:	**5 Ridges**			
Analysis:	**Existing Conditions**			
Prepared By:	BLJ	**Date:**	11/14/2019	
Checked By:	AMD	**Date:**	11/15/2019	
Basin:	Bon-H	**Tc:**	**0.82**	**hr**
		Lag Time:	**0.49**	**hr**
		Lag Time:	**29.50**	**min**

Overland Flow:

Eq:

P_2 =	1.36				
Surface =	Short Grass Prairie				
n =	0.15	Manning's roughness coefficient			
Elev Up =	5,005.39	ft	L =	300	Length, ft
Elev Down =	4,963.44	ft	S =	0.140	Slope, ft/ft
	T =	**0.28**	Travel time, (hr)		

Shallow Concentrated Flow:

Eq:

n = 0.073
Coef. = 6.962

Surface =	Short Grass Prairie				
Elev Up =	4,963.44	ft	L =	1,033.81	Length, ft
Elev Down =	4,843.67	ft	S =	0.116	Slope, ft/ft
	V =	2.37	Velocity, fps (from Figure 15-4 NEH-Chapter 15)		
	T =	**0.12**	Travel time, (hr)		

Shallow Concentrated Flow:

Eq:

n = 0.073
Coef. = 6.962

Surface =	Short Grass Prairie				
Elev Up =	4,843.67	ft	L =	2,093.69	Length, ft
Elev Down =	4,746.72	ft	S =	0.046	Slope, ft/ft
	V =	1.50	Velocity, fps (from Figure 15-4 NEH-Chapter 15)		
	T =	**0.39**	Travel time, (hr)		

Channel Flow Segment: **1**

Eq:

Material =	Ditch		Shape =	Trapezoidal	
n =	0.06	Manning's n	Width =	3	ft
Elev Up =	4,843.67	ft	Height =	1	ft
Elev Down =	4,622.96	ft	z =	5	Side slope, 1:z
L =	1,337.04	Length, ft			
S =	0.165	Slope, ft/ft	P_w =	13.20	Wetted Perimeter, ft
A =	16	Area, ft^2	R_h =	1.21	Hydraulic Radius, ft
	V =	11.46	Velocity, fps		
	T =	**0.03**	Travel time, (hr)		

LAG TIME CALCULATION

Project:	**5 Ridges**				
Analysis:	**Existing Conditions**				
Prepared By:	BLJ	**Date:**	11/14/2019		
Checked By:	AMD	**Date:**	11/15/2019		
Basin:	Bon-I	**Tc:**	**0.45**	**hr**	
		Lag Time:	**0.27**	**hr**	
		Lag Time:	**16.35**	**min**	

Overland Flow:

Eq:

P_2 =	1.36				
Surface =	Short Grass Prairie				
n =	0.15	Manning's roughness coefficient			
Elev Up =	4,935.08	ft	L =	300	Length, ft
Elev Down =	4,885.29	ft	S =	0.166	Slope, ft/ft
	T =	**0.26**	Travel time, (hr)		

Shallow Concentrated Flow:

Eq:

n = 0.073
Coef. = 6.962

Surface =	Short Grass Prairie				
Elev Up =	4,885.29	ft	L =	1,208.59	Length, ft
Elev Down =	4,669.58	ft	S =	0.178	Slope, ft/ft
	V =	2.94	Velocity, fps (from Figure 15-4 NEH-Chapter 15)		
	T =	**0.11**	Travel time, (hr)		

Channel Flow Segment: **1**

Eq:

Material =	Culvert		Shape =	Circular	
n =	0.05	Manning's n	Width =	4.333	ft
Elev Up =	4,669.58	ft	Height =	N/A	ft
Elev Down =	4,640.52	ft	z =	N/A	Side slope, 1:z
L =	720.03	Length, ft			
S =	0.040	Slope, ft/ft	P_w =	13.61	Wetted Perimeter, ft
A =	14.75	Area, ft^2	R_h =	1.08	Hydraulic Radius, ft
	V =	6.3	Velocity, fps		
	T =	**0.03**	Travel time, (hr)		

Channel Flow Segment: **2**

Eq:

Material =	Ditch		Shape =	Trapezoidal	
n =	0.06	Manning's n	Width =	15	ft
Elev Up =	4,640.52	ft	Height =	1	ft
Elev Down =	4,623.91	ft	z =	5	Side slope, 1:z
L =	891.31	Length, ft			
S =	0.019	Slope, ft/ft	P_w =	25.20	Wetted Perimeter, ft
A =	40	Area, ft^2	R_h =	1.59	Hydraulic Radius, ft

LAG TIME CALCULATION

Project:	**5 Ridges**			
Analysis:	**Existing Conditions**			
Prepared By:	BLJ	**Date:**	11/14/2019	
Checked By:	AMD	**Date:**	11/15/2019	
Basin:	Bon-J	**Tc:**	**0.23**	**hr**
		Lag Time:	**0.14**	**hr**
		Lag Time:	**8.18**	**min**

Overland Flow:

Eq:

P_2 =	1.36				
Surface =	Short Grass Prairie				
n =	0.15	Manning's roughness coefficient			
Elev Up =	4,835.51	ft	L =	300	Length, ft
Elev Down =	4,705.57	ft	S =	0.433	Slope, ft/ft

T = **0.18** Travel time, (hr)

Shallow Concentrated Flow:

Eq:

n = 0.073
Coef. = 6.962

Surface =	Short Grass Prairie				
Elev Up =	4,705.57	ft	L =	350.05	Length, ft
Elev Down =	4,612.81	ft	S =	0.265	Slope, ft/ft

V = 3.58 Velocity, fps (from Figure 15-4 NEH-Chapter 15)
T = **0.03** Travel time, (hr)

Channel Flow Segment: **1**

Eq:

Material =	Ditch		Shape =	Trapezoidal	
n =	0.06	Manning's n	Width =	15	ft
Elev Up =	4,612.81	ft	Height =	0.5	ft
Elev Down =	4,586.91	ft	z =	10	Side slope, 1:z
L =	492.96	Length, ft			
S =	0.053	Slope, ft/ft	P_w =	25.05	Wetted Perimeter, ft
A =	40	Area, ft^2	R_h =	1.6	Hydraulic Radius, ft

V = 7.79 Velocity, fps
T = **0.02** Travel time, (hr)

LAG TIME CALCULATION

Project:	**5 Ridges**			
Analysis:	**Existing Conditions**			
Prepared By:	BLJ	**Date:**	11/14/2019	
Checked By:	AMD	**Date:**	11/15/2019	
Basin:	Boff-A	**Tc:**	**1.03**	**hr**
		Lag Time:	**0.62**	**hr**
		Lag Time:	**37.06**	**min**

Overland Flow:

Eq:

P_2 =	1.36				
Surface =	Short Grass Prairie				
n =	0.15	Manning's roughness coefficient			
Elev Up =	5,002.30	ft	L =	300	Length, ft
Elev Down =	4,980.76	ft	S =	0.072	Slope, ft/ft
	T =	**0.36**	Travel time, (hr)		

Shallow Concentrated Flow:

Eq:

n = 0.073
Coef. = 6.962

Surface =	Short Grass Prairie				
Elev Up =	4,980.76	ft	L =	2,629.16	Length, ft
Elev Down =	4,816.40	ft	S =	0.063	Slope, ft/ft
	V =	1.74	Velocity, fps (from Figure 15-4 NEH-Chapter 15)		
	T =	**0.42**	Travel time, (hr)		

Channel Flow Segment: **1**

Eq:

Material =	Ditch		Shape =	Trapezoidal	
n =	0.06	Manning's n	Width =	5	ft
Elev Up =	4,816.40	ft	Height =	1	ft
Elev Down =	4,717.45	ft	z =	5	Side slope, 1:z
L =	4,099.74	Length, ft			
S =	0.024	Slope, ft/ft	P_w =	15.20	Wetted Perimeter, ft
A =	20	Area, ft^2	R_h =	1.32	Hydraulic Radius, ft
	V =	4.64	Velocity, fps		
	T =	**0.25**	Travel time, (hr)		

LAG TIME CALCULATION

Project:	**5 Ridges**			
Analysis:	**Existing Conditions**			
Prepared By:	BLJ	**Date:**	11/14/2019	
Checked By:	AMD	**Date:**	11/15/2019	
Basin:	Boff-B	**Tc:**	**0.45**	**hr**
		Lag Time:	**0.27**	**hr**
		Lag Time:	**16.36**	**min**

Overland Flow:

Eq:

P_2 =	1.36				
Surface =	Short Grass Prairie				
n =	0.15	Manning's roughness coefficient			
Elev Up =	4,923.35	ft	L =	300	Length, ft
Elev Down =	4,885.48	ft	S =	0.126	Slope, ft/ft
	T =	**0.29**	Travel time, (hr)		

Shallow Concentrated Flow:

Eq:

n = 0.073
Coef. = 6.962

Surface =	Short Grass Prairie				
Elev Up =	4,885.48	ft	L =	225.04	Length, ft
Elev Down =	4,870.22	ft	S =	0.068	Slope, ft/ft
	V =	1.81	Velocity, fps (from Figure 15-4 NEH-Chapter 15)		
	T =	**0.03**	Travel time, (hr)		

Channel Flow Segment: **1**

Eq:

Material =	Ditch		Shape =	Trapezoidal	
n =	0.06	Manning's n	Width =	5	ft
Elev Up =	4,870.22	ft	Height =	0.5	ft
Elev Down =	4,803.40	ft	z =	10	Side slope, 1:z
L =	2,390.59	Length, ft			
S =	0.028	Slope, ft/ft	P_w =	15.05	Wetted Perimeter, ft
A =	20	Area, ft^2	R_h =	1.33	Hydraulic Radius, ft
	V =	5.02	Velocity, fps		
	T =	**0.13**	Travel time, (hr)		

LAG TIME CALCULATION

Project:	**5 Ridges**			
Analysis:	**Existing Conditions**			
Prepared By:	BLJ	**Date:**	11/14/2019	
Checked By:	AMD	**Date:**	11/15/2019	
Basin:	Boff-C	**Tc:**	**0.52**	**hr**
		Lag Time:	**0.31**	**hr**
		Lag Time:	**18.74**	**min**

Overland Flow:

Eq:

P_2 =	1.36				
Surface =	Short Grass Prairie				
n =	0.15	Manning's roughness coefficient			
Elev Up =	4,874.70	ft	L =	300	Length, ft
Elev Down =	4,845.72	ft	S =	0.097	Slope, ft/ft
	T =	**0.32**	Travel time, (hr)		

Shallow Concentrated Flow:

Eq:

n = 0.073
Coef. = 6.962

Surface =	Short Grass Prairie				
Elev Up =	4,845.72	ft	L =	894.94	Length, ft
Elev Down =	4,706.78	ft	S =	0.155	Slope, ft/ft
	V =	2.74	Velocity, fps (from Figure 15-4 NEH-Chapter 15)		
	T =	**0.09**	Travel time, (hr)		

Channel Flow Segment: **1**

Eq:

Material =	Ditch		Shape =	Trapezoidal	
n =	0.06	Manning's n	Width =	5	ft
Elev Up =	4,706.78	ft	Height =	0.5	ft
Elev Down =	4,692.58	ft	z =	5	Side slope, 1:z
L =	1,288.36	Length, ft			
S =	0.011	Slope, ft/ft	P_w =	10.10	Wetted Perimeter, ft
A =	15	Area, ft^2	R_h =	1.49	Hydraulic Radius, ft
	V =	3.4	Velocity, fps		
	T =	**0.11**	Travel time, (hr)		

LAG TIME CALCULATION

Project:	**5 Ridges**			
Analysis:	**Existing Conditions**			
Prepared By:	BLJ	**Date:**	11/14/2019	
Checked By:	AMD	**Date:**	11/15/2019	
Basin:	Boff-D	**Tc:**	**1.06**	**hr**
		Lag Time:	**0.64**	**hr**
		Lag Time:	**38.28**	**min**

Overland Flow:

Eq:

P_2 =	1.36				
Surface =	Short Grass Prairie				
n =	0.15	Manning's roughness coefficient			
Elev Up =	5,016.80	ft	L =	300	Length, ft
Elev Down =	5,005.70	ft	S =	0.037	Slope, ft/ft

T = **0.47** Travel time, (hr)

Shallow Concentrated Flow:

Eq:

n = 0.073
Coef. = 6.962

Surface =	Short Grass Prairie				
Elev Up =	5,005.70	ft	L =	1,274.80	Length, ft
Elev Down =	4,859.86	ft	S =	0.114	Slope, ft/ft

V = 2.35 Velocity, fps (from Figure 15-4 NEH-Chapter 15)
T = **0.15** Travel time, (hr)

Channel Flow Segment: **1**

Eq:

Material =	Ditch		Shape =	Trapezoidal	
n =	0.06	Manning's n	Width =	5	ft
Elev Up =	4,859.86	ft	Height =	1	ft
Elev Down =	4,699.12	ft	z =	4	Side slope, 1:z
L =	1,125.38	Length, ft			
S =	0.143	Slope, ft/ft	P_w =	13.25	Wetted Perimeter, ft
A =	18	Area, ft^2	R_h =	1.36	Hydraulic Radius, ft

V = 11.52 Velocity, fps
T = **0.03** Travel time, (hr)

Shallow Concentrated Flow:

Eq:

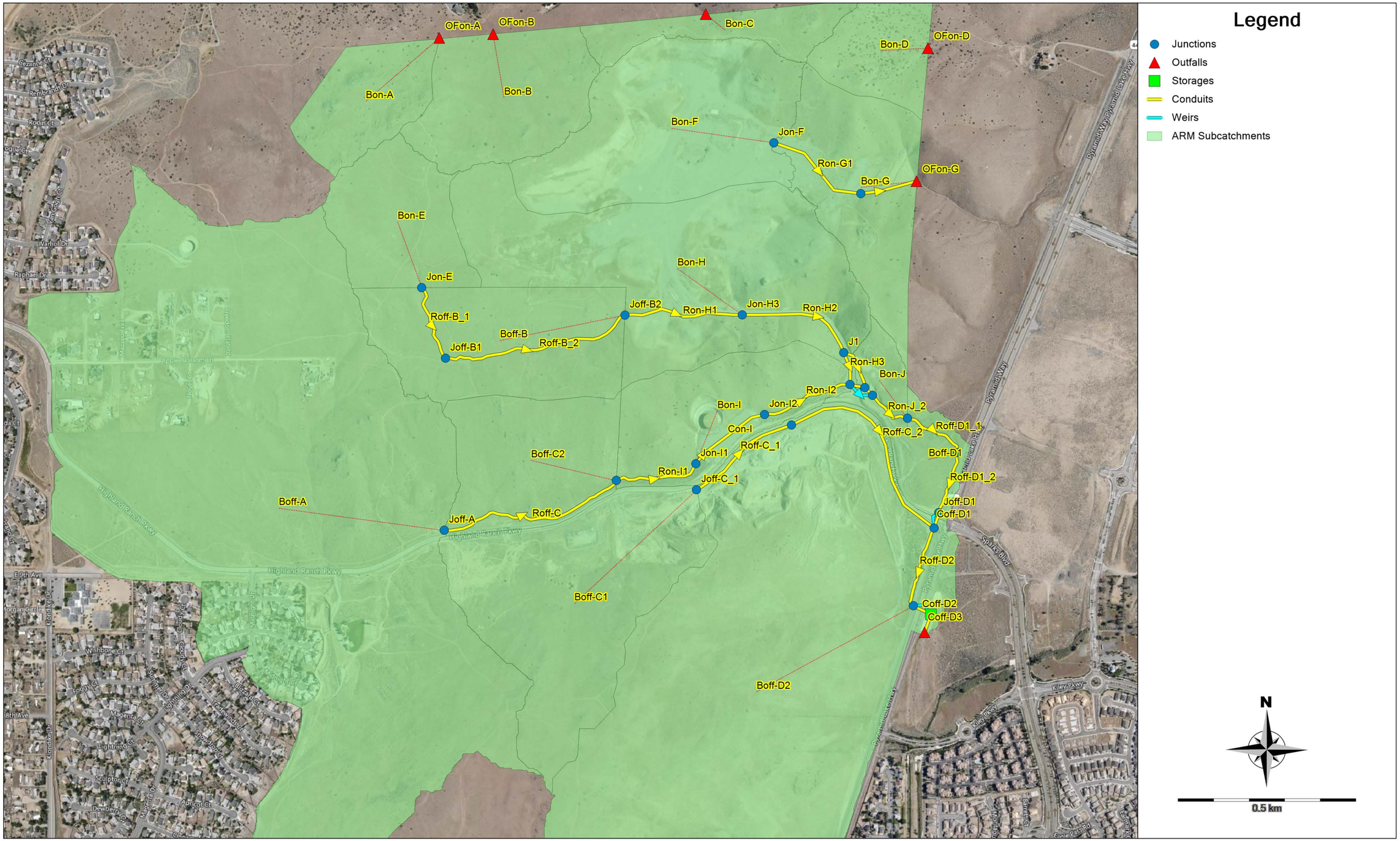
n = 0.051
Coef. = 9.965

Surface =	Nearly Bare and Untilled and Alluvial Fans in Western Mountain Regions				
Elev Up =	4,699.12	ft	L =	1,291.61	Length, ft
Elev Down =	4,678.19	ft	S =	0.016	Slope, ft/ft

V = 1.27 Velocity, fps (from Figure 15-4 NEH-Chapter 15)
T = **0.28** Travel time, (hr)

Appendix C – Existing Conditions Results

Existing Conditions Model Schematic





Existing Conditions Model Results – 5-year

```
ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM BETA VERSION 7.2.2785
---------------------------------------------------------------

This is a *BETA* version of ARM - your feedback and suggestions are solicited.
Create a ticket, post on the PCSWMM feature request forum, or email us directly!

Simulation start time:                  11/11/2019 00:00:00
Simulation end time:                    11/12/2019 00:00:00
Runoff wet weather time steps:          300 seconds
Report time steps:                      60 seconds
Number of data points:                  1441


*****************************
Unit Hydrographs Runoff Method
*****************************
```

Subcatchment	Runoff Method	Factor	Raingage	Area (ac)	Tc (min)	Tpeak (min)	Peak Flow L(cfs/in)	Depth (in)
Bon-H	UH	350	Sparks_5y	102.285	49.16	32	104.8952	0.999
Boff-A	UH	300	Sparks_5y	361.629	61.77	39.56	257.0855	0.999
Bon-B	UH	350	Sparks_5y	40.174	21.38	15.33	86.00009	0.998
Bon-A	UH	350	Sparks_5y	23.886	23.51	16.61	47.19736	0.998
Bon-F	UH	350	Sparks_5y	68.565	44.73	29.34	76.68515	0.998
Bon-D	UH	350	Sparks_5y	19.862	19.25	14.05	46.3859	0.999
Bon-G	UH	350	Sparks_5y	43.311	19.47	14.18	100.2075	0.998
Bon-C	UH	350	Sparks_5y	16.513	22.38	15.93	34.01763	0.999
Bon-E	UH	300	Sparks_5y	31.869	34.66	23.3	38.47509	0.996
Boff-B	UH	300	Sparks_5y	52.908	27.27	18.86	78.89076	0.997
Bon-I	UH	350	Sparks_5y	39.931	27.25	18.85	69.50854	0.998
Bon-J	UH	350	Sparks_5y	8.878	13.63	10.68	27.28127	0.997
Boff-C2	UH	300	Sparks_5y	40.038	18.74	13.74	81.93166	1
Boff-C1	UH	300	Sparks_5y	79.355	63.56	40.64	54.92321	0.999
Boff-D1	UH	300	Sparks_5y	12.333	18.6	13.66	25.3928	1
Boff-D2	UH	350	Sparks_5y	260.1	38.28	25.47	335.108	0.999

```
******************
ARM Runoff Summary
******************
```

Subcatchment	Total Precip (in)	Total Losses (in)	Total Runoff (in)	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff (fraction)
Bon-H	1.729	1.537	0.192	0.533	19.662	0.111
Boff-A	1.729	1.421	0.307	3.01	55.79	0.177
Bon-B	1.729	1.547	0.181	0.198	14.78	0.105
Bon-A	1.729	1.546	0.182	0.118	8.092	0.105
Bon-F	1.729	1.547	0.182	0.338	13.68	0.105
Bon-D	1.729	1.547	0.181	0.098	7.853	0.105
Bon-G	1.729	1.547	0.181	0.213	17.008	0.105
Bon-C	1.729	1.547	0.182	0.081	5.839	0.105
Bon-E	1.729	1.547	0.181	0.157	6.804	0.105
Boff-B	1.729	1.55	0.178	0.255	13.603	0.103
Bon-I	1.729	1.525	0.203	0.22	12.287	0.117
Bon-J	1.729	1.465	0.262	0.063	4.614	0.152
Boff-C2	1.729	1.547	0.181	0.197	14.04	0.105
Boff-C1	1.729	1.263	0.465	1.002	20.995	0.269
Boff-D1	1.729	1.423	0.303	0.102	4.711	0.175

Boff-D2	1.729	1.279	0.449	3.168	111.756	0.259

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)

WARNING 02: maximum depth increased for Node J1
WARNING 02: maximum depth increased for Node J3
WARNING 02: maximum depth increased for Node Joff-A
WARNING 02: maximum depth increased for Node Joff-B1
WARNING 02: maximum depth increased for Node Joff-B2
WARNING 02: maximum depth increased for Node Joff-C_1
WARNING 02: maximum depth increased for Node Joff-C_1a
WARNING 02: maximum depth increased for Node Joff-C_2
WARNING 02: maximum depth increased for Node Joff-D1
WARNING 02: maximum depth increased for Node Joff-D1_1
WARNING 02: maximum depth increased for Node Joff-D2
WARNING 02: maximum depth increased for Node Joff-D3
WARNING 02: maximum depth increased for Node Jon-E
WARNING 02: maximum depth increased for Node Jon-G1
WARNING 02: maximum depth increased for Node Jon-H1
WARNING 02: maximum depth increased for Node Jon-H2
WARNING 02: maximum depth increased for Node Jon-H3
WARNING 02: maximum depth increased for Node Jon-I1
WARNING 02: maximum depth increased for Node Jon-I2
WARNING 02: maximum depth increased for Node Jon-J

****
Element Count
****
Number of rain gages 6
Number of subcatchments ... 0
Number of nodes 28
Number of links 28
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Sparks_100y	Sparks_100y	VOLUME	6 min.
Sparks_10y	Sparks_10y	VOLUME	6 min.
Sparks_25y	Sparks_25y	VOLUME	6 min.
Sparks_2yr	Sparks_2yr	VOLUME	6 min.
Sparks_50y	Sparks_50y	VOLUME	6 min.
Sparks_5y	Sparks_5y	VOLUME	6 min.

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	4647.50	23.69	0.0	
J3	JUNCTION	4606.29	27.68	0.0	
Joff-A	JUNCTION	4718.94	15.70	50.0	
Joff-B1	JUNCTION	4844.15	11.34	50.0	
Joff-B2	JUNCTION	4801.28	11.34	50.0	
Joff-C_1	JUNCTION	4695.66	19.39	0.0	
Joff-C_1a	JUNCTION	4650.13	19.39	0.0	
Joff-C_2	JUNCTION	4686.17	29.35	50.0	
Joff-D1	JUNCTION	4527.28	18.51	50.0	
Joff-D1_1	JUNCTION	4541.73	18.51	50.0	
Joff-D2	JUNCTION	4525.50	16.17	500.0	
Joff-D3	JUNCTION	4507.58	16.17	500.0	
Jon-E	JUNCTION	4871.20	3.33	50.0	

Jon-F	JUNCTION	4789.16	5.00	50.0
Jon-G1	JUNCTION	4752.45	5.67	50.0
Jon-H1	JUNCTION	4616.94	66.97	50.0
Jon-H2	JUNCTION	4616.10	27.68	50.0
Jon-H3	JUNCTION	4747.08	23.69	50.0
Jon-I1	JUNCTION	4654.99	29.35	50.0
Jon-I2	JUNCTION	4629.70	66.97	50.0
Jon-J	JUNCTION	4564.60	27.68	50.0
OFoff-D	OUTFALL	4497.00	4.00	0.0
OFon-A	OUTFALL	0.00	0.00	0.0
OFon-B	OUTFALL	0.00	0.00	0.0
OFon-C	OUTFALL	0.00	0.00	0.0
OFon-D	OUTFALL	0.00	0.00	0.0
OFon-G	OUTFALL	4643.79	5.67	0.0
Soff-D	STORAGE	4496.00	12.50	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
Coff-D1	Joff-D1	Joff-D2	CONDUIT	148.9	1.1955	0.0130
Coff-D2	Joff-D3	Soff-D	CONDUIT	145.0	3.9617	0.0240
Coff-D3	Soff-D	OFoff-D	CONDUIT	177.4	0.5636	0.0130
Con-H	Jon-H1	Jon-H2	CONDUIT	139.3	0.6029	0.0240
Con-I	Jon-I1	Jon-I2	CONDUIT	794.0	3.1868	0.0130
Roff-B_1	Jon-E	Joff-B1	CONDUIT	734.4	3.6859	0.0400
Roff-B_2	Joff-B1	Joff-B2	CONDUIT	1795.5	2.3881	0.0400
Roff-C	Joff-A	Joff-C_2	CONDUIT	1770.5	1.8511	0.0400
Roff-C_1	Joff-C_1	Joff-C_1a	CONDUIT	1079.3	4.2223	0.0400
Roff-C_2	Joff-C_1a	Joff-D2	CONDUIT	1995.9	6.2566	0.0400
Roff-D1_1	Jon-J	Joff-D1_1	CONDUIT	606.5	3.7741	0.0400
Roff-D1_2	Joff-D1_1	Joff-D1	CONDUIT	587.1	2.4616	0.0400
Roff-D2	Joff-D2	Joff-D3	CONDUIT	770.1	2.3276	0.0400
Ron-G1	Jon-F	Jon-G1	CONDUIT	981.0	3.7446	0.0400
Ron-G2	Jon-G1	OFon-G	CONDUIT	528.2	21.0222	0.0400
Ron-H1	Joff-B2	Jon-H3	CONDUIT	1108.8	4.8943	0.0400
Ron-H2	Jon-H3	J1	CONDUIT	1117.0	8.9508	0.0400
Ron-H3	J1	Jon-H1	CONDUIT	306.1	10.0337	0.0400
Ron-H4	J1	Jon-H2	CONDUIT	404.6	7.7838	0.0400
Ron-I1	Joff-C_2	Jon-I1	CONDUIT	814.9	3.8290	0.0400
Ron-I2	Jon-I2	Jon-H1	CONDUIT	850.0	1.5013	0.0400
Ron-J_1	Jon-H2	J3	CONDUIT	100.6	9.7967	0.0400
Ron-J_2	J3	Jon-J	CONDUIT	427.8	9.7930	0.0400
W1	Jon-H1	Jon-H2	WEIR			
W2	Jon-H1	Jon-H2	WEIR			
W3	Jon-H1	J3	WEIR			
W4	Joff-D1	Joff-D2	WEIR			
W6	Joff-D3	Soff-D	WEIR			

****
Cross Section Summary
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Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
Coff-D1	CIRCULAR	2.50	4.91	0.63	2.50	5	44.85
Coff-D2	CIRCULAR	3.50	9.62	0.88	3.50	1	108.47
Coff-D3	RECT_CLOSED	4.00	32.00	1.33	8.00	1	332.66
Con-H	CIRCULAR	1.00	0.79	0.25	1.00	3	1.50
Con-I	CIRCULAR	4.33	14.75	1.08	4.33	1	317.37
Roff-B_1	XS-Roff-B-1	3.33	177.21	1.63	106.46	1	1753.23
Roff-B_2	XS-Roff-B_2	11.34	766.16	6.66	112.97	1	15567.79
Roff-C	XS-Roff-C	15.70	1445.69	8.69	186.34	1	30896.78
Roff-C_1	XS-Roff-C_1	19.39	1007.15	8.89	91.51	1	33004.69
Roff-C_2	XS-Roff-C_2	14.19	1217.82	9.40	129.17	1	50413.96
Roff-D1_1	XS-Roff-D1_1	6.45	254.33	3.15	85.89	1	3941.66
Roff-D1_2	XS-Roff-D1_2	18.51	2314.87	7.64	303.98	1	52360.23
Roff-D2	XS-Roff-D2	16.17	4216.24	10.13	400.30	1	111860.16
Ron-G1	TRAPEZOIDAL	1.00	25.00	0.83	30.00	1	158.46
Ron-G2	XS-Ron-G2	5.67	146.98	2.72	57.14	1	4876.16

Ron-H1	XS-Ron-H1	7.44	195.63	3.94	43.81	1 4013.54
Ron-H2	XS-Ron-H2	23.69	1146.73	15.38	78.28	1 78834.62
Ron-H3	XS-Ron-H3	10.96	672.73	6.83	114.12	1 28491.08
Ron-H4	XS-Ron-H4	9.63	623.61	7.12	108.05	1 23919.46
Ron-I1	XS-Ron-I1	29.35	2288.81	15.26	137.36	1 102369.82
Ron-I2	XS-Ron-I2	66.97	14347.28	61.85	336.30	1 1021372.49
Ron-J_1	XS-Ron-J	27.68	1419.08	13.44	92.15	1 93295.27
Ron-J_2	XS-Ron-J	27.68	1419.08	13.44	92.15	1 93277.69

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Transect Summary
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Transect XS-Roff-B_2
Area:

0.0009	0.0031	0.0064	0.0107	0.0159
0.0220	0.0291	0.0370	0.0458	0.0553
0.0658	0.0770	0.0889	0.1015	0.1147
0.1287	0.1438	0.1598	0.1763	0.1936
0.2116	0.2305	0.2503	0.2711	0.2926
0.3149	0.3382	0.3622	0.3869	0.4126
0.4388	0.4654	0.4922	0.5193	0.5467
0.5744	0.6024	0.6307	0.6594	0.6885
0.7178	0.7476	0.7777	0.8081	0.8389
0.8701	0.9019	0.9340	0.9667	1.0000

Hrad:

0.0203	0.0381	0.0562	0.0758	0.0959
0.1130	0.1303	0.1476	0.1692	0.1856
0.2040	0.2223	0.2427	0.2650	0.2836
0.2972	0.3092	0.3282	0.3500	0.3688
0.3826	0.3984	0.4139	0.4295	0.4464
0.4637	0.4778	0.4986	0.5148	0.5310
0.5558	0.5835	0.6118	0.6386	0.6634
0.6890	0.7175	0.7409	0.7625	0.7887
0.8133	0.8349	0.8591	0.8829	0.9059
0.9232	0.9455	0.9653	0.9785	1.0000

Width:

0.0471	0.0830	0.1150	0.1427	0.1671
0.1962	0.2242	0.2522	0.2718	0.2995
0.3235	0.3476	0.3676	0.3840	0.4051
0.4338	0.4660	0.4877	0.5044	0.5253
0.5535	0.5792	0.6055	0.6317	0.6561
0.6799	0.7086	0.7269	0.7522	0.7778
0.7904	0.7983	0.8051	0.8135	0.8244
0.8340	0.8397	0.8512	0.8648	0.8728
0.8825	0.8952	0.9050	0.9150	0.9257
0.9423	0.9536	0.9673	0.9880	1.0000

Transect XS-Roff-B-1
Area:

0.0014	0.0055	0.0109	0.0170	0.0238
0.0312	0.0392	0.0476	0.0564	0.0659
0.0760	0.0865	0.0975	0.1090	0.1209
0.1332	0.1459	0.1590	0.1726	0.1867
0.2011	0.2159	0.2311	0.2470	0.2635
0.2805	0.2981	0.3162	0.3350	0.3543
0.3740	0.3942	0.4157	0.4383	0.4620
0.4872	0.5150	0.5455	0.5802	0.6168
0.6541	0.6915	0.7290	0.7669	0.8050
0.8435	0.8823	0.9212	0.9604	1.0000

Hrad:

0.0200	0.0445	0.0776	0.1061	0.1348
0.1635	0.1941	0.2246	0.2509	0.2699
0.2973	0.3275	0.3524	0.3739	0.4037
0.4311	0.4562	0.4835	0.5032	0.5294
0.5562	0.5811	0.6016	0.6155	0.6332
0.6552	0.6756	0.6914	0.7085	0.7342
0.7593	0.7685	0.7720	0.7924	0.8076
0.8143	0.7923	0.7492	0.7114	0.6662
0.7038	0.7413	0.7775	0.8094	0.8420
0.8744	0.9093	0.9441	0.9763	1.0000

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Width:
            0.0767     0.1258     0.1419     0.1622     0.1786
            0.1934     0.2045     0.2144     0.2275     0.2470
            0.2587     0.2673     0.2797     0.2948     0.3029
            0.3124     0.3233     0.3324     0.3466     0.3562
            0.3652     0.3752     0.3880     0.4053     0.4203
            0.4325     0.4457     0.4620     0.4776     0.4875
            0.4975     0.5208     0.5542     0.5768     0.6074
            0.6554     0.7228     0.8286     0.8965     0.9314
            0.9342     0.9371     0.9413     0.9506     0.9587
            0.9667     0.9718     0.9766     0.9841     1.0000

Transect XS-Roff-C
Area:
            0.0006     0.0016     0.0031     0.0050     0.0074
            0.0110     0.0155     0.0207     0.0268     0.0339
            0.0417     0.0501     0.0590     0.0687     0.0796
            0.0914     0.1039     0.1170     0.1308     0.1453
            0.1605     0.1762     0.1926     0.2096     0.2274
            0.2459     0.2666     0.2901     0.3141     0.3387
            0.3642     0.3908     0.4183     0.4465     0.4754
            0.5053     0.5361     0.5676     0.5995     0.6322
            0.6656     0.6998     0.7350     0.7708     0.8072
            0.8440     0.8817     0.9205     0.9599     1.0000
Hrad:
            0.0246     0.0453     0.0637     0.0817     0.0893
            0.0928     0.1136     0.1265     0.1428     0.1593
            0.1808     0.2030     0.2227     0.2382     0.2444
            0.2645     0.2853     0.3081     0.3249     0.3454
            0.3647     0.3857     0.4066     0.4234     0.4419
            0.4592     0.4809     0.4996     0.5175     0.5374
            0.5472     0.5631     0.5838     0.6097     0.6344
            0.6465     0.6718     0.7029     0.7308     0.7557
            0.7782     0.8023     0.8224     0.8532     0.8812
            0.9132     0.9250     0.9490     0.9751     1.0000
Width:
            0.0208     0.0311     0.0417     0.0523     0.0714
            0.1028     0.1179     0.1418     0.1630     0.1849
            0.2004     0.2143     0.2304     0.2508     0.2834
            0.3009     0.3172     0.3306     0.3503     0.3661
            0.3826     0.3973     0.4118     0.4305     0.4473
            0.4716     0.5742     0.5856     0.6012     0.6170
            0.6455     0.6697     0.6901     0.7053     0.7223
            0.7543     0.7720     0.7831     0.7977     0.8158
            0.8365     0.8555     0.8793     0.8908     0.9055
            0.9153     0.9472     0.9661     0.9825     1.0000

Transect XS-Roff-C_1
Area:
            0.0014     0.0045     0.0102     0.0201     0.0327
            0.0456     0.0589     0.0725     0.0863     0.1005
            0.1149     0.1295     0.1445     0.1598     0.1754
            0.1913     0.2074     0.2239     0.2407     0.2578
            0.2752     0.2929     0.3110     0.3295     0.3482
            0.3674     0.3869     0.4067     0.4270     0.4478
            0.4691     0.4910     0.5135     0.5367     0.5607
            0.5853     0.6104     0.6363     0.6627     0.6897
            0.7172     0.7455     0.7745     0.8042     0.8348
            0.8664     0.8987     0.9318     0.9655     1.0000
Hrad:
            0.0275     0.0428     0.0607     0.0697     0.1085
            0.1461     0.1812     0.2159     0.2494     0.2816
            0.3129     0.3427     0.3712     0.3984     0.4251
            0.4520     0.4778     0.5028     0.5275     0.5507
            0.5735     0.5951     0.6166     0.6388     0.6610
            0.6789     0.6994     0.7185     0.7367     0.7503
            0.7647     0.7786     0.7897     0.7982     0.8139
            0.8273     0.8403     0.8542     0.8689     0.8855
            0.9031     0.9113     0.9255     0.9363     0.9406
            0.9520     0.9645     0.9807     0.9957     1.0000
Width:
            0.0600     0.1287     0.2046     0.3510     0.3630
            0.3711     0.3816     0.3894     0.3970     0.4047
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            0.4121     0.4201     0.4289     0.4383     0.4472
            0.4551     0.4633     0.4719     0.4801     0.4895
            0.4988     0.5090     0.5190     0.5278     0.5361
            0.5488     0.5584     0.5694     0.5810     0.5974
            0.6131     0.6295     0.6490     0.6717     0.6872
            0.7052     0.7240     0.7419     0.7591     0.7743
            0.7882     0.8130     0.8314     0.8539     0.8847
            0.9078     0.9300     0.9478     0.9672     1.0000

Transect XS-Roff-C_2
Area:
            0.0004     0.0012     0.0025     0.0043     0.0064
            0.0093     0.0133     0.0187     0.0253     0.0330
            0.0430     0.0542     0.0662     0.0793     0.0948
            0.1127     0.1313     0.1506     0.1703     0.1909
            0.2135     0.2367     0.2602     0.2841     0.3085
            0.3332     0.3583     0.3838     0.4098     0.4361
            0.4626     0.4894     0.5163     0.5434     0.5707
            0.5981     0.6257     0.6534     0.6813     0.7094
            0.7376     0.7660     0.7946     0.8233     0.8523
            0.8815     0.9109     0.9404     0.9701     1.0000
Hrad:
            0.0172     0.0333     0.0486     0.0637     0.0758
            0.0791     0.0848     0.0901     0.1050     0.1202
            0.1337     0.1553     0.1731     0.1903     0.1804
            0.2041     0.2281     0.2545     0.2809     0.2878
            0.3061     0.3312     0.3559     0.3816     0.4050
            0.4289     0.4533     0.4739     0.4976     0.5226
            0.5481     0.5734     0.5979     0.6239     0.6495
            0.6748     0.7005     0.7254     0.7492     0.7738
            0.7980     0.8216     0.8446     0.8680     0.8907
            0.9117     0.9351     0.9590     0.9825     1.0000
Width:
            0.0215     0.0359     0.0505     0.0641     0.0814
            0.1136     0.1523     0.2033     0.2361     0.2809
            0.3613     0.3828     0.4163     0.4543     0.5769
            0.6067     0.6322     0.6480     0.6615     0.7279
            0.7610     0.7756     0.7898     0.8006     0.8157
            0.8288     0.8398     0.8579     0.8693     0.8775
            0.8845     0.8911     0.8987     0.9036     0.9086
            0.9138     0.9182     0.9233     0.9299     0.9350
            0.9405     0.9466     0.9531     0.9591     0.9655
            0.9739     0.9793     0.9839     0.9887     1.0000

Transect XS-Roff-D1_1
Area:
            0.0014     0.0040     0.0074     0.0114     0.0159
            0.0208     0.0262     0.0321     0.0384     0.0450
            0.0520     0.0595     0.0673     0.0756     0.0844
            0.0936     0.1032     0.1133     0.1239     0.1349
            0.1466     0.1601     0.1765     0.1942     0.2141
            0.2359     0.2600     0.2854     0.3141     0.3435
            0.3732     0.4032     0.4335     0.4640     0.4948
            0.5257     0.5569     0.5882     0.6198     0.6517
            0.6838     0.7161     0.7486     0.7815     0.8149
            0.8489     0.8835     0.9190     0.9578     1.0000
Hrad:
            0.0263     0.0533     0.0805     0.1081     0.1343
            0.1619     0.1863     0.2113     0.2376     0.2626
            0.2862     0.3092     0.3305     0.3515     0.3717
            0.3923     0.4136     0.4343     0.4552     0.4701
            0.4763     0.4734     0.4780     0.4899     0.4923
            0.4860     0.4818     0.4930     0.4244     0.4581
            0.4914     0.5249     0.5581     0.5920     0.6255
            0.6589     0.6923     0.7253     0.7564     0.7874
            0.8191     0.8505     0.8795     0.9059     0.9277
            0.9480     0.9670     0.9869     1.0049     1.0000
Width:
            0.0490     0.0695     0.0853     0.0974     0.1093
            0.1187     0.1296     0.1395     0.1479     0.1566
            0.1659     0.1752     0.1854     0.1957     0.2063
            0.2168     0.2267     0.2368     0.2469     0.2603
            0.2795     0.3575     0.3919     0.4270     0.4844
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            0.5244     0.5681     0.6125     0.6708     0.6782
            0.6855     0.6920     0.6983     0.7034     0.7083
            0.7130     0.7174     0.7218     0.7280     0.7340
            0.7390     0.7440     0.7510     0.7601     0.7733
            0.7877     0.8032     0.8427     0.9381     1.0000

Transect XS-Roff-D1_2
Area:
            0.0007     0.0023     0.0044     0.0071     0.0102
            0.0137     0.0177     0.0223     0.0274     0.0331
            0.0394     0.0461     0.0535     0.0617     0.0708
            0.0815     0.0948     0.1086     0.1226     0.1371
            0.1525     0.1691     0.1865     0.2050     0.2241
            0.2441     0.2648     0.2866     0.3092     0.3328
            0.3574     0.3828     0.4094     0.4369     0.4651
            0.4941     0.5239     0.5542     0.5859     0.6182
            0.6514     0.6852     0.7200     0.7562     0.7932
            0.8310     0.8705     0.9112     0.9536     1.0000
Hrad:
            0.0299     0.0595     0.0855     0.1151     0.1444
            0.1749     0.1993     0.2141     0.2378     0.2609
            0.2876     0.3067     0.3249     0.3403     0.3378
            0.3149     0.3261     0.3683     0.4052     0.4364
            0.4403     0.4666     0.4778     0.5095     0.5291
            0.5608     0.5764     0.5938     0.6192     0.6366
            0.6562     0.6769     0.6973     0.7195     0.7518
            0.7732     0.8004     0.8328     0.8414     0.8680
            0.8908     0.9146     0.9374     0.9414     0.9725
            0.9953     1.0004     1.0030     1.0217     1.0000
Width:
            0.0243     0.0372     0.0501     0.0599     0.0688
            0.0762     0.0860     0.1009     0.1118     0.1231
            0.1325     0.1456     0.1595     0.1758     0.2038
            0.2524     0.2832     0.2859     0.2923     0.3024
            0.3331     0.3477     0.3742     0.3848     0.4048
            0.4149     0.4377     0.4594     0.4748     0.4969
            0.5173     0.5367     0.5568     0.5755     0.5855
            0.6045     0.6186     0.6434     0.6575     0.6719
            0.6894     0.7061     0.7236     0.7571     0.7681
            0.7951     0.8197     0.8564     0.8825     1.0000

Transect XS-Roff-D1_3
Area:
            0.0018     0.0049     0.0091     0.0155     0.0240
            0.0338     0.0448     0.0569     0.0704     0.0840
            0.0979     0.1119     0.1263     0.1410     0.1559
            0.1711     0.1869     0.2033     0.2204     0.2388
            0.2582     0.2790     0.3003     0.3221     0.3442
            0.3666     0.3892     0.4121     0.4353     0.4588
            0.4827     0.5072     0.5319     0.5570     0.5824
            0.6080     0.6339     0.6601     0.6865     0.7130
            0.7397     0.7667     0.7942     0.8226     0.8515
            0.8805     0.9099     0.9397     0.9696     1.0000
Hrad:
            0.0199     0.0430     0.0511     0.0667     0.0803
            0.0999     0.1188     0.1392     0.1587     0.1874
            0.2146     0.2408     0.2663     0.2914     0.3163
            0.3392     0.3539     0.3739     0.3783     0.3897
            0.3886     0.4057     0.4251     0.4492     0.4738
            0.4986     0.5228     0.5480     0.5713     0.5910
            0.6111     0.6295     0.6532     0.6751     0.6988
            0.7218     0.7444     0.7690     0.7938     0.8184
            0.8428     0.8644     0.8685     0.8769     0.8998
            0.9213     0.9408     0.9625     0.9833     1.0000
Width:
            0.0891     0.1139     0.1788     0.2326     0.2992
            0.3383     0.3772     0.4188     0.4439     0.4486
            0.4562     0.4651     0.4743     0.4838     0.4929
            0.5045     0.5282     0.5437     0.5829     0.6132
            0.6649     0.6881     0.7070     0.7176     0.7269
            0.7356     0.7450     0.7525     0.7622     0.7767
            0.7903     0.8061     0.8148     0.8255     0.8338
            0.8426     0.8519     0.8586     0.8649     0.8714
```

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            0.8777     0.8870     0.9145     0.9382     0.9464
            0.9558     0.9672     0.9762     0.9861     1.0000

Transect XS-Roff-D2
Area:
            0.0003     0.0009     0.0016     0.0024     0.0032
            0.0041     0.0051     0.0061     0.0090     0.0147
            0.0235     0.0345     0.0478     0.0636     0.0817
            0.1008     0.1214     0.1431     0.1650     0.1874
            0.2102     0.2336     0.2574     0.2815     0.3061
            0.3308     0.3561     0.3817     0.4075     0.4337
            0.4601     0.4866     0.5133     0.5401     0.5673
            0.5946     0.6221     0.6497     0.6776     0.7059
            0.7344     0.7632     0.7923     0.8216     0.8510
            0.8805     0.9102     0.9399     0.9697     1.0000
Hrad:
            0.0192     0.0448     0.0675     0.0894     0.1096
            0.1289     0.1472     0.1636     0.1398     0.1180
            0.1108     0.1110     0.1190     0.1159     0.1381
            0.1600     0.1782     0.2067     0.2336     0.2617
            0.2851     0.3097     0.3369     0.3616     0.3885
            0.4151     0.4350     0.4629     0.4902     0.5128
            0.5407     0.5684     0.5958     0.6211     0.6463
            0.6727     0.6985     0.7244     0.7461     0.7672
            0.7913     0.8126     0.8380     0.8625     0.8890
            0.9166     0.9437     0.9709     0.9924     1.0000
Width:
            0.0178     0.0209     0.0238     0.0260     0.0282
            0.0303     0.0324     0.0455     0.1422     0.2341
            0.3138     0.4022     0.4767     0.5652     0.6050
            0.6452     0.6986     0.7089     0.7229     0.7318
            0.7530     0.7698     0.7788     0.7931     0.8019
            0.8106     0.8321     0.8375     0.8435     0.8575
            0.8621     0.8666     0.8712     0.8789     0.8864
            0.8918     0.8980     0.9036     0.9145     0.9261
            0.9335     0.9442     0.9498     0.9562     0.9602
            0.9628     0.9658     0.9686     0.9771     1.0000

Transect XS-Ron-G2
Area:
            0.0009     0.0027     0.0052     0.0084     0.0123
            0.0167     0.0216     0.0269     0.0331     0.0401
            0.0478     0.0560     0.0651     0.0751     0.0858
            0.0976     0.1106     0.1250     0.1404     0.1568
            0.1744     0.1929     0.2121     0.2319     0.2524
            0.2735     0.2953     0.3176     0.3407     0.3645
            0.3891     0.4146     0.4413     0.4687     0.4965
            0.5248     0.5535     0.5827     0.6123     0.6425
            0.6733     0.7052     0.7378     0.7718     0.8071
            0.8435     0.8808     0.9193     0.9584     1.0000
Hrad:
            0.0247     0.0505     0.0744     0.0950     0.1199
            0.1460     0.1708     0.1901     0.2000     0.2197
            0.2419     0.2626     0.2742     0.2931     0.3086
            0.3171     0.3294     0.3374     0.3584     0.3742
            0.3902     0.4152     0.4427     0.4663     0.4907
            0.5159     0.5413     0.5661     0.5884     0.6093
            0.6278     0.6477     0.6573     0.6861     0.7147
            0.7432     0.7713     0.7986     0.8244     0.8499
            0.8653     0.8806     0.8867     0.9029     0.9060
            0.9254     0.9281     0.9581     0.9819     1.0000
Width:
            0.0326     0.0495     0.0645     0.0817     0.0946
            0.1049     0.1152     0.1290     0.1511     0.1668
            0.1802     0.1945     0.2169     0.2340     0.2543
            0.2819     0.3080     0.3403     0.3600     0.3853
            0.4113     0.4275     0.4404     0.4570     0.4724
            0.4868     0.5005     0.5147     0.5309     0.5485
            0.5684     0.5870     0.6160     0.6262     0.6363
            0.6464     0.6564     0.6670     0.6787     0.6905
            0.7107     0.7316     0.7606     0.7815     0.8150
            0.8340     0.8690     0.8786     0.8941     1.0000
```

```
Transect XS-Ron-H1
Area:
            0.0027     0.0093     0.0170     0.0254     0.0345
            0.0439     0.0537     0.0639     0.0744     0.0852
            0.0963     0.1077     0.1195     0.1318     0.1445
            0.1578     0.1717     0.1863     0.2016     0.2179
            0.2352     0.2538     0.2735     0.2941     0.3155
            0.3376     0.3605     0.3838     0.4075     0.4317
            0.4562     0.4809     0.5060     0.5314     0.5572
            0.5835     0.6102     0.6375     0.6653     0.6936
            0.7223     0.7515     0.7812     0.8112     0.8416
            0.8725     0.9038     0.9353     0.9672     1.0000
Hrad:
            0.0239     0.0479     0.0782     0.1077     0.1371
            0.1671     0.1959     0.2239     0.2520     0.2793
            0.3053     0.3300     0.3524     0.3730     0.3926
            0.4092     0.4260     0.4401     0.4527     0.4596
            0.4659     0.4725     0.4832     0.4996     0.5171
            0.5336     0.5559     0.5788     0.6010     0.6232
            0.6487     0.6738     0.6978     0.7171     0.7370
            0.7575     0.7757     0.7923     0.8075     0.8276
            0.8475     0.8649     0.8840     0.9046     0.9240
            0.9418     0.9625     0.9839     0.9999     1.0000
Width:
            0.1462     0.2175     0.2428     0.2624     0.2784
            0.2893     0.3002     0.3106     0.3194     0.3281
            0.3375     0.3478     0.3603     0.3747     0.3898
            0.4084     0.4269     0.4486     0.4727     0.5042
            0.5383     0.5740     0.6056     0.6304     0.6535
            0.6783     0.6927     0.7053     0.7183     0.7309
            0.7387     0.7465     0.7551     0.7693     0.7824
            0.7946     0.8093     0.8258     0.8438     0.8560
            0.8681     0.8831     0.8959     0.9067     0.9188
            0.9325     0.9427     0.9518     0.9667     1.0000

Transect XS-Ron-H2
Area:
            0.0006     0.0019     0.0037     0.0061     0.0091
            0.0130     0.0204     0.0344     0.0490     0.0641
            0.0795     0.0952     0.1113     0.1279     0.1448
            0.1621     0.1797     0.1977     0.2163     0.2351
            0.2543     0.2740     0.2941     0.3146     0.3355
            0.3568     0.3786     0.4008     0.4234     0.4466
            0.4703     0.4944     0.5191     0.5443     0.5699
            0.5960     0.6223     0.6490     0.6761     0.7034
            0.7312     0.7594     0.7881     0.8172     0.8467
            0.8765     0.9066     0.9372     0.9684     1.0000
Hrad:
            0.0165     0.0328     0.0470     0.0585     0.0714
            0.0790     0.0712     0.0977     0.1354     0.1742
            0.2143     0.2521     0.2874     0.3215     0.3544
            0.3858     0.4156     0.4428     0.4697     0.4975
            0.5213     0.5450     0.5672     0.5900     0.6108
            0.6319     0.6513     0.6706     0.6895     0.7054
            0.7217     0.7382     0.7535     0.7694     0.7861
            0.8037     0.8217     0.8381     0.8554     0.8709
            0.8865     0.9002     0.9143     0.9291     0.9452
            0.9604     0.9742     0.9864     0.9981     1.0000
Width:
            0.0313     0.0483     0.0638     0.0844     0.1033
            0.1354     0.4185     0.4417     0.4579     0.4735
            0.4814     0.4919     0.5050     0.5170     0.5280
            0.5394     0.5509     0.5654     0.5781     0.5867
            0.6012     0.6142     0.6282     0.6399     0.6538
            0.6660     0.6801     0.6933     0.7062     0.7236
            0.7396     0.7547     0.7711     0.7859     0.7990
            0.8097     0.8193     0.8312     0.8410     0.8532
            0.8651     0.8797     0.8933     0.9056     0.9154
            0.9262     0.9392     0.9544     0.9702     1.0000

Transect XS-Ron-H3
Area:
            0.0013     0.0035     0.0064     0.0100     0.0151
```

```
            0.0209     0.0270     0.0335     0.0405     0.0478
            0.0554     0.0634     0.0718     0.0807     0.0900
            0.0996     0.1096     0.1199     0.1305     0.1416
            0.1532     0.1652     0.1775     0.1908     0.2095
            0.2304     0.2527     0.2767     0.3010     0.3257
            0.3536     0.3839     0.4146     0.4460     0.4778
            0.5100     0.5430     0.5764     0.6101     0.6441
            0.6783     0.7129     0.7477     0.7830     0.8186
            0.8545     0.8906     0.9268     0.9633     1.0000
Hrad:
            0.0219     0.0425     0.0617     0.0812     0.0858
            0.1094     0.1339     0.1557     0.1774     0.1992
            0.2204     0.2388     0.2547     0.2747     0.2945
            0.3130     0.3323     0.3518     0.3692     0.3822
            0.3989     0.4164     0.4315     0.4411     0.4416
            0.4409     0.4310     0.4363     0.4619     0.4848
            0.4323     0.4626     0.4919     0.5206     0.5536
            0.5817     0.6070     0.6400     0.6727     0.7040
            0.7357     0.7676     0.7955     0.8251     0.8554
            0.8859     0.9169     0.9487     0.9797     1.0000
Width:
            0.0491     0.0695     0.0884     0.1043     0.1490
            0.1613     0.1700     0.1811     0.1912     0.2004
            0.2094     0.2210     0.2348     0.2442     0.2534
            0.2636     0.2726     0.2813     0.2914     0.3055
            0.3164     0.3264     0.3385     0.4119     0.5406
            0.5812     0.6304     0.6474     0.6585     0.6841
            0.8063     0.8200     0.8350     0.8510     0.8594
            0.8752     0.8950     0.9022     0.9093     0.9180
            0.9255     0.9324     0.9439     0.9530     0.9607
            0.9676     0.9735     0.9780     0.9831     1.0000

Transect XS-Ron-H4
Area:
            0.0005     0.0017     0.0037     0.0065     0.0104
            0.0151     0.0208     0.0312     0.0453     0.0616
            0.0780     0.0946     0.1113     0.1281     0.1451
            0.1622     0.1793     0.1966     0.2140     0.2316
            0.2494     0.2674     0.2856     0.3041     0.3229
            0.3432     0.3653     0.3879     0.4108     0.4341
            0.4577     0.4820     0.5070     0.5326     0.5586
            0.5848     0.6113     0.6381     0.6653     0.6931
            0.7214     0.7504     0.7803     0.8106     0.8413
            0.8722     0.9034     0.9350     0.9671     1.0000
Hrad:
            0.0157     0.0294     0.0402     0.0519     0.0644
            0.0782     0.0772     0.0662     0.0763     0.1003
            0.1255     0.1503     0.1747     0.1986     0.2224
            0.2462     0.2697     0.2926     0.3143     0.3354
            0.3559     0.3764     0.3962     0.4141     0.4315
            0.4480     0.4686     0.4899     0.5117     0.5341
            0.5559     0.5776     0.5987     0.6213     0.6451
            0.6693     0.6938     0.7190     0.7406     0.7644
            0.7861     0.8060     0.8286     0.8541     0.8805
            0.9073     0.9342     0.9599     0.9797     1.0000
Width:
            0.0267     0.0459     0.0722     0.1003     0.1282
            0.1532     0.2154     0.3770     0.4756     0.4903
            0.4942     0.4981     0.5023     0.5067     0.5104
            0.5132     0.5160     0.5193     0.5245     0.5302
            0.5365     0.5421     0.5486     0.5574     0.5841
            0.6407     0.6700     0.6816     0.6929     0.7014
            0.7180     0.7365     0.7597     0.7739     0.7824
            0.7906     0.7989     0.8059     0.8256     0.8385
            0.8585     0.8842     0.9029     0.9139     0.9228
            0.9313     0.9401     0.9518     0.9761     1.0000

Transect XS-Ron-I1
Area:
            0.0018     0.0045     0.0076     0.0116     0.0162
            0.0216     0.0278     0.0347     0.0424     0.0510
            0.0609     0.0714     0.0825     0.0948     0.1084
            0.1228     0.1378     0.1535     0.1698     0.1866
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            0.2042     0.2225     0.2415     0.2612     0.2814
            0.3023     0.3240     0.3464     0.3695     0.3934
            0.4179     0.4431     0.4689     0.4954     0.5224
            0.5500     0.5783     0.6072     0.6367     0.6668
            0.6976     0.7290     0.7610     0.7939     0.8275
            0.8614     0.8956     0.9301     0.9649     1.0000
Hrad:
            0.0287     0.0566     0.0786     0.0974     0.1172
            0.1328     0.1517     0.1710     0.1885     0.1958
            0.2146     0.2362     0.2553     0.2609     0.2778
            0.3001     0.3214     0.3426     0.3666     0.3867
            0.4051     0.4257     0.4445     0.4654     0.4875
            0.5042     0.5214     0.5395     0.5573     0.5762
            0.5965     0.6167     0.6352     0.6550     0.6758
            0.6966     0.7142     0.7335     0.7534     0.7723
            0.7906     0.8107     0.8264     0.8410     0.8651
            0.8922     0.9201     0.9458     0.9717     1.0000
Width:
            0.0680     0.0818     0.1001     0.1217     0.1406
            0.1659     0.1868     0.2065     0.2284     0.2661
            0.2890     0.3070     0.3281     0.3707     0.3983
            0.4167     0.4364     0.4554     0.4694     0.4886
            0.5104     0.5287     0.5493     0.5667     0.5818
            0.6044     0.6266     0.6471     0.6682     0.6878
            0.7052     0.7226     0.7423     0.7600     0.7760
            0.7918     0.8119     0.8296     0.8463     0.8643
            0.8830     0.8991     0.9209     0.9453     0.9582
            0.9668     0.9742     0.9841     0.9937     1.0000

Transect XS-Ron-I2
Area:
            0.0009     0.0026     0.0049     0.0087     0.0140
            0.0202     0.0270     0.0344     0.0423     0.0507
            0.0596     0.0690     0.0788     0.0892     0.1001
            0.1144     0.1338     0.1539     0.1744     0.1955
            0.2170     0.2390     0.2615     0.2845     0.3081
            0.3323     0.3568     0.3815     0.4065     0.4318
            0.4574     0.4833     0.5095     0.5360     0.5628
            0.5898     0.6171     0.6448     0.6727     0.7009
            0.7294     0.7583     0.7874     0.8169     0.8466
            0.8767     0.9071     0.9378     0.9687     1.0000
Hrad:
            0.0146     0.0271     0.0355     0.0387     0.0503
            0.0647     0.0787     0.0927     0.1060     0.1194
            0.1328     0.1456     0.1582     0.1700     0.1818
            0.1874     0.1930     0.2090     0.2276     0.2486
            0.2718     0.2945     0.3165     0.3390     0.3591
            0.3850     0.4120     0.4394     0.4661     0.4929
            0.5188     0.5455     0.5721     0.5986     0.6253
            0.6515     0.6774     0.7033     0.7296     0.7550
            0.7796     0.8038     0.8296     0.8545     0.8789
            0.9028     0.9273     0.9515     0.9756     1.0000
Width:
            0.0426     0.0628     0.0913     0.1491     0.1855
            0.2066     0.2260     0.2432     0.2606     0.2765
            0.2911     0.3062     0.3209     0.3371     0.3682
            0.5869     0.6308     0.6462     0.6640     0.6798
            0.6916     0.7067     0.7243     0.7417     0.7666
            0.7762     0.7842     0.7917     0.8007     0.8097
            0.8205     0.8297     0.8387     0.8481     0.8567
            0.8660     0.8756     0.8849     0.8934     0.9030
            0.9138     0.9251     0.9333     0.9427     0.9527
            0.9632     0.9725     0.9820     0.9914     1.0000

Transect XS-Ron-J
Area:
            0.0020     0.0065     0.0130     0.0203     0.0282
            0.0365     0.0452     0.0544     0.0640     0.0739
            0.0846     0.0975     0.1139     0.1313     0.1496
            0.1692     0.1890     0.2088     0.2288     0.2489
            0.2691     0.2893     0.3098     0.3305     0.3515
            0.3727     0.3942     0.4160     0.4381     0.4603
            0.4826     0.5052     0.5281     0.5516     0.5758
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            0.6004     0.6256     0.6510     0.6769     0.7032
            0.7300     0.7573     0.7853     0.8141     0.8436
            0.8737     0.9043     0.9353     0.9668     1.0000
Hrad:
            0.0249     0.0466     0.0742     0.1053     0.1349
            0.1627     0.1887     0.2142     0.2382     0.2593
            0.2753     0.2282     0.2459     0.2707     0.2890
            0.3134     0.3463     0.3786     0.4104     0.4418
            0.4727     0.5031     0.5314     0.5592     0.5867
            0.6134     0.6387     0.6644     0.6924     0.7200
            0.7468     0.7731     0.7947     0.8056     0.8239
            0.8427     0.8648     0.8880     0.9089     0.9282
            0.9486     0.9596     0.9758     0.9883     1.0009
            1.0211     1.0408     1.0632     1.0854     1.0000
Width:
            0.0882     0.1577     0.1953     0.2117     0.2251
            0.2373     0.2495     0.2601     0.2715     0.2853
            0.3055     0.4377     0.4742     0.4940     0.5267
            0.5481     0.5511     0.5540     0.5569     0.5599
            0.5629     0.5658     0.5725     0.5794     0.5863
            0.5940     0.6030     0.6111     0.6156     0.6200
            0.6255     0.6310     0.6421     0.6643     0.6792
            0.6936     0.7042     0.7137     0.7254     0.7388
            0.7510     0.7724     0.7893     0.8100     0.8310
            0.8442     0.8581     0.8690     0.8799     1.0000


************************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
************************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 11/11/2019 00:00:00
Ending Date .............. 11/12/2019 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.005000 ft


*************************        Volume        Volume
Flow Routing Continuity       acre-feet      10^6 gal
*************************     ---------     ---------
Dry Weather Inflow .......          0.000         0.000
Wet Weather Inflow .......          0.000         0.000
Groundwater Inflow .......          0.000         0.000
RDII Inflow ..............          0.000         0.000
External Inflow ..........         29.926         9.752
External Outflow .........         29.736         9.690
Flooding Loss ............          0.000         0.000
Evaporation Loss .........          0.000         0.000
Exfiltration Loss ........          0.000         0.000
Initial Stored Volume ....          0.000         0.000
Final Stored Volume ......          0.100         0.033
Continuity Error (%) .....          0.300
```

```
************************
Highest Continuity Errors
************************
Node Joff-B1 (2.60%)
Node Joff-D2 (-1.54%)
Node Joff-D3 (1.14%)


**************************
Time-Step Critical Elements
**************************
Link Coff-D2 (8.55%)


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
Minimum Time Step           :     4.48 sec
Average Time Step           :     4.97 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00


******************
Node Depth Summary
******************
```

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
J1	JUNCTION	0.05	0.60	4648.10	0 12:35	0.60
J3	JUNCTION	0.25	1.22	4607.51	0 12:36	1.22
Joff-A	JUNCTION	0.44	1.89	4720.83	0 12:43	1.89
Joff-B1	JUNCTION	0.04	0.46	4844.61	0 12:38	0.46
Joff-B2	JUNCTION	0.04	0.51	4801.79	0 12:29	0.51
Joff-C_1	JUNCTION	0.15	0.81	4696.47	0 12:42	0.81
Joff-C_1a	JUNCTION	0.18	0.92	4651.05	0 12:48	0.92
Joff-C_2	JUNCTION	0.21	1.09	4687.26	0 12:39	1.09
Joff-D1	JUNCTION	0.22	1.52	4528.80	0 12:36	1.52
Joff-D1_1	JUNCTION	0.35	1.62	4543.35	0 12:37	1.62
Joff-D2	JUNCTION	0.36	1.96	4527.46	0 12:47	1.96
Joff-D3	JUNCTION	0.86	6.26	4513.84	0 12:59	6.26
Jon-E	JUNCTION	0.02	0.27	4871.47	0 12:25	0.27
Jon-F	JUNCTION	0.01	0.24	4789.40	0 12:31	0.24
Jon-G1	JUNCTION	0.05	0.55	4753.00	0 12:36	0.55
Jon-H1	JUNCTION	0.56	3.36	4620.30	0 12:35	3.36
Jon-H2	JUNCTION	0.23	0.80	4616.90	0 12:35	0.80
Jon-H3	JUNCTION	0.14	1.58	4748.66	0 12:34	1.58
Jon-I1	JUNCTION	0.29	1.43	4656.42	0 12:33	1.43
Jon-I2	JUNCTION	0.27	1.44	4631.14	0 12:35	1.44
Jon-J	JUNCTION	0.29	1.51	4566.11	0 12:36	1.51
OFoff-D	OUTFALL	0.28	1.96	4498.96	0 12:59	1.96
OFon-A	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OFon-B	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OFon-C	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OFon-D	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OFon-G	OUTFALL	0.05	0.54	4644.33	0 12:36	0.54
Soff-D	STORAGE	2.30	4.96	4500.96	0 12:59	4.96

```
******************
```

Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
J1	JUNCTION	0.00	35.51	0 12:34	0	0.943	-0.175
J3	JUNCTION	0.00	101.64	0 12:35	0	4.34	0.042
Joff-A	JUNCTION	55.79	55.79	0 12:40	3.01	3.01	0.197
Joff-B1	JUNCTION	0.00	6.77	0 12:25	0	0.159	2.667
Joff-B2	JUNCTION	13.60	16.83	0 12:25	0.255	0.41	-0.549
Joff-C_1	JUNCTION	20.99	20.99	0 12:40	1	1	0.017
Joff-C_1a	JUNCTION	0.00	20.95	0 12:42	0	1	0.151
Joff-C_2	JUNCTION	14.04	58.91	0 12:37	0.196	3.2	0.109
Joff-D1	JUNCTION	0.00	103.97	0 12:36	0	4.49	0.050
Joff-D1_1	JUNCTION	4.71	104.05	0 12:36	0.102	4.5	0.099
Joff-D2	JUNCTION	0.00	123.95	0 12:39	0	5.49	-1.513
Joff-D3	JUNCTION	111.74	209.01	0 12:37	3.17	8.74	1.157
Jon-E	JUNCTION	6.80	6.80	0 12:25	0.157	0.157	-1.047
Jon-F	JUNCTION	13.68	13.68	0 12:30	0.338	0.338	-0.148
Jon-G1	JUNCTION	0.00	13.57	0 12:31	0	0.339	0.406
Jon-H1	JUNCTION	0.00	90.10	0 12:35	0	4.06	0.346
Jon-H2	JUNCTION	0.00	36.30	0 12:35	0	2.78	0.045
Jon-H3	JUNCTION	19.66	36.11	0 12:30	0.533	0.945	0.243
Jon-I1	JUNCTION	12.28	66.28	0 12:32	0.22	3.42	0.116
Jon-I2	JUNCTION	0.00	66.26	0 12:33	0	3.41	0.051
Jon-J	JUNCTION	4.61	102.24	0 12:35	0.0631	4.4	0.077
OFoff-D	OUTFALL	0.00	161.77	0 12:59	0	8.64	0.000
OFon-A	OUTFALL	8.09	8.09	0 12:15	0.118	0.118	0.000
OFon-B	OUTFALL	14.78	14.78	0 12:15	0.198	0.198	0.000
OFon-C	OUTFALL	5.84	5.84	0 12:15	0.0813	0.0813	0.000
OFon-D	OUTFALL	7.85	7.85	0 12:15	0.0977	0.0977	0.000
OFon-G	OUTFALL	17.01	21.48	0 12:25	0.213	0.551	0.000
Soff-D	STORAGE	0.00	161.75	0 12:59	0	8.64	0.007

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
Soff-D	0.000	4	0	0	0.000	16	0 12:59	161.77

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal

OFoff-D	96.63	14.53	161.77	8.644
OFon-A	10.43	1.78	8.09	0.118
OFon-B	9.66	3.22	14.78	0.198
OFon-C	9.30	1.37	5.84	0.081
OFon-D	8.43	1.81	7.85	0.098
OFon-G	50.99	1.75	21.48	0.551
System	30.91	24.46	21.48	9.689

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Coff-D1	CONDUIT	104.14	0	12:38	6.11	0.46	0.69
Coff-D2	CONDUIT	107.91	0	12:59	11.76	0.99	0.91
Coff-D3	CONDUIT	161.77	0	12:59	8.21	0.49	0.62
Con-H	CONDUIT	8.81	0	12:35	3.95	1.96	0.90
Con-I	CONDUIT	66.26	0	12:33	15.49	0.21	0.33
Roff-B_1	CHANNEL	6.77	0	12:25	2.71	0.00	0.11
Roff-B_2	CHANNEL	5.74	0	12:38	2.28	0.00	0.04
Roff-C	CHANNEL	55.18	0	12:43	5.62	0.00	0.09
Roff-C_1	CHANNEL	20.95	0	12:42	3.80	0.00	0.04
Roff-C_2	CHANNEL	20.74	0	12:48	3.88	0.00	0.10
Roff-D1_1	CHANNEL	102.18	0	12:36	6.62	0.03	0.24
Roff-D1_2	CHANNEL	103.97	0	12:36	5.90	0.00	0.09
Roff-D2	CHANNEL	120.00	0	12:47	3.05	0.00	0.25
Ron-G1	CONDUIT	13.57	0	12:31	2.04	0.09	0.39
Ron-G2	CHANNEL	13.18	0	12:36	7.76	0.00	0.10
Ron-H1	CHANNEL	16.46	0	12:29	1.76	0.00	0.14
Ron-H2	CHANNEL	35.51	0	12:34	12.59	0.00	0.05
Ron-H3	CHANNEL	23.92	0	12:35	0.96	0.00	0.18
Ron-H4	CHANNEL	11.57	0	12:35	3.39	0.00	0.07
Ron-I1	CHANNEL	58.79	0	12:39	5.29	0.00	0.04
Ron-I2	CHANNEL	66.18	0	12:35	3.21	0.00	0.04
Ron-J_1	CHANNEL	36.30	0	12:35	6.44	0.00	0.04
Ron-J_2	CHANNEL	101.64	0	12:36	8.02	0.00	0.05
W1	WEIR	7.96	0	12:35			1.00
W2	WEIR	7.96	0	12:35			1.00
W3	WEIR	65.34	0	12:35			0.06
W4	WEIR	0.00	0	00:00			0.00
W6	WEIR	53.85	0	12:59			0.05

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
Coff-D1	1.00	0.03	0.00	0.00	0.87	0.10	0.00	0.00	0.78	0.00
Coff-D2	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
Coff-D3	1.00	0.03	0.00	0.00	0.36	0.61	0.00	0.00	0.00	0.00
Con-H	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.00	0.00
Con-I	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	0.00	0.00
Roff-B_1	1.00	0.49	0.00	0.00	0.49	0.02	0.00	0.00	0.49	0.00
Roff-B_2	1.00	0.49	0.01	0.00	0.50	0.00	0.00	0.00	0.37	0.00
Roff-C	1.00	0.00	0.00	0.00	0.02	0.98	0.00	0.00	0.00	0.00
Roff-C_1	1.00	0.00	0.00	0.00	0.74	0.26	0.00	0.00	0.83	0.00
Roff-C_2	1.00	0.00	0.00	0.00	0.87	0.13	0.00	0.00	0.85	0.00
Roff-D1_1	1.00	0.00	0.00	0.00	0.94	0.06	0.00	0.00	0.97	0.00
Roff-D1_2	1.00	0.00	0.00	0.00	0.08	0.92	0.00	0.00	0.00	0.00
Roff-D2	1.00	0.00	0.05	0.00	0.95	0.00	0.00	0.00	0.95	0.00
Ron-G1	1.00	0.49	0.00	0.00	0.50	0.01	0.00	0.00	0.49	0.00

Ron-G2	1.00	0.50	0.00	0.00	0.00	0.50	0.00	0.00	0.19	0.00
Ron-H1	1.00	0.49	0.00	0.00	0.51	0.00	0.00	0.00	0.51	0.00
Ron-H2	1.00	0.49	0.00	0.00	0.00	0.51	0.00	0.00	0.00	0.00
Ron-H3	1.00	0.07	0.42	0.00	0.51	0.00	0.00	0.00	0.50	0.00
Ron-H4	1.00	0.08	0.42	0.00	0.50	0.01	0.00	0.00	0.50	0.00
Ron-I1	1.00	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.95	0.00
Ron-I2	1.00	0.01	0.00	0.00	0.98	0.01	0.00	0.00	0.87	0.00
Ron-J_1	1.00	0.08	0.00	0.00	0.01	0.92	0.00	0.00	0.06	0.00
Ron-J_2	1.00	0.00	0.10	0.00	0.02	0.89	0.00	0.00	0.88	0.00

****
Conduit Surcharge Summary
****

	Hours Full			Hours Above Full	Hours Capacity
Conduit	Both Ends	Upstream	Dnstream	Normal Flow	Limited
Coff-D2	0.01	1.96	0.01	0.01	0.01
Con-H	0.01	2.80	0.01	2.81	0.01

Analysis begun on: Thu Feb 27 16:34:53 2020
Analysis ended on: Thu Feb 27 16:34:54 2020
Total elapsed time: 00:00:01

Existing Conditions Model Results – 100-year

ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM BETA VERSION 7.2.2785

This is a *BETA* version of ARM - your feedback and suggestions are solicited.
Create a ticket, post on the PCSWMM feature request forum, or email us directly!

Simulation start time:	11/11/2019 00:00:00
Simulation end time:	11/12/2019 00:00:00
Runoff wet weather time steps:	300 seconds
Report time steps:	60 seconds
Number of data points:	1441

****
Unit Hydrographs Runoff Method
****

Subcatchment	Runoff Method	Factor	Raingage	Area (ac)	Tc (min)	Tpeak (min)	Peak Flow L(cfs/in)	Depth (in)
Bon-H	UH	350	Sparks_100y	102.285	49.16	32	104.8952	0.999
Boff-A	UH	300	Sparks_100y	361.629	61.77	39.56	257.0855	0.999
Bon-B	UH	350	Sparks_100y	40.174	21.38	15.33	86.00009	0.998
Bon-A	UH	350	Sparks_100y	23.886	23.51	16.61	47.19736	0.998
Bon-F	UH	350	Sparks_100y	68.565	44.73	29.34	76.68515	0.998
Bon-D	UH	350	Sparks_100y	19.862	19.25	14.05	46.3859	0.999
Bon-G	UH	350	Sparks_100y	43.311	19.47	14.18	100.2075	0.998
Bon-C	UH	350	Sparks_100y	16.513	22.38	15.93	34.01763	0.999
Bon-E	UH	300	Sparks_100y	31.869	34.66	23.3	38.47509	0.996
Boff-B	UH	300	Sparks_100y	52.908	27.27	18.86	78.89076	0.997
Bon-I	UH	350	Sparks_100y	39.931	27.25	18.85	69.50854	0.998
Bon-J	UH	350	Sparks_100y	8.878	13.63	10.68	27.28127	0.997
Boff-C2	UH	300	Sparks_100y	40.038	18.74	13.74	81.93166	1
Boff-C1	UH	300	Sparks_100y	79.355	63.56	40.64	54.92321	0.999
Boff-D1	UH	300	Sparks_100y	12.333	18.6	13.66	25.3928	1
Boff-D2	UH	350	Sparks_100y	260.1	38.28	25.47	335.108	0.999

****
ARM Runoff Summary
****

Subcatchment	Total Precip (in)	Total Losses (in)	Total Runoff (in)	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff (fraction)
Bon-H	3.146	2.296	0.849	2.359	82.967	0.27
Boff-A	3.146	2.119	1.022	10.039	219.724	0.325
Bon-B	3.146	2.326	0.817	0.892	58.424	0.26
Bon-A	3.146	2.325	0.819	0.531	32.348	0.26
Bon-F	3.146	2.326	0.819	1.525	58.796	0.26
Bon-D	3.146	2.326	0.816	0.44	30.766	0.26
Bon-G	3.146	2.326	0.817	0.96	66.693	0.26
Bon-C	3.146	2.326	0.818	0.367	23.209	0.26
Bon-E	3.146	2.326	0.818	0.708	29.078	0.26
Boff-B	3.146	2.337	0.806	1.158	57.398	0.256
Bon-I	3.146	2.293	0.851	0.922	49.855	0.27
Bon-J	3.146	2.203	0.936	0.226	16.622	0.298
Boff-C2	3.146	2.326	0.815	0.886	56.044	0.259
Boff-C1	3.146	1.898	1.246	2.684	59.324	0.396

Boff-D1	3.146	2.14	0.998	0.334	17.739	0.317
Boff-D2	3.146	1.908	1.237	8.737	320.54	0.393

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
--------------------------------------------------------------

WARNING 02: maximum depth increased for Node J1
WARNING 02: maximum depth increased for Node J3
WARNING 02: maximum depth increased for Node Joff-A
WARNING 02: maximum depth increased for Node Joff-B1
WARNING 02: maximum depth increased for Node Joff-B2
WARNING 02: maximum depth increased for Node Joff-C_1
WARNING 02: maximum depth increased for Node Joff-C_1a
WARNING 02: maximum depth increased for Node Joff-C_2
WARNING 02: maximum depth increased for Node Joff-D1
WARNING 02: maximum depth increased for Node Joff-D1_1
WARNING 02: maximum depth increased for Node Joff-D2
WARNING 02: maximum depth increased for Node Joff-D3
WARNING 02: maximum depth increased for Node Jon-E
WARNING 02: maximum depth increased for Node Jon-G1
WARNING 02: maximum depth increased for Node Jon-H1
WARNING 02: maximum depth increased for Node Jon-H2
WARNING 02: maximum depth increased for Node Jon-H3
WARNING 02: maximum depth increased for Node Jon-I1
WARNING 02: maximum depth increased for Node Jon-I2
WARNING 02: maximum depth increased for Node Jon-J

*************
Element Count
*************
Number of rain gages ...... 6
Number of subcatchments ... 0
Number of nodes ........... 28
Number of links ........... 28
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                 Data       Recording
Name                 Data Source                 Type       Interval
------------------------------------------------------------------------
Sparks_100y          Sparks_100y                 VOLUME       6 min.
Sparks_10y           Sparks_10y                  VOLUME       6 min.
Sparks_25y           Sparks_25y                  VOLUME       6 min.
Sparks_2yr           Sparks_2yr                  VOLUME       6 min.
Sparks_50y           Sparks_50y                  VOLUME       6 min.
Sparks_5y            Sparks_5y                   VOLUME       6 min.


************
Node Summary
************
                                      Invert      Max.    Ponded    External
Name                 Type              Elev.     Depth      Area    Inflow
--------------------------------------------------------------------------------
J1                   JUNCTION        4647.50     23.69       0.0
J3                   JUNCTION        4606.29     27.68       0.0
Joff-A               JUNCTION        4718.94     15.70      50.0
Joff-B1              JUNCTION        4844.15     11.34      50.0
Joff-B2              JUNCTION        4801.28     11.34      50.0
Joff-C_1             JUNCTION        4695.66     19.39       0.0
Joff-C_1a            JUNCTION        4650.13     19.39       0.0
Joff-C_2             JUNCTION        4686.17     29.35      50.0
Joff-D1              JUNCTION        4527.28     18.51      50.0
Joff-D1_1            JUNCTION        4541.73     18.51      50.0
Joff-D2              JUNCTION        4525.50     16.17     500.0
Joff-D3              JUNCTION        4507.58     16.17     500.0
```

Jon-E	JUNCTION	4871.20	3.33	50.0
Jon-F	JUNCTION	4789.16	5.00	50.0
Jon-G1	JUNCTION	4752.45	5.67	50.0
Jon-H1	JUNCTION	4616.94	66.97	50.0
Jon-H2	JUNCTION	4616.10	27.68	50.0
Jon-H3	JUNCTION	4747.08	23.69	50.0
Jon-I1	JUNCTION	4654.99	29.35	50.0
Jon-I2	JUNCTION	4629.70	66.97	50.0
Jon-J	JUNCTION	4564.60	27.68	50.0
OFoff-D	OUTFALL	4497.00	4.00	0.0
OFon-A	OUTFALL	0.00	0.00	0.0
OFon-B	OUTFALL	0.00	0.00	0.0
OFon-C	OUTFALL	0.00	0.00	0.0
OFon-D	OUTFALL	0.00	0.00	0.0
OFon-G	OUTFALL	4643.79	5.67	0.0
Soff-D	STORAGE	4496.00	12.50	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
Coff-D1	Joff-D1	Joff-D2	CONDUIT	148.9	1.1955	0.0130
Coff-D2	Joff-D3	Soff-D	CONDUIT	145.0	3.9617	0.0240
Coff-D3	Soff-D	OFoff-D	CONDUIT	177.4	0.5636	0.0130
Con-H	Jon-H1	Jon-H2	CONDUIT	139.3	0.6029	0.0240
Con-I	Jon-I1	Jon-I2	CONDUIT	794.0	3.1868	0.0130
Roff-B_1	Jon-E	Joff-B1	CONDUIT	734.4	3.6859	0.0400
Roff-B_2	Joff-B1	Joff-B2	CONDUIT	1795.5	2.3881	0.0400
Roff-C	Joff-A	Joff-C_2	CONDUIT	1770.5	1.8511	0.0400
Roff-C_1	Joff-C_1	Joff-C_1a	CONDUIT	1079.3	4.2223	0.0400
Roff-C_2	Joff-C_1a	Joff-D2	CONDUIT	1995.9	6.2566	0.0400
Roff-D1_1	Jon-J	Joff-D1_1	CONDUIT	606.5	3.7741	0.0400
Roff-D1_2	Joff-D1_1	Joff-D1	CONDUIT	587.1	2.4616	0.0400
Roff-D2	Joff-D2	Joff-D3	CONDUIT	770.1	2.3276	0.0400
Ron-G1	Jon-F	Jon-G1	CONDUIT	981.0	3.7446	0.0400
Ron-G2	Jon-G1	OFon-G	CONDUIT	528.2	21.0222	0.0400
Ron-H1	Joff-B2	Jon-H3	CONDUIT	1108.8	4.8943	0.0400
Ron-H2	Jon-H3	J1	CONDUIT	1117.0	8.9508	0.0400
Ron-H3	J1	Jon-H1	CONDUIT	306.1	10.0337	0.0400
Ron-H4	J1	Jon-H2	CONDUIT	404.6	7.7838	0.0400
Ron-I1	Joff-C_2	Jon-I1	CONDUIT	814.9	3.8290	0.0400
Ron-I2	Jon-I2	Jon-H1	CONDUIT	850.0	1.5013	0.0400
Ron-J_1	Jon-H2	J3	CONDUIT	100.6	9.7967	0.0400
Ron-J_2	J3	Jon-J	CONDUIT	427.8	9.7930	0.0400
W1	Jon-H1	Jon-H2	WEIR			
W2	Jon-H1	Jon-H2	WEIR			
W3	Jon-H1	J3	WEIR			
W4	Joff-D1	Joff-D2	WEIR			
W6	Joff-D3	Soff-D	WEIR			

****
Cross Section Summary
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Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
Coff-D1	CIRCULAR	2.50	4.91	0.63	2.50	5	44.85
Coff-D2	CIRCULAR	3.50	9.62	0.88	3.50	1	108.47
Coff-D3	RECT_CLOSED	4.00	32.00	1.33	8.00	1	332.66
Con-H	CIRCULAR	1.00	0.79	0.25	1.00	3	1.50
Con-I	CIRCULAR	4.33	14.75	1.08	4.33	1	317.37
Roff-B_1	XS-Roff-B-1	3.33	177.21	1.63	106.46	1	1753.23
Roff-B_2	XS-Roff-B_2	11.34	766.16	6.66	112.97	1	15567.79
Roff-C	XS-Roff-C	15.70	1445.69	8.69	186.34	1	30896.78
Roff-C_1	XS-Roff-C_1	19.39	1007.15	8.89	91.51	1	33004.69
Roff-C_2	XS-Roff-C_2	14.19	1217.82	9.40	129.17	1	50413.96
Roff-D1_1	XS-Roff-D1_1	6.45	254.33	3.15	85.89	1	3941.66
Roff-D1_2	XS-Roff-D1_2	18.51	2314.87	7.64	303.98	1	52360.23
Roff-D2	XS-Roff-D2	16.17	4216.24	10.13	400.30	1	111860.16
Ron-G1	TRAPEZOIDAL	1.00	25.00	0.83	30.00	1	158.46

Ron-G2	XS-Ron-G2	5.67	146.98	2.72	57.14	1 4876.16
Ron-H1	XS-Ron-H1	7.44	195.63	3.94	43.81	1 4013.54
Ron-H2	XS-Ron-H2	23.69	1146.73	15.38	78.28	1 78834.62
Ron-H3	XS-Ron-H3	10.96	672.73	6.83	114.12	1 28491.08
Ron-H4	XS-Ron-H4	9.63	623.61	7.12	108.05	1 23919.46
Ron-I1	XS-Ron-I1	29.35	2288.81	15.26	137.36	1 102369.82
Ron-I2	XS-Ron-I2	66.97	14347.28	61.85	336.30	1 1021372.49
Ron-J_1	XS-Ron-J	27.68	1419.08	13.44	92.15	1 93295.27
Ron-J_2	XS-Ron-J	27.68	1419.08	13.44	92.15	1 93277.69

****
Transect Summary
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Transect XS-Roff-B_2
Area:

0.0009	0.0031	0.0064	0.0107	0.0159
0.0220	0.0291	0.0370	0.0458	0.0553
0.0658	0.0770	0.0889	0.1015	0.1147
0.1287	0.1438	0.1598	0.1763	0.1936
0.2116	0.2305	0.2503	0.2711	0.2926
0.3149	0.3382	0.3622	0.3869	0.4126
0.4388	0.4654	0.4922	0.5193	0.5467
0.5744	0.6024	0.6307	0.6594	0.6885
0.7178	0.7476	0.7777	0.8081	0.8389
0.8701	0.9019	0.9340	0.9667	1.0000

Hrad:

0.0203	0.0381	0.0562	0.0758	0.0959
0.1130	0.1303	0.1476	0.1692	0.1856
0.2040	0.2223	0.2427	0.2650	0.2836
0.2972	0.3092	0.3282	0.3500	0.3688
0.3826	0.3984	0.4139	0.4295	0.4464
0.4637	0.4778	0.4986	0.5148	0.5310
0.5558	0.5835	0.6118	0.6386	0.6634
0.6890	0.7175	0.7409	0.7625	0.7887
0.8133	0.8349	0.8591	0.8829	0.9059
0.9232	0.9455	0.9653	0.9785	1.0000

Width:

0.0471	0.0830	0.1150	0.1427	0.1671
0.1962	0.2242	0.2522	0.2718	0.2995
0.3235	0.3476	0.3676	0.3840	0.4051
0.4338	0.4660	0.4877	0.5044	0.5253
0.5535	0.5792	0.6055	0.6317	0.6561
0.6799	0.7086	0.7269	0.7522	0.7778
0.7904	0.7983	0.8051	0.8135	0.8244
0.8340	0.8397	0.8512	0.8648	0.8728
0.8825	0.8952	0.9050	0.9150	0.9257
0.9423	0.9536	0.9673	0.9880	1.0000

Transect XS-Roff-B-1
Area:

0.0014	0.0055	0.0109	0.0170	0.0238
0.0312	0.0392	0.0476	0.0564	0.0659
0.0760	0.0865	0.0975	0.1090	0.1209
0.1332	0.1459	0.1590	0.1726	0.1867
0.2011	0.2159	0.2311	0.2470	0.2635
0.2805	0.2981	0.3162	0.3350	0.3543
0.3740	0.3942	0.4157	0.4383	0.4620
0.4872	0.5150	0.5455	0.5802	0.6168
0.6541	0.6915	0.7290	0.7669	0.8050
0.8435	0.8823	0.9212	0.9604	1.0000

Hrad:

0.0200	0.0445	0.0776	0.1061	0.1348
0.1635	0.1941	0.2246	0.2509	0.2699
0.2973	0.3275	0.3524	0.3739	0.4037
0.4311	0.4562	0.4835	0.5032	0.5294
0.5562	0.5811	0.6016	0.6155	0.6332
0.6552	0.6756	0.6914	0.7085	0.7342
0.7593	0.7685	0.7720	0.7924	0.8076
0.8143	0.7923	0.7492	0.7114	0.6662
0.7038	0.7413	0.7775	0.8094	0.8420

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            0.8744     0.9093     0.9441     0.9763     1.0000
Width:
            0.0767     0.1258     0.1419     0.1622     0.1786
            0.1934     0.2045     0.2144     0.2275     0.2470
            0.2587     0.2673     0.2797     0.2948     0.3029
            0.3124     0.3233     0.3324     0.3466     0.3562
            0.3652     0.3752     0.3880     0.4053     0.4203
            0.4325     0.4457     0.4620     0.4776     0.4875
            0.4975     0.5208     0.5542     0.5768     0.6074
            0.6554     0.7228     0.8286     0.8965     0.9314
            0.9342     0.9371     0.9413     0.9506     0.9587
            0.9667     0.9718     0.9766     0.9841     1.0000

Transect XS-Roff-C
Area:
            0.0006     0.0016     0.0031     0.0050     0.0074
            0.0110     0.0155     0.0207     0.0268     0.0339
            0.0417     0.0501     0.0590     0.0687     0.0796
            0.0914     0.1039     0.1170     0.1308     0.1453
            0.1605     0.1762     0.1926     0.2096     0.2274
            0.2459     0.2666     0.2901     0.3141     0.3387
            0.3642     0.3908     0.4183     0.4465     0.4754
            0.5053     0.5361     0.5676     0.5995     0.6322
            0.6656     0.6998     0.7350     0.7708     0.8072
            0.8440     0.8817     0.9205     0.9599     1.0000
Hrad:
            0.0246     0.0453     0.0637     0.0817     0.0893
            0.0928     0.1136     0.1265     0.1428     0.1593
            0.1808     0.2030     0.2227     0.2382     0.2444
            0.2645     0.2853     0.3081     0.3249     0.3454
            0.3647     0.3857     0.4066     0.4234     0.4419
            0.4592     0.4809     0.4996     0.5175     0.5374
            0.5472     0.5631     0.5838     0.6097     0.6344
            0.6465     0.6718     0.7029     0.7308     0.7557
            0.7782     0.8023     0.8224     0.8532     0.8812
            0.9132     0.9250     0.9490     0.9751     1.0000
Width:
            0.0208     0.0311     0.0417     0.0523     0.0714
            0.1028     0.1179     0.1418     0.1630     0.1849
            0.2004     0.2143     0.2304     0.2508     0.2834
            0.3009     0.3172     0.3306     0.3503     0.3661
            0.3826     0.3973     0.4118     0.4305     0.4473
            0.4716     0.5742     0.5856     0.6012     0.6170
            0.6455     0.6697     0.6901     0.7053     0.7223
            0.7543     0.7720     0.7831     0.7977     0.8158
            0.8365     0.8555     0.8793     0.8908     0.9055
            0.9153     0.9472     0.9661     0.9825     1.0000

Transect XS-Roff-C_1
Area:
            0.0014     0.0045     0.0102     0.0201     0.0327
            0.0456     0.0589     0.0725     0.0863     0.1005
            0.1149     0.1295     0.1445     0.1598     0.1754
            0.1913     0.2074     0.2239     0.2407     0.2578
            0.2752     0.2929     0.3110     0.3295     0.3482
            0.3674     0.3869     0.4067     0.4270     0.4478
            0.4691     0.4910     0.5135     0.5367     0.5607
            0.5853     0.6104     0.6363     0.6627     0.6897
            0.7172     0.7455     0.7745     0.8042     0.8348
            0.8664     0.8987     0.9318     0.9655     1.0000
Hrad:
            0.0275     0.0428     0.0607     0.0697     0.1085
            0.1461     0.1812     0.2159     0.2494     0.2816
            0.3129     0.3427     0.3712     0.3984     0.4251
            0.4520     0.4778     0.5028     0.5275     0.5507
            0.5735     0.5951     0.6166     0.6388     0.6610
            0.6789     0.6994     0.7185     0.7367     0.7503
            0.7647     0.7786     0.7897     0.7982     0.8139
            0.8273     0.8403     0.8542     0.8689     0.8855
            0.9031     0.9113     0.9255     0.9363     0.9406
            0.9520     0.9645     0.9807     0.9957     1.0000
Width:
            0.0600     0.1287     0.2046     0.3510     0.3630
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            0.3711     0.3816     0.3894     0.3970     0.4047
            0.4121     0.4201     0.4289     0.4383     0.4472
            0.4551     0.4633     0.4719     0.4801     0.4895
            0.4988     0.5090     0.5190     0.5278     0.5361
            0.5488     0.5584     0.5694     0.5810     0.5974
            0.6131     0.6295     0.6490     0.6717     0.6872
            0.7052     0.7240     0.7419     0.7591     0.7743
            0.7882     0.8130     0.8314     0.8539     0.8847
            0.9078     0.9300     0.9478     0.9672     1.0000

Transect XS-Roff-C_2
Area:
            0.0004     0.0012     0.0025     0.0043     0.0064
            0.0093     0.0133     0.0187     0.0253     0.0330
            0.0430     0.0542     0.0662     0.0793     0.0948
            0.1127     0.1313     0.1506     0.1703     0.1909
            0.2135     0.2367     0.2602     0.2841     0.3085
            0.3332     0.3583     0.3838     0.4098     0.4361
            0.4626     0.4894     0.5163     0.5434     0.5707
            0.5981     0.6257     0.6534     0.6813     0.7094
            0.7376     0.7660     0.7946     0.8233     0.8523
            0.8815     0.9109     0.9404     0.9701     1.0000
Hrad:
            0.0172     0.0333     0.0486     0.0637     0.0758
            0.0791     0.0848     0.0901     0.1050     0.1202
            0.1337     0.1553     0.1731     0.1903     0.1804
            0.2041     0.2281     0.2545     0.2809     0.2878
            0.3061     0.3312     0.3559     0.3816     0.4050
            0.4289     0.4533     0.4739     0.4976     0.5226
            0.5481     0.5734     0.5979     0.6239     0.6495
            0.6748     0.7005     0.7254     0.7492     0.7738
            0.7980     0.8216     0.8446     0.8680     0.8907
            0.9117     0.9351     0.9590     0.9825     1.0000
Width:
            0.0215     0.0359     0.0505     0.0641     0.0814
            0.1136     0.1523     0.2033     0.2361     0.2809
            0.3613     0.3828     0.4163     0.4543     0.5769
            0.6067     0.6322     0.6480     0.6615     0.7279
            0.7610     0.7756     0.7898     0.8006     0.8157
            0.8288     0.8398     0.8579     0.8693     0.8775
            0.8845     0.8911     0.8987     0.9036     0.9086
            0.9138     0.9182     0.9233     0.9299     0.9350
            0.9405     0.9466     0.9531     0.9591     0.9655
            0.9739     0.9793     0.9839     0.9887     1.0000

Transect XS-Roff-D1_1
Area:
            0.0014     0.0040     0.0074     0.0114     0.0159
            0.0208     0.0262     0.0321     0.0384     0.0450
            0.0520     0.0595     0.0673     0.0756     0.0844
            0.0936     0.1032     0.1133     0.1239     0.1349
            0.1466     0.1601     0.1765     0.1942     0.2141
            0.2359     0.2600     0.2854     0.3141     0.3435
            0.3732     0.4032     0.4335     0.4640     0.4948
            0.5257     0.5569     0.5882     0.6198     0.6517
            0.6838     0.7161     0.7486     0.7815     0.8149
            0.8489     0.8835     0.9190     0.9578     1.0000
Hrad:
            0.0263     0.0533     0.0805     0.1081     0.1343
            0.1619     0.1863     0.2113     0.2376     0.2626
            0.2862     0.3092     0.3305     0.3515     0.3717
            0.3923     0.4136     0.4343     0.4552     0.4701
            0.4763     0.4734     0.4780     0.4899     0.4923
            0.4860     0.4818     0.4930     0.4244     0.4581
            0.4914     0.5249     0.5581     0.5920     0.6255
            0.6589     0.6923     0.7253     0.7564     0.7874
            0.8191     0.8505     0.8795     0.9059     0.9277
            0.9480     0.9670     0.9869     1.0049     1.0000
Width:
            0.0490     0.0695     0.0853     0.0974     0.1093
            0.1187     0.1296     0.1395     0.1479     0.1566
            0.1659     0.1752     0.1854     0.1957     0.2063
            0.2168     0.2267     0.2368     0.2469     0.2603
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            0.2795     0.3575     0.3919     0.4270     0.4844
            0.5244     0.5681     0.6125     0.6708     0.6782
            0.6855     0.6920     0.6983     0.7034     0.7083
            0.7130     0.7174     0.7218     0.7280     0.7340
            0.7390     0.7440     0.7510     0.7601     0.7733
            0.7877     0.8032     0.8427     0.9381     1.0000

Transect XS-Roff-D1_2
Area:
            0.0007     0.0023     0.0044     0.0071     0.0102
            0.0137     0.0177     0.0223     0.0274     0.0331
            0.0394     0.0461     0.0535     0.0617     0.0708
            0.0815     0.0948     0.1086     0.1226     0.1371
            0.1525     0.1691     0.1865     0.2050     0.2241
            0.2441     0.2648     0.2866     0.3092     0.3328
            0.3574     0.3828     0.4094     0.4369     0.4651
            0.4941     0.5239     0.5542     0.5859     0.6182
            0.6514     0.6852     0.7200     0.7562     0.7932
            0.8310     0.8705     0.9112     0.9536     1.0000
Hrad:
            0.0299     0.0595     0.0855     0.1151     0.1444
            0.1749     0.1993     0.2141     0.2378     0.2609
            0.2876     0.3067     0.3249     0.3403     0.3378
            0.3149     0.3261     0.3683     0.4052     0.4364
            0.4403     0.4666     0.4778     0.5095     0.5291
            0.5608     0.5764     0.5938     0.6192     0.6366
            0.6562     0.6769     0.6973     0.7195     0.7518
            0.7732     0.8004     0.8328     0.8414     0.8680
            0.8908     0.9146     0.9374     0.9414     0.9725
            0.9953     1.0004     1.0030     1.0217     1.0000
Width:
            0.0243     0.0372     0.0501     0.0599     0.0688
            0.0762     0.0860     0.1009     0.1118     0.1231
            0.1325     0.1456     0.1595     0.1758     0.2038
            0.2524     0.2832     0.2859     0.2923     0.3024
            0.3331     0.3477     0.3742     0.3848     0.4048
            0.4149     0.4377     0.4594     0.4748     0.4969
            0.5173     0.5367     0.5568     0.5755     0.5855
            0.6045     0.6186     0.6434     0.6575     0.6719
            0.6894     0.7061     0.7236     0.7571     0.7681
            0.7951     0.8197     0.8564     0.8825     1.0000

Transect XS-Roff-D1_3
Area:
            0.0018     0.0049     0.0091     0.0155     0.0240
            0.0338     0.0448     0.0569     0.0704     0.0840
            0.0979     0.1119     0.1263     0.1410     0.1559
            0.1711     0.1869     0.2033     0.2204     0.2388
            0.2582     0.2790     0.3003     0.3221     0.3442
            0.3666     0.3892     0.4121     0.4353     0.4588
            0.4827     0.5072     0.5319     0.5570     0.5824
            0.6080     0.6339     0.6601     0.6865     0.7130
            0.7397     0.7667     0.7942     0.8226     0.8515
            0.8805     0.9099     0.9397     0.9696     1.0000
Hrad:
            0.0199     0.0430     0.0511     0.0667     0.0803
            0.0999     0.1188     0.1392     0.1587     0.1874
            0.2146     0.2408     0.2663     0.2914     0.3163
            0.3392     0.3539     0.3739     0.3783     0.3897
            0.3886     0.4057     0.4251     0.4492     0.4738
            0.4986     0.5228     0.5480     0.5713     0.5910
            0.6111     0.6295     0.6532     0.6751     0.6988
            0.7218     0.7444     0.7690     0.7938     0.8184
            0.8428     0.8644     0.8685     0.8769     0.8998
            0.9213     0.9408     0.9625     0.9833     1.0000
Width:
            0.0891     0.1139     0.1788     0.2326     0.2992
            0.3383     0.3772     0.4188     0.4439     0.4486
            0.4562     0.4651     0.4743     0.4838     0.4929
            0.5045     0.5282     0.5437     0.5829     0.6132
            0.6649     0.6881     0.7070     0.7176     0.7269
            0.7356     0.7450     0.7525     0.7622     0.7767
            0.7903     0.8061     0.8148     0.8255     0.8338
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            0.8426     0.8519     0.8586     0.8649     0.8714
            0.8777     0.8870     0.9145     0.9382     0.9464
            0.9558     0.9672     0.9762     0.9861     1.0000

Transect XS-Roff-D2
Area:
            0.0003     0.0009     0.0016     0.0024     0.0032
            0.0041     0.0051     0.0061     0.0090     0.0147
            0.0235     0.0345     0.0478     0.0636     0.0817
            0.1008     0.1214     0.1431     0.1650     0.1874
            0.2102     0.2336     0.2574     0.2815     0.3061
            0.3308     0.3561     0.3817     0.4075     0.4337
            0.4601     0.4866     0.5133     0.5401     0.5673
            0.5946     0.6221     0.6497     0.6776     0.7059
            0.7344     0.7632     0.7923     0.8216     0.8510
            0.8805     0.9102     0.9399     0.9697     1.0000
Hrad:
            0.0192     0.0448     0.0675     0.0894     0.1096
            0.1289     0.1472     0.1636     0.1398     0.1180
            0.1108     0.1110     0.1190     0.1159     0.1381
            0.1600     0.1782     0.2067     0.2336     0.2617
            0.2851     0.3097     0.3369     0.3616     0.3885
            0.4151     0.4350     0.4629     0.4902     0.5128
            0.5407     0.5684     0.5958     0.6211     0.6463
            0.6727     0.6985     0.7244     0.7461     0.7672
            0.7913     0.8126     0.8380     0.8625     0.8890
            0.9166     0.9437     0.9709     0.9924     1.0000
Width:
            0.0178     0.0209     0.0238     0.0260     0.0282
            0.0303     0.0324     0.0455     0.1422     0.2341
            0.3138     0.4022     0.4767     0.5652     0.6050
            0.6452     0.6986     0.7089     0.7229     0.7318
            0.7530     0.7698     0.7788     0.7931     0.8019
            0.8106     0.8321     0.8375     0.8435     0.8575
            0.8621     0.8666     0.8712     0.8789     0.8864
            0.8918     0.8980     0.9036     0.9145     0.9261
            0.9335     0.9442     0.9498     0.9562     0.9602
            0.9628     0.9658     0.9686     0.9771     1.0000

Transect XS-Ron-G2
Area:
            0.0009     0.0027     0.0052     0.0084     0.0123
            0.0167     0.0216     0.0269     0.0331     0.0401
            0.0478     0.0560     0.0651     0.0751     0.0858
            0.0976     0.1106     0.1250     0.1404     0.1568
            0.1744     0.1929     0.2121     0.2319     0.2524
            0.2735     0.2953     0.3176     0.3407     0.3645
            0.3891     0.4146     0.4413     0.4687     0.4965
            0.5248     0.5535     0.5827     0.6123     0.6425
            0.6733     0.7052     0.7378     0.7718     0.8071
            0.8435     0.8808     0.9193     0.9584     1.0000
Hrad:
            0.0247     0.0505     0.0744     0.0950     0.1199
            0.1460     0.1708     0.1901     0.2000     0.2197
            0.2419     0.2626     0.2742     0.2931     0.3086
            0.3171     0.3294     0.3374     0.3584     0.3742
            0.3902     0.4152     0.4427     0.4663     0.4907
            0.5159     0.5413     0.5661     0.5884     0.6093
            0.6278     0.6477     0.6573     0.6861     0.7147
            0.7432     0.7713     0.7986     0.8244     0.8499
            0.8653     0.8806     0.8867     0.9029     0.9060
            0.9254     0.9281     0.9581     0.9819     1.0000
Width:
            0.0326     0.0495     0.0645     0.0817     0.0946
            0.1049     0.1152     0.1290     0.1511     0.1668
            0.1802     0.1945     0.2169     0.2340     0.2543
            0.2819     0.3080     0.3403     0.3600     0.3853
            0.4113     0.4275     0.4404     0.4570     0.4724
            0.4868     0.5005     0.5147     0.5309     0.5485
            0.5684     0.5870     0.6160     0.6262     0.6363
            0.6464     0.6564     0.6670     0.6787     0.6905
            0.7107     0.7316     0.7606     0.7815     0.8150
            0.8340     0.8690     0.8786     0.8941     1.0000
```

```
Transect XS-Ron-H1
Area:
            0.0027     0.0093     0.0170     0.0254     0.0345
            0.0439     0.0537     0.0639     0.0744     0.0852
            0.0963     0.1077     0.1195     0.1318     0.1445
            0.1578     0.1717     0.1863     0.2016     0.2179
            0.2352     0.2538     0.2735     0.2941     0.3155
            0.3376     0.3605     0.3838     0.4075     0.4317
            0.4562     0.4809     0.5060     0.5314     0.5572
            0.5835     0.6102     0.6375     0.6653     0.6936
            0.7223     0.7515     0.7812     0.8112     0.8416
            0.8725     0.9038     0.9353     0.9672     1.0000
Hrad:
            0.0239     0.0479     0.0782     0.1077     0.1371
            0.1671     0.1959     0.2239     0.2520     0.2793
            0.3053     0.3300     0.3524     0.3730     0.3926
            0.4092     0.4260     0.4401     0.4527     0.4596
            0.4659     0.4725     0.4832     0.4996     0.5171
            0.5336     0.5559     0.5788     0.6010     0.6232
            0.6487     0.6738     0.6978     0.7171     0.7370
            0.7575     0.7757     0.7923     0.8075     0.8276
            0.8475     0.8649     0.8840     0.9046     0.9240
            0.9418     0.9625     0.9839     0.9999     1.0000
Width:
            0.1462     0.2175     0.2428     0.2624     0.2784
            0.2893     0.3002     0.3106     0.3194     0.3281
            0.3375     0.3478     0.3603     0.3747     0.3898
            0.4084     0.4269     0.4486     0.4727     0.5042
            0.5383     0.5740     0.6056     0.6304     0.6535
            0.6783     0.6927     0.7053     0.7183     0.7309
            0.7387     0.7465     0.7551     0.7693     0.7824
            0.7946     0.8093     0.8258     0.8438     0.8560
            0.8681     0.8831     0.8959     0.9067     0.9188
            0.9325     0.9427     0.9518     0.9667     1.0000

Transect XS-Ron-H2
Area:
            0.0006     0.0019     0.0037     0.0061     0.0091
            0.0130     0.0204     0.0344     0.0490     0.0641
            0.0795     0.0952     0.1113     0.1279     0.1448
            0.1621     0.1797     0.1977     0.2163     0.2351
            0.2543     0.2740     0.2941     0.3146     0.3355
            0.3568     0.3786     0.4008     0.4234     0.4466
            0.4703     0.4944     0.5191     0.5443     0.5699
            0.5960     0.6223     0.6490     0.6761     0.7034
            0.7312     0.7594     0.7881     0.8172     0.8467
            0.8765     0.9066     0.9372     0.9684     1.0000
Hrad:
            0.0165     0.0328     0.0470     0.0585     0.0714
            0.0790     0.0712     0.0977     0.1354     0.1742
            0.2143     0.2521     0.2874     0.3215     0.3544
            0.3858     0.4156     0.4428     0.4697     0.4975
            0.5213     0.5450     0.5672     0.5900     0.6108
            0.6319     0.6513     0.6706     0.6895     0.7054
            0.7217     0.7382     0.7535     0.7694     0.7861
            0.8037     0.8217     0.8381     0.8554     0.8709
            0.8865     0.9002     0.9143     0.9291     0.9452
            0.9604     0.9742     0.9864     0.9981     1.0000
Width:
            0.0313     0.0483     0.0638     0.0844     0.1033
            0.1354     0.4185     0.4417     0.4579     0.4735
            0.4814     0.4919     0.5050     0.5170     0.5280
            0.5394     0.5509     0.5654     0.5781     0.5867
            0.6012     0.6142     0.6282     0.6399     0.6538
            0.6660     0.6801     0.6933     0.7062     0.7236
            0.7396     0.7547     0.7711     0.7859     0.7990
            0.8097     0.8193     0.8312     0.8410     0.8532
            0.8651     0.8797     0.8933     0.9056     0.9154
            0.9262     0.9392     0.9544     0.9702     1.0000

Transect XS-Ron-H3
Area:
```

```
            0.0013     0.0035     0.0064     0.0100     0.0151
            0.0209     0.0270     0.0335     0.0405     0.0478
            0.0554     0.0634     0.0718     0.0807     0.0900
            0.0996     0.1096     0.1199     0.1305     0.1416
            0.1532     0.1652     0.1775     0.1908     0.2095
            0.2304     0.2527     0.2767     0.3010     0.3257
            0.3536     0.3839     0.4146     0.4460     0.4778
            0.5100     0.5430     0.5764     0.6101     0.6441
            0.6783     0.7129     0.7477     0.7830     0.8186
            0.8545     0.8906     0.9268     0.9633     1.0000
Hrad:
            0.0219     0.0425     0.0617     0.0812     0.0858
            0.1094     0.1339     0.1557     0.1774     0.1992
            0.2204     0.2388     0.2547     0.2747     0.2945
            0.3130     0.3323     0.3518     0.3692     0.3822
            0.3989     0.4164     0.4315     0.4411     0.4416
            0.4409     0.4310     0.4363     0.4619     0.4848
            0.4323     0.4626     0.4919     0.5206     0.5536
            0.5817     0.6070     0.6400     0.6727     0.7040
            0.7357     0.7676     0.7955     0.8251     0.8554
            0.8859     0.9169     0.9487     0.9797     1.0000
Width:
            0.0491     0.0695     0.0884     0.1043     0.1490
            0.1613     0.1700     0.1811     0.1912     0.2004
            0.2094     0.2210     0.2348     0.2442     0.2534
            0.2636     0.2726     0.2813     0.2914     0.3055
            0.3164     0.3264     0.3385     0.4119     0.5406
            0.5812     0.6304     0.6474     0.6585     0.6841
            0.8063     0.8200     0.8350     0.8510     0.8594
            0.8752     0.8950     0.9022     0.9093     0.9180
            0.9255     0.9324     0.9439     0.9530     0.9607
            0.9676     0.9735     0.9780     0.9831     1.0000

Transect XS-Ron-H4
Area:
            0.0005     0.0017     0.0037     0.0065     0.0104
            0.0151     0.0208     0.0312     0.0453     0.0616
            0.0780     0.0946     0.1113     0.1281     0.1451
            0.1622     0.1793     0.1966     0.2140     0.2316
            0.2494     0.2674     0.2856     0.3041     0.3229
            0.3432     0.3653     0.3879     0.4108     0.4341
            0.4577     0.4820     0.5070     0.5326     0.5586
            0.5848     0.6113     0.6381     0.6653     0.6931
            0.7214     0.7504     0.7803     0.8106     0.8413
            0.8722     0.9034     0.9350     0.9671     1.0000
Hrad:
            0.0157     0.0294     0.0402     0.0519     0.0644
            0.0782     0.0772     0.0662     0.0763     0.1003
            0.1255     0.1503     0.1747     0.1986     0.2224
            0.2462     0.2697     0.2926     0.3143     0.3354
            0.3559     0.3764     0.3962     0.4141     0.4315
            0.4480     0.4686     0.4899     0.5117     0.5341
            0.5559     0.5776     0.5987     0.6213     0.6451
            0.6693     0.6938     0.7190     0.7406     0.7644
            0.7861     0.8060     0.8286     0.8541     0.8805
            0.9073     0.9342     0.9599     0.9797     1.0000
Width:
            0.0267     0.0459     0.0722     0.1003     0.1282
            0.1532     0.2154     0.3770     0.4756     0.4903
            0.4942     0.4981     0.5023     0.5067     0.5104
            0.5132     0.5160     0.5193     0.5245     0.5302
            0.5365     0.5421     0.5486     0.5574     0.5841
            0.6407     0.6700     0.6816     0.6929     0.7014
            0.7180     0.7365     0.7597     0.7739     0.7824
            0.7906     0.7989     0.8059     0.8256     0.8385
            0.8585     0.8842     0.9029     0.9139     0.9228
            0.9313     0.9401     0.9518     0.9761     1.0000

Transect XS-Ron-I1
Area:
            0.0018     0.0045     0.0076     0.0116     0.0162
            0.0216     0.0278     0.0347     0.0424     0.0510
            0.0609     0.0714     0.0825     0.0948     0.1084
```

```
            0.1228     0.1378     0.1535     0.1698     0.1866
            0.2042     0.2225     0.2415     0.2612     0.2814
            0.3023     0.3240     0.3464     0.3695     0.3934
            0.4179     0.4431     0.4689     0.4954     0.5224
            0.5500     0.5783     0.6072     0.6367     0.6668
            0.6976     0.7290     0.7610     0.7939     0.8275
            0.8614     0.8956     0.9301     0.9649     1.0000
Hrad:
            0.0287     0.0566     0.0786     0.0974     0.1172
            0.1328     0.1517     0.1710     0.1885     0.1958
            0.2146     0.2362     0.2553     0.2609     0.2778
            0.3001     0.3214     0.3426     0.3666     0.3867
            0.4051     0.4257     0.4445     0.4654     0.4875
            0.5042     0.5214     0.5395     0.5573     0.5762
            0.5965     0.6167     0.6352     0.6550     0.6758
            0.6966     0.7142     0.7335     0.7534     0.7723
            0.7906     0.8107     0.8264     0.8410     0.8651
            0.8922     0.9201     0.9458     0.9717     1.0000
Width:
            0.0680     0.0818     0.1001     0.1217     0.1406
            0.1659     0.1868     0.2065     0.2284     0.2661
            0.2890     0.3070     0.3281     0.3707     0.3983
            0.4167     0.4364     0.4554     0.4694     0.4886
            0.5104     0.5287     0.5493     0.5667     0.5818
            0.6044     0.6266     0.6471     0.6682     0.6878
            0.7052     0.7226     0.7423     0.7600     0.7760
            0.7918     0.8119     0.8296     0.8463     0.8643
            0.8830     0.8991     0.9209     0.9453     0.9582
            0.9668     0.9742     0.9841     0.9937     1.0000

Transect XS-Ron-I2
Area:
            0.0009     0.0026     0.0049     0.0087     0.0140
            0.0202     0.0270     0.0344     0.0423     0.0507
            0.0596     0.0690     0.0788     0.0892     0.1001
            0.1144     0.1338     0.1539     0.1744     0.1955
            0.2170     0.2390     0.2615     0.2845     0.3081
            0.3323     0.3568     0.3815     0.4065     0.4318
            0.4574     0.4833     0.5095     0.5360     0.5628
            0.5898     0.6171     0.6448     0.6727     0.7009
            0.7294     0.7583     0.7874     0.8169     0.8466
            0.8767     0.9071     0.9378     0.9687     1.0000
Hrad:
            0.0146     0.0271     0.0355     0.0387     0.0503
            0.0647     0.0787     0.0927     0.1060     0.1194
            0.1328     0.1456     0.1582     0.1700     0.1818
            0.1874     0.1930     0.2090     0.2276     0.2486
            0.2718     0.2945     0.3165     0.3390     0.3591
            0.3850     0.4120     0.4394     0.4661     0.4929
            0.5188     0.5455     0.5721     0.5986     0.6253
            0.6515     0.6774     0.7033     0.7296     0.7550
            0.7796     0.8038     0.8296     0.8545     0.8789
            0.9028     0.9273     0.9515     0.9756     1.0000
Width:
            0.0426     0.0628     0.0913     0.1491     0.1855
            0.2066     0.2260     0.2432     0.2606     0.2765
            0.2911     0.3062     0.3209     0.3371     0.3682
            0.5869     0.6308     0.6462     0.6640     0.6798
            0.6916     0.7067     0.7243     0.7417     0.7666
            0.7762     0.7842     0.7917     0.8007     0.8097
            0.8205     0.8297     0.8387     0.8481     0.8567
            0.8660     0.8756     0.8849     0.8934     0.9030
            0.9138     0.9251     0.9333     0.9427     0.9527
            0.9632     0.9725     0.9820     0.9914     1.0000

Transect XS-Ron-J
Area:
            0.0020     0.0065     0.0130     0.0203     0.0282
            0.0365     0.0452     0.0544     0.0640     0.0739
            0.0846     0.0975     0.1139     0.1313     0.1496
            0.1692     0.1890     0.2088     0.2288     0.2489
            0.2691     0.2893     0.3098     0.3305     0.3515
            0.3727     0.3942     0.4160     0.4381     0.4603
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            0.4826     0.5052     0.5281     0.5516     0.5758
            0.6004     0.6256     0.6510     0.6769     0.7032
            0.7300     0.7573     0.7853     0.8141     0.8436
            0.8737     0.9043     0.9353     0.9668     1.0000
Hrad:
            0.0249     0.0466     0.0742     0.1053     0.1349
            0.1627     0.1887     0.2142     0.2382     0.2593
            0.2753     0.2282     0.2459     0.2707     0.2890
            0.3134     0.3463     0.3786     0.4104     0.4418
            0.4727     0.5031     0.5314     0.5592     0.5867
            0.6134     0.6387     0.6644     0.6924     0.7200
            0.7468     0.7731     0.7947     0.8056     0.8239
            0.8427     0.8648     0.8880     0.9089     0.9282
            0.9486     0.9596     0.9758     0.9883     1.0009
            1.0211     1.0408     1.0632     1.0854     1.0000
Width:
            0.0882     0.1577     0.1953     0.2117     0.2251
            0.2373     0.2495     0.2601     0.2715     0.2853
            0.3055     0.4377     0.4742     0.4940     0.5267
            0.5481     0.5511     0.5540     0.5569     0.5599
            0.5629     0.5658     0.5725     0.5794     0.5863
            0.5940     0.6030     0.6111     0.6156     0.6200
            0.6255     0.6310     0.6421     0.6643     0.6792
            0.6936     0.7042     0.7137     0.7254     0.7388
            0.7510     0.7724     0.7893     0.8100     0.8310
            0.8442     0.8581     0.8690     0.8799     1.0000

**********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
**********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 11/11/2019 00:00:00
Ending Date .............. 11/12/2019 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.005000 ft


*************************        Volume        Volume
Flow Routing Continuity       acre-feet      10^6 gal
*************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.000         0.000
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........       100.539        32.762
External Outflow .........        97.092        31.639
Flooding Loss ............         3.164         1.031
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.179         0.058
```

```
Continuity Error (%) .....         0.103


*************************
Highest Continuity Errors
*************************
Node Joff-B1 (1.27%)


***************************
Time-Step Critical Elements
***************************
Link Coff-D2 (9.10%)
Link Coff-D3 (3.52%)


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     4.92 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.05
Percent Not Converging      :     0.80


******************
Node Depth Summary
******************
```

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
J1	JUNCTION	0.09	1.15	4648.65	0 12:33	1.15
J3	JUNCTION	0.40	2.20	4608.49	0 12:32	2.20
Joff-A	JUNCTION	0.67	2.92	4721.86	0 12:42	2.92
Joff-B1	JUNCTION	0.08	0.87	4845.03	0 12:32	0.87
Joff-B2	JUNCTION	0.08	1.09	4802.37	0 12:26	1.09
Joff-C_1	JUNCTION	0.23	1.21	4696.87	0 12:42	1.21
Joff-C_1a	JUNCTION	0.28	1.42	4651.55	0 12:49	1.42
Joff-C_2	JUNCTION	0.37	2.29	4688.46	0 12:38	2.29
Joff-D1	JUNCTION	0.57	5.62	4532.90	0 12:33	5.62
Joff-D1_1	JUNCTION	0.55	3.00	4544.73	0 12:33	3.00
Joff-D2	JUNCTION	0.60	3.35	4528.85	0 12:38	3.35
Joff-D3	JUNCTION	1.32	7.47	4515.05	0 12:37	7.47
Jon-E	JUNCTION	0.04	0.52	4871.72	0 12:25	0.52
Jon-F	JUNCTION	0.04	0.57	4789.72	0 12:30	0.57
Jon-G1	JUNCTION	0.09	1.06	4753.50	0 12:33	1.06
Jon-H1	JUNCTION	0.83	3.94	4620.88	0 12:32	3.94
Jon-H2	JUNCTION	0.32	1.16	4617.26	0 12:33	1.16
Jon-H3	JUNCTION	0.26	3.15	4750.23	0 12:32	3.15
Jon-I1	JUNCTION	0.56	5.14	4660.13	0 12:45	5.14
Jon-I2	JUNCTION	0.47	2.78	4632.48	0 12:31	2.78
Jon-J	JUNCTION	0.48	3.01	4567.61	0 12:32	3.01
OFoff-D	OUTFALL	0.54	3.96	4500.96	0 13:23	3.95
OFon-A	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OFon-B	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OFon-C	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OFon-D	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OFon-G	OUTFALL	0.09	1.04	4644.83	0 12:33	1.04
Soff-D	STORAGE	3.06	17.50	4513.50	0 12:29	17.50

```
******************
```

Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
J1	JUNCTION	0.00	158.74	0 12:32	0	4.22	-0.055
J3	JUNCTION	0.00	417.56	0 12:32	0	16	0.018
Joff-A	JUNCTION	219.71	219.71	0 12:40	10	10	0.149
Joff-B1	JUNCTION	0.00	28.97	0 12:25	0	0.71	1.290
Joff-B2	JUNCTION	57.39	80.14	0 12:25	1.16	1.86	-0.371
Joff-C_1	JUNCTION	59.32	59.32	0 12:40	2.68	2.68	-0.041
Joff-C_1a	JUNCTION	0.00	59.22	0 12:42	0	2.68	0.079
Joff-C_2	JUNCTION	56.01	239.02	0 12:35	0.885	10.9	0.013
Joff-D1	JUNCTION	0.00	430.86	0 12:33	0	16.6	0.085
Joff-D1_1	JUNCTION	17.73	431.41	0 12:32	0.334	16.6	-0.006
Joff-D2	JUNCTION	0.00	481.70	0 12:34	0	19.2	-0.350
Joff-D3	JUNCTION	320.53	770.60	0 12:35	8.73	28	0.332
Jon-E	JUNCTION	29.07	29.07	0 12:25	0.707	0.707	-0.405
Jon-F	JUNCTION	58.79	58.79	0 12:30	1.52	1.52	-0.068
Jon-G1	JUNCTION	0.00	58.54	0 12:30	0	1.53	0.128
Jon-H1	JUNCTION	0.00	353.98	0 12:31	0	14.5	0.153
Jon-H2	JUNCTION	0.00	90.16	0 12:33	0	5.24	0.036
Jon-H3	JUNCTION	82.97	161.01	0 12:30	2.36	4.23	0.075
Jon-I1	JUNCTION	49.85	271.71	0 12:32	0.922	11.8	0.051
Jon-I2	JUNCTION	0.00	259.83	0 12:30	0	11.8	0.035
Jon-J	JUNCTION	16.61	421.89	0 12:32	0.226	16.2	0.029
OFoff-D	OUTFALL	0.00	624.21	0 12:32	0	26.9	0.000
OFon-A	OUTFALL	32.35	32.35	0 12:15	0.531	0.531	0.000
OFon-B	OUTFALL	58.40	58.40	0 12:15	0.891	0.891	0.000
OFon-C	OUTFALL	23.20	23.20	0 12:15	0.366	0.366	0.000
OFon-D	OUTFALL	30.75	30.75	0 12:15	0.44	0.44	0.000
OFon-G	OUTFALL	66.65	105.16	0 12:20	0.96	2.48	0.000
Soff-D	STORAGE	0.00	759.34	0 12:38	0	27.9	-0.023

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
Soff-D	STORAGE	0.87	6.500	0.000

****
Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CFS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 gal	Maximum Ponded Depth Feet
Soff-D	0.45	135.13	0 12:38	1.031	5.000

****
Storage Volume Summary
****

	Average Volume	Avg Pcnt	Evap Pcnt	Exfil Pcnt	Maximum Volume	Max Pcnt	Time of Max Occurrence	Maximum Outflow

Storage Unit	1000 ft3	Full	Loss	Loss	1000 ft3	Full	days hr:min	CFS
Soff-D	0.000	9	0	0	0.001	100	0 12:25	624.21

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OFoff-D	97.82	47.32	624.21	26.923
OFon-A	13.13	6.88	32.35	0.531
OFon-B	12.28	12.31	58.40	0.891
OFon-C	12.30	5.06	23.20	0.366
OFon-D	11.21	6.63	30.75	0.440
OFon-G	52.87	8.11	105.16	2.484
System	33.27	86.30	105.16	31.636

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Coff-D1	CONDUIT	247.34	0 12:20	10.08	1.10	1.00
Coff-D2	CONDUIT	113.51	0 12:22	11.89	1.05	1.00
Coff-D3	CONDUIT	624.21	0 12:32	19.80	1.88	1.00
Con-H	CONDUIT	9.43	0 13:09	4.07	2.10	1.00
Con-I	CONDUIT	259.83	0 12:30	21.15	0.82	0.82
Roff-B_1	CHANNEL	28.97	0 12:25	2.73	0.02	0.21
Roff-B_2	CHANNEL	27.50	0 12:32	3.07	0.00	0.09
Roff-C	CHANNEL	218.55	0 12:41	6.79	0.01	0.17
Roff-C_1	CHANNEL	59.22	0 12:42	4.61	0.00	0.07
Roff-C_2	CHANNEL	58.27	0 12:50	3.79	0.00	0.17
Roff-D1_1	CHANNEL	421.74	0 12:32	9.13	0.11	0.47
Roff-D1_2	CHANNEL	430.86	0 12:33	6.74	0.01	0.23
Roff-D2	CHANNEL	474.75	0 12:38	3.02	0.00	0.33
Ron-G1	CONDUIT	58.54	0 12:30	3.13	0.37	0.78
Ron-G2	CHANNEL	58.15	0 12:33	11.35	0.01	0.18
Ron-H1	CHANNEL	79.09	0 12:26	3.10	0.02	0.28
Ron-H2	CHANNEL	158.74	0 12:32	17.91	0.00	0.09
Ron-H3	CHANNEL	94.88	0 12:33	2.35	0.00	0.23
Ron-H4	CHANNEL	63.83	0 12:33	6.81	0.00	0.12
Ron-I1	CHANNEL	238.27	0 12:38	6.56	0.00	0.13
Ron-I2	CHANNEL	259.41	0 12:31	4.82	0.00	0.05
Ron-J_1	CHANNEL	90.16	0 12:33	6.63	0.00	0.06
Ron-J_2	CHANNEL	417.54	0 12:32	11.37	0.00	0.09
W1	WEIR	8.73	0 12:32			1.00
W2	WEIR	8.73	0 12:32			1.00
W3	WEIR	327.52	0 12:32			0.18
W4	WEIR	196.11	0 12:33			0.12
W6	WEIR	713.55	0 12:38			0.29

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
Coff-D1	1.00	0.00	0.00	0.00	0.91	0.09	0.00	0.00	0.78	0.00

Coff-D2	1.00	0.00	0.00	0.00	0.05	0.00	0.00	0.95	0.00	0.00
Coff-D3	1.00	0.02	0.00	0.00	0.19	0.79	0.00	0.00	0.00	0.00
Con-H	1.00	0.05	0.00	0.00	0.95	0.00	0.00	0.00	0.00	0.00
Con-I	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	0.00	0.00
Roff-B_1	1.00	0.47	0.00	0.00	0.51	0.02	0.00	0.00	0.50	0.00
Roff-B_2	1.00	0.47	0.01	0.00	0.52	0.00	0.00	0.00	0.37	0.00
Roff-C	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	0.00	0.00
Roff-C_1	1.00	0.00	0.00	0.00	0.83	0.17	0.00	0.00	0.88	0.00
Roff-C_2	1.00	0.02	0.00	0.00	0.89	0.09	0.00	0.00	0.89	0.00
Roff-D1_1	1.00	0.00	0.00	0.00	0.89	0.11	0.00	0.00	0.91	0.00
Roff-D1_2	1.00	0.00	0.00	0.00	0.12	0.88	0.00	0.00	0.07	0.00
Roff-D2	1.00	0.00	0.03	0.00	0.97	0.00	0.00	0.00	0.97	0.00
Ron-G1	1.00	0.47	0.00	0.00	0.52	0.01	0.00	0.00	0.50	0.00
Ron-G2	1.00	0.48	0.00	0.00	0.00	0.52	0.00	0.00	0.18	0.00
Ron-H1	1.00	0.47	0.00	0.00	0.53	0.00	0.00	0.00	0.52	0.00
Ron-H2	1.00	0.47	0.00	0.00	0.00	0.53	0.00	0.00	0.00	0.00
Ron-H3	1.00	0.05	0.43	0.00	0.52	0.00	0.00	0.00	0.51	0.00
Ron-H4	1.00	0.05	0.42	0.00	0.46	0.06	0.00	0.00	0.50	0.00
Ron-I1	1.00	0.00	0.01	0.00	0.99	0.00	0.00	0.00	0.96	0.00
Ron-I2	1.00	0.01	0.00	0.00	0.98	0.01	0.00	0.00	0.91	0.00
Ron-J_1	1.00	0.05	0.00	0.00	0.09	0.85	0.00	0.00	0.11	0.00
Ron-J_2	1.00	0.00	0.07	0.00	0.01	0.92	0.00	0.00	0.92	0.00

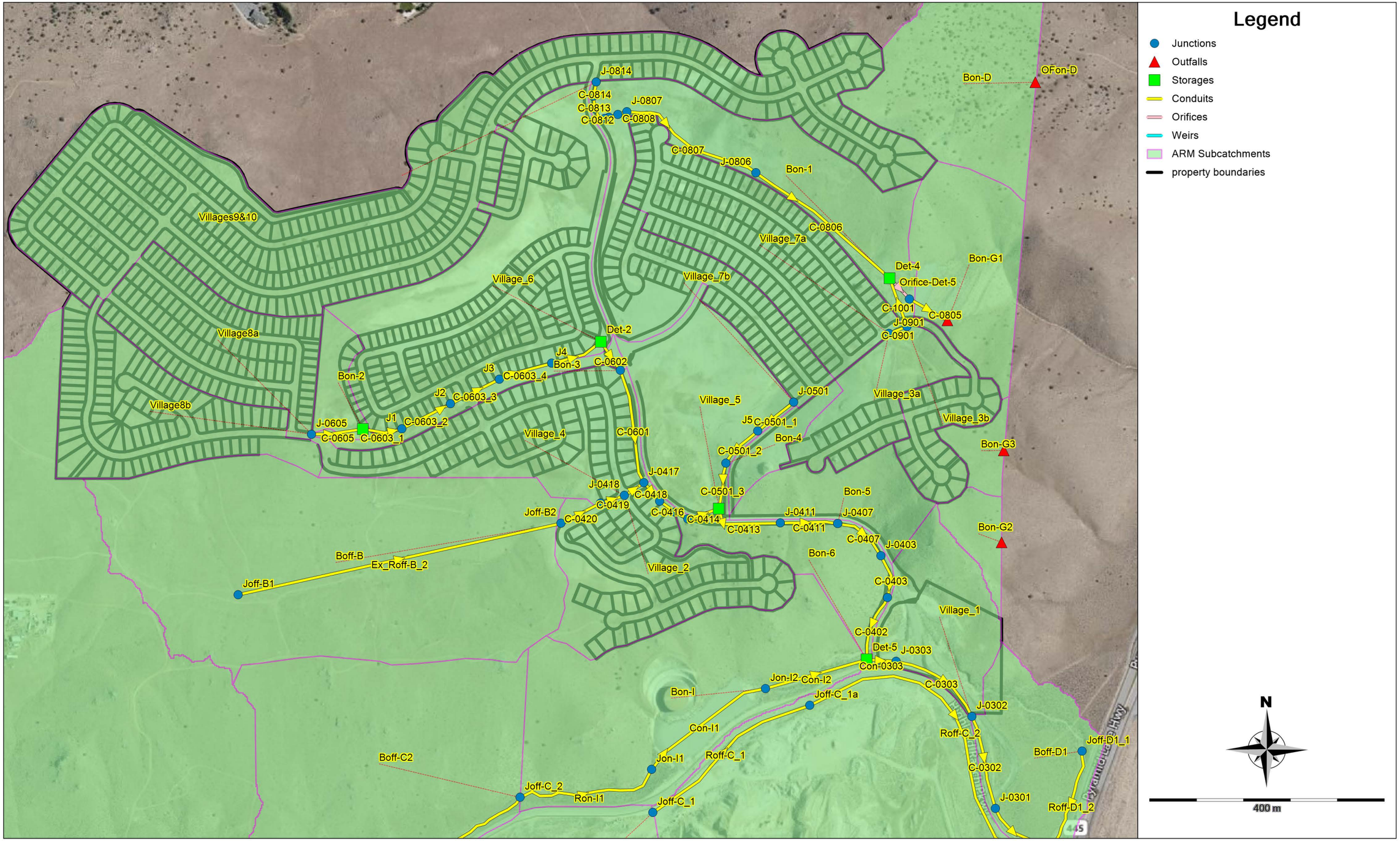
****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
Coff-D1	1.35	1.47	1.43	1.09	1.34
Coff-D2	0.99	3.02	0.99	0.94	0.24
Coff-D3	0.01	1.44	0.01	1.08	0.01
Con-H	0.74	3.79	0.74	3.80	0.74
Con-I	0.01	0.39	0.01	0.01	0.01
Ron-G1	0.01	0.01	0.35	0.01	0.01

Analysis begun on: Thu Feb 27 15:59:35 2020
Analysis ended on: Thu Feb 27 15:59:36 2020
Total elapsed time: 00:00:01

Appendix D – Proposed Conditions Results

Proposed Model Schematic



Proposed Conditions Model Results – 5-year

```
ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM BETA VERSION 7.2.2785
---------------------------------------------------------------

This is a *BETA* version of ARM - your feedback and suggestions are solicited.
Create a ticket, post on the PCSWMM feature request forum, or email us directly!

Simulation start time:                  11/11/2019 00:00:00
Simulation end time:                    11/12/2019 00:00:00
Runoff wet weather time steps:          300 seconds
Report time steps:                      60 seconds
Number of data points:                  1441


*****************************
Unit Hydrographs Runoff Method
*****************************
```

Subcatchment	Runoff Method	Factor	Raingage	Area (ac)	Tc (min)	Tpeak (min)	Peak Flow L(cfs/in)	Depth (in)
Village_2	UH	450	Sparks_5y	16.894	15	11.5	61.97527	1
Boff-A	UH	300	Sparks_5y	361.888	61.77	39.56	257.2696	0.999
Bon-D	UH	450	Sparks_5y	18.293	15	11.5	67.10747	1
Bon-G1	UH	300	Sparks_5y	13.576	15	11.5	33.20217	0.998
Boff-B	UH	300	Sparks_5y	57.861	27.27	18.86	86.27614	0.997
Bon-I	UH	350	Sparks_5y	32.327	27.25	18.85	56.27213	0.998
Boff-C2	UH	300	Sparks_5y	40.032	18.74	13.74	81.91938	1
Boff-C1	UH	300	Sparks_5y	79.354	63.56	40.64	54.92251	0.999
Boff-D2	UH	350	Sparks_5y	260.1	38.28	25.47	335.108	0.999
Bon-G2	UH	350	Sparks_5y	2.959	15	11.5	8.4428	1
Village_3b	UH	450	Sparks_5y	6.172	15	11.5	22.64185	1
Bon-G3	UH	350	Sparks_5y	2.466	15	11.5	7.03614	1
Bon-6	UH	350	Sparks_5y	8.942	49.16	32	9.17019	0.999
Villages9&10	UH	450	Sparks_5y	64.32	15	11.5	235.9565	1
Village_1	UH	450	Sparks_5y	11.324	15	11.5	41.54185	1
Boff-D1	UH	300	Sparks_5y	12.983	18.42	13.55	26.94413	0.999
Bon-5	UH	350	Sparks_5y	7.975	15	11.5	22.75476	1
Village_7a	UH	450	Sparks_5y	19.436	15	11.5	71.30054	1
Village_5	UH	450	Sparks_5y	15.854	15	11.5	58.16005	1
Bon-4	UH	350	Sparks_5y	2.931	15	11.5	8.36291	1
Village_3a	UH	400	Sparks_5y	8.336	15	11.5	27.18261	1
Village_4	UH	450	Sparks_5y	17.63	15	11.5	64.67527	1
Bon-2	UH	350	Sparks_5y	3.335	15	11.5	9.51563	1
Bon-1	UH	350	Sparks_5y	16.509	15	11.5	47.10448	1
Bon-3	UH	450	Sparks_5y	1.484	15	11.5	5.44402	1
Village_6	UH	400	Sparks_5y	35.603	15	11.5	116.0967	1
Village8a	UH	450	Sparks_5y	15.019	15	11.5	55.09688	1
Village8b	UH	450	Sparks_5y	17.382	15	11.5	63.76549	1
Village_7b	UH	450	Sparks_5y	14.45	15	11.5	53.00951	1

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******************
ARM Runoff Summary
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Subcatchment	Total Precip (in)	Total Losses (in)	Total Runoff (in)	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff (fraction)
Village_2	1.729	1.16	0.57	0.261	11.348	0.329
Boff-A	1.729	1.421	0.307	3.012	55.83	0.177
Bon-D	1.729	1.547	0.182	0.091	10.378	0.105
Bon-G1	1.729	1.547	0.18	0.066	5.517	0.104
Boff-B	1.729	1.55	0.178	0.279	14.876	0.103
Bon-I	1.729	1.328	0.399	0.35	10.834	0.231
Boff-C2	1.729	1.547	0.181	0.196	14.038	0.105
Boff-C1	1.729	1.263	0.465	1.002	20.994	0.269
Boff-D2	1.729	1.279	0.449	3.168	111.756	0.259
Bon-G2	1.729	1.547	0.181	0.015	1.367	0.105
Village_3b	1.729	0.866	0.864	0.145	4.635	0.5
Bon-G3	1.729	1.547	0.181	0.012	1.139	0.105
Bon-6	1.729	1.547	0.182	0.044	1.631	0.105
Villages9&10	1.729	0.965	0.764	1.335	46.588	0.442
Village_1	1.729	1.036	0.693	0.213	7.985	0.401
Boff-D1	1.729	1.423	0.303	0.107	4.989	0.175
Bon-5	1.729	1.392	0.334	0.072	3.998	0.193
Village_7a	1.729	0.866	0.864	0.456	14.597	0.5
Village_5	1.729	0.866	0.864	0.372	11.907	0.5
Bon-4	1.729	1.508	0.219	0.017	1.383	0.127
Village_3a	1.729	1.175	0.553	0.125	5.137	0.32
Village_4	1.729	1.005	0.724	0.347	12.578	0.419
Bon-2	1.729	1.315	0.411	0.037	1.738	0.238
Bon-1	1.729	1.469	0.257	0.115	7.951	0.149
Bon-3	1.729	0.031	1.7	0.069	1.449	0.983
Village_6	1.729	0.99	0.739	0.714	23.686	0.427
Village8a	1.729	0.866	0.864	0.352	11.28	0.5
Village8b	1.729	0.866	0.864	0.408	13.054	0.5
Village_7b	1.729	0.982	0.747	0.293	10.399	0.432

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
--------------------------------------------------------------

WARNING 02: maximum depth increased for Node Joff-A
WARNING 02: maximum depth increased for Node Joff-B1
WARNING 02: maximum depth increased for Node Joff-B2
WARNING 02: maximum depth increased for Node Joff-C_1
WARNING 02: maximum depth increased for Node Joff-C_1a
WARNING 02: maximum depth increased for Node Joff-C_2
WARNING 02: maximum depth increased for Node Joff-D1
WARNING 02: maximum depth increased for Node Joff-D1_1
WARNING 02: maximum depth increased for Node Joff-D2
WARNING 02: maximum depth increased for Node J-off-D3
WARNING 02: maximum depth increased for Node Jon-I1

*************
Element Count
*************
Number of rain gages ...... 5
Number of subcatchments ... 0
Number of nodes ........... 57
Number of links ........... 54
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                 Data       Recording
Name                 Data Source                 Type       Interval
```

Sparks_100y	Sparks_100y	VOLUME	6 min.
Sparks_10y	Sparks_10y	VOLUME	6 min.
Sparks_25y	Sparks_25y	VOLUME	6 min.
Sparks_50y	Sparks_50y	VOLUME	6 min.
Sparks_5y	Sparks_5y	VOLUME	6 min.

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J-0301	JUNCTION	4543.50	4.50	0.0	
J-0302	JUNCTION	4582.50	4.50	0.0	
J-0303	JUNCTION	4619.00	4.00	0.0	
J-0402	JUNCTION	4648.00	8.00	0.0	
J-0403	JUNCTION	4667.00	8.00	0.0	
J-0407	JUNCTION	4698.50	6.00	50.0	
J-0411	JUNCTION	4726.00	6.00	0.0	
J-0414	JUNCTION	4758.00	8.00	0.0	
J-0415	JUNCTION	4765.50	6.50	0.0	
J-0416	JUNCTION	4771.50	6.50	0.0	
J-0417	JUNCTION	4777.00	8.00	0.0	
J-0418	JUNCTION	4784.00	6.00	50.0	
J-0419	JUNCTION	4788.00	6.50	50.0	
J-0501	JUNCTION	4779.50	4.50	50.0	
J-0601	JUNCTION	4797.00	11.00	0.0	
J-0605	JUNCTION	4893.50	5.50	0.0	
J-0806	JUNCTION	4798.00	4.00	0.0	
J-0807	JUNCTION	4814.00	4.00	0.0	
J-0808	JUNCTION	4816.00	4.00	0.0	
J-0809	JUNCTION	4825.00	15.00	0.0	
J-0810	JUNCTION	4836.00	15.00	0.0	
J-0811	JUNCTION	4847.00	15.00	0.0	
J-0812	JUNCTION	4858.00	8.00	0.0	
J-0813	JUNCTION	4862.00	8.00	0.0	
J-0814	JUNCTION	4867.50	6.50	0.0	
J-0901	JUNCTION	4782.00	5.00	50.0	
J1	JUNCTION	4872.00	4.00	0.0	
J-1001	JUNCTION	4781.00	12.00	0.0	
J2	JUNCTION	4857.13	3.88	0.0	
J3	JUNCTION	4842.25	3.75	0.0	
J4	JUNCTION	4827.38	3.63	0.0	
J5	JUNCTION	4769.33	4.67	0.0	
J6	JUNCTION	4759.17	4.83	0.0	
J-Det-5-Out	JUNCTION	4780.00	10.00	0.0	
Joff-A	JUNCTION	4718.94	15.70	50.0	
Joff-B1	JUNCTION	4844.15	11.34	0.0	
Joff-B2	JUNCTION	4800.80	11.34	0.0	
Joff-C_1	JUNCTION	4695.66	19.39	0.0	
Joff-C_1a	JUNCTION	4650.13	19.39	0.0	
Joff-C_2	JUNCTION	4686.17	29.35	50.0	
Joff-D1	JUNCTION	4527.28	18.51	50.0	
Joff-D1_1	JUNCTION	4541.73	18.51	50.0	
Joff-D2	JUNCTION	4525.50	16.17	500.0	
J-off-D3	JUNCTION	4507.58	16.17	500.0	
Jon-I1	JUNCTION	4654.99	29.35	50.0	
Jon-I2	JUNCTION	4625.70	12.33	50.0	
OFoff-D	OUTFALL	4497.00	4.00	0.0	
OFon-D	OUTFALL	0.00	0.00	0.0	
OFon-G	OUTFALL	4774.00	1.50	0.0	
OFon-G2	OUTFALL	0.00	0.00	0.0	
OFon-G3	OUTFALL	0.00	0.00	0.0	
Det-1	STORAGE	4874.00	4.00	0.0	
Det-2	STORAGE	4806.00	10.00	0.0	
Det-3	STORAGE	4738.00	16.00	0.0	
Det-4	STORAGE	4780.00	10.00	0.0	
Det-5	STORAGE	4620.00	10.00	0.0	
Soff-D	STORAGE	4496.00	12.50	0.0	

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Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
C-0301	J-0301	Joff-D1	CONDUIT	412.9	3.8097	0.0450
C-0302	J-0302	J-0301	CONDUIT	529.3	7.3884	0.0450
C-0303	J-0303	J-0302	CONDUIT	546.7	6.5992	0.0450
C-0402	J-0402	Det-5	CONDUIT	373.9	6.0286	0.0130
C-0403	J-0403	J-0402	CONDUIT	246.4	6.0990	0.0130
C-0407	J-0407	J-0403	CONDUIT	319.6	8.6365	0.0130
C-0411	J-0411	J-0407	CONDUIT	319.6	8.0042	0.0130
C-0413	Det-3	J-0411	CONDUIT	410.3	2.4380	0.0130
C-0414	J-0414	Det-3	CONDUIT	181.9	6.0584	0.0130
C-0415	J-0415	J-0414	CONDUIT	80.8	8.0707	0.0130
C-0416	J-0416	J-0415	CONDUIT	105.1	5.7182	0.0130
C-0417	J-0417	J-0416	CONDUIT	135.4	4.0654	0.0130
C-0418	J-0418	J-0417	CONDUIT	130.2	3.8431	0.0130
C-0419	J-0419	J-0418	CONDUIT	139.9	2.8604	0.0130
C-0420	Joff-B2	J-0419	CONDUIT	249.1	4.3397	0.0450
C-0501_1	J-0501	J5	CONDUIT	257.0	3.9591	0.0130
C-0501_2	J5	J6	CONDUIT	257.0	3.9587	0.0130
C-0501_3	J6	Det-3	CONDUIT	257.0	3.9591	0.0130
C-0601	J-0601	J-0417	CONDUIT	642.6	2.4907	0.0130
C-0602	Det-2	J-0601	CONDUIT	192.4	1.0396	0.0130
C-0603_1	Det-1	J1	CONDUIT	50.0	4.0032	0.0130
C-0603_2	J1	J2	CONDUIT	312.5	4.7654	0.0130
C-0603_3	J2	J3	CONDUIT	312.5	4.7654	0.0130
C-0603_4	J3	J4	CONDUIT	312.5	4.7654	0.0130
C-0603_5	J4	Det-2	CONDUIT	312.5	4.7654	0.0130
C-0605	J-0605	Det-1	CONDUIT	180.0	10.0504	0.0130
C-0805	J-Det-5-Out	OFon-G	CONDUIT	245.0	2.4497	0.0130
C-0806	J-0806	Det-4	CONDUIT	675.0	1.7781	0.0350
C-0807	J-0807	J-0806	CONDUIT	831.6	1.9243	0.0450
C-0808	J-0808	J-0807	CONDUIT	51.8	3.8631	0.0450
C-0809	J-0809	J-0808	CONDUIT	51.8	16.6311	0.0130
C-0810	J-0810	J-0809	CONDUIT	25.9	7.7439	0.0130
C-0811	J-0811	J-0810	CONDUIT	25.9	5.8003	0.0130
C-0812	J-0812	J-0811	CONDUIT	69.2	6.5210	0.0130
C-0813	J-0813	J-0812	CONDUIT	70.9	5.6486	0.0130
C-0814	J-0814	J-0813	CONDUIT	81.2	6.7925	0.0130
C-0901	J-0901	J-1001	CONDUIT	107.2	0.9326	0.0130
C-1001	J-1001	Det-4	CONDUIT	75.0	1.3335	0.0130
Coff-D1	Joff-D1	Joff-D2	CONDUIT	148.9	1.1955	0.0130
Coff-D2	J-off-D3	Soff-D	CONDUIT	145.0	3.9617	0.0240
Coff-D3	Soff-D	OFoff-D	CONDUIT	177.4	0.5636	0.0130
Con-0303	Det-5	J-0303	CONDUIT	200.0	0.5000	0.0130
Con-I1	Jon-I1	Jon-I2	CONDUIT	794.0	3.1868	0.0130
Con-I2	Jon-I2	Det-5	CONDUIT	430.0	0.9768	0.0130
Ex_Roff-B_2	Joff-B1	Joff-B2	CONDUIT	1795.5	2.4152	0.0400
Roff-C	Joff-A	Joff-C_2	CONDUIT	1770.5	1.8511	0.0400
Roff-C_1	Joff-C_1	Joff-C_1a	CONDUIT	1079.3	4.2223	0.0400
Roff-C_2	Joff-C_1a	Joff-D2	CONDUIT	1995.9	6.2566	0.0400
Roff-D1_2	Joff-D1_1	Joff-D1	CONDUIT	587.1	2.4616	0.0400
Roff-D2	Joff-D2	J-off-D3	CONDUIT	770.1	2.3276	0.0400
Ron-I1	Joff-C_2	Jon-I1	CONDUIT	814.9	3.8290	0.0400
Orifice-Det-5	Det-4	J-Det-5-Out	ORIFICE			
W1	Joff-D1	Joff-D2	WEIR			
W2	J-off-D3	Soff-D	WEIR			

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Cross Section Summary
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Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C-0301	TRAPEZOIDAL	4.50	54.00	2.34	21.00	1	612.62
C-0302	TRAPEZOIDAL	4.50	54.00	2.34	21.00	1	853.14
C-0303	TRAPEZOIDAL	4.00	44.00	2.11	19.00	1	613.34
C-0402	CIRCULAR	2.00	3.14	0.50	2.00	1	55.55
C-0403	CIRCULAR	2.00	3.14	0.50	2.00	1	55.87
C-0407	CIRCULAR	2.00	3.14	0.50	2.00	1	66.48

C-0411	CIRCULAR	2.00	3.14	0.50	2.00	1	64.00
C-0413	CIRCULAR	2.00	3.14	0.50	2.00	1	35.32
C-0414	CIRCULAR	4.00	12.57	1.00	4.00	1	353.56
C-0415	CIRCULAR	4.00	12.57	1.00	4.00	1	408.08
C-0416	CIRCULAR	4.00	12.57	1.00	4.00	1	343.49
C-0417	CIRCULAR	3.50	9.62	0.88	3.50	1	202.86
C-0418	CIRCULAR	3.50	9.62	0.88	3.50	1	197.23
C-0419	CIRCULAR	3.00	7.07	0.75	3.00	1	112.80
C-0420	TRAPEZOIDAL	4.00	88.00	2.49	34.00	1	1113.02
C-0501_1	CIRCULAR	2.00	3.14	0.50	2.00	1	45.01
C-0501_2	CIRCULAR	2.00	3.14	0.50	2.00	1	45.01
C-0501_3	CIRCULAR	2.00	3.14	0.50	2.00	1	45.01
C-0601	CIRCULAR	2.00	3.14	0.50	2.00	1	35.70
C-0602	CIRCULAR	2.00	3.14	0.50	2.00	1	23.07
C-0603_1	CIRCULAR	1.50	1.77	0.38	1.50	1	21.02
C-0603_2	CIRCULAR	1.50	1.77	0.38	1.50	1	22.93
C-0603_3	CIRCULAR	1.50	1.77	0.38	1.50	1	22.93
C-0603_4	CIRCULAR	1.50	1.77	0.38	1.50	1	22.93
C-0603_5	CIRCULAR	1.50	1.77	0.38	1.50	1	22.93
C-0605	CIRCULAR	2.50	4.91	0.63	2.50	1	130.03
C-0805	CIRCULAR	1.50	1.77	0.38	1.50	1	16.44
C-0806	TRAPEZOIDAL	4.00	44.00	2.11	19.00	1	409.33
C-0807	TRAPEZOIDAL	4.00	44.00	2.11	19.00	1	331.20
C-0808	TRAPEZOIDAL	4.00	44.00	2.11	19.00	1	469.27
C-0809	CIRCULAR	3.50	9.62	0.88	3.50	1	410.30
C-0810	CIRCULAR	3.50	9.62	0.88	3.50	1	279.98
C-0811	CIRCULAR	3.50	9.62	0.88	3.50	1	242.31
C-0812	CIRCULAR	4.00	12.57	1.00	4.00	1	366.81
C-0813	CIRCULAR	4.00	12.57	1.00	4.00	1	341.39
C-0814	CIRCULAR	4.00	12.57	1.00	4.00	1	374.37
C-0901	RECT_CLOSED	3.00	9.00	0.75	3.00	1	82.01
C-1001	RECT_CLOSED	3.00	9.00	0.75	3.00	1	98.07
Coff-D1	CIRCULAR	2.50	4.91	0.63	2.50	5	44.85
Coff-D2	CIRCULAR	3.50	9.62	0.88	3.50	1	108.47
Coff-D3	RECT_CLOSED	4.00	32.00	1.33	8.00	1	332.66
Con-0303	RECT_CLOSED	3.00	24.00	1.09	8.00	1	205.57
Con-I1	CIRCULAR	4.33	14.75	1.08	4.33	1	317.37
Con-I2	CIRCULAR	5.00	19.63	1.25	5.00	1	257.40
Ex_Roff-B_2	XS-Roff-B_2	11.34	766.16	6.66	112.97	1	15655.66
Roff-C	XS-Roff-C	15.70	1445.69	8.69	186.34	1	30896.78
Roff-C_1	XS-Roff-C_1	19.39	1007.15	8.89	91.51	1	33004.69
Roff-C_2	XS-Roff-C_2	14.19	1217.82	9.40	129.17	1	50413.96
Roff-D1_2	XS-Roff-D1_2	18.51	2314.87	7.64	303.98	1	52360.23
Roff-D2	XS-Roff-D2	16.17	4216.24	10.13	400.30	1	111860.16
Ron-I1	XS-Ron-I1	29.35	2288.81	15.26	137.36	1	102369.82

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Transect Summary
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Transect XS-Roff-B_2
Area:
            0.0009     0.0031     0.0064     0.0107     0.0159
            0.0220     0.0291     0.0370     0.0458     0.0553
            0.0658     0.0770     0.0889     0.1015     0.1147
            0.1287     0.1438     0.1598     0.1763     0.1936
            0.2116     0.2305     0.2503     0.2711     0.2926
            0.3149     0.3382     0.3622     0.3869     0.4126
            0.4388     0.4654     0.4922     0.5193     0.5467
            0.5744     0.6024     0.6307     0.6594     0.6885
            0.7178     0.7476     0.7777     0.8081     0.8389
            0.8701     0.9019     0.9340     0.9667     1.0000
Hrad:
            0.0203     0.0381     0.0562     0.0758     0.0959
            0.1130     0.1303     0.1476     0.1692     0.1856
            0.2040     0.2223     0.2427     0.2650     0.2836
            0.2972     0.3092     0.3282     0.3500     0.3688
            0.3826     0.3984     0.4139     0.4295     0.4464
            0.4637     0.4778     0.4986     0.5148     0.5310
            0.5558     0.5835     0.6118     0.6386     0.6634
            0.6890     0.7175     0.7409     0.7625     0.7887
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            0.8133     0.8349     0.8591     0.8829     0.9059
            0.9232     0.9455     0.9653     0.9785     1.0000
Width:
            0.0471     0.0830     0.1150     0.1427     0.1671
            0.1962     0.2242     0.2522     0.2718     0.2995
            0.3235     0.3476     0.3676     0.3840     0.4051
            0.4338     0.4660     0.4877     0.5044     0.5253
            0.5535     0.5792     0.6055     0.6317     0.6561
            0.6799     0.7086     0.7269     0.7522     0.7778
            0.7904     0.7983     0.8051     0.8135     0.8244
            0.8340     0.8397     0.8512     0.8648     0.8728
            0.8825     0.8952     0.9050     0.9150     0.9257
            0.9423     0.9536     0.9673     0.9880     1.0000

Transect XS-Roff-B-1
Area:
            0.0014     0.0055     0.0109     0.0170     0.0238
            0.0312     0.0392     0.0476     0.0564     0.0659
            0.0760     0.0865     0.0975     0.1090     0.1209
            0.1332     0.1459     0.1590     0.1726     0.1867
            0.2011     0.2159     0.2311     0.2470     0.2635
            0.2805     0.2981     0.3162     0.3350     0.3543
            0.3740     0.3942     0.4157     0.4383     0.4620
            0.4872     0.5150     0.5455     0.5802     0.6168
            0.6541     0.6915     0.7290     0.7669     0.8050
            0.8435     0.8823     0.9212     0.9604     1.0000
Hrad:
            0.0200     0.0445     0.0776     0.1061     0.1348
            0.1635     0.1941     0.2246     0.2509     0.2699
            0.2973     0.3275     0.3524     0.3739     0.4037
            0.4311     0.4562     0.4835     0.5032     0.5294
            0.5562     0.5811     0.6016     0.6155     0.6332
            0.6552     0.6756     0.6914     0.7085     0.7342
            0.7593     0.7685     0.7720     0.7924     0.8076
            0.8143     0.7923     0.7492     0.7114     0.6662
            0.7038     0.7413     0.7775     0.8094     0.8420
            0.8744     0.9093     0.9441     0.9763     1.0000
Width:
            0.0767     0.1258     0.1419     0.1622     0.1786
            0.1934     0.2045     0.2144     0.2275     0.2470
            0.2587     0.2673     0.2797     0.2948     0.3029
            0.3124     0.3233     0.3324     0.3466     0.3562
            0.3652     0.3752     0.3880     0.4053     0.4203
            0.4325     0.4457     0.4620     0.4776     0.4875
            0.4975     0.5208     0.5542     0.5768     0.6074
            0.6554     0.7228     0.8286     0.8965     0.9314
            0.9342     0.9371     0.9413     0.9506     0.9587
            0.9667     0.9718     0.9766     0.9841     1.0000

Transect XS-Roff-C
Area:
            0.0006     0.0016     0.0031     0.0050     0.0074
            0.0110     0.0155     0.0207     0.0268     0.0339
            0.0417     0.0501     0.0590     0.0687     0.0796
            0.0914     0.1039     0.1170     0.1308     0.1453
            0.1605     0.1762     0.1926     0.2096     0.2274
            0.2459     0.2666     0.2901     0.3141     0.3387
            0.3642     0.3908     0.4183     0.4465     0.4754
            0.5053     0.5361     0.5676     0.5995     0.6322
            0.6656     0.6998     0.7350     0.7708     0.8072
            0.8440     0.8817     0.9205     0.9599     1.0000
Hrad:
            0.0246     0.0453     0.0637     0.0817     0.0893
            0.0928     0.1136     0.1265     0.1428     0.1593
            0.1808     0.2030     0.2227     0.2382     0.2444
            0.2645     0.2853     0.3081     0.3249     0.3454
            0.3647     0.3857     0.4066     0.4234     0.4419
            0.4592     0.4809     0.4996     0.5175     0.5374
            0.5472     0.5631     0.5838     0.6097     0.6344
            0.6465     0.6718     0.7029     0.7308     0.7557
            0.7782     0.8023     0.8224     0.8532     0.8812
            0.9132     0.9250     0.9490     0.9751     1.0000
Width:
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            0.0208     0.0311     0.0417     0.0523     0.0714
            0.1028     0.1179     0.1418     0.1630     0.1849
            0.2004     0.2143     0.2304     0.2508     0.2834
            0.3009     0.3172     0.3306     0.3503     0.3661
            0.3826     0.3973     0.4118     0.4305     0.4473
            0.4716     0.5742     0.5856     0.6012     0.6170
            0.6455     0.6697     0.6901     0.7053     0.7223
            0.7543     0.7720     0.7831     0.7977     0.8158
            0.8365     0.8555     0.8793     0.8908     0.9055
            0.9153     0.9472     0.9661     0.9825     1.0000

Transect XS-Roff-C_1
Area:
            0.0014     0.0045     0.0102     0.0201     0.0327
            0.0456     0.0589     0.0725     0.0863     0.1005
            0.1149     0.1295     0.1445     0.1598     0.1754
            0.1913     0.2074     0.2239     0.2407     0.2578
            0.2752     0.2929     0.3110     0.3295     0.3482
            0.3674     0.3869     0.4067     0.4270     0.4478
            0.4691     0.4910     0.5135     0.5367     0.5607
            0.5853     0.6104     0.6363     0.6627     0.6897
            0.7172     0.7455     0.7745     0.8042     0.8348
            0.8664     0.8987     0.9318     0.9655     1.0000
Hrad:
            0.0275     0.0428     0.0607     0.0697     0.1085
            0.1461     0.1812     0.2159     0.2494     0.2816
            0.3129     0.3427     0.3712     0.3984     0.4251
            0.4520     0.4778     0.5028     0.5275     0.5507
            0.5735     0.5951     0.6166     0.6388     0.6610
            0.6789     0.6994     0.7185     0.7367     0.7503
            0.7647     0.7786     0.7897     0.7982     0.8139
            0.8273     0.8403     0.8542     0.8689     0.8855
            0.9031     0.9113     0.9255     0.9363     0.9406
            0.9520     0.9645     0.9807     0.9957     1.0000
Width:
            0.0600     0.1287     0.2046     0.3510     0.3630
            0.3711     0.3816     0.3894     0.3970     0.4047
            0.4121     0.4201     0.4289     0.4383     0.4472
            0.4551     0.4633     0.4719     0.4801     0.4895
            0.4988     0.5090     0.5190     0.5278     0.5361
            0.5488     0.5584     0.5694     0.5810     0.5974
            0.6131     0.6295     0.6490     0.6717     0.6872
            0.7052     0.7240     0.7419     0.7591     0.7743
            0.7882     0.8130     0.8314     0.8539     0.8847
            0.9078     0.9300     0.9478     0.9672     1.0000

Transect XS-Roff-C_2
Area:
            0.0004     0.0012     0.0025     0.0043     0.0064
            0.0093     0.0133     0.0187     0.0253     0.0330
            0.0430     0.0542     0.0662     0.0793     0.0948
            0.1127     0.1313     0.1506     0.1703     0.1909
            0.2135     0.2367     0.2602     0.2841     0.3085
            0.3332     0.3583     0.3838     0.4098     0.4361
            0.4626     0.4894     0.5163     0.5434     0.5707
            0.5981     0.6257     0.6534     0.6813     0.7094
            0.7376     0.7660     0.7946     0.8233     0.8523
            0.8815     0.9109     0.9404     0.9701     1.0000
Hrad:
            0.0172     0.0333     0.0486     0.0637     0.0758
            0.0791     0.0848     0.0901     0.1050     0.1202
            0.1337     0.1553     0.1731     0.1903     0.1804
            0.2041     0.2281     0.2545     0.2809     0.2878
            0.3061     0.3312     0.3559     0.3816     0.4050
            0.4289     0.4533     0.4739     0.4976     0.5226
            0.5481     0.5734     0.5979     0.6239     0.6495
            0.6748     0.7005     0.7254     0.7492     0.7738
            0.7980     0.8216     0.8446     0.8680     0.8907
            0.9117     0.9351     0.9590     0.9825     1.0000
Width:
            0.0215     0.0359     0.0505     0.0641     0.0814
            0.1136     0.1523     0.2033     0.2361     0.2809
            0.3613     0.3828     0.4163     0.4543     0.5769
```

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            0.6067     0.6322     0.6480     0.6615     0.7279
            0.7610     0.7756     0.7898     0.8006     0.8157
            0.8288     0.8398     0.8579     0.8693     0.8775
            0.8845     0.8911     0.8987     0.9036     0.9086
            0.9138     0.9182     0.9233     0.9299     0.9350
            0.9405     0.9466     0.9531     0.9591     0.9655
            0.9739     0.9793     0.9839     0.9887     1.0000

Transect XS-Roff-D1_1
Area:
            0.0014     0.0040     0.0074     0.0114     0.0159
            0.0208     0.0262     0.0321     0.0384     0.0450
            0.0520     0.0595     0.0673     0.0756     0.0844
            0.0936     0.1032     0.1133     0.1239     0.1349
            0.1466     0.1601     0.1765     0.1942     0.2141
            0.2359     0.2600     0.2854     0.3141     0.3435
            0.3732     0.4032     0.4335     0.4640     0.4948
            0.5257     0.5569     0.5882     0.6198     0.6517
            0.6838     0.7161     0.7486     0.7815     0.8149
            0.8489     0.8835     0.9190     0.9578     1.0000
Hrad:
            0.0263     0.0533     0.0805     0.1081     0.1343
            0.1619     0.1863     0.2113     0.2376     0.2626
            0.2862     0.3092     0.3305     0.3515     0.3717
            0.3923     0.4136     0.4343     0.4552     0.4701
            0.4763     0.4734     0.4780     0.4899     0.4923
            0.4860     0.4818     0.4930     0.4244     0.4581
            0.4914     0.5249     0.5581     0.5920     0.6255
            0.6589     0.6923     0.7253     0.7564     0.7874
            0.8191     0.8505     0.8795     0.9059     0.9277
            0.9480     0.9670     0.9869     1.0049     1.0000
Width:
            0.0490     0.0695     0.0853     0.0974     0.1093
            0.1187     0.1296     0.1395     0.1479     0.1566
            0.1659     0.1752     0.1854     0.1957     0.2063
            0.2168     0.2267     0.2368     0.2469     0.2603
            0.2795     0.3575     0.3919     0.4270     0.4844
            0.5244     0.5681     0.6125     0.6708     0.6782
            0.6855     0.6920     0.6983     0.7034     0.7083
            0.7130     0.7174     0.7218     0.7280     0.7340
            0.7390     0.7440     0.7510     0.7601     0.7733
            0.7877     0.8032     0.8427     0.9381     1.0000

Transect XS-Roff-D1_2
Area:
            0.0007     0.0023     0.0044     0.0071     0.0102
            0.0137     0.0177     0.0223     0.0274     0.0331
            0.0394     0.0461     0.0535     0.0617     0.0708
            0.0815     0.0948     0.1086     0.1226     0.1371
            0.1525     0.1691     0.1865     0.2050     0.2241
            0.2441     0.2648     0.2866     0.3092     0.3328
            0.3574     0.3828     0.4094     0.4369     0.4651
            0.4941     0.5239     0.5542     0.5859     0.6182
            0.6514     0.6852     0.7200     0.7562     0.7932
            0.8310     0.8705     0.9112     0.9536     1.0000
Hrad:
            0.0299     0.0595     0.0855     0.1151     0.1444
            0.1749     0.1993     0.2141     0.2378     0.2609
            0.2876     0.3067     0.3249     0.3403     0.3378
            0.3149     0.3261     0.3683     0.4052     0.4364
            0.4403     0.4666     0.4778     0.5095     0.5291
            0.5608     0.5764     0.5938     0.6192     0.6366
            0.6562     0.6769     0.6973     0.7195     0.7518
            0.7732     0.8004     0.8328     0.8414     0.8680
            0.8908     0.9146     0.9374     0.9414     0.9725
            0.9953     1.0004     1.0030     1.0217     1.0000
Width:
            0.0243     0.0372     0.0501     0.0599     0.0688
            0.0762     0.0860     0.1009     0.1118     0.1231
            0.1325     0.1456     0.1595     0.1758     0.2038
            0.2524     0.2832     0.2859     0.2923     0.3024
            0.3331     0.3477     0.3742     0.3848     0.4048
            0.4149     0.4377     0.4594     0.4748     0.4969
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            0.5173     0.5367     0.5568     0.5755     0.5855
            0.6045     0.6186     0.6434     0.6575     0.6719
            0.6894     0.7061     0.7236     0.7571     0.7681
            0.7951     0.8197     0.8564     0.8825     1.0000

Transect XS-Roff-D1_3
Area:
            0.0018     0.0049     0.0091     0.0155     0.0240
            0.0338     0.0448     0.0569     0.0704     0.0840
            0.0979     0.1119     0.1263     0.1410     0.1559
            0.1711     0.1869     0.2033     0.2204     0.2388
            0.2582     0.2790     0.3003     0.3221     0.3442
            0.3666     0.3892     0.4121     0.4353     0.4588
            0.4827     0.5072     0.5319     0.5570     0.5824
            0.6080     0.6339     0.6601     0.6865     0.7130
            0.7397     0.7667     0.7942     0.8226     0.8515
            0.8805     0.9099     0.9397     0.9696     1.0000
Hrad:
            0.0199     0.0430     0.0511     0.0667     0.0803
            0.0999     0.1188     0.1392     0.1587     0.1874
            0.2146     0.2408     0.2663     0.2914     0.3163
            0.3392     0.3539     0.3739     0.3783     0.3897
            0.3886     0.4057     0.4251     0.4492     0.4738
            0.4986     0.5228     0.5480     0.5713     0.5910
            0.6111     0.6295     0.6532     0.6751     0.6988
            0.7218     0.7444     0.7690     0.7938     0.8184
            0.8428     0.8644     0.8685     0.8769     0.8998
            0.9213     0.9408     0.9625     0.9833     1.0000
Width:
            0.0891     0.1139     0.1788     0.2326     0.2992
            0.3383     0.3772     0.4188     0.4439     0.4486
            0.4562     0.4651     0.4743     0.4838     0.4929
            0.5045     0.5282     0.5437     0.5829     0.6132
            0.6649     0.6881     0.7070     0.7176     0.7269
            0.7356     0.7450     0.7525     0.7622     0.7767
            0.7903     0.8061     0.8148     0.8255     0.8338
            0.8426     0.8519     0.8586     0.8649     0.8714
            0.8777     0.8870     0.9145     0.9382     0.9464
            0.9558     0.9672     0.9762     0.9861     1.0000

Transect XS-Roff-D2
Area:
            0.0003     0.0009     0.0016     0.0024     0.0032
            0.0041     0.0051     0.0061     0.0090     0.0147
            0.0235     0.0345     0.0478     0.0636     0.0817
            0.1008     0.1214     0.1431     0.1650     0.1874
            0.2102     0.2336     0.2574     0.2815     0.3061
            0.3308     0.3561     0.3817     0.4075     0.4337
            0.4601     0.4866     0.5133     0.5401     0.5673
            0.5946     0.6221     0.6497     0.6776     0.7059
            0.7344     0.7632     0.7923     0.8216     0.8510
            0.8805     0.9102     0.9399     0.9697     1.0000
Hrad:
            0.0192     0.0448     0.0675     0.0894     0.1096
            0.1289     0.1472     0.1636     0.1398     0.1180
            0.1108     0.1110     0.1190     0.1159     0.1381
            0.1600     0.1782     0.2067     0.2336     0.2617
            0.2851     0.3097     0.3369     0.3616     0.3885
            0.4151     0.4350     0.4629     0.4902     0.5128
            0.5407     0.5684     0.5958     0.6211     0.6463
            0.6727     0.6985     0.7244     0.7461     0.7672
            0.7913     0.8126     0.8380     0.8625     0.8890
            0.9166     0.9437     0.9709     0.9924     1.0000
Width:
            0.0178     0.0209     0.0238     0.0260     0.0282
            0.0303     0.0324     0.0455     0.1422     0.2341
            0.3138     0.4022     0.4767     0.5652     0.6050
            0.6452     0.6986     0.7089     0.7229     0.7318
            0.7530     0.7698     0.7788     0.7931     0.8019
            0.8106     0.8321     0.8375     0.8435     0.8575
            0.8621     0.8666     0.8712     0.8789     0.8864
            0.8918     0.8980     0.9036     0.9145     0.9261
            0.9335     0.9442     0.9498     0.9562     0.9602
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            0.9628     0.9658     0.9686     0.9771     1.0000

Transect XS-Ron-G2
Area:
            0.0009     0.0027     0.0052     0.0084     0.0123
            0.0167     0.0216     0.0269     0.0331     0.0401
            0.0478     0.0560     0.0651     0.0751     0.0858
            0.0976     0.1106     0.1250     0.1404     0.1568
            0.1744     0.1929     0.2121     0.2319     0.2524
            0.2735     0.2953     0.3176     0.3407     0.3645
            0.3891     0.4146     0.4413     0.4687     0.4965
            0.5248     0.5535     0.5827     0.6123     0.6425
            0.6733     0.7052     0.7378     0.7718     0.8071
            0.8435     0.8808     0.9193     0.9584     1.0000
Hrad:
            0.0247     0.0505     0.0744     0.0950     0.1199
            0.1460     0.1708     0.1901     0.2000     0.2197
            0.2419     0.2626     0.2742     0.2931     0.3086
            0.3171     0.3294     0.3374     0.3584     0.3742
            0.3902     0.4152     0.4427     0.4663     0.4907
            0.5159     0.5413     0.5661     0.5884     0.6093
            0.6278     0.6477     0.6573     0.6861     0.7147
            0.7432     0.7713     0.7986     0.8244     0.8499
            0.8653     0.8806     0.8867     0.9029     0.9060
            0.9254     0.9281     0.9581     0.9819     1.0000
Width:
            0.0326     0.0495     0.0645     0.0817     0.0946
            0.1049     0.1152     0.1290     0.1511     0.1668
            0.1802     0.1945     0.2169     0.2340     0.2543
            0.2819     0.3080     0.3403     0.3600     0.3853
            0.4113     0.4275     0.4404     0.4570     0.4724
            0.4868     0.5005     0.5147     0.5309     0.5485
            0.5684     0.5870     0.6160     0.6262     0.6363
            0.6464     0.6564     0.6670     0.6787     0.6905
            0.7107     0.7316     0.7606     0.7815     0.8150
            0.8340     0.8690     0.8786     0.8941     1.0000

Transect XS-Ron-H1
Area:
            0.0027     0.0093     0.0170     0.0254     0.0345
            0.0439     0.0537     0.0639     0.0744     0.0852
            0.0963     0.1077     0.1195     0.1318     0.1445
            0.1578     0.1717     0.1863     0.2016     0.2179
            0.2352     0.2538     0.2735     0.2941     0.3155
            0.3376     0.3605     0.3838     0.4075     0.4317
            0.4562     0.4809     0.5060     0.5314     0.5572
            0.5835     0.6102     0.6375     0.6653     0.6936
            0.7223     0.7515     0.7812     0.8112     0.8416
            0.8725     0.9038     0.9353     0.9672     1.0000
Hrad:
            0.0239     0.0479     0.0782     0.1077     0.1371
            0.1671     0.1959     0.2239     0.2520     0.2793
            0.3053     0.3300     0.3524     0.3730     0.3926
            0.4092     0.4260     0.4401     0.4527     0.4596
            0.4659     0.4725     0.4832     0.4996     0.5171
            0.5336     0.5559     0.5788     0.6010     0.6232
            0.6487     0.6738     0.6978     0.7171     0.7370
            0.7575     0.7757     0.7923     0.8075     0.8276
            0.8475     0.8649     0.8840     0.9046     0.9240
            0.9418     0.9625     0.9839     0.9999     1.0000
Width:
            0.1462     0.2175     0.2428     0.2624     0.2784
            0.2893     0.3002     0.3106     0.3194     0.3281
            0.3375     0.3478     0.3603     0.3747     0.3898
            0.4084     0.4269     0.4486     0.4727     0.5042
            0.5383     0.5740     0.6056     0.6304     0.6535
            0.6783     0.6927     0.7053     0.7183     0.7309
            0.7387     0.7465     0.7551     0.7693     0.7824
            0.7946     0.8093     0.8258     0.8438     0.8560
            0.8681     0.8831     0.8959     0.9067     0.9188
            0.9325     0.9427     0.9518     0.9667     1.0000

Transect XS-Ron-H2
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Area:
            0.0006     0.0019     0.0037     0.0061     0.0091
            0.0130     0.0204     0.0344     0.0490     0.0641
            0.0795     0.0952     0.1113     0.1279     0.1448
            0.1621     0.1797     0.1977     0.2163     0.2351
            0.2543     0.2740     0.2941     0.3146     0.3355
            0.3568     0.3786     0.4008     0.4234     0.4466
            0.4703     0.4944     0.5191     0.5443     0.5699
            0.5960     0.6223     0.6490     0.6761     0.7034
            0.7312     0.7594     0.7881     0.8172     0.8467
            0.8765     0.9066     0.9372     0.9684     1.0000
Hrad:
            0.0165     0.0328     0.0470     0.0585     0.0714
            0.0790     0.0712     0.0977     0.1354     0.1742
            0.2143     0.2521     0.2874     0.3215     0.3544
            0.3858     0.4156     0.4428     0.4697     0.4975
            0.5213     0.5450     0.5672     0.5900     0.6108
            0.6319     0.6513     0.6706     0.6895     0.7054
            0.7217     0.7382     0.7535     0.7694     0.7861
            0.8037     0.8217     0.8381     0.8554     0.8709
            0.8865     0.9002     0.9143     0.9291     0.9452
            0.9604     0.9742     0.9864     0.9981     1.0000
Width:
            0.0313     0.0483     0.0638     0.0844     0.1033
            0.1354     0.4185     0.4417     0.4579     0.4735
            0.4814     0.4919     0.5050     0.5170     0.5280
            0.5394     0.5509     0.5654     0.5781     0.5867
            0.6012     0.6142     0.6282     0.6399     0.6538
            0.6660     0.6801     0.6933     0.7062     0.7236
            0.7396     0.7547     0.7711     0.7859     0.7990
            0.8097     0.8193     0.8312     0.8410     0.8532
            0.8651     0.8797     0.8933     0.9056     0.9154
            0.9262     0.9392     0.9544     0.9702     1.0000

Transect XS-Ron-H3
Area:
            0.0013     0.0035     0.0064     0.0100     0.0151
            0.0209     0.0270     0.0335     0.0405     0.0478
            0.0554     0.0634     0.0718     0.0807     0.0900
            0.0996     0.1096     0.1199     0.1305     0.1416
            0.1532     0.1652     0.1775     0.1908     0.2095
            0.2304     0.2527     0.2767     0.3010     0.3257
            0.3536     0.3839     0.4146     0.4460     0.4778
            0.5100     0.5430     0.5764     0.6101     0.6441
            0.6783     0.7129     0.7477     0.7830     0.8186
            0.8545     0.8906     0.9268     0.9633     1.0000
Hrad:
            0.0219     0.0425     0.0617     0.0812     0.0858
            0.1094     0.1339     0.1557     0.1774     0.1992
            0.2204     0.2388     0.2547     0.2747     0.2945
            0.3130     0.3323     0.3518     0.3692     0.3822
            0.3989     0.4164     0.4315     0.4411     0.4416
            0.4409     0.4310     0.4363     0.4619     0.4848
            0.4323     0.4626     0.4919     0.5206     0.5536
            0.5817     0.6070     0.6400     0.6727     0.7040
            0.7357     0.7676     0.7955     0.8251     0.8554
            0.8859     0.9169     0.9487     0.9797     1.0000
Width:
            0.0491     0.0695     0.0884     0.1043     0.1490
            0.1613     0.1700     0.1811     0.1912     0.2004
            0.2094     0.2210     0.2348     0.2442     0.2534
            0.2636     0.2726     0.2813     0.2914     0.3055
            0.3164     0.3264     0.3385     0.4119     0.5406
            0.5812     0.6304     0.6474     0.6585     0.6841
            0.8063     0.8200     0.8350     0.8510     0.8594
            0.8752     0.8950     0.9022     0.9093     0.9180
            0.9255     0.9324     0.9439     0.9530     0.9607
            0.9676     0.9735     0.9780     0.9831     1.0000

Transect XS-Ron-H4
Area:
            0.0005     0.0017     0.0037     0.0065     0.0104
            0.0151     0.0208     0.0312     0.0453     0.0616
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            0.0780     0.0946     0.1113     0.1281     0.1451
            0.1622     0.1793     0.1966     0.2140     0.2316
            0.2494     0.2674     0.2856     0.3041     0.3229
            0.3432     0.3653     0.3879     0.4108     0.4341
            0.4577     0.4820     0.5070     0.5326     0.5586
            0.5848     0.6113     0.6381     0.6653     0.6931
            0.7214     0.7504     0.7803     0.8106     0.8413
            0.8722     0.9034     0.9350     0.9671     1.0000
Hrad:
            0.0157     0.0294     0.0402     0.0519     0.0644
            0.0782     0.0772     0.0662     0.0763     0.1003
            0.1255     0.1503     0.1747     0.1986     0.2224
            0.2462     0.2697     0.2926     0.3143     0.3354
            0.3559     0.3764     0.3962     0.4141     0.4315
            0.4480     0.4686     0.4899     0.5117     0.5341
            0.5559     0.5776     0.5987     0.6213     0.6451
            0.6693     0.6938     0.7190     0.7406     0.7644
            0.7861     0.8060     0.8286     0.8541     0.8805
            0.9073     0.9342     0.9599     0.9797     1.0000
Width:
            0.0267     0.0459     0.0722     0.1003     0.1282
            0.1532     0.2154     0.3770     0.4756     0.4903
            0.4942     0.4981     0.5023     0.5067     0.5104
            0.5132     0.5160     0.5193     0.5245     0.5302
            0.5365     0.5421     0.5486     0.5574     0.5841
            0.6407     0.6700     0.6816     0.6929     0.7014
            0.7180     0.7365     0.7597     0.7739     0.7824
            0.7906     0.7989     0.8059     0.8256     0.8385
            0.8585     0.8842     0.9029     0.9139     0.9228
            0.9313     0.9401     0.9518     0.9761     1.0000

Transect XS-Ron-I1
Area:
            0.0018     0.0045     0.0076     0.0116     0.0162
            0.0216     0.0278     0.0347     0.0424     0.0510
            0.0609     0.0714     0.0825     0.0948     0.1084
            0.1228     0.1378     0.1535     0.1698     0.1866
            0.2042     0.2225     0.2415     0.2612     0.2814
            0.3023     0.3240     0.3464     0.3695     0.3934
            0.4179     0.4431     0.4689     0.4954     0.5224
            0.5500     0.5783     0.6072     0.6367     0.6668
            0.6976     0.7290     0.7610     0.7939     0.8275
            0.8614     0.8956     0.9301     0.9649     1.0000
Hrad:
            0.0287     0.0566     0.0786     0.0974     0.1172
            0.1328     0.1517     0.1710     0.1885     0.1958
            0.2146     0.2362     0.2553     0.2609     0.2778
            0.3001     0.3214     0.3426     0.3666     0.3867
            0.4051     0.4257     0.4445     0.4654     0.4875
            0.5042     0.5214     0.5395     0.5573     0.5762
            0.5965     0.6167     0.6352     0.6550     0.6758
            0.6966     0.7142     0.7335     0.7534     0.7723
            0.7906     0.8107     0.8264     0.8410     0.8651
            0.8922     0.9201     0.9458     0.9717     1.0000
Width:
            0.0680     0.0818     0.1001     0.1217     0.1406
            0.1659     0.1868     0.2065     0.2284     0.2661
            0.2890     0.3070     0.3281     0.3707     0.3983
            0.4167     0.4364     0.4554     0.4694     0.4886
            0.5104     0.5287     0.5493     0.5667     0.5818
            0.6044     0.6266     0.6471     0.6682     0.6878
            0.7052     0.7226     0.7423     0.7600     0.7760
            0.7918     0.8119     0.8296     0.8463     0.8643
            0.8830     0.8991     0.9209     0.9453     0.9582
            0.9668     0.9742     0.9841     0.9937     1.0000

Transect XS-Ron-I2
Area:
            0.0019     0.0046     0.0079     0.0120     0.0172
            0.0230     0.0296     0.0367     0.0445     0.0527
            0.0616     0.0717     0.0876     0.1048     0.1226
            0.1409     0.1598     0.1793     0.1995     0.2203
            0.2414     0.2628     0.2845     0.3066     0.3290
```

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            0.3518     0.3749     0.3984     0.4221     0.4463
            0.4708     0.4957     0.5209     0.5465     0.5725
            0.5988     0.6254     0.6524     0.6797     0.7073
            0.7352     0.7634     0.7919     0.8207     0.8498
            0.8792     0.9089     0.9390     0.9693     1.0000
Hrad:
            0.0174     0.0310     0.0431     0.0513     0.0621
            0.0740     0.0857     0.0973     0.1091     0.1207
            0.1316     0.1408     0.1441     0.1596     0.1781
            0.1998     0.2213     0.2426     0.2631     0.2883
            0.3146     0.3403     0.3656     0.3913     0.4168
            0.4427     0.4681     0.4932     0.5184     0.5428
            0.5665     0.5910     0.6152     0.6384     0.6621
            0.6859     0.7091     0.7321     0.7558     0.7796
            0.8027     0.8252     0.8479     0.8705     0.8930
            0.9146     0.9365     0.9583     0.9789     1.0000
Width:
            0.0742     0.0967     0.1193     0.1521     0.1790
            0.2009     0.2214     0.2415     0.2596     0.2768
            0.2957     0.3959     0.5477     0.5665     0.5875
            0.6024     0.6214     0.6423     0.6677     0.6785
            0.6876     0.6985     0.7104     0.7215     0.7329
            0.7432     0.7542     0.7655     0.7761     0.7880
            0.8011     0.8120     0.8229     0.8358     0.8469
            0.8575     0.8688     0.8802     0.8898     0.8985
            0.9084     0.9189     0.9286     0.9383     0.9477
            0.9584     0.9684     0.9782     0.9896     1.0000

Transect XS-Ron-J
Area:
            0.0020     0.0065     0.0130     0.0203     0.0282
            0.0365     0.0452     0.0544     0.0640     0.0739
            0.0846     0.0975     0.1139     0.1313     0.1496
            0.1692     0.1890     0.2088     0.2288     0.2489
            0.2691     0.2893     0.3098     0.3305     0.3515
            0.3727     0.3942     0.4160     0.4381     0.4603
            0.4826     0.5052     0.5281     0.5516     0.5758
            0.6004     0.6256     0.6510     0.6769     0.7032
            0.7300     0.7573     0.7853     0.8141     0.8436
            0.8737     0.9043     0.9353     0.9668     1.0000
Hrad:
            0.0249     0.0466     0.0742     0.1053     0.1349
            0.1627     0.1887     0.2142     0.2382     0.2593
            0.2753     0.2282     0.2459     0.2707     0.2890
            0.3134     0.3463     0.3786     0.4104     0.4418
            0.4727     0.5031     0.5314     0.5592     0.5867
            0.6134     0.6387     0.6644     0.6924     0.7200
            0.7468     0.7731     0.7947     0.8056     0.8239
            0.8427     0.8648     0.8880     0.9089     0.9282
            0.9486     0.9596     0.9758     0.9883     1.0009
            1.0211     1.0408     1.0632     1.0854     1.0000
Width:
            0.0882     0.1577     0.1953     0.2117     0.2251
            0.2373     0.2495     0.2601     0.2715     0.2853
            0.3055     0.4377     0.4742     0.4940     0.5267
            0.5481     0.5511     0.5540     0.5569     0.5599
            0.5629     0.5658     0.5725     0.5794     0.5863
            0.5940     0.6030     0.6111     0.6156     0.6200
            0.6255     0.6310     0.6421     0.6643     0.6792
            0.6936     0.7042     0.7137     0.7254     0.7388
            0.7510     0.7724     0.7893     0.8100     0.8310
            0.8442     0.8581     0.8690     0.8799     1.0000


**********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
**********************************************************

***************
Analysis Options
***************
```

```
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... YES
  Water Quality ..... NO
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date ..... 11/11/2019 00:00:00
Ending Date ..... 11/12/2019 00:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:01:00
Routing Time Step ..... 1.00 sec
Variable Time Step ..... YES
Maximum Trials ..... 8
Number of Threads ..... 4
Head Tolerance ..... 0.005000 ft
```

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	41.962	13.674
External Outflow	39.481	12.865
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.691	0.225
Initial Stored Volume	0.000	0.000
Final Stored Volume	1.742	0.568
Continuity Error (%)	0.116	

```
*************************
Highest Continuity Errors
*************************
Node Joff-D2 (-1.27%)
Node J-off-D3 (1.07%)


***************************
Time-Step Critical Elements
***************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00


******************
Node Depth Summary
******************
```

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
J-0301	JUNCTION	0.49	2.05	4545.55	0 12:37	2.05
J-0302	JUNCTION	0.41	1.72	4584.22	0 12:36	1.72
J-0303	JUNCTION	0.41	1.78	4620.78	0 12:37	1.78
J-0402	JUNCTION	0.35	1.33	4649.33	0 12:13	1.32
J-0403	JUNCTION	0.36	1.42	4668.42	0 12:13	1.42
J-0407	JUNCTION	0.32	1.20	4699.70	0 12:13	1.20
J-0411	JUNCTION	0.32	1.17	4727.17	0 12:42	1.17
J-0414	JUNCTION	0.25	1.38	4759.38	0 12:15	1.37
J-0415	JUNCTION	0.25	1.56	4767.06	0 12:15	1.56
J-0416	JUNCTION	0.27	1.46	4772.96	0 12:15	1.46
J-0417	JUNCTION	0.30	1.72	4778.72	0 12:15	1.72
J-0418	JUNCTION	0.17	1.34	4785.34	0 12:15	1.34
J-0419	JUNCTION	0.04	0.80	4788.80	0 12:23	0.80
J-0501	JUNCTION	0.12	0.71	4780.21	0 12:10	0.71
J-0601	JUNCTION	0.30	1.21	4798.21	0 12:23	1.21
J-0605	JUNCTION	0.15	0.86	4894.36	0 12:10	0.85
J-0806	JUNCTION	0.24	1.47	4799.47	0 12:16	1.46
J-0807	JUNCTION	0.27	1.72	4815.72	0 12:12	1.72
J-0808	JUNCTION	0.21	1.47	4817.47	0 12:10	1.46
J-0809	JUNCTION	0.17	1.23	4826.23	0 12:10	1.23
J-0810	JUNCTION	0.23	2.13	4838.13	0 12:10	2.12
J-0811	JUNCTION	0.25	2.24	4849.24	0 12:10	2.23
J-0812	JUNCTION	0.20	1.54	4859.54	0 12:10	1.53
J-0813	JUNCTION	0.21	1.43	4863.43	0 12:10	1.42
J-0814	JUNCTION	0.19	1.29	4868.79	0 12:10	1.29
J-0901	JUNCTION	0.13	1.27	4783.27	0 12:10	1.26
J1	JUNCTION	0.19	0.70	4872.70	0 12:28	0.70
J-1001	JUNCTION	0.44	1.43	4782.43	0 12:10	1.43
J2	JUNCTION	0.19	0.70	4857.83	0 12:28	0.70
J3	JUNCTION	0.19	0.70	4842.95	0 12:28	0.70
J4	JUNCTION	0.19	0.71	4828.09	0 12:29	0.71
J5	JUNCTION	0.12	0.69	4770.03	0 12:10	0.69
J6	JUNCTION	0.12	0.77	4759.94	0 12:11	0.77
J-Det-5-Out	JUNCTION	0.36	0.65	4780.65	0 12:57	0.65
Joff-A	JUNCTION	0.43	1.89	4720.83	0 12:43	1.89
Joff-B1	JUNCTION	0.00	0.00	4844.15	0 00:00	0.00
Joff-B2	JUNCTION	0.02	0.39	4801.19	0 12:21	0.39
Joff-C_1	JUNCTION	0.15	0.81	4696.47	0 12:42	0.81
Joff-C_1a	JUNCTION	0.18	0.92	4651.05	0 12:48	0.92
Joff-C_2	JUNCTION	0.21	1.09	4687.26	0 12:39	1.09
Joff-D1	JUNCTION	0.31	1.51	4528.79	0 12:35	1.51
Joff-D1_1	JUNCTION	0.05	0.42	4542.14	0 12:15	0.42
Joff-D2	JUNCTION	0.49	1.97	4527.47	0 12:48	1.97
J-off-D3	JUNCTION	1.01	6.33	4513.91	0 12:52	6.33
Jon-I1	JUNCTION	0.28	1.36	4656.35	0 12:41	1.36
Jon-I2	JUNCTION	0.40	2.03	4627.73	0 12:35	2.03
OFoff-D	OUTFALL	0.35	2.15	4499.15	0 12:52	2.15
OFon-D	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OFon-G	OUTFALL	0.34	0.59	4774.59	0 12:57	0.59
OFon-G2	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
OFon-G3	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
Det-1	STORAGE	0.23	1.02	4875.02	0 12:27	1.02
Det-2	STORAGE	0.40	2.45	4808.45	0 12:24	2.45
Det-3	STORAGE	0.52	3.82	4741.82	0 12:41	3.82
Det-4	STORAGE	1.03	2.41	4782.41	0 12:57	2.41
Det-5	STORAGE	0.32	2.18	4622.18	0 12:36	2.18
Soff-D	STORAGE	2.39	5.30	4501.30	0 12:52	5.30

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent

J-0301	JUNCTION	0.00	101.33	0	12:36	0	6.85	0.064
J-0302	JUNCTION	7.98	101.34	0	12:36	0.213	6.85	0.015
J-0303	JUNCTION	0.00	100.27	0	12:36	0	6.64	0.057
J-0402	JUNCTION	0.00	35.44	0	12:13	0	3.06	0.013
J-0403	JUNCTION	0.00	35.48	0	12:13	0	3.06	0.009
J-0407	JUNCTION	4.00	35.51	0	12:12	0.0724	3.06	0.010
J-0411	JUNCTION	0.00	33.01	0	12:42	0	2.99	0.010
J-0414	JUNCTION	0.00	55.92	0	12:15	0	2.37	0.006
J-0415	JUNCTION	0.00	55.93	0	12:15	0	2.37	0.004
J-0416	JUNCTION	0.00	55.93	0	12:15	0	2.37	0.004
J-0417	JUNCTION	0.00	55.92	0	12:15	0	2.37	0.003
J-0418	JUNCTION	23.92	35.52	0	12:15	0.608	0.887	-0.004
J-0419	JUNCTION	0.00	14.62	0	12:21	0	0.279	0.028
J-0501	JUNCTION	10.40	10.40	0	12:10	0.293	0.293	0.006
J-0601	JUNCTION	1.45	21.55	0	12:23	0.0685	1.49	0.040
J-0605	JUNCTION	24.33	24.33	0	12:10	0.76	0.76	0.005
J-0806	JUNCTION	0.00	46.00	0	12:13	0	1.34	0.308
J-0807	JUNCTION	0.00	46.64	0	12:10	0	1.34	-0.019
J-0808	JUNCTION	0.00	46.61	0	12:10	0	1.34	0.003
J-0809	JUNCTION	0.00	46.59	0	12:10	0	1.34	-0.001
J-0810	JUNCTION	0.00	46.59	0	12:10	0	1.34	0.001
J-0811	JUNCTION	0.00	46.59	0	12:10	0	1.34	0.001
J-0812	JUNCTION	0.00	46.66	0	12:10	0	1.34	0.003
J-0813	JUNCTION	0.00	46.64	0	12:10	0	1.34	0.002
J-0814	JUNCTION	46.58	46.58	0	12:10	1.34	1.34	0.001
J-0901	JUNCTION	19.73	19.73	0	12:10	0.581	0.581	0.007
J1	JUNCTION	0.00	9.09	0	12:27	0	0.722	0.012
J-1001	JUNCTION	4.63	24.35	0	12:10	0.145	0.726	0.007
J2	JUNCTION	0.00	9.09	0	12:28	0	0.722	0.021
J3	JUNCTION	0.00	9.09	0	12:28	0	0.722	0.021
J4	JUNCTION	0.00	9.09	0	12:28	0	0.722	0.032
J5	JUNCTION	0.00	10.40	0	12:10	0	0.293	0.012
J6	JUNCTION	1.38	11.76	0	12:10	0.0174	0.311	0.023
J-Det-5-Out	JUNCTION	0.00	5.45	0	12:57	0	1.59	0.037
Joff-A	JUNCTION	55.83	55.83	0	12:40	3.01	3.01	0.198
Joff-B1	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
gal								
Joff-B2	JUNCTION	14.88	14.88	0	12:20	0.279	0.279	0.014
Joff-C_1	JUNCTION	20.99	20.99	0	12:40	1	1	0.012
Joff-C_1a	JUNCTION	0.00	20.95	0	12:42	0	1	0.407
Joff-C_2	JUNCTION	14.04	58.94	0	12:37	0.196	3.2	0.100
Joff-D1	JUNCTION	0.00	103.59	0	12:35	0	6.96	0.065
Joff-D1_1	JUNCTION	4.99	4.99	0	12:15	0.107	0.107	-1.210
Joff-D2	JUNCTION	0.00	123.31	0	12:39	0	7.95	-1.250
J-off-D3	JUNCTION	111.75	218.87	0	12:31	3.17	11.2	1.083
Jon-I1	JUNCTION	0.00	58.82	0	12:39	0	3.2	0.147
Jon-I2	JUNCTION	10.83	64.99	0	12:35	0.35	3.54	0.018
OFoff-D	OUTFALL	0.00	184.87	0	12:52	0	11.1	0.000
OFon-D	OUTFALL	10.38	10.38	0	12:10	0.0906	0.0906	0.000
OFon-G	OUTFALL	5.52	9.48	0	12:15	0.0664	1.65	0.000
OFon-G2	OUTFALL	1.37	1.37	0	12:10	0.0145	0.0145	0.000
OFon-G3	OUTFALL	1.14	1.14	0	12:10	0.0121	0.0121	0.000
Det-1	STORAGE	1.74	26.03	0	12:10	0.0372	0.797	0.002
Det-2	STORAGE	23.68	29.03	0	12:15	0.714	1.44	0.017
Det-3	STORAGE	11.91	78.24	0	12:15	0.372	3.05	0.020
Det-4	STORAGE	7.95	74.16	0	12:15	0.115	2.17	0.037
Det-5	STORAGE	1.63	100.37	0	12:34	0.0442	6.65	0.010
Soff-D	STORAGE	0.00	184.86	0	12:52	0	11.1	0.008

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
Det-1	7.426	5	0	5	33.163	24	0 12:27	9.23
Det-2	2.250	3	0	1	15.016	17	0 12:24	20.77
Det-3	9.328	2	0	1	73.874	17	0 12:41	33.19
Det-4	66.261	9	0	6	157.152	21	0 12:57	5.86
Det-5	1.106	2	0	0	8.431	13	0 12:36	100.29
Soff-D	0.000	0	0	0	0.000	0	0 00:00	184.87

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OFoff-D	96.61	17.77	184.87	11.096
OFon-D	5.27	2.66	10.38	0.091
OFon-G	95.30	2.68	9.48	1.651
OFon-G2	5.91	0.38	1.37	0.015
OFon-G3	5.84	0.32	1.14	0.012
System	41.79	23.81	1.14	12.865

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
C-0301	CONDUIT	101.29	0 12:37	7.06	0.17	0.45
C-0302	CONDUIT	101.33	0 12:36	7.95	0.12	0.42
C-0303	CONDUIT	100.24	0 12:37	8.68	0.16	0.44
C-0402	CONDUIT	35.37	0 12:13	17.19	0.64	0.62
C-0403	CONDUIT	35.44	0 12:13	16.55	0.63	0.65
C-0407	CONDUIT	35.48	0 12:13	19.64	0.53	0.56
C-0411	CONDUIT	33.01	0 12:42	18.79	0.52	0.55
C-0413	CONDUIT	33.01	0 12:42	11.45	0.93	0.88
C-0414	CONDUIT	55.92	0 12:15	17.12	0.16	0.31
C-0415	CONDUIT	55.92	0 12:15	16.11	0.14	0.32
C-0416	CONDUIT	55.93	0 12:15	12.88	0.16	0.38
C-0417	CONDUIT	55.93	0 12:15	13.16	0.28	0.45
C-0418	CONDUIT	35.46	0 12:15	12.51	0.18	0.34
C-0419	CONDUIT	14.61	0 12:21	8.14	0.13	0.35
C-0420	CONDUIT	14.62	0 12:21	3.38	0.01	0.10
C-0501_1	CONDUIT	10.40	0 12:10	10.61	0.23	0.35
C-0501_2	CONDUIT	10.39	0 12:10	10.03	0.23	0.36
C-0501_3	CONDUIT	11.70	0 12:11	11.21	0.26	0.37
C-0601	CONDUIT	21.55	0 12:23	11.34	0.60	0.58
C-0602	CONDUIT	20.72	0 12:24	7.14	0.90	0.87
C-0603_1	CONDUIT	9.09	0 12:27	8.66	0.43	0.57
C-0603_2	CONDUIT	9.09	0 12:28	11.25	0.40	0.47
C-0603_3	CONDUIT	9.09	0 12:28	11.28	0.40	0.47
C-0603_4	CONDUIT	9.09	0 12:28	11.18	0.40	0.47
C-0603_5	CONDUIT	9.09	0 12:29	11.60	0.40	0.46
C-0605	CONDUIT	24.30	0 12:10	18.10	0.19	0.32
C-0805	CONDUIT	5.45	0 12:57	7.88	0.33	0.41

C-0806	CONDUIT	44.05	0	12:16	5.27	0.11	0.36
C-0807	CONDUIT	46.00	0	12:13	4.87	0.14	0.39
C-0808	CONDUIT	46.64	0	12:10	4.79	0.10	0.40
C-0809	CONDUIT	46.61	0	12:10	18.01	0.11	0.32
C-0810	CONDUIT	46.59	0	12:10	11.35	0.17	0.44
C-0811	CONDUIT	46.59	0	12:10	10.51	0.19	0.47
C-0812	CONDUIT	46.59	0	12:10	13.87	0.13	0.31
C-0813	CONDUIT	46.66	0	12:10	11.02	0.14	0.37
C-0814	CONDUIT	46.64	0	12:10	12.41	0.12	0.34
C-0901	CONDUIT	19.72	0	12:10	4.88	0.24	0.45
C-1001	CONDUIT	24.30	0	12:10	5.91	0.25	0.64
Coff-D1	CONDUIT	103.65	0	12:36	5.81	0.46	0.69
Coff-D2	CONDUIT	108.36	0	12:52	11.79	1.00	0.91
Coff-D3	CONDUIT	184.87	0	12:52	8.48	0.56	0.68
Con-0303	CONDUIT	100.27	0	12:36	6.33	0.49	0.66
Con-I1	CONDUIT	58.77	0	12:42	15.58	0.19	0.30
Con-I2	CONDUIT	64.99	0	12:35	9.67	0.25	0.37
Ex_Roff-B_2	CHANNEL	0.00	0	00:00	0.00	0.00	0.02
Roff-C	CHANNEL	55.22	0	12:43	5.62	0.00	0.09
Roff-C_1	CHANNEL	20.95	0	12:42	3.84	0.00	0.04
Roff-C_2	CHANNEL	20.73	0	12:48	2.54	0.00	0.10
Roff-D1_2	CHANNEL	4.90	0	12:15	1.19	0.00	0.05
Roff-D2	CHANNEL	121.43	0	12:48	2.90	0.00	0.26
Ron-I1	CHANNEL	58.82	0	12:39	5.42	0.00	0.04
Orifice-Det-5	ORIFICE	5.45	0	12:57			1.00
W1	WEIR	0.00	0	00:00			0.00
W2	WEIR	76.50	0	12:52			0.07

****
Flow Classification Summary
****

	Adjusted	Fraction of Time in Flow Class								
Conduit	/Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C-0301	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C-0302	1.00	0.00	0.00	0.00	0.26	0.74	0.00	0.00	0.97	0.00
C-0303	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00
C-0402	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C-0403	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C-0407	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C-0411	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C-0413	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C-0414	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C-0415	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C-0416	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C-0417	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C-0418	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C-0419	1.00	0.00	0.49	0.00	0.44	0.07	0.00	0.00	0.46	0.00
C-0420	1.00	0.49	0.00	0.00	0.00	0.00	0.00	0.51	0.00	0.00
C-0501_1	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C-0501_2	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C-0501_3	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C-0601	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C-0602	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C-0603_1	1.00	0.02	0.00	0.00	0.01	0.98	0.00	0.00	0.00	0.00
C-0603_2	1.00	0.02	0.00	0.00	0.00	0.98	0.00	0.00	0.00	0.00
C-0603_3	1.00	0.02	0.00	0.00	0.00	0.98	0.00	0.00	0.00	0.00
C-0603_4	1.00	0.02	0.00	0.00	0.00	0.97	0.00	0.00	0.03	0.00
C-0603_5	1.00	0.03	0.00	0.00	0.00	0.00	0.00	0.97	0.00	0.00
C-0605	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C-0805	1.00	0.03	0.00	0.00	0.00	0.97	0.00	0.00	0.00	0.00
C-0806	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C-0807	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.08	0.00
C-0808	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.97	0.00
C-0809	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.99	0.00	0.00
C-0810	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C-0811	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C-0812	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C-0813	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00

C-0814	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C-0901	1.00	0.00	0.00	0.00	0.52	0.48	0.00	0.00	0.38	0.00
C-1001	1.00	0.00	0.00	0.00	0.89	0.11	0.00	0.00	0.41	0.00
Coff-D1	1.00	0.01	0.00	0.00	0.90	0.08	0.00	0.00	0.83	0.00
Coff-D2	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
Coff-D3	1.00	0.03	0.00	0.00	0.19	0.77	0.00	0.00	0.00	0.00
Con-0303	1.00	0.01	0.00	0.00	0.98	0.01	0.00	0.00	0.83	0.00
Con-I1	1.00	0.04	0.00	0.00	0.00	0.00	0.00	0.96	0.00	0.00
Con-I2	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
Ex_Roff-B_2	1.00	0.49	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roff-C	1.00	0.00	0.00	0.00	0.02	0.98	0.00	0.00	0.00	0.00
Roff-C_1	1.00	0.00	0.00	0.00	0.74	0.26	0.00	0.00	0.83	0.00
Roff-C_2	1.00	0.02	0.01	0.00	0.97	0.00	0.00	0.00	0.97	0.00
Roff-D1_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.97	0.00
Roff-D2	1.00	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.98	0.00
Ron-I1	1.00	0.02	0.00	0.00	0.94	0.04	0.00	0.00	0.92	0.00

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Conduit Surcharge Summary
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Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C-0413	0.01	1.22	0.01	0.01	0.01
C-0602	0.01	0.39	0.01	0.01	0.01
Coff-D2	0.01	2.22	0.01	0.01	0.01

Analysis begun on: Thu Feb 27 16:44:13 2020
Analysis ended on: Thu Feb 27 16:44:17 2020
Total elapsed time: 00:00:04

Proposed Conditions Model Results – 100-year

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ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM BETA VERSION 7.2.2785
---------------------------------------------------------------

This is a *BETA* version of ARM - your feedback and suggestions are solicited.
Create a ticket, post on the PCSWMM feature request forum, or email us directly!

Simulation start time:                  11/11/2019 00:00:00
Simulation end time:                    11/12/2019 00:00:00
Runoff wet weather time steps:          300 seconds
Report time steps:                      60 seconds
Number of data points:                  1441


*****************************
Unit Hydrographs Runoff Method
*****************************
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Subcatchment	Runoff Method	Factor	Raingage	Area (ac)	Tc (min)	Tpeak (min)	Peak Flow L(cfs/in)	Depth (in)
Village_2	UH	450	Sparks_100y	16.894	15	11.5	61.97527	1
Boff-A	UH	300	Sparks_100y	361.888	61.77	39.56	257.2696	0.999
Bon-D	UH	450	Sparks_100y	18.293	15	11.5	67.10747	1
Bon-G1	UH	300	Sparks_100y	13.576	15	11.5	33.20217	0.998
Boff-B	UH	300	Sparks_100y	57.861	27.27	18.86	86.27614	0.997
Bon-I	UH	350	Sparks_100y	32.327	27.25	18.85	56.27213	0.998
Boff-C2	UH	300	Sparks_100y	40.032	18.74	13.74	81.91938	1
Boff-C1	UH	300	Sparks_100y	79.354	63.56	40.64	54.92251	0.999
Boff-D2	UH	350	Sparks_100y	260.1	38.28	25.47	335.108	0.999
Bon-G2	UH	350	Sparks_100y	2.959	15	11.5	8.4428	1
Village_3b	UH	450	Sparks_100y	6.172	15	11.5	22.64185	1
Bon-G3	UH	350	Sparks_100y	2.466	15	11.5	7.03614	1
Bon-6	UH	350	Sparks_100y	8.942	49.16	32	9.17019	0.999
Villages9&10	UH	450	Sparks_100y	64.32	15	11.5	235.9565	1
Village_1	UH	450	Sparks_100y	11.324	15	11.5	41.54185	1
Boff-D1	UH	300	Sparks_100y	12.983	18.42	13.55	26.94413	0.999
Bon-5	UH	350	Sparks_100y	7.975	15	11.5	22.75476	1
Village_7a	UH	450	Sparks_100y	19.436	15	11.5	71.30054	1
Village_5	UH	450	Sparks_100y	15.854	15	11.5	58.16005	1
Bon-4	UH	350	Sparks_100y	2.931	15	11.5	8.36291	1
Village_3a	UH	400	Sparks_100y	8.336	15	11.5	27.18261	1
Village_4	UH	450	Sparks_100y	17.63	15	11.5	64.67527	1
Bon-2	UH	350	Sparks_100y	3.335	15	11.5	9.51563	1
Bon-1	UH	350	Sparks_100y	16.509	15	11.5	47.10448	1
Bon-3	UH	450	Sparks_100y	1.484	15	11.5	5.44402	1
Village_6	UH	400	Sparks_100y	35.603	15	11.5	116.0967	1
Village8a	UH	450	Sparks_100y	15.019	15	11.5	55.09688	1
Village8b	UH	450	Sparks_100y	17.382	15	11.5	63.76549	1
Village_7b	UH	450	Sparks_100y	14.45	15	11.5	53.00951	1

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ARM Runoff Summary
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Subcatchment	Total Precip (in)	Total Losses (in)	Total Runoff (in)	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff (fraction)
Village_2	3.146	1.744	1.404	0.644	36.625	0.446
Boff-A	3.146	2.119	1.022	10.046	219.881	0.325
Bon-D	3.146	2.326	0.822	0.408	37.677	0.261
Bon-G1	3.146	2.326	0.812	0.299	21.126	0.258
Boff-B	3.146	2.337	0.806	1.266	62.771	0.256
Bon-I	3.146	2.017	1.124	0.987	40.936	0.357
Boff-C2	3.146	2.326	0.814	0.885	56.036	0.259
Boff-C1	3.146	1.898	1.246	2.684	59.323	0.396
Boff-D2	3.146	1.908	1.237	8.737	320.54	0.393
Bon-G2	3.146	2.326	0.815	0.065	5.143	0.259
Village_3b	3.146	1.302	1.846	0.309	13.889	0.587
Bon-G3	3.146	2.326	0.815	0.055	4.286	0.259
Bon-6	3.146	2.326	0.819	0.199	7.051	0.26
Villages9&10	3.146	1.451	1.697	2.964	142.952	0.539
Village_1	3.146	1.558	1.59	0.489	24.942	0.505
Boff-D1	3.146	2.14	0.998	0.352	18.776	0.317
Bon-5	3.146	2.093	1.045	0.226	14.197	0.332
Village_7a	3.146	1.302	1.845	0.974	43.736	0.587
Village_5	3.146	1.302	1.845	0.794	35.675	0.587
Bon-4	3.146	2.268	0.872	0.069	5.125	0.277
Village_3a	3.146	1.768	1.378	0.312	16.813	0.438
Village_4	3.146	1.512	1.636	0.783	38.984	0.52
Bon-2	3.146	1.977	1.161	0.105	6.008	0.369
Bon-1	3.146	2.21	0.93	0.417	29.041	0.296
Bon-3	3.146	0.047	3.102	0.125	3.687	0.986
Village_6	3.146	1.489	1.657	1.602	73.649	0.527
Village8a	3.146	1.302	1.845	0.753	33.796	0.587
Village8b	3.146	1.302	1.846	0.871	39.114	0.587
Village_7b	3.146	1.477	1.671	0.656	32.045	0.531

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EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)
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WARNING 02: maximum depth increased for Node Joff-A
WARNING 02: maximum depth increased for Node Joff-B1
WARNING 02: maximum depth increased for Node Joff-B2
WARNING 02: maximum depth increased for Node Joff-C_1
WARNING 02: maximum depth increased for Node Joff-C_1a
WARNING 02: maximum depth increased for Node Joff-C_2
WARNING 02: maximum depth increased for Node Joff-D1
WARNING 02: maximum depth increased for Node Joff-D1_1
WARNING 02: maximum depth increased for Node Joff-D2
WARNING 02: maximum depth increased for Node J-off-D3
WARNING 02: maximum depth increased for Node Jon-I1

*************
Element Count
*************
Number of rain gages ...... 5
Number of subcatchments ... 0
Number of nodes ........... 57
Number of links ........... 54
Number of pollutants ...... 0
Number of land uses ....... 0


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Raingage Summary
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Name	Data Source	Data Type	Recording Interval
Sparks_100y	Sparks_100y	VOLUME	6 min.
Sparks_10y	Sparks_10y	VOLUME	6 min.

Sparks_25y	Sparks_25y	VOLUME	6 min.
Sparks_50y	Sparks_50y	VOLUME	6 min.
Sparks_5y	Sparks_5y	VOLUME	6 min.

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Node Summary
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Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J-0301	JUNCTION	4543.50	4.50	0.0	
J-0302	JUNCTION	4582.50	4.50	0.0	
J-0303	JUNCTION	4619.00	4.00	0.0	
J-0402	JUNCTION	4648.00	8.00	0.0	
J-0403	JUNCTION	4667.00	8.00	0.0	
J-0407	JUNCTION	4698.50	6.00	50.0	
J-0411	JUNCTION	4726.00	6.00	0.0	
J-0414	JUNCTION	4758.00	8.00	0.0	
J-0415	JUNCTION	4765.50	6.50	0.0	
J-0416	JUNCTION	4771.50	6.50	0.0	
J-0417	JUNCTION	4777.00	8.00	0.0	
J-0418	JUNCTION	4784.00	6.00	50.0	
J-0419	JUNCTION	4788.00	6.50	50.0	
J-0501	JUNCTION	4779.50	4.50	50.0	
J-0601	JUNCTION	4797.00	11.00	0.0	
J-0605	JUNCTION	4893.50	5.50	0.0	
J-0806	JUNCTION	4798.00	4.00	0.0	
J-0807	JUNCTION	4814.00	4.00	0.0	
J-0808	JUNCTION	4816.00	4.00	0.0	
J-0809	JUNCTION	4825.00	15.00	0.0	
J-0810	JUNCTION	4836.00	15.00	0.0	
J-0811	JUNCTION	4847.00	15.00	0.0	
J-0812	JUNCTION	4858.00	8.00	0.0	
J-0813	JUNCTION	4862.00	8.00	0.0	
J-0814	JUNCTION	4867.50	6.50	0.0	
J-0901	JUNCTION	4782.00	5.00	50.0	
J1	JUNCTION	4872.00	4.00	0.0	
J-1001	JUNCTION	4781.00	12.00	0.0	
J2	JUNCTION	4857.13	3.88	0.0	
J3	JUNCTION	4842.25	3.75	0.0	
J4	JUNCTION	4827.38	3.63	0.0	
J5	JUNCTION	4769.33	4.67	0.0	
J6	JUNCTION	4759.17	4.83	0.0	
J-Det-5-Out	JUNCTION	4780.00	10.00	0.0	
Joff-A	JUNCTION	4718.94	15.70	50.0	
Joff-B1	JUNCTION	4844.15	11.34	0.0	
Joff-B2	JUNCTION	4800.80	11.34	0.0	
Joff-C_1	JUNCTION	4695.66	19.39	0.0	
Joff-C_1a	JUNCTION	4650.13	19.39	0.0	
Joff-C_2	JUNCTION	4686.17	29.35	50.0	
Joff-D1	JUNCTION	4527.28	18.51	50.0	
Joff-D1_1	JUNCTION	4541.73	18.51	50.0	
Joff-D2	JUNCTION	4525.50	16.17	500.0	
J-off-D3	JUNCTION	4507.58	16.17	500.0	
Jon-I1	JUNCTION	4654.99	29.35	50.0	
Jon-I2	JUNCTION	4625.70	12.33	50.0	
OFoff-D	OUTFALL	4497.00	4.00	0.0	
OFon-D	OUTFALL	0.00	0.00	0.0	
OFon-G	OUTFALL	4774.00	1.50	0.0	
OFon-G2	OUTFALL	0.00	0.00	0.0	
OFon-G3	OUTFALL	0.00	0.00	0.0	
Det-1	STORAGE	4874.00	4.00	0.0	
Det-2	STORAGE	4806.00	10.00	0.0	
Det-3	STORAGE	4738.00	16.00	0.0	
Det-4	STORAGE	4780.00	10.00	0.0	
Det-5	STORAGE	4620.00	10.00	0.0	
Soff-D	STORAGE	4496.00	12.50	0.0	

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Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
C-0301	J-0301	Joff-D1	CONDUIT	412.9	3.8097	0.0450
C-0302	J-0302	J-0301	CONDUIT	529.3	7.3884	0.0450
C-0303	J-0303	J-0302	CONDUIT	546.7	6.5992	0.0450
C-0402	J-0402	Det-5	CONDUIT	373.9	6.0286	0.0130
C-0403	J-0403	J-0402	CONDUIT	246.4	6.0990	0.0130
C-0407	J-0407	J-0403	CONDUIT	319.6	8.6365	0.0130
C-0411	J-0411	J-0407	CONDUIT	319.6	8.0042	0.0130
C-0413	Det-3	J-0411	CONDUIT	410.3	2.4380	0.0130
C-0414	J-0414	Det-3	CONDUIT	181.9	6.0584	0.0130
C-0415	J-0415	J-0414	CONDUIT	80.8	8.0707	0.0130
C-0416	J-0416	J-0415	CONDUIT	105.1	5.7182	0.0130
C-0417	J-0417	J-0416	CONDUIT	135.4	4.0654	0.0130
C-0418	J-0418	J-0417	CONDUIT	130.2	3.8431	0.0130
C-0419	J-0419	J-0418	CONDUIT	139.9	2.8604	0.0130
C-0420	Joff-B2	J-0419	CONDUIT	249.1	4.3397	0.0450
C-0501_1	J-0501	J5	CONDUIT	257.0	3.9591	0.0130
C-0501_2	J5	J6	CONDUIT	257.0	3.9587	0.0130
C-0501_3	J6	Det-3	CONDUIT	257.0	3.9591	0.0130
C-0601	J-0601	J-0417	CONDUIT	642.6	2.4907	0.0130
C-0602	Det-2	J-0601	CONDUIT	192.4	1.0396	0.0130
C-0603_1	Det-1	J1	CONDUIT	50.0	4.0032	0.0130
C-0603_2	J1	J2	CONDUIT	312.5	4.7654	0.0130
C-0603_3	J2	J3	CONDUIT	312.5	4.7654	0.0130
C-0603_4	J3	J4	CONDUIT	312.5	4.7654	0.0130
C-0603_5	J4	Det-2	CONDUIT	312.5	4.7654	0.0130
C-0605	J-0605	Det-1	CONDUIT	180.0	10.0504	0.0130
C-0805	J-Det-5-Out	OFon-G	CONDUIT	245.0	2.4497	0.0130
C-0806	J-0806	Det-4	CONDUIT	675.0	1.7781	0.0350
C-0807	J-0807	J-0806	CONDUIT	831.6	1.9243	0.0450
C-0808	J-0808	J-0807	CONDUIT	51.8	3.8631	0.0450
C-0809	J-0809	J-0808	CONDUIT	51.8	16.6311	0.0130
C-0810	J-0810	J-0809	CONDUIT	25.9	7.7439	0.0130
C-0811	J-0811	J-0810	CONDUIT	25.9	5.8003	0.0130
C-0812	J-0812	J-0811	CONDUIT	69.2	6.5210	0.0130
C-0813	J-0813	J-0812	CONDUIT	70.9	5.6486	0.0130
C-0814	J-0814	J-0813	CONDUIT	81.2	6.7925	0.0130
C-0901	J-0901	J-1001	CONDUIT	107.2	0.9326	0.0130
C-1001	J-1001	Det-4	CONDUIT	75.0	1.3335	0.0130
Coff-D1	Joff-D1	Joff-D2	CONDUIT	148.9	1.1955	0.0130
Coff-D2	J-off-D3	Soff-D	CONDUIT	145.0	3.9617	0.0240
Coff-D3	Soff-D	OFoff-D	CONDUIT	177.4	0.5636	0.0130
Con-0303	Det-5	J-0303	CONDUIT	200.0	0.5000	0.0130
Con-I1	Jon-I1	Jon-I2	CONDUIT	794.0	3.1868	0.0130
Con-I2	Jon-I2	Det-5	CONDUIT	430.0	0.9768	0.0130
Ex_Roff-B_2	Joff-B1	Joff-B2	CONDUIT	1795.5	2.4152	0.0400
Roff-C	Joff-A	Joff-C_2	CONDUIT	1770.5	1.8511	0.0400
Roff-C_1	Joff-C_1	Joff-C_1a	CONDUIT	1079.3	4.2223	0.0400
Roff-C_2	Joff-C_1a	Joff-D2	CONDUIT	1995.9	6.2566	0.0400
Roff-D1_2	Joff-D1_1	Joff-D1	CONDUIT	587.1	2.4616	0.0400
Roff-D2	Joff-D2	J-off-D3	CONDUIT	770.1	2.3276	0.0400
Ron-I1	Joff-C_2	Jon-I1	CONDUIT	814.9	3.8290	0.0400
Orifice-Det-5	Det-4	J-Det-5-Out	ORIFICE			
W1	Joff-D1	Joff-D2	WEIR			
W2	J-off-D3	Soff-D	WEIR			

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Cross Section Summary
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Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C-0301	TRAPEZOIDAL	4.50	54.00	2.34	21.00	1	612.62
C-0302	TRAPEZOIDAL	4.50	54.00	2.34	21.00	1	853.14
C-0303	TRAPEZOIDAL	4.00	44.00	2.11	19.00	1	613.34
C-0402	CIRCULAR	2.00	3.14	0.50	2.00	1	55.55
C-0403	CIRCULAR	2.00	3.14	0.50	2.00	1	55.87
C-0407	CIRCULAR	2.00	3.14	0.50	2.00	1	66.48
C-0411	CIRCULAR	2.00	3.14	0.50	2.00	1	64.00
C-0413	CIRCULAR	2.00	3.14	0.50	2.00	1	35.32
C-0414	CIRCULAR	4.00	12.57	1.00	4.00	1	353.56

C-0415	CIRCULAR	4.00	12.57	1.00	4.00	1	408.08
C-0416	CIRCULAR	4.00	12.57	1.00	4.00	1	343.49
C-0417	CIRCULAR	3.50	9.62	0.88	3.50	1	202.86
C-0418	CIRCULAR	3.50	9.62	0.88	3.50	1	197.23
C-0419	CIRCULAR	3.00	7.07	0.75	3.00	1	112.80
C-0420	TRAPEZOIDAL	4.00	88.00	2.49	34.00	1	1113.02
C-0501_1	CIRCULAR	2.00	3.14	0.50	2.00	1	45.01
C-0501_2	CIRCULAR	2.00	3.14	0.50	2.00	1	45.01
C-0501_3	CIRCULAR	2.00	3.14	0.50	2.00	1	45.01
C-0601	CIRCULAR	2.00	3.14	0.50	2.00	1	35.70
C-0602	CIRCULAR	2.00	3.14	0.50	2.00	1	23.07
C-0603_1	CIRCULAR	1.50	1.77	0.38	1.50	1	21.02
C-0603_2	CIRCULAR	1.50	1.77	0.38	1.50	1	22.93
C-0603_3	CIRCULAR	1.50	1.77	0.38	1.50	1	22.93
C-0603_4	CIRCULAR	1.50	1.77	0.38	1.50	1	22.93
C-0603_5	CIRCULAR	1.50	1.77	0.38	1.50	1	22.93
C-0605	CIRCULAR	2.50	4.91	0.63	2.50	1	130.03
C-0805	CIRCULAR	1.50	1.77	0.38	1.50	1	16.44
C-0806	TRAPEZOIDAL	4.00	44.00	2.11	19.00	1	409.33
C-0807	TRAPEZOIDAL	4.00	44.00	2.11	19.00	1	331.20
C-0808	TRAPEZOIDAL	4.00	44.00	2.11	19.00	1	469.27
C-0809	CIRCULAR	3.50	9.62	0.88	3.50	1	410.30
C-0810	CIRCULAR	3.50	9.62	0.88	3.50	1	279.98
C-0811	CIRCULAR	3.50	9.62	0.88	3.50	1	242.31
C-0812	CIRCULAR	4.00	12.57	1.00	4.00	1	366.81
C-0813	CIRCULAR	4.00	12.57	1.00	4.00	1	341.39
C-0814	CIRCULAR	4.00	12.57	1.00	4.00	1	374.37
C-0901	RECT_CLOSED	3.00	9.00	0.75	3.00	1	82.01
C-1001	RECT_CLOSED	3.00	9.00	0.75	3.00	1	98.07
Coff-D1	CIRCULAR	2.50	4.91	0.63	2.50	5	44.85
Coff-D2	CIRCULAR	3.50	9.62	0.88	3.50	1	108.47
Coff-D3	RECT_CLOSED	4.00	32.00	1.33	8.00	1	332.66
Con-0303	RECT_CLOSED	3.00	24.00	1.09	8.00	1	205.57
Con-I1	CIRCULAR	4.33	14.75	1.08	4.33	1	317.37
Con-I2	CIRCULAR	5.00	19.63	1.25	5.00	1	257.40
Ex_Roff-B_2	XS-Roff-B_2	11.34	766.16	6.66	112.97	1	15655.66
Roff-C	XS-Roff-C	15.70	1445.69	8.69	186.34	1	30896.78
Roff-C_1	XS-Roff-C_1	19.39	1007.15	8.89	91.51	1	33004.69
Roff-C_2	XS-Roff-C_2	14.19	1217.82	9.40	129.17	1	50413.96
Roff-D1_2	XS-Roff-D1_2	18.51	2314.87	7.64	303.98	1	52360.23
Roff-D2	XS-Roff-D2	16.17	4216.24	10.13	400.30	1	111860.16
Ron-I1	XS-Ron-I1	29.35	2288.81	15.26	137.36	1	102369.82

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Transect Summary
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Transect XS-Roff-B_2
Area:
            0.0009     0.0031     0.0064     0.0107     0.0159
            0.0220     0.0291     0.0370     0.0458     0.0553
            0.0658     0.0770     0.0889     0.1015     0.1147
            0.1287     0.1438     0.1598     0.1763     0.1936
            0.2116     0.2305     0.2503     0.2711     0.2926
            0.3149     0.3382     0.3622     0.3869     0.4126
            0.4388     0.4654     0.4922     0.5193     0.5467
            0.5744     0.6024     0.6307     0.6594     0.6885
            0.7178     0.7476     0.7777     0.8081     0.8389
            0.8701     0.9019     0.9340     0.9667     1.0000
Hrad:
            0.0203     0.0381     0.0562     0.0758     0.0959
            0.1130     0.1303     0.1476     0.1692     0.1856
            0.2040     0.2223     0.2427     0.2650     0.2836
            0.2972     0.3092     0.3282     0.3500     0.3688
            0.3826     0.3984     0.4139     0.4295     0.4464
            0.4637     0.4778     0.4986     0.5148     0.5310
            0.5558     0.5835     0.6118     0.6386     0.6634
            0.6890     0.7175     0.7409     0.7625     0.7887
            0.8133     0.8349     0.8591     0.8829     0.9059
            0.9232     0.9455     0.9653     0.9785     1.0000
Width:
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            0.0471     0.0830     0.1150     0.1427     0.1671
            0.1962     0.2242     0.2522     0.2718     0.2995
            0.3235     0.3476     0.3676     0.3840     0.4051
            0.4338     0.4660     0.4877     0.5044     0.5253
            0.5535     0.5792     0.6055     0.6317     0.6561
            0.6799     0.7086     0.7269     0.7522     0.7778
            0.7904     0.7983     0.8051     0.8135     0.8244
            0.8340     0.8397     0.8512     0.8648     0.8728
            0.8825     0.8952     0.9050     0.9150     0.9257
            0.9423     0.9536     0.9673     0.9880     1.0000

Transect XS-Roff-B-1
Area:
            0.0014     0.0055     0.0109     0.0170     0.0238
            0.0312     0.0392     0.0476     0.0564     0.0659
            0.0760     0.0865     0.0975     0.1090     0.1209
            0.1332     0.1459     0.1590     0.1726     0.1867
            0.2011     0.2159     0.2311     0.2470     0.2635
            0.2805     0.2981     0.3162     0.3350     0.3543
            0.3740     0.3942     0.4157     0.4383     0.4620
            0.4872     0.5150     0.5455     0.5802     0.6168
            0.6541     0.6915     0.7290     0.7669     0.8050
            0.8435     0.8823     0.9212     0.9604     1.0000
Hrad:
            0.0200     0.0445     0.0776     0.1061     0.1348
            0.1635     0.1941     0.2246     0.2509     0.2699
            0.2973     0.3275     0.3524     0.3739     0.4037
            0.4311     0.4562     0.4835     0.5032     0.5294
            0.5562     0.5811     0.6016     0.6155     0.6332
            0.6552     0.6756     0.6914     0.7085     0.7342
            0.7593     0.7685     0.7720     0.7924     0.8076
            0.8143     0.7923     0.7492     0.7114     0.6662
            0.7038     0.7413     0.7775     0.8094     0.8420
            0.8744     0.9093     0.9441     0.9763     1.0000
Width:
            0.0767     0.1258     0.1419     0.1622     0.1786
            0.1934     0.2045     0.2144     0.2275     0.2470
            0.2587     0.2673     0.2797     0.2948     0.3029
            0.3124     0.3233     0.3324     0.3466     0.3562
            0.3652     0.3752     0.3880     0.4053     0.4203
            0.4325     0.4457     0.4620     0.4776     0.4875
            0.4975     0.5208     0.5542     0.5768     0.6074
            0.6554     0.7228     0.8286     0.8965     0.9314
            0.9342     0.9371     0.9413     0.9506     0.9587
            0.9667     0.9718     0.9766     0.9841     1.0000

Transect XS-Roff-C
Area:
            0.0006     0.0016     0.0031     0.0050     0.0074
            0.0110     0.0155     0.0207     0.0268     0.0339
            0.0417     0.0501     0.0590     0.0687     0.0796
            0.0914     0.1039     0.1170     0.1308     0.1453
            0.1605     0.1762     0.1926     0.2096     0.2274
            0.2459     0.2666     0.2901     0.3141     0.3387
            0.3642     0.3908     0.4183     0.4465     0.4754
            0.5053     0.5361     0.5676     0.5995     0.6322
            0.6656     0.6998     0.7350     0.7708     0.8072
            0.8440     0.8817     0.9205     0.9599     1.0000
Hrad:
            0.0246     0.0453     0.0637     0.0817     0.0893
            0.0928     0.1136     0.1265     0.1428     0.1593
            0.1808     0.2030     0.2227     0.2382     0.2444
            0.2645     0.2853     0.3081     0.3249     0.3454
            0.3647     0.3857     0.4066     0.4234     0.4419
            0.4592     0.4809     0.4996     0.5175     0.5374
            0.5472     0.5631     0.5838     0.6097     0.6344
            0.6465     0.6718     0.7029     0.7308     0.7557
            0.7782     0.8023     0.8224     0.8532     0.8812
            0.9132     0.9250     0.9490     0.9751     1.0000
Width:
            0.0208     0.0311     0.0417     0.0523     0.0714
            0.1028     0.1179     0.1418     0.1630     0.1849
            0.2004     0.2143     0.2304     0.2508     0.2834
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            0.3009     0.3172     0.3306     0.3503     0.3661
            0.3826     0.3973     0.4118     0.4305     0.4473
            0.4716     0.5742     0.5856     0.6012     0.6170
            0.6455     0.6697     0.6901     0.7053     0.7223
            0.7543     0.7720     0.7831     0.7977     0.8158
            0.8365     0.8555     0.8793     0.8908     0.9055
            0.9153     0.9472     0.9661     0.9825     1.0000

Transect XS-Roff-C_1
Area:
            0.0014     0.0045     0.0102     0.0201     0.0327
            0.0456     0.0589     0.0725     0.0863     0.1005
            0.1149     0.1295     0.1445     0.1598     0.1754
            0.1913     0.2074     0.2239     0.2407     0.2578
            0.2752     0.2929     0.3110     0.3295     0.3482
            0.3674     0.3869     0.4067     0.4270     0.4478
            0.4691     0.4910     0.5135     0.5367     0.5607
            0.5853     0.6104     0.6363     0.6627     0.6897
            0.7172     0.7455     0.7745     0.8042     0.8348
            0.8664     0.8987     0.9318     0.9655     1.0000
Hrad:
            0.0275     0.0428     0.0607     0.0697     0.1085
            0.1461     0.1812     0.2159     0.2494     0.2816
            0.3129     0.3427     0.3712     0.3984     0.4251
            0.4520     0.4778     0.5028     0.5275     0.5507
            0.5735     0.5951     0.6166     0.6388     0.6610
            0.6789     0.6994     0.7185     0.7367     0.7503
            0.7647     0.7786     0.7897     0.7982     0.8139
            0.8273     0.8403     0.8542     0.8689     0.8855
            0.9031     0.9113     0.9255     0.9363     0.9406
            0.9520     0.9645     0.9807     0.9957     1.0000
Width:
            0.0600     0.1287     0.2046     0.3510     0.3630
            0.3711     0.3816     0.3894     0.3970     0.4047
            0.4121     0.4201     0.4289     0.4383     0.4472
            0.4551     0.4633     0.4719     0.4801     0.4895
            0.4988     0.5090     0.5190     0.5278     0.5361
            0.5488     0.5584     0.5694     0.5810     0.5974
            0.6131     0.6295     0.6490     0.6717     0.6872
            0.7052     0.7240     0.7419     0.7591     0.7743
            0.7882     0.8130     0.8314     0.8539     0.8847
            0.9078     0.9300     0.9478     0.9672     1.0000

Transect XS-Roff-C_2
Area:
            0.0004     0.0012     0.0025     0.0043     0.0064
            0.0093     0.0133     0.0187     0.0253     0.0330
            0.0430     0.0542     0.0662     0.0793     0.0948
            0.1127     0.1313     0.1506     0.1703     0.1909
            0.2135     0.2367     0.2602     0.2841     0.3085
            0.3332     0.3583     0.3838     0.4098     0.4361
            0.4626     0.4894     0.5163     0.5434     0.5707
            0.5981     0.6257     0.6534     0.6813     0.7094
            0.7376     0.7660     0.7946     0.8233     0.8523
            0.8815     0.9109     0.9404     0.9701     1.0000
Hrad:
            0.0172     0.0333     0.0486     0.0637     0.0758
            0.0791     0.0848     0.0901     0.1050     0.1202
            0.1337     0.1553     0.1731     0.1903     0.1804
            0.2041     0.2281     0.2545     0.2809     0.2878
            0.3061     0.3312     0.3559     0.3816     0.4050
            0.4289     0.4533     0.4739     0.4976     0.5226
            0.5481     0.5734     0.5979     0.6239     0.6495
            0.6748     0.7005     0.7254     0.7492     0.7738
            0.7980     0.8216     0.8446     0.8680     0.8907
            0.9117     0.9351     0.9590     0.9825     1.0000
Width:
            0.0215     0.0359     0.0505     0.0641     0.0814
            0.1136     0.1523     0.2033     0.2361     0.2809
            0.3613     0.3828     0.4163     0.4543     0.5769
            0.6067     0.6322     0.6480     0.6615     0.7279
            0.7610     0.7756     0.7898     0.8006     0.8157
            0.8288     0.8398     0.8579     0.8693     0.8775
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            0.8845     0.8911     0.8987     0.9036     0.9086
            0.9138     0.9182     0.9233     0.9299     0.9350
            0.9405     0.9466     0.9531     0.9591     0.9655
            0.9739     0.9793     0.9839     0.9887     1.0000

Transect XS-Roff-D1_1
Area:
            0.0014     0.0040     0.0074     0.0114     0.0159
            0.0208     0.0262     0.0321     0.0384     0.0450
            0.0520     0.0595     0.0673     0.0756     0.0844
            0.0936     0.1032     0.1133     0.1239     0.1349
            0.1466     0.1601     0.1765     0.1942     0.2141
            0.2359     0.2600     0.2854     0.3141     0.3435
            0.3732     0.4032     0.4335     0.4640     0.4948
            0.5257     0.5569     0.5882     0.6198     0.6517
            0.6838     0.7161     0.7486     0.7815     0.8149
            0.8489     0.8835     0.9190     0.9578     1.0000
Hrad:
            0.0263     0.0533     0.0805     0.1081     0.1343
            0.1619     0.1863     0.2113     0.2376     0.2626
            0.2862     0.3092     0.3305     0.3515     0.3717
            0.3923     0.4136     0.4343     0.4552     0.4701
            0.4763     0.4734     0.4780     0.4899     0.4923
            0.4860     0.4818     0.4930     0.4244     0.4581
            0.4914     0.5249     0.5581     0.5920     0.6255
            0.6589     0.6923     0.7253     0.7564     0.7874
            0.8191     0.8505     0.8795     0.9059     0.9277
            0.9480     0.9670     0.9869     1.0049     1.0000
Width:
            0.0490     0.0695     0.0853     0.0974     0.1093
            0.1187     0.1296     0.1395     0.1479     0.1566
            0.1659     0.1752     0.1854     0.1957     0.2063
            0.2168     0.2267     0.2368     0.2469     0.2603
            0.2795     0.3575     0.3919     0.4270     0.4844
            0.5244     0.5681     0.6125     0.6708     0.6782
            0.6855     0.6920     0.6983     0.7034     0.7083
            0.7130     0.7174     0.7218     0.7280     0.7340
            0.7390     0.7440     0.7510     0.7601     0.7733
            0.7877     0.8032     0.8427     0.9381     1.0000

Transect XS-Roff-D1_2
Area:
            0.0007     0.0023     0.0044     0.0071     0.0102
            0.0137     0.0177     0.0223     0.0274     0.0331
            0.0394     0.0461     0.0535     0.0617     0.0708
            0.0815     0.0948     0.1086     0.1226     0.1371
            0.1525     0.1691     0.1865     0.2050     0.2241
            0.2441     0.2648     0.2866     0.3092     0.3328
            0.3574     0.3828     0.4094     0.4369     0.4651
            0.4941     0.5239     0.5542     0.5859     0.6182
            0.6514     0.6852     0.7200     0.7562     0.7932
            0.8310     0.8705     0.9112     0.9536     1.0000
Hrad:
            0.0299     0.0595     0.0855     0.1151     0.1444
            0.1749     0.1993     0.2141     0.2378     0.2609
            0.2876     0.3067     0.3249     0.3403     0.3378
            0.3149     0.3261     0.3683     0.4052     0.4364
            0.4403     0.4666     0.4778     0.5095     0.5291
            0.5608     0.5764     0.5938     0.6192     0.6366
            0.6562     0.6769     0.6973     0.7195     0.7518
            0.7732     0.8004     0.8328     0.8414     0.8680
            0.8908     0.9146     0.9374     0.9414     0.9725
            0.9953     1.0004     1.0030     1.0217     1.0000
Width:
            0.0243     0.0372     0.0501     0.0599     0.0688
            0.0762     0.0860     0.1009     0.1118     0.1231
            0.1325     0.1456     0.1595     0.1758     0.2038
            0.2524     0.2832     0.2859     0.2923     0.3024
            0.3331     0.3477     0.3742     0.3848     0.4048
            0.4149     0.4377     0.4594     0.4748     0.4969
            0.5173     0.5367     0.5568     0.5755     0.5855
            0.6045     0.6186     0.6434     0.6575     0.6719
            0.6894     0.7061     0.7236     0.7571     0.7681
```

```
            0.7951     0.8197     0.8564     0.8825     1.0000

Transect XS-Roff-D1_3
Area:
            0.0018     0.0049     0.0091     0.0155     0.0240
            0.0338     0.0448     0.0569     0.0704     0.0840
            0.0979     0.1119     0.1263     0.1410     0.1559
            0.1711     0.1869     0.2033     0.2204     0.2388
            0.2582     0.2790     0.3003     0.3221     0.3442
            0.3666     0.3892     0.4121     0.4353     0.4588
            0.4827     0.5072     0.5319     0.5570     0.5824
            0.6080     0.6339     0.6601     0.6865     0.7130
            0.7397     0.7667     0.7942     0.8226     0.8515
            0.8805     0.9099     0.9397     0.9696     1.0000
Hrad:
            0.0199     0.0430     0.0511     0.0667     0.0803
            0.0999     0.1188     0.1392     0.1587     0.1874
            0.2146     0.2408     0.2663     0.2914     0.3163
            0.3392     0.3539     0.3739     0.3783     0.3897
            0.3886     0.4057     0.4251     0.4492     0.4738
            0.4986     0.5228     0.5480     0.5713     0.5910
            0.6111     0.6295     0.6532     0.6751     0.6988
            0.7218     0.7444     0.7690     0.7938     0.8184
            0.8428     0.8644     0.8685     0.8769     0.8998
            0.9213     0.9408     0.9625     0.9833     1.0000
Width:
            0.0891     0.1139     0.1788     0.2326     0.2992
            0.3383     0.3772     0.4188     0.4439     0.4486
            0.4562     0.4651     0.4743     0.4838     0.4929
            0.5045     0.5282     0.5437     0.5829     0.6132
            0.6649     0.6881     0.7070     0.7176     0.7269
            0.7356     0.7450     0.7525     0.7622     0.7767
            0.7903     0.8061     0.8148     0.8255     0.8338
            0.8426     0.8519     0.8586     0.8649     0.8714
            0.8777     0.8870     0.9145     0.9382     0.9464
            0.9558     0.9672     0.9762     0.9861     1.0000

Transect XS-Roff-D2
Area:
            0.0003     0.0009     0.0016     0.0024     0.0032
            0.0041     0.0051     0.0061     0.0090     0.0147
            0.0235     0.0345     0.0478     0.0636     0.0817
            0.1008     0.1214     0.1431     0.1650     0.1874
            0.2102     0.2336     0.2574     0.2815     0.3061
            0.3308     0.3561     0.3817     0.4075     0.4337
            0.4601     0.4866     0.5133     0.5401     0.5673
            0.5946     0.6221     0.6497     0.6776     0.7059
            0.7344     0.7632     0.7923     0.8216     0.8510
            0.8805     0.9102     0.9399     0.9697     1.0000
Hrad:
            0.0192     0.0448     0.0675     0.0894     0.1096
            0.1289     0.1472     0.1636     0.1398     0.1180
            0.1108     0.1110     0.1190     0.1159     0.1381
            0.1600     0.1782     0.2067     0.2336     0.2617
            0.2851     0.3097     0.3369     0.3616     0.3885
            0.4151     0.4350     0.4629     0.4902     0.5128
            0.5407     0.5684     0.5958     0.6211     0.6463
            0.6727     0.6985     0.7244     0.7461     0.7672
            0.7913     0.8126     0.8380     0.8625     0.8890
            0.9166     0.9437     0.9709     0.9924     1.0000
Width:
            0.0178     0.0209     0.0238     0.0260     0.0282
            0.0303     0.0324     0.0455     0.1422     0.2341
            0.3138     0.4022     0.4767     0.5652     0.6050
            0.6452     0.6986     0.7089     0.7229     0.7318
            0.7530     0.7698     0.7788     0.7931     0.8019
            0.8106     0.8321     0.8375     0.8435     0.8575
            0.8621     0.8666     0.8712     0.8789     0.8864
            0.8918     0.8980     0.9036     0.9145     0.9261
            0.9335     0.9442     0.9498     0.9562     0.9602
            0.9628     0.9658     0.9686     0.9771     1.0000

Transect XS-Ron-G2
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```
Area:
            0.0009     0.0027     0.0052     0.0084     0.0123
            0.0167     0.0216     0.0269     0.0331     0.0401
            0.0478     0.0560     0.0651     0.0751     0.0858
            0.0976     0.1106     0.1250     0.1404     0.1568
            0.1744     0.1929     0.2121     0.2319     0.2524
            0.2735     0.2953     0.3176     0.3407     0.3645
            0.3891     0.4146     0.4413     0.4687     0.4965
            0.5248     0.5535     0.5827     0.6123     0.6425
            0.6733     0.7052     0.7378     0.7718     0.8071
            0.8435     0.8808     0.9193     0.9584     1.0000
Hrad:
            0.0247     0.0505     0.0744     0.0950     0.1199
            0.1460     0.1708     0.1901     0.2000     0.2197
            0.2419     0.2626     0.2742     0.2931     0.3086
            0.3171     0.3294     0.3374     0.3584     0.3742
            0.3902     0.4152     0.4427     0.4663     0.4907
            0.5159     0.5413     0.5661     0.5884     0.6093
            0.6278     0.6477     0.6573     0.6861     0.7147
            0.7432     0.7713     0.7986     0.8244     0.8499
            0.8653     0.8806     0.8867     0.9029     0.9060
            0.9254     0.9281     0.9581     0.9819     1.0000
Width:
            0.0326     0.0495     0.0645     0.0817     0.0946
            0.1049     0.1152     0.1290     0.1511     0.1668
            0.1802     0.1945     0.2169     0.2340     0.2543
            0.2819     0.3080     0.3403     0.3600     0.3853
            0.4113     0.4275     0.4404     0.4570     0.4724
            0.4868     0.5005     0.5147     0.5309     0.5485
            0.5684     0.5870     0.6160     0.6262     0.6363
            0.6464     0.6564     0.6670     0.6787     0.6905
            0.7107     0.7316     0.7606     0.7815     0.8150
            0.8340     0.8690     0.8786     0.8941     1.0000

Transect XS-Ron-H1
Area:
            0.0027     0.0093     0.0170     0.0254     0.0345
            0.0439     0.0537     0.0639     0.0744     0.0852
            0.0963     0.1077     0.1195     0.1318     0.1445
            0.1578     0.1717     0.1863     0.2016     0.2179
            0.2352     0.2538     0.2735     0.2941     0.3155
            0.3376     0.3605     0.3838     0.4075     0.4317
            0.4562     0.4809     0.5060     0.5314     0.5572
            0.5835     0.6102     0.6375     0.6653     0.6936
            0.7223     0.7515     0.7812     0.8112     0.8416
            0.8725     0.9038     0.9353     0.9672     1.0000
Hrad:
            0.0239     0.0479     0.0782     0.1077     0.1371
            0.1671     0.1959     0.2239     0.2520     0.2793
            0.3053     0.3300     0.3524     0.3730     0.3926
            0.4092     0.4260     0.4401     0.4527     0.4596
            0.4659     0.4725     0.4832     0.4996     0.5171
            0.5336     0.5559     0.5788     0.6010     0.6232
            0.6487     0.6738     0.6978     0.7171     0.7370
            0.7575     0.7757     0.7923     0.8075     0.8276
            0.8475     0.8649     0.8840     0.9046     0.9240
            0.9418     0.9625     0.9839     0.9999     1.0000
Width:
            0.1462     0.2175     0.2428     0.2624     0.2784
            0.2893     0.3002     0.3106     0.3194     0.3281
            0.3375     0.3478     0.3603     0.3747     0.3898
            0.4084     0.4269     0.4486     0.4727     0.5042
            0.5383     0.5740     0.6056     0.6304     0.6535
            0.6783     0.6927     0.7053     0.7183     0.7309
            0.7387     0.7465     0.7551     0.7693     0.7824
            0.7946     0.8093     0.8258     0.8438     0.8560
            0.8681     0.8831     0.8959     0.9067     0.9188
            0.9325     0.9427     0.9518     0.9667     1.0000

Transect XS-Ron-H2
Area:
            0.0006     0.0019     0.0037     0.0061     0.0091
            0.0130     0.0204     0.0344     0.0490     0.0641
```

```
            0.0795     0.0952     0.1113     0.1279     0.1448
            0.1621     0.1797     0.1977     0.2163     0.2351
            0.2543     0.2740     0.2941     0.3146     0.3355
            0.3568     0.3786     0.4008     0.4234     0.4466
            0.4703     0.4944     0.5191     0.5443     0.5699
            0.5960     0.6223     0.6490     0.6761     0.7034
            0.7312     0.7594     0.7881     0.8172     0.8467
            0.8765     0.9066     0.9372     0.9684     1.0000
Hrad:
            0.0165     0.0328     0.0470     0.0585     0.0714
            0.0790     0.0712     0.0977     0.1354     0.1742
            0.2143     0.2521     0.2874     0.3215     0.3544
            0.3858     0.4156     0.4428     0.4697     0.4975
            0.5213     0.5450     0.5672     0.5900     0.6108
            0.6319     0.6513     0.6706     0.6895     0.7054
            0.7217     0.7382     0.7535     0.7694     0.7861
            0.8037     0.8217     0.8381     0.8554     0.8709
            0.8865     0.9002     0.9143     0.9291     0.9452
            0.9604     0.9742     0.9864     0.9981     1.0000
Width:
            0.0313     0.0483     0.0638     0.0844     0.1033
            0.1354     0.4185     0.4417     0.4579     0.4735
            0.4814     0.4919     0.5050     0.5170     0.5280
            0.5394     0.5509     0.5654     0.5781     0.5867
            0.6012     0.6142     0.6282     0.6399     0.6538
            0.6660     0.6801     0.6933     0.7062     0.7236
            0.7396     0.7547     0.7711     0.7859     0.7990
            0.8097     0.8193     0.8312     0.8410     0.8532
            0.8651     0.8797     0.8933     0.9056     0.9154
            0.9262     0.9392     0.9544     0.9702     1.0000

Transect XS-Ron-H3
Area:
            0.0013     0.0035     0.0064     0.0100     0.0151
            0.0209     0.0270     0.0335     0.0405     0.0478
            0.0554     0.0634     0.0718     0.0807     0.0900
            0.0996     0.1096     0.1199     0.1305     0.1416
            0.1532     0.1652     0.1775     0.1908     0.2095
            0.2304     0.2527     0.2767     0.3010     0.3257
            0.3536     0.3839     0.4146     0.4460     0.4778
            0.5100     0.5430     0.5764     0.6101     0.6441
            0.6783     0.7129     0.7477     0.7830     0.8186
            0.8545     0.8906     0.9268     0.9633     1.0000
Hrad:
            0.0219     0.0425     0.0617     0.0812     0.0858
            0.1094     0.1339     0.1557     0.1774     0.1992
            0.2204     0.2388     0.2547     0.2747     0.2945
            0.3130     0.3323     0.3518     0.3692     0.3822
            0.3989     0.4164     0.4315     0.4411     0.4416
            0.4409     0.4310     0.4363     0.4619     0.4848
            0.4323     0.4626     0.4919     0.5206     0.5536
            0.5817     0.6070     0.6400     0.6727     0.7040
            0.7357     0.7676     0.7955     0.8251     0.8554
            0.8859     0.9169     0.9487     0.9797     1.0000
Width:
            0.0491     0.0695     0.0884     0.1043     0.1490
            0.1613     0.1700     0.1811     0.1912     0.2004
            0.2094     0.2210     0.2348     0.2442     0.2534
            0.2636     0.2726     0.2813     0.2914     0.3055
            0.3164     0.3264     0.3385     0.4119     0.5406
            0.5812     0.6304     0.6474     0.6585     0.6841
            0.8063     0.8200     0.8350     0.8510     0.8594
            0.8752     0.8950     0.9022     0.9093     0.9180
            0.9255     0.9324     0.9439     0.9530     0.9607
            0.9676     0.9735     0.9780     0.9831     1.0000

Transect XS-Ron-H4
Area:
            0.0005     0.0017     0.0037     0.0065     0.0104
            0.0151     0.0208     0.0312     0.0453     0.0616
            0.0780     0.0946     0.1113     0.1281     0.1451
            0.1622     0.1793     0.1966     0.2140     0.2316
            0.2494     0.2674     0.2856     0.3041     0.3229
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            0.3432     0.3653     0.3879     0.4108     0.4341
            0.4577     0.4820     0.5070     0.5326     0.5586
            0.5848     0.6113     0.6381     0.6653     0.6931
            0.7214     0.7504     0.7803     0.8106     0.8413
            0.8722     0.9034     0.9350     0.9671     1.0000
Hrad:
            0.0157     0.0294     0.0402     0.0519     0.0644
            0.0782     0.0772     0.0662     0.0763     0.1003
            0.1255     0.1503     0.1747     0.1986     0.2224
            0.2462     0.2697     0.2926     0.3143     0.3354
            0.3559     0.3764     0.3962     0.4141     0.4315
            0.4480     0.4686     0.4899     0.5117     0.5341
            0.5559     0.5776     0.5987     0.6213     0.6451
            0.6693     0.6938     0.7190     0.7406     0.7644
            0.7861     0.8060     0.8286     0.8541     0.8805
            0.9073     0.9342     0.9599     0.9797     1.0000
Width:
            0.0267     0.0459     0.0722     0.1003     0.1282
            0.1532     0.2154     0.3770     0.4756     0.4903
            0.4942     0.4981     0.5023     0.5067     0.5104
            0.5132     0.5160     0.5193     0.5245     0.5302
            0.5365     0.5421     0.5486     0.5574     0.5841
            0.6407     0.6700     0.6816     0.6929     0.7014
            0.7180     0.7365     0.7597     0.7739     0.7824
            0.7906     0.7989     0.8059     0.8256     0.8385
            0.8585     0.8842     0.9029     0.9139     0.9228
            0.9313     0.9401     0.9518     0.9761     1.0000

Transect XS-Ron-I1
Area:
            0.0018     0.0045     0.0076     0.0116     0.0162
            0.0216     0.0278     0.0347     0.0424     0.0510
            0.0609     0.0714     0.0825     0.0948     0.1084
            0.1228     0.1378     0.1535     0.1698     0.1866
            0.2042     0.2225     0.2415     0.2612     0.2814
            0.3023     0.3240     0.3464     0.3695     0.3934
            0.4179     0.4431     0.4689     0.4954     0.5224
            0.5500     0.5783     0.6072     0.6367     0.6668
            0.6976     0.7290     0.7610     0.7939     0.8275
            0.8614     0.8956     0.9301     0.9649     1.0000
Hrad:
            0.0287     0.0566     0.0786     0.0974     0.1172
            0.1328     0.1517     0.1710     0.1885     0.1958
            0.2146     0.2362     0.2553     0.2609     0.2778
            0.3001     0.3214     0.3426     0.3666     0.3867
            0.4051     0.4257     0.4445     0.4654     0.4875
            0.5042     0.5214     0.5395     0.5573     0.5762
            0.5965     0.6167     0.6352     0.6550     0.6758
            0.6966     0.7142     0.7335     0.7534     0.7723
            0.7906     0.8107     0.8264     0.8410     0.8651
            0.8922     0.9201     0.9458     0.9717     1.0000
Width:
            0.0680     0.0818     0.1001     0.1217     0.1406
            0.1659     0.1868     0.2065     0.2284     0.2661
            0.2890     0.3070     0.3281     0.3707     0.3983
            0.4167     0.4364     0.4554     0.4694     0.4886
            0.5104     0.5287     0.5493     0.5667     0.5818
            0.6044     0.6266     0.6471     0.6682     0.6878
            0.7052     0.7226     0.7423     0.7600     0.7760
            0.7918     0.8119     0.8296     0.8463     0.8643
            0.8830     0.8991     0.9209     0.9453     0.9582
            0.9668     0.9742     0.9841     0.9937     1.0000

Transect XS-Ron-I2
Area:
            0.0019     0.0046     0.0079     0.0120     0.0172
            0.0230     0.0296     0.0367     0.0445     0.0527
            0.0616     0.0717     0.0876     0.1048     0.1226
            0.1409     0.1598     0.1793     0.1995     0.2203
            0.2414     0.2628     0.2845     0.3066     0.3290
            0.3518     0.3749     0.3984     0.4221     0.4463
            0.4708     0.4957     0.5209     0.5465     0.5725
            0.5988     0.6254     0.6524     0.6797     0.7073
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            0.7352     0.7634     0.7919     0.8207     0.8498
            0.8792     0.9089     0.9390     0.9693     1.0000
Hrad:
            0.0174     0.0310     0.0431     0.0513     0.0621
            0.0740     0.0857     0.0973     0.1091     0.1207
            0.1316     0.1408     0.1441     0.1596     0.1781
            0.1998     0.2213     0.2426     0.2631     0.2883
            0.3146     0.3403     0.3656     0.3913     0.4168
            0.4427     0.4681     0.4932     0.5184     0.5428
            0.5665     0.5910     0.6152     0.6384     0.6621
            0.6859     0.7091     0.7321     0.7558     0.7796
            0.8027     0.8252     0.8479     0.8705     0.8930
            0.9146     0.9365     0.9583     0.9789     1.0000
Width:
            0.0742     0.0967     0.1193     0.1521     0.1790
            0.2009     0.2214     0.2415     0.2596     0.2768
            0.2957     0.3959     0.5477     0.5665     0.5875
            0.6024     0.6214     0.6423     0.6677     0.6785
            0.6876     0.6985     0.7104     0.7215     0.7329
            0.7432     0.7542     0.7655     0.7761     0.7880
            0.8011     0.8120     0.8229     0.8358     0.8469
            0.8575     0.8688     0.8802     0.8898     0.8985
            0.9084     0.9189     0.9286     0.9383     0.9477
            0.9584     0.9684     0.9782     0.9896     1.0000

Transect XS-Ron-J
Area:
            0.0020     0.0065     0.0130     0.0203     0.0282
            0.0365     0.0452     0.0544     0.0640     0.0739
            0.0846     0.0975     0.1139     0.1313     0.1496
            0.1692     0.1890     0.2088     0.2288     0.2489
            0.2691     0.2893     0.3098     0.3305     0.3515
            0.3727     0.3942     0.4160     0.4381     0.4603
            0.4826     0.5052     0.5281     0.5516     0.5758
            0.6004     0.6256     0.6510     0.6769     0.7032
            0.7300     0.7573     0.7853     0.8141     0.8436
            0.8737     0.9043     0.9353     0.9668     1.0000
Hrad:
            0.0249     0.0466     0.0742     0.1053     0.1349
            0.1627     0.1887     0.2142     0.2382     0.2593
            0.2753     0.2282     0.2459     0.2707     0.2890
            0.3134     0.3463     0.3786     0.4104     0.4418
            0.4727     0.5031     0.5314     0.5592     0.5867
            0.6134     0.6387     0.6644     0.6924     0.7200
            0.7468     0.7731     0.7947     0.8056     0.8239
            0.8427     0.8648     0.8880     0.9089     0.9282
            0.9486     0.9596     0.9758     0.9883     1.0009
            1.0211     1.0408     1.0632     1.0854     1.0000
Width:
            0.0882     0.1577     0.1953     0.2117     0.2251
            0.2373     0.2495     0.2601     0.2715     0.2853
            0.3055     0.4377     0.4742     0.4940     0.5267
            0.5481     0.5511     0.5540     0.5569     0.5599
            0.5629     0.5658     0.5725     0.5794     0.5863
            0.5940     0.6030     0.6111     0.6156     0.6200
            0.6255     0.6310     0.6421     0.6643     0.6792
            0.6936     0.7042     0.7137     0.7254     0.7388
            0.7510     0.7724     0.7893     0.8100     0.8310
            0.8442     0.8581     0.8690     0.8799     1.0000


************************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
************************************************************

***************
Analysis Options
***************
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
```

```
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 11/11/2019 00:00:00
Ending Date .............. 11/12/2019 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.005000 ft
```

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	116.836	38.073
External Outflow	109.791	35.777
Flooding Loss	0.098	0.032
Evaporation Loss	0.000	0.000
Exfiltration Loss	1.084	0.353
Initial Stored Volume ..	0.000	0.000
Final Stored Volume	5.812	1.894
Continuity Error (%) ...	0.044	

```
Time-Step Critical Elements
Link C-0810 (2.09%)
```

```
Highest Flow Instability Indexes
All links are stable.
```

```
Routing Time Step Summary
Minimum Time Step           :     0.26 sec
Average Time Step           :     0.99 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.01
Percent Not Converging      :     0.08
```

```
Node Depth Summary
```

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
J-0301	JUNCTION	0.83	3.36	4546.86	0 12:42	3.36
J-0302	JUNCTION	0.69	2.90	4585.40	0 12:41	2.90
J-0303	JUNCTION	0.71	3.04	4622.04	0 12:42	3.04
J-0402	JUNCTION	0.66	6.34	4654.34	0 12:24	6.34
J-0403	JUNCTION	0.87	8.00	4675.00	0 12:14	7.80

J-0407	JUNCTION	0.55	1.62	4700.12	0	12:13	1.61
J-0411	JUNCTION	0.55	1.52	4727.52	0	13:08	1.52
J-0414	JUNCTION	0.40	2.90	4760.90	0	12:16	2.90
J-0415	JUNCTION	0.43	3.42	4768.92	0	12:15	3.42
J-0416	JUNCTION	0.44	3.21	4774.71	0	12:16	3.21
J-0417	JUNCTION	0.55	7.06	4784.06	0	12:16	7.06
J-0418	JUNCTION	0.31	5.62	4789.62	0	12:14	5.60
J-0419	JUNCTION	0.12	3.96	4791.96	0	12:19	3.96
J-0501	JUNCTION	0.18	1.50	4781.00	0	12:10	1.50
J-0601	JUNCTION	0.68	8.66	4805.66	0	12:33	8.66
J-0605	JUNCTION	0.21	1.87	4895.37	0	12:10	1.87
J-0806	JUNCTION	0.35	2.53	4800.53	0	12:15	2.53
J-0807	JUNCTION	0.39	2.88	4816.88	0	12:11	2.88
J-0808	JUNCTION	0.32	2.70	4818.70	0	12:10	2.69
J-0809	JUNCTION	0.26	2.92	4827.92	0	12:10	2.89
J-0810	JUNCTION	0.42	8.94	4844.94	0	12:10	8.80
J-0811	JUNCTION	0.45	8.89	4855.89	0	12:10	8.74
J-0812	JUNCTION	0.31	3.72	4861.72	0	12:09	3.57
J-0813	JUNCTION	0.31	3.58	4865.58	0	12:10	3.57
J-0814	JUNCTION	0.29	3.05	4870.55	0	12:10	3.05
J-0901	JUNCTION	1.52	5.11	4787.11	0	12:15	5.10
J1	JUNCTION	0.30	1.05	4873.05	0	12:34	1.05
J-1001	JUNCTION	2.01	5.22	4786.22	0	12:52	5.22
J2	JUNCTION	0.30	1.04	4858.16	0	12:34	1.04
J3	JUNCTION	0.30	1.06	4843.31	0	12:35	1.06
J4	JUNCTION	0.30	1.03	4828.41	0	12:54	1.03
J5	JUNCTION	0.17	1.43	4770.76	0	12:10	1.42
J6	JUNCTION	0.18	1.88	4761.04	0	12:11	1.88
J-Det-5-Out	JUNCTION	0.55	0.92	4780.92	0	12:52	0.92
Joff-A	JUNCTION	0.65	2.92	4721.86	0	12:42	2.92
Joff-B1	JUNCTION	0.00	0.00	4844.15	0	00:00	0.00
Joff-B2	JUNCTION	0.04	0.89	4801.69	0	12:21	0.89
Joff-C_1	JUNCTION	0.23	1.21	4696.87	0	12:42	1.21
Joff-C_1a	JUNCTION	0.27	1.42	4651.55	0	12:49	1.42
Joff-C_2	JUNCTION	0.36	2.29	4688.46	0	12:38	2.29
Joff-D1	JUNCTION	0.71	5.36	4532.64	0	12:41	5.36
Joff-D1_1	JUNCTION	0.08	0.75	4542.48	0	12:15	0.75
Joff-D2	JUNCTION	0.78	3.17	4528.67	0	12:48	3.17
J-off-D3	JUNCTION	1.61	7.30	4514.88	0	12:40	7.30
Jon-I1	JUNCTION	0.48	3.36	4658.35	0	12:40	3.36
Jon-I2	JUNCTION	0.86	12.33	4638.03	0	12:24	10.88
OFoff-D	OUTFALL	0.66	3.96	4500.96	0	13:22	3.96
OFon-D	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OFon-G	OUTFALL	0.50	0.81	4774.81	0	12:52	0.81
OFon-G2	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OFon-G3	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
Det-1	STORAGE	0.45	2.91	4876.91	0	12:33	2.91
Det-2	STORAGE	0.92	8.80	4814.80	0	12:32	8.80
Det-3	STORAGE	2.25	13.97	4751.97	0	13:08	13.97
Det-4	STORAGE	2.69	6.22	4786.22	0	12:52	6.22
Det-5	STORAGE	0.82	8.26	4628.26	0	12:42	8.26
Soff-D	STORAGE	3.13	17.50	4513.50	0	12:36	17.50

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
J-0301	JUNCTION	0.00	313.33	0 12:41	0	20.2	0.080
J-0302	JUNCTION	24.94	313.34	0 12:41	0.489	20.2	0.010
J-0303	JUNCTION	0.00	311.57	0 12:42	0	19.7	0.035
J-0402	JUNCTION	0.00	52.02	0 12:16	0	7.65	0.120
J-0403	JUNCTION	0.00	52.19	0 12:14	0	7.65	0.012
J-0407	JUNCTION	14.20	52.02	0 12:16	0.226	7.65	0.012
J-0411	JUNCTION	0.00	46.01	0 13:08	0	7.43	0.009
J-0414	JUNCTION	0.00	154.03	0 12:16	0	6.03	0.099
J-0415	JUNCTION	0.00	154.02	0 12:16	0	6.03	0.001

J-0416	JUNCTION	0.00	154.02	0	12:16	0	6.03	0.004
J-0417	JUNCTION	0.00	154.02	0	12:16	0	6.03	0.011
J-0418	JUNCTION	75.61	120.74	0	12:15	1.43	2.69	0.043
J-0419	JUNCTION	0.00	62.04	0	12:21	0	1.27	0.103
J-0501	JUNCTION	32.04	32.04	0	12:10	0.655	0.655	0.007
J-0601	JUNCTION	3.69	39.29	0	12:27	0.125	3.32	-0.478
J-0605	JUNCTION	72.91	72.91	0	12:10	1.62	1.62	0.108
J-0806	JUNCTION	0.00	141.78	0	12:12	0	2.96	0.301
J-0807	JUNCTION	0.00	143.66	0	12:10	0	2.96	-0.034
J-0808	JUNCTION	0.00	143.60	0	12:10	0	2.96	0.002
J-0809	JUNCTION	0.00	143.58	0	12:10	0	2.96	0.001
J-0810	JUNCTION	0.00	143.68	0	12:10	0	2.96	0.001
J-0811	JUNCTION	0.00	144.44	0	12:10	0	2.96	0.001
J-0812	JUNCTION	0.00	143.38	0	12:10	0	2.96	0.007
J-0813	JUNCTION	0.00	143.04	0	12:10	0	2.96	0.003
J-0814	JUNCTION	142.95	142.95	0	12:10	2.96	2.96	0.001
J-0901	JUNCTION	60.55	60.55	0	12:10	1.29	1.29	0.116
J1	JUNCTION	0.00	16.51	0	12:34	0	1.62	0.011
J-1001	JUNCTION	13.89	74.44	0	12:10	0.309	1.59	0.302
J2	JUNCTION	0.00	16.51	0	12:34	0	1.62	0.019
J3	JUNCTION	0.00	16.52	0	12:34	0	1.62	0.019
J4	JUNCTION	0.00	16.51	0	12:34	0	1.62	0.023
J5	JUNCTION	0.00	32.07	0	12:10	0	0.655	0.016
J6	JUNCTION	5.12	37.19	0	12:10	0.0694	0.725	0.147
J-Det-5-Out	JUNCTION	0.00	9.42	0	12:52	0	3.07	0.033
Joff-A	JUNCTION	219.88	219.88	0	12:40	10	10	0.149
Joff-B1	JUNCTION	0.00	0.00	0	00:00	0	0	0.000
gal								
Joff-B2	JUNCTION	62.77	62.77	0	12:20	1.27	1.27	-0.100
Joff-C_1	JUNCTION	59.32	59.32	0	12:40	2.68	2.68	-0.045
Joff-C_1a	JUNCTION	0.00	59.22	0	12:42	0	2.68	0.025
Joff-C_2	JUNCTION	56.03	239.16	0	12:35	0.885	10.9	0.001
Joff-D1	JUNCTION	0.00	320.50	0	12:39	0	20.5	0.047
Joff-D1_1	JUNCTION	18.78	18.78	0	12:15	0.352	0.352	-3.412
Joff-D2	JUNCTION	0.00	376.94	0	12:43	0	23.2	-0.287
J-off-D3	JUNCTION	320.54	646.26	0	12:35	8.73	32	0.327
Jon-I1	JUNCTION	0.00	238.43	0	12:38	0	10.9	0.064
Jon-I2	JUNCTION	40.93	260.61	0	12:36	0.987	11.9	0.102
OFoff-D	OUTFALL	0.00	624.21	0	12:38	0	31.9	0.000
OFon-D	OUTFALL	37.67	37.67	0	12:10	0.408	0.408	0.000
OFon-G	OUTFALL	21.13	28.02	0	12:15	0.299	3.36	0.000
OFon-G2	OUTFALL	5.14	5.14	0	12:10	0.0655	0.0655	0.000
OFon-G3	OUTFALL	4.29	4.29	0	12:10	0.0546	0.0546	0.000
Det-1	STORAGE	6.01	78.82	0	12:10	0.105	1.73	-0.073
Det-2	STORAGE	73.65	86.00	0	12:10	1.6	3.22	0.019
Det-3	STORAGE	35.67	224.54	0	12:12	0.794	7.54	-0.054
Det-4	STORAGE	29.04	237.62	0	12:14	0.417	4.96	0.058
Det-5	STORAGE	7.05	316.19	0	12:35	0.199	19.7	-0.019
Soff-D	STORAGE	0.00	636.89	0	12:40	0	31.9	0.001

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
J-0402	JUNCTION	0.06	0.341	1.659
J-0403	JUNCTION	0.15	2.000	0.000
J-0417	JUNCTION	0.25	1.063	0.937
J-0418	JUNCTION	0.24	2.121	0.379
J-0901	JUNCTION	5.48	2.110	0.000
J-1001	JUNCTION	9.55	2.216	6.784
Jon-I2	JUNCTION	0.54	3.997	0.000
Soff-D	STORAGE	0.81	6.500	0.000

****
Node Flooding Summary

****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CFS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 gal	Maximum Ponded Depth Feet
J-0403	0.01	1.38	0 12:14	0.000	0.000
J-0901	0.04	0.48	0 12:14	0.000	0.110
Soff-D	0.14	12.68	0 12:40	0.032	5.000

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
Det-1	14.520	10	0	3	99.095	71	0 12:33	16.79
Det-2	6.036	7	0	0	72.828	84	0 12:32	38.07
Det-3	51.056	12	0	1	360.490	83	0 13:08	46.60
Det-4	181.479	25	0	4	431.836	58	0 12:52	10.23
Det-5	3.562	6	0	0	47.459	76	0 12:42	311.69
Soff-D	0.000	0	0	0	0.000	0	0 00:00	624.21

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OFoff-D	97.81	50.97	624.21	31.883
OFon-D	7.94	10.03	37.67	0.408
OFon-G	97.72	5.44	28.02	3.363
OFon-G2	8.68	1.44	5.14	0.065
OFon-G3	8.58	1.21	4.29	0.055
System	44.15	69.08	4.29	35.774

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
C-0301	CONDUIT	313.30	0 12:42	8.43	0.51	0.87
C-0302	CONDUIT	313.33	0 12:41	10.80	0.37	0.70
C-0303	CONDUIT	311.54	0 12:42	11.51	0.51	0.75
C-0402	CONDUIT	51.94	0 12:28	17.71	0.94	1.00
C-0403	CONDUIT	52.02	0 12:16	17.73	0.93	1.00
C-0407	CONDUIT	52.19	0 12:14	20.64	0.78	0.88
C-0411	CONDUIT	46.01	0 13:08	19.80	0.72	0.69
C-0413	CONDUIT	46.01	0 13:08	14.65	1.30	1.00
C-0414	CONDUIT	154.03	0 12:16	19.85	0.44	0.70
C-0415	CONDUIT	154.03	0 12:16	17.55	0.38	0.66
C-0416	CONDUIT	154.02	0 12:16	13.85	0.45	0.83
C-0417	CONDUIT	154.02	0 12:16	16.24	0.76	0.96
C-0418	CONDUIT	120.74	0 12:15	14.35	0.61	1.00
C-0419	CONDUIT	71.89	0 12:26	10.35	0.64	1.00
C-0420	CONDUIT	62.04	0 12:21	5.35	0.06	0.36

C-0501_1	CONDUIT	32.07	0	12:10	13.03	0.71	0.73
C-0501_2	CONDUIT	32.08	0	12:10	11.80	0.71	0.82
C-0501_3	CONDUIT	36.77	0	12:12	13.71	0.82	0.81
C-0601	CONDUIT	38.97	0	12:33	12.41	1.09	1.00
C-0602	CONDUIT	37.91	0	12:32	12.07	1.64	1.00
C-0603_1	CONDUIT	16.51	0	12:34	10.33	0.79	0.85
C-0603_2	CONDUIT	16.51	0	12:34	12.60	0.72	0.70
C-0603_3	CONDUIT	16.52	0	12:34	12.52	0.72	0.70
C-0603_4	CONDUIT	16.51	0	12:34	12.97	0.72	0.68
C-0603_5	CONDUIT	16.52	0	12:35	12.99	0.72	0.83
C-0605	CONDUIT	72.81	0	12:10	21.86	0.56	0.64
C-0805	CONDUIT	9.42	0	12:52	8.88	0.57	0.58
C-0806	CONDUIT	138.27	0	12:15	6.92	0.34	0.62
C-0807	CONDUIT	141.78	0	12:12	6.41	0.43	0.67
C-0808	CONDUIT	143.66	0	12:10	6.06	0.31	0.69
C-0809	CONDUIT	143.60	0	12:10	19.06	0.35	0.73
C-0810	CONDUIT	143.58	0	12:10	18.46	0.51	0.75
C-0811	CONDUIT	143.68	0	12:10	17.91	0.59	0.78
C-0812	CONDUIT	144.44	0	12:10	15.35	0.39	0.73
C-0813	CONDUIT	143.38	0	12:10	12.32	0.42	0.90
C-0814	CONDUIT	143.04	0	12:10	12.94	0.38	0.83
C-0901	CONDUIT	60.55	0	12:10	6.73	0.74	1.00
C-1001	CONDUIT	74.45	0	12:10	8.69	0.76	1.00
Coff-D1	CONDUIT	238.72	0	12:26	9.73	1.06	1.00
Coff-D2	CONDUIT	113.34	0	12:21	11.88	1.04	1.00
Coff-D3	CONDUIT	624.21	0	12:38	19.80	1.88	1.00
Con-0303	CONDUIT	311.57	0	12:42	12.98	1.52	1.00
Con-I1	CONDUIT	237.85	0	12:42	20.30	0.75	0.89
Con-I2	CONDUIT	260.61	0	12:36	13.27	1.01	1.00
Ex_Roff-B_2	CHANNEL	0.00	0	00:00	0.00	0.00	0.04
Roff-C	CHANNEL	218.70	0	12:41	6.80	0.01	0.17
Roff-C_1	CHANNEL	59.22	0	12:42	4.62	0.00	0.07
Roff-C_2	CHANNEL	58.31	0	12:49	2.59	0.00	0.16
Roff-D1_2	CHANNEL	18.53	0	12:15	1.33	0.00	0.16
Roff-D2	CHANNEL	373.83	0	12:48	3.56	0.00	0.32
Ron-I1	CHANNEL	238.43	0	12:38	7.32	0.00	0.10
Orifice-Det-5	ORIFICE	9.42	0	12:52			1.00
W1	WEIR	87.98	0	12:41			0.07
W2	WEIR	593.68	0	12:40			0.26

****
Flow Classification Summary
****

	Adjusted	Fraction of Time in Flow Class								
	/Actual		Up	Down	Sub	Sup	Up	Down	Norm	Inlet
Conduit	Length	Dry	Dry	Dry	Crit	Crit	Crit	Crit	Ltd	Ctrl
C-0301	1.00	0.00	0.00	0.00	0.06	0.01	0.00	0.93	0.06	0.00
C-0302	1.00	0.00	0.00	0.00	0.04	0.96	0.00	0.00	0.98	0.00
C-0303	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C-0402	1.00	0.00	0.00	0.00	0.01	0.01	0.00	0.97	0.00	0.00
C-0403	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C-0407	1.00	0.00	0.00	0.00	0.00	0.02	0.00	0.98	0.00	0.00
C-0411	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C-0413	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
C-0414	1.00	0.00	0.00	0.00	0.08	0.02	0.00	0.89	0.09	0.00
C-0415	1.00	0.00	0.00	0.00	0.00	0.02	0.00	0.98	0.00	0.00
C-0416	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C-0417	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C-0418	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.98	0.00	0.00
C-0419	1.00	0.00	0.48	0.00	0.45	0.08	0.00	0.00	0.45	0.00
C-0420	1.00	0.48	0.00	0.00	0.01	0.00	0.00	0.51	0.01	0.00
C-0501_1	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C-0501_2	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.01	0.00
C-0501_3	1.00	0.00	0.00	0.00	0.08	0.01	0.00	0.92	0.08	0.00
C-0601	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.98	0.00	0.00
C-0602	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C-0603_1	1.00	0.01	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C-0603_2	1.00	0.01	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C-0603_3	1.00	0.01	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00

C-0603_4	1.00	0.01	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00
C-0603_5	1.00	0.01	0.00	0.00	0.00	0.03	0.00	0.96	0.00	0.00
C-0605	1.00	0.00	0.00	0.00	0.03	0.02	0.00	0.95	0.05	0.00
C-0805	1.00	0.02	0.00	0.00	0.00	0.98	0.00	0.00	0.00	0.00
C-0806	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C-0807	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.04	0.00
C-0808	1.00	0.00	0.00	0.00	0.99	0.01	0.00	0.00	0.95	0.00
C-0809	1.00	0.00	0.00	0.00	0.00	0.03	0.00	0.97	0.00	0.00
C-0810	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C-0811	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C-0812	1.00	0.00	0.00	0.00	0.00	0.01	0.00	0.99	0.00	0.00
C-0813	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C-0814	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C-0901	1.00	0.00	0.00	0.00	0.54	0.46	0.00	0.00	0.03	0.00
C-1001	1.00	0.00	0.00	0.00	0.93	0.07	0.00	0.00	0.41	0.00
Coff-D1	1.00	0.01	0.00	0.00	0.93	0.06	0.00	0.00	0.72	0.00
Coff-D2	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.96	0.00	0.00
Coff-D3	1.00	0.02	0.00	0.00	0.16	0.82	0.00	0.00	0.00	0.00
Con-0303	1.00	0.01	0.00	0.00	0.95	0.04	0.00	0.00	0.74	0.00
Con-I1	1.00	0.03	0.00	0.00	0.00	0.03	0.00	0.94	0.00	0.00
Con-I2	1.00	0.00	0.00	0.00	0.04	0.01	0.00	0.95	0.00	0.00
Ex_Roff-B_2	1.00	0.48	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roff-C	1.00	0.00	0.00	0.00	0.01	0.99	0.00	0.00	0.00	0.00
Roff-C_1	1.00	0.00	0.00	0.00	0.82	0.18	0.00	0.00	0.87	0.00
Roff-C_2	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.98	0.00
Roff-D1_2	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.98	0.00
Roff-D2	1.00	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.98	0.00
Ron-I1	1.00	0.01	0.00	0.00	0.94	0.05	0.00	0.00	0.94	0.00

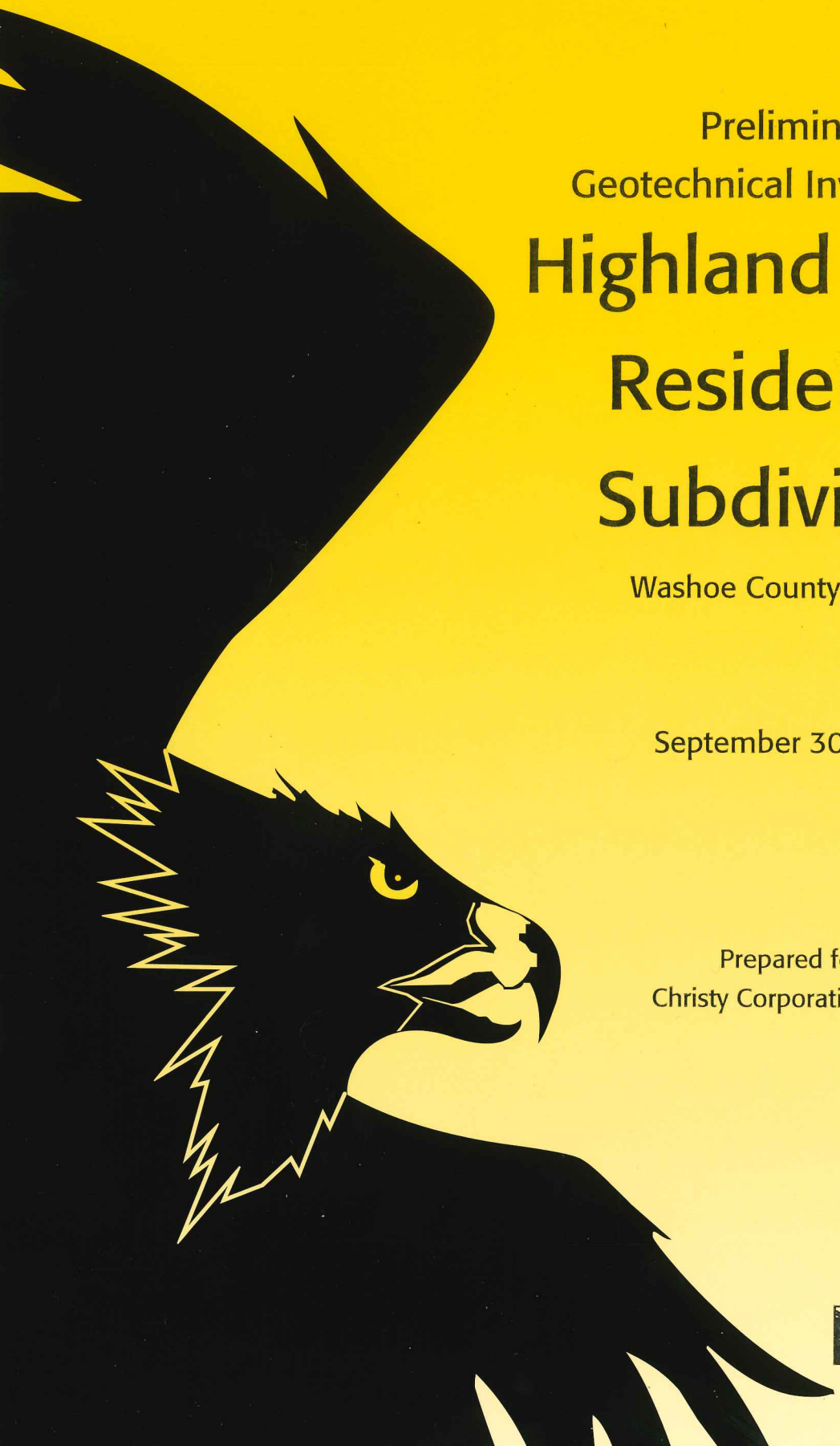
****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C-0301	0.01	0.01	0.96	0.01	0.01
C-0402	0.25	0.48	0.47	0.01	0.16
C-0403	0.06	2.41	0.06	0.01	0.06
C-0407	0.01	0.01	0.15	0.01	0.01
C-0413	3.83	4.67	3.83	3.83	3.83
C-0414	0.01	0.01	1.19	0.01	0.01
C-0417	0.01	0.36	0.01	0.01	0.01
C-0418	0.24	0.24	0.28	0.01	0.18
C-0419	0.22	0.22	0.29	0.01	0.01
C-0501_3	0.01	0.01	1.19	0.01	0.01
C-0601	0.78	1.07	0.82	0.68	0.75
C-0602	0.59	1.92	0.59	1.58	0.59
C-0603_1	0.01	1.53	0.01	0.01	0.01
C-0603_5	0.01	0.01	0.43	0.01	0.01
C-0810	0.01	0.33	0.01	0.01	0.01
C-0811	0.01	0.35	0.01	0.01	0.01
C-0901	5.48	5.48	9.55	0.01	0.20
C-1001	9.46	9.55	11.81	0.01	0.16
Coff-D1	1.50	1.62	1.56	1.05	1.48
Coff-D2	0.99	3.75	0.99	1.26	0.34
Coff-D3	0.01	1.55	0.01	1.10	0.01
Con-0303	0.34	1.60	0.34	1.14	0.34
Con-I1	0.01	0.01	0.54	0.01	0.01
Con-I2	0.69	0.84	0.69	0.19	0.69

Analysis begun on: Thu Feb 27 16:48:39 2020
Analysis ended on: Thu Feb 27 16:48:44 2020
Total elapsed time: 00:00:05

Appendix E – Geotechnical Reports

Black Eagle Consulting, Inc.



Preliminary
Geotechnical Investigation

Highland Ranch Residential Subdivision

Washoe County, Nevada

September 30, 2016

Prepared for
Christy Corporation, LTD

Black Eagle Consulting, Inc.
Geotechnical & Construction Services

Mr. Doug Buck
Christy Corporation, LTD
1000 Kiley Parkway
Sparks, NV 89436

September 30, 2016
Project No.: 1651-04-1

L

RE: Preliminary Geotechnical Investigation
Highland Ranch Residential Subdivision
Washoe County, Nevada

Dear Mr. Buck:

Black Eagle Consulting, Inc. 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 planning and preliminary design of this residential subdivision.

The proposed project will ultimately involve the design and construction of a residential subdivision with single-family homes, associated streets, and utility infrastructure within a 387-acre parcel. The parcel hosts a large previous aggregate quarry which is now partially regraded. Based on the conditions observed during our investigation, geotechnical-related concerns for the project include the inconsistent density and quality of fills throughout the quarry area and along the pit slopes. These fill materials will require reworking through their full depth to limit the potential for differential settlement to structural improvements. Hard bedrock exists below the fills of the quarry and near the surface within undisturbed areas outside the quarry limits; the bedrock will be difficult to excavate. Expansive clay soils exist near the surface within undisturbed areas and will require separation with structural fill from improvements.

Additional exploration and geotechnical analysis will be required for this project as updates to this preliminary investigation once more details regarding proposed grading and site layout are determined. The results from the additional exploration and analysis will allow for more detailed recommendations for final design and construction of this project.

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.

PROFESSIONAL ENGINEER-STATE OF NEVADA
PANCHALINGAM
VIMALARAJ
Exp. 6-30-18
CIVIL
No. 19732

9/30/16

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

Jeff Wilbrecht, P.E.
Project Engineer

Copies to: Addressee (3 copies and PDF via email)

JP:JW:LJJ:PV:cjr

Table of Contents

Introduction 1

Project Description 2

- Preliminary Structure/Development Information 2
- Preliminary Grading 2

Site Conditions 3

- Topography 3
- Aggregate Quarry 4
- Vegetation 5

Exploration 6

- Material Classification 6

Laboratory Testing 7

- Index Tests 7
- Laboratory Moisture-Density Relation Test 7
- Chemical Tests 7

Geologic and General Soil Conditions 8

Geologic Hazards 10

- Seismicity 10
- Faults 10
- Ground Motion and Liquefaction 11
- Flood Plains 11
- Other Geologic Hazards 11

Discussion and Recommendations 12

- General Information 12
- Site Preparation 13
- Trenching and Excavation 16
- Mass Grading 18
- Seismic Design Parameters 19
- Foundation 20
- Subsidence and Shrinkage 20
- Slope Stability and Erosion Control 20
- Site Drainage 21
- Concrete Slabs 22
- Asphalt Concrete 23

Table of Contents

Corrosion Potential 24

Anticipated Construction Problems 25

Recommendations for Design-Level Geotechnical Investigations 26

Quality Control 27

Homeowner's Responsibilities 28

Standard Limitations Clause 29

References 30

Tables

1 - Minimum Required Properties for Separator Geotextile
2 - Maximum Allowable Temporary Slopes
3 - Seismic Design Criteria Using 2012 *International Residential Code*
4 - Sulfate Exposure Class

Plates

1 - Plot Plan
2 - Test Pit Logs
3 - USCS Soil Classification Chart
4 - Index Test Results
5 - Compaction Test Report

Appendices

A - Chemical Test Results

Introduction

Presented herein are the results of Black Eagle Consulting, Inc.'s (BEC's) preliminary geotechnical investigation, laboratory testing, and associated geotechnical recommendations for planning and preliminary design of the proposed residential subdivision to be located at the Highland Ranch parcel in Washoe County, Nevada. These recommendations are based on surface and subsurface conditions encountered in our explorations and on limited and assumed 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 planning and preliminary design 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 on-site materials. Results of our field exploration and testing programs are included in this report and form the basis for all preliminary recommendations.

The services described above were conducted in accordance with the BEC Professional Geotechnical Agreement dated July 27, 2016, which was signed by Mr. Doug Buck of Christy Corporation, LTD.

Project Description

The proposed Highland Ranch Subdivision site consists of an irregularly-shaped parcel of approximately 387 acres located in Washoe County, Nevada. The property has been assigned Accessor's Parcel Number (APN) 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 that 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 that 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.

Preliminary Structure/Development Information

At the time of this preliminary investigation, the project is in the feasibility and planning stages. As such, site layout and grading concepts have not been established. Ultimately, the project will involve the design and construction of a residential subdivision that will be developed in several phases. Early stages will likely include major collector streets and utility infrastructure. Subsequent phases will include single-family lots and the continuation of residential streets and infrastructure.

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, raised floors, or a combination of both. 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.

Preliminary Grading

The site exhibits mountainous terrain with extensive topographic relief (400+ feet). It is assumed that the property will include a layout of residential streets and lots, which may require significant cuts and fills. Residential lots with homes consisting of walkout-style basements/backyards may also be considered to reduce the magnitude of cuts and fills within individual residential pads.

The aggregate quarry has gone through an extensive reclamation program via regrading/filling activities. A significant portion of the pit slopes have been reclaimed to create moderate slopes where shear rock cliffs were previously present. Likewise, extensive ponds and steps in the quarry bottom have been graded to create a relatively level to minimally sloping pad. These reclamation activities were completed by placement of fills throughout the area. Our site exploration and review/research of the property indicates that there are large areas of uncompacted fill and isolated areas of compacted fill within the wheel path of major haul routes associated with the quarry. The areas of poorly compacted fill also include soils placed along slopes as part of the site reclamation. Mitigation of the existing fill materials will require significant earthwork activities on this project.

Site Conditions

Topography

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 sight slope to the north and west.



Google Earth® Isometric View of Site – Looking North
(Highland Ranch Parkway on the South and Pyramid Highway on the East)

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 (horizontal to vertical), and also included benches.

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 this undeveloped portion of the subject property.

Aggregate Quarry


Reclaimed Quarry Pit (Looking East from Northwestern Pit Slope)

The site to host the proposed Highland Ranch 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. 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. 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 or overburden from the quarry, as shown by end-dumped piles in the Google Earth® imagery. These materials have 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. 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.

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.

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

Test Pits

The property to host the Highland Ranch Subdivision was explored on September 8 and 9, 2016, by excavating 19 test pits (Test Pit TP-01 through TP-19) using a CAT® 430D backhoe. Locations of the test pits are shown on Plate 1. The maximum depth of exploration, which was 15 feet below the existing ground surface, was limited as a result of the maximum reach with the backhoe. Loose materials caving and sloughing into the test pit also limited the depth of test pit exploration. Several of our test pits were terminated at shallower depths due to difficult digging conditions in bedrock and ultimate refusal with equipment on site. Bulk samples for index testing were collected from the trench wall sides at specific depths of each soil horizon. The test pits were backfilled immediately after exploration. Backfill was loosely placed and the area regraded to the extent possible with equipment on hand.



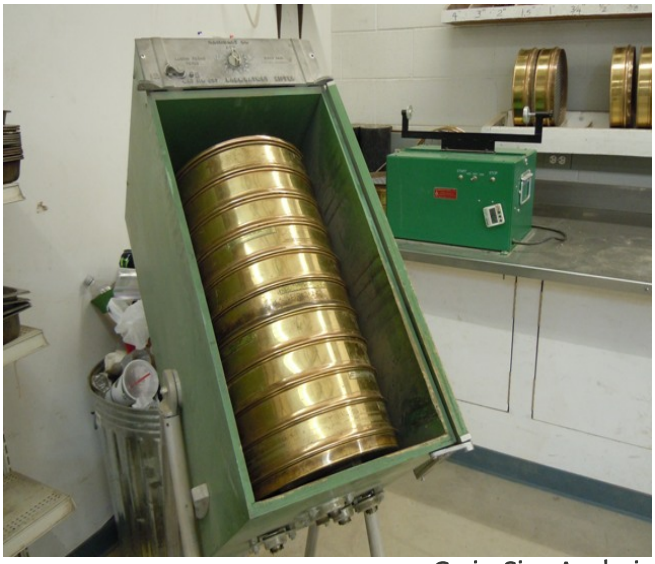
Test Pit Exploration (Test Pit TP-19 South of Quarry)

Material Classification

A 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. 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 are presented as Plate 2 (Test Pit Logs), and a USCS chart has been included as Plate 3 (USCS Soil Classification Chart).

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 published charts (Bowles, 1996; Naval Facilities Engineering Command [NAVFAC], 1986a and b) to evaluate preliminary bearing capacity, lateral earth pressures, and settlement potential.

Laboratory Moisture-Density Relation Test

A moisture-density relation test (ASTM D 1557) was performed on a representative sample of the existing fill. The maximum density shown by this test is compared with field densities to determine the percent of relative compaction. The moisture density curve is included as Plate 5 (Compaction Test Report).

Chemical Tests

Chemical testing was performed on representative samples of site foundation soils 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 A (Chemical Test Results). Chemical testing was performed by Sierra Environmental Monitoring 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 as *medium to coarse-grained plutonic rock with sodic plagioclase, microline, quartz, hornblend and biotite…* The undisturbed areas are consistent with the geologic map.

Undisturbed Areas

Outside of the aggregate quarry, the native soil profile consists of a surficial layer of bedrock weathered to clayey gravel or sand underlain by moderately hard to very hard granitic bedrock. Test pit refusal was encountered in all native areas of the site at depths of 2.5 to 7 feet beneath the existing ground surface.

The surficial clayey gravel soils are described as reddish brown, moist, dense, and contain 20 to 48 percent medium to high plasticity fines and 12 to 40 percent angular gravel. Cobbles and boulders up to 1.5 feet in diameter make up about 5 to 15 percent of the total soil mass. Cobbles are much more common than boulders.

The bedrock materials consist of light to dark gray granodiorite. The bedrock has been weathered to a reddish brown color near the surface. Generally, the bedrock has close fracture spacing (less than 8 inches), is slightly to moderately weathered, and is moderately hard to very hard. During the excavation, the bedrock materials broke down to poorly graded gravel soil consisting of 5 to 11 percent non-plastic to medium plasticity fines and 45 to 60 percent gravel. Cobbles and boulders up to 1.5 feet in diameter make up about 10 to 40 percent of the total excavated soil mass. However, most oversized material is 8 inches or less in diameter and makes up about 15 percent of the total soil mass. Due to relatively close fracture spacing within the bedrock, additional excavation depth should be possible using a large excavator. However, the competent nature of the rock is not likely conducive to deep cuts using conventional excavation techniques.

Materials within the Aggregate Quarry

Extensive fill materials are present within the aggregate quarry, as shown on Plate 1. Fill thickness is widely variable and is in excess of 15 feet in places. Within the eastern wedge-shaped fill, fill depths may approach 100 feet. Within the eastern fill area, fill consists of minimally processed sand and gravel materials and fine-grained silt materials. Within the western portion of the pit, where end-dumped loads are present, fill consists of clayey gravel and clayey sand materials. Within the main level of the pit, fill consists of manufactured crushed rock aggregates, minimally processed sand and gravel, bedding sand, and fine-grained silt. Fill consisting of various sized drain rock and uncrushed rock excavation materials was also encountered, and these materials may have been screened to

remove larger particles. Easily excavated bedrock, interpreted to be pre-blasted/over-shot materials, is present within 3 test pits.

The aggregate base-like materials are classified as well-graded sand or gravel to silty, clayey sand with gravel. 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. Generally, the maximum particle size is ½ inch, but some areas exhibit a maximum particle size of 3 inches.

The bedding sand materials are classified as well-graded sand. They are described as gray to brown, moist, loose to medium dense, and contain 10 percent non-plastic fines and 90 percent fine to coarse sand.

Minimally processed aggregate materials range from clayey sand with gravel to poorly graded gravel. They are described as gray to brown to reddish brown, moist to very moist, medium dense to dense, and contain 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 up to 8 inches in diameter make up to 10 percent of the total excavated soil mass. Boulders up to 1.5 feet in diameter are also infrequently present in these materials.

Fine-grained (silty sand to silt) and clay materials are interpreted to be waste from washing operations and are therefore common within the old ponds and basins. These materials are described as light brown to brown, slightly moist to very moist, soft to very stiff (medium dense), and contain about 40 to 59 percent low plasticity fines and 41 to 60 percent fine to medium sand.

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.

Groundwater was not encountered during exploration and is expected to lie at a depth well below that which would affect design or construction of the proposed subdivision.

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 Nevada. The most active segment of this fault system in the Reno-Sparks area is located at the base of the mountains near Thomas Creek, Whites Creek, and Mt. Rose Highway, some 15 miles southwest of the project. Several other Holocene age fault splays are located within the overall Spanish Springs Valley; however, the maximum credible earthquake associated with these faults is relatively low when compared to the frontal fault system of the Eastern Sierra Nevada.

Faults

An earthquake hazards map is not available for the project area. The published *Quaternary Fault Map of Nevada – Reno Sheet* (Bell, 1984) shows a Holocene age normal fault located approximately 1/3 mile east of the project site. This fault is located at the transition between the mountainous terrain of the project site and the moderately sloping terrain within Spanish Springs Valley.

The Nevada Earthquake Safety Council (NESC, 1998) has developed and adopted the criteria for evaluation of Quaternary age earthquake faults. *Holocene Active Faults* are defined as those with evidence of movement within the past 10,000 years (Holocene time). Those faults with evidence of displacement during the last 130,000 years are termed *Late Quaternary Active Faults*. A *Quaternary Active Fault* is one that has moved within the last 1.6 million years. An *Inactive Fault* is a fault *without recognized activity within Quaternary time* (last 1.6 million years). Holocene Active Faults normally require that occupied structures be set back a minimum of 50 feet (100-foot-wide zone) from the ground surface fault trace. An *Occupied Structure* is considered a building, as defined by the *International Building Code* (*IBC*), *which is expected to have a human occupancy rate of more than 2,000 hours per year* (International Code Council [ICC], 2012).

The setback from Quaternary Active Faults is left to the judgment of the geologist/engineer; however, no *Critical Facility* is permitted to be placed over the trace of a Late Quaternary Active Fault. A *Critical Facility* is defined as *a building or structure that is considered critical to the function of the community or the project under consideration. Examples include, but are not limited to, hospitals, fire stations, emergency management operations centers and schools.*

Based on the available fault mapping, the faults in the vicinity of the project are *Holocene Active Faults.* Because no faults are mapped as passing through the site, and no evidence of active faults was discovered during site exploration, no further fault investigation is necessary for this project.

Ground Motion and Liquefaction

Mapping by the United States Geological Survey (USGS, 2016) indicates that there is a 2 percent probability that a *bedrock* ground acceleration of 0.58 g will be exceeded in any 50-year interval.

Because the site area is underlain by bedrock at shallow depth, liquefaction potential is negligible or does not exist.

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 potential for dust generation is present if grading is performed in dry weather. No other geologic hazards were identified.

Discussion and Recommendations

General Information

The Highland Ranch Subdivision will be located within a parcel that includes an area previously used as an aggregate quarry and undisturbed areas outside the limits of the quarry. At the time of this investigation, the quarry has ceased operations and has been partially reclaimed through regrading of the site. Regrading has included the placement of fill along pit slopes and across the majority of the quarry to a series of relatively level pads. The fills include both high quality granular materials as well as fine-grained soils that are byproducts from the aggregate production. The relative compaction of fills placed during the reclamation varies across the site; significant areas of loose fills were identified in our exploration.

Geotechnical-related issues for the residential subdivision include the following:

- Inconsistent density and quality of fills throughout the pit areas and along the pit slopes,
- Soft, loose bedrock materials that are most likely due to previous blasting or ripping operations,
- Not keying the fills into the pit slopes during reclamation,
- Fills of great thickness, and
- Steepness of undisturbed slopes, filled slopes, and quarry slopes.

These conditions lead to probable differential settlement of the existing fill materials when subjected to structural loading and/or structural fill and necessitate the mitigation of existing fill materials to reduce the potential for differential settlement of the proposed improvements (refer to Site Preparation section). These conditions also have the potential of causing slope failure if not properly mitigated. Lastly, concern exists for site drainage easily infiltrating these fills and percolating along the interface of bedrock and fill. In general, reworking of the fills and loosened bedrock materials, properly keying fills into slopes, and providing adequate surface and subsurface drain systems will be required to mitigate the geotechnical concerns.

Areas outside of the aggregate quarry have native topography that commonly includes surficial layers of clay soils overlying bedrock materials. These surficial clay soils are potentially expansive; as such, they will require separation from structural improvements and are not suitable to use as structural fill, as discussed in Site Preparation and Mass Grading sections.

Once more detailed grading concepts and project layouts are developed, or as phases of the project are proposed, additional exploration will be necessary to determine the horizontal and vertical extents of the fill, as well as fill

quality, throughout the aggregate quarry. Similarly, where the proposed improvements require deeper excavations into bedrock, additional exploration will be required in these areas to provide final geotechnical recommendations.

When properly prepared, the reworked granular fill materials and loosened fills, as well as bedrock materials outside the limits of the quarry, will provide excellent support for the proposed improvements when located in cut or when reused as structural fill.

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 structures 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.

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.

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 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.

All areas to receive structural fill or structural loading shall be densified to at least 90 percent relative compaction.

Reworking of Fill Materials and Loosened Bedrock

Fills exist throughout the limits of the aggregate quarry, as identified on Plate 1. In the areas of deep fill and extensive reclaimed slopes shown on Plate 1, the maximum depth of fill is currently unknown, and determining the depth of these fills will require additional research of quarry routine surveys as well as additional exploration. 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 most likely a byproduct of the aggregate production during quarry operations.

Our exploration encountered loose bedrock materials that most likely exist due to over-blasting or excessive ripping of the native bedrock during quarry operations. 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 a depth such that no more than 12 inches remain in place, then moisture conditioning the remaining material through its full depth and densifying to 90 percent relative compaction. The excavated material can then be placed as discussed in the Mass Grading section. 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.

Clay Material Mitigation

Clay soils were found across the surface of the undisturbed portions of the property outside the aggregate quarry. Surficial clay soils on this project will exhibit considerable shrink-swell with changes in moisture content. Failure to recognize and properly mitigate expansive clays will result in damage to improvements. Clay soils shall be separated from beneath structural areas unless grading is such that those soils will be covered by at least 2 feet of structural fill beneath footings and home floor slabs and 1.5 feet beneath pavements and exterior slabs. Thickness of aggregate base courses beneath slabs and pavements can 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.

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 areas to receive structural fill or structural loading 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.

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 1 (Minimum Required Properties for Separator Geotextile).

TABLE 1 - 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*], 2012), Class C or D drain rock (*SSPWC*, 2012), 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 and Excavation

The project is still in feasibility and planning stages. However, we anticipate earthwork on this project to include extensive grading to develop a residential subdivision. This will include extensive cutting and filling for residential streets and level, or stepped, building pads. An underground utility network will also be constructed throughout the project site. The difficulty of excavation will vary across the project site; the bedrock materials are known to have produced high quality aggregate, such that blasting was previously necessary to accommodate excavation. Reworking of existing fills will be extensive. Additional exploration will be necessary in areas of deep cut and existing fills to determine the quality and consistency of the underlying materials.

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 (CFR, 2010) require that temporary sidewall slopes be no greater than those presented in Table 2 (Maximum Allowable Temporary Slopes).

TABLE 2 - 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 fill soils are predominately Type C. The native soils and weathered bedrock materials are predominately Type B. In some areas the undisturbed bedrock can be considered Stable Rock; however, more exploration will be required to verify this. 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.

Utility Trench Backfill

Bedding and initial backfill 12 inches over the pipe will require import, or could possibly be manufactured on site, 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. Native granular soil will provide adequate final backfill as long as oversized particles are excluded, and it 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 project is in feasibility and planning stages. The majority of fill materials within the quarry are distributed aggregates that remain following the closing of the quarry. These materials are generally suitable for reuse as structural fill. Native granular soils will be suitable for structural fill provided particles larger than 4 inches are removed.

However, fine-grained materials exist in several areas across the project limits (most likely resulting from washing during aggregate production). These fine-grained materials will not be suitable for reuse as structural fill and shall only be placed as fill in non-structural areas. Native clay soils that exist in the areas outside the quarry shall also be placed as fill only in nonstructural areas.

Excavation of deep fills will generate oversized rock that can be stockpiled for later use as erosion protection or placed in the bottom of deep nonstructural fills. In deep fills, oversized rocks must be scattered in such a manner as to preclude development of voids between the particles (nesting). It is not anticipated that import of fills will be required on this project.

All fill placed on hillsides steeper than 5H:1V shall be keyed into existing materials in equipment-wide benches. The maximum vertical separation between benches shall be 8 feet.

Whenever possible, structure foundations shall not be placed partially on bedrock and partially on structural fill. Where structure foundations will be placed partially on bedrock and partially on deeper structural fill due to cut and fill operations, differential settlement of the structural fill may be on the order of 1 percent of the maximum fill height; the fill differential settlement would result in differential settlement of structure foundations. Such differential settlement should be minimized. Measures to minimize such differential settlement may include providing a gradual transition from the bedrock to structural fill and/or over-excavating a portion of the bedrock and backfilling with structural fill.

For preliminary design and cost estimating, where fill depths exceed 5 feet contractors should plan to place structural fill in maximum 8-inch-thick loose lifts, each densified to at least 95 percent relative compaction. Thinner areas of fill (both structural and non-structural) shall be densified to a minimum 90 percent relative compaction.

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 and 8 inches, respectively. A proof rolling program of at least 5 single passes of a minimum CAT® 815 roller in mass grading, or at least 5 complete passes with hand compactors in footing trenches, is recommended. If a CAT® 825 or larger compactor is used, it could be possible to increase both lift thickness and particle size to a maximum of 18 inches and 12 inches, respectively, with the contractor's proven ability to compact thicker lifts.

Properly constructed rock fills have a long history of excellent performance in northern Nevada. 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 18 inches. Within 4 feet of subgrade elevations, the rock fill should exhibit a maximum particle size of 8 inches, with a maximum lift height of 12 inches. As an alternate, the owner may wish to restrict the maximum particle size to 6 inches in the upper 2 feet to facilitate fine grading, trenching, and footing excavation. 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. 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.

Seismic Design Parameters

The 2012 *International Residential Code* ([*IRC*] ICC, 2012), adopted by Washoe County, requires a detailed soils evaluation to a depth of 100 feet to develop appropriate soils criteria. However, the code states that a Site Class D may be used as a default value when the soil properties are not known in sufficient detail to determine the soil profile type. The Site Class D soil profile is for stiff soils with a shear velocity between 600 and 1,200 feet per second, 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 default Site Class D is appropriate at this time due to the preliminary nature of available information and the fact that project grading concepts have not been determined. With that assumption, the recommended seismic design criteria are presented in Table 3 (Seismic Design Criteria Using 2012 *International Residential Code*).

TABLE 3 - SEISMIC DESIGN CRITERIA USING 2012 *INTERNATIONAL RESIDENTIAL CODE* (USGS, 2016)

Latitude	39.6171
Longitude	-119.7407
Spectral Response at Short Periods, S_s, percent of gravity	145.2
Site Class	D
Soil Factor for Site Class D	1.0
Occupancy Category	II
Residential Site Value, percent of gravity	96.8
Residential Seismic Design Category	D_2

Foundation

For preliminary design of foundation systems on this project, individual column footings and continuous wall footings underlain by a minimum of 2 feet of structural fill or native granular soil should be designed for a net maximum allowable bearing pressure of approximately 2,000 to 3,000 psf and should have minimum footing widths of 24 and 12 inches, respectively. 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 which 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 this allowable bearing pressure, total foundation movements on the order of ¾ 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 majority of the anticipated movement will occur during the construction period as loads are applied. This settlement does not account for the internal consolidation of deep fills that may be shown on grading plans. In general, such internal fill settlement could be about ½ percent of the fill thickness and could take variable time for completion depending on the thickness and quality of the fill.

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 0.42 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 1.5 feet below adjacent finished grade for frost protection.

Subsidence and Shrinkage

Granular alluvial soils excavated and recompacted in structural fills should experience quantity shrinkage of approximately 10 percent, including removal of oversized particles. In other words, 1 cubic yard of excavated granular alluvium will generate about 0.9 cubic yards of structural fill at 90 percent relative compaction. Excavated bedrock may have quantity swell of around 5 to 15 percent, depending on the degree to which oversized particles are processed and incorporated into fills.

Slope Stability and Erosion Control

The project will most likely include continued reclamation of the aggregate quarry and flattening of pit slopes. The stability of these slopes 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 slopes is dependent upon shear strength, unit weight, moisture content, and slope angle. The fill keyed into quarry slopes will be stable when sloped to 2H:1V of flatter. A subsurface drain system should be considered for these tall fill slopes to control the flow of water that will develop and percolate between the interface of soil fills and bedrock slopes. Failure to adequately control this flow of water could result in slope failure or excessive moisture near the toe of the slope causing failure of improvements in these areas.

The project includes significant topographic relief as a result of the project location and previous quarry operations. As such, where tall, steep slopes are to be incorporated into the design, a brow ditch along the crest of the slope as well as toe drains should be included.

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 water or wind on the ground surface. Erosion control is typically implemented on cut and fill slopes that are 5H:1V or steeper. Slopes between 3H:1V and 5H:1V can be stabilized by hydroseeding. Slopes steeper than 3H:1V require mechanical stabilization. After minor processing, the aggregate materials that exist throughout the quarry area may meet the requirements for mechanical stabilization materials. Further analysis of material susceptibility to erosion on slopes will be performed once a final grading plan has been developed for specific phases of the project.

Dust potential at this site will be moderate 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

Adequate surface drainage shall be provided so moisture is directed away from residential structures. A system of roof gutters and downspouts is recommended to collect roof drainage and direct it away from the foundations.

Surface drainage around the fill slopes will be required. A brow ditch along the crest of the hillside can direct runoff such that it does not flow across the surface of the fill. Similarly, a channel at the bottom of the fill slopes can direct runoff to drain systems. Where tall fill slopes are proposed along the steep pit slopes, a subsurface drain system located at the interface between fills and the underlying bedrock may be warranted to intercept water

percolating along this interface. Failure to properly manage water flows within the fill slope areas could result in significant damage to improvements.

The ponding of water on finished grade or at the edge of pavements shall be prevented by grading the site in accordance with *IRC* (ICC, 2012) requirements.

Concrete Slabs

It is unknown at this time if any of the improvements will be dedicated to governing agencies. If improvements are to be dedicated, they shall be underlain by Type 2, Class B, aggregate base (*SSPWC*, 2012). Imported or on-site manufactured granular material with a minimum R-value of 60 may be acceptable for non-dedicated improvements. 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 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.

The Reno area 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 (ACI, 2008) 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 northern Nevada.

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 StegoRap® vapor barrier or 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

The number of residential lots and the anticipated traffic volumes are not available at the time of this preliminary geotechnical investigation. For planning and preliminary design of the proposed subdivision project, paved areas subject to automobile traffic and infrequent delivery truck traffic (residential/local streets) should consist of 3 inches of asphalt concrete underlain by 6 inches of Type 2, Class B, aggregate base (*SSPWC,* 2012). Any collector streets or streets subject to frequent truck traffic should consist of 4 inches of asphalt concrete underlain by 6 inches of Type 2, Class B, aggregate base (*SSPWC*, 2012). All aggregate base beneath asphalt pavements shall be densified to at least 95 percent relative compaction. The adequacy of the above-recommended structural sections for streets to support the average daily traffic will require verification and updates, as necessary, once the number of lots and street layouts within the proposed residential subdivision become available. Additionally, if the streets are to be dedicated, the preliminary asphalt concrete and/or aggregate thickness values (structural section) provided above will likely need to be increased to the minimum structural sections required by the governing agency for various street categories (residential, collector, etc.).

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 sealing, 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 [AWWA], 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 4 (Sulfate Exposure Class).

TABLE 4 - 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 A) 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.

Anticipated Construction Problems

The reclaimed site exhibits uncontrolled fill across the majority of the quarry bottom as well as many of the reclaimed pit slopes. Difficulty will occur when trying to identify the bottom of the fill within loosened bedrock areas, such that the contractor should pay careful attention to excavation characteristics to ensure full reworking of disturbed materials.

Difficultly will also exist during excavation and trenching due to the presence of hard bedrock.

Recommendations for Design-Level Geotechnical Investigations

The following list identifies items that will need to be performed as part of the design-level geotechnical investigation for the subdivision or multiple design-level geotechnical investigations that may be necessary for various phases of the subdivision. Depending on the subdivision layout, areas of structural improvements, and grading concepts, the design-level geotechnical investigation(s) may need to include some or all the following items:

- Research and review of available surveys that were performed during quarry operations and later reclaiming activities to determine the thickness of deep fills within the quarry pit and pit slopes.
- Additional targeted site exploration, including advancement of deep test pits using a large excavator and/or borings, to better characterize and delineate the extent of fill areas associated with the quarry.
- Rippability characterization of hard bedrock areas where deep cuts are proposed in the grading plans. This task will require bedrock coring, shear-wave velocity measurements, and/or seismic wave velocity measurements.
- Site exploration and laboratory strength testing (R-value tests) for streets shown in the residential layout to perform asphalt concrete pavement analysis and to provide final pavement structural section recommendations.
- Additional targeted site exploration and laboratory testing within the undisturbed areas outside the quarry limits to delineate the extent of expansive clay soils that will require separation from structural improvements.
- Targeted exploration and laboratory testing for any geotechnically-related features, including retaining walls or large improvements.

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 on-site 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.

It should be anticipated that quality control will require full-time testing and inspection during earthwork associated with reworking the existing fill.

Homeowner's Responsibilities

The developer of this project will mitigate potentially expansive soils that exist in driveways and sidewalks for areas of the subdivision that are outside of the aggregate quarry. 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 feet below the flatwork and backfilling the over-excavation with granular, non-expansive material.

The developer will finish grade the lot 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 to provide preliminary information for the planning and preliminary design of the project. 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 additional exploration and 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.

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.

It is anticipated that the site will be graded cut to fill. 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 on-site materials are used as the fill source. Acceptable performance of such materials is formulated around the provisions and requirements of the *IRC*, as applicable.

This report has been produced to provide information allowing the architect or engineer to plan and perform preliminary design of 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 expressed or implied, as to the professional advice provided under the terms of this agreement and included in this report.

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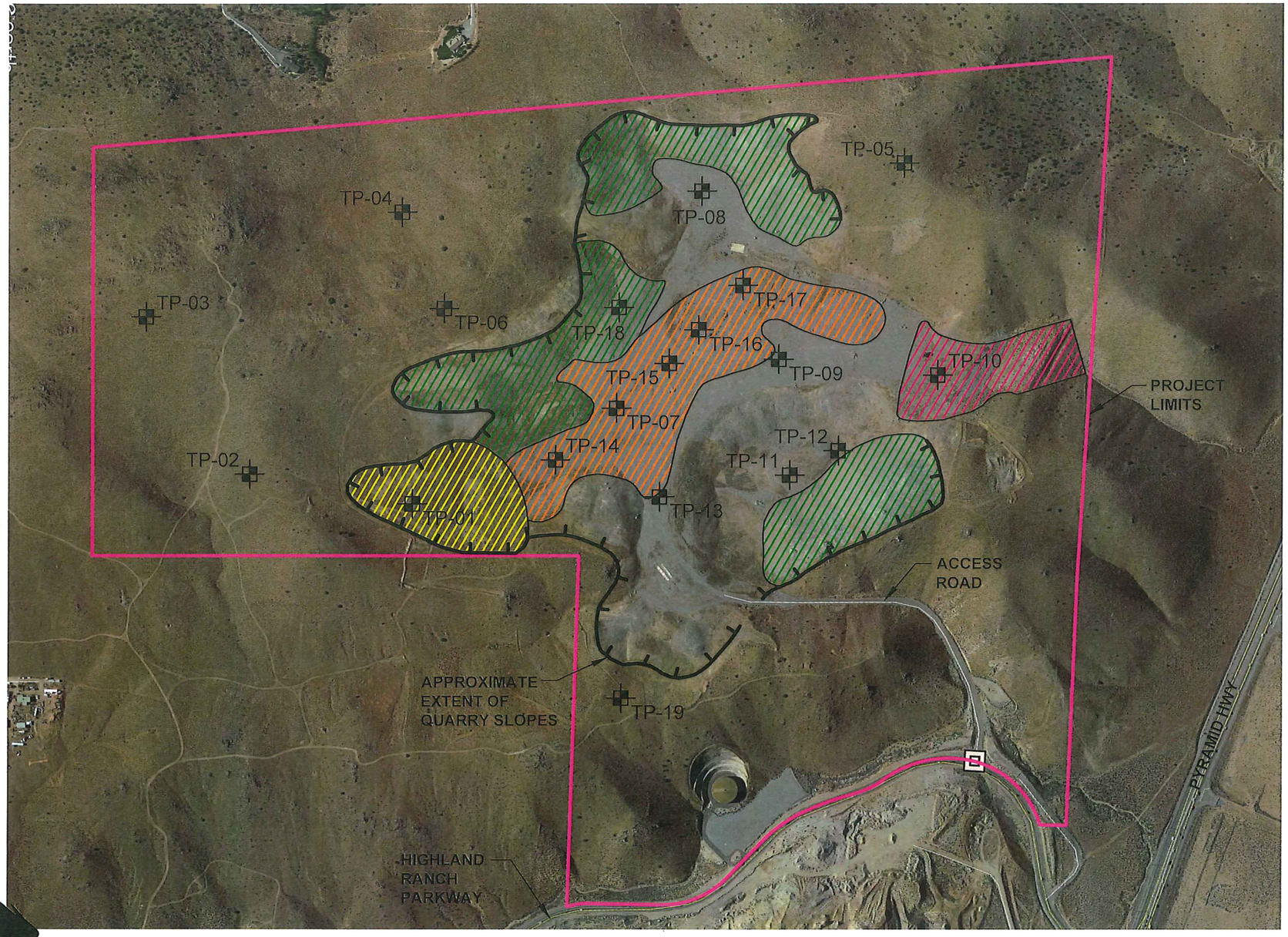
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PLATES



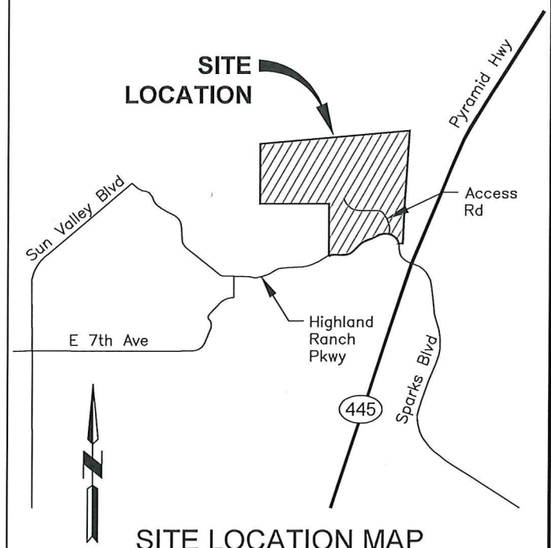
SCALE: 1"=600'
(APPROXIMATE)

LEGEND

- TP-01 APPROXIMATE TEST PIT LOCATION
- APPROXIMATE WESTERN FILL AREA
- APPROXIMATE AREA OF DEEPER FILL (>10')
- APPROXIMATE AREAS OF EXTENSIVE RECLAIMED SLOPES
- APPROXIMATE EASTERN FILL AREA

NOTES

1. BASE MAP PROVIDED BY GOOGLE EARTH, INC. 7/13/16.



SITE LOCATION MAP
N.T.S.

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CHRISTY CORPORATION, LTD

PLOT PLAN

HIGHLAND RANCH RESIDENTIAL SUBDIVISION APN 083-011-15

WASHOE COUNTY, NEVADA

Project No.
1651-04-1

Plate 1

TEST PIT LOG

TEST PIT NO.: TP-01 DATE: 9/8/2016

TYPE OF HOE: Cat 430 D DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
								Clayey Gravel with Sand (Fill) Light brown to brown, dry to slightly moist, loose, with an estimated 20% medium to high plasticity fines, 35% fine to coarse sand, and 45% angular gravel up to 3 inches in diameter.
A	GRAB					GC		
					2			
								Clayey Sand with Gravel (Fill) Light brown to brown, dry to slightly moist, loose, with an estimated 45% medium to high plasticity fines, 40% fine to coarse sand, and 15% angular gravel up to 3 inches in diameter.
B	GRAB				4	SC		
					6			
						SC		**Clayey Sand with Gravel** Reddish brown, moist, medium dense, with an estimated 40% medium to high plasticity fines, 35% fine to coarse sand, and 25% angular gravel up to 3 inches in diameter. Weathered bedrock.
						GP		**Bedrock** Granitic bedrock. Light gray to dark gray, close to moderate fracture spacing, slight weathering, hard. Refusal in hard bedrock.

N 4388636 E 264275 UTM NAD83

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Washoe County, NV

PROJECT NO.: 1651-04-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 1651041.GPJ BLKEAGLE.GDT 9/21/2016

TEST PIT LOG

TEST PIT NO.: TP-02

DATE: 9/8/2016

TYPE OF HOE: Cat 430 D

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
						GP-GC		**Poorly Graded Gravel with Clay and Sand** Gray to light brown to reddish brown, slightly moist, dense to very dense, with an estimated 10% low to medium plasticity fines, 20% fine to coarse sand, and 70% angular gravel up to 3 inches in diameter. Weathered bedrock.
A	GRAB							Cobbles up to 12 inches in diameter make up about 10% of the total soil mass (tsm).
					2			**Bedrock** Granitic bedrock. Gray, close to moderate fracture spacing, slight to moderate weathering, hard.
								Refusal in hard bedrock.
					4			
					6			

N 4388694 E 264000 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 1651041.GPJ BLKEAGLE.GDT 9/21/2016

TEST PIT LOG

TEST PIT NO.: TP-03 | DATE: 9/8/2016

TYPE OF HOE: Cat 430 D | DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP | 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** Reddish brown to light brown, dry to slightly moist, dense to very dense, with an estimated 35% medium plasticity fines, 30% fine to coarse sand, and 35% angular gravel up to 3 inches in diameter. Cobbles and boulders up to 2 feet in diameter make up about 20% of the tsm.
B	GRAB		8.5	NP	2	GP-GM		**Bedrock** Granitic bedrock. Light tan to gray, very close to close fracture spacing, slight to moderate weathering, hard. Excavates as Poorly Graded Gravel with Silt and Sand. Gray to light reddish gray, slightly moist, very dense, with 11% non-plastic fines, 38% fine to coarse sand, and 51% angular gravel up to 3 inches in diameter. Cobbles and boulders up to 1.5 feet in diameter make up about 15% of the tsm. Refusal in hard bedrock.
					4			
					6			

N 4388893 E 263811 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 1651041.GPJ BLKEAGLE.GDT 9/21/2016

TEST PIT LOG

TEST PIT NO.: TP-04

DATE: 9/8/2016

TYPE OF HOE: Cat 430 D

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB		10.7	28		SC		**Clayey Sand** Reddish brown, slightly moist to moist, medium dense to dense, with 48% high plasticity fines, 40% fine to coarse sand, and 12% angular gravel up to 3 inches in diameter. Weathered bedrock.
								Cobbles and boulders up to 1.5 feet in diameter make up about 10% of the tsm.
B	GRAB				2	GP		**Bedrock** Granitic bedrock. Light gray to gray, very close to close fracture spacing, moderate weathering, moderately hard to hard. Excavates as Poorly Graded Gravel with Sand. Dry to slightly moist, very dense, with an estimated 5% non-plastic fines, 40% fine to coarse sand, and 55% angular gravel up to 3 inches in diameter.
								Cobbles up to 6 inches in diameter make up about 10% of the tsm.
					4			Refusal in hard bedrock.
					6			

N 4389089 E 264238 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 1651041.GPJ BLKEAGLE.GDT 9/21/2016

TEST PIT LOG

TEST PIT NO.: TP-05 DATE: 9/8/2016

TYPE OF HOE: Cat 430 D DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP 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** Light brown to light gray, dry to slightly moist, medium dense, with an estimated 20% medium plasticity fines, 50% fine to coarse sand, and 30% angular gravel up to 3 inches in diameter.
B	GRAB					GC		Cobbles up to 12 inches in diameter make up about 10% of the tsm. Surficial boulders up to 2 feet in diameter present. **Clayey Gravel with Sand** Reddish brown, moist, medium dense to dense, with an estimated 35% high plasticity fines, 30% fine to coarse sand, and 35% angular gravel up to 3 inches in diameter. Weathered bedrock.
C	GRAB				2	GP		**Bedrock** Granitic bedrock. Gray to light gray, very close to close fracture spacing, moderate to complete weathering, moderately hard. Excavates to the consistency of Poorly Graded Gravel with Sand. Slighlty moist, very dense, with an estimated 5% non-plastic fines, 45% fine to coarse sand, and 50% angular gravel up to 3 inches in diameter. Cobbles up to 6 inches in diameter make up about 10% of the tsm.
					4			Practical digging refusal in increasingly hard bedrock.
					6			

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 1651041.GPJ BLKEAGLE.GDT 9/21/2016

TEST PIT LOG

TEST PIT NO.: TP-06 | DATE: 9/8/2016

TYPE OF HOE: Cat 430 D | DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP | 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** Reddish brown, moist, dense, with an estimated 35% high plasticity fines, 25% fine to coarse sand, and 40% angular gravel up to 3 inches in diameter. Cobbles up to 8 inches in diameter make up about 10% of the tsm.
					2			**Bedrock** Granitic bedrock. Excavates to Clayey Gravel with Sand, light reddish brown to gray, dry to slightly moist, dense to very dense, with an estimated 15% medium plasticity fines, 40% fine to coarse sand, and 45% angular gravel up to 3 inches in diameter. Cobbles up to 8 inches in diameter make up about 10% of the tsm. Rock hardness increases with depth.
B	GRAB				4	GC		
					6			Refusal in hard bedrock.

N 4388965 E 264325 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 1651041.GPJ BLKEAGLE.GDT 9/21/2016

TEST PIT LOG

TEST PIT NO.: TP-07 DATE: 9/8/2016

TYPE OF HOE: Cat 430 D DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
						GP		**Gravel Surfacing (Fill)** An approximate 12-inch-thick layer of plus 1/4-inch, minus 1-inch angular gravel.
A	GRAB				2	SM		**Silty Sand with Gravel (Fill)** Gray to brown, moist, medium dense, with an estimated 15% low plasticity fines, 65% fine to coarse sand, and 20% angular gravel up to 1/2 inch in diameter. Manufactured, crushed rock aggregate.
					4			
					6			
					8			
B	GRAB				10	SP-SC		**Poorly Graded Sand with Clay and Gravel (Fill)** Gray to brown, moist to very moist, medium dense, with an estimated 10% medium plasticity fines, 55% fine to coarse sand, and 35% angular gravel up to 3 inches in diameter. Minimally processed aggregate. Cobbles up to 12 inches in diameter make up about 5% of the tsm. Cobble content increases to about 10% with depth.
					12			
					14			
					16			Test pit terminated due to backhoe reach.

N 4388762 E 264622 UTM NAD83

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BORING_LOG 1651041.GPJ BLKEAGLE.GDT 9/22/2016

TEST PIT LOG

TEST PIT NO.: TP-08 DATE: 9/8/2016

TYPE OF HOE: Cat 430 D DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
						GP		**Gravel Surfacing (Fill)** An approximate 8-inch-thick layer of plus 1/4-inch, minus 1-inch angular gravel.
A	GRAB				2	SM		**Silty Sand with Gravel (Fill)** Gray to brown, moist, medium dense, with an estimated 15% low plasticity fines, 50% fine to coarse sand, and 35% angular gravel up to 3 inches in diameter. Manufactured, crushed rock aggregate.
					4			**Bedrock** Granitic bedrock. Light gray to gray, close to moderate fracture spacing, slight to moderate weathering, moderately hard to very hard. Excavates to the consistency of Poorly Graded Gravel with Sand, slightly moist, dense to very dense, with an estimated 5% non-plastic fines, 25% fine to coarse sand, and 70% angular gravel up to 3 inches in diameter.
					6			Cobbles up to 8 inches in diameter make up about 10% of the tsm.
						GP		Excavated with moderate effort, possibly pre-blasted or over-blasted bedrock material.
					8			
					10			

N 4389129 E 264769 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 1651041.GPJ BLKEAGLE.GDT 9/21/2016

TEST PIT LOG

TEST PIT NO.: TP-09 | DATE: 9/8/2016

TYPE OF HOE: Cat 430 D | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
						GP		**Gravel Surfacing (Fill)** An approximate 4-inch-thick layer of 3/8 inch crushed drain rock.
								Silty Sand with Gravel (Fill) Gray to brown, moist, dense to very dense, with an estimated 15% non-plastic fines, 65% fine to coarse sand, and 20% angular gravel up to 3 inches in diameter. Manufactured, crushed rock aggregate.
					2			
						SW-SM		
					4			
						SW-SM		**Well-Graded Sand with Silt and Gravel (Fill)** Gray to brown, moist, dense to very dense, with an estimated 10% non-plastic fines, 45% fine to coarse sand, and 45% angular gravel up to 3 inches in diameter. Manufactured, crushed rock aggregate.
					6			**Bedrock** Granitic bedrock. Light gray to gray, close to moderate fracture spacing, slight to moderate weathering, moderately hard to very hard.
						GP		Refusal in hard bedrock.

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PROJECT NO.: 1651-04-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 1651041.GPJ BLKEAGLE.GDT 9/21/2016

TEST PIT LOG

TEST PIT NO.: TP-10 DATE: 9/8/2016

TYPE OF HOE: Cat 430 D DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				2	SC		**Clayey Sand with Gravel (Fill)** Brown to reddish brown, moist, loose to medium dense, with an estimated 20% medium plasticity fines, 60% fine to coarse sand, and 20% subangular to angular gravel up to 3 inches in diameter. Cobbles and boulders up to 1.5 feet in diameter make up about 10% of the tsm.
					4			
B	GRAB	2.5	10.8	6	6			**Sandy Silty Clay (Fill)** Light gray to gray, moist, stiff to very stiff, with 59% low plasticity fines and 41% fine to medium sand. Washed fines from aggregate processing.
					8	CL-ML		
					10			
C	GRAB	<0.5			12	ML		**Sandy Silt (Fill)** Brown, very moist, very soft to soft, with an estimated 60% low plasticity fines and 40% fine to medium sand. Washed fines from aggregate processing.
					14			Test pit terminated due to backhoe reach.
					16			

N 4388835 E 265100 UTM NAD83

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PROJECT NO.: 1651-04-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 1651041.GPJ BLKEAGLE.GDT 9/22/2016

TEST PIT LOG

TEST PIT NO.: TP-11 | DATE: 9/8/2016

TYPE OF HOE: Cat 430 D | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB					GP		**Poorly Graded Gravel with Sand (Fill)** Light gray to gray, slightly moist, dense, with an estimated 5% non-plastic fines, 40% fine to coarse sand, and 60% angular gravel up to 3 inches in diameter. Rockfill material or over-shoot from quarry activities.
					2			**Bedrock** Granitic bedrock. Light gray to gray, close to moderate fracture spacing, slight to moderate weathering, moderately hard to very hard. Excavates to the consistency of Poorly Graded Gravel with Sand, slightly moist, dense to very dense, with an estimated 5% non-plastic fines, 25% fine to coarse sand, and 70% angular gravel up to 3 inches in diameter. Cobbles and boulders up to 1.5 feet in diameter make up about 15% of the tsm.
					4			
						GP		Excavated with moderate effort, possibly pre-blasted/ over-blasted bedrock material.
					6			
					8			Test pit terminated due to sidewall stability.
					10			

N 4388682 E 264870 UTM NAD83

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SHEET 1 OF 1

BORING_LOG 1651041.GPJ BLKEAGLE.GDT 9/21/2016

TEST PIT LOG

TEST PIT NO.: TP-12

DATE: 9/8/2016

TYPE OF HOE: Cat 430 D

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SC		**Clayey Sand with Gravel (Fill)** Brown to reddish brown, dry to slightly moist, medium dense, with an estimated 20% low to medium plasticity fines, 60% fine to coarse sand, and 20% angular gravel up to 3 inches in diameter. Concrete pieces up to 2.5 feet in long dimension make up about 5% of the tsm. Moisture increases to very moist at 1.5 feet beneath the ground surface (bgs).
					4			
					6			Refusal in hard bedrock.

N 4388723 E 264968 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 1651041.GPJ BLKEAGLE.GDT 9/21/2016

TEST PIT LOG

TEST PIT NO.: TP-13 DATE: 9/9/2016

TYPE OF HOE: Cat 430 D DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP 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)** Gray to brown, slightly moist, medium dense to dense, with an estimated 15% low to medium plasticity fines, 30% fine to coarse sand, and 55% angular gravel up to 3 inches in diameter. Cobbles and boulders up to 18 inches in diameter make up about 15% of the tsm. Rockfill material or over-shoot from quarry activities.
					2			**Bedrock** Granitic bedrock. Gray to brown, close to moderate fracture spacing, moderate weathering, moderately hard to hard. Excavates to the consistency of Poorly Graded Gravel with Sand, slightly moist, very dense, with an estimated 5% medium plasticity fines, 30% fine to coarse sand, and 65% angular gravel up to 3 inches in diameter. Cobble content increases from about 10-40% with depth. Rock hardness increases with depth.
					4	GP		
					6			Practical refusal in bedrock.

N 4388700 E 264686 UTM NAD83

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PROJECT NO.: 1651-04-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 1651041.GPJ BLKEAGLE.GDT 9/22/2016

TEST PIT LOG

TEST PIT NO.: TP-14 DATE: 9/9/2016

TYPE OF HOE: Cat 430 D DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB		6.4	4	2	SC-SM		**Silty, Clayey Sand with Gravel (Fill)** Gray to brown, moist, dense to very dense, with 24% low plasticity fines, 47% fine to coarse sand, and 29% angular gravel up to 3 inches in diameter. Manufactured crushed rock aggregate.
					4			
B	GRAB				6	SM		**Silty Sand (Fill)** Brown, moist, medium dense, with an estimated 40% non-plastic to low plasticity fines and 60% fine to medium sand. Possible washed fines or crushed dust from aggregate processing.
					8			
C	GRAB				10	GP-GM		**Poorly Graded Gravel with Silt and Sand (Fill)** Gray with reddish brown clumps, moist, medium dense to dense, with an estimated 10% low plasticity fines, 40% fine to coarse sand, and 50% angualr gravel up to 1 inch in diameter. Reddish brown clumps with medium plasticity fines make up about 5-10% of the tsm. Minimally processed aggregate.
					12	GP-GC		**Poorly Graded Gravel with Clay and Sand** Reddish brown to brown, moist, dense, with an estimated 10% medium plasticity fines, 40% fine to coarse sand, and 50% angular gravel up to 1/2 inch in diameter. Weathered bedrock material excavates as soil
					14			
					16			

N 4388725 E 264528 UTM NAD83

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PROJECT NO.: 1651-04-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 1651041.GPJ BLKEAGLE.GDT 9/21/2016

TEST PIT LOG

TEST PIT NO.: TP-15 | DATE: 9/9/2016

TYPE OF HOE: Cat 430 D | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SP-SM		**Poorly Graded Sand with Silt and Gravel (Fill)** Gray to brown, moist, dense, with an estimated 10% non-plastic fines, 55% fine to coarse sand, and 35% angular gravel up to 3 inches in diameter. Minimally processed aggregate.
					2			Cobbles and boulders up to 1.5 feet in diameter make up about 15% of the tsm.
A	GRAB				4	SM		**Silty Sand with Gravel (Fill)** Gray to brown, moist, dense with an estimated 15% non-plastic to low plasticity fines, 50% fine to coarse sand, and 35% angular gravel up to 1.5 inches in diameter. Manufactured, crushed rock aggregate.
					6			
B	GRAB				8			**Well-Graded Sand with Silt (Fill)** Brown to gray, moist, medium dense, with an estimated 10% non-plastic fines and 90% fine to coarse sand. Manufactured sand.
					10	SW-SM		10 feet bgs - sand sloughing.
					12			
					14			Test pit terminated due to sloughing sands.
					16			

N 4388855 E 264687 UTM NAD83

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PROJECT NO.: 1651-04-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 1651041.GPJ BLKEAGLE.GDT 9/21/2016

TEST PIT LOG

TEST PIT NO.: TP-16 DATE: 9/9/2016

TYPE OF HOE: Cat 430 D DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
								Well-Graded Gravel with Silt and Sand (Fill) Gray to brown, moist, dense with an estimated 10% non-plastic to low plasticity fines, 40% fine to coarse sand, and 50% angular gravel up to 1.5 inches in diameter. Manufactured, crushed rock aggregate.
					2			
A	GRAB							
					4	SW-SM		
					6			
					8			
B	GRAB	0.5-1.0				ML		**Silt with Sand (Fill)** Light gray to gray, moist, firm, with and estimated 75% low plasticity fines and 25% fine to coarse sand. Washed fines from aggregate processing.
								Test pit terminated due to sloughing sands.
					10			

N 4388916 E 264754 UTM NAD83

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PROJECT NO.: 1651-04-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 1651041.GPJ BLKEAGLE.GDT 9/21/2016

TEST PIT LOG

TEST PIT NO.: TP-17 | DATE: 9/9/2016

TYPE OF HOE: Cat 430 D | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
						GW-GM		**Well-Graded Gravel with Silt and Sand (Fill)** Gray to brown, moist, dense with an estimated 10% non-plastic to low plasticity fines, 40% fine to coarse sand, and 50% angular gravel up to 1.5 inches in diameter. Manufactured, crushed rock aggregate.
A	GRAB		11.1	15	2	SC		**Clayey Sand with Gravel (Fill)** Brown, moist to very moist, dense, with 47% medium plasticity fines, 35% fine to coarse sand, and 18% angular gravel up to 3 inches in diameter. Minimally processed aggregate. 5 feet bgs - moisture increases to very moist.
					4			
					6			
					8			
					10	ML		**Silt with Sand (Fill)** Light gray to gray, moist, firm, with an estimated 75% low plasticity fines and 25% fine to coarse sand. Washed fines from aggregate processing.

N 4388985 E 264842 UTM NAD83

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PROJECT NO.: 1651-04-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 1651041.GPJ BLKEAGLE.GDT 9/22/2016

TEST PIT LOG

TEST PIT NO.: TP-18

DATE: 9/9/2016

TYPE OF HOE: Cat 430 D

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				2 4 6 8 10	SM		**Silty Sand with Gravel (Fill)** Gray to brown, moist, medium dense, with an estimated 15% low plasticity fines, 50% fine to coarse sand, and 35% angular gravel up to 1.5 inches in diameter. Raw materials for aggregate processing/ overburden. Cobbles and boulders up to 2 feet in diameter make up about 10% of the tsm.

N 4388951 E 264618 UTM NAD83

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PROJECT NO.: 1651-04-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 1651041.GPJ BLKEAGLE.GDT 9/21/2016

TEST PIT LOG

TEST PIT NO.: TP-19 | DATE: 9/9/2016

TYPE OF HOE: Cat 430 D | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				2	GM		**Silty Gravel with Sand** Reddish brown, slightly moist to moist, dense, with an estimated 15% low plasticity fines, 25% fine to coarse sand, and 60% angular gravel up to 3/4 inch in diameter. Weathered bedrock. Occasional cobbles up to 6 inches in diameter present.
B	GRAB				4	GM		**Bedrock** Granitic bedrock. Excavates to the consistency of Silty Gravel with Sand. Gray, slightly moist to moist, dense, with an estimated 15% low plasticity fines, 25% fine to coarse sand, and 60% angular gravel up to 3/4 inch in diameter. Increasing cobble content. Cobbles up to 8 inches in diameter make up about 5-15% of the tsm. Rock hardness increases with depth.
					6			Practical digging refusal in bedrock.

N 4388315 E 264631 UTM NAD83

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PROJECT NO.: 1651-04-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 1651041.GPJ BLKEAGLE.GDT 9/22/2016

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE			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
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	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
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	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
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	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.

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		

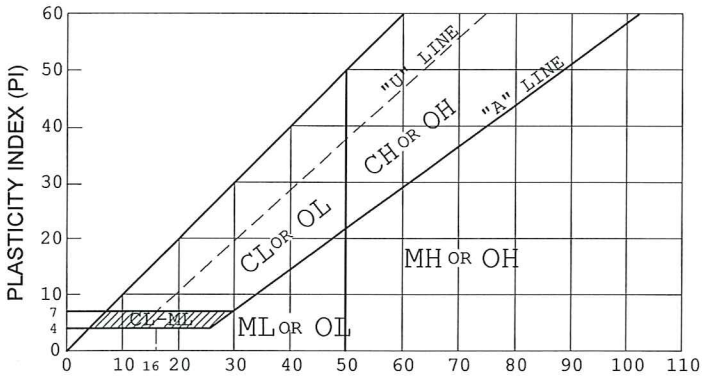
GRAIN SIZE TERMINOLOGY

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

PLASTICITY CHART



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

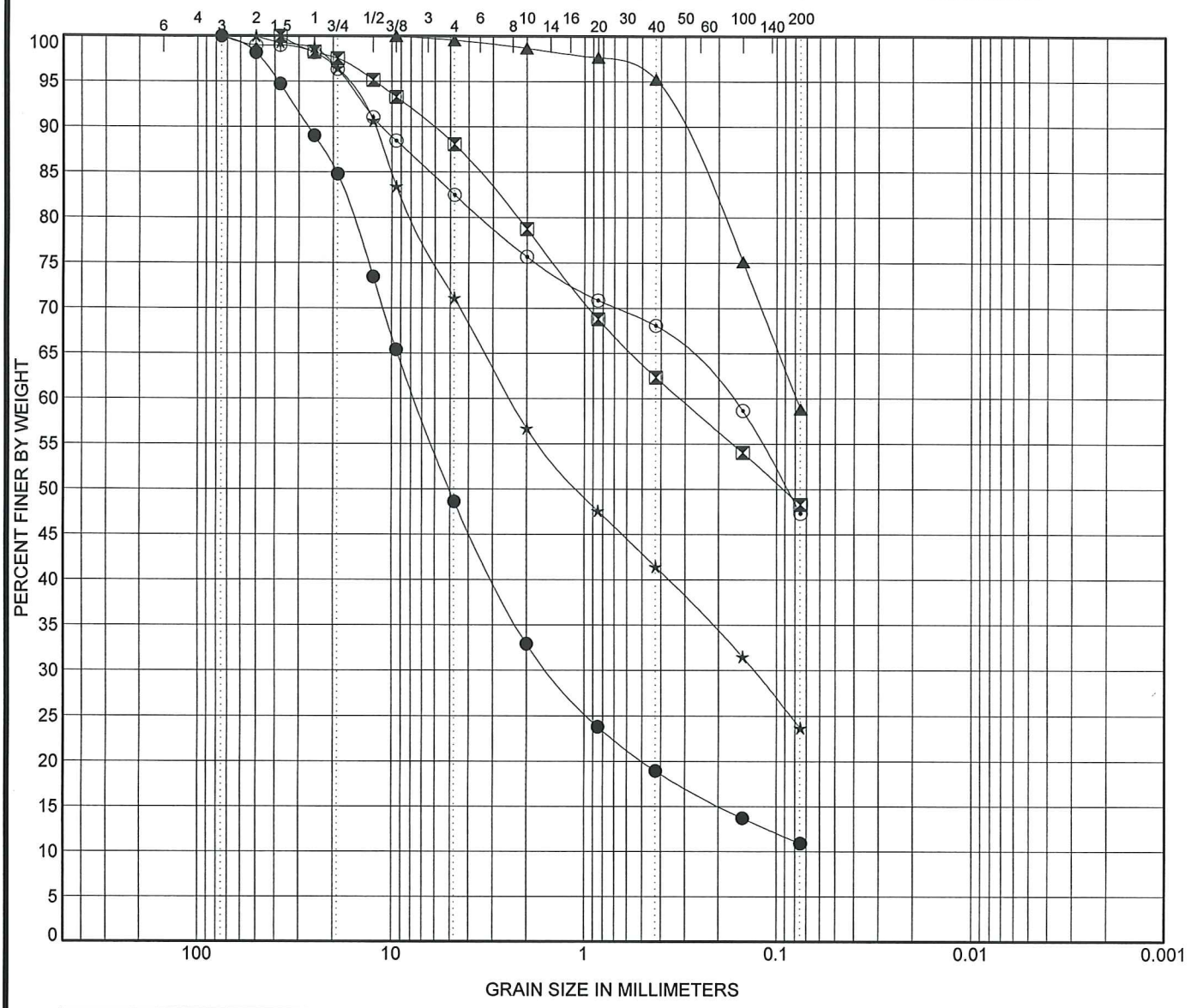
CONSISTENCY OF COHESIVE SOILS

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: Highland Ranch Subdivision
Location: Washoe County, NV
Project Number: 1651-04-1 Plate: 3



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		USCS Classification	LL	PL	PI	Cc	Cu
●	TP-03	2.0'	POORLY GRADED GRAVEL with SILT and SAND (GP-GM)	NP	NP	NP	5.08	126.80
⊠	TP-04	0.0'	CLAYEY SAND (SC)	51	23	28		
▲	TP-10	5.0'	SANDY SILTY CLAY (CL-ML)	26	20	6		
★	TP-14	1.0'	SILTY, CLAYEY SAND with GRAVEL (SC-SM)	24	20	4		
⊙	TP-17	2.0'	CLAYEY SAND with GRAVEL (SC)	36	21	15		

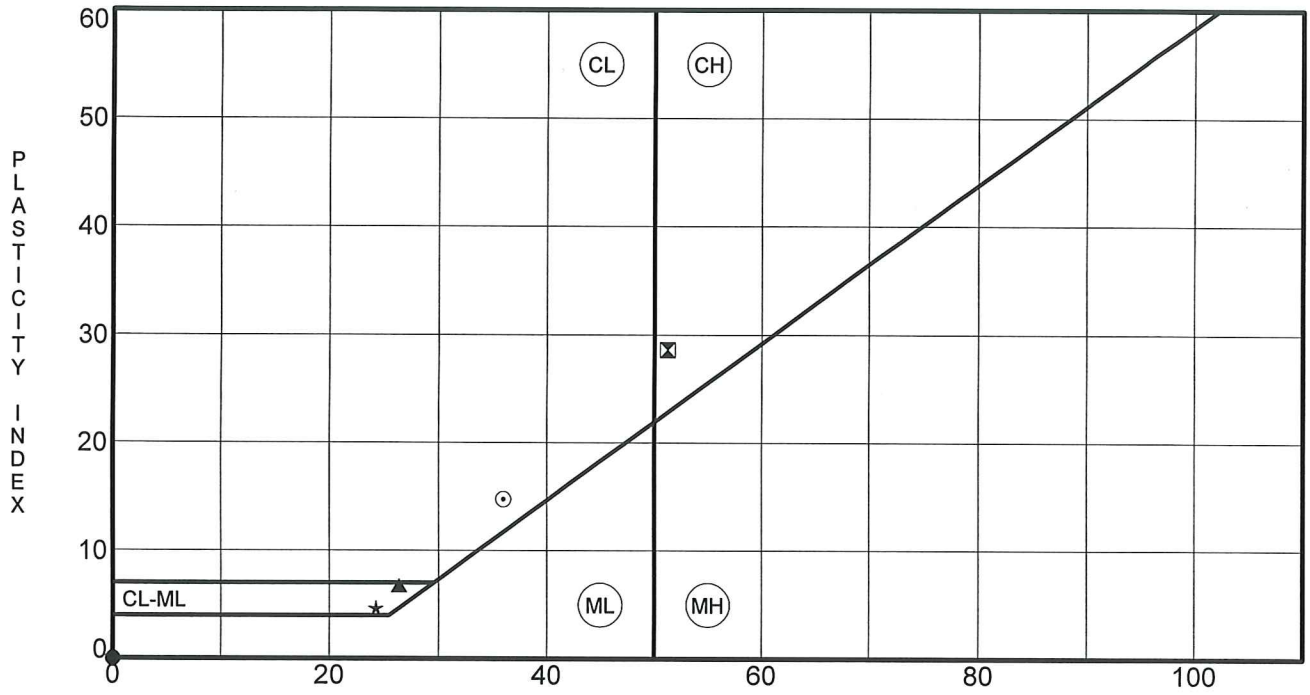
	Specimen Identification		D100	D60	D30	D10	MC %	%Gravel	%Sand	%Silt	%Clay
●	TP-03	2.0'	75	7.599	1.521		8.5	51.4	37.7	10.9	
⊠	TP-04	0.0'	37.5	0.317			10.7	11.9	39.8	48.3	
▲	TP-10	5.0'	9.5	0.079			10.8	0.5	40.7	58.8	
★	TP-14	1.0'	50	2.438	0.131		6.4	28.9	47.4	23.7	
⊙	TP-17	2.0'	75	0.174			11.1	17.5	35.2	47.3	

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GRAIN SIZE DISTRIBUTION

Project: Highland Ranch Subdivision
Location: Washoe County, NV
Project Number: 1651-04-1 Plate: 4a

US GRAIN SIZE2 1651041.GPJ US LAB.GDT 9/21/2016



Specimen Depth in Feet.

	Specimen Identification			LL	PL	PI	Fines	USCS Classification
●	TP-03	B	2.0'	NP	NP	NP	11	POORLY GRADED GRAVEL with SILT and SAND (GP-GM)
⊠	TP-04	A	0.0'	51	23	28	48	CLAYEY SAND (SC)
▲	TP-10	B	5.0'	26	20	6	59	SANDY SILTY CLAY (CL-ML)
★	TP-14	A	1.0'	24	20	4	24	SILTY, CLAYEY SAND with GRAVEL (SC-SM)
⊙	TP-17	A	2.0'	36	21	15	47	CLAYEY SAND with GRAVEL (SC)

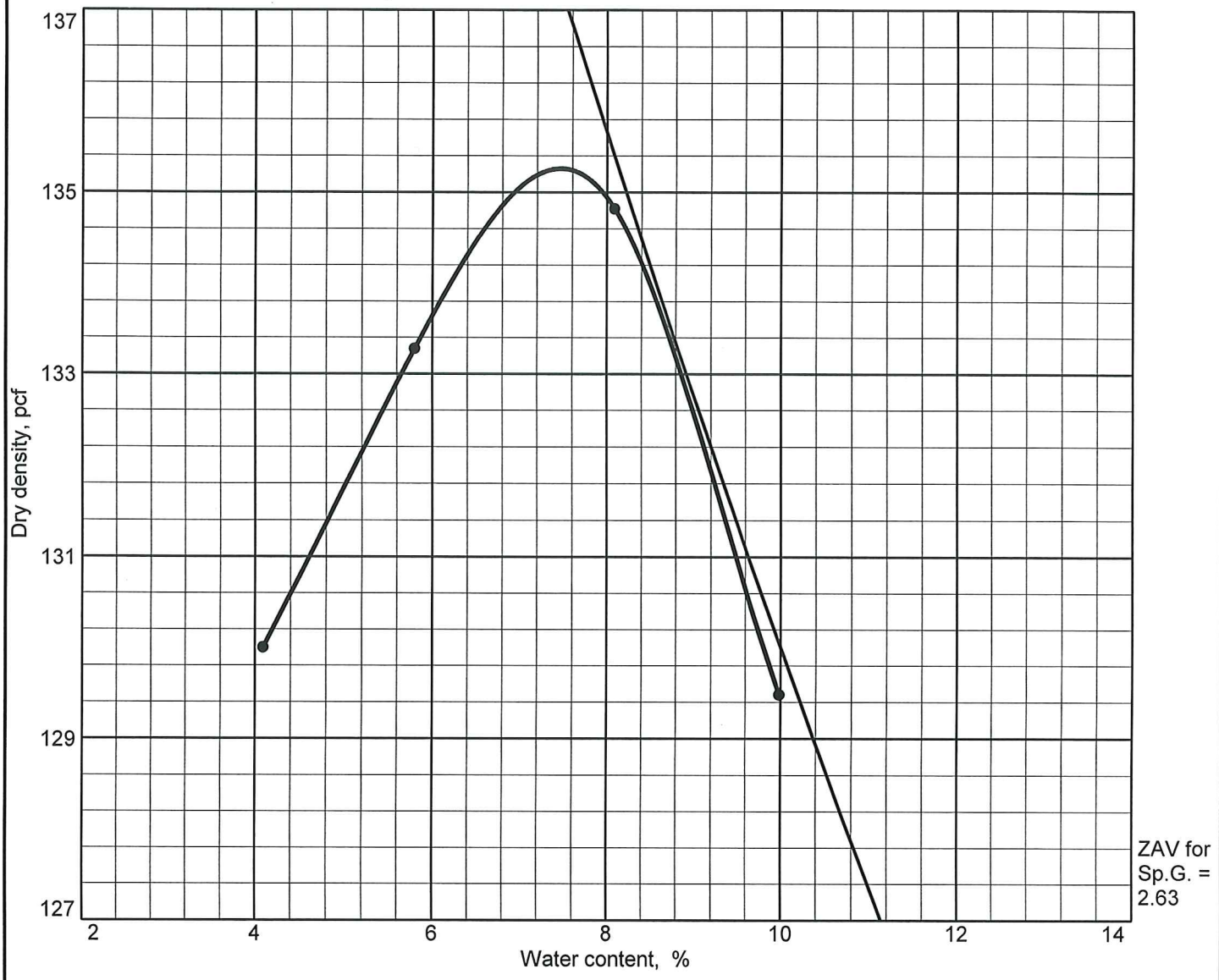
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ATTERBERG LIMITS RESULTS

Project: Highland Ranch Subdivision
Location: Washoe County, NV
Project Number: 1651-04-1 Plate: 4b

US ATTERBERG LIMITS 1651041.GPJ US LAB.GDT 9/21/2016

COMPACTION TEST REPORT



Test specification: ASTM D 1557 Procedure C Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
1'	SC-SM		6.4		24	4	3.5	23.7

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 135.3 pcf Optimum moisture = 7.5 %	Silty, Clayey Sand with Gravel

Project No. 1651-04-1 **Client:** Christy Corporation
Project: Highland Ranch Subdivision

● **Source:** TP-14 **Sample No.:** A **Elev./Depth:** 1'

BLACK EAGLE CONSULTING, INC.
Reno, Nevada

Remarks:
Laboratory Log 5293

Figure 5a

APPENDIX A

CHEMICAL TEST RESULTS

SilverState Analytical Laboratories

Sierra Environmental Monitoring

EnviroTech

Laboratory Report

Report ID: 150358

Black Eagle Consulting, Inc.
Attn: Jeff Wilbrecht
1345 Capital Blvd., Suite A
Reno, NV 89502-7140

Date: 9/21/2016
Client: BEC-100
Taken by: J. Payne
PO #: 1651-04-1

Analysis Report

Laboratory Accreditation Number: NV-00015

Laboratory Sample ID	Customer Sample ID	Date Sampled	Time Sampled	Date Received
S201609-0541	1651-04-1 TP-04A	9/8/2016	10:00 AM	9/13/2016

Parameter	Method	Result	Units	Reporting Limit	Analyst	Date Analyzed	Data Flag
pH - Saturated Paste	SW-846 9045D	6.35	pH Units		Bergstrom	9/19/2016	
pH - Temperature	SW-846 9045D	21.1	°C		Bergstrom	9/19/2016	
Redox Potential	SM 2580 B	7	MV		Bergstrom	9/19/2016	
Resistivity	EPA 120.1	12658	ohm cm		Bergstrom	9/19/2016	
Sulfate - Ion Chromatography	EPA 300.0	3	mg/Kg	2	Faulstich	9/20/2016	
Sulfide	EPA 376.1	Negative	Pos/Neg	1	Bergstrom	9/19/2016	

Laboratory Accreditation Number: NV-00015

Laboratory Sample ID	Customer Sample ID	Date Sampled	Time Sampled	Date Received
S201609-0542	1651-04-1 TP-03B	9/8/2016	9:30 AM	9/13/2016

Parameter	Method	Result	Units	Reporting Limit	Analyst	Date Analyzed	Data Flag
pH - Saturated Paste	SW-846 9045D	7.51	pH Units		Bergstrom	9/19/2016	
pH - Temperature	SW-846 9045D	21.0	°C		Bergstrom	9/19/2016	
Redox Potential	SM 2580 B	-59	MV		Bergstrom	9/19/2016	
Resistivity	EPA 120.1	2331	ohm cm		Bergstrom	9/19/2016	
Sulfate - Ion Chromatography	EPA 300.0	72	mg/Kg	2	Faulstich	9/20/2016	
Sulfide	EPA 376.1	Negative	Pos/Neg	1	Bergstrom	9/19/2016	

Data Flag Legend:

Carly Wood
Laboratory Director

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Phone (775) 857-2400 Fax
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John Faulstich
Quality Assurance Manager

Mr. Perry Di Loreto
Di Loreto Construction and Development
985 Damonte Ranch Parkway, Suite 310
Reno, NV 89521

Project No.: 0183-27-1
July 5, 2018

RE: Site Exploration Data
Highland Ranch Subdivision (The Quarry)
Washoe County, Nevada

Dear Mr. Di Loreto:

This letter provides the summary of Black Eagle Consulting, Inc. (BEC)'s exploration and laboratory testing to date and encloses the associated data. We advanced 33 borings to depths of as deep as 75 feet below existing ground surface, 90 excavator test pits to depths of as deep as 23 feet below existing ground surface, and 7 refraction microtremor (ReMi) shear-wave velocity surveys throughout the 387-acre Highland Ranch parcel, Accessor's Parcel Number 083-011-15, located off of Highland Ranch Parkway in Washoe County, Nevada. As requested by you, the remaining laboratory testing work as well as the analyses and preparation of a final geotechnical investigation report for a residential subdivision project that were proposed are not being performed, and this summary letter concludes our work on this project.

The approximate exploration locations are shown on Plate 1 (Plot Plan). All exploration was logged in the field by a BEC geologist/geotechnical technician in accordance with American Society for Testing and Materials (ASTM) D 2488. Where bedrock coring was employed, bedrock cores were logged describing weathering, fracturing, strength and quality of the rock as measured by Rock Quality Designation. The preliminary logs of the borings and test pits with field classification of the materials are included as Plate 2 (Exploration Logs). A Unified Soil Classification System (USCS) chart is included as Plate 3 (USCS Soil Classification Chart). The laboratory in-situ moisture content (ASTM D 2216), grain size distribution (ASTM D 422), plasticity index (ASTM D 4318), and resistance value (R-value; ASTM D 2844) completed to date are enclosed in Plate 4 (Index Test Results) and Plate 5 (R-Value Test Results). It must be noted that the preliminary logs included in Plate 2 have not been updated based on the laboratory test results. The results of the ReMi geophysical surveys are included as Appendix A (Shear-Wave Velocity Modeling Results). Chemical test results on representative site materials are enclosed as Appendix B (Chemical Test Results).

We wish to thank you for the opportunity to provide our services on this project. Please do not hesitate to contact us if you have any questions regarding the geotechnical exploration data.

Sincerely,

Black Eagle Consulting, Inc.

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

PV:cjr

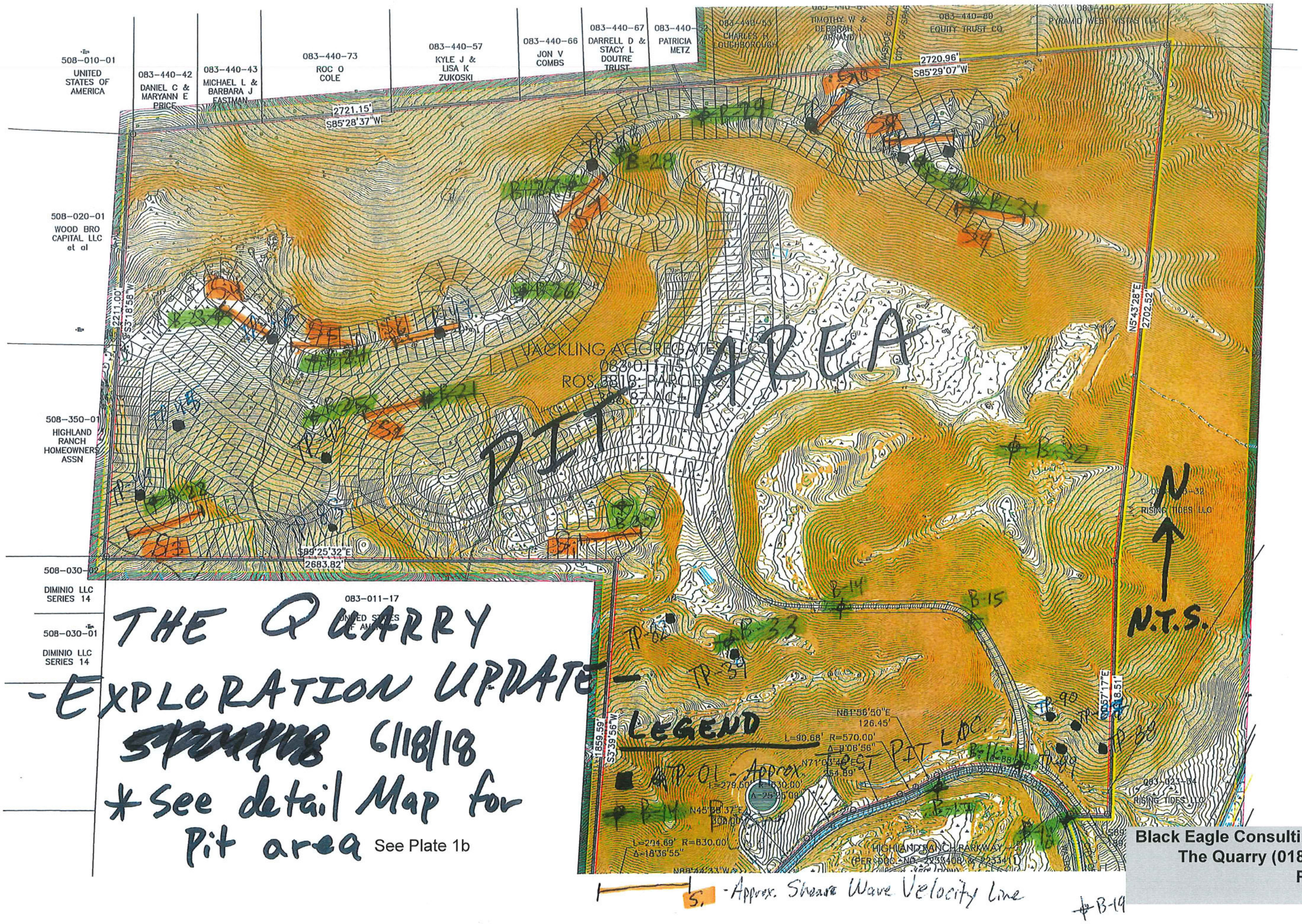
Enclosures: Plate 1 – Plot Plan
Plate 2 – Exploration Logs
Plate 3 – USCS Soil Classification Chart
Plate 4 – Index Test Results
Plate 5 – R-Value Test Results
Appendix A – Shear-Wave Velocity Modeling Results
Appendix B – Chemical Test Results

Copies to: Addressee (1 copy and PDF)

References

American Society for Testing and Materials (ASTM), 2012, *Soil and Rock,* Volumes 4.08 and 4.09.

PLATES



THE QUARRY
- EXPLORATION UPDATE
~~SPRING~~ 6/18/18
* See detail Map for Pit area See Plate 1b

Black Eagle Consulting, Inc.
The Quarry (0183-27-1)
Plate 1a

THE QUARRY
- EXPLORATION UPDATE -
6/18/18
- PIT AREA DETAIL -

JACKLING AGGREGATES, LLC.
083-011-15
ROS 3818, PARCEL 2
±386.87 AC±

N5°43'28"E
2702.52'

S89°25'32"E
2683.82'

N

N.T.S.

LEGEND

083-011-17

UNITED STATES OF AMERICA

+ B-01 - Approx. Boring Loc.

TP-01 - Approx. Test Pit Loc.

Black Eagle Consulting, Inc.
The Quarry (0183-27-1)
Plate 1b

BORING LOG

BORING NO.: B-01 | DATE: 5/11/2018

TYPE OF RIG: BK 81 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SM		**Silty Sand with Gravel (Fill)** Brown, slightly moist to moist, loose to medium dense, with an estimated 15% non-plastic fines, 80% fine to coarse sand, and 30% angular to subangular gravel up to 1 inch in diameter. Angular gravel up to 1 inch in diameter cover.
A	SPT	82						Crushed rock aggregate.
					4	SM		**Silty Sand (Fill)** Gray, moist, very dense, with an estimated 15% non-plastic fines, 80% fine to coarse sand, and 5% angular to subangular gravel up to 0.5 inch in diameter.
B	SPT	50/5.5"			6			Crushed rock aggregate.
C	SPT	43			8	GP		**Poorly Graded Gravel with Sand (Fill)** Gray, moist, dense, with an estimated 5% non-plastic fines, 40% fine to coarse sand, and 55% angular gravel up to 1 inch in diameter.
					10			Crushed rock aggregate.
D	SPT	9				SM		**Silty Sand with Gravel (Fill)** Gray, moist, loose to medium dense, with an estimated 15% non-plastic to low plasticity fines, 70% fine to coarse sand, and 15% subangular gravel up to 0.5 inch in diameter.
E	SPT	7			12			Crushed rock aggregate.
					14			
F	SPT	9			16			
G	SPT	15			18			
					20			
H	SPT	16						
					22			
					24			

Hollow-Stem Augers
N 4388869 E 264745 UTM NAD83

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Di Loreto Construction and Development
Highland Ranch Subdivision
Washoe County, Nevada

PROJECT NO.: 0183-27-1

PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-01 | DATE: 5/11/2018

TYPE OF RIG: BK 81 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
I/J	SPT	44			26	CH		**Sandy Fat Clay (Fill)** Brown, moist, very stiff, with an estimated 70% medium to high plasticity fines, 25% fine to coarse sand, and 5% angular to subangular gravel up to 0.5 inch in diameter.
					28	SC		**Clayey Sand** Brown with yellow, moist, dense to very dense, with an estimated 30% medium to high plasticity fines and 70% fine to coarse sand.
K	SPT	50/4"			30			**Bedrock** Weathered granitic bedrock, sampled as **Silty Sand** Gray, slightly moist, very dense, with an estimated 20% non-plastic to low plasticity fines, 75% fine to coarse sand, and 5% subangular gravel up to 0.5 inch in diameter.
					32	SM		
					34			
L	SPT	50/3"			36			**Bedrock** Weathered granitic bedrock, sampled as **Silt with Sand** Grayish white, moist, very hard, with an estimated 80% low plasticity fines and 20% mostly fine to medium sand.
					38	ML		
M	SPT	50/3"			40			**Bedrock** Weathered granitic bedrock, sampled as **Silty Sand** Yellowish white, moist, very dense, with an estimated 35% low plasticity fines, 55% fine to coarse sand, and 10% subangular gravel up to 0.5 inch in diameter.
					42	SM		
					44			
N	SPT	50/4"				SM		**Bedrock** Weathered granitic bedrock, sampled as **Silty Sand with Gravel** Gray, moist, very dense, with an estimated 30% non-plastic to low plasticity fines, 55% fine to coarse sand, and 15% subangular gravel up to 0.5 inch in diameter.
					46			
					48			

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PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-02 | DATE: 5/11/2018

TYPE OF RIG: BK 81 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SM		**Silty Sand (Fill)** Brown, slightly moist to moist, loose to medium dense, with an estimated 15% non-plastic fines, 75% fine to coarse sand, and 10% angular gravel up to 1 inch in diameter. Angular gravel up to 1 inch in diameter cover.
A	SPT	50						Crushed rock aggregate.
					4	SP-SM		**Poorly Graded Sand with Silt and Gravel (Fill)** Gray, moist, very dense, with an estimated 10% non-plastic fines, 75% fine to coarse sand, and 15% subangular gravel up to 0.5 inch in diameter.
B	SPT	28			6			Crushed rock aggregate.
								Silty Sand (Fill) Gray, moist, loose to medium dense, with an estimated 20% non-plastic fines, 70-75% fine to coarse sand, and 5-10% subangular gravel up to 0.5 inch in diameter.
C	SPT	8			8			
					10	SM		Crushed rock aggregate.
D	SPT	8						
					12			
E	SPT	8						
					14			
F	SPT	31			16			**Clayey Sand (Fill)** Gray, moist, medium dense to dense, with an estimated 30-40% medium to high plasticity fines, 60-70% fine to coarse sand, and 10% subangular gravel up to 0.5 inch in diameter.
						SC		
G	SPT	15			18			Waste rock/overburden material.
					20			
H	SPT	61						**Silty Sand (Fill)** Grayish white, moist, very dense, with an estimated 35% low plasticity fines, 55% fine to coarse sand, and 10% subangular to subrounded gravel up to 0.75 inch in diameter.
					22	SM		
								Crushed rock aggregate.
					24			

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PROJECT NO.: 0183-27-1

PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/19/2018

BORING LOG

BORING NO.: B-02 | DATE: 5/11/2018

TYPE OF RIG: BK 81 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
I	SPT	72/11"			26	SM		**Bedrock** Weathered granitic bedrock, sampled as **Silty Sand with Gravel**, Gray, moist, very dense, with an estimated 30% low plasticity fines, 55% fine to coarse sand, and 15% subangular to subrounded gravel up to 0.5 inch in diameter.
					28			
J	SPT	50/5"			30	SM		**Bedrock** Weathered granitic bedrock, sampled as **Silty Sand with Gravel** Gray, moist, very dense, with an estimated 15% non-plastic fines, 65% fine to coarse sand, and 20% subrounded gravel up to 1 inch in diameter.
					32			
					34			
K	SPT	50/3"						SPT Sample K: No recovery.
					36			
					38			
					40			
					42			
					44			
					46			
					48			

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BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/19/2018

BORING LOG

BORING NO.: B-03 DATE: 5/11/2018

TYPE OF RIG: BK 81 DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SM		**Silty Sand (Fill)** Brown, slightly moist to moist, loose, with an estimated 15% non-plastic fines, 75% fine to coarse sand, and 10% angular to subangular gravel up to 1 inch in diameter. Angular gravel up to 1 inch in diameter cover. Crushed rock aggregate
A	SPT	2			4	SM		**Silty Sand (Fill)** Greenish brown, moist, very loose, with an estimated 40% non-plastic to low plasticity fines, 55% fine to medium sand, and 5% subangular gravel up to 0.5 inch in diameter.
B	SPT	2			6			Crushed rock aggregate.
C	SPT	2			8			**Sandy, Silty Clay (Fill)** Greenish brown, moist, very soft, with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand.
D	SPT	3			10			Washed fines from aggregate processing.
E	SPT	3			12			
F	SPT	1			14			
G	SPT	1			16	CL-ML		
H	SPT	3			18			
					20			
					22			
					24			

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BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-03 DATE: 5/11/2018

TYPE OF RIG: BK 81 DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
I	SPT	2			26			
					28			
J	SPT	19			30	SM		**Silty Sand (Fill)** Gray, moist, medium dense, with an estimated 20% non-plastic fines, 70% fine to coarse sand, and 10% subangular gravel up to 0.5 inch in diameter. Crushed rock aggregate.
					32			
					34			
K	SPT	24			36	SC		**Clayey Sand with Gravel (Fill)** Dark gray, moist, medium dense, with an estimated 30% medium plasticity fines, 55% fine to coarse sand, and 15% subangular gravel up to 0.75 inch in diameter.
					38			
L	SPT	50/5.75"			40	SM		**Bedrock** Weathered granitic bedrock, sampled as **Silty Sand with Gravel** Yellowish brown, moist, very dense, with an estimated 15% non-plastic fines, 70% fine to coarse sand, and 15% subangular gravel up to 0.5 inch in diameter.
					42			
					44			
M	SPT	50/5.5"			46	SM		**Bedrock** Weathered granitic bedrock, sampled as **Silty Sand** Gray, moist, very dense, with an estimated 15% non-plastic fines, 80% fine to coarse sand, and 5% subangular gravel up to 0.5 inch in diameter.
					48			

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PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-04 DATE: 5/11/2018

TYPE OF RIG: BK 81 DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SM		**Silty Sand (Fill)** Brown, slightly moist to moist, medium dense, with an estimated 15% non-plastic fines, 75% fine to coarse sand, and 10% angular to subangular gravel up to 1 inch in diameter. Angular gravel up to 1 inch in diameter cover.
A	SPT	15			4	SM		Crushed rock aggregate. **Silty Sand with Gravel (Fill)** Grayish brown, moist, loose to medium dense, with an estimated 15% non-plastic fines, 70% fine to coarse sand, and 15% angular gravel up to 0.75 inch in diameter.
B	SPT	6			6			Crushed rock aggregate.
C	SPT	4			8	SM		**Silty Sand with Gravel (Fill)** Light brown, moist, very loose, with an estimated 15-20% non-plastic to low plasticity fines, 60-70% fine to coarse sand, and 15-20% angular to subangular gravel up to 0.75 inch in diameter.
D	SPT	4			10			Crushed rock aggregate.
E	SPT	6			12	SC		**Clayey Sand (Fill)** Light brown to brown, moist, loose, with an estimated 25-30% low to high plasticity fines, 40-60% fine to coarse sand, and 10-30% angular to subangular gravel up to 0.75 inch in diameter.
F	SPT	8			14			Waste rock/overburden material.
G	SPT	6			16			
H	SPT	6			18	CH		**Sandy Fat Clay with Gravel (Fill)** Brown to dark brown, moist, stiff, with an estimated 70% medium to high plasticity fines, 15% fine to coarse sand, and 15% subangular to subrounded gravel up to 0.75 inch in diameter.
					20			Waste rock/ overburden material.
					22			
					24			

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N 4388906 E 264981 UTM NAD83

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PROJECT NO.: 0183-27-1

PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-04 DATE: 5/11/2018

TYPE OF RIG: BK 81 DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
I	SPT	22			26	SC		**Clayey Sand with Gravel (Fill)** Dark brown, moist, medium dense, with an estimated 30% medium to high plasticity fines, 40% fine to coarse sand, and 30% subrounded gravel up to 1 inch in diameter.
					28			Crushed rock aggregate.
J	SPT	8			30	SC		**Clayey Sand with Gravel (Fill)** Blueish green, moist, loose, with an estimated 30% medium to high plasticity fines, 55% fine to coarse sand, and 15% subangular to subrounded gravel up to 0.75 inch in diameter.
					32			Contact indicated by drilling response.
					34	SM		**Bedrock** Weathered granitic bedrock, sampled as **Silty Sand** Reddish brown, moist, very dense, wtih an estimated 25% non-plastic to low plasticity fines, 70% fine to coarse sand, and 5% subangular gravel up to 0.5 inch in diameter.
K	SPT	93/10.5"			36			
					38			
					40			
					42			
					44			
					46			
					48			

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Washoe County, Nevada

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PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-05 | DATE: 5/11/2018

TYPE OF RIG: BK 81 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SP-SM		**Poorly Graded Sand with Silt and Gravel (Fill)** Brown, slightly moist to moist, loose, with an estimated 10% non-plastic fines, 70% fine to coarse sand, and 20% angular gravel up to 1 inch in diameter. Angular gravel up to 1 inch in diameter cover.
A	SPT	3						Crushed rock aggregate.
					4			**Silty Sand (Fill)** Greenish brown, moist, very loose, with an estimated 45% non-plastic to low plasticity fines, 50-55% fine to medium sand, and up to 5% angular to subangular gravel up to 0.5 inch in diameter.
B	SPT	3			6	SM		Crushed rock aggregate.
C	SPT	2			8			
					10			
D/E	SPT	4						**Silty Sand with Gravel (Fill)** Greenish brown, moist, very loose to loose, with an estimated 15-30% non-plastic to low plasticity fines, 55-70% fine to coarse sand, and 15-20% angular to subrounded gravel up to 0.5 inch in diameter.
F	SPT	7			12			
					14	SM		Crushed rock aggregate.
G	SPT	9			16			Contact indicated by drilling response.
H	SPT	72			18	SC		**Bedrock** Weathered granitic bedrock, sampled as **Clayey Sand with Gravel** Greenish brown, moist, very dense, with an estimated 15% low to medium plasticity fines, 70% fine to coarse sand, and 15% angular to subrounded gravel up to 0.75 inch in diameter.
					20			
I	SPT	50/5.5"						
					22			
					24			

Hollow-Stem Augers
N 4388866 E 265123 UTM NAD83

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Highland Ranch Subdivision
Washoe County, Nevada

PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-06 DATE: 5/11/2018

TYPE OF RIG: BK 81 DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SM		**Silty Sand with Gravel (Fill)** Brown, slightly moist to moist, loose to medium dense, with an estimated 20-30% non-plastic fines, 40-55% fine to coarse sand, and 15-20% angular to subangular gravel up to 2 inches in diameter.
A	SPT	10			4			Crushed rock aggregate.
B	SPT	3			6	SC		**Clayey Sand (Fill)** Brown, moist, very loose, with an estimated 40% medium to high plasticity fines, 50% fine to coarse sand, and 10% angular to subangular gravel up to 0.75 inch in diameter.
C	SPT	1			8			Crushed rock aggregate. **Sandy, Silty Clay (Fill)** Greenish brown, moist to ver moist, very loose, with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand. Washed fines from aggregate processing.
D	SPT	1			10			
E	SPT	1			12			
F	SPT	1			14			
G	SPT	2			16			
H	SPT	3			18			
					20			
					22			
					24	CL-ML		

Hollow-Stem Augers
N 4388547 E 264809 UTM NAD83

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Di Loreto Construction and Development
Highland Ranch Subdivision
Washoe County, Nevada

PROJECT NO.: 0183-27-1

PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-06 | DATE: 5/11/2018

TYPE OF RIG: BK 81 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
I	SPT	0			26			
					28			
					30			
J	SPT	4				CL-ML		
					32			
					34			
K	SPT	3			36			
					38			
					40			
L	SPT	24				SC		**Clayey Sand with Gravel (Fill)** Gray, moist, medium dense, with an estimated 30% low to medium plasticity fines, 55% fine to coarse sand, and 15% angular to subangular gravel up to 0.5 inch in diameter. Crushed rock aggregate.
					42			
					44			
M	SPT	18				SM		**Silty Sand with Gravel (Fill)** Gray, moist, medium dense, with an estimated 30% non-plastic low plasticity fines, 55% fine to coarse sand, and 15% subangular to subrounded gravel up to 0.75 inch in diameter. Crushed rock aggregate.
					46			
					48			Contact indicated by drilling response. **Bedrock** Weathered granitic bedrock, sampled as **Silty Sand with Gravel** Gray, moist, very dense, with an estimated 15%
						SM		

Hollow-Stem Augers
N 4388547 E 264809 UTM NAD83

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Di Loreto Construction and Development
Highland Ranch Subdivision
Washoe County, Nevada

PROJECT NO.: 0183-27-1

PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-06 DATE: 5/11/2018

TYPE OF RIG: BK 81 DEPTH TO GROUND WATER (ft): NE

LOGGED BY: DEP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
N	SPT	50/4.5"						non-plastic fines, 60% fine to coarse sand, and 25% angular to subangular gravel up to 0.75 inch in diameter.

52
54
56
58
60
62
64
66
68
70
72
74

Hollow-Stem Augers
N 4388547 E 264809 UTM NAD83

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Di Loreto Construction and Development
Highland Ranch Subdivision
Washoe County, Nevada

PROJECT NO.: 0183-27-1

PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-07 | DATE: 5/12/2018

TYPE OF RIG: BK 81 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SC		**Clayey Sand with Gravel (Fill)** Brown, slightly moist to moist, loose to medium dense, with an estimated 25% low to medium plasticity fines, 45% fine to coarse sand, and 30% fine to coarse angular to rounded gravel.
A	SPT	5			4	SC		**Clayey Sand with Gravel (Fill)** Brown, moist, loose, with an estimated 30% medium to high plasticity fines, 55% fine to coarse sand, and 15% angular to subrounded gravel up to 0.75 inch in diameter.
B	SPT	3			6	SM		**Silty Sand (Fill)** Brown, moist, very loose, with an estimated 30% non-plastic to low plasticity fines, 65% fine to coarse sand, and 5% subangular gravel up to 0.75 inch in diameter.
C	SPT	3			8	SM		Crushed rock aggregate. **Silty Sand (Fill)** Green, moist, very loose, with an estimated 40% non-plastic to low plasticity fines and 60% fine to medium sand.
D	SPT	4			10			Crushed rock aggregate.
E	SPT	3			12			**Sandy, Silty Clay (Fill)** Greenish brown, moist to very moist, very loose with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand. Washed fines from aggregate processing.
F	SPT	2			14			
G	SPT	3			16	CL-ML		
H	SPT	2			18			
					20			
					22			
					24			

Hollow-Stem Augers
N 4388593 E 264782 UTM NAD83

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PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-07 | DATE: 5/12/2018

TYPE OF RIG: BK 81 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
I	SPT	4			26	CL-ML		
J	SPT	4			30			
K	SPT	3			36			
L	SPT	4			40			
M	SPT	50/4"			46	SM		
					48			

Contact indicated by drilling response.

Bedrock Weathered granitic bedrock, sampled as **Silty Sand with Gravel** Gray, slightly moist, very dense, with an estimated 20% non-plastic fines, 45% fine to coarse sand, and 35% subangular to rounded gravel up to 1 inch in diameter.

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PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-07 | DATE: 5/12/2018

TYPE OF RIG: BK 81 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
N	SPT	50/3"			52	GM		**Bedrock** Weathered granitic bedrock, sampled as **Silty Gravel with Sand** White, slightly moist, very dense, with an estimated 15% non-plastic fines, 30% fine to coarse sand, and 55% angular to subangular gravel up to 0.75 inch in diameter.
					54			
					56			
					58			
					60			
					62			
					64			
					66			
					68			
					70			
					72			
					74			

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PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 3 OF 3

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-08 | DATE: 5/22/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SC		**Clayey Sand with Gravel (Fill)** Brown, moist, medium dense, with an estimated 30% medium to high plasticity fines, 55% fine to coarse sand, and 15% subangular to subrounded gravel. Fill material
A	SPT	14			4			
B	SPT	28			6			**Silty Sand with Gravel (Fill)** Orangish brown to brown, moist, loose to medium dense, with an estimated 15-20% non-plastic to medium plasticity fines, 55-60% fine to coarse sand, and 25% angular to rounded gravel. Fill material.
C	SPT	28			8			
D	SPT	19			10			
E	SPT	29			12	SM		
F	SPT	7			14			
G	SPT	21			16			
H	SPT	12			18			STP Sample G: No recovery, sampler clogged.
					20			**Clayey Sand with Gravel (Fill)** Brown, very moist, medium dense, with an estimated 20% medium to high plasticity fines, 60% fine to coarse sand, and 20% angular to subangular gravel.
					22	SC		Fill material from altered volcanics.
					24			

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PROJECT NO.: 0183-27-1

PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/19/2018

BORING LOG

BORING NO.: B-08 | DATE: 5/22/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
I	SPT	19			26			**Clayey Sand with Gravel (Fill)** Brown, very moist, medium dense, with an estimated 40% medium to high plasticity fines, 40% fine to coarse sand, and 20% angular to subangular gravel. Fill material from altered volcanics.
					28			
J	SPT	29			30	SC		
					32			
					34			
K	SPT	16			36			**Sandy Lean Clay with Gravel (Fill)** Purple to brown, moist, moist, very stiff, with an estimated 55% medium plasticity fines, 30% fine to coarse sand, and 15% angular gravel. Fill material from altered volcanics.
					38	CL		
L	SPT	15			40			**Clayey Sand with Gravel (Fill)** Brown with orange staining, moist, medium dense, with an estimated 40% medium plasticity fines, 40% fine to coarse sand, and 20% angular gravel. Fill material from altered volcanics.
					42	SC		
					44			
M	SPT	14			46			**Sandy Lean Clay with Gravel (Fill)** Purple to brown, moist, moist, stiff, with an estimated 55% medium plasticity fines, 30% fine to coarse sand, and 15% angular gravel. Fill material from altered volcanics.
					48	CL		

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PROJECT NO.: 0183-27-1

PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/19/2018

BORING LOG

BORING NO.: B-08 | DATE: 5/22/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
N	SPT	34			52	GC		**Clayey Gravel with Sand (Fill)** Purple to brown, moist, medium dense to dense, with an estimated 15% medium plasticity fines, 35% fine to coarse sand, and 50% angular gravel. Fill material from altered volcanics.
O	SPT	23			54			
P	SPT	19			56			
Q	SPT	57			58			
R	SPT	36			60	SC		**Clayey Sand with Gravel (Fill)** Brown, moist, medium dense, with an estimated 40% medium plasticity fines, 40% fine to coarse sand, and 20% angular gravel. Fill material from altered volcanics.
S	SPT	30/0"			62	CL-ML		**Sandy, Silty, Clay (Fill)** Gray, moist, very stiff, with an estimated 70% low to medium plasticity fines and 30% fine to medium sand. Washed fines from aggregate processing.
					64	SC		**Clayey Sand with Gravel (Fill)** Gray, slightly moist, very dense, with an estimated 30% medium plasticity fines, 50% fine to coarse sand, and 20% angular gravel. Fill material.
					66	CL-ML		**Sandy, Silty Clay (Fill)** Gray, moist, stiff, with an estimated 70% non-plastic to low plasticity fines and 30% fine to medium sand. Washed fines from aggregate processing.
					68	SM		**Silty Sand with Gravel (Fill)** Gray, very moist, dense, with an estimated 15% non-plastic fines, 65% fine to coarse sand, and 20% angular gravel. Contact indicated by drilling response.
					70			**Bedrock** SPT Sample S: No recovery.
					72			
					74			

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PROJECT NO.: 0183-27-1

PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/19/2018

BORING LOG

BORING NO.: B-08

DATE: 5/22/2018

TYPE OF RIG: CME 850

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					76			
					78			
					80			
					82			
					84			
					86			
					88			
					90			
					92			
					94			
					96			
					98			

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PLATE: 2

SHEET 4 OF 4

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/19/2018

BORING LOG

BORING NO.: B-09 | DATE: 5/22/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SC		**Clayey Sand with Gravel (Fill)** Brown, moist, loose to medium dense, with an estimated 20% low to medium plasticity fines, 60% fine to coarse sand, and 20% angular to subangular gravel. Fill material.
A	SPT	6			4			
B	SPT	9			6			
C	SPT	16			8			
D	SPT	12			10			
E	SPT	10			12			
F	SPT	8			14			
G	SPT	11			16	SM		**Silty Sand with Gravel (Fill)** Brown, moist, loose to medium dense, with an estimated 15% non-plastic to low plasticity fines, 55% fine to coarse sand, and 30% subangular gravel. Fill material.
H	SPT	14			18			
					20			
					22			
					24			

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PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-09 | DATE: 5/22/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
I	SPT	23			26	SC		**Clayey Sand with Gravel (Fill)** Brown, moist, medium dense, with an estimated 20% low to medium plasticity fines, 55% fine to coarse sand, and 25% angular to subangular gravel. Fill material.
					28			
					30			
J	SPT	18				SC		**Clayey Sand with Gravel (Fill)** Brown, moist, medium dense, with an estimated 30% medium plasticity fines, 50% fine to coarse sand, and 20% angular to subangular gravel. Fill material.
					32			
					34			
K	SPT	17				SM		**Silty Sand with Gravel (Fill)** Brown, moist, medium dense, with an estimated 15% non-plastic to low plasticity fines, 60% fine to coarse sand, and 25% angular to subangular gravel. Fill material.
					36			
					38			
					40			
L	SPT	14				SC		**Clayey Sand with Gravel (Fill)** Dark brown to blueish gray, moist, medium dense, with an estimated 20% low to medium plasticity fines, 60% fine to coarse sand, and 20% angular to subangular gravel. Fill material from altered volcanics.
					42			
					44			
M	SPT	17						
					46			
					48			

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PROJECT NO.: 0183-27-1

PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-09 DATE: 5/22/2018

TYPE OF RIG: CME 850 DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
N	SPT	32			52	GC		**Clayey Gravel with Sand (Fill)** Grayish brown with yellow, moist, medium dense, with an estimated 15% low to medium plasticity fines, 40% fine to coarse sand, and 45% angular gravel. Fill material from altered volcanics.
					54			
O	SPT	2			56			**Clayey Gravel with Sand (Fill)** Brown to gray to purple to yellow, very moist, very loose, with an estimated 25% low to medium plasticity fines, 35% fine to coarse sand, and 40% angular gravel. Fill material from altered volcanics.
					58			
P	SPT	11			60	GC		
					62			
					64			
Q	SPT	12			66	SC		**Clayey Sand with Gravel (Fill)** Tan to green to purple, very moist, medium dense, with an estimated 40% medium plasticity fines, 40% fine to coarse sand, and 20% angular gravel. Fill material from altered volcanics.
					68			**Bedrock** Weathered granitic bedrock, sampled as **Poorly Graded Gravel with Sand**, very dense, with an estimated 5% fines, 30% fine to coarse sand, and 60% gravel.
R	SPT	66/10"			70	GP		
					72			
					74			

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PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-10 DATE: 5/23/2018

TYPE OF RIG: CME 850 DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	SPT				2	SC		**Clayey Sand with Gravel (Fill)** Brown, very moist, medium dense, with an estimated 30% medium plasticity fines, 50% fine to coarse sand, and 20% angular gravel. Fill material. SPT Sample A: Stopped sampling due to sampler out of plumb. Hard cobbles and boulders indicated by drilling response from 3 to 6 feet bgs.
					4			
					6			**Sandy, Silty Clay (Fill)** Gray to olive brown, very moist, very soft, with an estimated non-plastic to low plasticity fines and 10% fine sand. Washed fines from aggregate processing.
C	SPT	0			8			
					10			
D	SPT	1						
					12			
E	SPT	2						
					14			
F	SPT	2						
					16			
G	SPT	2						
					18	CL-ML		
H	SPT	1			20			
					22			
					24			

N 4388872 E 265073 UTM NAD83

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PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-10 | DATE: 5/23/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
I	SPT	10			26			
					28			
J	SPT	13			30			**Silty Sand with Gravel (Fill)** Brown, moist, medium dense, with an estimated 15% low to medium plasticity fines, 55% fine to coarse sand, and 30% angular gravel up to 0.75 inch in diameter.
					32			Crushed rock aggregate.
					34	SM		
K	SPT	13			36			Contact indicated by drilling response.
					38			**Bedrock** Weathered granitic bedrock, sampled as Clayey Sand with Gravel. Gray, moist, very dense, with an estimated 15% low to medium plasticity fines, 65% fine to coarse sand, and 20% angular gravel up to 0.5 inch in diameter.
L	SPT	68			40	SC		
					42			
					44			
M	SPT	50/5"			46	SP		**Bedrock** Weathered granitic bedrock, sampled as **Poorly Graded Sand with Gravel** Gray to black, moist, very dense, with an estimated 5% non-plastic fines, 60% fine to coarse sand, and 35% angular gravel up to 0.5 inch in diameter.
					48			

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PROJECT NO.: 0183-27-1

PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-11 | DATE: 5/23/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SC		**Clayey Sand with Gravel (Fill)** Brown, moist, loose, with an estimated 25% medium plasticity fines, 55% fine to coarse sand, and 20% gravel. Fill material.
A	SPT	9			4			
B	SPT	5			6			
C	SPT	1			8			**Sandy, Silty Clay (Fill)** Gray to olive brown,very moist to wet, very soft, with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand. Washed fines from aggregate processing. Sandy layers wet from 7.5 to ~25 feet bgs.
D	SPT	1			10			
					12			
					14			
E	SPT	2			16			
					18			
					20			
F	SPT	2				CL-ML		
					22			
					24			

N 4388575 E 264839 UTM NAD83

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PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-11 | DATE: 5/23/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
G	SPT	2			26			
					28			
H	SPT	4			30	CL-ML		
					32			
					34			Contact indicated by drilling response.
L	SPT	50/3"			36	SP		**Bedrock** Weathered granitic bedrock, sampled as **Poorly Graded Sand with Gravel** Gray, moist, very dense, with an estimated 5% non-plastic fines, 60% fine to coarse sand, and 35% angular gravel up to 0.5 inch in diameter.
					38			
					40			
					42			
					44			
					46			
					48			

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PROJECT NO.: 0183-27-1

PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-12 | DATE: 5/23/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0			**Clayey Sand with Gravel (Fill)** Brown, moist, very loose, with an estimated 20% medium plasticity fines, 60% fine to coase sand, and 20% angular to rounded gravel.
					2			Fill material.
A	SPT	3			4			
B	SPT	3			6			
						SC		
C	SPT	3			8			
D	SPT	3			10			
					12			
E	SPT	30/0"			14			**Bedrock** Granitic bedrock. Drilling refusal in hard bedrock.
					16			
					18			
					20			
					22			
					24			

N 4388529 E 264776 UTM NAD83

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PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-13 | DATE: 5/24/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SP-SM		**Poorly Graded Sand with Silt and Gravel (Fill)** Gray, moist, medium dense, with an estimated 10% non-plastic fines, 60% fine to coarse sand, and 30% angular gravel up to 0.75 inch in diameter.
A	SPT	20			4			Crushed rock aggregate.
								Drain rock surfacing.
B	SPT	6			6			
C	SPT	3			8			**Sandy, Silty Clay (Fill)** Gray to orangish white,very moist, very soft, with an estimated 70-90% non-plastic to low plasticity fines, 10-30% fine sand, and trace amounts of 0.38 inch gravel.
					10	CL-ML		Washed fines from aggregate processing.
D	SPT	3						Pocket Pentrometer < 0.5 tons per square inch.
					12			
					14			
E	SPT	12			16			**Silty Sand with Gravel (Fill)** Brown, moist, medium dense, with an estimated 15% non-plastic to low plasticity fines, 55% fine to coarse sand, and 30% angular gravel up to 1.25 inches in diameter.
					18			Crushed rock aggregate.
F	SPT	13			20	SM		
					22			
					24			

N 4388948 E 265008 UTM NAD83

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PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/19/2018

BORING LOG

BORING NO.: B-13 | DATE: 5/24/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
G	SPT	25			26			**Clayey Sand with Gravel (Fill)** Brown to tan to gray, moist, medium dense, with an estimated 15% low to medium plasticity fines, 55% fine to coarse sand, and 30% angular gravel up to 1.25 inches in diameter.
					28			Fill material.
H	SPT	16			30	SC		SPT Sample H: Possible weathered rock texture, increased drilling response.
					32			
					34			
I	SPT	34			36			**Clayey Sand with Gravel** Brown to tan to gray, moist, dense, with an estimated 15% low to medium plasticity fines, 55% fine to coarse sand, and 30% angular gravel up to 1.25 inches in diameter.
					38	SC		
J	SPT	50/5"			40	SP		**Bedrock** Weathered granitic bedrock, sampled as **Poorly Graded Sand with Gravel** Tan to reddish brown, moist, very dense, with an estimated 5% non-plastic fines, 60% fine to coarse sand, and 35% angular gravel up to 0.38 inch in diameter.
					42			
					44			
					46			
					48			

N 4388948 E 265008 UTM NAD83

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PROJECT NO.: 0183-27-1

PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/19/2018

BORING LOG

BORING NO.: B-14 | DATE: 5/24/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	SPT	33			0	SP-SM		**Poorly Graded Sand with Silt and Gravel (Fill)** Brown to tan, moist, dense, with an estimated 10% non-plastic fines, 60% fine to coarse sand, and 30% angular gravel up to 0.5 inch in diameter. Fill material.
B	SPT	20			2	GP		**Poorly Graded Gravel with Sand** Brown to tan, moist, medium dense, with an estimated 5% non-plastic fines, 45% fine to coarse sand, and 50% angular gravel up to 1.25 inches in diameter.
C	SPT	17			4	SC		**Clayey Sand with Gravel** Reddish brown to dark brown, moist, medium dense, with an estimated 20% medium plasticity fines, 50% fine to coarse sand, and 30% angular gravel up to 1.25 inches in diameter.
D	SPT	49			6	SP-SM		**Bedrock** Weathered granitic bedrock, sampled as **Poorly Graded Sand with Silt and Gravel** Light gray to light brown, moist, dense to very dense, with an estimated 10% non-plastic to low plasticity fines, 50% fine to coarse sand, and 40% angular gravel up to 1.25 inches in diameter.
E	SPT				8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388476 E 264914 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-15 | DATE: 5/24/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	SPT	50/0"			2	SP-SC		**Bedrock** Weathered granitic bedrock, sampled as Poorly Graded Sand with Clay and Gravel. Brown, moist, medium dense, with an estimated 10% low to medium plasticity fines, 55% fine to coarse sand, and 30% angular gravel up to 0.5 inch in diameter. SPT refusal at 0 feet, no sample.
B	SPT	25			4			
C	SPT	56			6	SP-SM		**Bedrock** Weathered granitic bedrock, sampled as Poorly Graded Sand with Silt and Gravel. Gray to brown, moist, very dense, with an estimated 10% non-plastic fines, 50% fine to coarse sand, and 40% angular gravel up to 0.5 inch in diameter.
D	SPT	69/6"			8	SP		**Bedrock** Weathered granitic bedrock, sampled as Poorly Graded Sand with Gravel. Gray to tan, moist, very dense, with an estimated 5% non-plastic fines, 55% fine to coarse sand, and 40% angular gravel up to 0.5 inch in diameter.
E	SPT	50/5.5"			10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388460 E 265095 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/19/2018

BORING LOG

BORING NO.: B-16 | DATE: 6/1/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	SPT	25			2	SM		**Asphalt Concrete** An approximate 6-inch thick layer of asphalt concrete. **Silty Sand** Brown to tan, moist, dense, with an estimated 20% non-plastic fines and 80% fine to coarse sand.
					4			Possible fill material. Contact indicated by drilling response. **Bedrock** Weathered granitic bedrock, sampled as **Poorly Graded Sand** Gray, slightly moist, very dense, with an estimated 5% non-plastic fines, 85% fine to coarse sand, and 10% angular gravel up to 0.38 inch in diameter.
B	SPT	50/5.5"			6	SP		
C	SPT	95			8			
D	SPT	91/9"			10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388240 E 268188 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-17 | DATE: 6/1/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SM		**Silty Sand** Tan to brown, slightly moist, very dense, with an estimated 20% non-plastic fines and 80% fine to coarse sand.
A	SPT	50/5"						
					4			**Bedrock** Granitic bedrock, sampled as **Silty Sand** Light gray to tan, slightly moist, very dense, with an estimated 20% non-plastic fines 80% fine to coarse sand.
B	SPT	50/1"			6	SM		
C	SPT	50/0"			8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388182 E 265049 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-18 | DATE: 6/1/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SC		**Clayey Sand** Tan to brown, very moist, loose, with an estimated 40% medium plasticity fines, 60% fine to coarse sand, and trace amounts of gravel.
A	SPT	7			4			
B	SPT	12			6	CL		**Lean Clay with Sand** Gray to tan to pink, very moist, stiff, with an estimated 80% medium plasticity fines, 20% fine to coarse sand, and trace amounts of gravel.
C	SPT	18			8	CL		**Lean Clay with Sand** Brown to tan to pink, very moist, very stiff, with an estimated 80% medium plasticity fines, 20% fine to coarse sand, and trace amounts of gravel.
D	SPT	18			10	SC		**Clayey Sand** Gray to black to tan, moist, medium dense, with an estimated 45% medium plasticity fines, 45% fine to coarse sand, and 10% angular gravel up to 1 inch in diameter.
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388113 E 265263 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-19 DATE: 6/1/2018

TYPE OF RIG: CME 850 DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SC		**Clayey Sand** Brown to tan, moist, medium dense, with an estimated 20% low to medium plasticity fines, 80% fine to coarse sand, and trace amounts of gravel up to 0.5 inch in diameter.
A	SPT	13			4			
B	SPT	28			6			**Clayey Sand** Brown, moist, medium dense, with an estimated 25% medium plasticity fines, 65% fine to coarse sand, and 10% angular to subangular gravel up to 0.75 inch in diameter.
C	SPT	35			8	SC		
D	SPT	30			10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4387914 E 265326 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-20 | DATE: 5/29/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SC		**Clayey Sand with Gravel** Reddish brown, moist, dense to very dense, with an estimated 30% medium to high plasticity fines, 35% fine to coarse sand, and 35% angular gravel.
A	SPT	50/4.5"			2	SM		**Bedrock** Weathered granitic bedrock, sampled as Silty Sand. Light gray to gray, moist, very dense, with an estimated 15% non-plastic fines, 80% fine to coarse sand, and 5% angular gravel up to 0.5 inch in diameter.
B	SPT	50/5"			4			
C	SPT	50/4"			6	SP		**Bedrock** Weathered granitic bedrock, sampled as Poorly Graded Sand with Gravel. Light gray to gray, moist, very dense, with an estimated 5% non-plastic fines, 65-75% fine to coarse sand, and 20-30% angular gravel up to 1 inch in diameter.
D	SPT	50/4"			8			
E	SPT	50/3.5"			10			
F	SPT	50/4"			12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388641 E 264554 UTM NAD83

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PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-20 DATE: 5/29/2018

TYPE OF RIG: CME 850 DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
G	SPT	50/4"			26	SP		
					28			
H	SPT	50/4"			30	GP		**Bedrock** Weathered granitic bedrock, sampled as Poorly Graded Gravel with Sand. Light gray to gray, moist, very dense, with an estimated 5% non-plastic fines, 45% fine to coarse sand, and 50% angular gravel up to 0.5 inch in diameter.
					32			
					34			
					36			
					38			
					40			
					42			
					44			
					46			
					48			

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PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-21 | DATE: 5/29/2018

TYPE OF BORING: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	RECOVERY (%)	RQD %	Fractures per Foot	Weathering	Rock Strength	Coring Rate min/foot	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
										SC		**Clayey Sand with Gravel** Reddish brown, moist, dense, with an estimated 15% medium to high plasiticity fines, 55% fine to coarse sand, and 30% angular fine to coarse gravel.
A	X	50/5"										**Bedrock** Weathered granitic bedrock, gray with orange staining, moderately strong, moderately weathered. Sampled as Poorly Graded Sand with Silt and Gravel, with an estimated 10% non-plastic fines, 70% fine to coarse sand, and 20% angular gravel up to 3/4 inch in diameter.
B	X	50/4.5"							5	SP-SM		
C	X	50/2"										**Bedrock** Granitic bedrock, gray to light gray, strong, slightly weathered. Sampled as Poorly Graded Gravel. Very poor recovery.
D	~~X~~	~~50/2"~~								GP		
E			91	43	1-12	S	I	1.1	10			**Bedrock** Granitic bedrock, light gray to gray, strong to extremely strong, very close to moderately close fracture spacing, slightly to moderately weathered, maximum fracture spacing 20 inches. Poor to Very Poor Rock Quality Designation (RQD).
F			83	50	0.5-12	S	I	1.6	15			
G			95	0	1-12	S-M	I-III	2.0	20			
H			100	17	2-12	S-M	I-III	2.0				

ROCK_CORE 0183271 CORING.GPJ BLKEAGLE.GDT 6/19/2018

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PLATE: 2

BORING LOG

BORING NO.: B-21 DATE: 5/29/2018

TYPE OF BORING: CME 850 DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	RECOVERY (%)	RQD %	Fractures per Foot	Weathering	Rock Strength	Coring Rate min/foot	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
I			100	71	1-12	S-M	II	2.3				Maximum fracture spacing 10 inches, Fair RQD.
J			100	53	1-12	S-M	II	2.3	30			
									35			
									40			
									45			

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PLATE: 2a

ROCK_CORE 0183271 CORING.GPJ BLKEAGLE.GDT 6/19/2018

BORING LOG

BORING NO.: B-22 | DATE: 5/30/2018

TYPE OF BORING: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	RECOVERY (%)	RQD %	Fractures per Foot	Weathering	Rock Strength	Coring Rate min/foot	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
										SC		**Clayey Sand with Gravel** Reddish brown, moist, dense, with an estimated 30% medium to high plasticity fines, 40% fine to coarse sand, and 30% angular fine to coarse gravel.
A	X	50/5"										**Bedrock** Weathered granitic bedrock, gray to brown, moderately strong. Sampled as Poorly Graded Sand with Gravel, with an estimated 5% non-plastic fines, 60% fine to coarse sand, and 35% angular gravel up to 1 inch in diameter.
B	X	50/4.5"							5	SP		
C	X	50/3"										**Bedrock** Granitic bedrock, gray, strong. Sampled as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel up to 3/4 inch in diameter.
D	X	50/3"							10	GP		
E		50/1"							15			**Bedrock** Granitic bedrock, gray, very strong, very close to moderately close fracture spacing, moderately to highly weathered. Maximum fracture spacing 10 inches. Poor RQD.
F			94	44	1-24	M-H	II	2.1				
G			33	0	6-24	M-H	II-III		20			**Bedrock** Granitic bedrock, gray to light gray with orange fracture staining, moderately strong to very strong, very close to close fracture spacing, moderately to highly weathered. Maximum fracture spacing 4 inches. Very Poor RQD.
H			21	0	6-24	M-H	III-IV	1.9				

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PLATE: 2

ROCK_CORE 0183271 CORING.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-22

DATE: 5/30/2018

TYPE OF BORING: CME 850

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	RECOVERY (%)	RQD %	Fractures per Foot	Weathering	Rock Strength	Coring Rate min/foot	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
I			82	0	3-24	M-H	II-III	2.2	30			
									35			
									40			
									45			

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PLATE: 2a

ROCK_CORE 0183271 CORING.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-23 | DATE: 5/30/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SC		**Clayey Sand with Gravel** Reddish brown, moist, dense to very dense, with an estimated 30% medium to high plasticity fines, 35% fine to coarse sand, and 35% angular gravel.
					2			**Bedrock** Weathered granitic bedrock, sampled as Silty Sand with Gravel. Light gray to light brown, moist, very dense, with an estimated 15% non-plastic fines, 65% fine to coarse sand, and 20% angular gravel up to 0.5 inch in diameter.
A	SPT	50/4"			4	SM		
					6			
B	SPT	50/5"			8	SM		**Bedrock** Weathered granitic bedrock, sampled as Silty Sand. Tan to light brown to light gray, slightly moist, very dense, with an estimated 20% low plasticity fines, 70% fine to coarse sand, and 10% angular gravel up to 0.5 inch in diameter.
C	SPT	46			10			**Bedrock** Weathered granitic bedrock, sampled as Clayey Sand. Tan to light brown to light gray, slightly moist, dense, with an estimated 25% medium plasticity fines, 65% fine to coarse sand, and 10% angular gravel up to 0.5 inch in diameter.
					12	SC		
					14			
D	SPT	46			16			**Bedrock** Weathered granitic bedrock, sampled as Clayey Sand with Gravel. Tan to light brown to light gray, slightly moist, dense to very dense, with an estimated 15% medium plasticity fines, 70% fine to coarse sand, and 15% angular gravel up to 0.5 inch in diameter.
					18			
E	SPT	31			20			
					22	SC		
					24			

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PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/19/2018

BORING LOG

BORING NO.: B-23 | DATE: 5/30/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
F	SPT	71			26	SC		
					28			
G	SPT	42			30	SC		**Bedrock** Weathered granitic bedrock, sampled as Clayey Sand with Gravel. Tan to light brown to light gray, slightly moist, very dense, with an estimated 15% medium plasticity fines, 55% fine to coarse sand, and 30% angular gravel up to 1.25 inches in diameter.
					32			
					34			
					36			
					38			
					40			
					42			
					44			
					46			
					48			

N 4388951 E 263904 UTM NAD83

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PROJECT NO.: 0183-27-1

PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/19/2018

BORING LOG

BORING NO.: B-24 | DATE: 5/30/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SC		**Clayey Sand with Gravel** Reddish brown, moist, dense to very dense, with an estimated 30% medium to high plasticity fines, 35% fine to coarse sand, and 35% angular gravel.
					2			**Bedrock** Weathered granitic bedrock, sampled as Silty Sand with Gravel. Tan to brown to gray, slightly moist, very dense, with an estimated 15% non-plastic to low plasticity fines, 60% fine to coarse sand, and 25% angular gravel up to 1 inch in diameter.
					4	SM		
A	SPT	98/11"			6			
B	SPT	69			8			**Bedrock** Weathered granitic bedrock, sampled as Clayey Sand. Tan to brown to gray, slightly moist, very dense, with an estimated 20% low to medium plasticity fines, 70% fine to coarse sand, and 10% angular gravel up to 0.5 inch in diameter.
C	SPT	61			10			
					12	SC		
					14			
D	SPT	66			16			**Bedrock** Weathered granitic bedrock, sampled as Poorly Graded Sand with Gravel. Gray to tan, slightly moist, very dense, with an estimated 5% non-plastic fines, 60% fine to coarse sand, and 35% angular gravel up to 1.25 inches in diameter.
					18	SP		
E	SPT	99/6"			20			**Bedrock** Weathered granitic bedrock, sampled as Poorly Graded Gravel with Sand. Gray to tan, slightly moist, very dense, with an estimated 5% non-plastic fines, 20% fine to coarse sand, 75% angular gravel up to 1.25 inches in diameter.
					22	GP		
					24			

N 4388885 E 264054 UTM NAD83

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PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-24 | DATE: 5/30/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
F	SPT	83			26–28	GM		**Bedrock** Weathered granitic bedrock, sampled as Silty Gravel with Sand. Gray to tan, slightly moist, very dense, with an estimated 15% non-plastic fines, 35% fine to coarse sand, and 50% angular gravel up to 1.25 inches in diameter.
G	SPT	48			30	GP		**Bedrock** Weathered granitic bedrock, sampled as Poorly Graded Gravel with Sand. Gray to tan, slightly moist, very dense, with an estimated 5% non-plastic fines, 20% fine to coarse sand, 75% angular gravel up to 1.25 inches in diameter.
					32			
					34			
					36			
					38			
					40			
					42			
					44			
					46			
					48			

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PROJECT NO.: 0183-27-1

PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-25 | DATE: 5/30/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SC		**Clayey Sand with Gravel** Reddish brown, moist, dense to very dense, with an estimated 30% medium to high plasticity fines, 35% fine to coarse sand, and 35% angular gravel.
					2			**Bedrock** Weathered granitic bedrock, sampled as Poorly Graded Gravel with Sand. Gray to tan, slightly moist, very dense, with an estimated 5% non-plastic fines, 25% fine to coarse sand, and 70% angular gravel up to 1.25 inches in diameter.
A	SPT	88			4	GP		
B	SPT	49			6			**Bedrock** Weathered granitic bedrock, sampled as Poorly Graded Gravel with Sand. Gray to tan, slightly moist, dense to very dense, with an estimated 5% non-plastic to medium plasticity fines, 45% fine to coarse sand, and 50% angular gravel up to 1.25 inches in diameter.
C	SPT	85			8			
D	SPT	97/11.5"			10	GP		
					12			
					14			
E	SPT	50/3"			16			**Bedrock** Weathered granitic bedrock, sampled as Poorly Graded Gravel with Sand. Gray, slightly moist, very dense, with an estimated trace amounts of non-plastic fines, 20% fine to coarse sand, and 80% angular gravel up to 0.75 inch in diameter.
					18			
F	SPT	50/5"			20	GP		
					22			
					24			

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PROJECT NO.: 0183-27-1

PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-25 | DATE: 5/30/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
G	SPT	80/10"			26	GP		**Bedrock** Weathered granitic bedrock, sampled as Poorly Graded Gravel with Sand. Tan to gray, slightly moist, very dense, with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel up to 1.25 inches in diameter.
					28			
H	SPT	50/2"			30			
					32			
					34			
					36			
					38			
					40			
					42			
					44			
					46			
					48			

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PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 2 OF 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-26 | DATE: 5/31/2018

TYPE OF BORING: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	RECOVERY (%)	RQD %	Fractures per Foot	Weathering	Rock Strength	Coring Rate min/foot	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
										GC		**Clayey Gravel with Sand** Reddish brown, moist, very dense, with an estimated 20% medium to high plasticity fines, 35% fine to coarse sand, and 45% angular fine to coarse gravel.
A	X	72/9"										**Bedrock** Weathered granitic bedrock, brown to tan, friable to weak. Sampled as Clayey Sand with Gravel, with an estimated 20% low to medium plasticity fines, 70% fine to coarse sand, and 10% angular gravel up to 1-1/4 inches in diameter.
B	X	50/5"							5	SC		
C	X	87										**Bedrock** Weathered granitic bedrock, tan to gray, weak. Sampled as Silty Sand with Gravel, with an estimated 15% non-plastic to low plasticity fines, 70% fine to coarse sand, and 15% angular gravel up to 3/4 inch in diameter.
D	X	50/5"							10	SM		
E	X	86							15			
F	X	50/5"							20	GP		**Bedrock** Granitic bedrock, gray, strong. Sampled as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel up to 1/2 inch in diameter.
												Bedrock Granitic bedrock, light gray to gray,

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PROJECT NO.: 0183-27-1

PLATE: 2

ROCK_CORE 0183271 CORING.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-26 | DATE: 5/31/2018

TYPE OF BORING: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	RECOVERY (%)	RQD %	Fractures per Foot	Weathering	Rock Strength	Coring Rate min./foot	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
G			100	100	0	S	I-II	2.2				very strong to extremely strong, close to wide fracture spacing, slight weathering. Maximum fracture spacing 27 inches. Fair to Excellent RQD.
H			100	74	.5-3	S	I-II	2.1	30			
I			100	31	1-12	S-M	II	2.3				Maximum fracture spacing 7 inches, Poor RQD.
									35			
									40			
									45			

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PROJECT NO.: 0183-27-1

PLATE: 2a

ROCK_CORE 0183271 CORING.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-27 | DATE: 5/31/2018

TYPE OF BORING: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	RECOVERY (%)	RQD %	Fractures per Foot	Weathering	Rock Strength	Coring Rate min/foot	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
										CH		**Sandy Fat Clay** Reddish brown, very moist, hard, with an estimated 55% medium to high plasticity fines, 35% fine to coarse sand, and 10% angular gravel up to 3 inches in diameter.
A	X	50/4"										**Bedrock** Granitic bedrock, gray to light gray, moderately strong to strong. Sampled as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 45% fine to coarse sand, and 50% angular gravel up to 3/4 inch in diameter.
B	X	50/2"							5	GP		
C	X	50/4"										
D		50/4"							10			
E			79	26	2-24	M	III					**Bedrock** Weathered granitic bedrock, gray to light gray, weak to strong, very close to close fracture spacing, moderately to completely weathered. Maximum fracture spacing 6 inches. Very Poor to Poor RQD.
F			22	0	6->24	M	III-V	1.1	15			Poor core return, core washed out.
G			55	0	>24	M-H	III-V	2.1	20			
H			35	8	2->24	M-H	II-IV	1.3				

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PROJECT NO.: 0183-27-1

PLATE: 2

ROCK_CORE 0183271 CORING.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-27

DATE: 5/31/2018

TYPE OF BORING: CME 850

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	RECOVERY (%)	RQD %	Fractures per Foot	Weathering	Rock Strength	Coring Rate min/foot	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
I			47	0	>24	M-C	IV-V	1.3	30			
									35			
									40			
									45			

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PROJECT NO.: 0183-27-1

PLATE: 2a

ROCK_CORE 0183271 CORING.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-28 | DATE: 5/31/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SC		**Clayey Sand with Gravel** Reddish brown, moist, dense to very dense, with an estimated 30% medium to high plasticity fines, 35% fine to coarse sand, and 35% angular gravel.
A	SPT	50/5"			2	SP-SM		**Bedrock** Weathered granitic bedrock, sampled as Poorly Graded Sand with Silt and Gravel. Gray to tan, slightly moist, very dense, with an estimated 10% non-plastic to low plasticity fines, 75% fine to coarse sand, and 15% angular gravel up to 0.75 inch in diameter.
B	SPT	50/5.5"			4			
					6	SM		**Bedrock** Weathered granitic bedrock, sampled as Silty Sand. Tan to brown to gray, slightly moist, very dense, with an estimated 15% non-plastic to low plasticity fines, 75% fine to coarse sand, and 10% angular gravel up to 0.5 inch in diameter.
C	SPT	50/3"			8	GP		**Bedrock** Weathered granitic bedrock, sampled as Poorly Graded Gravel with Sand. Gray, slightly moist, very dense, with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel up to 0.75 inch in diameter.
D	SPT	50/3"			10			
					12			
					14			
E	SPT	50/5.5"			16	SP		**Bedrock** Weathered granitic bedrock, sampled as Poorly Graded Sand with Gravel. Brown to tan to gray, slightly moist, very dense, with an estimated 5% non-plastic fines, 65% fine to coarse sand, and 30% angular gravel up to 0.5 inch in diameter.
					18			
F	SPT	50/5"			20	SP-SC		**Bedrock** Weathered granitic bedrock, sampled as Poorly Graded Sand with Clay and Gravel. Tan to light brown to greenish gray, slightly moist, very dense, with an estimated 10% medium plasticity fines, 50% fine to coarse sand, and 40% angular gravel up to 1.25 inch in diameter.
					22			
					24			

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PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-28 | DATE: 5/31/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
G	SPT	50/5"			26	GP		**Bedrock** Weathered granitic bedrock, sampled as Poorly Graded Gravel with Sand. Gray, slightly moist, very dense, with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel up to 0.75 inch in diameter.
					28			
H	SPT	50/3"			30			
					32			
					34			
					36			
					38			
					40			
					42			
					44			
					46			
					48			

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PROJECT NO.: 0183-27-1

PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-29 | DATE: 5/31/2018

TYPE OF RIG: CME 850 | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SC		**Clayey Sand with Gravel** Reddish brown, moist, dense to very dense, with an estimated 30% medium to high plasticity fines, 35% fine to coarse sand, and 35% angular gravel.
A	SPT	89			2	SP-SM		**Bedrock** Weathered granitic bedrock, sampled as Poorly Graded Sand with Silt and Gravel. Tan to gray, slightly moist, very dense, with an estimated 10% non-plastic fines, 60% fine to coarse sand, and 30% angular gravel up to 0.5 inch in diameter.
B	SPT	50/4"			4			
					6	GP		**Bedrock** Weathered granitic bedrock, sampled as Poorly Graded Gravel with Sand. Gray to tan, slightly moist, very dense, with an estimated 5% non-plastic fines, 45% fine to coarse sand, and 50% angular gravel up to 0.75 inch in diameter.
C	SPT	50/5"			8			**Bedrock** Weathered granitic bedrock, sampled as Poorly Graded Sand with Gravel. Gray to tan, slightly moist, very dense, with an estimated 5% non-plastic fines, 60% fine to coarse sand, and 35% angular gravel up to 0.5 inch in diameter.
D	SPT	50/4"			10			
					12	SP		
					14			
E	SPT	96			16			
					18			
					20			
					22			
					24			

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PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-30

TYPE OF BORING: CME 850

LOGGED BY: JP

DATE: 5/31/2018

DEPTH TO GROUND WATER (ft): NE

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	RECOVERY (%)	RQD %	Fractures per Foot	Weathering	Rock Strength	Coring Rate min/foot	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
										GC		**Clayey Gravel with Sand** Reddish brown, moist, dense, with an estimated 15% medium to high plasticity fines, 40% fine to coarse sand, and 45% angular fine to coarse gravel.
A	X	50/3"										**Bedrock** Granitic bedrock, gray, strong. Sampled as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel up to 1/2 inch in diameter.
B	X	50/3"							5	GP		
C	X	50/5"										
D	X	50/5.5"							10	SP		**Bedrock** Granitic bedrock, gray to tan, strong. Sampled as Poorly Graded Sand with Gravel, with an estimated 5% non-plastic fines, 70% fine to coarse sand, and 25% angular gravel up to 1/2 inch in diameter.
E	X	50/2"							15			
F			100	87	1-2	F-S	I-II	2.0				**Bedrock** Granitic bedrock, gray to light gray, very strong to extremely strong, very close to wide fracture spacing, fresh to slightly weathered. Maximum fracture spacing 36 inches. Fair to Excellent RQD.
G			100	55	0.5-24	F-S	I-II	1.4	20			

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PROJECT NO.: 0183-27-1

PLATE: 2

ROCK_CORE 0183271 CORING.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-30

DATE: 5/31/2018

TYPE OF BORING: CME 850

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	RECOVERY (%)	RQD %	Fractures per Foot	Weathering	Rock Strength	Coring Rate min./foot	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
H			100	100	<1	F-S	I-II	1.9	30			
									35			
									40			
									45			

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PROJECT NO.: 0183-27-1

PLATE: 2a

ROCK_CORE 0183271 CORING.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-31 DATE: 6/1/2018

TYPE OF BORING: CME 850 DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	RECOVERY (%)	RQD %	Fractures per Foot	Weathering	Rock Strength	Coring Rate min/foot	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
										GC		**Clayey Gravel with Sand** Reddish brown, moist, dense, with an estimated 15% medium to high plasticity fines, 40% fine to coarse sand, and 45% angular fine to coarse gravel.
A	X	50/2"										**Bedrock** Granitic bedrock, gray, strong. Sampled as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel up to 1/2 inch in diameter.
B	X	50/2"							5	GP		
									10			
D			79	0	6-24	S-M	II	2.0				**Bedrock** Granitic bedrock, light gray to gray, very strong to extremely strong, very close to close fractures, fresh to moderately weathered. Maximum fracture spacing 6 inches. Very Poor RQD.
E			100	87	0.5-24	F-S	I	5.0	15			Very close to moderately close fracture spacing, maximum fracture spacing 24 inches, Good RQD.
F			100	42	1-24	F-M	I	5.9	20			Very close to moderately close fracture spacing, maximum fracture spacing 12 inches, Very Poor to Poor RQD.
G			85	0	4-24	F-M	I	4.8				

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PROJECT NO.: 0183-27-1

PLATE: 2

ROCK_CORE 0183271 CORING.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-31

DATE: 6/1/2018

TYPE OF BORING: CME 850

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	RECOVERY (%)	RQD %	Fractures per Foot	Weathering	Rock Strength	Coring Rate min/foot	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
H			100	33	1-24	F-M	I	8.7				
									30			
									35			
									40			
									45			

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PROJECT NO.: 0183-27-1

PLATE: 2a

ROCK_CORE 0183271 CORING.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-32

TYPE OF BORING: CME 850

LOGGED BY: JP

DATE: 6/2/2018

DEPTH TO GROUND WATER (ft): NE

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	RECOVERY (%)	RQD %	Fractures per Foot	Weathering	Rock Strength	Coring Rate min/foot	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
										GP		**Bedrock** Granitic bedrock, gray, strong. Sampled as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel up to 1/2 inch in diameter.
A	X	50/5"										
B			44	0	2-12	S-M	II	1.5	5			**Bedrock** Granitic bedrock, light gray to gray, strong to very strong, very close to close fracture spacing, slightly to highly weathered. Maximum fracture spacing 6 inches. Very Poor RQD.
C			5	0	NA	M-H	NA	1.1				
D			43	0	4-24	M-H	III	1.4	10			
E			53	0	4-24	S-M	III	1.6	15			
F			57	27	1-12	S	III	1.3	20			Very close to close fracture spacing, maximum fracture spacing 10 inches, Poor RQD.

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PROJECT NO.: 0183-27-1

PLATE: 2

ROCK_CORE 0183271 CORING.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-32

DATE: 6/2/2018

TYPE OF BORING: CME 850

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	RECOVERY (%)	RQD %	Fractures per Foot	Weathering	Rock Strength	Coring Rate min/foot	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
G			45	45	1-12	S	III	1.7	30			
									35			
									40			
									45			

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PROJECT NO.: 0183-27-1

PLATE: 2a

ROCK_CORE 0183271 CORING.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-33

TYPE OF BORING: CME 850

LOGGED BY: JP

DATE: 6/2/2018

DEPTH TO GROUND WATER (ft): NE

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	RECOVERY (%)	RQD %	Fractures per Foot	Weathering	Rock Strength	Coring Rate min/foot	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
										GP		**Bedrock** Granitic bedrock, gray, strong. Sampled as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel up to 1/2 inch in diameter.
A			73	40	1-8	F-S	II	0.9	5			**Bedrock** Granitic bedrock, light gray to gray, strong to very strong, very close to moderately close fracture spacing, fresh to moderately weathered. Maximum fracture spacing 10 inches. Poor RQD.
B			93	85	1-12	F-S	III	1.2	10			Good RQD.
C			100	68	1-12	F-S	III	1.2	15			Fair RQD.
D			72	55	0.5-24	F-S	II	1.4	20			
E			60	30	0.5-24	F-S	II	1.5				Maximum fracture spacing 20 inches, Poor RQD.

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PROJECT NO.: 0183-27-1

PLATE: 2

ROCK_CORE 0183271 CORING.GPJ BLKEAGLE.GDT 6/18/2018

BORING LOG

BORING NO.: B-33

DATE: 6/2/2018

TYPE OF BORING: CME 850

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	BLOWS/12 inches	RECOVERY (%)	RQD %	Fractures per Foot	Weathering	Rock Strength	Coring Rate min/foot	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
F			76	38	0.5-12	F-S	II	1.2	30			Maximum fracture spacing 21 inches, Poor RQD.
									35			
									40			
									45			

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PROJECT NO.: 0183-27-1

PLATE: 2a

ROCK_CORE 0183271 CORING.GPJ BLKEAGLE.GDT 6/18/2018

TEST PIT LOG

TEST PIT NO.: TP-01

DATE: 5/10/2018

TYPE OF HOE: Cat 336 E

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				2	SP-SM		**Poorly Graded Sand with Silt and Gravel (Fill)** Brown to gray, moist, loose to medium dense, with an estimated 10% non-plastic to low plasticity fines, 55% fine to coarse sand, and 35% angular gravel. Cobbles and boulders up to 2 feet in diameter make up about 25% of the total soil mass (tsm). Crushed rock aggregate, generally 1-inch-minus.
					4			
					6	GP		**Bedrock** Granitic bedrock, gray, moderately strong to very strong, slightly to moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel. Cobbles and boulders up to 2 feet in diameter make up about 30% of the total rock mass (trm). Increasing hardness with depth.
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388748 E 264683 UTM NAD83

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Washoe County, Nevada

PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-02 DATE: 5/10/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SP-SM		**Poorly Graded Sand with Silt and Gravel (Fill)** Brown to gray, moist, medium dense, with an estimated 10% non-plastic to low plasticity fines, 50% fine to coarse sand, and 40% angular gravel. Trace amounts of cobbles up to 12 inches in diameter. Crushed rock aggregate, generally 1.25-inch-minus.
A	GRAB				4			
					6			
					8	SP-SM		**Poorly Graded Sand with Silt and Gravel (Fill)** Brown to gray, moist, loose, with an estimated 10% non-plastic to low plasticity fines, 60% fine to coarse sand, and 30% angular gravel. Trace amounts of cobbles up to 12 inches in diameter. Crushed rock aggregate, generally 0.5-inch-minus.
B	GRAB				10			
					12	GP		**Bedrock** Granitic bedrock, reddish brown, very strong, slightly to moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel. Cobbles up to 12 inches in diameter make up about 30% of the trm. Increasing hardness with depth. Refusal in hard bedrock.
					14			
					16			
					18			
					20			
					22			
					24			

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-03 DATE: 5/10/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				2	SM		**Bedrock** Granitic bedrock, light brown to light gray to yellow brown, friable to weak, moderately to highly weathered, sheared, includes clay gouge damage zone material. Excavates as Silty Sand with Gravel, with an estimated 15% non-plastic to medium plasticity fines, 50% fine to coarse sand, and 35% angular gravel. Friable rock breaks down to soil sized particles.
					4			Thin surficial fill less than 1-foot-thick.
B	GRAB				6			
					8			
					10			
					12			
					14	SP		**Bedrock** Granitic bedrock, gray, improving rock quality, weak to moderately strong, moderately weathered. Excavates as Poorly Graded Sand with Gravel, with an estimated 5% non-plastic fines, 55% fine to coarse sand, and 40% angular gravel. Cobbles 12 inches in diameter make up about 30% of the trm.
					16			Increasing hardness with depth.
					18			
					20			
					22			
					24			

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-04 DATE: 5/10/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SM		**Bedrock** Granitic bedrock, light brown to light gray to yellow brown, friable to weak, moderatley to highly weathered, sheared, includes clay gouge damage zone material. Excavates as Silty Sand with Gravel, with an estimated 15% non-plastic to medium plasticity fines, 50% fine to coarse sand, and 35% angular gravel. Friable rock breaks down to soil sized particles.
					4			Thin surficial fill less than 1-foot-thick.
					6			
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

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PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-05 DATE: 5/10/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SP		**Poorly Graded Sand with Silt and Gravel (Fill)** Brown to gray, moist, medium dense, with an estimated 10% non-plastic to low plasticity fines, 50% fine to coarse sand, and 40% angular gravel. Trace amounts of cobbles up to 12 inches in diameter.
					4	SM		Crushed rock aggregate, generally 1.25-inch-minus.
					6			**Bedrock** Granitic bedrock, light brown to light gray to yellow brown, weak, moderatley to highly weathered, sheared, includes clay gouge damage zone material. Excavates as Silty Sand with Gravel, with an estimated 15% non-plastic to medium plasticity fines, 50% fine to coarse sand, and 35% angular gravel. Friable rock breaks down to soil sized particles.
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-06 DATE: 5/11/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SP		**Poorly Graded Sand with Silt and Gravel (Fill)** Brown to gray, moist, medium dense, with an estimated 10% non-plastic to low plasticity fines, 50% fine to coarse sand, and 40% angular gravel. Trace amounts of cobbles up to 12 inches in diameter.
					2	GC		Crushed rock aggregate, generally 1.25-inch-minus.
A	GRAB				4			**Clayey Gravel with Sand** Reddish brown, very moist, dense, with an estimated 30% high plasticity fines, 30% fine to coarse sand, and 40% angular gravel. Cobbles up to 12 inches in diameter make up about 20% of the tsm.
					6			**Bedrock** Granitic bedrock, yellow brown to gray, weak to moderately strong, moderately weathered. Excavates as Poorly Graded Sand with Gravel, with an estimated 5% non-plastic fines, 55% fine to coarse sand, and 40% angular gravel. Generally 6-inch-minus material, trace boulders up to 18 inches in diameter.
					8			
					10			
B	GRAB				12	SP		
					14			
					16			
					18			
					20			
					22			
					24			

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-07 DATE: 5/10/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SP-SM		**Poorly Graded Sand with Silt and Gravel (Fill)** Brown to gray, moist, medium dense, with an estimated 10% non-plastic fines, 50% fine to coarse sand, and 40% angular gravel. Trace amounts of cobbles up to 12 inches in diameter. Crushed rock aggregate, generally 1.25-inch-minus. Loose starting 4 feet beneath the ground surface (bgs).
					4			
					6			
					8	GP		**Poorly Graded Gravel with Sand (Fill)** Brown to gray, moist, loose, with an estimated 5% non-plastic fines, 45% fine to coarse sand, and 50% angular gravel. Trace amounts of cobbles up to 12 inches in diameter. Crushed rock aggregate, generally 1.25-inch-minus. Includes seams of 2-inch-diameter crushed drain rock.
					10			
					12	GC		Significant ravelling.
					14	GP		**Clayey Gravel with Sand (Fill)** Reddish brown, very moist, loose, with an estimated 15% medium plasticity fines, 35% fine to coarse sand, and 50% angular gravel. Waste rock/ overburden material.
					16			**Bedrock** Granitic bedrock, reddish brown, very strong, slightly to moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel. Cobbles 12 inches in diameter make up about 30% of the trm. Increasing hardness with depth.
					18			
					20			
					22			
					24			

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-08 DATE: 5/10/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				2	SM		**Silty Sand with Gravel (Fill)** Brown to gray, moist, loose to medium dense, with an estimated 15% non-plastic fines, 60% fine to coarse sand, and 25% angular gravel. Crushed rock aggregate, generally 1.25-inch-minus.
					4	GP		**Bedrock** Granitic bedrock, gray to black, moderately strong to very strong, slightly to moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel. Cobbles up to 12 inches in diameter make up about 40% of the trm. Trace boulders up to 18 inches in diameter. Increasing hardness with depth.
					6			
					8			Refusal in hard bedrock.
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388921 E 264663 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-09 DATE: 5/10/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				2	SP-SM		**Poorly Graded Sand with Silt and Gravel (Fill)** Brown to gray, moist, medium dense, with an estimated 10% non-plastic to low plasticity fines, 55% fine to coarse sand, and 35% angular gravel. Cobbles up to 12 inches in diameter make up about 5% of the tsm. Trace amounts of boulders up to 3 feet in diameter.
					4			Crushed rock aggregate, generally 1.25-inch-minus.
					6			Loose starting 3 feet bgs, extensive ravelling and caving.
					8			
					10			
					12			
					14	GP		**Bedrock** Granitic bedrock, gray.
								Test pit collapse, depth to bedrock estimated.
					16			
					18			
					20			
					22			
					24			

N 4389009 E 264731 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-10 DATE: 5/10/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2			**Poorly Graded Sand with Gravel (Fill)** Brown to gray, moist, medium dense, with an estimated 5% non-plastic fines, 60% fine to coarse sand, and 35% angular gravel. Cobbles up to 8 inches in diameter make up about 10% of the tsm.
					4			Crushed rock aggregate.
					6	SP		Loose starting 3.5 feet bgs, extensive ravelling and caving.
A	GRAB				8			
					10			
					12			
B	GRAB					CH		**Sandy Fat Clay (Fill)** Reddish brown, very moist, stiff, with an estimated 75% high plasticity fines, 15% fine to coarse sand, and 10% angular gravel up to 2 inches in diameter.
					14	GP		**Bedrock** Granitic bedrock, reddish brown.
								Test pit collapse, depth to bedrock estimated.
					16			
					18			
					20			
					22			
					24			

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-11 DATE: 5/10/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SP		**Poorly Graded Sand with Gravel (Fill)** Brown to gray, moist, medium dense, with an estimated 5% non-plastic fines, 60% fine to coarse sand, and 35% angular gravel. Trace amounts of cobbles up to 6 inches in diameter.
					4			Crushed rock aggregate, generally 1.25-inch-minus.
					6	SP		**Bedrock** Granitic bedrock, brown to gray, weak to moderately strong, moderately weathered. Excavates as Poorly Graded Sand with Gravel, with an estimated 5% non-plastic fines, 55% fine to coarse sand, and 40% angular gravel. Cobbles up to 12 inches in diameter make up about 10% of the trm.
A	GRAB				8			Increased hardness at 9 feet bgs.
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-12 | DATE: 5/10/2018

TYPE OF HOE: Cat 336 E | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2			**Poorly Graded Sand with Gravel (Fill)** Brown to gray, moist, medium dense, with an estimated 5% non-plastic fines, 60% fine to coarse sand, and 35% angular gravel. Trace amounts of cobbles up to 6 inches in diameter.
A	GRAB				4	SP		Crushed rock aggregate, generally 1.25-inch-minus.
					6			
					8	SP		**Bedrock** Granitic bedrock, brown to gray, friable to moderately strong, moderately weathered. Excavates as Poorly Graded Sand with Silt and Gravel, with an estimated 10% non-plastic fines, 65% fine to coarse sand, and 25% angular gravel. Trace amounts of cobbles up to 6 inches in diameter.
					10			Increased hardness at 9 feet bgs.
					12			Practical digging refusal in bedrock.
					14			
					16			
					18			
					20			
					22			
					24			

N 4388822 E 264762 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-13 DATE: 5/10/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				2	SW-SM		**Well-Graded Sand (Fill)** Brown to gray, moist, medium dense, with an estimated 5% non-plastic fines, 85% fine to coarse sand, and 10% angular gravel up to 3/8 inch in diameter. Trace amounts of cobbles up to 6 inches in diameter. Crushed rock aggregate, generally bedding sand. 2- to 3-foot- diameter boulders 5-8.5 feet bgs.
					4			
					6			
					8	SP-SC		**Poorly Graded Sand with Clay and Gravel (Fill)** Dark bluish gray, moist, loose, with an estimated 10% medium plasticity fines, 55% fine to coarse sand, and 35% angular gravel. Trace amounts of cobbles up to 12 inches in diameter. Crushed rock aggregate, includes trace amounts of strippings and sage brush.
					10	GP		**Bedrock** Granitic bedrock, reddish brown, very strong, slightly to moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel. Cobbles up to 12 inches in diameter make up about 30% of the trm. Refusal in hard bedrock.
					12			
					14			
					16			
					18			
					20			
					22			
					24			

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-14 | DATE: 5/10/2018

TYPE OF HOE: Cat 336 E | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SP		**Poorly Graded Sand with Silt and Gravel (Fill)** Brown to gray, moist, medium dense, with an estimated 10% non-plastic fines, 55% fine to coarse sand, and 35% angular gravel. Trace amounts of cobbles up to 6 inches in diameter. Crushed rock aggregate, generally 1.25-inch-minus. Encountered ~12-inch-diameter PVC pipe at ~4 feet bgs crossing test pit in north-south to northeast-southwest direction.
A	GRAB				6	ML		**Silt with Sand (Fill)** Gray, very moist, very soft, with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand. Washed fines from aggregate processing.
					8			**Poorly Graded Sand with Silt and Gravel (Fill)** Brown to gray, moist, loose, with an estimated 10% non-plastic fines, 75% fine to coarse sand, and 15% angular gravel. Crushed rock aggregate, generally 0.5-inch-minus.
					10			
					12	SP-SM		
					14			
					16			
					18	SP		**Bedrock** Granitic bedrock, gray. Test pit collapse, depth to bedrock estimated.
					20			
					22			
					24			

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PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-15 | DATE: 5/10/2018

TYPE OF HOE: Cat 336 E | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SP		**Poorly Graded Sand with Gravel (Fill)** Brown to gray, moist, medium dense, with an estimated 5% non-plastic fines, 55% fine to coarse sand, and 40% angular gravel. Cobbles and boulders up to 18 inches in diameter make up about 10% of the tsm.
A	GRAB				4			Minimally processed crushed rock aggregate.
					6			
					8	ML		**Silt with Sand (Fill)** Gray, very moist, very soft, with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand.
					10			Washed fines from aggregate processing.
B	GRAB				12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388888 E 264966 UTM NAD83

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PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-16 DATE: 5/10/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				0–10	GC		**Clayey Gravel with Sand** Reddish brown, very moist, medium dense, with an estimated 35% medium to high plasticity fines, 25% fine to coarse sand, and 40% angular gravel. Cobbles and boulders up to 18 inches in diameter make up about 15% of the tsm. Waste rock/ overburden material.
B	GRAB				10–22	ML		**Silt with Sand (Fill)** Gray, very moist, very soft, with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand. Washed fines from aggregate processing.
C	GRAB				22–24			

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SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-17 DATE: 5/10/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2			**Poorly Graded Sand wtih Gravel (Fill)** Brown to gray, moist, medium dense, with an estimated 10% non-plastic fines, 70% fine to coarse sand, and 20% angular gravel. Trace amounts of cobbles up to 6 inches in diameter. Crushed rock aggregate, generally 0.5-inch-minus Loose starting 10 feet bgs, ravelling, caving below.
					4			
					6			
A	GRAB				8			
						SP-SM		
					10			
					12			
					14			
					16			
					18			**Poorly Graded Sand with Clay and Gravel (Fill)** Dark bluish gray, moist, loose, with an estimated 10% medium plasticity fines, 60% fine to coarse sand, and 30% angular gravel. Trace amounts of cobbles up to 12 inches in diameter.
B	GRAB					SP-SC		
					20			
C	GRAB					GP		Crushed rock aggregate, includes trace amounts of strippings and sage brush.
					22			**Bedrock** Granitic bedrock, light brown to tan, weak to moderately strong, moderately weathered. Excavates as Poorly Graded Sand with Gravel, with an estimated 10% non-plastic fines, 50% fine to coarse sand, and 40% angular gravel. Cobbles
					24			

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PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-17 DATE: 5/10/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					26			up to 8 inches in diameter make up about 10% of the trm.
					28			
					30			
					32			
					34			
					36			
					38			
					40			
					42			
					44			
					46			
					48			

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PLATE: 2

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-18 DATE: 5/10/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	GC		**Poorly Graded Gravel with Clay and Sand** Reddish brown, very moist, loose, with an estimated 10% low to medium plasticity fines, 40% fine to coarse sand, and 50% angular gravel. Cobbles and boulders up to 3 feet in diameter make up about 30-40% of the tsm. Waste rock/ overburden material.
					4			
					6	ML		**Silt with Sand (Fill)** Gray, very moist, very soft, with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand. Washed fines from aggregate processing.
					8			
					10			Test pit terminated due to collapsing side walls.
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388895 E 265039 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-19 | DATE: 5/10/2018

TYPE OF HOE: Cat 336 E | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				0	SC		**Clayey Sand with Gravel (Fill)** Reddish brown, very moist medium dense, with an estimated 45% medium to high plasticity fines, 40% fine to coarse sand, and 15% angular gravel. Includes trace amounts of asphalt concrete grindings.
B	GRAB				2	SP		**Poorly Graded Sand (Fill)** Gray, moist, loose, with an estimated 5% non-plastic fines, 85% fine to coarse sand, and 10% angular gravel up to 3/8 inch in diameter.
					4	GC		Crushed rock aggregate, bedding sand. **Clayey Gravel with Sand** Reddish brown to yellow brown, moist, loose to medium dense, with an estimated 15% medium plasticity fines, 35% fine to coarse sand, and 50% angular gravel. Cobbles up to 6 inches in diameter make up about 20% of the tsm.
C	GRAB				6			Waste rock/ overburden material. **Poorly Graded Sand with Silt and Gravel (Fill)** Brown to gray, moist, medium dense, with an estimated 10% non-plastic to low plasticity fines, 55% fine to coarse sand, and 35% angular gravel.
					8			Crushed rock aggregate, generally 1.25-inch-minus.
					10			
					12			
					14	SP-SM		
					16			
					18			
					20			
					22	GP-GM		**Bedrock** Granitic bedrock, light brown to brown, friable to weak, moderately weathered. Excavates as Poorly Graded Gravel with Silt and Sand, with an estimated 10% non-plastic fines, 40% fine to coarse sand, and 50% angular gravel. Cobbles up to 8 inches in diameter make up about 10% of the trm.
					24			

N 4388986 E 264956 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-20 DATE: 5/10/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				0–8	GP		**Bedrock** Granitic bedrock, gray, moderately strong to very strong, slightly to moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 25% medium to coarse sand, and 70% angular gravel. Cobbles and boulders up to 3 feet in diameter make up about 60-70% of the trm.
					8			Refusal in hard bedrock.

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-21 DATE: 5/11/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0			**Poorly Graded Sand with Silt and Gravel (Fill)** Yellowish brown to reddish brown, moist, medium dense, with an estimated 10% non-plastic fines, 60% fine to coarse sand, and 30% angular gravel. Cobbles and boulders up to 18 inches in diameter make up about 10% of the tsm.
A	GRAB				4	SP-SM		Waste rock/ overburden material.
					8	SC		**Clayey Sand with Gravel** Reddish brown, moist, dense, with an estimated 30% medium to high plasticity fines, 40% fine to coarse sand, and 30% angular gravel. Cobbles up to 8 inches in diameter make up about 10% of the tsm.
B	GRAB				10			**Bedrock** Granitic bedrock, yellow brown to brown, weak to moderately strong, moderately weathered. Excavates as Poorly Graded Sand with Gravel, with an estimated 5% non-plastic fines, 55% fine to coarse sand, and 40% angular gravel. Cobbles up to 12 inches in diameter make up about 10% of the trm.
					12	SP		Increasing hardness with depth.
					14			
					16			
					18			
					20			
					22			
					24			

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SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-22 DATE: 5/11/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				0–8	SM		**Silty Sand (Fill)** Gray, moist, medium dense, with an estimated 20% non-plastic fines, 70% fine to coarse sand, and 10% angular gravel. Cobbles 8 inches in diameter make up about 10% of the tsm. Crushed rock aggregate, minimally processed.
B	GRAB				8–10	SC		**Clayey Sand with Gravel** Reddish brown, moist, dense, with an estimated 30% medium to high plasticity fines, 40% fine to coarse sand, and 30% angular gravel. Cobbles up to 8 inches in diameter make up about 10% of the tsm.
					10–12	SP		**Bedrock** Granitic bedrock, yellow brown to brown, weak to moderately strong, moderately weathered. Excavates as Poorly Graded Sand with Gravel, with an estimated 5% non-plastic fines, 55% fine to coarse sand, and 40% angular gravel. Cobbles up to 12 inches in diameter make up about 10% of the trm. Increasing hardness with depth.

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-23 DATE: 5/11/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				2	SC		**Clayey Sand with Gravel (Fill)** Brown to light brown, moist, medium dense, with an estimated 15% medium plasticity fines, 55% fine to coarse sand, and 30% angular gravel. Trace amounts of cobbles up to 6 inches in diameter.
					4			
					6			
					8			
B	GRAB				10	GC		**Clayey Gravel with Sand** Reddish brown, moist, dense, with an estimated 30% medium to high plasticity fines, 30% fine to coarse sand, and 40% angular gravel. Cobbles up to 8 inches in diameter make up about 5% of the tsm.
					12	SP		**Bedrock** Granitic bedrock, yellow brown to brown, weak to moderately strong, moderately weathered. Excavates as Poorly Graded Sand with Gravel, with an estimated 5% non-plastic fines, 55% fine to coarse sand, and 40% angular gravel. Cobbles up to 12 inches in diameter make up about 10% of the trm. Increasing hardness with depth.
					14			
					16			
					18			
					20			
					22			
					24			

N 4388617 E 264386 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-24 DATE: 5/11/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				2	SC		**Clayey Sand with Gravel (Fill)** Light brown, slightly moist, medium dense, with an estimated 35% medium to high plasticity fines, 50% fine to coarse sand, and 15% angular gravel up to 3 inches in diameter.
					4	SC		**Clayey Sand** Reddish brown, very moist, medium dense, with an estimated 45% medium to high plasticity fines, 45% fine to coarse sand, and 10% angular gravel up to 2 inches in diameter.
					6	GP		**Bedrock** Granitic bedrock, gray, very strong, slightly to moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 45% fine to coarse sand, and 50% angular gravel. Cobbles up to 6 inches in diameter make up about 15% of the trm. Refusal in hard bedrock.
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388592 E 264532 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-25 DATE: 5/11/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				2	SC		**Clayey Sand with Gravel (Fill)** Light brown, slightly moist, medium dense, with an estimated 15% medium plasticity fines, 55% fine to coarse sand, and 30% angular gravel. Cobbles up to 12 inches in diameter make up about 15% of the tsm.
								Waste rock/ overburden material.
B	GRAB				4			**Silt with Sand (Fill)** Gray, very moist, very soft, with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand.
					6			Washed fines from aggregate processing.
					8	ML		
					10			
					12			
					14	GP		**Bedrock** Granitic bedrock, gray, very strong, slightly to moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 45% fine to coarse sand, and 50% angular gravel. Cobbles and boulders up to 2 feet in diameter make up about 30% of the trm.
					16			Contact with fill slopes up to the northeast.
					18			Refusal in hard bedrock.
					20			
					22			
					24			

N 4388662 E 264289 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-26 DATE: 5/11/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				0	CH		**Sandy Fat Clay (Fill)** Reddish brown, very moist, stiff, with an estimated 65% medium to high plasticity fines, 25% fine to coarse sand, and 10% angular gravel up to 3 inches in diameter.
					2			**Bedrock** Granitic bedrock, gray, very strong to extremely strong, slightly to moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 45% fine to coarse sand, and 50% angular gravel. Cobbles up to 12 inches in diameter make up about 15% of the trm.
					4	GP		
B	GRAB				6			
					8			Refusal in hard bedrock.
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388724 E 264319 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-27 DATE: 5/11/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SC		**Clayey Sand with Gravel (Fill)** Light brown, slightly moist, medium dense, with an estimated 15% medium plasticity fines, 55% fine to coarse sand, and 30% angular gravel. Cobbles up to 12 inches in diameter make up about 15% of the tsm. Waste rock/ overburden material.
					4			
					6	GP		**Bedrock** Granitic bedrock, gray, very strong to extremely strong, slightly to moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 45% fine to coarse sand, and 50% angular gravel. Cobbles up to 12 inches in diameter make up about 15% of the trm. Refusal in hard bedrock.
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388688 E 264339 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-28 DATE: 5/11/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	GP		**Bedrock** Granitic bedrock, gray, very strong to extremely strong, slightly weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 45% fine to coarse sand, and 50% angular gravel. Cobbles and boulders up to 2 feet in diameter make up about 25% of the trm. Refusal in hard bedrock.
					4			
					6			
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388777 E 264389 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-29 DATE: 5/11/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2			**Clayey Sand with Gravel (Fill)** Brown to reddish brown, moist to very moist, loose to medium dense, with an estimated 25% medium to high plasticity fines, 50% fine to coarse sand, and 25% angular gravel. Cobbles and boulders up to 4 feet in diameter make up about 20-30% of the tsm. Rock content variable.
					4			Waste rock/ overburden material.
A	GRAB				6			
					8	SC		
					10			
					12			
					14			
					16			Test pit terminated due to caving, collapsing sidewalls.
					18			
					20			
					22			
					24			

N 4388760 E 264451 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-30 DATE: 5/11/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				2	SC		**Clayey Sand with Gravel (Fill)** Brown to reddish brown, moist to very moist, loose to medium dense, with an estimated 20% medium to high plasticity fines, 55% fine to coarse sand, and 25% angular gravel. Cobbles and boulders up to 2 feet in diameter make up about 10% of the tsm. Waste rock/ overburden material.
B	GRAB				4			
					6	SP-SM		**Bedrock** Granitic bedrock, light brown to tan, friable to weak, moderately to highly weathered. Excavates as Poorly Graded Sand with Silt and Gravel, with an estimated 10% low plasticity fines, 55% fine to coarse sand, and 35% angular gravel. Cobbles up to 6 inches in diameter make up about 10% of the trm.
					8			
					10	SP		**Bedrock** Granitic bedrock, gray, moderately strong to strong, moderately weathered. Excavates as Poorly Graded Sand with Gravel, with an estimated 5% non-plastic fines, 55% fine to coarse sand, and 45% angular gravel. Cobbles up to 12 inches in diameter make up about 30% of the trm. Increasing hardness with depth.
					12			
					14			Practical digging refusal.
					16			
					18			
					20			
					22			
					24			

N 4388792 E 264517 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

TEST PIT LOG

TEST PIT NO.: TP-31 DATE: 5/11/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				0–6	SC		**Clayey Sand with Gravel (Fill)** Brown, moist, loose, with an estimated 20% medium plasticity fines, 60% fine to coarse sand, and 20% angular to rounded gravel. Cobbles and boulders up to 18 inches in diameter make up about 10% of the tsm. Includes trace amounts of asphalt concrete debris.
B	GRAB				6–14	ML		**Silt with Sand (Fill)** Gray, very moist, very soft, with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand. Washed fines from aggregate processing.
					14			Test pit terminated due to collapsing side walls.

N 4388577 E 264819 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-32 DATE: 5/11/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SC		**Clayey Sand with Gravel (Fill)** Brown, moist, loose, with an estimated 20% medium plasticity fines, 60% fine to coarse sand, and 20% angular to rounded gravel. Cobbles and boulders up to 18 inches in diameter make up about 10% of the tsm. Includes trace amounts of asphalt concrete debris.
					4			
					6			
					8	ML		**Silt with Sand (Fill)** Gray, very moist, very soft, with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand. Washed fines from aggregate processing.
					10			
					12			
					14			Test pit terminated due to collapsing side walls.
					16			
					18			
					20			
					22			
					24			

N 4388612 E 264806 UTM NAD83

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PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-33 DATE: 5/11/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				0	SC		**Clayey Sand with Gravel (Fill)** Brown, moist, loose, with an estimated 20% medium plasticity fines, 60% fine to coarse sand, and 20% angular to rounded gravel. Cobbles and boulders up to 18 inches in diameter make up about 10% of the tsm. Includes trace amounts of asphalt concrete debris.
					2			**Silt with Sand (Fill)** Gray, very moist, very soft, with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand.
					4	ML		Washed fines from aggregate processing.
					6			
					8	GP		**Bedrock** Granitic bedrock, gray, moderately strong to strong, slightly to moderately weathered. Excavates as Poorly Graded Gravel.
					10			Bedrock slopes up to the north, out of the old pond area.
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388637 E 264798 UTM NAD83

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PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-34 DATE: 5/11/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SC		**Clayey Sand with Gravel (Fill)** Brown, moist, loose, with an estimated 20% medium plasticity fines, 60% fine to coarse sand, and 20% angular to rounded gravel. Cobbles and boulders up to 18 inches in diameter make up about 10% of the tsm. Includes trace amounts of asphalt concrete debris. Includes PCC debis (K rail and slabs) up to 4 feet in length.
					4			
					6			
					8			
					10	ML		**Silt with Sand (Fill)** Gray, very moist, very soft, with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand. Washed fines from aggregate processing.
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388552 E 264786 UTM NAD83

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SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-35 DATE: 5/11/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2			**Clayey Sand with Gravel (Fill)** Brown, moist, loose, with an estimated 20% medium plasticity fines, 60% fine to coarse sand, and 20% angular to rounded gravel. Cobbles and boulders up to 3 feet in diameter make up about 15% of the tsm. Includes trace amounts of asphalt concrete debris.
A	GRAB				4	SC		Includes PCC debis (K rail and slabs) up to 4 feet in length.
					6			
					8			**Silt with Sand (Fill)** Gray, very moist to wet, very soft, with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand.
					10			Washed fines from aggregate processing.
						ML		Seeping water at 7.5 feet bgs, not saturated below.
					12			
					14			
					16			Test pit terminated due to collapsing side walls, bottom depth estimated.
					18			
					20			
					22			
					24			

N 4388528 E 264836 UTM NAD83

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SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-36 DATE: 5/11/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SC		**Clayey Sand with Gravel (Fill)** Brown, moist, loose, with an estimated 20% medium plasticity fines, 60% fine to coarse sand, and 20% angular to rounded gravel. Cobbles and boulders up to 3 feet in diameter make up about 15% of the tsm. Includes trace amounts of asphalt concrete debris. Includes PCC debis up to 3 feet in length.
					4			
					6			
					8			
					10			
					12			
					14			
					16	SM		**Silty Sand with Gravel (Fill)** Gray, moist, loose, with an estimated 15% non-plastic fines, 50% fine to coarse sand, and 35% angular gravel. PCC, AC, and oversized rock up to 2 feet in diameter make up about 40% of the tsm.
					18	ML		**Silt with Sand (Fill)** Gray, very moist to wet, very soft, with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand.
					20			Washed fines from aggregate processing. Seeping water at 7.5 feet bgs, not saturated below. Test pit terminated due to collapsing side walls, bottom depth estimated.
					22			
					24			

N 4388588 E 264765 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-37 DATE: 5/14/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SP		**Poorly Graded Sand with Gravel (Fill)** Gray, moist, loose, with an estimated 5% non-plastic fines, 60% fine to coarse sand, and 35% angular gravel. Cobbles and boulders up to 1.5 feet in diameter make up about 20% of the tsm. Minimally processed aggregate materials.
					4			
					6			
					8			
					10	SC		**Clayey Sand with Gravel (Fill)** Brown, moist, loose, with an estimated 20% medium plasticity fines, 60% fine to coarse sand, and 20% angular to rounded gravel. Cobbles and boulders up to 3 feet in diameter make up about 15% of the tsm.
					12			
					14			
					16			
					18	ML		**Silt with Sand (Fill)** Gray, very moist, very soft, with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand. Washed fines from aggregate processing.
					20			
					22			
					24			

N 4388586 E 264854 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-38 DATE: 5/14/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SP		**Poorly Graded Sand with Silt (Fill)** Gray, moist, loose, with an estimated 10% non-plastic fines, 90% fine to coarse sand, and trace amounts of angular gravel up to 2 inches in diameter. Crushed rock aggregate, bedding sand.
					4	SM		**Silty Sand with Gravel (Fill)** Brown, moist, loose, with an estimated 15% non-plastic fines, 65% fine to coarse sand, and 20% angular gravel. Cobbles 8 inches in diameter make up about 10% of the tsm. Crushed rock aggregate, minimally processed.
					8	ML		**Silt with Sand (Fill)** Gray, very moist, very soft, with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand. Washed fines from aggregate processing.
					12	GP		**Bedrock** Granitic bedrock, gray, strong, slightly weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel. Cobbles and boulders up to 18 inches in diameter make up about 30-40% of the trm.
					16			
					18			
					20			
					22			
					24			

N 4388499 E 264858 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-39 DATE: 5/14/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	GC		**Clayey Gravel with Sand** Brown, very moist, medium dense, with an estimated 35% medium to high plasticity fines, 25% fine to coarse sand, and 40% angular gravel. Cobbles and boulders up to 18 inches in diameter make up about 15% of the tsm.
					2			Waste rock/ overburden material.
					4			**Bedrock** Granitic bedrock, gray, strong, slightly weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel. Cobbles and boulders up to 18 inches in diameter make up about 40% of the trm.
					6			
					8	GP		
					10			Shallow refusal immediately north in hard bedrock.
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388408 E 264727 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-40 DATE: 5/14/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	GP		**Bedrock** Granitic bedrock, gray to tan, moderately strong to strong, slightly to moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel. Cobbles up to 8 inches in diameter make up about 30% of the trm.
					4			Increasing hardness with depth.
					6			
					8			Refusal in hard bedrock.
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388512 E 264666 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-41 DATE: 5/14/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				2	ML		**Sandy Silt (Fill)** Gray, slightly moist, soft, with an estimated 60% non-plastic to low plasticity fines, 30% fine to coarse sand, and 10% angular to rounded gravel up to 2 inches in diameter.
					4	CH		**Sandy Fat Clay** Reddish brown, very moist, very stiff, with an estimated 60% high plasticity fines, 30% fine to coarse sand, and 10% angular gravel up to 3 inches in diameter.
B	GRAB				6			**Bedrock** Granitic bedrock, reddish brown to gray, friable to weak, moderately to strongly weathered. Excavates as Clayey Sand with Gravel, with an estimated 15% medium plasticity fines, 60% fine to coarse sand, and 35% angular gravel up to 3 inches in diameter. Rock breaks down to soil sized particles during excavation.
					8	SC		
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388666 E 264207 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-42 | DATE: 5/14/2018

TYPE OF HOE: Cat 336 E | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SC		**Clayey Sand with Gravel** Reddish brown, moist, medium dense, with an estimated 30% medium to high plasticity fines, 40% fine to coarse sand, and 30% angular gravel up to 3 inches in diameter.
A	GRAB				2	GP		**Bedrock** Granitic bedrock, gray with reddish brown staining, very strong, slightly to moderately weathered. Excavates as Poorly Graded Gravel with an estimated 5% non-plastic fines, 40% fine to coarse sand, and 55% angular gravel. Cobbles and boulders up to 18 inches in diameter make up about 30-40% of the trm.
					4			Refusal in hard bedrock.
					6			
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388815 E 264250 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-43 DATE: 5/14/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	CH		**Sandy Fat Clay with Gravel** Reddish brown, moist, very stiff, with an estimated 55% high plasticity fines, 30% fine to coarse sand, and 15% angular gravel. Cobbles and boulders up to 18 inches in diameter make up about 15% of the tsm.
					4	SP-SM		**Bedrock** Granitic bedrock, gray to yellow brown, weak to moderately strong, moderately to highly weathered. Excavates as Poorly Graded Sand with Silt and Gravel with an estimated 10% low plasticity fines, 55% fine to coarse sand, and 35% angular gravel. Cobbles up to 6 inches in diameter make up about 15% of the tsm.
					6			Very tough digging.
					8			Gray, moderately strong, slightly to moderately weathered.
					10	SP-SM		Easier digging characteristics.
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388734 E 264076 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-44 DATE: 5/14/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SC		**Clayey Sand with Gravel** Reddish brown, moist, medium dense, with an estimated 30% medium to high plasticity fines, 40% fine to coarse sand, and 30% angular gravel up to 3 inches in diameter. Cobbles up to 12 inches in diameter make up about 10% of the tsm.
A	GRAB				2	GP		**Bedrock** Granitic bedrock, gray to yellow brown, strong to very strong, slightly to moderately weathered. Excavates as Poorly Graded Gravel with an estimated 5% non-plastic fines, 40% fine to coarse sand, and 55% angular gravel. Cobbles and boulders up to 18 inches in diameter make up about 10% of the trm. Refusal in hard bedrock.
					4			
					6			
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388668 E 263823 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-45 DATE: 5/14/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				0	CH		**Sandy Fat Clay with Gravel** Reddish brown, moist, very stiff, with an estimated 55% high plasticity fines, 30% fine to coarse sand, and 15% angular gravel. Cobbles and boulders up to 18 inches in diameter make up about 15% of the tsm.
					2			**Bedrock** Granitic bedrock, gray to yellow brown, moderately strong, moderately to highly weathered. Excavates as Poorly Graded Sand with Silt and Gravel with an estimated 10% non-plastic fines, 55% fine to coarse sand, and 35% angular gravel. Cobbles up to 6 inches in diameter make up about 15% of the tsm.
					4	SP-SM		
					6			Increasing hardness with depth. Refusal in hard bedrock.
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388726 E 263901 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-46 DATE: 5/14/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	GC		**Clayey Gravel with Sand** Reddish brown, moist, medium dense, with an estimated 15% medium to high plasticity fines, 25% fine to coarse sand, and 60% angular gravel up to 3 inches in diameter. Cobbles up to 12 inches in diameter make up about 30% of the tsm.
					2	GP		**Bedrock** Granitic bedrock, gray to yellow brown, very strong to extremely strong, slightly to moderately weathered. Excavates as Poorly Graded Gravel with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel. Cobbles and boulders up to 3 feet in diameter make up about 60-70% of the trm.
					4			
					6			Increasing hardness and boulder size with depth. Refusal in hard bedrock.
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388906 E 263944 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-47 DATE: 5/14/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	GC		**Clayey Gravel with Sand** Reddish brown, moist, medium dense, with an estimated 15% medium to high plasticity fines, 25% fine to coarse sand, and 60% angular gravel up to 3 inches in diameter. Cobbles and boulders up to 18 inches in diameter make up about 20% of the tsm.
					2			**Bedrock** Granitic bedrock, gray to yellow brown, very strong to extremely strong, slightly to moderately weathered. Excavates as Poorly Graded Gravel with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel. Cobbles and boulders up to 3 feet in diameter make up about 50-60% of the trm. Mostly 12-inch-minus material.
					4	GP		
					6			Increasing hardness and boulder size with depth.
					8			
					10			Refusal in hard bedrock.
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388919 E 264309 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-48 DATE: 5/14/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	CH		**Sandy Fat Clay with Gravel** Reddish brown, moist, very stiff, with an estimated 55% high plasticity fines, 30% fine to coarse sand, and 15% angular gravel up to 3 inches in diameter.
					2	SP		**Bedrock** Granitic bedrock, yellow brown, friable to weak, moderately to highly weathered. Excavates as Poorly Graded Sand with Gravel with an estimated 5% non-plastic fines, 65% fine to coarse sand, and 30% angular gravel up to 3 inches in diameter.
					4			Very tough digging.
					6	SP		Gray, friable to weak, moderately weathered.
					8			Easier digging characteristics.
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4389181 E 264522 UTM NAD83

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PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-49 DATE: 5/14/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	CH		**Sandy Fat Clay with Gravel** Reddish brown, moist, very stiff, with an estimated 55% high plasticity fines, 30% fine to coarse sand, and 15% angular gravel up to 3 inches in diameter.
A	GRAB				2	GP		**Bedrock** Granitic bedrock, yellow brown, friable to weak, moderately to highly weathered. Excavates as Poorly Graded Gravel with Sand with an estimated 5% non-plastic fines, 40% fine to coarse sand, and 55% angular gravel. Cobbles up to 6 inches in diameter make up about 10% of the trm.
					4			
					6			Very tough digging. Gray, friable to weak, moderately weathered.
					8	SP		Easier digging characteristics.
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4389112 E 264569 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-50 DATE: 5/14/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SC		**Clayey Sand with Gravel (Fill)** Brown, moist, loose, with an estimated 15% medium plasticity fines, 55% fine to coarse sand, and 30% angular gravel. Cobbles and boulders up to 2 feet in diameter make up about 40% of the tsm.
					2			Waste rock/ overburden material.
					4			**Bedrock** Granitic bedrock, yellow brown, friable to weak, moderately to highly weathered. Excavates as Poorly Graded Sand with Gravel with an estimated 5% non-plastic fines, 65% fine to coarse sand, and 30% angular gravel up to 3 inches in diameter.
					6	SP		Very tough digging.
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4389069 E 264629 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-51 DATE: 5/14/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SC		**Clayey Sand with Gravel (Fill)** Reddish brown, very moist, loose, with an estimated 45% medium to high plasticity fines, 30% fine to coarse sand, and 25% angular gravel. Cobbles and boulders up to 2 feet in diameter make up about 20-30% of the tsm.
					4			Sloping contact along steep bedrock cut slope.
					6	SP		**Bedrock** Granitic bedrock, gray, friable to weak, moderately weathered. Excavates as Poorly Graded Sand with Gravel with an estimated 5% non-plastic fines, 65% fine to coarse sand, and 30% angular gravel. Cobbles up to 12 inches in diameter make up about 10% of the trm.
					8			
					10			
					12			Test pit excavated at top of reclaimed slope where slumping fill exists below the bedrock cut slope. The reclaimed slope appears to be 0.75H:1V or steeper.
					14			
					16			
					18			
					20			
					22			
					24			

N 4389045 E 264566 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-52 DATE: 5/14/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	GC		**Clayey Gravel with Sand** Reddish brown, moist, dense, with an estimated 15% high plasticity fines, 40% fine to coarse sand, and 45% angular gravel. Cobbles up to 8 inches in diameter make up about 15% of the tsm.
					2	GP		**Bedrock** Granitic bedrock, gray to light gray, very strong to extremely strong, slightly to moderately weathered. Excavates as Poorly Graded Gravel with Sand with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel. Cobbles and boulders up to 2 feet in diameter make up about 30% of the trm.
					4			
					6			Increasing hardness with depth. Refusal in hard bedrock.
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4389245 E 264819 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-53 DATE: 5/14/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	GC		**Clayey Gravel with Sand** Reddish brown, very moist, dense, with an estimated 15% medium to high plasticity fines, 40% fine to coarse sand, and 45% angular fine to coarse gravel. Cobbles and boulders up to 18 inches in diameter make up about 20% of the tsm.
					2	GP		**Bedrock** Granitic bedrock, gray to light gray, very strong to extremely strong, slightly to moderately weathered. Excavates as Poorly Graded Gravel with Sand with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel. Cobbles and boulders up to 2 feet in diameter make up about 30-50% of the trm.
					4			Increasing hardness with depth.
					6			Refusal in hard bedrock.
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4389228 E 264978 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-54 DATE: 5/14/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SC		**Clayey Sand with Gravel** Reddish brown, very moist, dense, with an estimated 30% medium to high plasticity fines, 40% fine to coarse sand, and 30% angular fine to coarse gravel. Cobbles and boulders up to 18 inches in diameter make up about 10% of the tsm.
					2	GP		**Bedrock** Granitic bedrock, gray to light gray, strong to very strong, slightly to moderately weathered. Excavates as Poorly Graded Gravel with Sand with an estimated 5% non-plastic fines, 25% fine to coarse sand, and 70% angular gravel. Cobbles up to 6 inches in diameter make up about 20% of the trm.
					4			
					6	SP-SM		**Bedrock** Granitic bedrock, gray, weak to moderately strong, moderately weathered. Excavates as Poorly Graded Sand with Silt and Gravel with an estimated 10% non-plastic fines, 45% fine to coarse sand, and 45% angular fine to coarse gravel. Cobbles up to 12 inches in diameter make up about 20% of the trm.
					8			
					10			Increasing hardness with depth. Practical digging refusal in bedrock.
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4389187 E 265076 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-55 DATE: 5/15/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SM		**Silty Sand with Gravel (Fill)** Brown, moist, loose, with an estimated 20% non-plastic to low plasticity fines, 60% fine to coarse sand, and 20% angular gravel. Cobbles up to 12 inches in diameter make up about 20% of the tsm.
					4			
					6	GP		**Bedrock** Granitic bedrock, gray, strong to very strong, slightly weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 25% fine to coarse sand, and 70% fine to coarse gravel. Cobbles and boulders up to 18 inches in diameter make up about 40% of the trm. Refusal in hard bedrock.
					8			Excavated near toe of reclaimed slope.
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-56 | DATE: 5/15/2018

TYPE OF HOE: Cat 336 E | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SM		**Silty Sand with Gravel (Fill)** Brown, moist, loose, with an estimated 20% non-plastic to low plasticity fines, 60% fine to coarse sand, and 20% angular gravel. Cobbles up to 12 inches in diameter make up about 20% of the tsm.
					4	ML		**Silt with Sand** Gray, very moist, very soft, with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand. Washed fines from aggregate processing.
					6			
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-57 | DATE: 5/15/2018

TYPE OF HOE: Cat 336 E | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				2	SC		**Clayey Sand with Gravel (Fill)** Brown, moist, loose, with an estimated 25% medium plasticity fines, 60% fine to coarse sand, and 15% angular gravel. Cobbles up to 12 inches in diameter make up about 20% of the tsm.
					4			**Silt with Sand** Gray, very moist, very soft, with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand.
					6			Washed fines from aggregate processing.
					8			
					10			
					12	ML		
					14			
					16			
					18			
					20			
					22			
						GP		**Bedrock** Granitic bedrock excavates as Poorly Graded Gravel.
					24			Maximum excavator reach, poor recovery.

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-58 DATE: 5/15/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SC		**Clayey Sand with Gravel (Fill)** Brown, moist, loose, with an estimated 25% medium plasticity fines, 60% fine to coarse sand, and 15% angular gravel. Cobbles up to 12 inches in diameter make up about 20% of the tsm. 3-foot-diameter boulder at 2 feet bgs.
					4			
					6	ML		**Silt with Sand** Gray, very moist, very soft, with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand. Washed fines from aggregate processing.
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-59 DATE: 5/15/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SC		**Clayey Sand with Gravel (Fill)** Brown, moist, very loose to loose, with an estimated 25% medium plasticity fines, 60% fine to coarse sand, and 15% angular gravel. Cobbles up to 12 inches in diameter make up about 40% of the tsm. Waste rock/ overburden material.
					4			
					6			
					8	ML		**Silt with Sand** Gray, very moist, very soft, with an estimated 60-90% non-plastic to low plasticity fines and 10-40% fine sand. Washed fines from aggregate processing.
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-60 DATE: 5/15/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SM		**Silty Sand with Gravel (Fill)** Brown, moist, loose, with an estimated 20% non-plastic to low plasticity fines, 60% fine to coarse sand, and 20% angular gravel. Cobbles up to 12 inches in diameter make up about 20% of the tsm.
					2			**Bedrock** Granitic bedrock, gray, strong to very strong, moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 45% fine to coarse sand, and 50% fine to coarse gravel. Cobbles and boulders up to 18 inches in diameter make up about 20% of the trm.
					4			
					6	GP		Increasing hardness with depth.
					8			
					10			Refusal in hard bedrock.
					12			
					14			
					16			
					18			
					20			
					22			
					24			

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-61 DATE: 5/15/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SP-SM		**Poorly Graded Sand with Silt and Gravel (Fill)** Brown, moist, loose, with an estimated 10% non-plastic fines, 60% fine to coarse sand, and 30% angular gravel. Cobbles and boulders up to 3 feet in diameter make up about 50-70% of the tsm. Waste rock/ material for processing. 5-foot-diameter boulder at about 3 feet bgs.
					10	GP		**Bedrock** Granitic bedrock, gray, strong to very strong, moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 45% fine to coarse sand, and 50% fine to coarse gravel. Cobbles up to 12 inches in diameter make up about 40% of the trm. Increasing hardness with depth. Refusal in hard bedrock.

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-62 DATE: 5/15/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0			**Clayey Sand (Fill)** Variable clayey sand, clay, silt and silty sand fill materials within reclaimed slope.
					2			
					4	SC		
					6			
					8			
					10	GP		**Bedrock** Granitic bedrock, gray, strong to very strong, moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 45% fine to coarse sand, and 50% fine to coarse gravel. Cobbles up to 12 inches in diameter make up about 40% of the trm.
					12			Increasing hardness with depth.
					14			Test pit excavated as trench through toe of reclaimed slope. Native bedrock slopes approximately 4H:1V and steepens towards pit.
					16			
					18			
					20			
					22			
					24			

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-63 DATE: 5/15/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SC		**Clayey Sand with Gravel (Fill)** Brown to reddish brown, moist, loose, with an estimated 30% medium to high plasticity fines, 40% fine to coarse sand, and 30% angular gravel. Cobbles and boulders up to 18 inches in diameter make up about 20% of the tsm.
					4			
					6	SP-SM		**Bedrock** Granitic bedrock, gray, strong, moderately weathered. Excavates as Poorly Graded Sand with Silt and Gravel with an estimated 10% non-plastic fines, 55% fine to coarse sand, and 35% angular gravel. Cobbles up to 8 inches in diameter make up about 15% of the trm.
					8			
					10			Test pit excavated on reclaimed slope. Fill cover over native rock sloping at about 2H:1V.
					12			
					14			
					16			
					18			
					20			
					22			
					24			

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-64 DATE: 5/15/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SP		**Poorly Graded Sand with Gravel (Fill)** Brown to gray, moist, very loose, with an estimated 5% non-plastic fines, 70% fine to coarse sand, and 25% angular gravel. Cobbles up to 12 inches in diameter make up about 20% of the tsm. Waste rock/ material for aggregate processing. Severe ravelling and caving.
					4			
					6			
					8			
					10	SP-SM		**Bedrock** Granitic bedrock, gray, strong, moderately weathered. Excavates as Poorly Graded Sand with Silt and Gravel with an estimated 10% non-plastic fines, 55% fine to coarse sand, and 35% angular gravel. Cobbles up to 8 inches in diameter make up about 15% of the trm.
					12			
					14			Test pit excavated on reclaimed slope. Fill cover over steep native rock sloping steeper than 0.5H:1V.
					16			
					18			
					20			
					22			
					24			

N 4389047 E 264855 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-65 DATE: 5/15/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SP		**Poorly Graded Sand with Gravel (Fill)** Brown to gray, moist, very loose, with an estimated 5% non-plastic fines, 70% fine to coarse sand, and 25% angular gravel. Cobbles up to 12 inches in diameter make up about 20% of the tsm. Waste rock/ material for aggregate processing.
					4			Severe ravelling and caving.
						SP-SM		**Bedrock** Granitic bedrock, gray, very strong, slightly to moderately weathered. Excavates as Poorly Graded Sand with Silt and Gravel with an estimated 10% non-plastic fines, 55% fine to coarse sand, and 35% angular gravel. Cobbles up to 8 inches in diameter make up about 15% of the trm.
					6			
					8			Test pit excavated on reclaimed slope. Fill cover over native rock sloping moderately at about 1H:1V.
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4389081 E 264850 UTM NAD83

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PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-66 DATE: 5/15/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SP		**Poorly Graded Sand with Gravel (Fill)** Brown to gray, moist, very loose, with an estimated 5% non-plastic fines, 70% fine to coarse sand, and 25% angular gravel. Cobbles up to 12 inches in diameter make up about 20% of the tsm.
								Waste rock/ material for aggregate processing.
					4			Severe ravelling and caving.
						SP-SM		**Bedrock** Granitic bedrock, gray, very strong, slightly to moderately weathered. Excavates as Poorly Graded Sand with Silt and Gravel with an estimated 10% non-plastic fines, 55% fine to coarse sand, and 35% angular gravel. Cobbles up to 8 inches in diameter make up about 15% of the trm.
					6			
					8			Test pit excavated on reclaimed slope. Fill cover over native rock sloping moderately at about 1H:1V.
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4389105 E 264837 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-67 DATE: 5/15/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SM		**Silty Sand with Gravel (Fill)** Light brown, slightly moist, loose, with an estimated 15% non-plastic fines, 50% fine to coarse sand, and 35% angular to rounded gravel. Cobbles and boulders up to 2 feet in diameter make up about 10% of the tsm. Contains about 40% PCC debris up to 4 feet in length. Waste rock/ overburden material. Ravelling and caving.
					4			
					6			
					8	SC		**Clayey Sand with Gravel (Fill)** Reddish brown, moist, loose, with an estimated 25% low to medium plasticity fines, 55% fine to coarse sand, and 20% angular to rounded gravel. Cobbles and boulders up to 2 feet in diameter make up about 20% of the tsm.
					10			
					12			
					14			
					16	SM		**Silty Sand with Gravel (Fill)** Light brown, slightly moist, loose, with an estimated 15% non-plastic fines, 60% fine to coarse sand, and 25% angular to rounded gravel. Cobbles up to 12 inches in diameter make up about 10% of the tsm. Waste rock/ aggregates material. Severe ravelling and caving.
					18			
					20			
					22	SP-SM		**Bedrock** Granitic bedrock. No details due to caving, ravelling fill material.
					24			Test pit excavated on reclaimed slope. Fill cover over native rock, fill beneath pit floor, no geometery of native rock encountered.

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-68

DATE: 5/15/2018

TYPE OF HOE: Cat 336 E

DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP

GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SP		**Poorly Graded Sand with Silt and Gravel (Fill)** Gray, very moist, loose, with an estimated 10% non-plastic fines, 75% fine to coarse sand, and 15% angular gravel up to 3/4 inch in diameter. Cobbles and boulders up to 3 feet make up about 20% of the tsm.
					4	GC		Crushed rock aggregates and rock for processing. **Bedrock** Weathered granitic bedrock. Excavates as Clayey Gravel with Sand with an estimated 15% medium plasticity fines, 40% fine to coarse sand, and 45% angular gravel.
					6			Test pit excavated at toe of reclaimed slope.
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4389171 E 264684 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-69 DATE: 5/15/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				2	SP-SC		**Poorly Graded Sand with Clay and Gravel (Fill)** Brown to light reddish brown, moist, loose, with an estimated 10% low to medium plasticity fines, 55% fine to coarse sand, and 35% angular gravel up to 1-1/2 inches in diameter. Cobbles and boulders up to 18 inches in diameter make up about 10% of the tsm. Waste rock/ overburden material.
					8	SP-SM		**Bedrock** Granitic bedrock, gray, friable to weak, moderately to highly weathered. Excavates as Poorly Graded Sand with Silt and Clay with an estimated 10% non-plastic fines, 75% fine to coarse sand, and 15% angular gravel up to 3 inches in diameter.
					12			Test pit excavated in slope bench. Fill over native rock sloping at about 0.5H:1V.
					14			
					16			
					18			
					20			
					22			
					24			

N 4389167 E 264637 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-70 | DATE: 5/15/2018

TYPE OF HOE: Cat 336 E | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SP		**Poorly Graded Sand with Silt and Gravel (Fill)** Brown to gray, moist, very loose, with an estimated 10% non-plastic fines, 65% fine to coarse sand, and 25% angular gravel. Cobbles up to 12 inches in diameter make up about 20% of the tsm.
					4	SP-SC		Waste rock/ material for aggregate processing. **Bedrock** Weathered granitic bedrock. Excavates as Poorly Graded Sand with Clay and Gravel with an estimated 10% medium plasticity fines, 65% fine to coarse sand, and 25% angular gravel up to 3 inches in diameter. Test pit excavated near tow of reclaimed slope.
					6			
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4389114 E 264717 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-71 DATE: 5/15/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SP-SM		**Poorly Graded Sand with Silt and Gravel (Fill)** Brown to gray, moist, very loose, with an estimated 10% non-plastic fines, 65% fine to coarse sand, and 25% angular gravel. Cobbles up to 12 inches in diameter make up about 20% of the tsm. Waste rock/ material for aggregate processing.
					4			
					6	GP		**Bedrock** Granitic bedrock, gray, strong to very strong, moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 45% fine to coarse sand, and 50% fine to coarse gravel. Cobbles and boulders up to 2 feet in diameter make up about 40% of the trm. Increasing hardness with depth. Refusal in hard bedrock. Test pit excavated near tow of reclaimed slope. Fill cover over native rock sloping at about 4H:1V.
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4389034 E 264685 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-72 DATE: 5/15/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SP-SM		**Poorly Graded Sand with Silt and Gravel (Fill)** Brown to gray, moist, very loose, with an estimated 10% non-plastic fines, 65% fine to coarse sand, and 25% angular gravel. Cobbles up to 12 inches in diameter make up about 20% of the tsm.
					2	GP		Waste rock/ material for aggregate processing.
					4			**Bedrock** Granitic bedrock, gray, strong to very strong, moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 45% fine to coarse sand, and 50% fine to coarse gravel. Cobbles and boulders up to 2 feet in diameter make up about 40% of the trm.
					6			Increasing hardness with depth.
					8			Refusal in hard bedrock.
					10			Test pit excavated at tow of reclaimed slope. Thin fill over native bedrock.
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388979 E 264622 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-73 DATE: 5/15/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	GC		**Clayey Gravel with Sand (Fill)** Reddish brown, moist, very loose, with an estimated 15% medium platicity fines, 30% fine to coarse sand, and 55% angular gravel. Cobbles up to 12 inches in diameter make up about 15% of the tsm.
					2			Waste rock/ material for aggregate processing.
					4			**Bedrock** Granitic bedrock, gray, friable to moderately strong, moderately weathered. Excavates as Poorly Graded Sand with Silt and Gravel, with an estimated 10% non-plastic fines, 60% fine to coarse sand, and 30% fine to coarse gravel. Cobbles up to 6 inches in diameter make up about 10% of the trm.
					6	GP		Increasing hardness with depth.
					8			
					10			Test pit excavated at tow of reclaimed slope. Thin fill over native bedrock.
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388942 E 264599 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-74 | DATE: 5/15/2018

TYPE OF HOE: Cat 336 E | DEPTH TO GROUND WATER (ft): NE

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

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SP-SM		**Poorly Graded Sand with Silt and Gravel (Fill)** Brown to gray, moist, very loose, with an estimated 10% non-plastic fines, 60% fine to coarse sand, and 30% angular gravel. Cobbles up to 6 inches in diameter make up about 10% of the tsm. Crushed rock aggregates.
					4			
					6			
					8			
					10	GP		**Bedrock** Granitic bedrock, gray, strong to very strong, moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 45% fine to coarse sand, and 50% fine to coarse gravel. Cobbles and boulders up to 3 feet in diameter make up about 50-60% of the trm.
					12			Increasing hardness with depth.
					14			
					16			Test pit excavated on reclaimed slope bench. Fill cover over native rock with steep dropoff to the south at approximately 0.5H:1V.
					18			
					20			
					22			
					24			

N 4388968 E 264621 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-75 DATE: 5/15/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	GP		**Poorly Graded Gravel with Sand (Fill)** Brown to gray, moist, very loose, with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel. Cobbles and boulders up to 2 feet in diameter make up about 15% of the tsm.
					4			Crushed rock aggregates.
					6			Caving, ravelling test pit sidewalls.
					8			
					10	GP		**Bedrock** Granitic bedrock, gray, strong to very strong, moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 45% fine to coarse sand, and 50% fine to coarse gravel. Cobbles and boulders up to 3 feet in diameter make up about 50-60% of the trm.
					12			Increasing hardness with depth.
					14			
					16			Test pit excavated on reclaimed slope bench. Fill cover over native rock with steep dropoff to the south at approximately 0.5H:1V.
					18			
					20			
					22			
					24			

N 4388917 E 264596 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-76 DATE: 5/15/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SM		**Silty Sand with Gravel (Fill)** Brown to gray, moist, very loose, with an estimated 15% non-plastic fines, 50% fine to coarse sand, and 35% angular gravel. Cobbles and boulders up to 2 feet in diameter make up about 15% of the tsm. Caving, ravelling test pit sidewalls.
					8	GP		**Bedrock** Granitic bedrock, gray, strong to very strong, moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 45% fine to coarse sand, and 50% fine to coarse gravel. Cobbles and boulders up to 3 feet in diameter make up about 50-60% of the trm. Increasing hardness with depth.
					14			Test pit excavated at toe of reclaimed slope. Fill extends to about 3 feet below the existing pit bottom elevation.
					24			

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-77 DATE: 5/16/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SP-SC		**Poorly Graded Sand with Clay and Gravel (Fill)** Brown to tan, moist, loose, with an estimated 10% medium plasticity fines, 55% fine to coarse sand, and 35% angular gravel. Cobbles and boulders make up about 30-40% of the tsm. Waste rock/ overburden material.
					4			
					6			**Bedrock** Weathered granitic bedrock, excavates as Poorly Graded Sand with Clay and Gravel. Brown to tan, with an estimated 10% medium plasticity fines, 70% fine to coarse sand, and 20% angular gravel. Cobbles up to 6 inches in diameter make up about 15% of the trm.
					8	SP-SM		Included clay gouge, mechanically sheared rock.
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388807 E 264463 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-78 DATE: 5/16/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2			**Poorly Graded Sand with Clay and Gravel (Fill)** Brown to tan, moist, loose, with an estimated 10% medium plasticity fines, 55% fine to coarse sand, and 35% angular gravel. Cobbles and boulders make up about 30-40% of the tsm.
					4			Waste rock/ overburden material.
					6	SP-SC		Caving/ ravelling test pit walls.
					8			
					10			
					12			
					14			Excavated into reclaimed slope, bedrock not encountered.
					16			
					18			
					20			
					22			
					24			

N 4388816 E 264453 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-79 DATE: 5/16/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SC		**Clayey Sand with Gravel (Fill)** Brown, moist, loose, with an estimated 15% medium plasticity fines, 50% fine to coarse sand, and 35% angular gravel. Cobbles and boulders up to 2 feet in diameter make up about 15% of the tsm.
					4			Waste rock/ overburden material.
					6			
					8	SP-SC		**Poorly Graded Sand with Clay and Gravel (Fill)** Brown to tan, moist, loose, with an estimated 10% medium plasticity fines, 55% fine to coarse sand, and 35% angular gravel. Cobbles and boulders make up about 30-40% of the tsm.
					10			Waste rock/ overburden material.
								Caving/ ravelling test pit walls.
					12			Excavated into reclaimed slope, bedrock not encountered. Sagging fill above test pit.
					14			
					16			
					18			
					20			
					22			
					24			

N 4388813 E 264497 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-80 DATE: 5/16/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SC		**Clayey Sand with Gravel (Fill)** Brown, moist, loose, with an estimated 15% medium plasticity fines, 50% fine to coarse sand, and 35% angular gravel. Cobbles and boulders up to 2 feet in diameter make up about 15% of the tsm. Waste rock/ overburden material.
					4			
					6	SP-SM		**Bedrock** Granitic bedrock, diggable. Excavates as Poorly Graded Sand with Silt and Gravel, gray, with an estimated 10% non-plastic fines, 55% fine to coarse sand, and 35% angular gravel. Cobbles up to 12 inches in diameter make up about 15% of the trm. Cobbles generally friable.
					8			
					10			Excavated at sag in reclaimed slope. Bedrock cut slopes approx. 0.4V:1H.
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388798 E 264492 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-81 DATE: 5/16/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SC		**Clayey Sand with Gravel (Fill)** Brown, moist, loose, with an estimated 15% medium plasticity fines, 50% fine to coarse sand, and 35% angular gravel. Cobbles and boulders up to 2 feet in diameter make up about 20% of the tsm.
					2	SC		Waste rock/ overburden material.
					4	SP-SM		**Clayey Sand with Gravel** Reddish brown, very moist, dense, with an estimated 30% high plasticity fines, 35% fine to coarse sand, and 35% angular gravel.
					6			**Bedrock** Granitic bedrock, diggable. Excavates as Poorly Graded Sand with Silt and Gravel, gray to yellow brown, with an estimated 10% non-plastic fines, 55% fine to coarse sand, and 35% angular gravel. Cobbles up to 12 inches in diameter make up about 15% of the trm. Cobbles generally friable.
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388757 E 264474 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-82 DATE: 5/16/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				2	GP		**Bedrock** Mechanically damaged granitic bedrock, gray, weak to moderately strong, moderately weathered. Excavates as Poorly Graded Gravel with Sand with an estimated 5% non-plastic fines, 45% fine to coarse sand, and 50% angular gravel. Cobbles and boulders up to 18 inches in diameter make up about 40% of the trm.
					4			Brittle deformation damage adjacent bedrock shear zone, located on south side of shearzone.
B	GRAB				6	CH		**Bedrock** Granitic bedrock shear zone, bedrock damaged and altered to expansive clay minerology. Gray to white to purple gray to reddish hues, very moist, very dense, with an estimated 25-70% medium to very high plasticity fines, 20-50% fine to coarse sand, and 10-25% angular gravel.
					8			Sheared zone located on north side of test pit. Approximately 15 feet wide, north-south.
					10			
					12			
					14			Bedrock shearzone encountered with expansive bedrock materials, shear zone on trend with drainage to west and access road to east. Inclined, near vertical dip to south.
					16			
					18			
					20			
					22			
					24			

N 4388453 E 264629 UTM NAD83

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PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-83 DATE: 5/16/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				0	CH		**Sandy Fat Clay** Reddish brown, very moist, very stiff, with an estimated 55% high plasticity fines, 35% fine to coarse sand, and 10% angular gravel. Trace amounts of cobbles up to 6 inches in diameter.
					2	SP		**Bedrock** Granitic bedrock, gray to brown, moderately strong to strong, moderately weathered. Excavates as Poorly Graded Sand with Gravel, with an estimated 5% non-plastic fines, 60% fine to coarse sand, and 35% angular gravel. Cobbles up to 8 inches in diameter make up about 20% of the trm.
B	GRAB				4			Refusal in hard bedrock.
					6			
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388614 E 264067 UTM NAD83

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PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-84 DATE: 5/16/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SC		**Clayey Sand with Gravel** Light brown, slightly moist, loose, with an estimated 25% low to medium plasticity fines, 60% fine to coarse sand, and 15% angular gravel up to 3 inches in diameter.
						SC		
A	GRAB				2			**Clayey Sand** Reddish brown, very moist, medium dense, with an estimated 25% high plasticity fines, 65% fine to coarse sand, and 10% angular gravel up to 3 inches in diameter.
						SP-SM		**Bedrock** Granitic bedrock, gray to brown, weak to strong, moderately weathered. Excavates as Poorly Graded Sand with Silt and Gravel, with an estimated 10% non-plastic fines, 60% fine to coarse sand, and 30% angular gravel up to 3/4 inch in diameter.
					4			
					6			Refusal in hard bedrock.
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388620 E 264196 UTM NAD83

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PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-85 DATE: 5/16/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SM		**Silty Sand with Gravel (Fill)** Tan to brown, moist, loose, with an estimated 15% non-plastic fines, 60% fine to coarse sand, and 25% angular gravel. Cobbles up to 12 inches in diameter make up about 10% of the tsm.
A	GRAB				4	SM		Crushed rock aggregates. **Silty Sand (Fill)** Gray, moist, loose, with an estimated 30% non-plastic fines and 70% fine sand.
B	GRAB				6	CH		**Sandy Fat Clay** Reddish brown, very moist, very stiff, with an estimated 55% high plasticity fines and 45% fine to coarse sand.
					8	SP-SM		**Bedrock** Granitic bedrock, yellow brown to gray, weak to strong, moderately weathered. Excavates as Poorly Graded Sand with Silt and Gravel, with an estimated 10% non-plastic fines, 60% fine to coarse sand, and 30% angular gravel up to 3/4 inch in diameter.
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388589 E 264348 UTM NAD83

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PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-86 DATE: 5/16/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SP-SC		**Poorly Graded Sand with Clay and Gravel (Fill)** Brown to gray, moist, loose, with an estimated 10% non-plastic to medium plasticity fines, 55% fine to coarse sand, and 35% angular gravel. Cobbles and boulders up to 18 inches in diameter make up about 15% of the tsm.
					4			Waste rock material.
					6	CH		**Sandy Fat Clay** Reddish brown, very moist, very stiff, with an estimated 55% high plasticity fines, 35% fine to coarse sand, and 10% angular gravel up to 3 inches in diameter.
					8	SC		**Bedrock** Granitic bedrock, tan to yellow brown, weak to moderately strong, moderately to highly weathered. Excavates as Clayey Sand with Gravel, with an estimated 15% medium plasticity fines, 55% fine to coarse sand, and 30% angular gravel up to 3 inches in diameter. Increasing hardness with depth.
					10			
					12			Color changes to gray.
					14			
					16			
					18			
					20			
					22			
					24			

N 4388634 E 264444 UTM NAD83

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PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-87 DATE: 5/16/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
A	GRAB				0	SC		**Clayey Sand with Gravel** Dark brown, very moist, medium dense, with an estimated 20% medium plasticity fines, 50% fine to coarse sand, and 30% angular gravel up to 3 inches in diameter.
					2			**Bedrock** Weathered granitic bedrock, brown to tan, friable to weak, completely to highly weathered. Excavates as Silty Sand with Gravel, with an estimated 15% non-plastic fines, 50% fine to coarse sand, and 35% angular gravel. Cobbles up to 8 inches in diameter make up about 20% of the trm.
B	GRAB				4			
					6	SM		
					8			
					10			**Bedrock** Granitic bedrock, brown to gray, moderately strong, moderately weathered. Excavates as Poorly Graded Sand with Silt and Gravel, with an estimated 10% non-plastic fines, 50% fine to coarse sand, and 40% angular gravel. Cobbles and boulders up to 2 feet in diameter make up about 30% of the trm.
					12	SP-SM		Increasing hardness with depth.
					14			
					16			
					18			
					20			
					22			
					24			

N 4388297 E 265275 UTM NAD83

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PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-88 DATE: 5/16/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	CH		**Sandy Fat Clay** Dark brown to reddish brown, very moist, very stiff, with an estimated 55% high plasticity fines, 35% fine to coarse sand, and 10% angular gravel up to 3 inches in diameter.
					2			**Bedrock** Granitic bedrock, gray to light brown, weak to strong, moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel. Cobbles and boulders up to 2 feet in diameter make up about 30% of the trm.
					4			
					6			
					8	GP		
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388250 E 265304 UTM NAD83

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PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-89 DATE: 5/16/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					0	SC		**Clayey Sand with Gravel** Dark brown to reddish brown, very moist, dense, with an estimated 30% high plasticity fines, 40% fine to coarse sand, and 30% angular gravel. Cobbles up to 8 inches in diameter make up about 15% of the tsm.
					2	GP		**Poorly Graded Gravel with Sand** Reddish brown to brown, moist, very dense, with an estimated 5% medium plasticity fines, 45% fine to coarse sand, and 50% subangular gravel. Cobbles and boulders up to 3 feet in diameter make up about 40% of the tsm.
					4			
					6	GP		**Bedrock** Granitc bedrock, brown to gray, very strong, slightly to moderately weathered. Excavates as Poorly Graded Gravel with Sand, with an estimated 5% non-plastic fines, 35% fine to coarse sand, and 60% angular gravel. Cobbles up to 12 inches in diameter make up about 30-40% of the trm.
					8			Refusal in hard bedrock.
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388256 E 265262 UTM NAD83

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PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

TEST PIT LOG

TEST PIT NO.: TP-90 DATE: 5/16/2018

TYPE OF HOE: Cat 336 E DEPTH TO GROUND WATER (ft): NE

LOGGED BY: JP GROUND ELEVATION (ft): NA

SAMPLE NO.	SAMPLE TYPE	PENETROMETER (tsf)	MOISTURE (%)	PLASTICITY INDEX	DEPTH (ft)	USCS SYMBOL	LITHOLOGY	DESCRIPTION
					2	SM		**Silty Sand with Gravel (Fill)** Tan to brown, slightly moist, loose to medium dense, with an estimated 15% non-plastic fines, 60% fine to coarse sand, and 25% angular gravel. Cobbles up to 12 inches in diameter are present variably, and 10-20% of the tsm in some layers. Isolated boulders up to 4 feet in diameter.
					4			
					6			
					8			
					10			
					12			
					14			
					16			
					18			
					20			
					22			
					24			

N 4388295 E 265135 UTM NAD83

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Washoe County, Nevada

PROJECT NO.: 0183-27-1

PLATE: 2

SHEET 1 OF 1

BORING_LOG 0183271.GPJ BLKEAGLE.GDT 6/13/2018

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.

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		

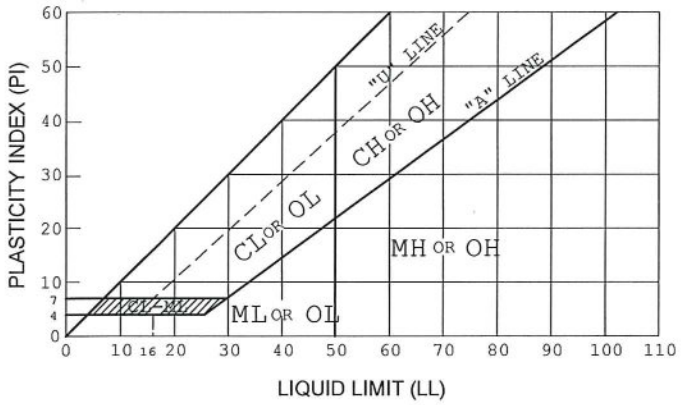
GRAIN SIZE TERMINOLOGY

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

PLASTICITY CHART



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

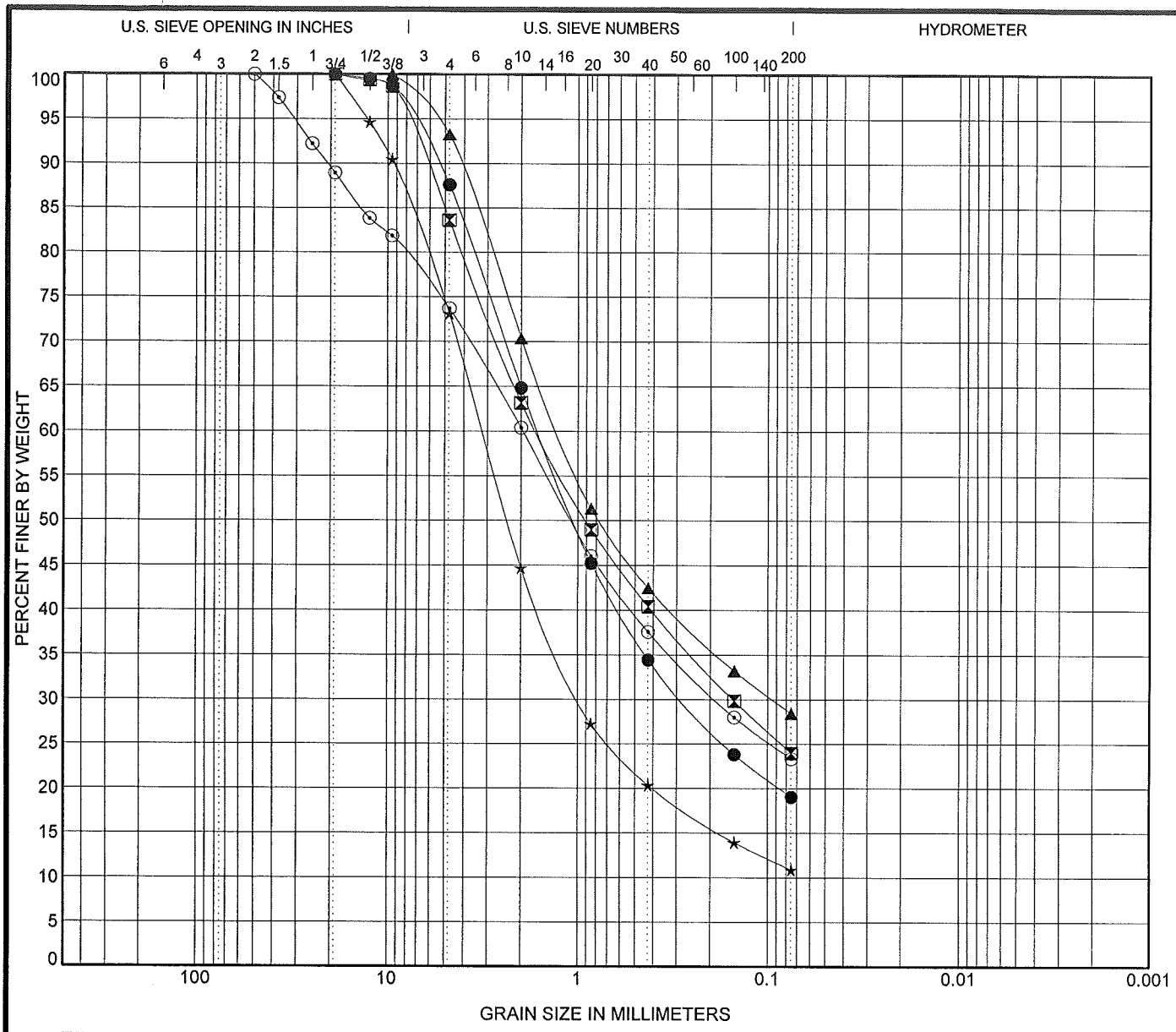
CONSISTENCY OF COHESIVE SOILS

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: Highland Ranch Subdivision
Location: Washoe County, Nevada
Project Number: 0183-27-1 Plate: 3



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	B-01	D	10.0	CLAYEY SAND SC	27	19	8		
⊠	TP-03	B	6.0	CLAYEY SAND with GRAVEL SC	31	21	10		
▲	TP-07		13.0	CLAYEY SAND SC	36	16	20		
★	TP-10	A	6.0	POORLY GRADED SAND with SILTY CLAY and GRAVEL SP-SC	25	19	6	4.81	51.61
⊙	TP-31	A	0.0	CLAYEY SAND with GRAVEL SC	34	17	17		

	Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-01	D	10.0	19	1.62	0.275		12.4	68.6	19.0	
⊠	TP-03	B	6.0	19	1.654	0.152		16.4	59.6	24.0	
▲	TP-07		13.0	9.5	1.255	0.094		6.7	64.8	28.4	
★	TP-10	A	6.0	19	3.188	0.973		26.9	62.2	10.9	
⊙	TP-31	A	0.0	50	1.954	0.186		26.3	50.4	23.3	

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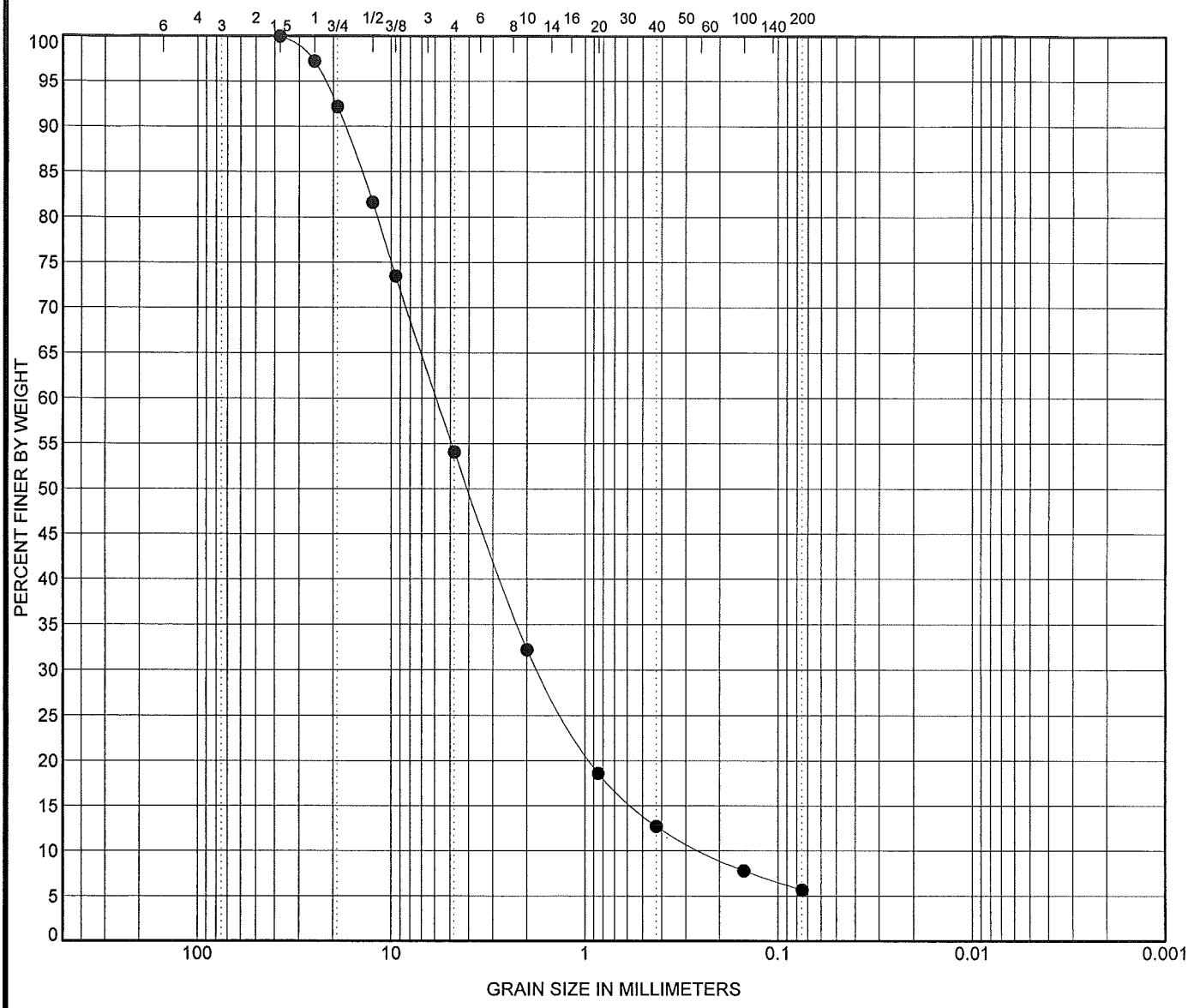
GRAIN SIZE DISTRIBUTION

Project: Highland Ranch Subdivision

Location: Washoe County, Nevada

Project Number: 0183-27-1 Plate Number: 4a

US GRAIN SIZE 0183271.GPJ US_LAB.GDT 6/13/2018



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	TP-49	A	1.0	**WELL-GRADED SAND with SILT and GRAVEL SW-SM**	**NP**	**NP**	**NP**	**2.15**	**24.50**

	Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP-49	A	1.0	**37.5**	**5.869**	**1.74**	**0.24**	**45.9**	**48.4**	**5.7**	

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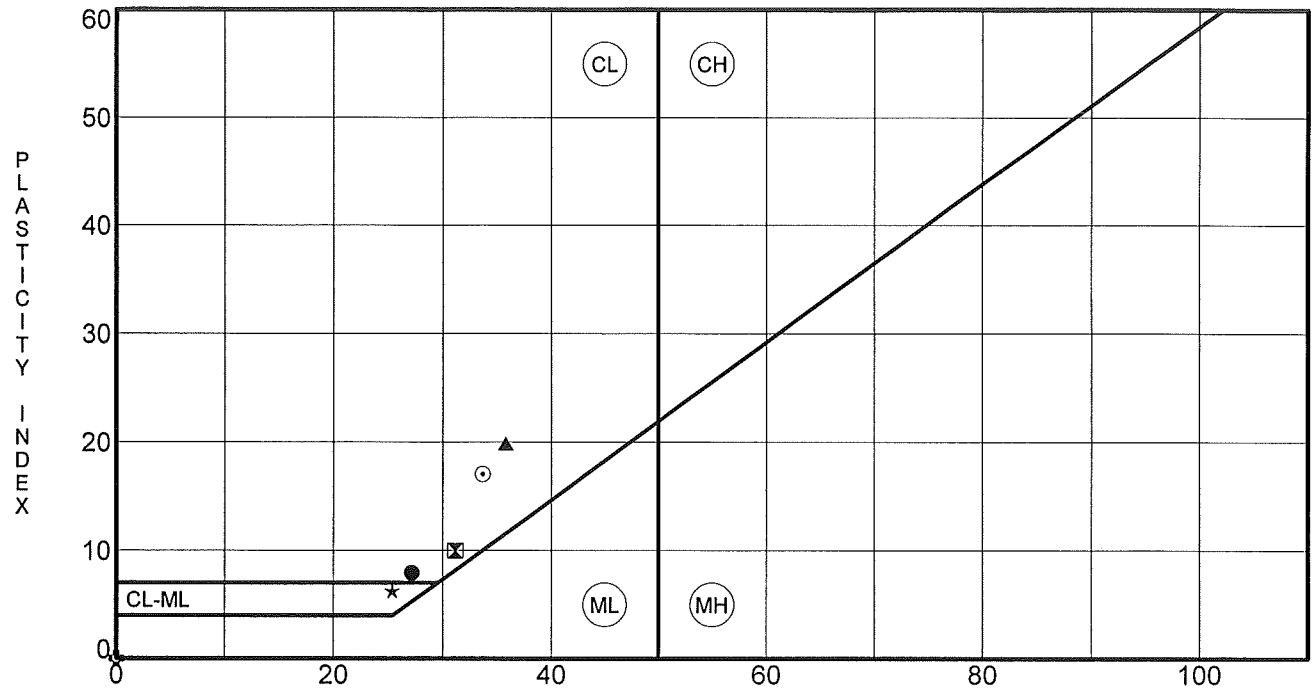
GRAIN SIZE DISTRIBUTION

Project: Highland Ranch Subdivision

Location: Washoe County, Nevada

Project Number: 0183-27-1 Plate Number: 4b

US_GRAIN_SIZE_0183271.GPJ_US_LAB.GDT 6/13/2018



Specimen Depth in Feet.

Specimen Identification			LL	PL	PI	Fines	USCS Classification
● B-01	D	10.0'	27	19	8	19	CLAYEY SAND (SC)
⊠ TP-03	B	6.0'	31	21	10	24	CLAYEY SAND with GRAVEL (SC)
▲ TP-07		13.0'	36	16	20	28	CLAYEY SAND (SC)
★ TP-10	A	6.0'	25	19	6	11	POORLY GRADED SAND with SILTY CLAY and GRAVEL (SP-SC)
⊙ TP-31	A	0.0'	34	17	17	23	CLAYEY SAND with GRAVEL (SC)
✿ TP-49	A	1.0'	NP	NP	NP	6	WELL-GRADED SAND with SILT and GRAVEL (SW-SM)

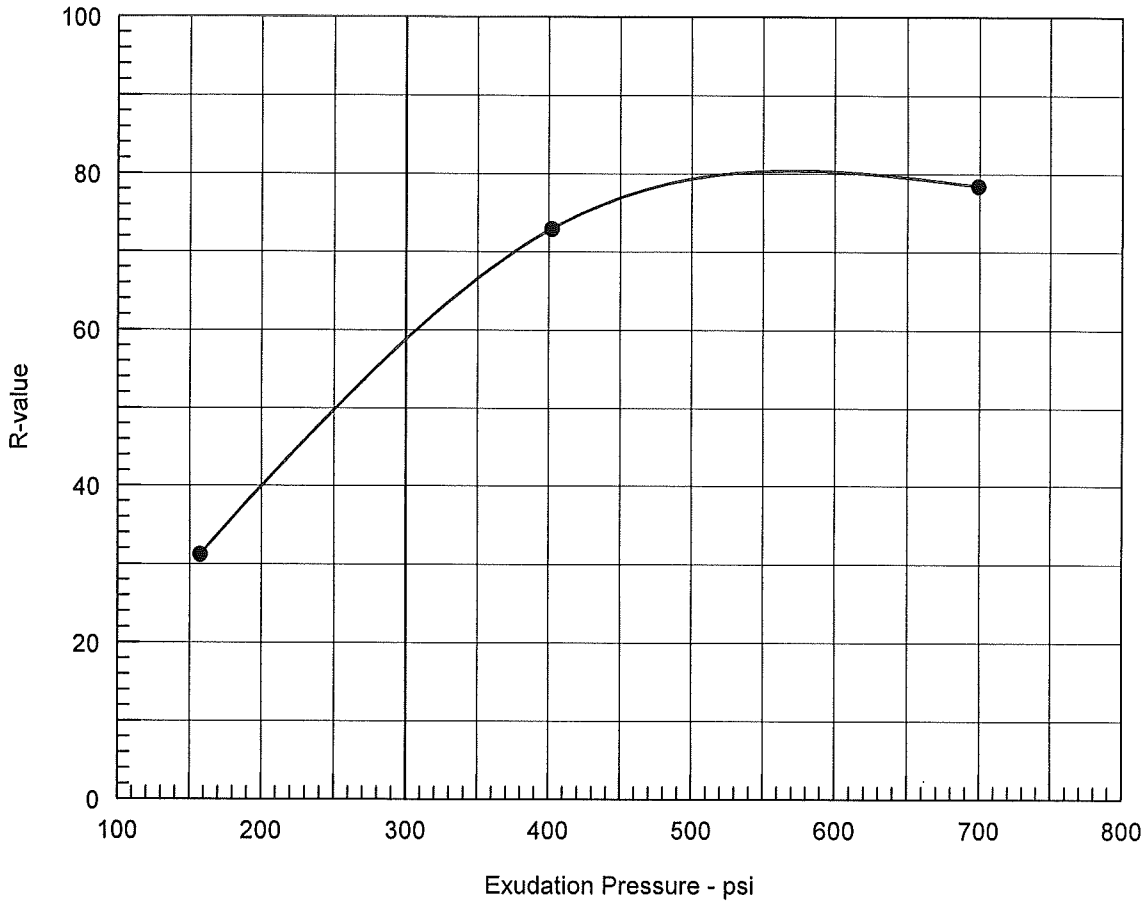
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ATTERBERG LIMITS RESULTS

Project: Highland Ranch Subdivision
Location: Washoe County, Nevada
Project Number: 0183-27-1 Plate: 4c

US ATTERBERG LIMITS 0183271.GPJ US_LAB.GDT 6/13/2018

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	150	124.9	12.3	0.00	91	2.55	157	31	31
2	250	124.4	11.6	0.00	30	2.52	402	73	73
3	300	126.6	10.1	0.00	24	2.50	699	78	78

Test Results	Material Description
R-value at 300 psi exudation pressure = 59	Silty Clay with Sand and Pea Gravel

Project No.: 0183-27-1
Project: Highland Ranch Subdivision
Source of Sample: TP-03B 6-8'

Date: 7/5/2018

Tested by: GLO
Checked by: LO

Remarks:
Laboratory Log 6576

R-VALUE TEST REPORT

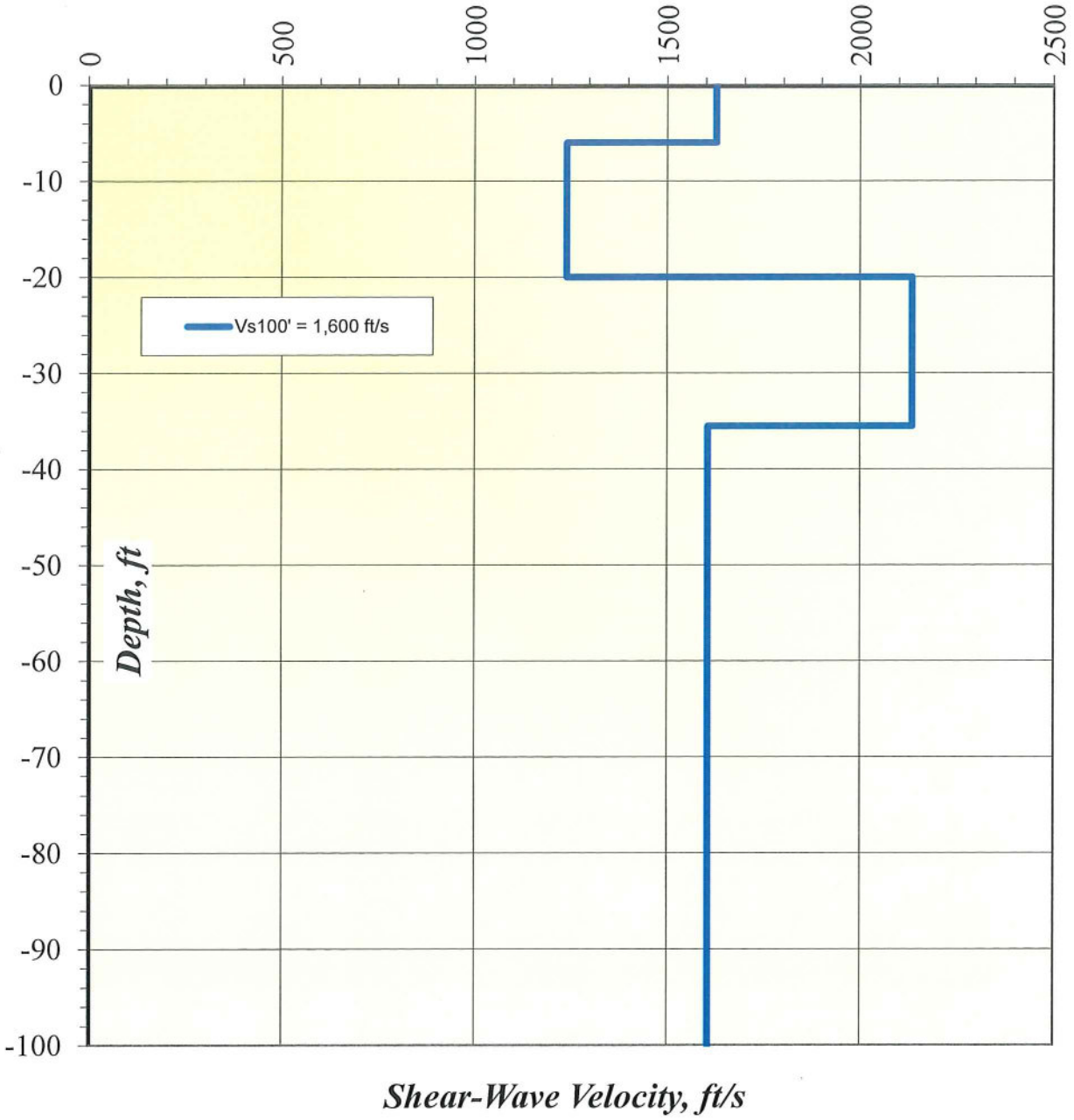
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Figure 5

APPENDIX A

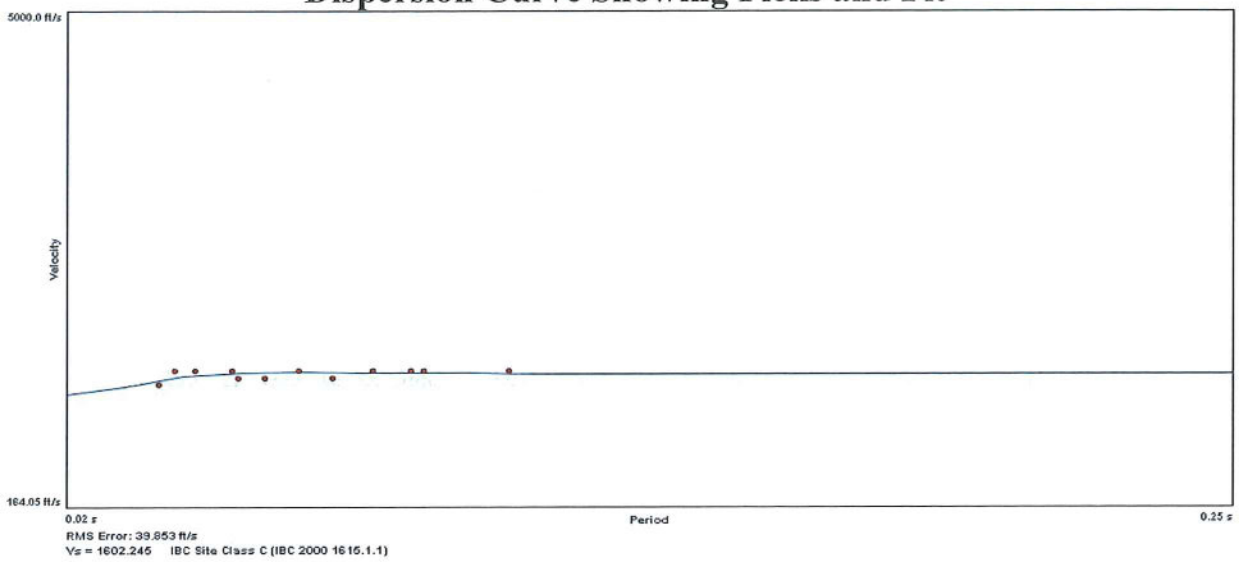
SHEAR-WAVE VELOCITY MODELING RESULTS

Shear Wave Velocity Modeling Results
The Quarry- Line 1

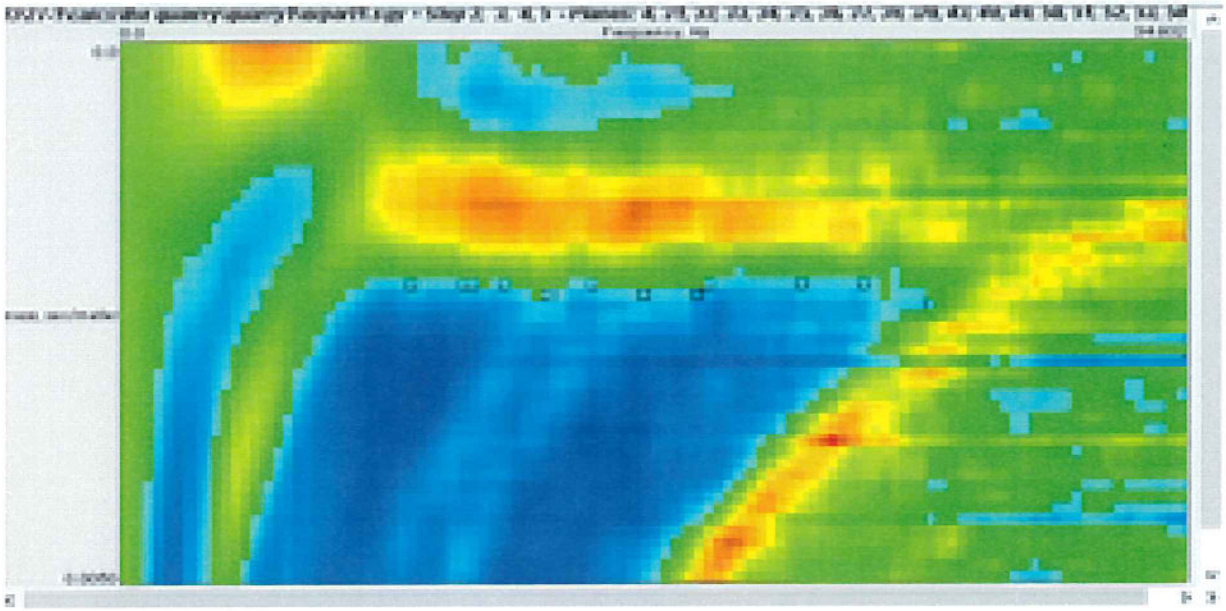


The Quarry - Line 1

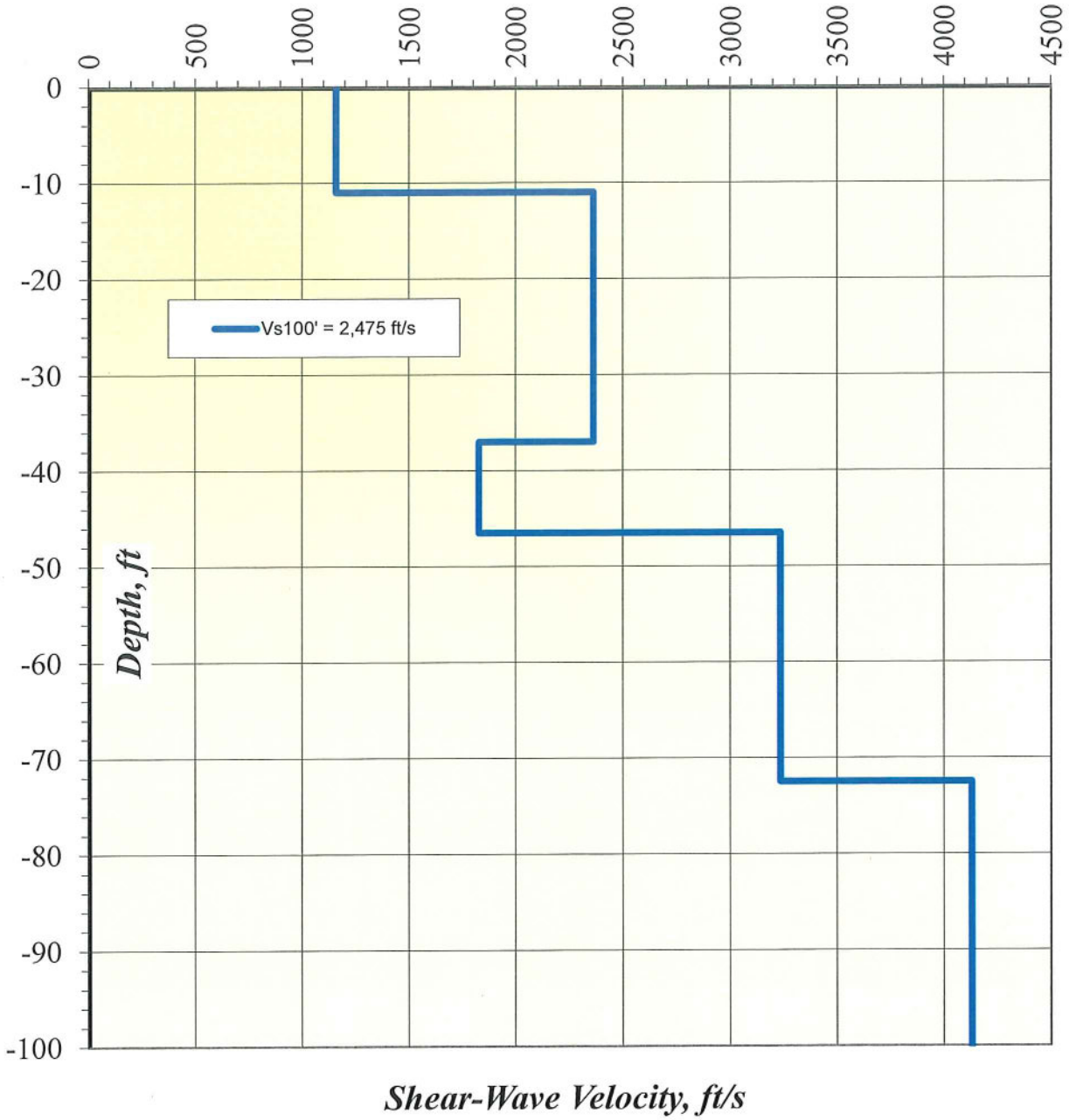
Dispersion Curve Showing Picks and Fit



p-f Image

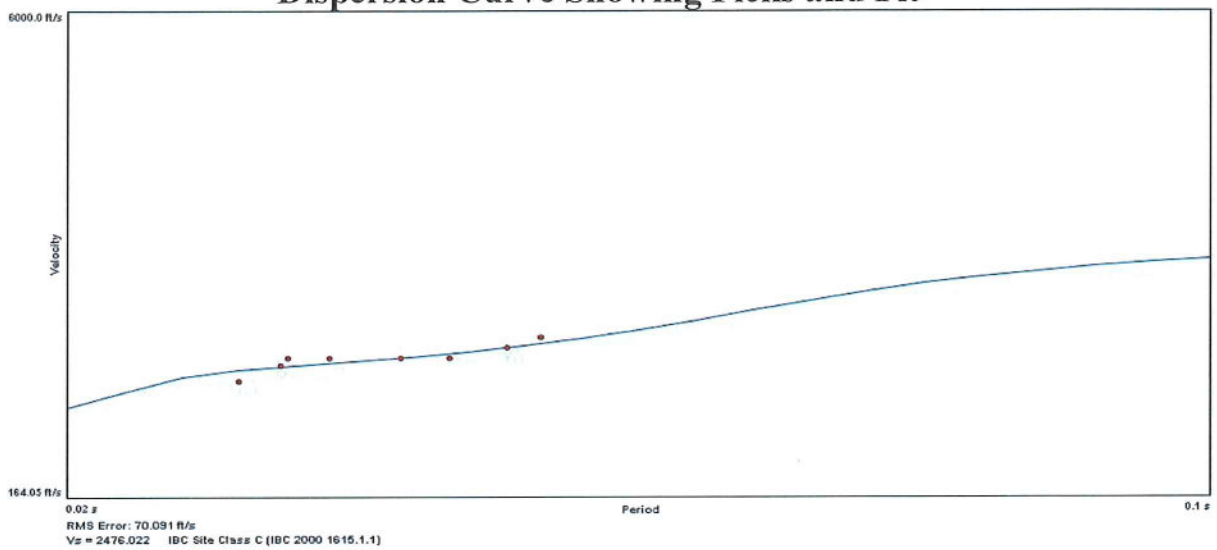


Shear Wave Velocity Modeling Results
The Quarry- Line 3

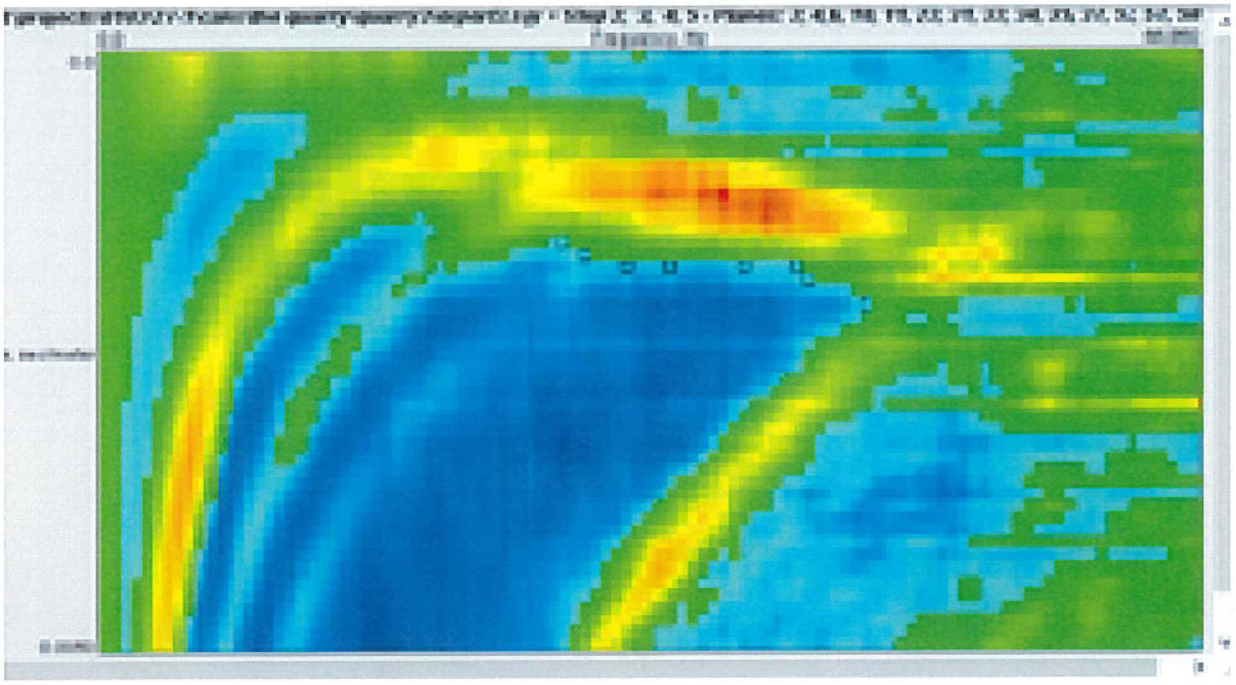


The Quarry - Line 3

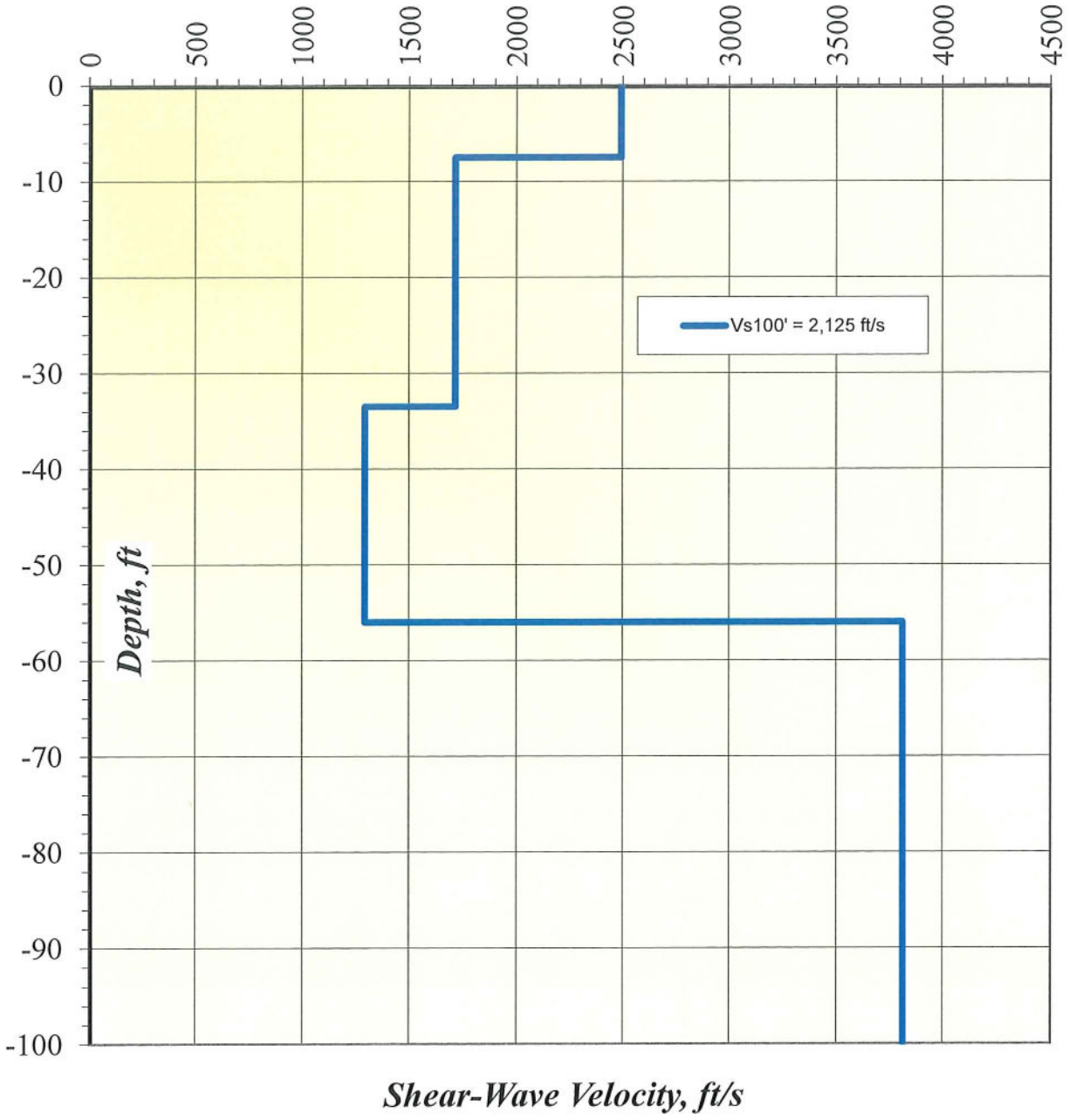
Dispersion Curve Showing Picks and Fit



p-f Image

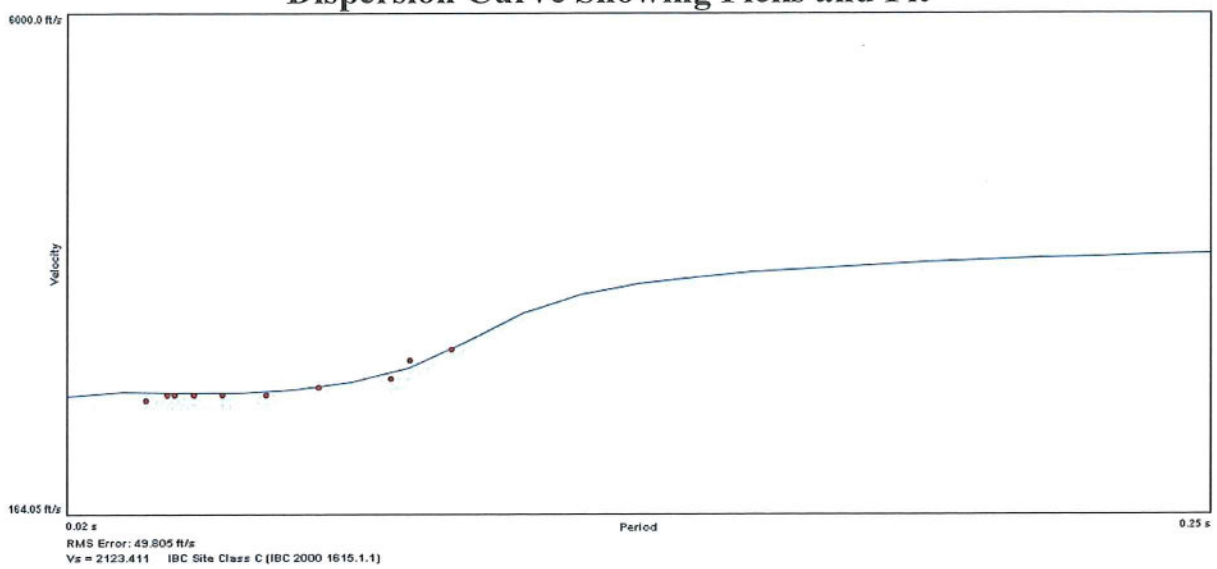


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The Quarry- Line 4

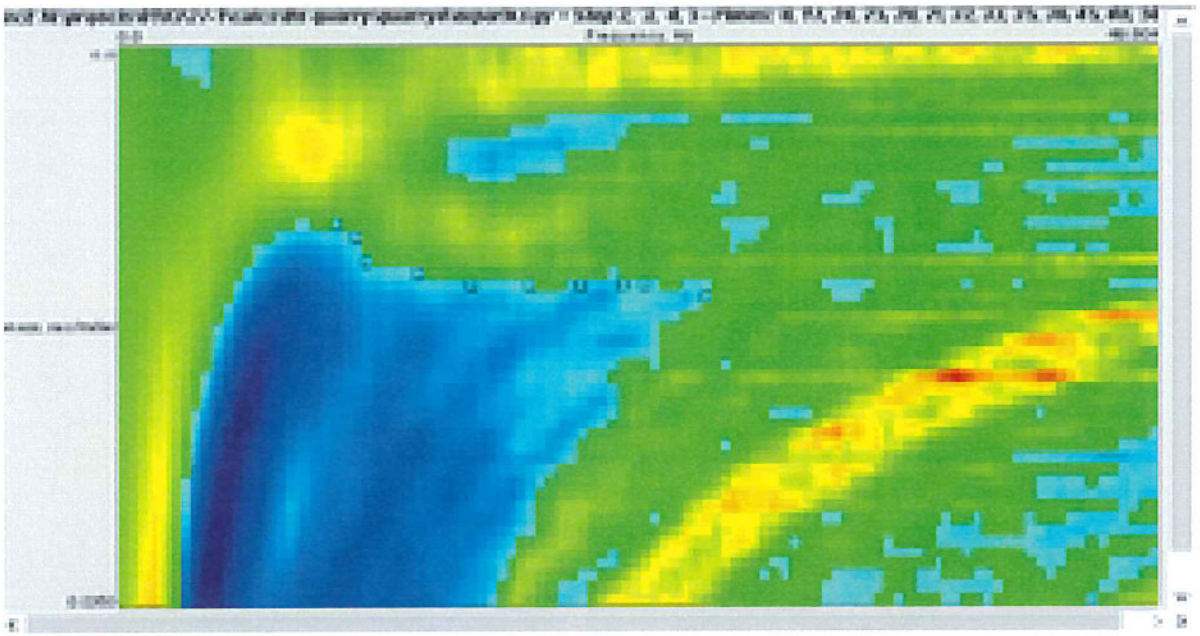


The Quarry - Line 4

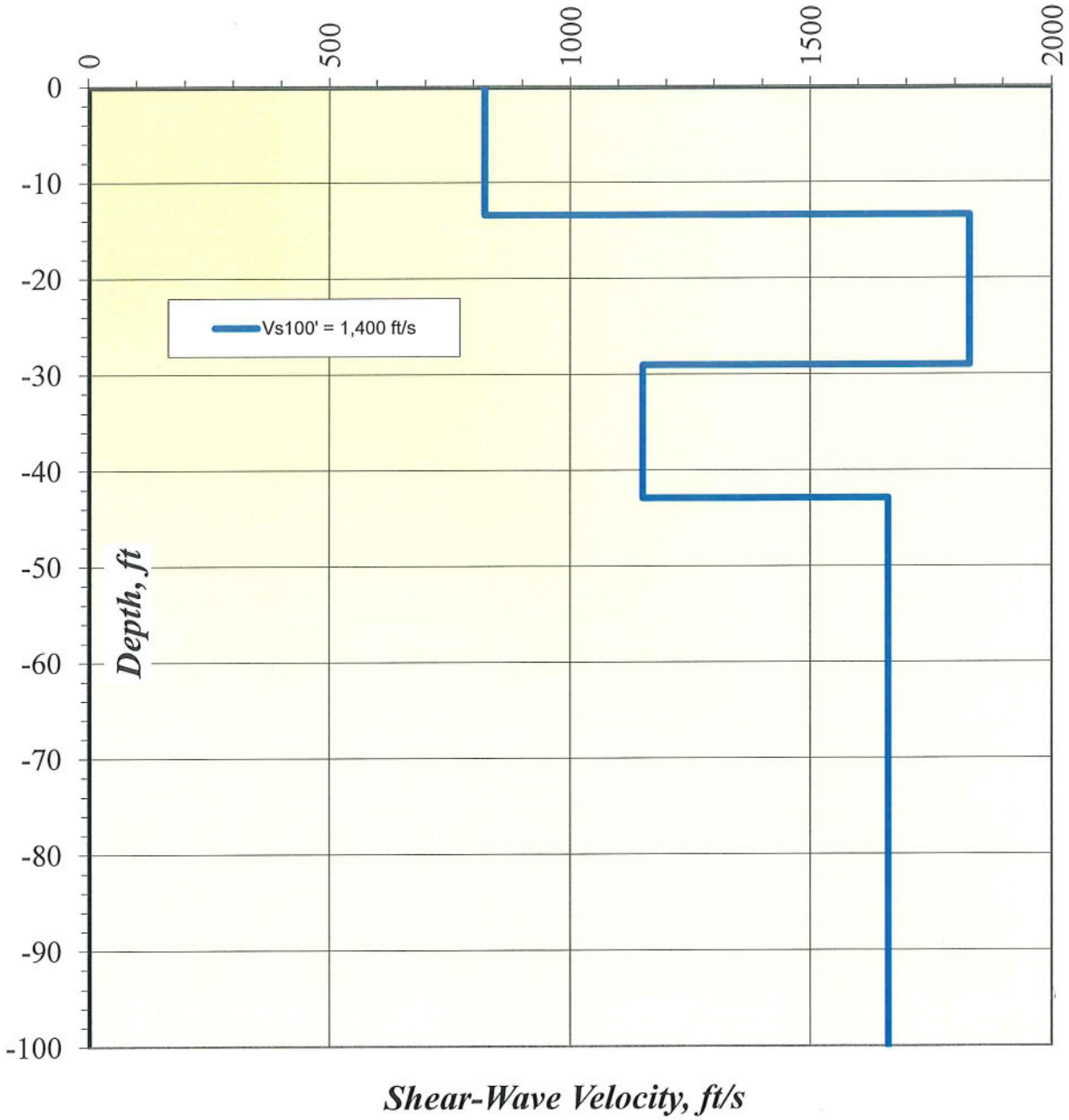
Dispersion Curve Showing Picks and Fit



p-f Image

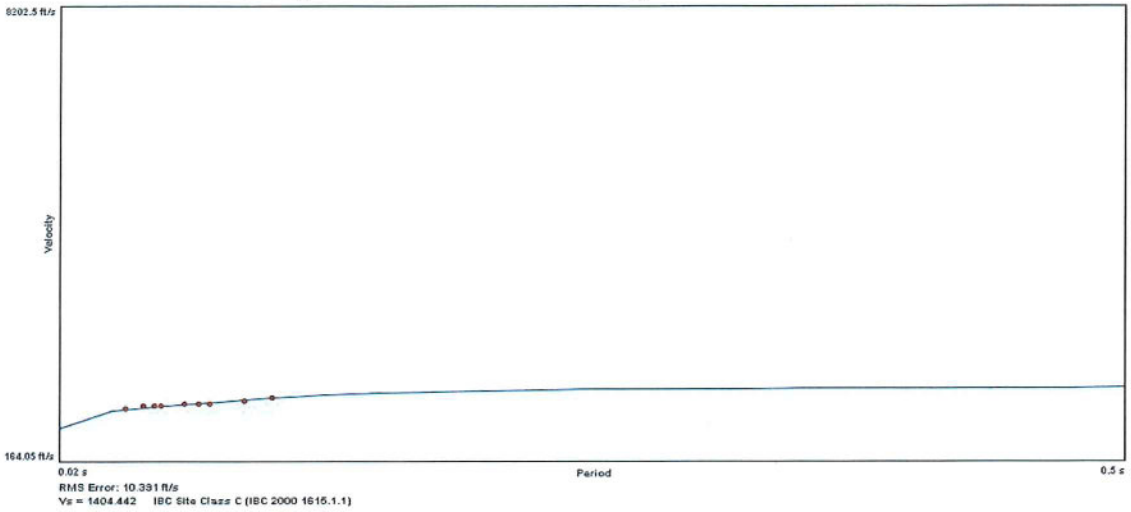


Shear Wave Velocity Modeling Results
The Quarry- Line 5

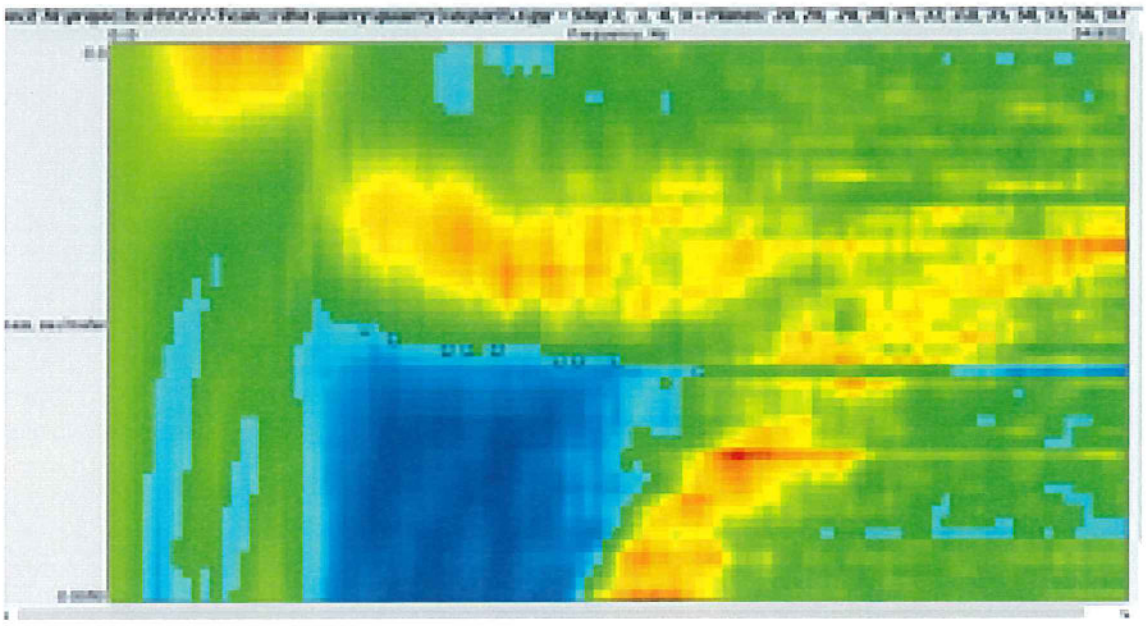


The Quarry - Line 5

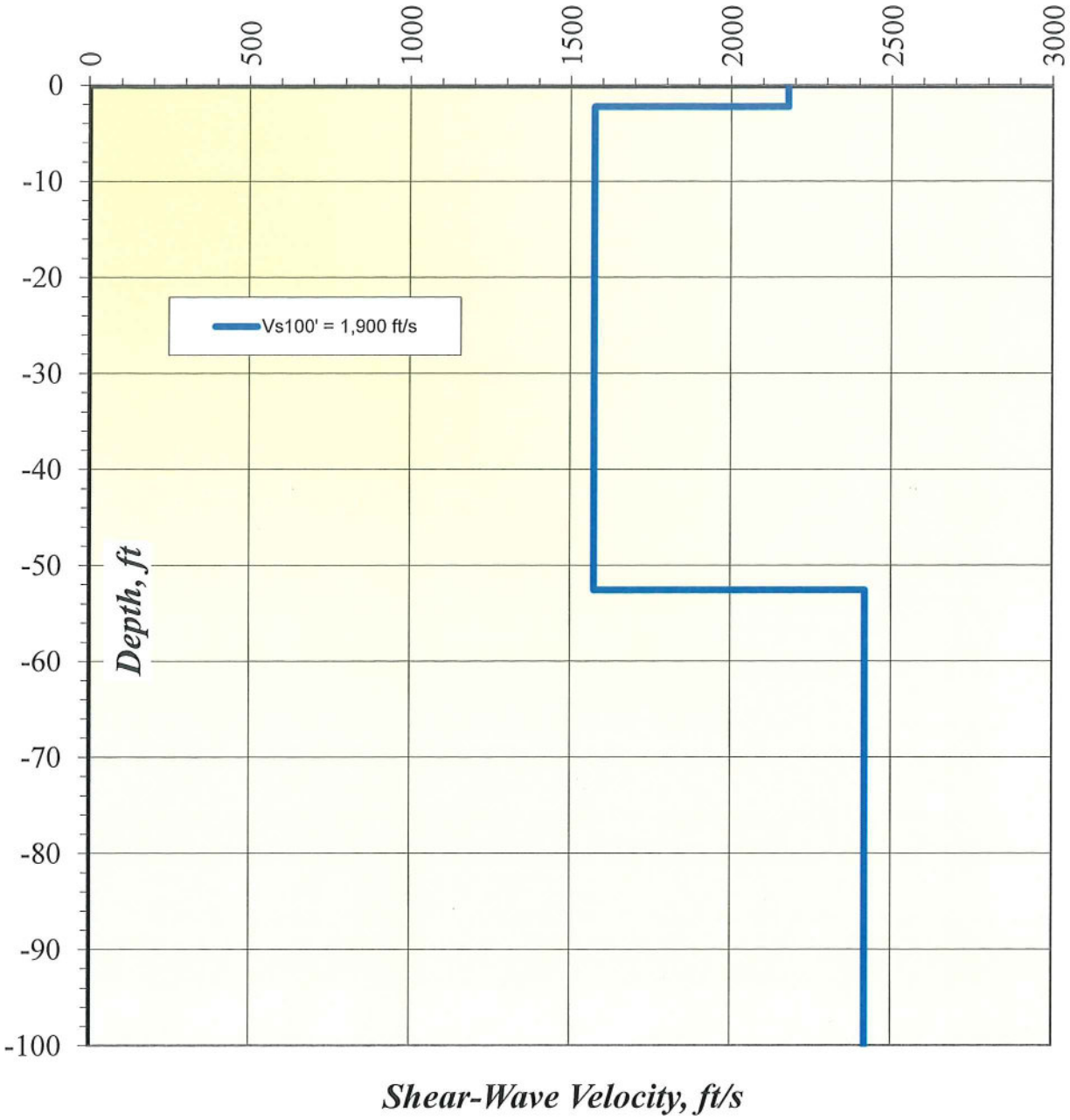
Dispersion Curve Showing Picks and Fit



p-f Image

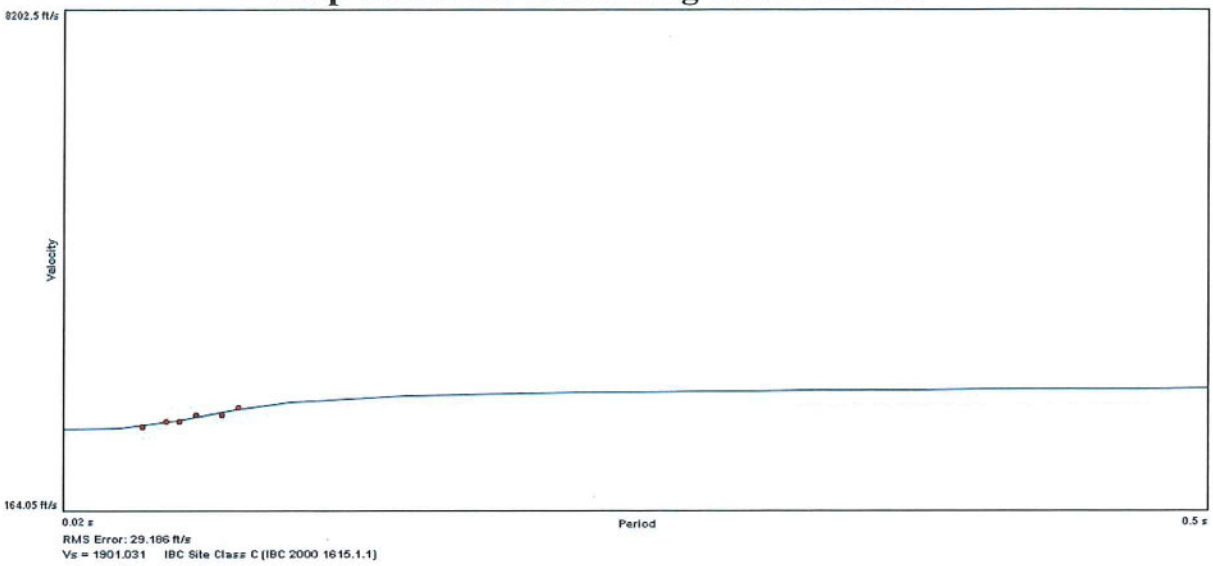


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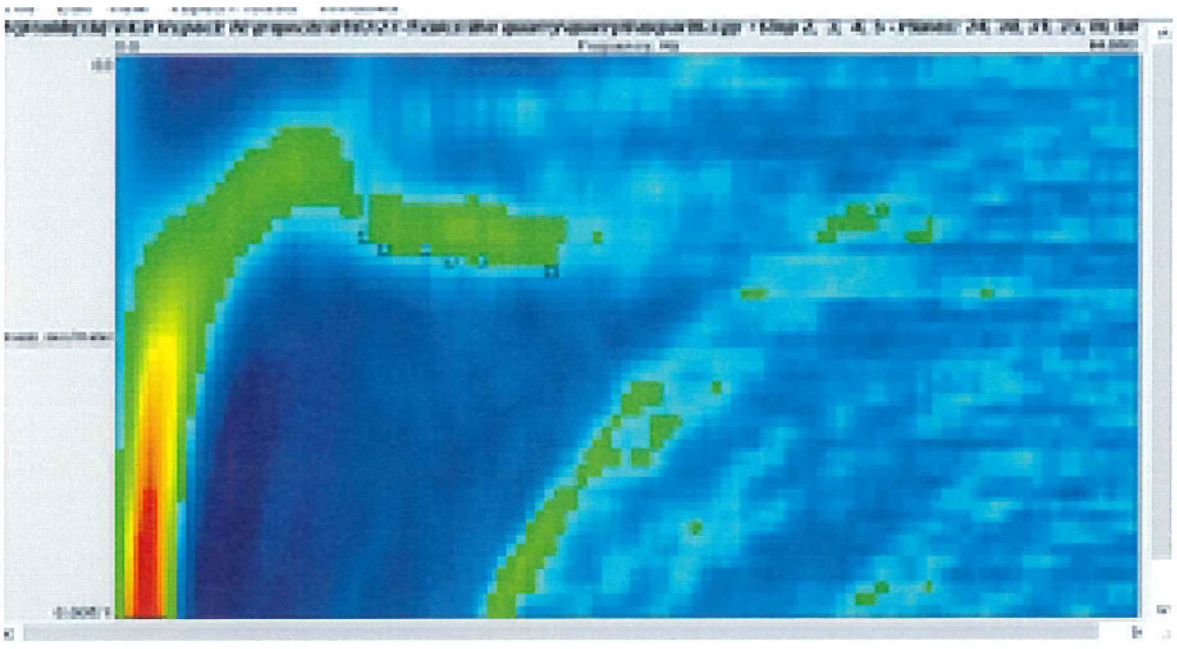


The Quarry - Line 6

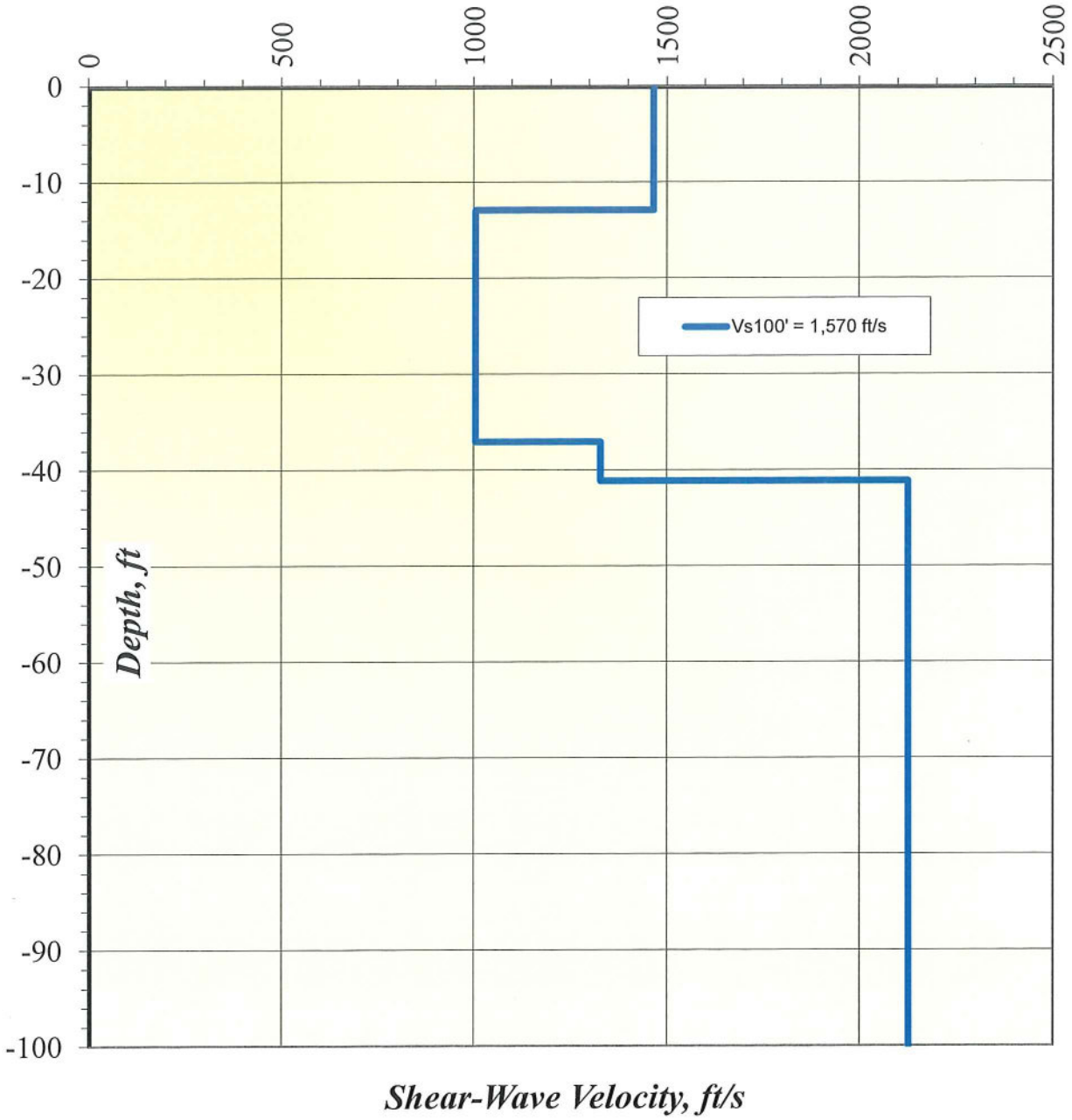
Dispersion Curve Showing Picks and Fit



p-f Image

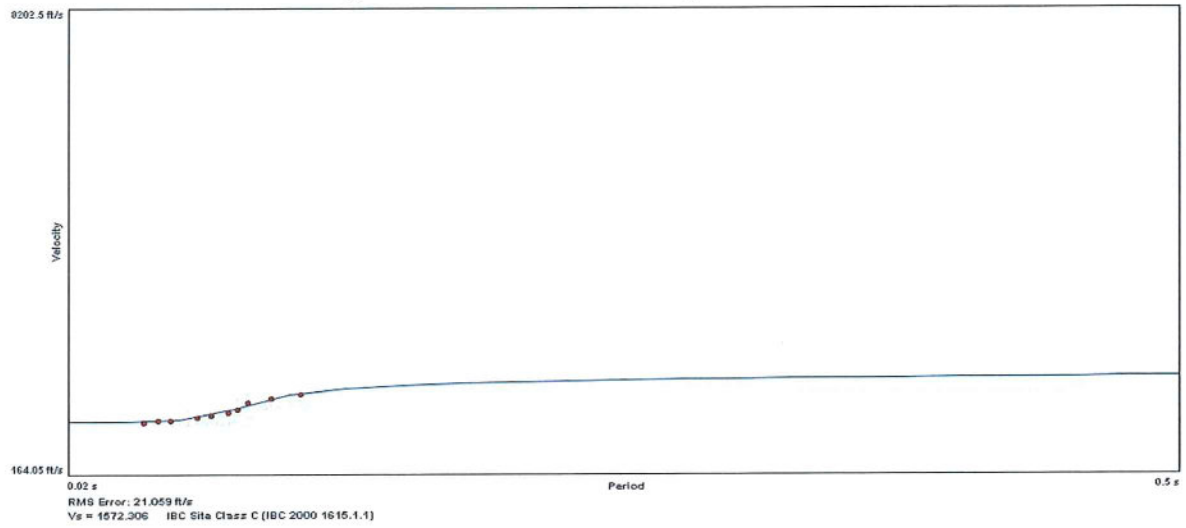


Shear Wave Velocity Modeling Results
The Quarry- Line 7

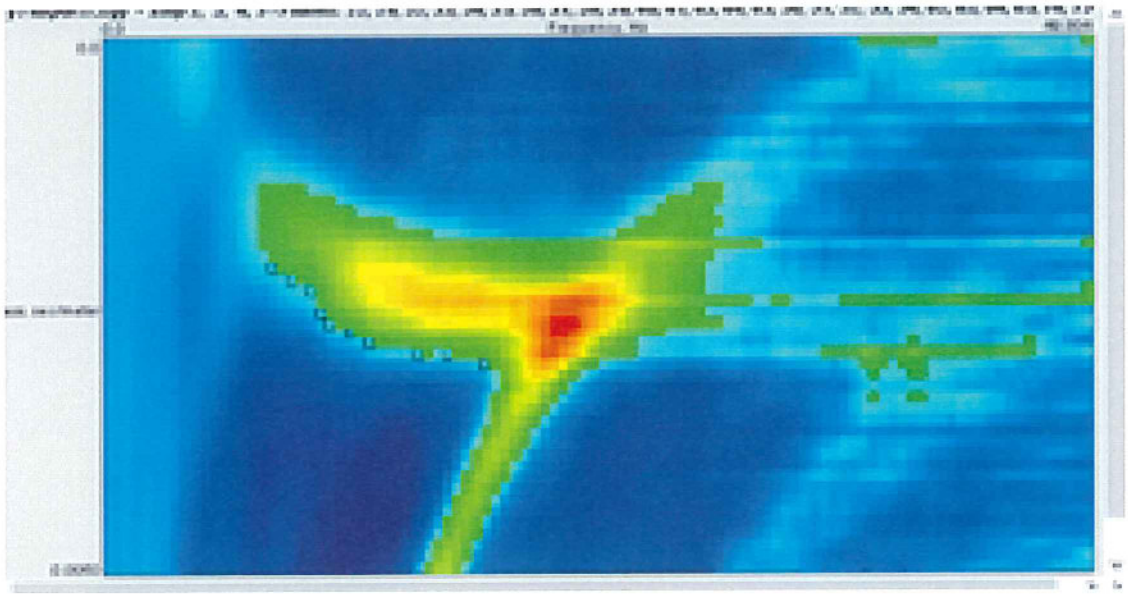


The Quarry - Line 7

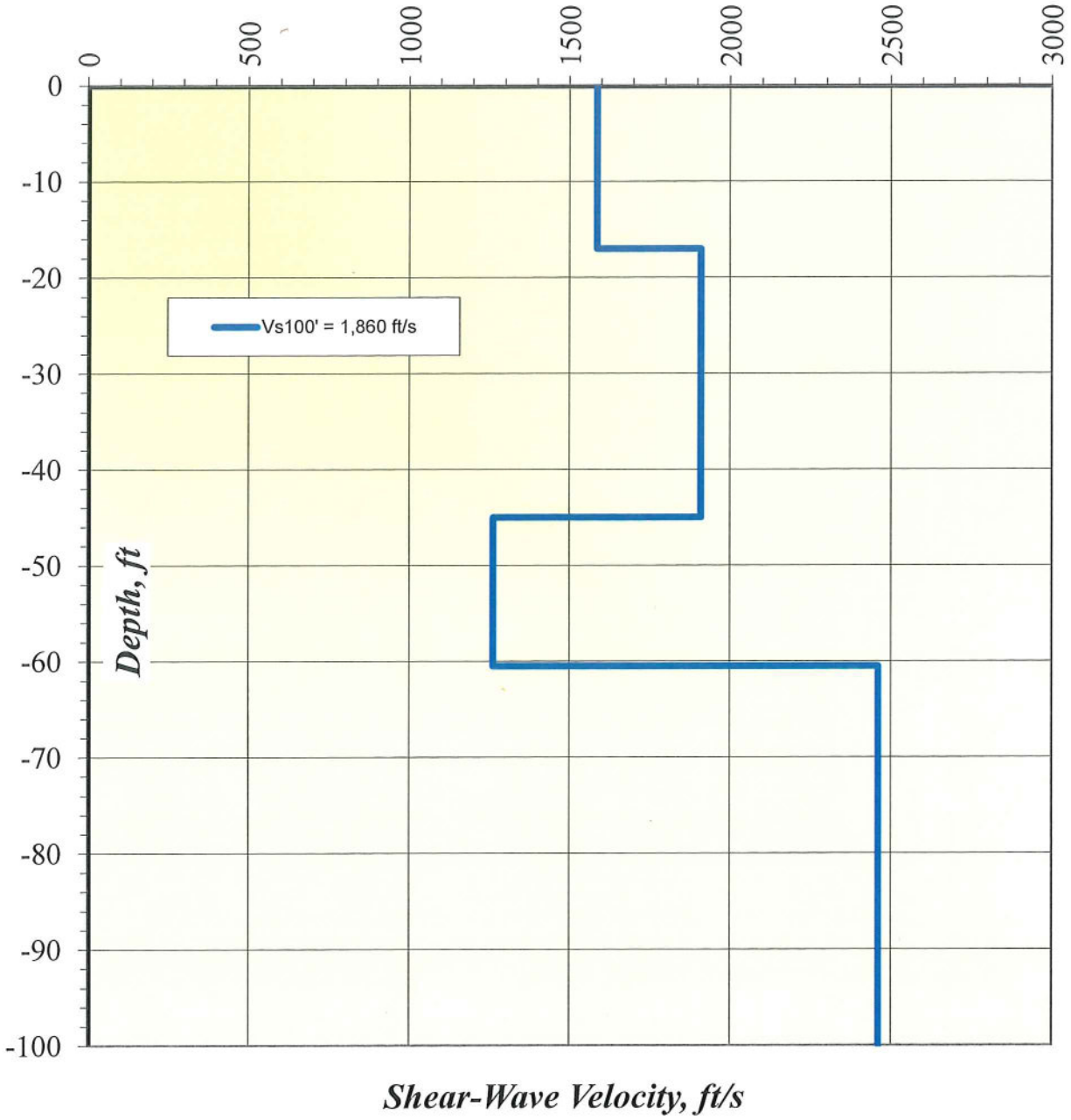
Dispersion Curve Showing Picks and Fit



p-f Image

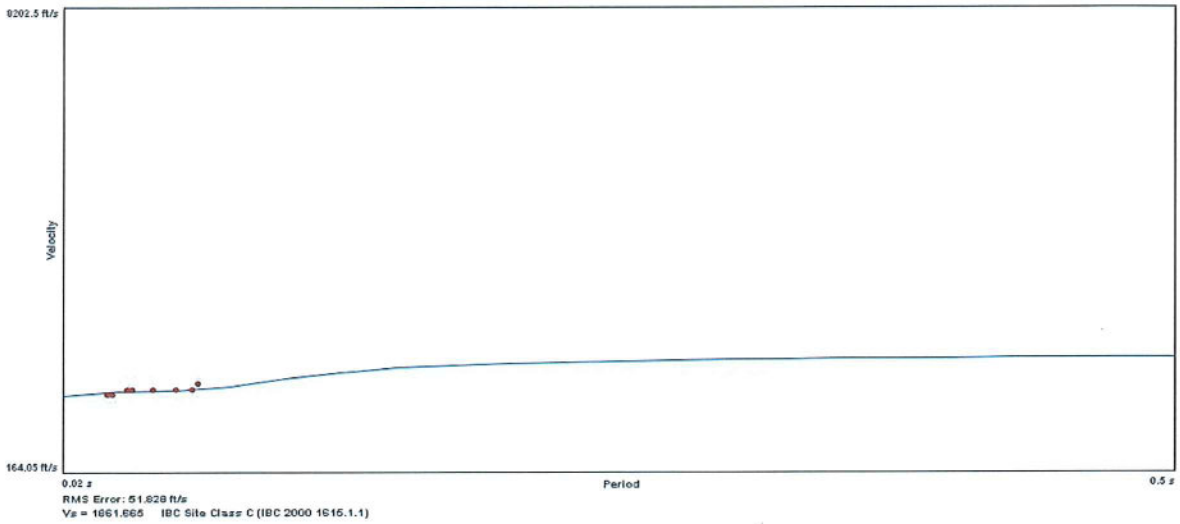


Shear Wave Velocity Modeling Results
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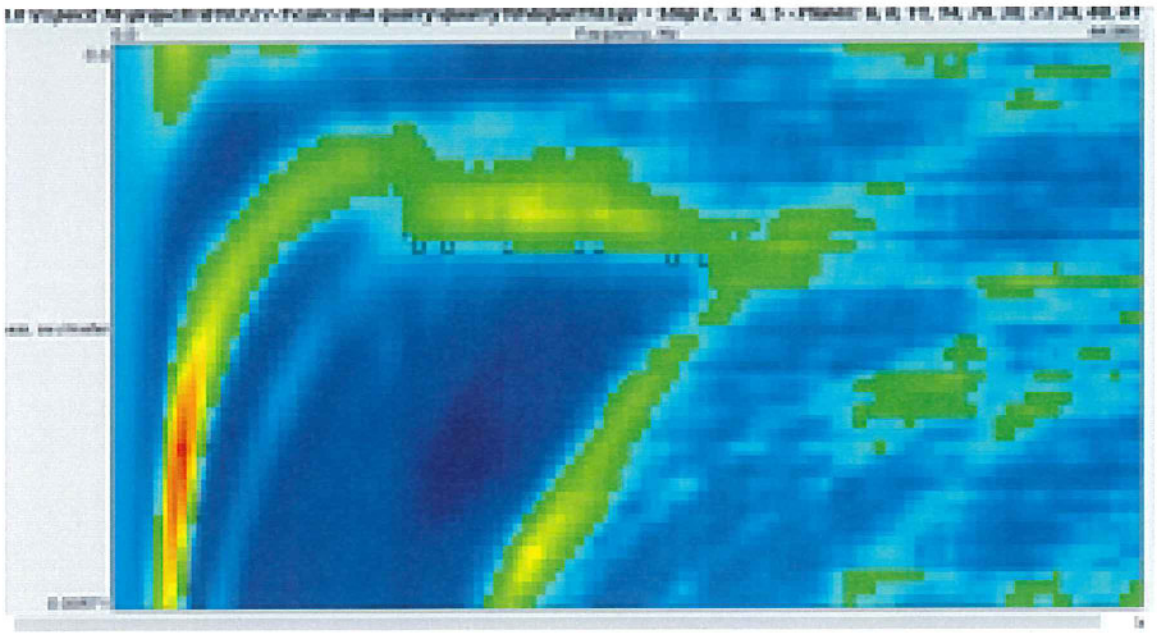


The Quarry - Line 10

Dispersion Curve Showing Picks and Fit



p-f Image



APPENDIX B

CHEMICAL TEST RESULTS

SilverState Analytical Laboratories
Sierra Environmental Monitoring
Silver State Labs-Reno
1135 Financial Blvd
Reno, NV 89502
(775) 857-2400 FAX: (888) 398-7002
www.ssalabs.com

Analytical Report

Workorder#: **18060456**
Date Reported: **6/21/2018**

Client: Black Eagle Consulting, Inc
Project Name: 0183-27-1
PO #: 0183-27-1
Sampled By: J. Payne

Laboratory Accreditation Number: NV015/CA2990

Laboratory ID	Client Sample ID	Date/Time Sampled	Date Received
18060456-01	B-03 15/17.5	05/11/2018 13:00	6/8/2018

Parameter	Method	Result	Units	PQL	Analyst	Date/Time Analyzed	Data Flag
Oxidation-Reduction Potential	SM 2580B	499	mV		LRB	06/20/2018 8:38	
pH	SW-846 9045D	8.15	pH Units		LRB	06/08/2018 16:09	H
pH Temperature	SW-846 9045D	22.0	°C		LRB	06/08/2018 16:09	H
Resistivity	EPA 120.1	8200	Ohms-cm		LRB	06/11/2018 10:40	
Sulfate	EPA 300.0	8	mg/Kg	2	JF	06/12/2018 20:38	
Sulfide	AWWA C105	Negative	POS/NEG		LRB	06/08/2018 15:56	

Laboratory Accreditation Number: NV015/CA2990

Laboratory ID	Client Sample ID	Date/Time Sampled	Date Received
18060456-02	TP-07A 12.5'	05/10/2018 10:00	6/8/2018

Parameter	Method	Result	Units	PQL	Analyst	Date/Time Analyzed	Data Flag
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pH	SW-846 9045D	7.18	pH Units		LRB	06/08/2018 16:09	H
pH Temperature	SW-846 9045D	22.0	°C		LRB	06/08/2018 16:09	H
Resistivity	EPA 120.1	18000	Ohms-cm		LRB	06/11/2018 10:40	
Sulfate	EPA 300.0	17	mg/Kg	2	JF	06/12/2018 21:05	
Sulfide	AWWA C105	Negative	POS/NEG		LRB	06/08/2018 15:56	

Laboratory Accreditation Number: NV015/CA2990

Laboratory ID	Client Sample ID	Date/Time Sampled	Date Received
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Parameter	Method	Result	Units	PQL	Analyst	Date/Time Analyzed	Data Flag
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pH	SW-846 9045D	8.48	pH Units		LRB	06/08/2018 16:09	H
pH Temperature	SW-846 9045D	22.0	°C		LRB	06/08/2018 16:09	H
Resistivity	EPA 120.1	18000	Ohms-cm		LRB	06/11/2018 10:40	
Sulfate	EPA 300.0	<2	mg/Kg	2	JF	06/12/2018 22:23	
Sulfide	AWWA C105	Negative	POS/NEG		LRB	06/08/2018 15:56	

ADDENDUM TO
5 RIDGES
CONCEPTUAL DRAINAGE REPORT

ADDRESSING OFFSIGHT DRAINAGE ON NEAR THE INTERSECTION OF HIHGLAND RANCH PARKWAY AND PYRAMID WAY



Prepared For:

FIVE RIDGES

Mr. Blake Smith
5 Ridges Development, Inc.
1 E Liberty Street, Suite 444
Reno, NV 89511

Prepared By:

Annjanette Dodd, PhD, PE
House Moran Consulting, Inc.
10399 Double R. Boulevard, Suite 110
Reno, NV 89521
775-293-4000

March 2020

TABLE OF CONTENTS

1.1 Introduction 3
1.2 Existing Conditions 3
1.3 Previous Studies 4
1.4 Hydrologic and Hydraulic Modeling of Existing Conditions 4
1.5 Summary 7

FIGURES

Figure 1. Location Map (blue arrows represent flow direction)
Figure 2. Detention Basin Profile from May 2006 Plans by Wood Rodgers
Figure 3. HEC-1 Subbasins from Kiley Ranch North Storm Drainage Master Plan
Figure 4. Existing Conditions PCSWMM Model Layout (excerpt from 5 Ridges Conceptual Drainage Report)
Figure 5. Facing South on Pyramid Way just South of the Intersection with Highland Ranch Parkway
Figure 6. Existing Conditions 100-year Model Results
Figure 7. Existing Conditions 100-year Model Results, Clogging Factor 50%
Figure 8. 100-year Model Results - RCPs Replaced with two 6'x4' RCBCs
Figure 9. Existing Conditions 50-year Model Results
Figure 10. Existing Conditions 25-year Model Results

1.1 Introduction

The Conceptual Drainage Report for 5 Ridges, prepared by House Moran Consulting (House Moran) was submitted to the City of Sparks (City) on February 28, 2020. Per the City's request, this addendum to the 5 Ridges Conceptual Drainage Report has been prepared to provide an evaluation of the offsite drainage from just upstream of the intersection of Highland Ranch Parkway with Pyramid Way to the detention basin located on the east side of Pyramid Way approximately 700 feet southwest of the intersection (Figure 1).

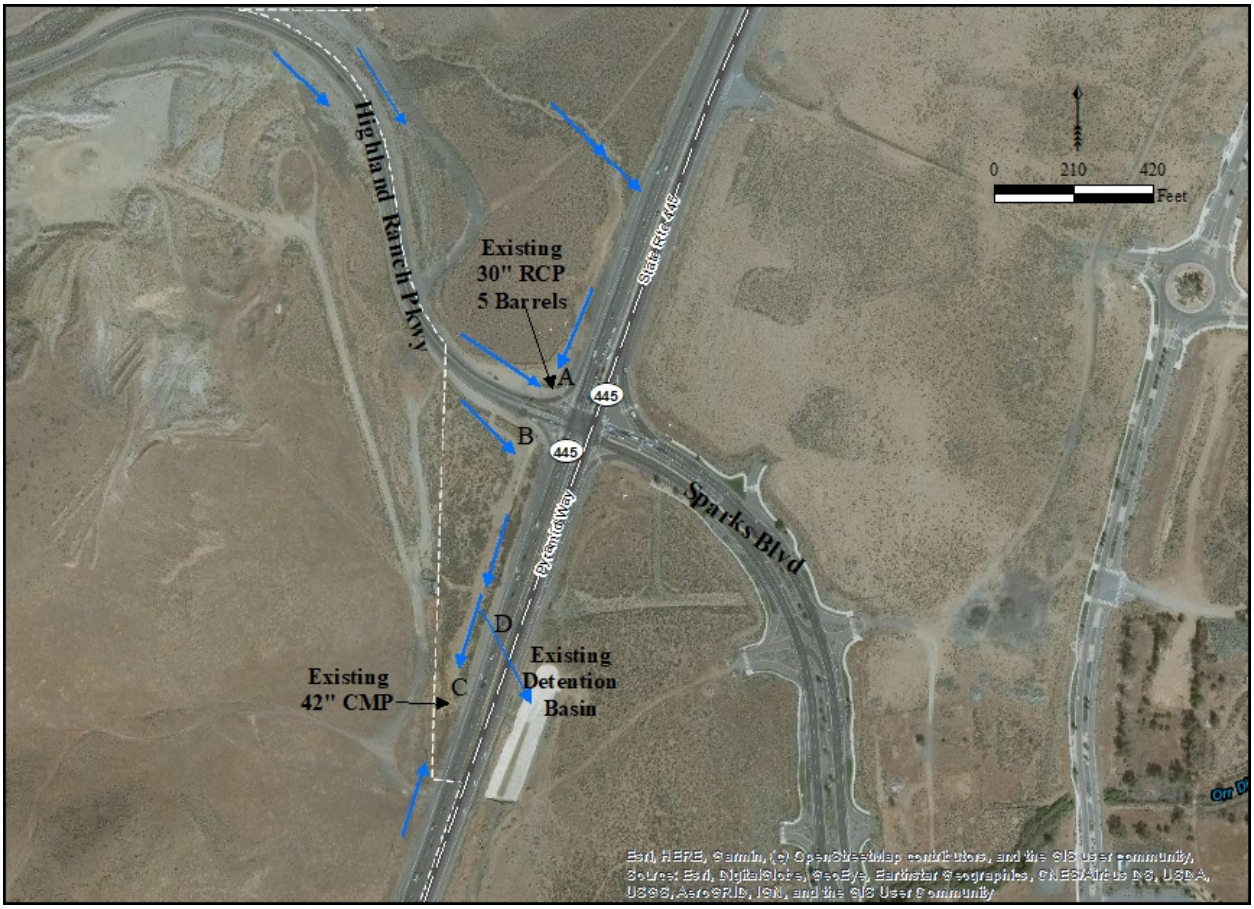


Figure 1. Location Map (blue arrows represent flow direction)

1.2 Existing Conditions

The flow travels from the north and west towards five (5) existing 30-inch RCPs under Highland Ranch Parkway at the intersection with Pyramid Way (Point A), into an existing ditch (Points B to C), and then into an existing detention basin on the eastern side of Pyramid Way, via a combination an existing 42-inch CMP (Point C) and overtopping Pyramid Way (Point D) (Figure 1). The inverts and sizes of the existing RCPs and CMP were surveyed by Christy Corporation in November 2019. Sediment clogging the of the existing RCPs has been a maintenance issue for the City.

1.3 Previous Studies

The City's existing detention basin is shown on the Improvement Plans for the Sun Valley Diversion Channel, dated May 2006, provided to House Moran by the City. The profile of the basin, from the plans, is provided in Figure 2. As shown on the plans, the design was intended to overtop Pyramid Way during the 100-year event with a peak flow of 376 cfs and a depth of 1-foot. The 100-year peak flow was determined as part of the Storm Drainage Master Plan, using HEC-1, for Kiley Ranch North prepared by Wood Rodgers in May 2005. A screen capture of the HEC-1 hydrology model subbasin layout in the vicinity of 5 Ridges is provided in Figure 3. The HEC-1 100-year flow (376 cfs) is highlighted for Reach 10 and matches the 100-year flow on the detention basin plans in Figure 2. Thus, the detention basin appears to have been designed for a 100-year flow of 376 cfs with about 1.5-feet of freeboard. The outflow is via an 8'x4' RCB culvert (RCBC). The depth of the detention basin, at the outlet, is 12-feet and at the inlet it is 13-feet.

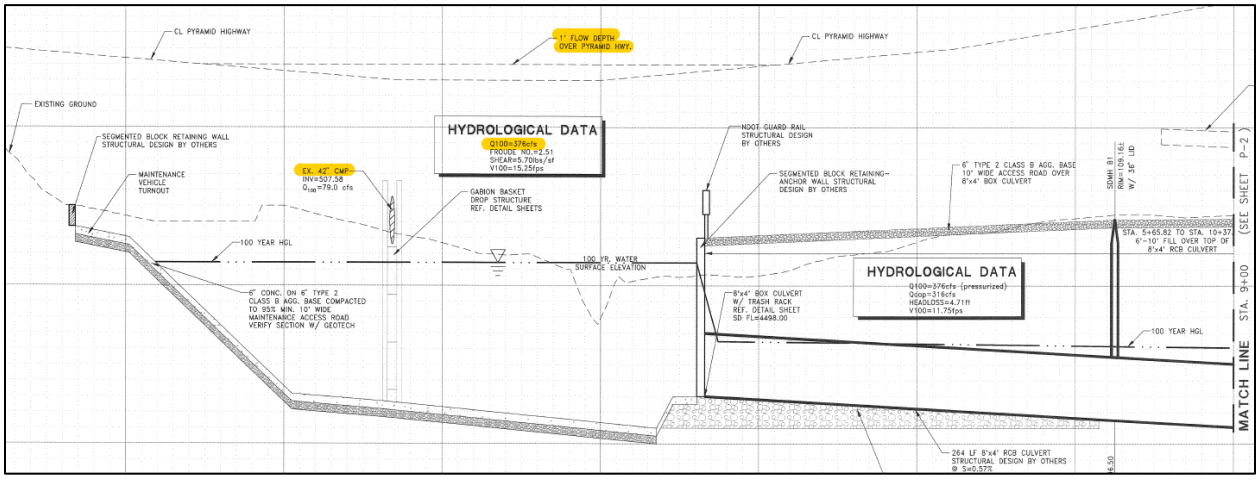


Figure 2. Detention Basin Profile from May 2006 Plans by Wood Rodgers

1.4 Hydrologic and Hydraulic Modeling of Existing Conditions

As part of the 5 Ridges Conceptual Drainage Study, detailed existing conditions hydrologic and hydraulic modelling was conducted using Computational Hydraulics, Inc's (CHI) PCSWMM version 7.2 (Figure 4). Existing subbasins, representing a total area of approximately 990 acres (1.55 square miles), that contribute flow to the City's detention basin are shown in Figure 4 (blue and green arrows indicate flow direction).

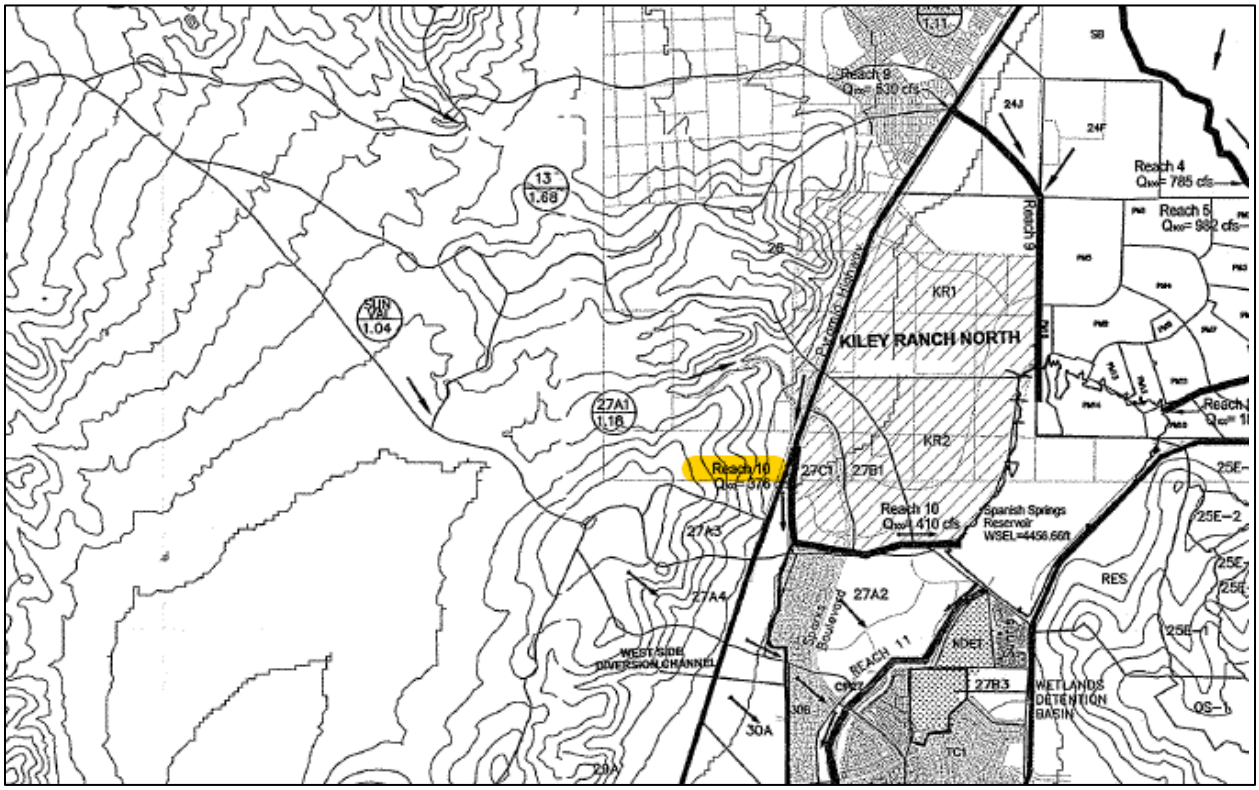


Figure 3. HEC-1 Subbasins from Kiley Ranch North Storm Drainage Master Plan

The existing conditions 100-year flow upstream of the intersection is estimated in PCSWMM to be 431 cfs (see Figure 4 and Point A in Figure 1). There are five, existing 30-inch RCPs passing under Highland Ranch Parkway that do not have the capacity to pass the entire 100-year flow. The flow is detained behind the roadway until it overtops Highland Ranch Parkway and either enters the ditch along the western side of Pyramid Way (Points B to C in Figure 1) or overtops Pyramid Way and flow towards the City's detention basin (Point D in Figure 1) at the lowest elevation on Pyramid Way (Figure 2 and Figure 5); all flows ultimately drain to the City's detention basin. Runoff from subbasin Boff-D2 drains towards Pyramid Way and then down Pyramid Way towards the northeast and ultimately to the low spot on Pyramid Way and into the City's detention basin.

Under existing conditions, approximately 229 cfs passes through the five, existing 30-inch RCPs under Highland Ranch Parkway and the remaining flow overtops Highland Ranch Parkway. The model shows a total peak of approximately 755 cfs entering the City's detention basin and that the capacity of the basin is exceeded (Figure 6); 63% of the flow exits through the RCBC and 37% overtops the rim of the basin and flows overland towards the south. Due to the size of the RCBC exiting the City's basin, very little detention is achieved in the basin.

To evaluate flows when sediment deposition is considered existing conditions, a 50% clogging factor was applied to the culverts under Highland Ranch Parkway. When the culverts are modeled as 50% clogged, the peak flow into the City's detention basin is approximately 739 cfs,

which is not much less than if there is assumed no clogging due to the road overtopping (Figure 7).

To pass the existing 100-year flow under Highland Ranch Parkway, the five, 30-inch RCPs were replaced in the PCSWMM model with two, 6'x4' RCBCs. Under this condition, only 11 cfs overtops Highland Ranch Parkway with less than 0.5 feet backing up behind the road. The peak flow entering the City's detention basin is approximately 751 cfs; which is slightly less than under existing conditions without pipe clogging (Figure 8).

The City's detention basin also floods during the 50-year event (Figure 9), but not the 25-year event (Figure 10). The peak flow is attenuated by approximately 26 cfs during the 25-year event.

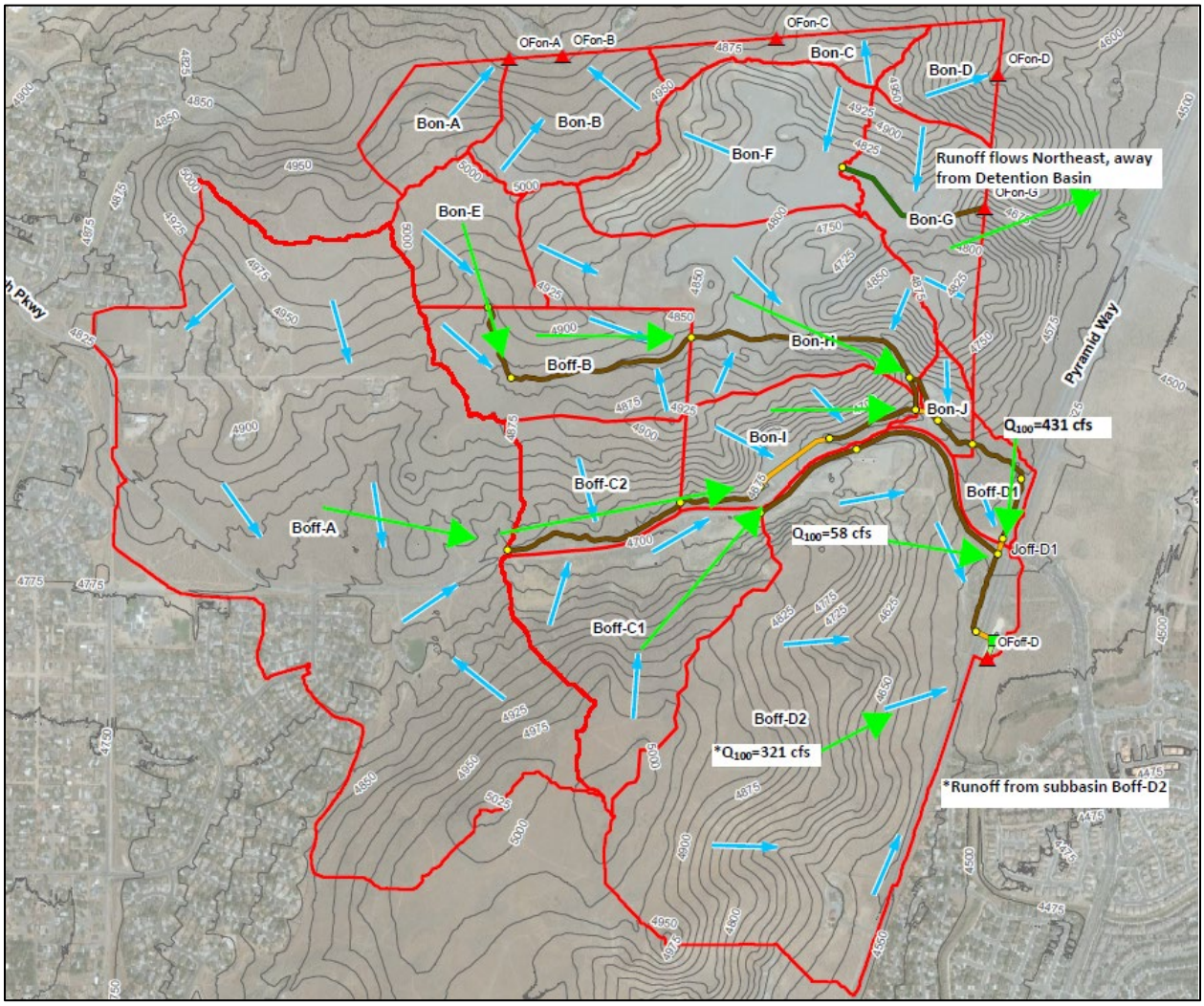


Figure 4. Existing Conditions PCSWMM Model Layout (excerpt from 5 Ridges Conceptual Drainage Report)

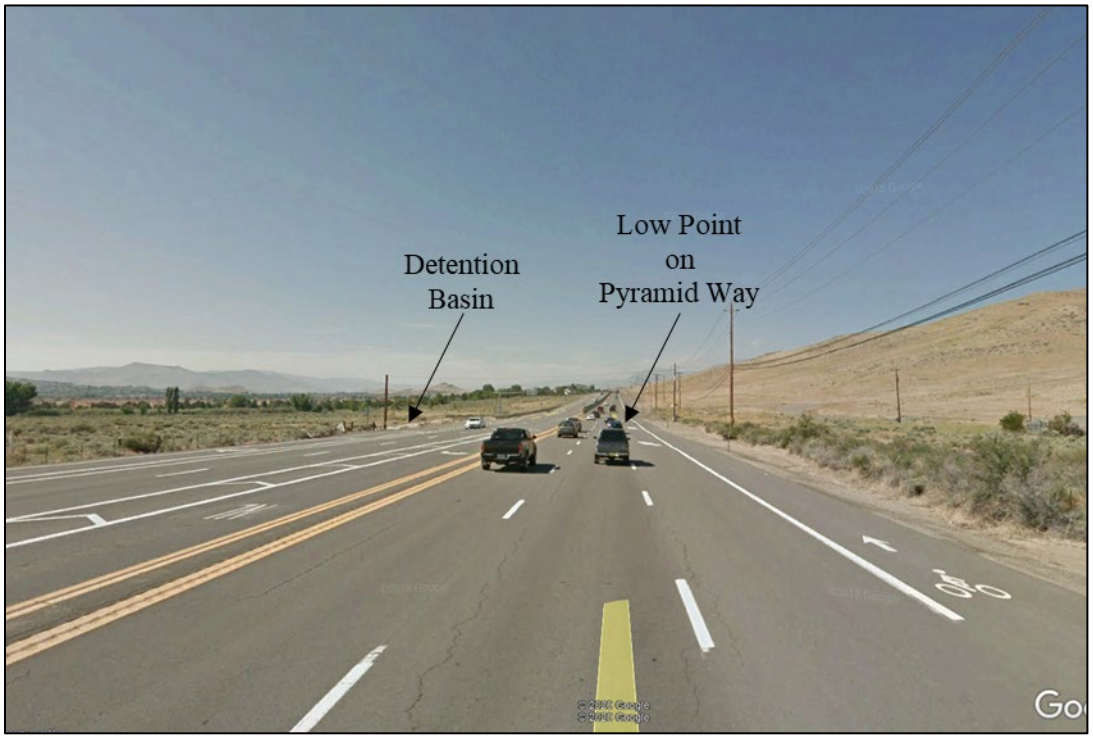


Figure 5. Facing South on Pyramid Way just South of the Intersection with Highland Ranch Parkway

1.5 Summary

Based on the Improvement Plans for the Sun Valley Diversion Channel, the City's existing detention basin was designed for a peak 100-year flow of 376 cfs overtopping Pyramid Way while the 42" CMP into the basin was designed with a capacity of 79 cfs. The modeling presented here shows that the 100-year peak flow into the City's existing detention basin is double the design flow, the basin provides some detention up to the 25-year event, the basin overflows somewhere between the 25-year and 50-year events, and very little detention is provided for the 50-year or 100-year events.

To completely pass the flow under Highland Ranch Parkway, it is recommended that the five existing RCPs be replaced with two 6'x4' RCBCs or similar.

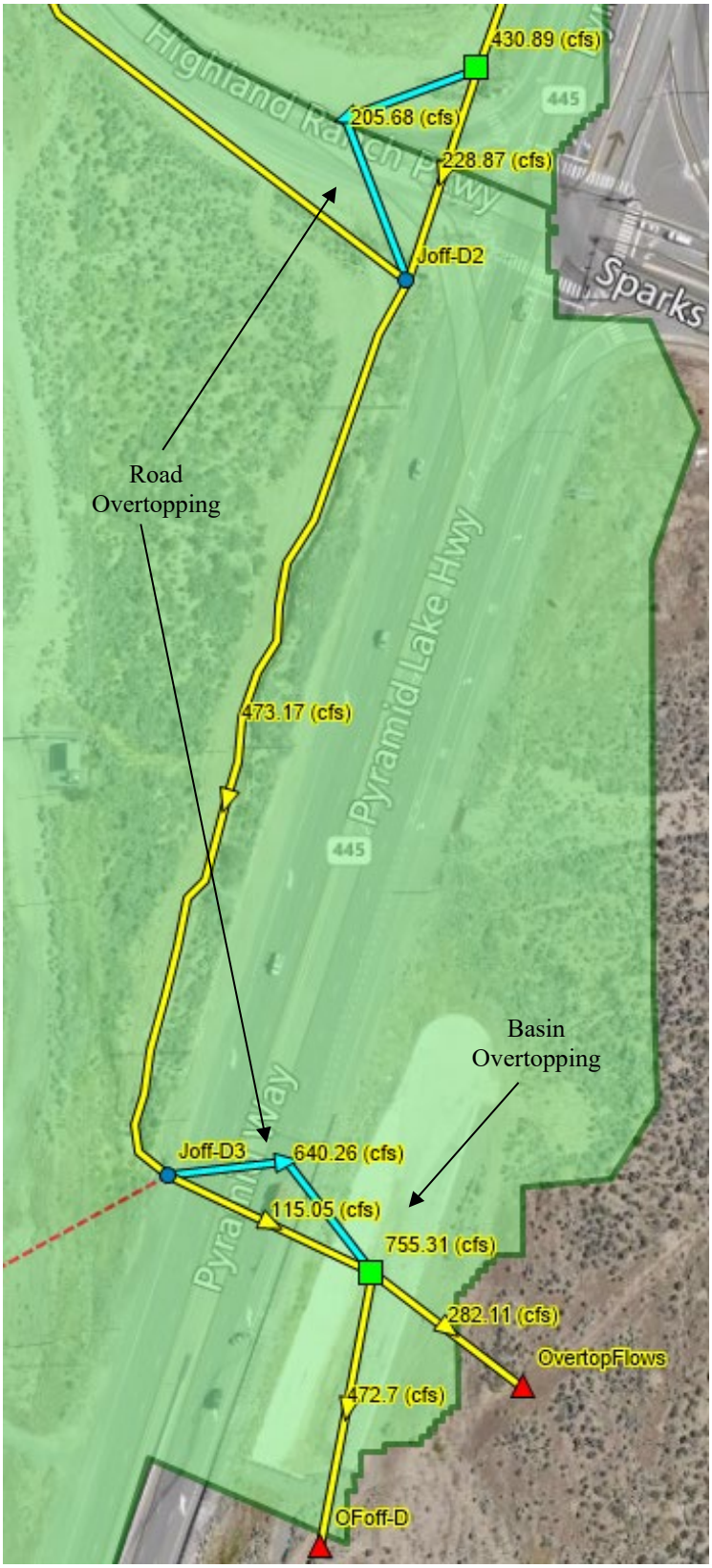


Figure 6. Existing Conditions 100-year Model Results

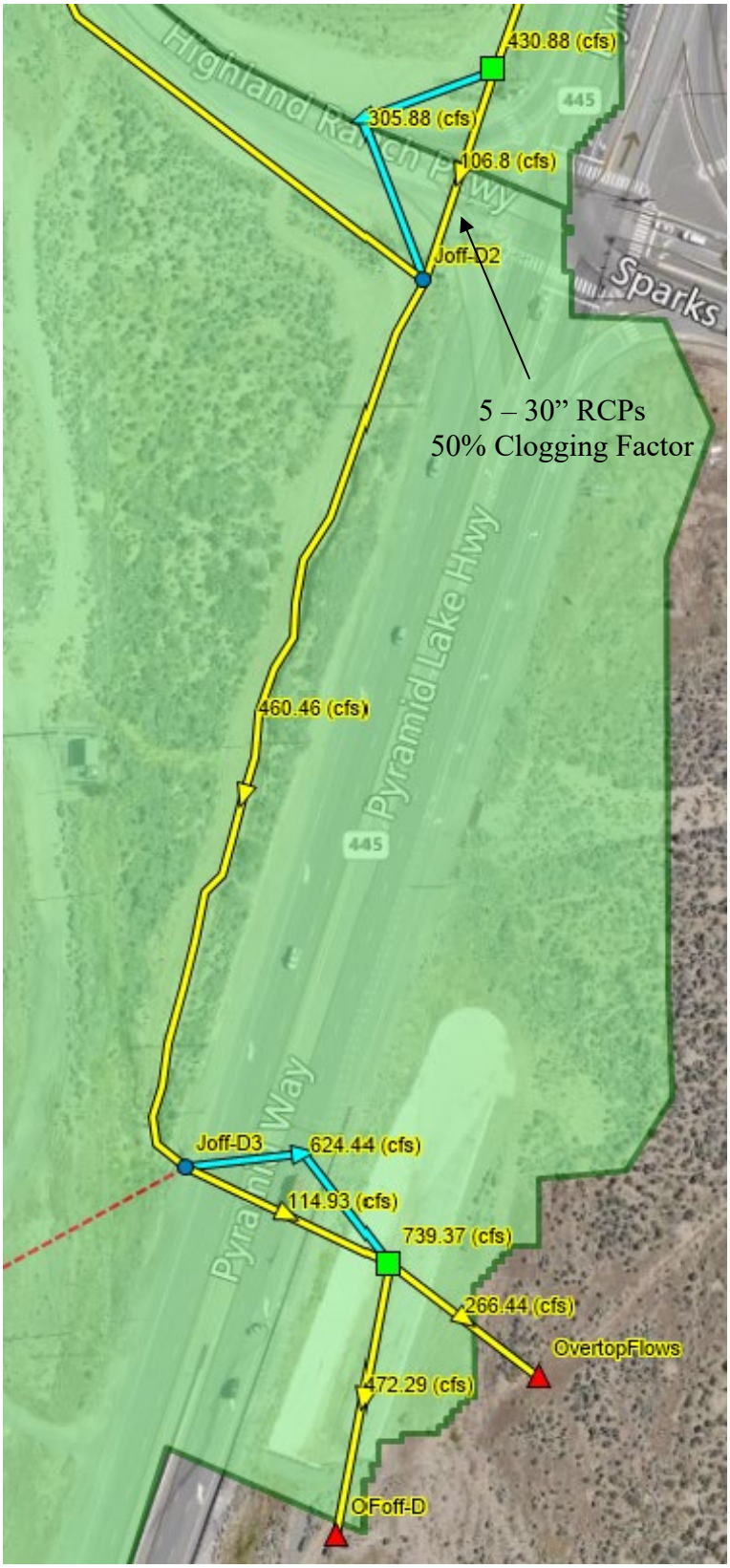


Figure 7. Existing Conditions 100-year Model Results, Clogging Factor 50%



Figure 8. 100-year Model Results - RCPs Replaced with two 6'x4' RCBCs



Figure 9. Existing Conditions 50-year Model Results

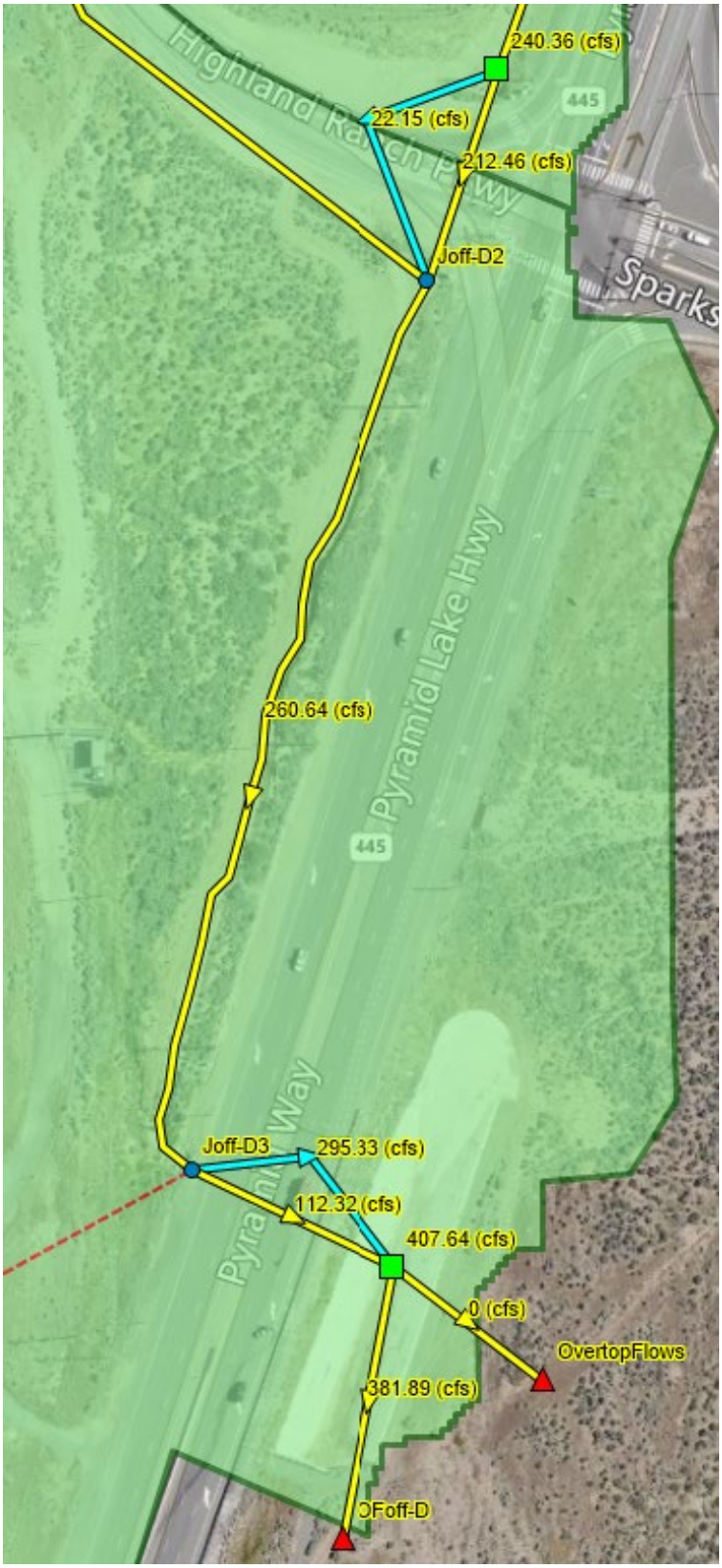


Figure 10. Existing Conditions 25-year Model Results

House Moran Consulting, Inc.
Water Resources and Environmental Engineering



March 22, 2020

Mr. Jon Ericson, PE, PTOE
City Engineer
City of Sparks
431 Prater Way
Sparks, NV 89431

RE: 5 Ridges Land Use and Tentative Map Revisions
Discussion of Impacts to the Conceptual Drainage Model Results

Dear Mr. Ericson:

Pursuant to your request, House Moran Consulting, Inc. (House Moran) has reviewed the 5 Ridges Land Plan and Tentative Map Revisions to provide an assessment of the impacts to the Conceptual Drainage Model (model) results. Christy Corporation provided a list of changes to the layout since the submittal of the 5 Ridges Conceptual Drainage Report in February 2020. Below is a list of the changes provided, along with House Moran's response to each change.

1. Revision: Phase 1 of 5 Ridges Parkway now extends approximately 1100 feet further to the north and the alignment of the northern section has shifted east by approximately 10 feet. Shifting

   Response: Constructing a longer segment of the alignment in Phase 1 does not change the model results since the model was developed for full buildout conditions. Also, shifting the road 10 feet is a minor change that would not result a change in the conceptual model results.

2. Revision: All of the perimeter lot lines have been revised in Villages 6 and 7 to allow for access points to adjacent open space.

   Response: This does not result in a change in drainage area, layout, or percent impervious, so this would have no impact on the model results.

3. Revision: Lot lines on the west side of Village 7 have been extended to 5 Ridges Parkway, eliminating the open space between 5 Ridges parkway and Village 7.

   Response: Although the lot lines change, the overall slopes and land cover remain the same, thus there would be no impact to the model results.

4. Revision: Rear lot lines in Villages 2 and 3 have been revised to include cut slopes.

   Response: The overall land cover remains the same, thus there would be no impact to model results.

5. Revision: One lot has been removed from both Villages 2 and 3 from the private driveways which extend from the west knuckles.

   Response: The overall density of land use does not change; therefore, this would not impact model results.

6. Revision: The total lot count is now 460.

   Response: The Conceptual Drainage Report is based on the lot count from the Land Plan Submitted in December 2019, which was 465. Reducing the over lot county by 5 lots would not have an impact on the overall model results.

7. Revision: 27 lots have been added to Village 6 at the northeast corner running parallel to 5 Ridges Parkway and all of Village 6 grading has been revised.

   Response: The layout of Village 6 and a portion of Village 10 have changed. Screen captures of the former and current Land Plans are provided side-by-side for comparison (Figure 1 and 2). The areas that have changed are contained within the model subbasin titled *Village_6*, as highlighted in Figure 3. The change in density within this subbasin is summarized in Table 1. There is a slight increase in density. The subbasin model parameters affected by the change are impervious area and depression storage. The weighted parameters are summarized in Tables 2 and 3. There is a slight increase in impervious area and a slight decrease in depression storage between the former and current Land Plans. These parameters were put into the model to estimate the difference in 100-year peak flows under both scenarios. The *Village 6* subbasin 100-year peak flows for the former land plan and current land plan are 73.8 cfs and 74.4 cfs, respectively – an insignificant increase. Subbasin *Village 6* drains to the detention basin labeled Det-2. Under both conditions the minimum freeboard condition of 1.0-feet is still met in Det-2.

Table 1. Summary of Land Plan Changes within the *Village_6* subbasin.

Land Plan	Village 6		Village 10		Total		Density (lots/acre)
	Area (acres)	Lots	Area (acres)	Lots	Area (acres)	Lots	
Former	18.4	137	4.1	17	22.5	154	6.8
Current	20.9	148	0	0	20.9	148	7.1

Table 2. Former Land Plan Percent Impervious and Depression Storage within the *Village 6* subbasin.

Land Use	Area (acres)	% Impervious	Depression Storage (in)
1/8 acre or less Residential (all from Village 6)	15.7	60	0.05
1/6 acre or less Residential (from Village 10)	4.1	44	0.08
Open Space	10.8	0	0.20
	Weighted	*37*	*0.11*

Table 3. Current Land Plan Percent Impervious and Depression Storage within the *Village 6* subbasin.

Land Use	Area (acres)	% Impervious	Depression Storage (in)
1/8 acre or less Residential (all from Village 6)	20.9	60	0.05
1/6 acre or less Residential (from Village 10)	0	44	0.08
Open Space	9.7	0	0.20
	Weighted	*41*	*0.10*

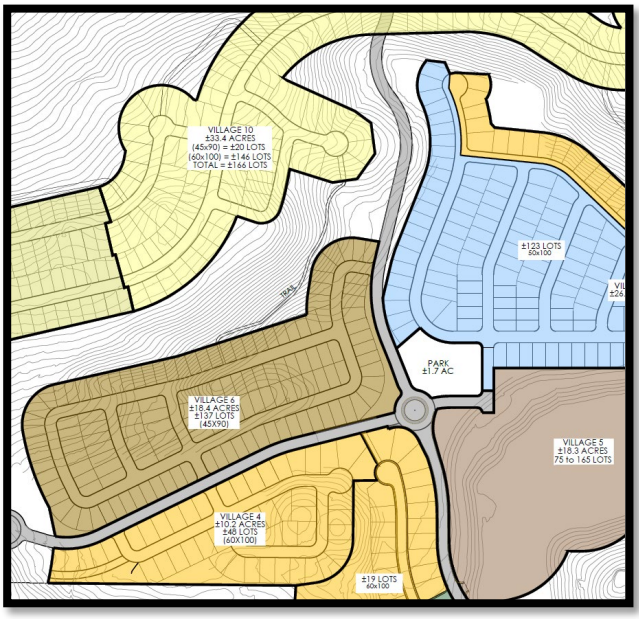


Figure 1. Screen Capture of Former Land Plan

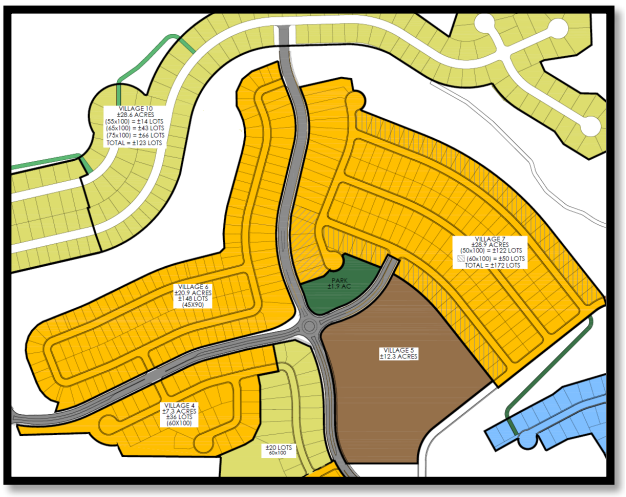


Figure 2. Screen Capture of Current Land Plan

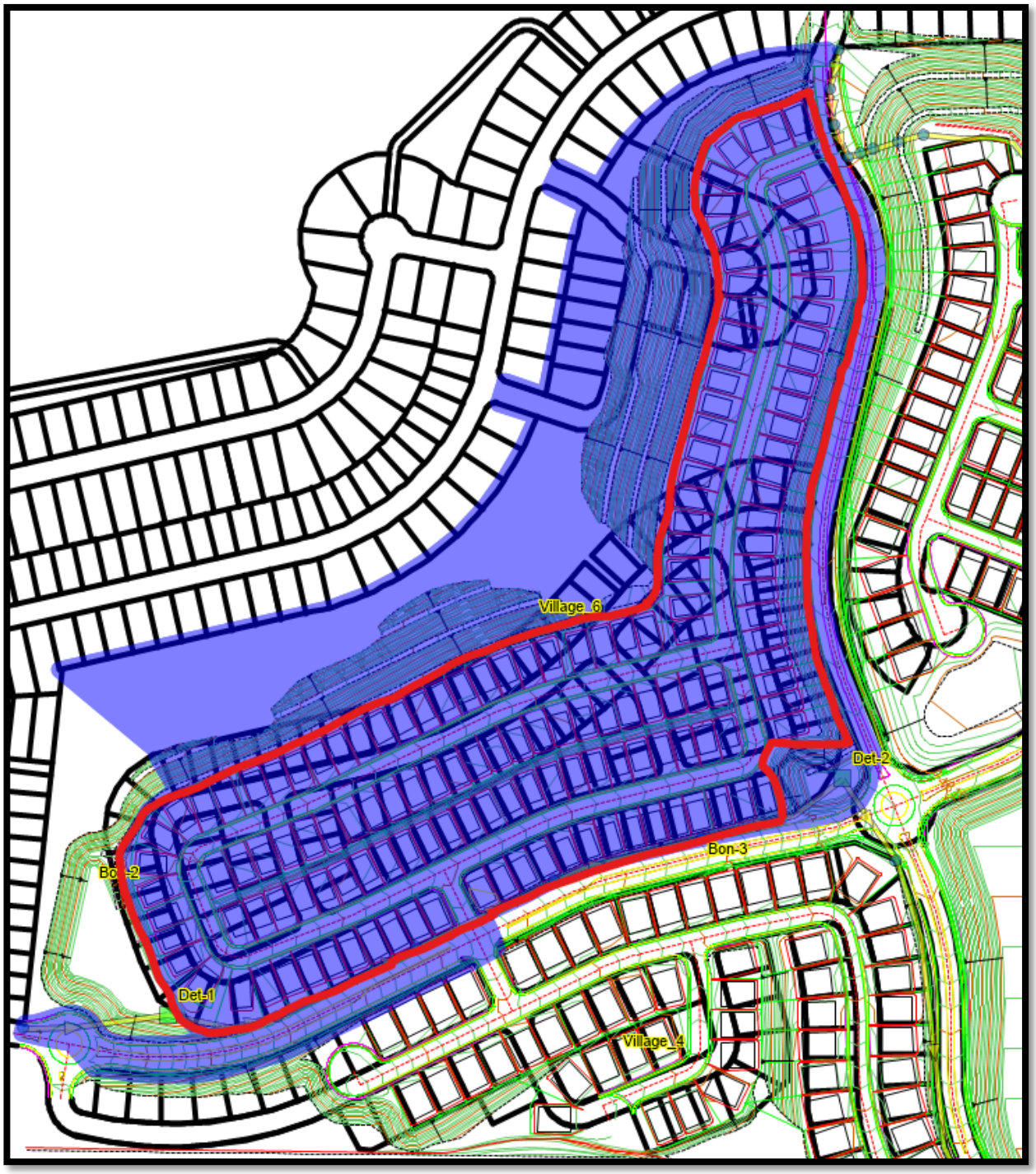


Figure 3. Screen Capture of the *Village_6* Subbasin (highlighted in blue). (Note: The thick black lines represent the former lot lines. The current lot line extents are outlined in red.)

In conclusion, the overall changes to the Land Plan and Tentative Map do not result in significant changes to the Conceptual Drainage Model (model) results and there is no need to revise the 5 Ridges Conceptual Drainage Report submitted in February 2020.

If you have any questions, please do not hesitate to contact Jeff House at (775) 293-4000 or myself at (707) 845-1340.

Sincerely,



Annjanette Dodd, PE, PhD

SOLAEGUI
ENGINEERS

February 28, 2020

Ms. Amber Sosa
City of Sparks
431 Prater Way
Sparks, Nevada 89431

Re: 5 Ridges Trip Generation Review

Dear Amber:

This letter contains the findings of our trip generation review of the proposed 5 Ridges February, 2020 Land Plan map. The project takes access off Highland Ranch Parkway west of the Pyramid Highway. In September, 2017 a full traffic study was completed for the project. At that time the project included 1,223 single family homes and 13 acres of mini warehouse. The current submittal includes 88 townhouses and 1,047signal family homes. The proposed land plan map is attached.

In 2017 trip generation calculations were based on the Ninth Edition of *ITE Trip Generation*. Table 1 shows the trip generation summary from the 2017 study.

TABLE 1
TRIP GENERATION

LAND USE	ADT	AM PEAK HOUR TOTAL	PM PEAK HOUR TOTAL
Single Family Detached Housing 1,223 Dwelling Units	10,513	866	1,000
Mini Warehouse 13 Acres	461	34	46
Total	10,974	900	1,046

As indicated in Table 1, trip generation totals using from the 2017 traffic study included 10,974 average daily trips with 900 AM peak hour trips and 1,046 PM peak hour trips.

Trip generation calculations for the currently proposed land plan are based on the new Tenth Edition of *ITE Trip Generation*. The calculation sheets are attached for ITE land use #210 Single Family Detached Housing and #220 Multifamily Housing (Low Rise). Volumes from the fitted curve equation calculation method are utilized. The equation method was

also used in the 2017 traffic study. Table 2 shows the trip generation summary for the new land plan.

TABLE 2
TRIP GENERATION FEBRUARY 2020 LAND PLAN

LAND USE	ADT	AM PEAK HOUR TOTAL	PM PEAK HOUR TOTAL
Single Family Detached Housing 1,047 Dwelling Units	9,022	748	968
Multifamily Housing (Townhomes) 88 Dwelling Units	624	42	53
Total	9,646	790	1,021
Comparison With 2017 Totals	-1,328	-110	-25

As indicated in Table 2, trip generation totals for the current land plan include 9,646 average daily trips with 790 AM peak hour trips and 1,021 PM peak hour trips. These totals include 1,328 fewer average daily trips with 110 less AM peak hour trips and 25 less PM peak hour trips than presented in the original traffic study. These reduced trip totals will result in slightly less traffic impact at the key intersections and roadways than anticipated in the original traffic study.

We trust that this information will be helpful to you. Please contact us if you have questions or comments.

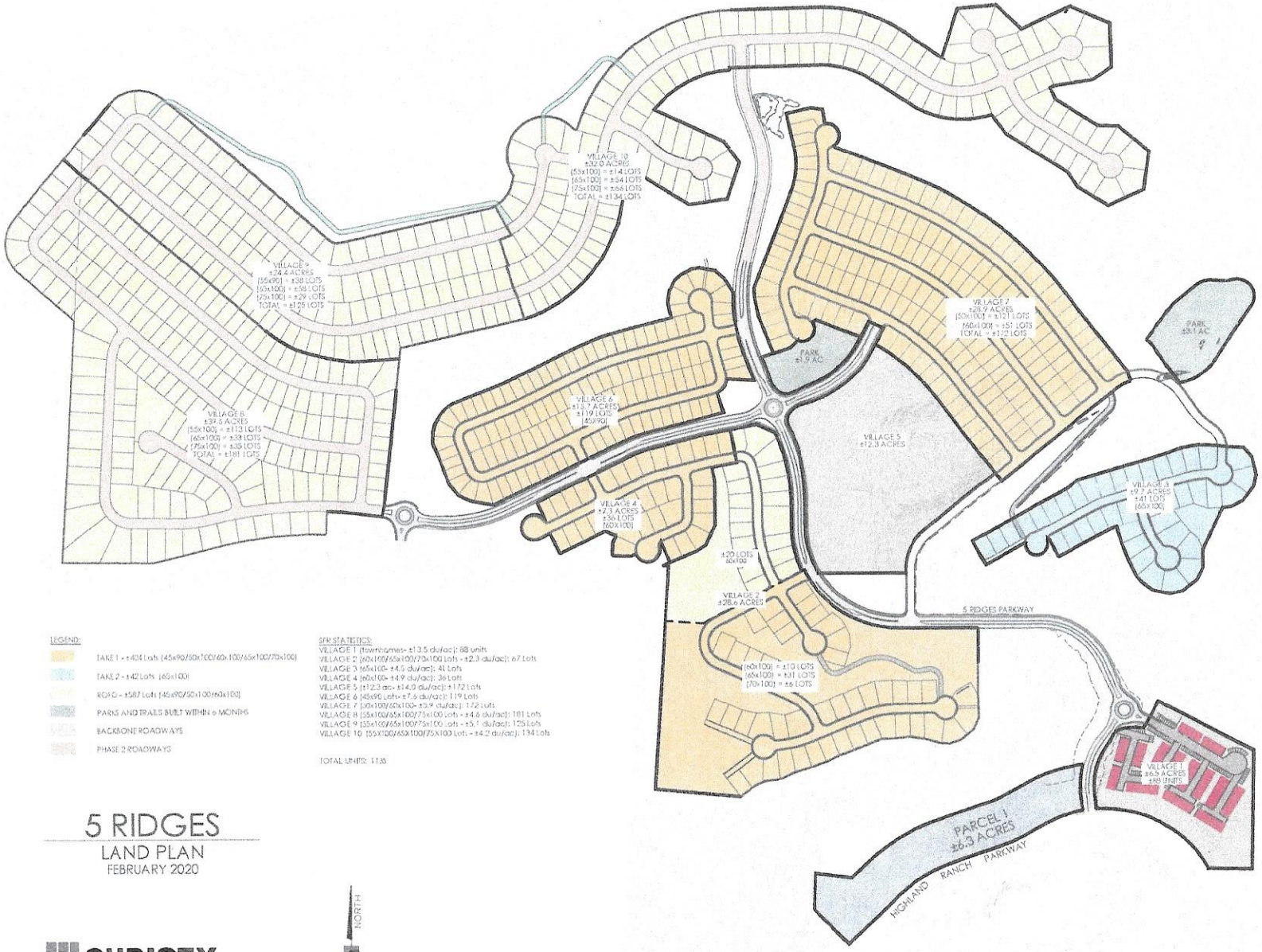
Very truly yours,
SOLAEGUI ENGINEERS, LTD

Paul W. Solaegui, P.E.

PROFESSIONAL ENGINEER
PAUL W. SOLAEGUI
CIVIL
No. 7163
STATE OF NEVADA
REGISTERED

2-28-20
EXP 6-30-20

Enclosures
Letters/Five Ridges February 2020 Land Plan Trip Generation Letter



LEGEND:

- TAKE 1 - ±404 Lots (45x90/50x100/60x100/65x100/70x100)
- TAKE 2 - ±42 Lots (65x100)
- ROFO - ±587 Lots (45x90/50x100/60x100)
- PARKS AND TRAILS BUILT WITHIN 6 MONTHS
- BACKBONE ROADWAYS
- PHASE 2 ROADWAYS

STATISTICS:

VILLAGE 1 (townhomes- ±13.5 du/ac): 88 units
VILLAGE 2 (60x100/65x100/70x100 Lots - ±2.3 du/ac): 67 Lots
VILLAGE 3 (65x100- ±4.5 du/ac): 41 Lots
VILLAGE 4 (60x100- ±4.9 du/ac): 36 Lots
VILLAGE 5 (±12.3 ac- ±14.0 du/ac): ±172 Lots
VILLAGE 6 (45x90 Lots- ±7.6 du/ac): 119 Lots
VILLAGE 7 (50x100/60x100- ±5.9 du/ac): 172 Lots
VILLAGE 8 (55x100/65x100/75x100 Lots - ±4.6 du/ac): 181 Lots
VILLAGE 9 (55x100/65x100/75x100 Lots - ±5.1 du/ac): 125 Lots
VILLAGE 10 (55X100/65X100/75X100 Lots - ±4.2 du/ac): 134 Lots

TOTAL UNITS: 1135

5 RIDGES

LAND PLAN

FEBRUARY 2020

CHRISTY CORPORATION
1000 Kiley Pkwy | Sparks, Nevada 89436
775.502.8552

NORTH

1"=200'

Single-Family Detached Housing
(210)

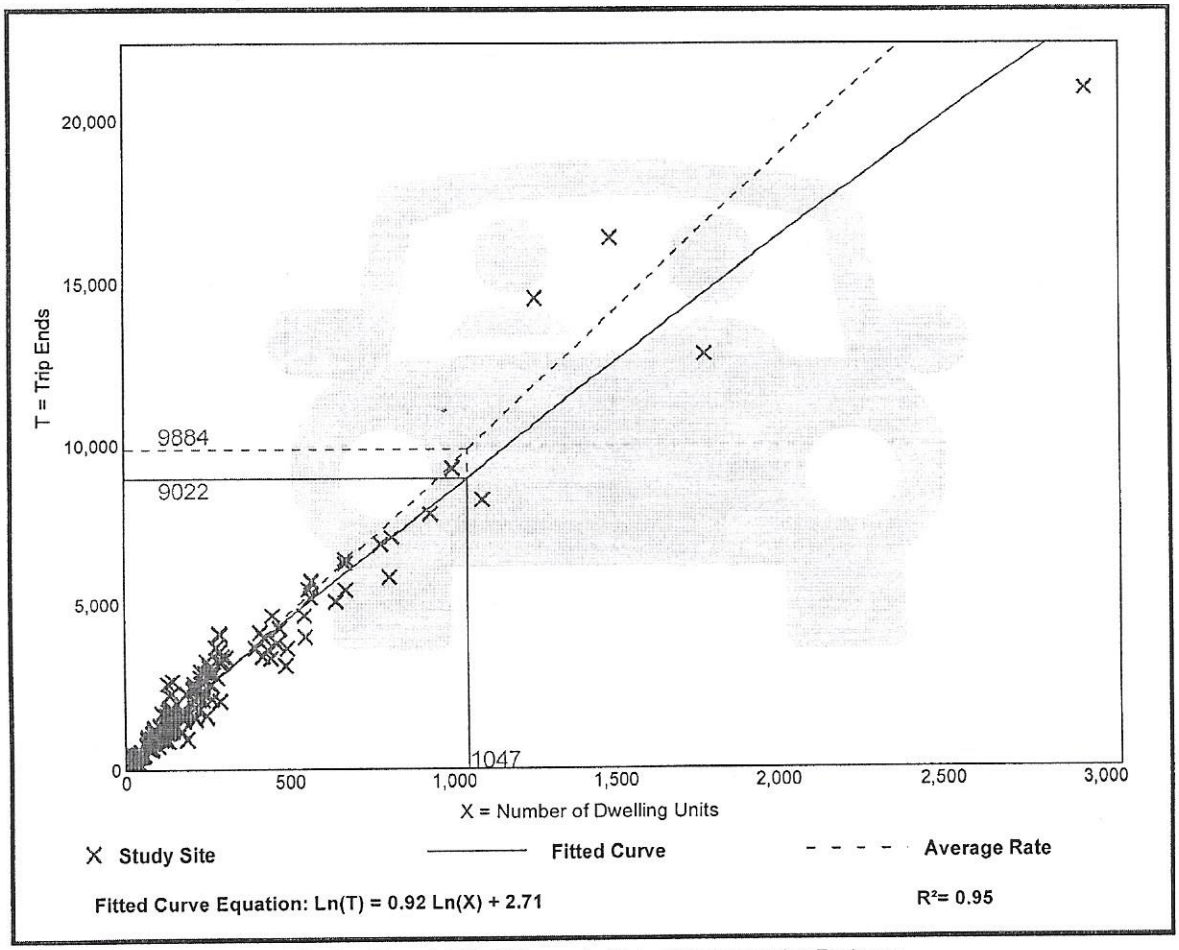
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 159
Avg. Num. of Dwelling Units: 264
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.44	4.81 - 19.39	2.10

Data Plot and Equation



Trip Gen Manual, 10th Edition • Institute of Transportation Engineers

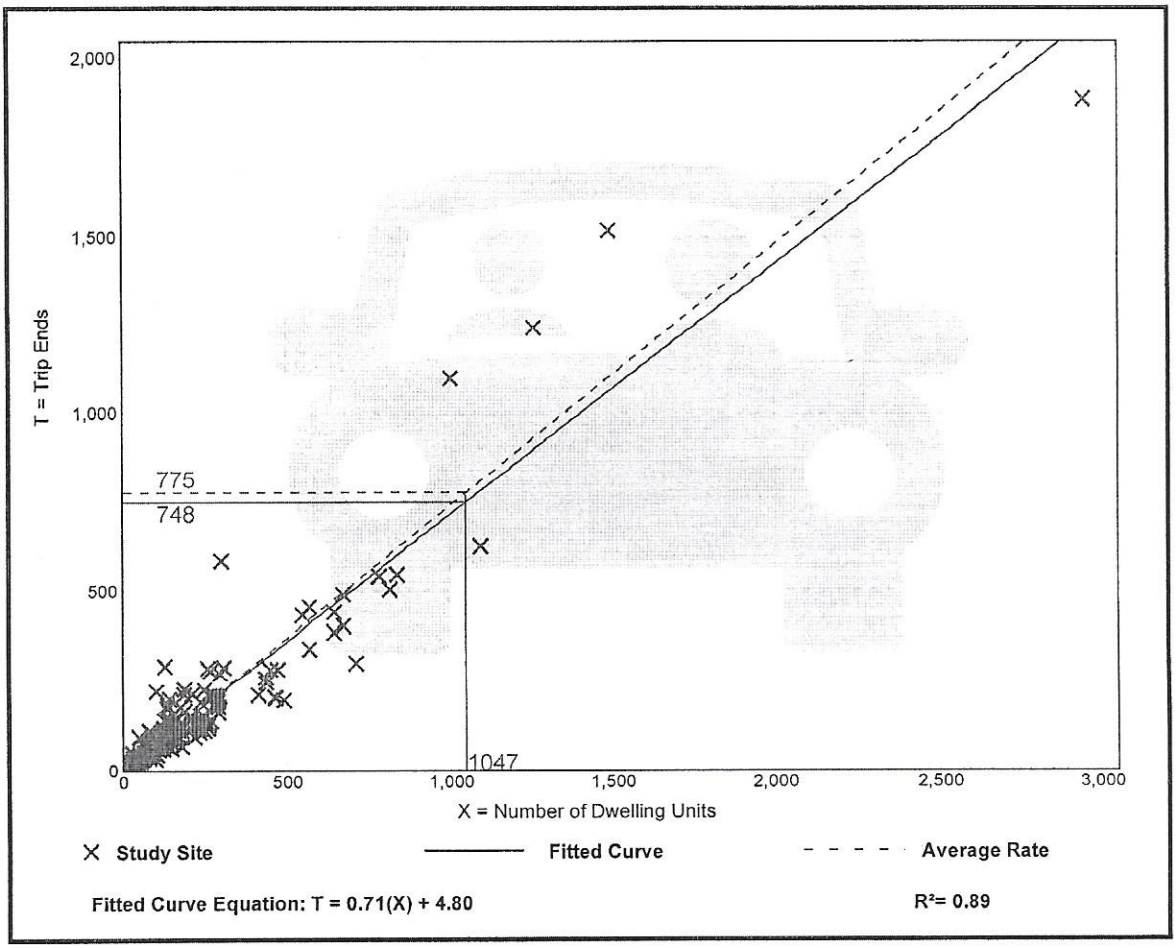
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	173
Avg. Num. of Dwelling Units:	219
Directional Distribution:	25% entering, 75% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.74	0.33 - 2.27	0.27

Data Plot and Equation



Trip Gen Manual, 10th Edition • Institute of Transportation Engineers

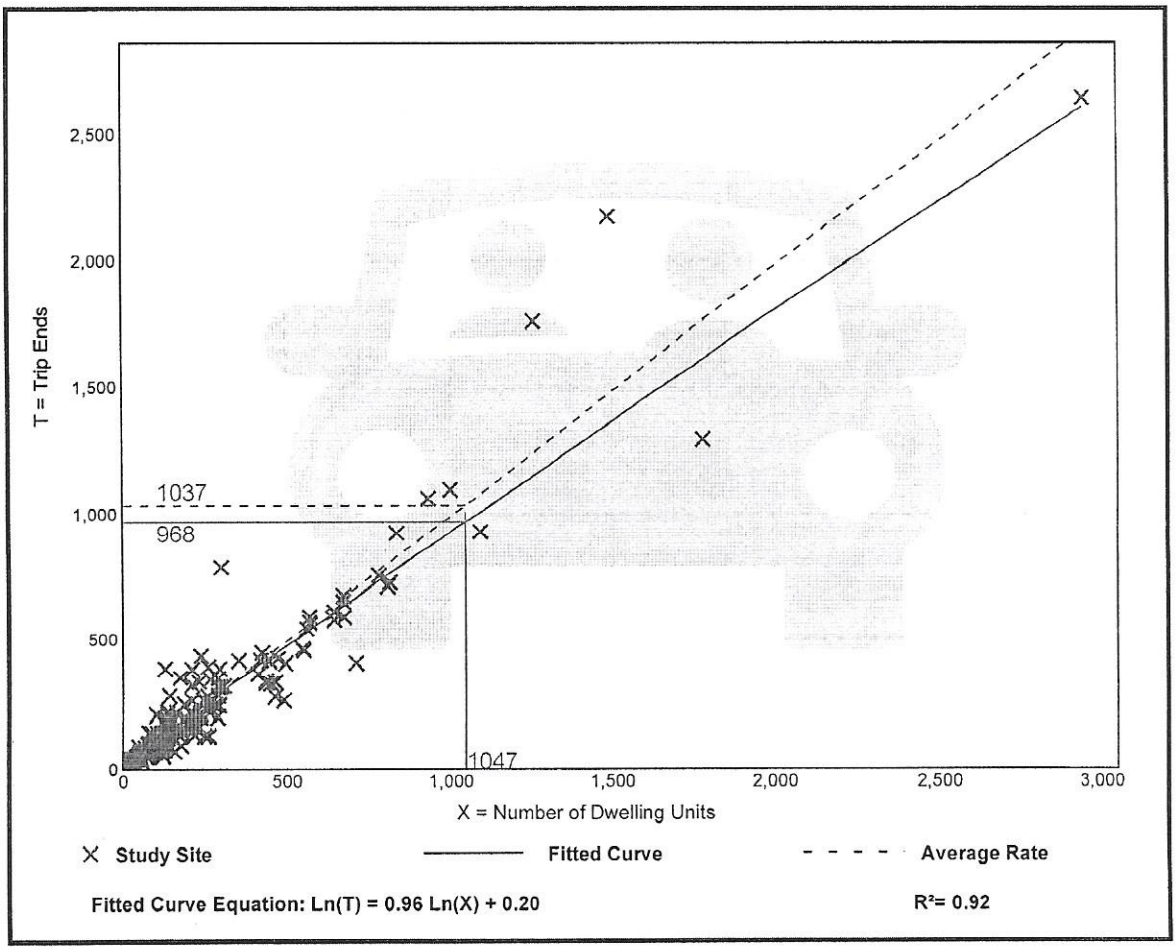
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	190
Avg. Num. of Dwelling Units:	242
Directional Distribution:	63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.99	0.44 - 2.98	0.31

Data Plot and Equation



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Multifamily Housing (Low-Rise)
(220)

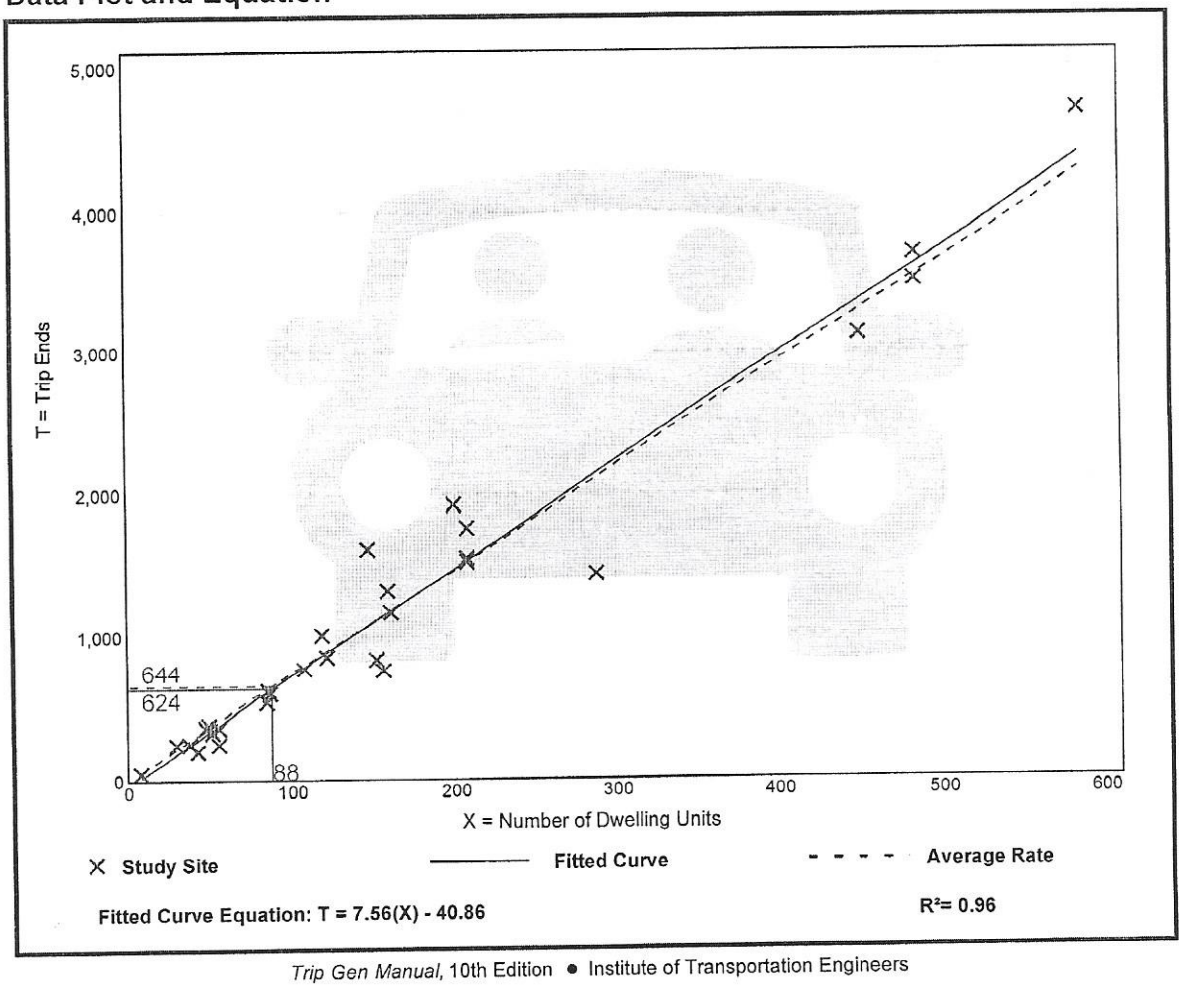
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 29
Avg. Num. of Dwelling Units: 168
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
7.32	4.45 - 10.97	1.31

Data Plot and Equation



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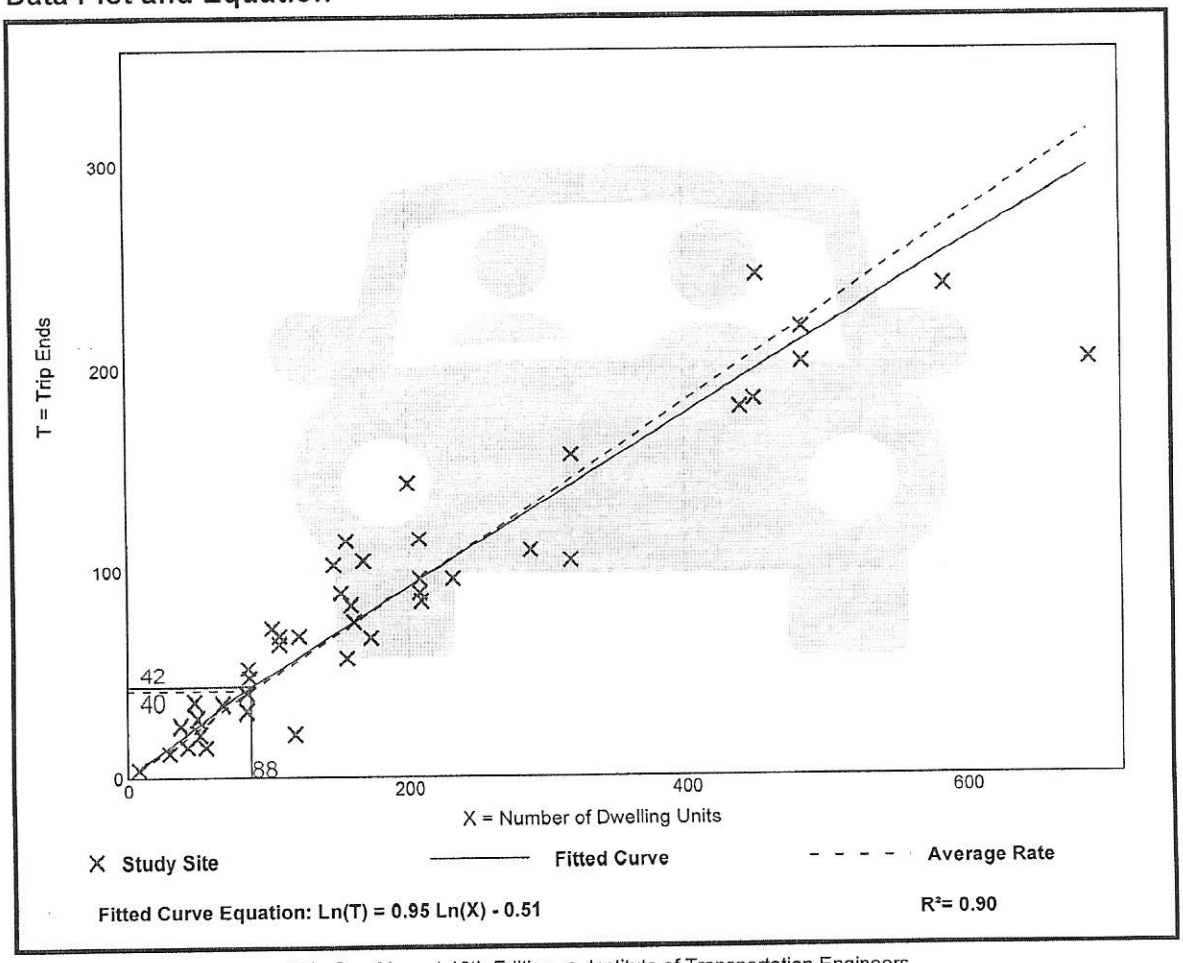
Multifamily Housing (Low-Rise)
(220)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
Number of Studies: 42
Avg. Num. of Dwelling Units: 199
Directional Distribution: 23% entering, 77% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.46	0.18 - 0.74	0.12

Data Plot and Equation



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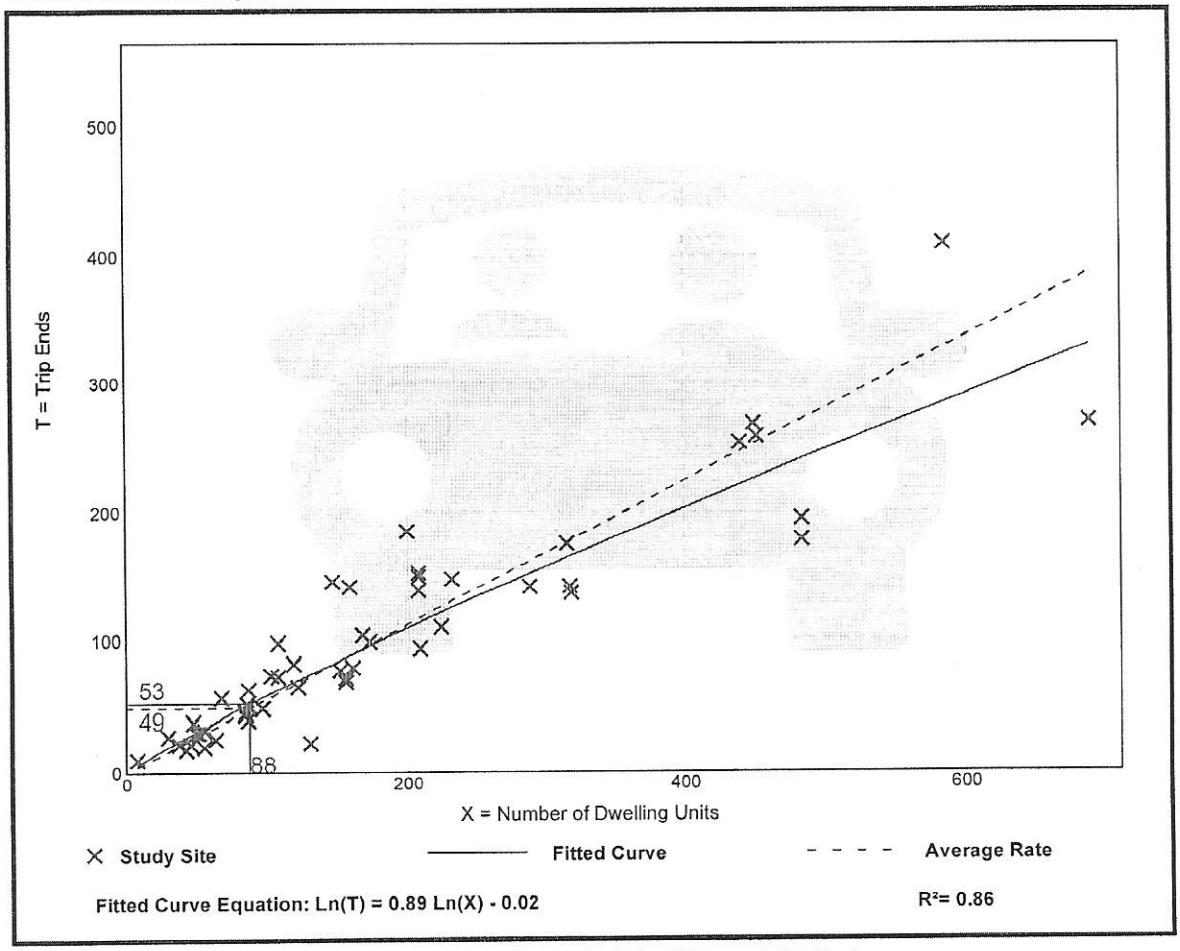
Multifamily Housing (Low-Rise)
(220)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: General Urban/Suburban
Number of Studies: 50
Avg. Num. of Dwelling Units: 187
Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.56	0.18 - 1.25	0.16

Data Plot and Equation



Trip Gen Manual, 10th Edition • Institute of Transportation Engineers

SOLAEGUI
ENGINEERS

March 13, 2020

Janelle Thomas, P.E.
City of Sparks
431 Prater Way
Sparks, Nevada 89431

RE: Five Ridges

Dear Janelle:

This letter is in response to the Application Review Comment 2 from the City of Sparks in a letter dated February 26, 2020. Comment 2 generally states that updated analysis shall be provided for the segment of Highland Ranch Parkway between Pyramid Highway and the project access and at the Pyramid Highway/Highland Ranch Parkway intersection for existing conditions. This letter therefore provides a review of existing traffic volumes, roadway capacity analysis, intersection capacity analysis, and subsequent findings. These items are addressed below.

Existing Traffic Volumes

Existing average daily traffic volumes on Highland Ranch Parkway were obtained from pneumatic tube counts conducted on Tuesday, March 10, 2020. Existing AM and PM peak hour turning movement volumes at the Pyramid Highway/Highland Ranch Parkway intersection were obtained from manual traffic counts conducted on Tuesday, March 10, 2020. The attached Figure 1 shows the existing traffic volumes.

Roadway Capacity Analysis

The segment of Highland Ranch Parkway between Pyramid Highway and the project access was analyzed for capacity based on average daily level of service thresholds established by the Regional Transportation Commission. The 2040 Regional Transportation Plan indicates that Highland Ranch Parkway is classified as an arterial with moderate access control. Table 1 shows the average daily level of service thresholds for a moderate access control (MAC) arterial with two lanes.

TABLE 1
LEVEL OF SERVICE CRITERIA FOR ROADWAY SEGMENTS

FACILITY/LANES	AVERAGE DAILY TRAFFIC VOLUME			
	LOS C	LOS D	LOS E	LOS F
2-Lane Arterial with MAC	≤14,800	14,801-17,500	17,501-18,600	>18,600

Table 2 shows a summary of the roadway segment level of service results for Highland Ranch Parkway for existing conditions.

TABLE 2 ROADWAY SEGMENT LEVEL OF SERVICE RESULTS EXISTING CONDITIONS		
ROADWAY SEGMENT	ADT	LOS
Highland Ranch between Pyramid and the Project Access 2-Lane Moderate Access Control Arterial	12,336	C

The existing two-lane segment of Highland Ranch Parkway between Pyramid Highway and the project access operates at LOS C for the existing traffic volumes.

Intersection Capacity Analysis

The Pyramid Highway/Highland Ranch Parkway intersection was analyzed for capacity based on procedures presented in the *Highway Capacity Manual (6th Edition)*, prepared by the Transportation Research Board, for signalized intersections using the latest version of the Highway Capacity Software.

The result of capacity analysis is a level of service (LOS) rating for each signalized intersection. Level of service is a qualitative measure of traffic operating conditions where a letter grade "A" through "F", corresponding to progressively worsening traffic operation, is assigned to the signalized intersection.

Level of service for signalized intersections is stated in terms of the average control delay per vehicle for a peak 15 minute analysis period. The level of service criteria for signalized intersections is shown in Table 3.

TABLE 3 LEVEL OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS	
LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (SEC)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

Table 4 shows a summary of the level of service and delay results at the Pyramid Highway/ Highland Ranch Parkway intersection for the existing traffic volumes. The intersection capacity worksheets are attached.

TABLE 4 INTERSECTION LEVEL OF SERVICE AND DELAY RESULTS EXISTING CONDITIONS		
INTERSECTION	AM PEAK HOUR	PM PEAK HOUR
Pyramid Highway/Highland Ranch Parkway	D48.0	D47.6

As shown in Table 4, the intersection currently operates at LOS D with a delay of 48.0 seconds per vehicle during the AM peak hour and LOS D with a delay of 47.6 seconds per vehicle during the PM peak hour. The intersection was analyzed with the existing approach lanes and signal phasing.

Findings

The two-lane segment of Highland Ranch Parkway between Pyramid Highway and the project access operates at LOS C for the existing traffic volumes and therefore meets the policy LOS D standard specified under the City of Spark's Application Review Comment 2. The existing Pyramid Highway/Highland Ranch Parkway intersection operates at LOS D during the AM and PM peak hours and therefore meets the policy LOS E standard specified under the City of Spark's Application Review Comment 2.

We trust that this information will meet your requirements. Please call if you have any questions or comments.

Very truly yours,
SOLAEGUI ENGINEERS, LTD.

REGISTERED PROFESSIONAL ENGINEER STATE OF NEVADA
PAUL W. SOLAEGUI
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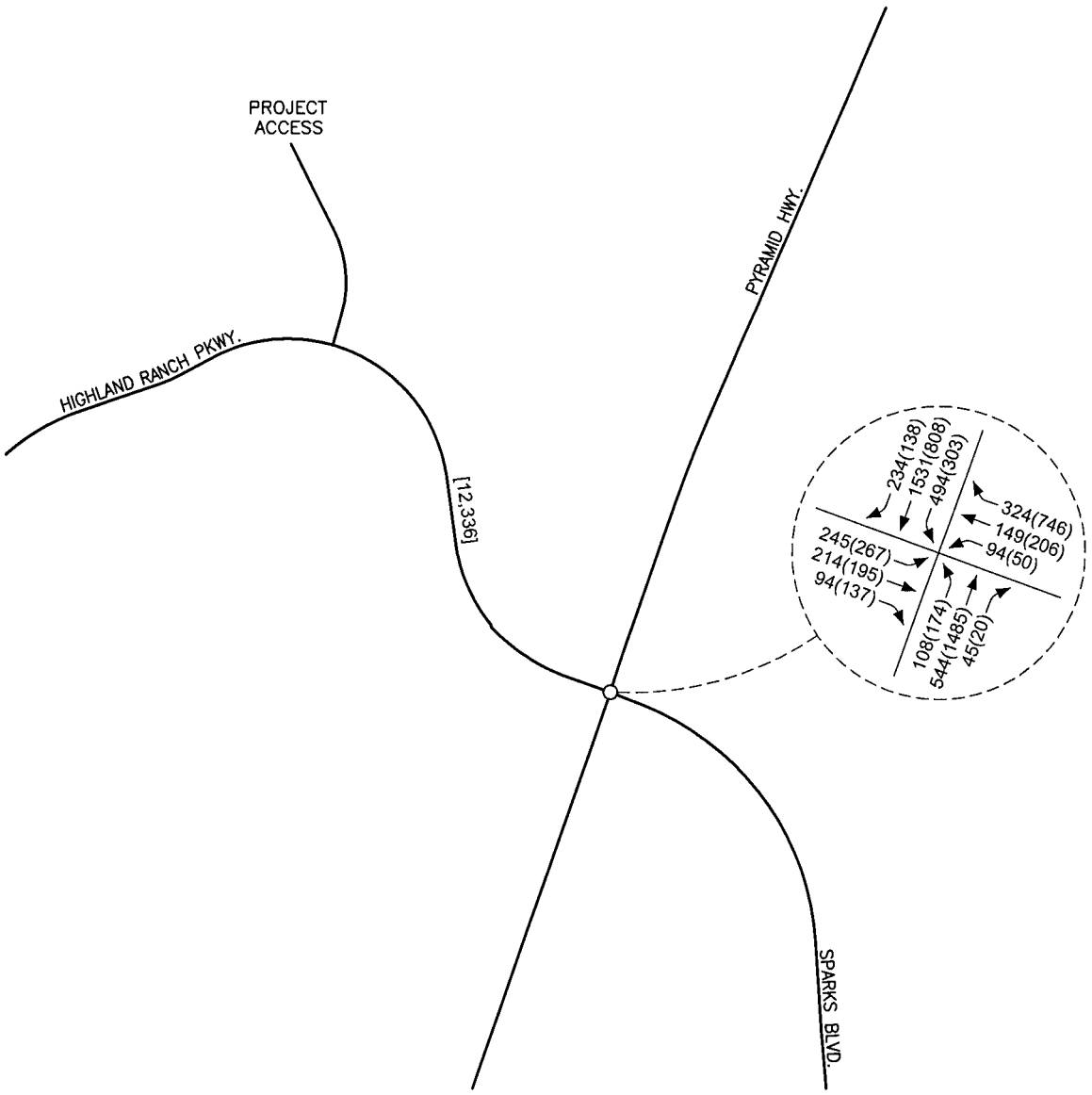
Paul W. Solaegui, P.E. 3-13-20
EXP 6-30-20

Enclosures
Letters/Sparks/Five Ridges

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N.T.S.

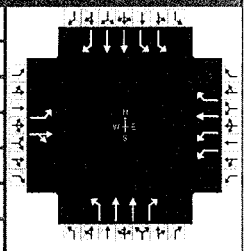
LEGEND
– AM PEAK HOUR
(–) PM PEAK HOUR
[–] AVERAGE DAILY TRAFFIC



FIVE RIDGES
EXISTING TRAFFIC VOLUMES
FIGURE 1

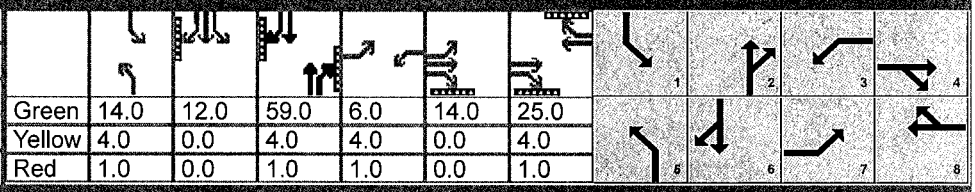
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Mar 11, 2020	Area Type	Other
Jurisdiction	NDOT	Time Period	AM Peak Hour	PHF	0.92
Urban Street		Analysis Year	Existing	Analysis Period	1> 7:00
Intersection	Pyramid & Highland Ra...	File Name	PySp20ax.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	245	214	94	94	149	324	108	544	45	494	1531	234

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	14.0	12.0	59.0	6.0	14.0	25.0						
Yellow	4.0	0.0	4.0	4.0	0.0	4.0						
Red	1.0	0.0	1.0	1.0	0.0	1.0						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	2.0	4.0	2.0	3.0	2.0	3.0	2.0	3.0
Phase Duration, s	25.0	44.0	11.0	30.0	19.0	64.0	31.0	76.0
Change Period, ($Y+R_c$), s	0.0	5.0	5.0	5.0	5.0	5.0	0.0	5.0
Max Allow Headway (*MAH*), s	3.1	3.2	3.0	3.2	2.9	0.0	2.9	0.0
Queue Clearance Time (g_s), s	22.9	21.4	6.4	27.0	11.7		22.8	
Green Extension Time (g_e), s	0.1	1.4	0.0	0.0	0.0	0.0	0.9	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00		1.00	
Max Out Probability	1.00	0.00	1.00	1.00	1.00		0.02	

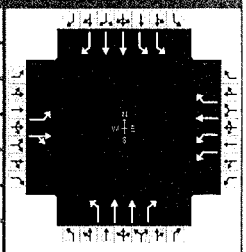
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	266	280		102	162	298	117	591	49	537	1664	254
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1856	1882		1730	1870		1759	1744	1536	1802	1841	1603
Queue Service Time (g_s), s	20.9	19.4		4.4	11.8		9.7	18.6	3.0	20.8	65.2	14.9
Cycle Queue Clearance Time (g_c), s	20.9	19.4		4.4	11.8		9.7	18.6	3.0	20.8	65.2	14.9
Green Ratio (*g/C*)	0.17	0.26		0.04	0.17		0.09	0.39	0.39	0.21	0.47	0.47
Capacity (*c*), veh/h	309	489		138	312		164	1372	604	745	1743	759
Volume-to-Capacity Ratio (*X*)	0.861	0.573		0.738	0.520		0.715	0.431	0.081	0.721	0.955	0.335
Back of Queue (*Q*), ft/ln (95 th percentile)	435.4	362.4		102.3	240.4		212.8	315.6	51.1	368.8	1010	243.2
Back of Queue (*Q*), veh/ln (95 th percentile)	17.1	14.3		4.0	9.5		8.4	12.3	2.0	14.5	39.5	9.6
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	60.8	48.3		71.2	57.0		66.1	33.2	28.5	55.5	38.0	24.7
Incremental Delay (d_2), s/veh	20.3	1.1		16.7	0.7		12.0	1.0	0.3	3.0	13.2	1.2
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	81.1	49.3		87.9	57.7	0.0	78.0	34.2	28.8	58.4	51.2	25.9
Level of Service (LOS)	F	D		F	E	A	E	C	C	E	D	C
Approach Delay, s/veh / LOS	64.8	E		32.6	C		40.7	D		50.2	D	
Intersection Delay, s/veh / LOS	48.1						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.46	B	2.61	C	2.51	C	1.99	B
Bicycle LOS Score / LOS	1.39	A	1.41	A	1.11	A	2.51	C

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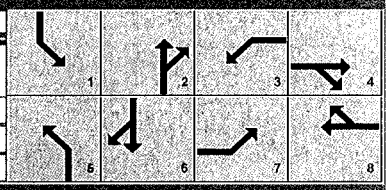
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	Solaegui Engineers			Duration, h	0.25
Analyst	MSH	Analysis Date	Mar 11, 2020	Area Type	Other
Jurisdiction	NDOT	Time Period	PM Peak Hour	PHF	0.95
Urban Street		Analysis Year	Existing	Analysis Period	1> 7:00
Intersection	Pyramid & Highland Ra...	File Name	PySp20px.xus		
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	245	214	94	50	206	746	174	1485	20	303	808	138

Signal Information			
Cycle, s	140.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	15.0	3.0	62.0	7.0	8.0	25.0	
Yellow	4.0	0.0	4.0	4.0	0.0	4.0	
Red	1.0	0.0	1.0	1.0	0.0	1.0	

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	2.0	4.0	2.0	3.0	2.0	3.0	2.0	3.0
Phase Duration, s	20.0	38.0	12.0	30.0	23.0	70.0	20.0	67.0
Change Period, (*Y+R c*), s	0.0	5.0	5.0	5.0	0.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s	3.1	3.2	3.0	3.2	2.9	0.0	2.9	0.0
Queue Clearance Time (*g s*), s	21.4	22.5	4.1	27.0	15.6		14.1	
Green Extension Time (*g e*), s	0.0	1.5	0.0	0.0	0.2	0.0	0.1	0.0
Phase Call Probability	1.00	1.00	1.00	1.00	1.00		1.00	
Max Out Probability	1.00	0.06	1.00	1.00	0.01		1.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	258	298		53	217	364	183	1563	21	319	851	145
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1856	1855		1730	1870		1759	1744	1538	1802	1841	1602
Queue Service Time (*g s*), s	19.4	20.5		2.1	15.1		13.6	60.9	1.0	12.1	23.4	7.8
Cycle Queue Clearance Time (*g c*), s	19.4	20.5		2.1	15.1		13.6	60.9	1.0	12.1	23.4	7.8
Green Ratio (*g/C*)	0.14	0.24		0.05	0.18		0.16	0.46	0.46	0.11	0.44	0.44
Capacity (*c*), veh/h	265	437		173	334		289	1619	714	386	1630	710
Volume-to-Capacity Ratio (*X*)	0.973	0.681		0.304	0.649		0.634	0.965	0.029	0.826	0.522	0.205
Back of Queue (*Q*), ft/ln (95 th percentile)	465.9	381.7		41.2	297.4		257.7	919	17.1	256.5	389.7	134.8
Back of Queue (*Q*), veh/ln (95 th percentile)	18.3	15.0		1.6	11.7		10.1	35.9	0.7	10.1	15.2	5.3
Queue Storage Ratio (*RQ*) (95 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (*d 1*), s/veh	59.7	48.7		64.2	53.4		54.6	36.4	20.4	61.2	28.3	23.9
Incremental Delay (*d 2*), s/veh	47.4	3.6		0.4	3.5		3.4	15.5	0.1	12.9	1.2	0.7
Initial Queue Delay (*d 3*), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	107.1	52.3		64.5	56.9	0.0	58.0	51.9	20.4	74.1	29.5	24.5
Level of Service (LOS)	F	D		E	E	A	E	D	C	E	C	C
Approach Delay, s/veh / LOS	77.7	E		24.8	C		52.2	D		39.8	D	
Intersection Delay, s/veh / LOS	47.6						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.46	B	2.61	C	3.00	C	1.96	B
Bicycle LOS Score / LOS	1.40	A	1.53	B	1.95	B	1.57	B

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TENTATIVE MAP FOR

5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.

VILLAGES 2, 3, 4, 6, & 7

SPARKS, NEVADA

SECTION 9 TOWNSHIP 20 N RANGE 20 E

MARCH 2020

FIVE RIDGES

APPLICANT/DEVELOPER

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

PROPERTY OWNER

QK LLC
4785 CAUGHLIN PARKWAY
RENO, NV 89519

GEOTECHNICAL ENGINEER

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

CIVIL ENGINEER/PLANNER/SURVEYOR

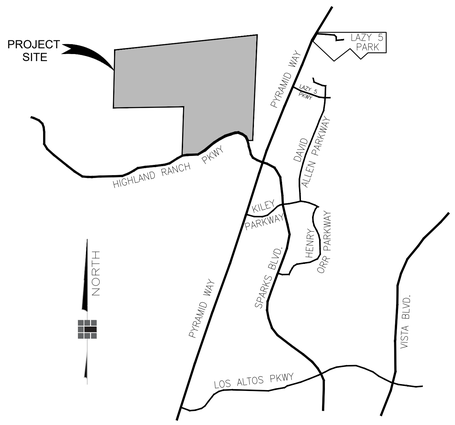
CHRISTY CORPORATION
ATTN: DANIEL MANGUSO, P.E.
1000 KILEY PARKWAY
SPARKS, NV 89436
(775) 502-8552

LANDSCAPE ARCHITECT

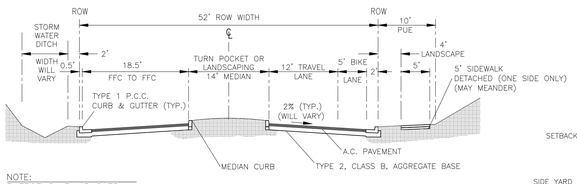
L.A. STUDIO NEVADA
1552 C STREET
SPARKS, NV 89431
(775) 323-2223

HYDROLOGIST

HOUSE MORAN CONSULTING, INC.
10399 DOUBLE R BOULEVARD
RENO, NV 89521
(775) 293-4000

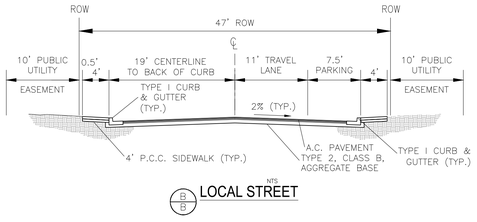


VICINITY MAP
NOT TO SCALE



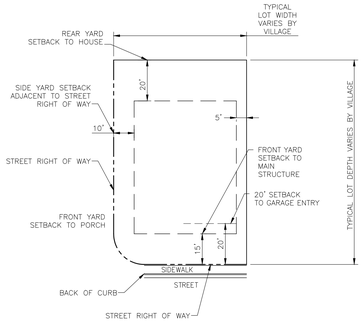
NOTE:
EMERGENCY BUMP OUTS ARE TO BE PROVIDED PER THE DEVELOPMENT AGREEMENT

A/A COLLECTOR STREET
NTS
NO PARKING ON STREET

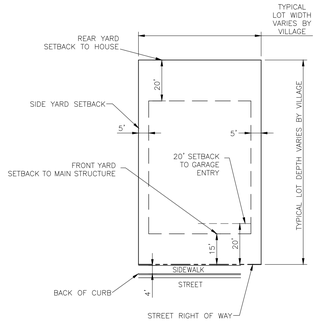


B/B LOCAL STREET
NTS

TYPICAL STREET SECTIONS



TYPICAL CORNER LOT & SETBACKS



TYPICAL INTERIOR LOT & SETBACKS

SITE INFORMATION

ASSESSOR'S PARCEL NUMBER 083-011-15

TOTAL PARCEL AREA (PARCEL 2 PER RECORD OF SURVEY 3818A) = 386.87 AC

SETBACKS

THE FOLLOWING MINIMUM SETBACKS APPLY TO ALL LOTS:

FRONT YARD: 15'
GARAGE: 20'
SIDE YARD: 5'
EXTERIOR SIDE YARD: 10'
REAR YARD: 20'

TYPICAL LOT SIZES

TYPICAL LOT WIDTHS AND DEPTHS ARE AS FOLLOWS:

VILLAGE 2: 60' X 100' TO 70' X 100'
VILLAGE 3: 60' X 100'
VILLAGE 4: 65' X 100'
VILLAGE 6: 45' X 90'
VILLAGE 7: 50' X 100' TO 60 X 100'

SMALL LOT/CLUSTER STANDARDS (APPLIES TO ALL VILLAGES)
MINIMUM LOT WIDTH IS 45' (MEASURED AT FRONT YARD SETBACK)
MINIMUM LOT DEPTH IS 90'

LOT STATISTICS

TYPICAL LOT SIZE STATISTICS ARE AS FOLLOWS:

VILLAGE 2: ±66 LOTS
AVERAGE LOT SIZE: 8,123 SF
SMALLEST LOT SIZE: 6,000 SF
LARGEST LOT SIZE: 15,016 SF
VILLAGE 3: ±39 LOTS
AVERAGE LOT SIZE: 7,696 SF
SMALLEST LOT SIZE: 6,297 SF
LARGEST LOT SIZE: 10,651 SF
VILLAGE 4: ±36 LOTS
AVERAGE LOT SIZE: 6,489 SF
SMALLEST LOT SIZE: 5,999 SF
LARGEST LOT SIZE: 9,825 SF
VILLAGE 6: ±147 LOTS
AVERAGE LOT SIZE: 4,741 SF
SMALLEST LOT SIZE: 4,050 SF
LARGEST LOT SIZE: 9,418 SF
VILLAGE 7: ±172 LOTS
AVERAGE LOT SIZE: 6,020 SF
SMALLEST LOT SIZE: 5,000SF
LARGEST LOT SIZE: 14,364 SF

TOTAL TENTATIVE MAP LOT STATISTICS:
460 LOTS
AVERAGE LOT SIZE: 6,092 SF
SMALLEST LOT SIZE: 4,050 SF
LARGEST LOT SIZE: 15,016 SF
MINIMUM LOT SIZE: 4,000 SF

DEVELOPMENT STATISTICS:
OVERALL SITE STANDARDS SHALL BE PER THE PER THE DEVELOPMENT AGREEMENT FOR THIS SITE WITH THE CITY OF SPARKS. THESE STATISTICS APPLY TO THE FULL DEVELOPMENT, INCLUDING THIS TENTATIVE MAP, FUTURE TENTATIVE MAPS AND ANY NON SUBDIVISION DEVELOPMENTS.
MINIMUM OPEN SPACE: 100 ACRES
GROSS DENSITY:
3.1 DWELLING UNITS PER ACRE MINIMUM
4.6 DWELLING UNITS PER ACRE MAXIMUM

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

SHT No.	DRAWING DESCRIPTION
1	TITLE SHEET
2	PRELIMINARY OVERALL SITE PLAN
3	PRELIMINARY LOT & BLOCK PLAN (VILLAGE 1 – UNIT 1)
4	PRELIMINARY LOT & BLOCK PLAN (VILLAGE 1 – UNIT 2)
5	PRELIMINARY LOT & BLOCK PLAN (VILLAGE 3)
6	PRELIMINARY LOT & BLOCK PLAN (VILLAGE 4)
7	PRELIMINARY LOT & BLOCK PLAN (VILLAGE 6)
8	PRELIMINARY LOT & BLOCK PLAN (VILLAGE 6)
9	PRELIMINARY LOT & BLOCK PLAN (VILLAGE 7)
10	PRELIMINARY GRADING PLAN (VILLAGE 1 – UNIT 1)
11	PRELIMINARY GRADING PLAN (VILLAGE 1 – UNIT 2)
12	PRELIMINARY GRADING PLAN (VILLAGE 3)
13	PRELIMINARY GRADING PLAN (VILLAGE 4)
14	PRELIMINARY GRADING PLAN (VILLAGE 6)
15	PRELIMINARY GRADING PLAN (VILLAGE 7)
16	PRELIMINARY UTILITY PLAN (VILLAGE 1 – UNIT 1)
17	PRELIMINARY UTILITY PLAN (VILLAGE 1 – UNIT 2)
18	PRELIMINARY UTILITY PLAN (VILLAGE 3)
19	PRELIMINARY UTILITY PLAN (VILLAGE 4)
20	PRELIMINARY UTILITY PLAN (VILLAGE 6)
21	PRELIMINARY UTILITY PLAN (VILLAGE 7)
22	PRELIMINARY CROSS SECTIONS
23	PRELIMINARY CROSS SECTION A
24	PRELIMINARY CROSS SECTION B
25	PRELIMINARY LANDSCAPING PLAN (VILLAGE 2)
26	PRELIMINARY LANDSCAPING PLAN (VILLAGE 3)
27	PRELIMINARY LANDSCAPING PLAN (VILLAGE 4)
28	PRELIMINARY LANDSCAPING PLAN (VILLAGE 6)
29	PRELIMINARY LANDSCAPING PLAN (VILLAGE 7)



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

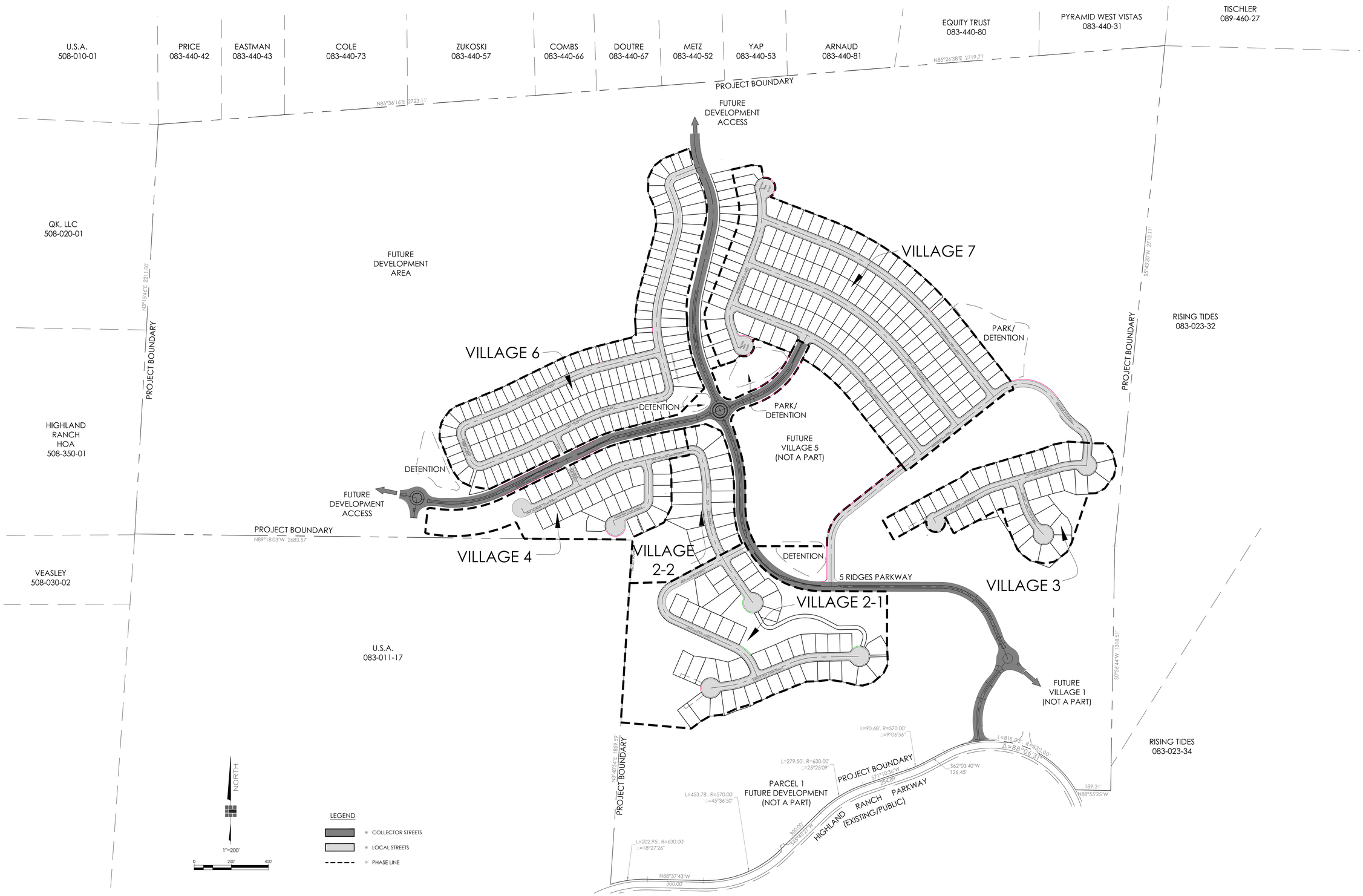
TITLE SHEET

SHEET 1 OF 29

TENTATIVE MAP FOR

5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.



OVERALL SITE PLAN

SHEET 2 OF 29

BASIS OF BEARING

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)

NEIL L. MANGUSO Exp. 12-31-21 CIVIL No. 23930 STATE OF NEVADA PROFESSIONAL ENGINEER 3/20/2020

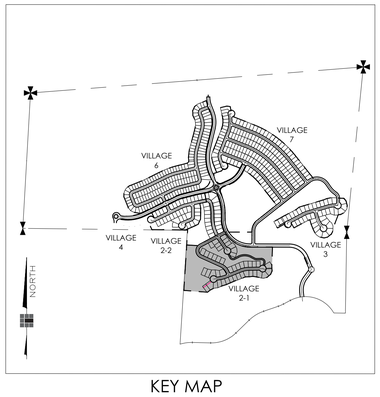
CHRISTY CORPORATION
1000 Kiley Pkwy | Sparks Nevada 89436
775.502.8552

TENTATIVE MAP FOR

5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.





KEY MAP
N.T.S.

PRELIMINARY LOT & BLOCK PLAN
VILLAGE 2 UNIT 1

SHEET 3 OF 29

BASIS OF BEARING

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)

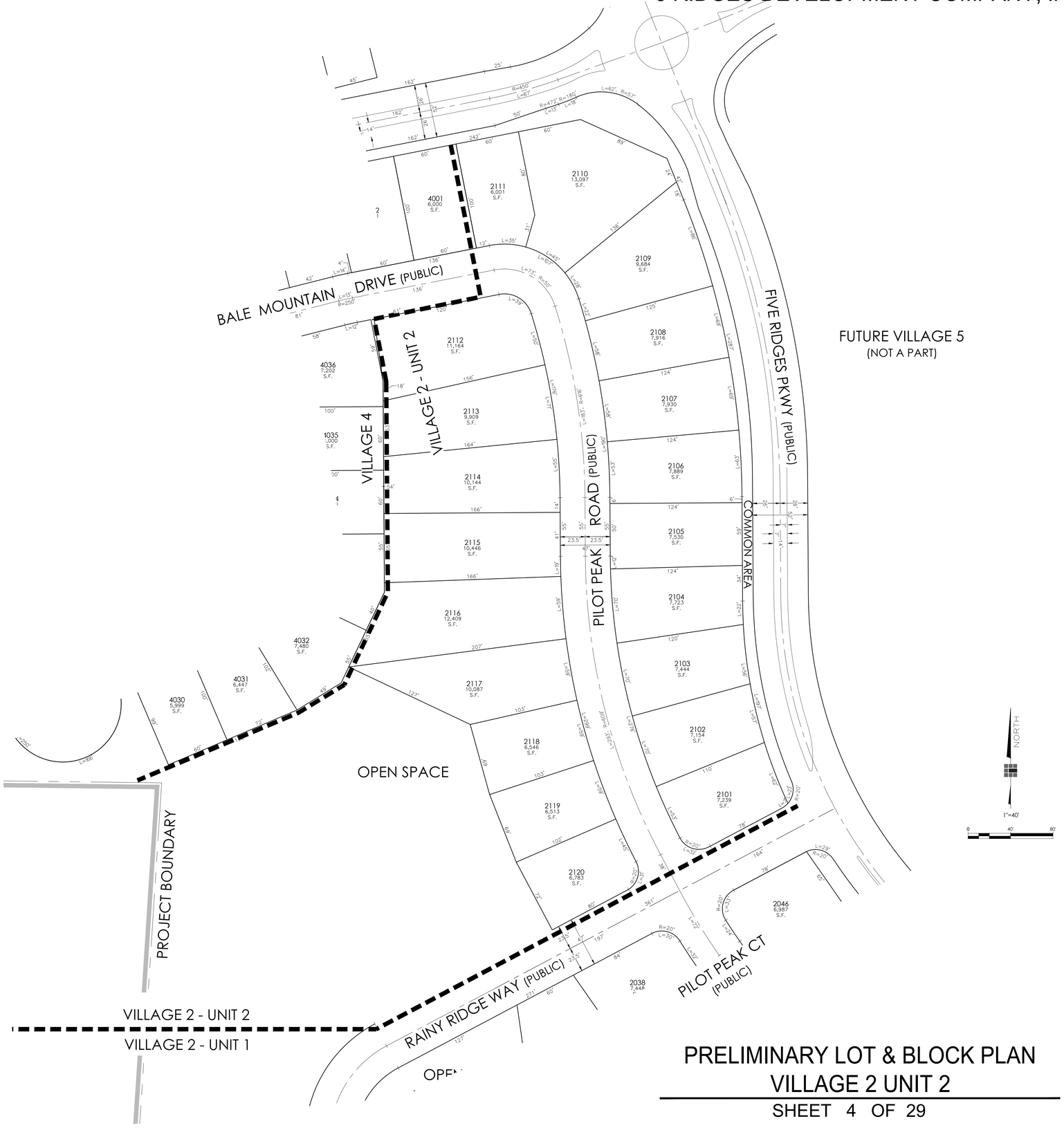
DANIEL L. MANGUSO
Exp. 12-31-21
CIVIL
No. 23930
STATE OF NEVADA
PROFESSIONAL ENGINEER
5/20/2020

CHRISTY CORPORATION
1000 Kiley Pkwy | Sparks Nevada 89436
775.502.8552

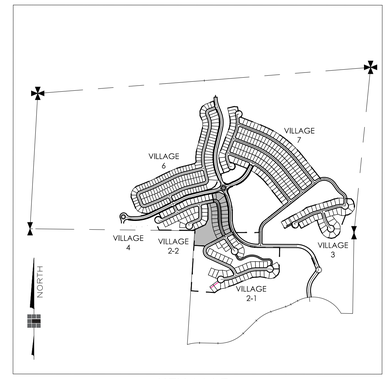
TENTATIVE MAP FOR

5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.



FUTURE VILLAGE 5
(NOT A PART)



KEY MAP
N.T.S.

PRELIMINARY LOT & BLOCK PLAN
VILLAGE 2 UNIT 2

SHEET 4 OF 29

BASIS OF BEARING

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)

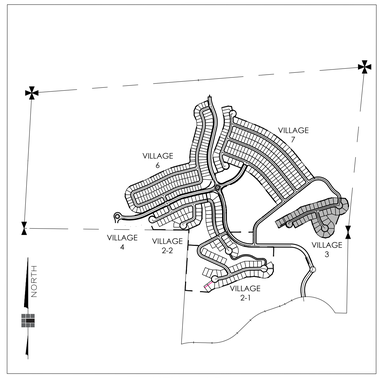
DANIEL L. MANGUSO
Exp. 12-31-21
CIVIL
No. 23930
5/20/2020

CHRISTY CORPORATION
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775.502.8552

TENTATIVE MAP FOR

5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.



KEY MAP
N.T.S.

TO VILLAGE 7

ADEN RIDGE WAY (PUBLIC)

OPEN SPACE

SPLIT RIDGE DRIVE (PUBLIC)

SPLIT RIDGE CT (PUBLIC)

SUNLIGHT PEAK CT (PUBLIC)

20' EMERGENCY ACCESS ROAD & UTILITY CORRIDOR EASEMENT TO ADEN RIDGE WAY

20' ACCESS & UTILITY EASEMENT

OPEN SPACE

OPEN SPACE

OPEN SPACE

PROJECT BOUNDARY

S5°43'20"W 2710.11'

9 10

3001 7,799 S.F.
3002 7,906 S.F.
3003 6,291 S.F.
3004 6,500 S.F.
3005 6,500 S.F.
3006 6,500 S.F.
3007 6,875 S.F.
3008 7,416 S.F.
3009 6,510 S.F.
3010 6,500 S.F.
3011 6,500 S.F.
3012 6,500 S.F.
3013 6,500 S.F.
3014 6,785 S.F.
3015 7,286 S.F.
3016 7,509 S.F.
3017 9,660 S.F.
3018 9,199 S.F.
3019 9,259 S.F.
3020 7,493 S.F.
3021 8,604 S.F.
3022 6,580 S.F.
3023 6,500 S.F.
3024 7,340 S.F.
3025 8,395 S.F.
3026 9,884 S.F.
3027 9,200 S.F.
3028 9,197 S.F.
3029 10,651 S.F.
3030 10,389 S.F.
3031 8,284 S.F.
3032 8,317 S.F.
3033 9,100 S.F.
3034 6,314 S.F.
3035 6,949 S.F.
3036 8,333 S.F.
3037 7,055 S.F.
3038 6,500 S.F.
3039 6,477 S.F.

BASIS OF BEARING

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)

NORTH

1"=40'

0 40' 80'

PRELIMINARY LOT & BLOCK PLAN
VILLAGE 3

SHEET 5 OF 29

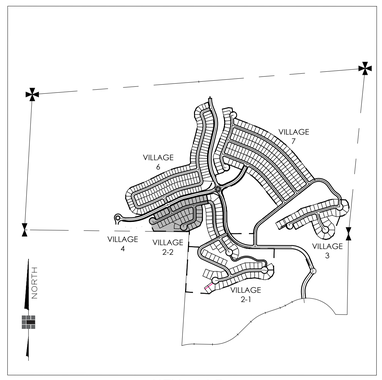


CHRISTY CORPORATION
1000 Kiley Pkwy | Sparks Nevada 89436
775.502.8552

TENTATIVE MAP FOR

5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.



KEY MAP
N.T.S.

FUTURE DEVELOPMENT ACCESS & EMERGENCY ACCESS/UTILITY CORRIDOR

OPEN SPACE

VILLAGE 6

COMMON AREA

COMMON AREA

SALT RIDGE WAY (PUBLIC)

SALT RIDGE WAY (PUBLIC)

ANTELOPE RIDGE PKWY (PUBLIC)

BALE MOUNTAIN DRIVE (PUBLIC)

VILLAGE 2 - UNIT 2

BALE MOUNTAIN COURT (PUBLIC)

PARKER PEAK COURT (PUBLIC)

OPEN SPACE

PROJECT BOUNDARY

N89°18'03"W 2683.57'

BASIS OF BEARING

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)

NORTH

1"=40'

0 40' 80'

PRELIMINARY LOT & BLOCK PLAN
VILLAGE 4

SHEET 6 OF 29

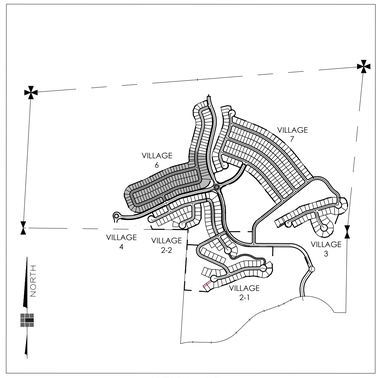
RACHEL E. MANGUSO Exp. 12-31-21 CIVIL No. 23920 STATE OF NEVADA PROFESSIONAL ENGINEER 5/20/2020

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1000 Kiley Pkwy | Sparks Nevada 89436
775.502.8552

TENTATIVE MAP FOR

5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.



KEY MAP
N.T.S.

BASIS OF BEARING

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)

OPEN SPACE

BOBCAT RIDGE ROAD (PUBLIC)

CASCADE RANGE DRIVE (PUBLIC)

SNOWDAN RAZOR ST (PUBLIC)

SALT RIDGE WAY (PUBLIC)

SALT RIDGE WAY (PUBLIC)

ANTELOPE RIDGE PKWY (PUBLIC)

MOUNT NIMBA ST (PUBLIC)

MOUNT NIMBA ST (PUBLIC)

FIVE RIDGES PKWY (PUBLIC)

VILLAGE 7

VILLAGE 4

COMMON AREA

COMMON AREA

NORTH

1"=40'

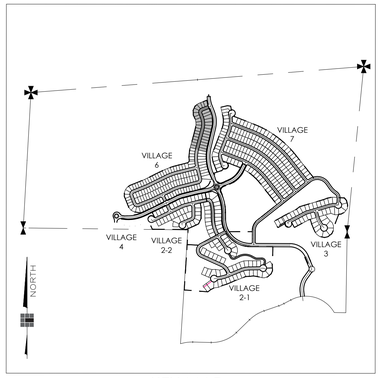
PRELIMINARY LOT & BLOCK PLAN
VILLAGE 6

SHEET 7 OF 29

DANIEL L. MANGUSO Exp. 12-31-21 CIVIL No. 23930 5/20/2020

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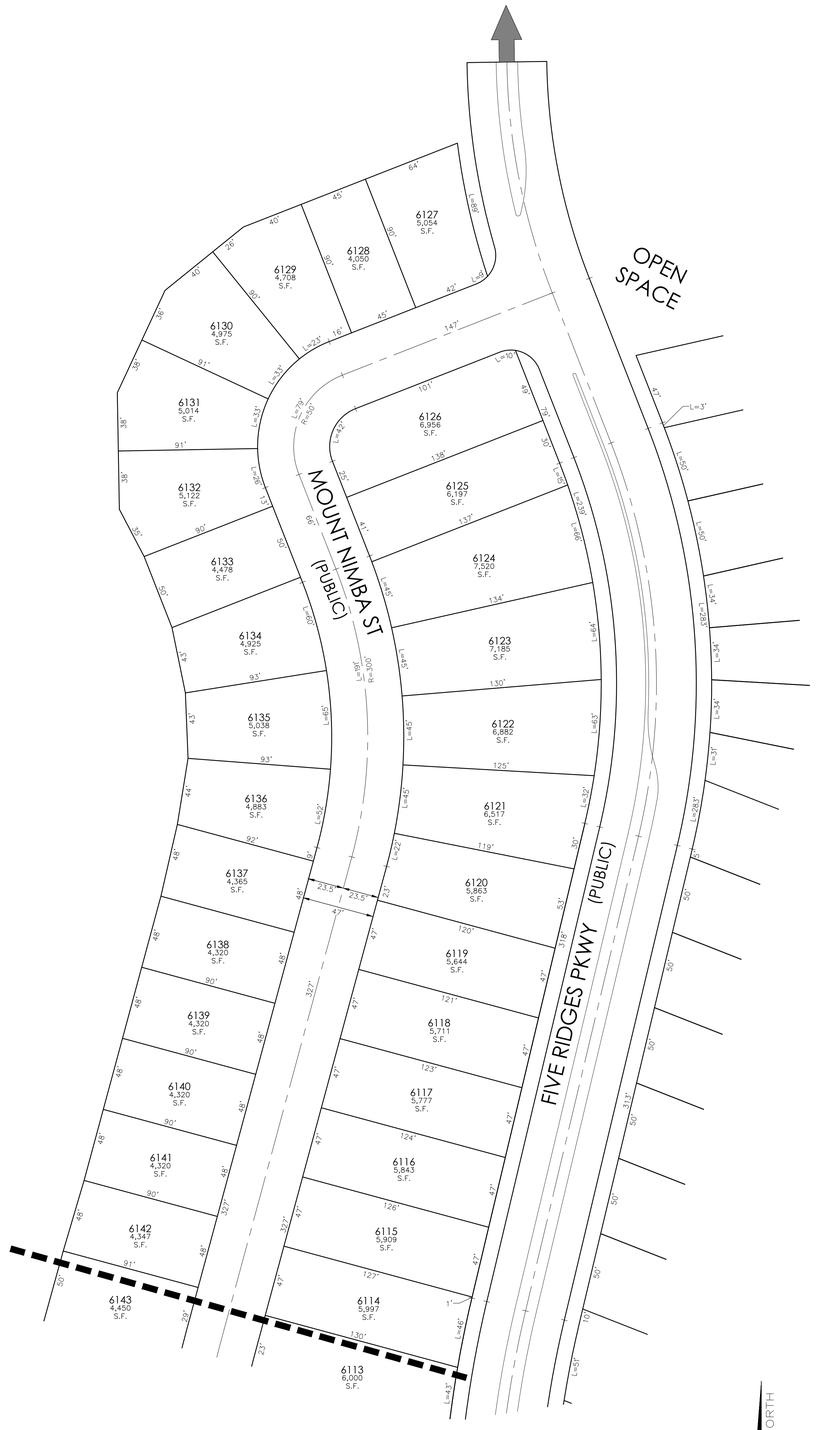
TENTATIVE MAP FOR
5 RIDGES - PHASE 1
5 RIDGES DEVELOPMENT COMPANY, INC.



KEY MAP
N.T.S.

BASIS OF BEARING

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)



PRELIMINARY LOT & BLOCK PLAN
VILLAGE 6

SHEET 8 OF 29

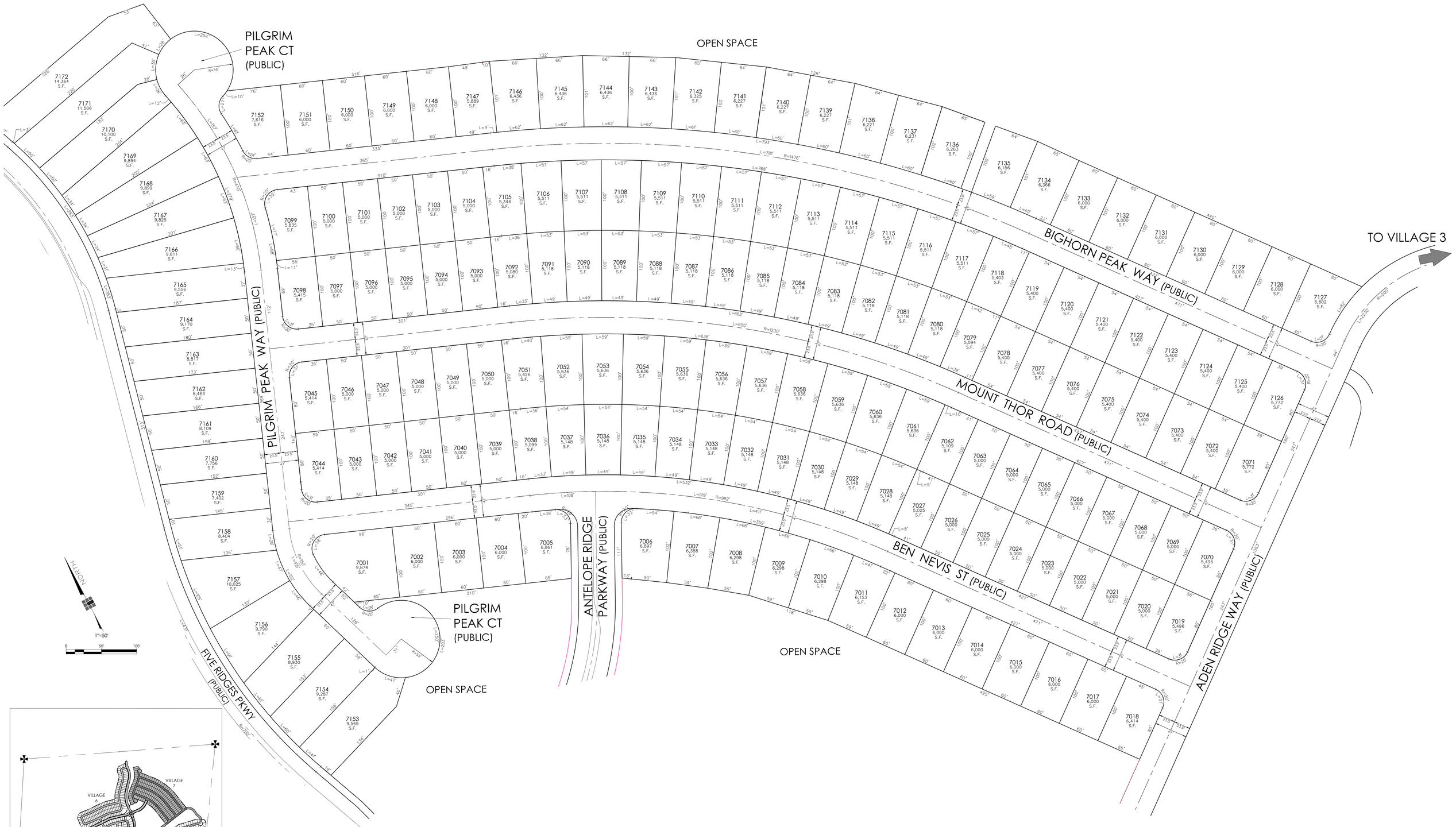
DANIEL L. MANGUSO
Exp. 12-31-21
CIVIL
No. 23920
STATE OF NEVADA
PROFESSIONAL ENGINEER
3/20/2020

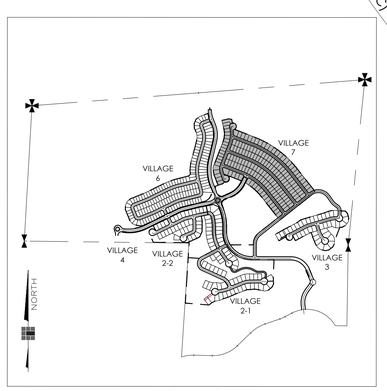
CHRISTY CORPORATION
1000 Kiley Pkwy | Sparks Nevada 89436
775.502.8552

TENTATIVE MAP FOR

5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.





KEY MAP
N.T.S.

BASIS OF BEARING

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)

PRELIMINARY LOT & BLOCK PLAN
VILLAGE 7

SHEET 9 OF 29

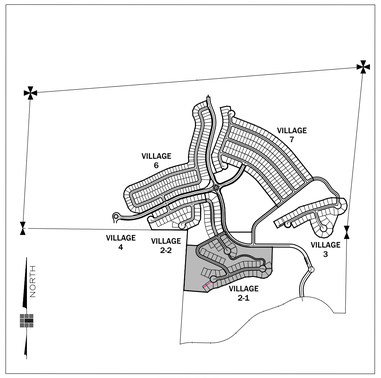
DANIEL L. MANGUSO
Exp. 12-31-21
CIVIL
No. 20920
STATE OF NEVADA
3/20/2020

CHRISTY CORPORATION
1000 Kiley Pkwy | Sparks Nevada 89436
775.502.8552

TENTATIVE MAP FOR

5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.



KEY MAP
N.T.S.



LEGEND (GRADING)

- PORTLAND CEMENT CONCRETE (SIDEWALKS, RAMPS & GUTTERS)
- ASPHALT PAVEMENT
- 50.00 FG — ELEVATION TAG (EXISTING)
- 4.9% — SLOPE (EXISTING)
- CATCH BASIN
- (D) — STORM DRAIN MANHOLE
- 18"SD — STORM DRAIN (SIZE AND DIRECTION)
- GRADE BREAK
- PHASE LINE

NOTES:

1. ALL STREETS ARE PROPOSED PUBLIC
2. REFERENCE TITLE SHEET FOR SITE STATISTICS, TYPICAL LOT SETBACKS, AND STREET SECTIONS.

PRELIMINARY GRADING PLAN

SHEET 10 OF 29

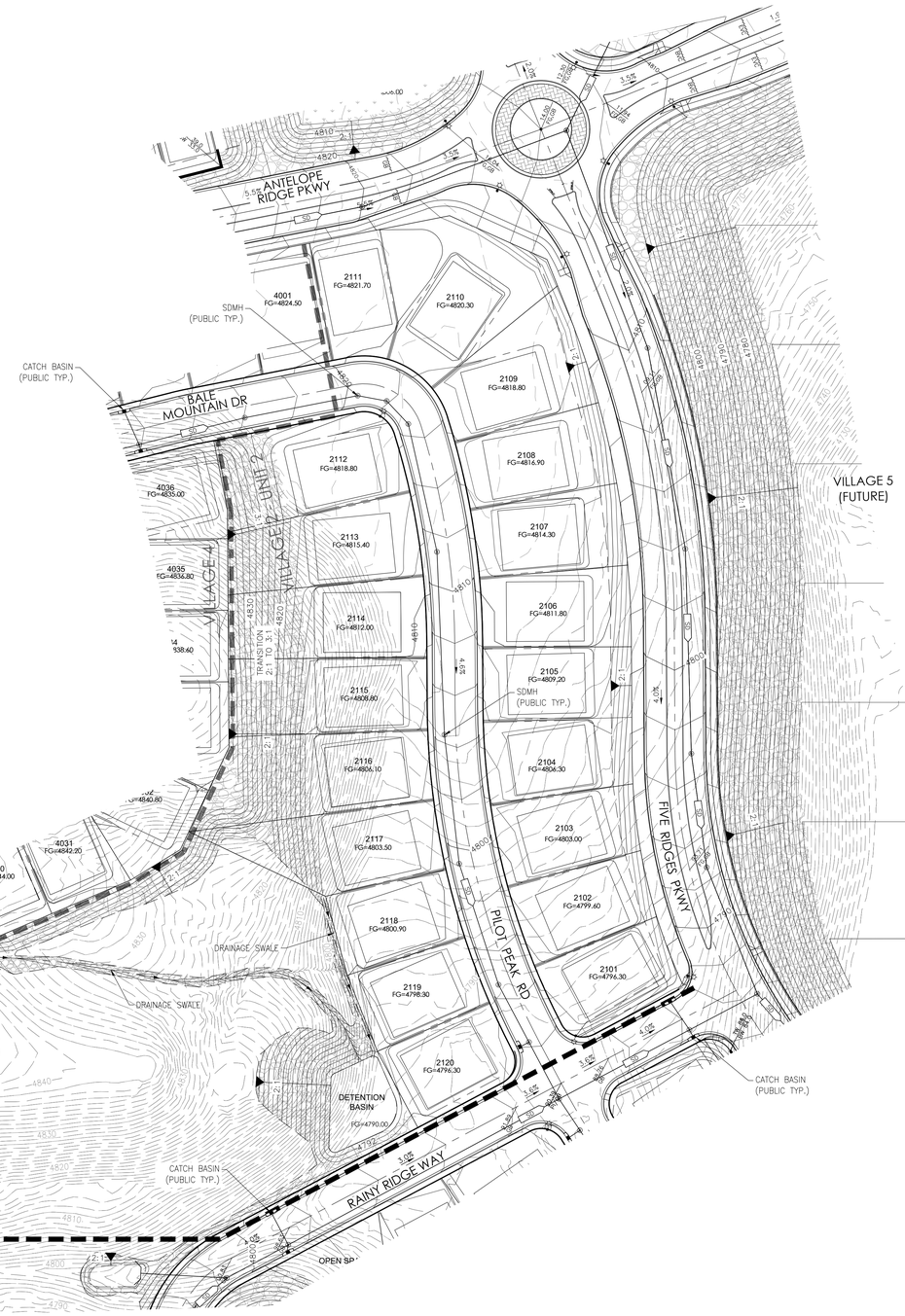
DANIEL L. MANGUSO
Exp. 12-31-21
CIVIL
No. 23930
3/20/2020

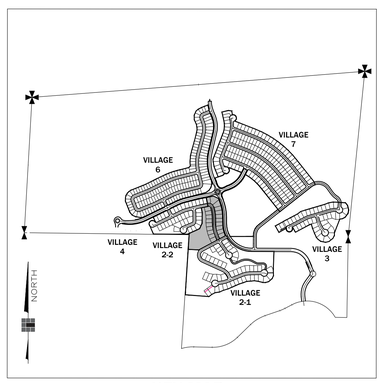
CHRISTY CORPORATION
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P 775.502.8552 W christynv.com

TENTATIVE MAP FOR

5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.





KEY MAP
N.T.S.

PRELIMINARY GRADING PLAN

SHEET 11 OF 29

NORTH

0 50' 100'

NOTES:
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LEGEND (GRADING)

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- CATCH BASIN
- STORM DRAIN MANHOLE
- 18"SD — STORM DRAIN (SIZE AND DIRECTION)
- GRADE BREAK
- PHASE LINE

DANIEL O. MANGUSO
Exp. 12-31-21
CIVIL
No. 23920
STATE OF NEVADA
PROFESSIONAL ENGINEER
5/20/2020

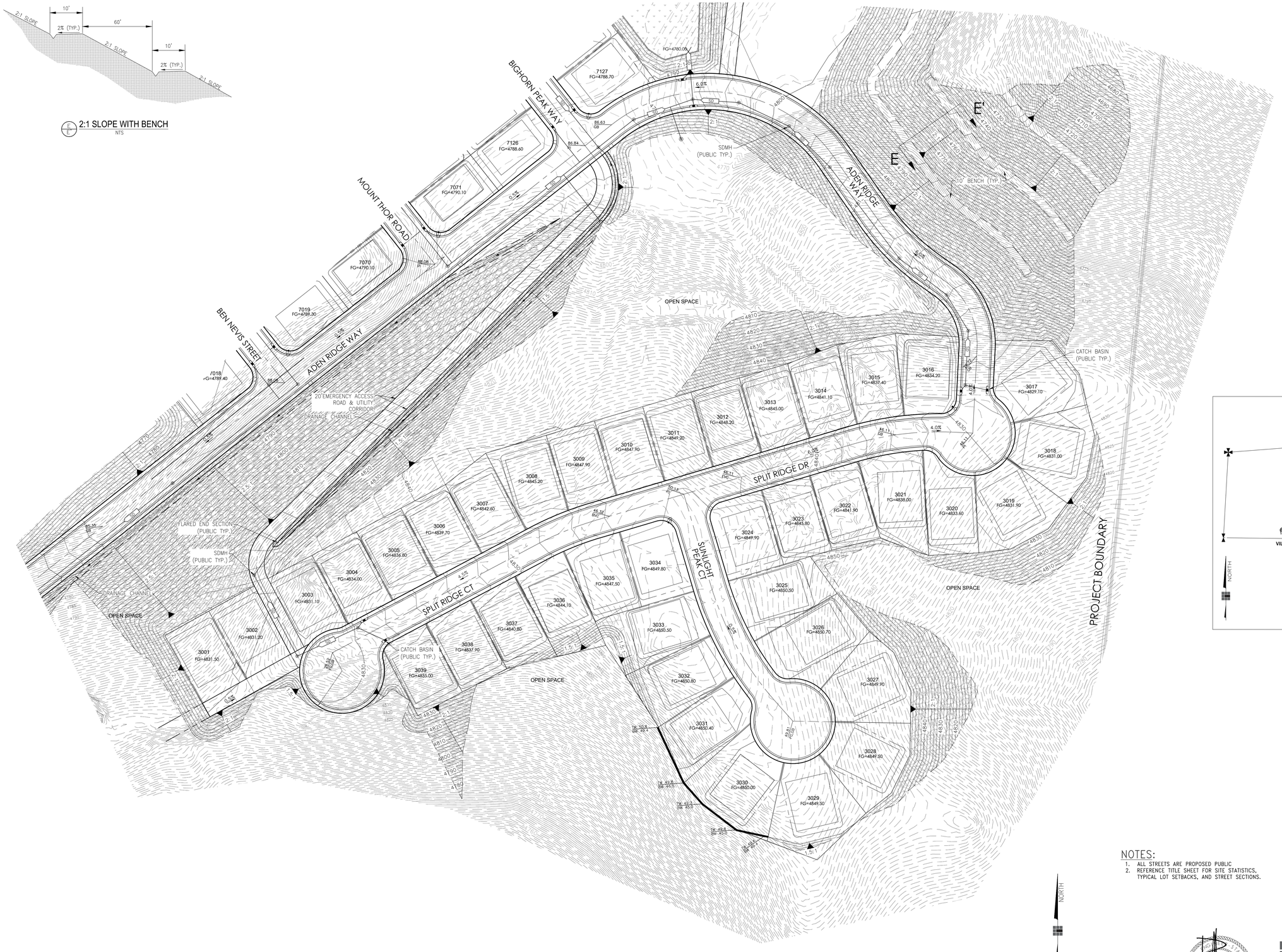
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P 775.502.8552 W christynv.com

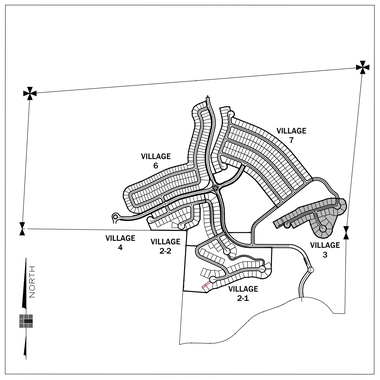
TENTATIVE MAP FOR

5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.

E E' 2:1 SLOPE WITH BENCH
NTS





KEY MAP
N.T.S.

LEGEND (GRADING)

- PORTLAND CEMENT CONCRETE (SIDEWALKS, RAMPS & GUTTERS)
- ASPHALT PAVEMENT
- 50.00 TC — ELEVATION TAG (EXISTING)
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- CATCH BASIN
- D — STORM DRAIN MANHOLE
- 18"SD — STORM DRAIN (SIZE AND DIRECTION)
- GRADE BREAK
- PHASE LINE

NOTES:

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2. REFERENCE TITLE SHEET FOR SITE STATISTICS, TYPICAL LOT SETBACKS, AND STREET SECTIONS.

PRELIMINARY GRADING PLAN

SHEET 12 OF 29

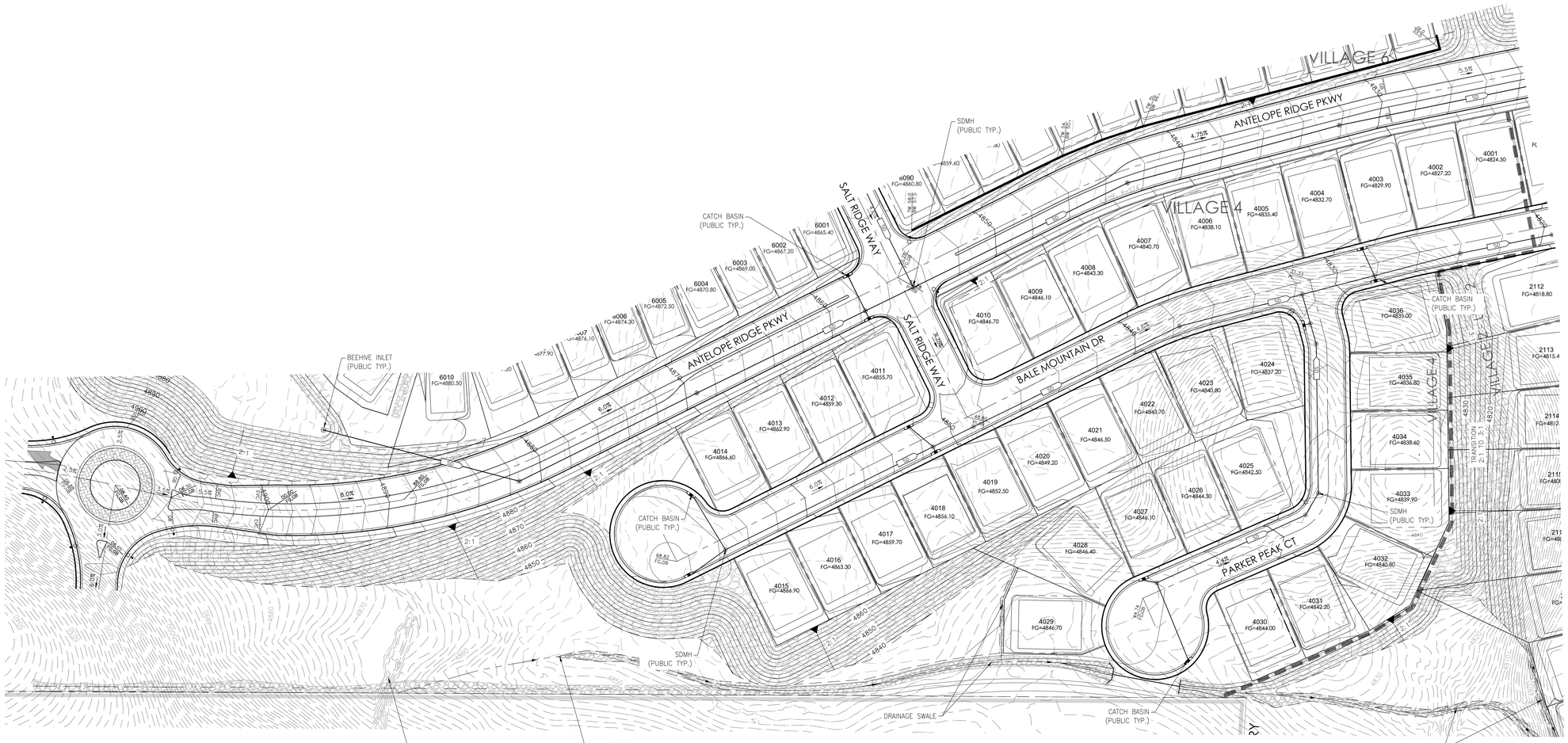
DANIEL L MANGUSO
Exp. 12-31-21
CIVIL
No. 23920
STATE OF NEVADA
3/20/2020

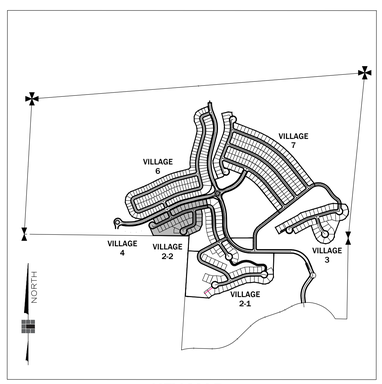
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TENTATIVE MAP FOR

5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.





KEY MAP
N.T.S.

NOTES:

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- CATCH BASIN
- STORM DRAIN MANHOLE
- 18" SD — STORM DRAIN (SIZE AND DIRECTION)
- GRADE BREAK
- PHASE LINE

NORTH

0 50' 100'

PRELIMINARY GRADING PLAN

SHEET 13 OF 29

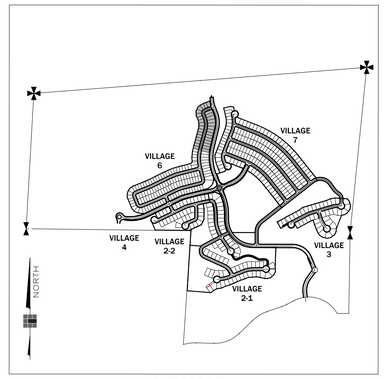
DANIEL L. MANGUSO
Exp. 12-31-21
CIVIL
No. 23930
STATE OF NEVADA
3/20/2020

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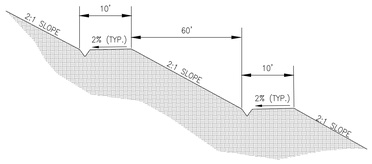
TENTATIVE MAP FOR
5 RIDGES - PHASE 1
5 RIDGES DEVELOPMENT COMPANY, INC.

LEGEND (GRADING)

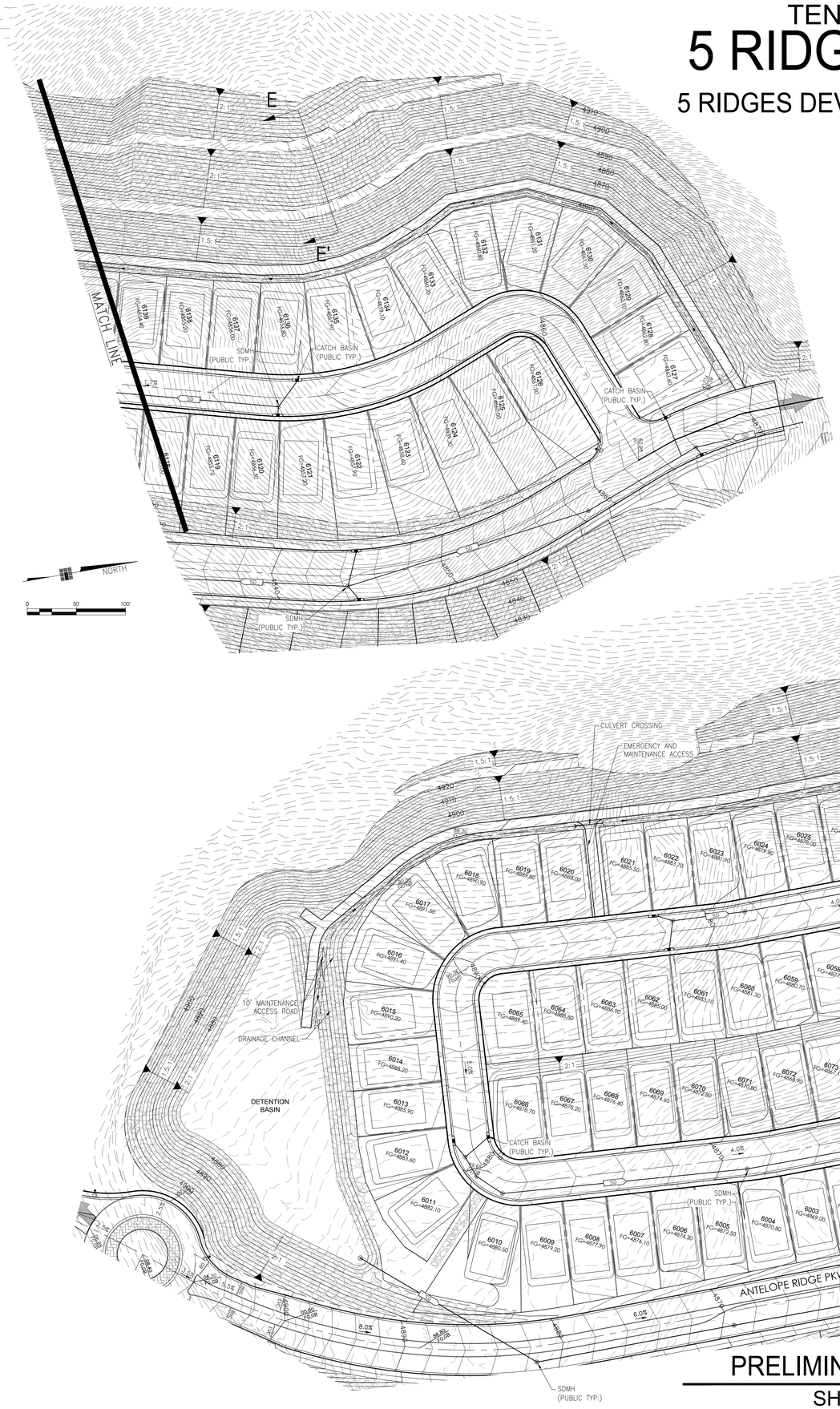
- PORTLAND CEMENT CONCRETE (SIDEWALKS, RAMPS & GUTTERS)
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- 50.00 FG — ELEVATION TAG (EXISTING)
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- CATCH BASIN
- STORM DRAIN MANHOLE
- 18"SD — STORM DRAIN (SIZE AND DIRECTION)
- GRADE BREAK
- PHASE LINE



KEY MAP
N.T.S.



E/E — 2:1 SLOPE WITH BENCH
NTS



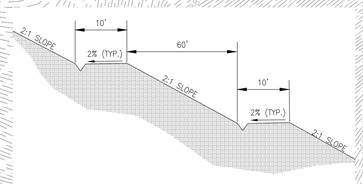
PRELIMINARY GRADING PLAN
SHEET 14 OF 29

NOTES:
1. ALL STREETS ARE PROPOSED PUBLIC
2. REFERENCE TITLE SHEET FOR SITE STATISTICS, TYPICAL LOT SETBACKS, AND STREET SECTIONS.

MICHAEL J. MANGUSO
Exp. 12-31-21
CIVIL
No. 22920
STATE OF NEVADA
5/20/2020

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TENTATIVE MAP FOR
5 RIDGES - PHASE 1
5 RIDGES DEVELOPMENT COMPANY, INC.



E/E' 2:1 SLOPE WITH BENCH
NTS

10' BENCH REF. SECTION E-E'

20' MAINTENANCE ACCESS ROAD

10' MAINTENANCE ACCESS ROAD

DRAINAGE CHANNEL

DETENTION BASIN

BIGHORN PEAK WAY

PILGRIM PEAK WAY

MOUNT THOR RD

BEN NEVIS ST

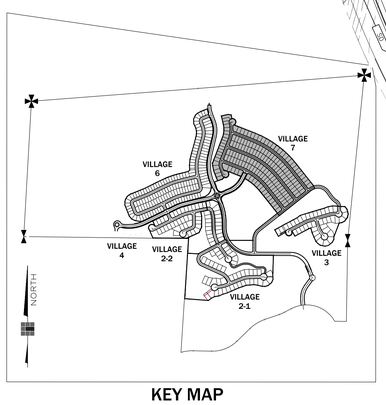
FIVE RIDGES PARKWAY

ANTELOPE RIDGE PKWY

VILLAGE 1

CATCH BASIN (PUBLIC TYP.)

SDMH (PUBLIC TYP.)



KEY MAP
N.T.S.

NOTES:
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LEGEND (GRADING)

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- GRADE BREAK
- PHASE LINE

PRELIMINARY GRADING PLAN
SHEET 15 OF 29

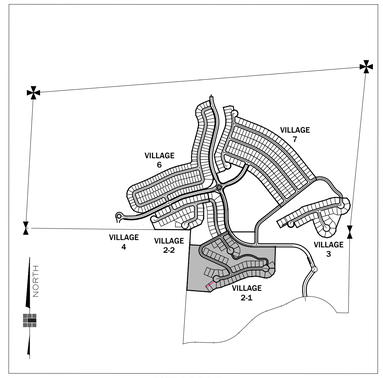


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TENTATIVE MAP FOR

5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.



KEY MAP
N.T.S.

VILLAGE 2 - UNIT 2
VILLAGE 2 - UNIT 1

RAINY RIDGE WAY (PUBLIC)
PILOT PEAK CT (PUBLIC)
FIVE RIDGES PKWY (PUBLIC)
ADEN RIDGE WAY (PUBLIC)
EQUINOX PEAK CT (PUBLIC)
HIGHLAND RANCH PKWY (PUBLIC)

DETENTION BASIN

OPEN SPACE

20' EMERGENCY ACCESS ROAD & UTILITY CORRIDOR

20' ACCESS & UTILITY EASEMENT

STORMWATER OVERFLOW

RETAINING WALL (TYP)

STREET LIGHT (TYP./PUBLIC)

OPEN CHANNEL

CATCH BASIN (PUBLIC)

SD INLET/OUTLET

PROPOSED SEWER CONNECTION AT SPARKS BLVD AND PYRAMID HWY

2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2101 2120

LEGEND

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- ASPHALT PAVEMENT
- STORM DRAIN MANHOLE
- 18"SD — STORM DRAIN (SIZE AND DIRECTION)
- CATCH BASIN
- SANITARY SEWER MANHOLE
- 8"SS — SANITARY SEWER (SIZE AND DIRECTION)
- SANITARY SEWER LATERAL (PRIVATE)
- STREET LIGHT
- FIRE HYDRANT
- WATER VALVE
- WATER SERVICE
- 8"WTR — WATER MAIN (SIZE)
- PHASE LINE

NORTH

0 50' 100'

NOTES:

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3. ALL UTILITIES AND STORM DRAIN FACILITIES ARE PROPOSED PUBLIC.
4. WATER SHALL BE PROVIDED BY SUN VALLEY GID.
5. DETENTION FACILITIES SHALL BE PRIVATELY MAINTAINED.

VILLAGE 2 UNIT 1 - PRELIMINARY UTILITY PLAN

SHEET 16 OF 29

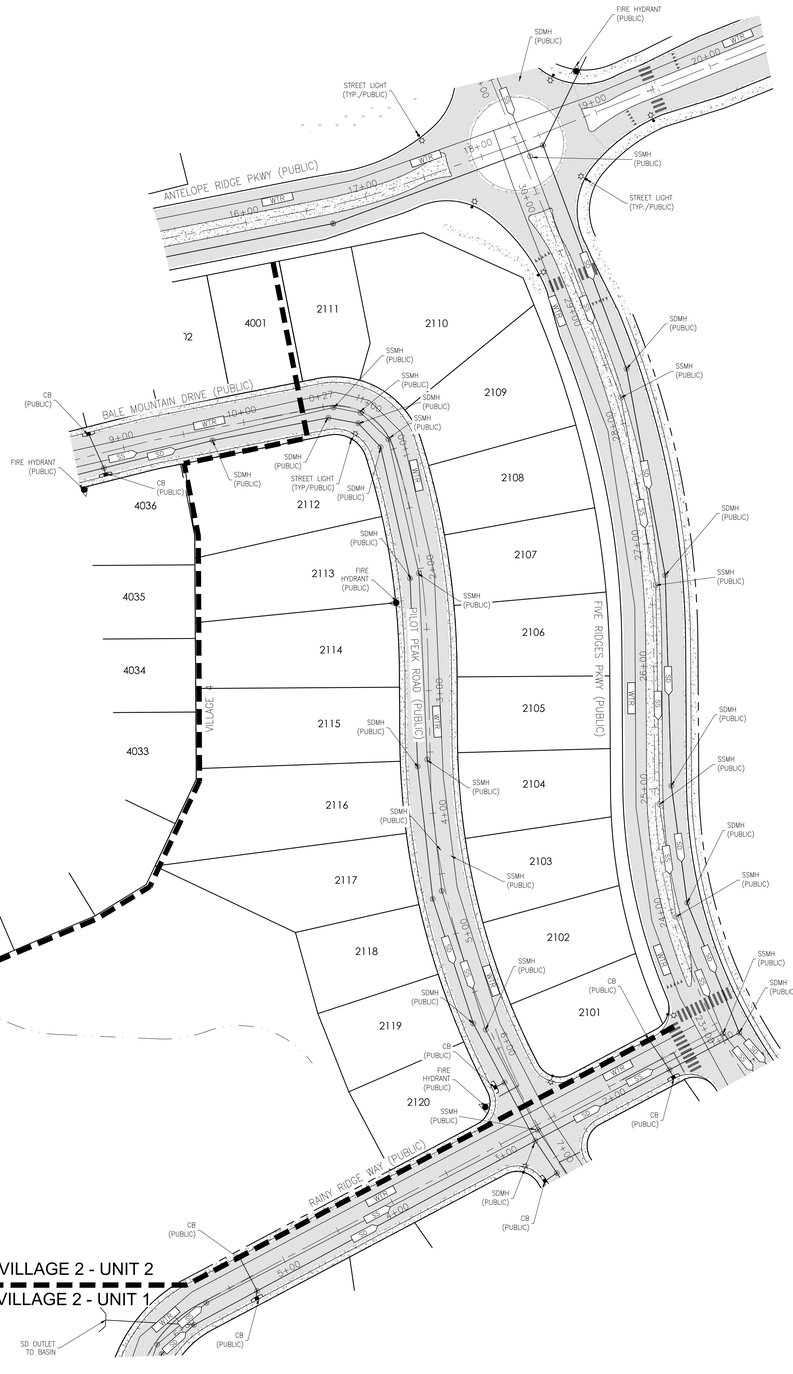
DANIEL L. MANGUSO — No. 23020 — Exp. 12-31-21 — CIVIL — STATE OF NEVADA — PROFESSIONAL ENGINEER — 1/20/2020

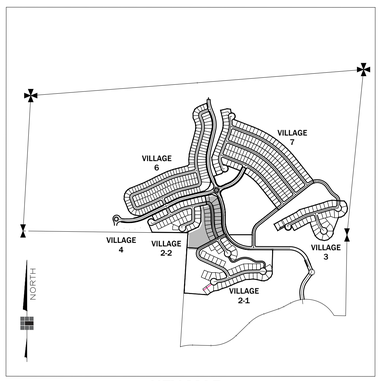
CHRISTY CORPORATION
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TENTATIVE MAP FOR

5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.





KEY MAP
N.T.S.

LEGEND

- PORTLAND CEMENT CONCRETE (SIDEWALKS, RAMPS & GUTTERS)
- ASPHALT PAVEMENT
- STORM DRAIN MANHOLE
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- CATCH BASIN
- SANITARY SEWER MANHOLE
- 8"SS — SANITARY SEWER (SIZE AND DIRECTION)
- SANITARY SEWER LATERAL (PRIVATE)
- STREET LIGHT
- FIRE HYDRANT
- WATER VALVE
- WATER SERVICE
- 8"W/R — WATER MAIN (SIZE)
- PHASE LINE

NORTH

0 50' 100'

NOTES:

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4. WATER SHALL BE PROVIDED BY SUN VALLEY GID.
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REGISTERED PROFESSIONAL ENGINEER
DANIEL L. MANGUSO
Exp. 12-31-21
CIVIL
No. 23800
STATE OF NEVADA
3/20/2020

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1000 Kiley Parkway | Sparks Nevada 89436
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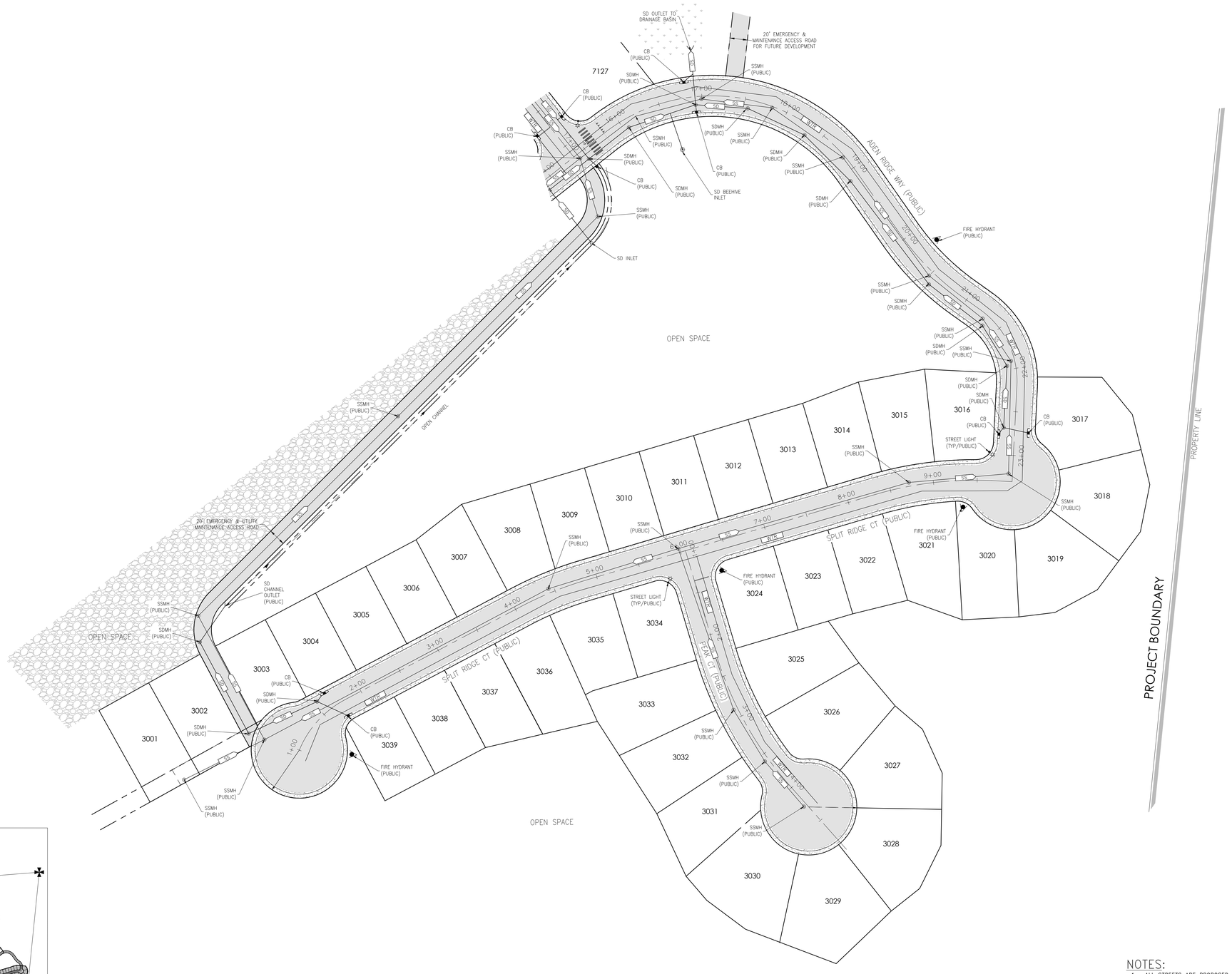
VILLAGE 2 UNIT 2 - PRELIMINARY UTILITY PLAN

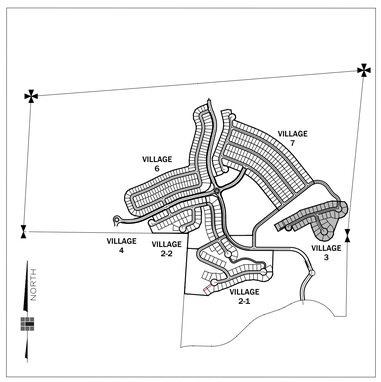
SHEET 17 OF 29

TENTATIVE MAP FOR

5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.





KEY MAP
N.T.S.

LEGEND

- PORTLAND CEMENT CONCRETE (SIDEWALKS, RAMPS & GUTTERS)
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- STORM DRAIN MANHOLE
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- CATCH BASIN
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- SANITARY SEWER LATERAL (PRIVATE)
- STREET LIGHT
- FIRE HYDRANT
- WATER VALVE
- WATER SERVICE
- 8"WTR — WATER MAIN (SIZE)
- PHASE LINE

NOTES:

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4. WATER SHALL BE PROVIDED BY SUN VALLEY GID.
5. DETENTION FACILITIES SHALL BE PRIVATELY MAINTAINED.

NORTH
0 50' 100'

VILLAGE 3 - PRELIMINARY UTILITY PLAN

SHEET 18 OF 29

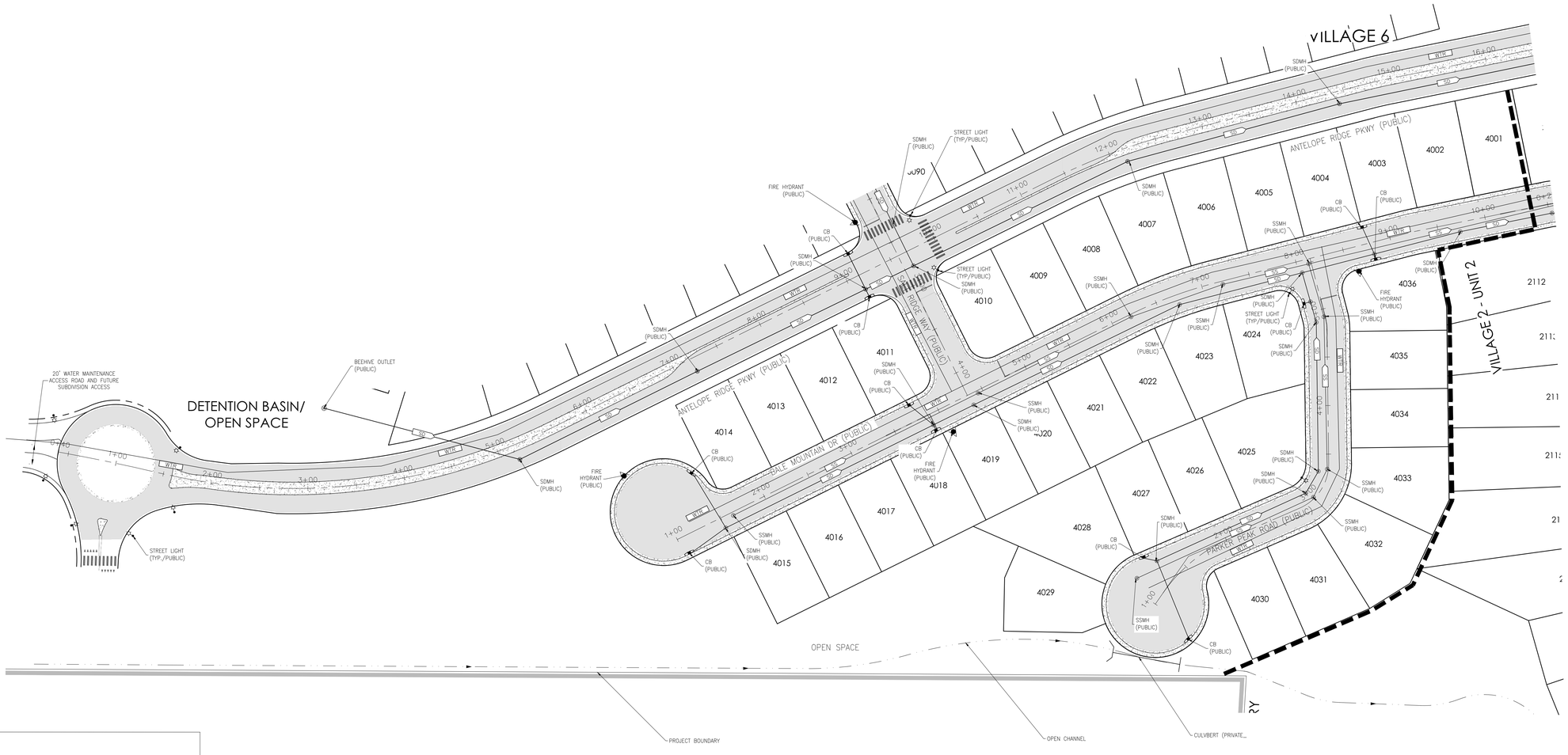
DANIEL L. MANGUSO — Exp. 12-31-21 — CIVIL — No. 23803 — 3/20/2020

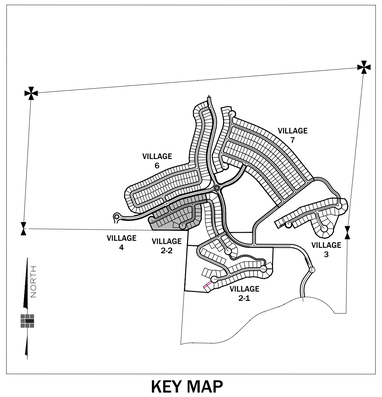
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TENTATIVE MAP FOR

5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.





KEY MAP
N.T.S.

LEGEND

- PORTLAND CEMENT CONCRETE (SIDEWALKS, RAMPS & GUTTERS)
- ASPHALT PAVEMENT
- STORM DRAIN MANHOLE
- 18"SD — STORM DRAIN (SIZE AND DIRECTION)
- CATCH BASIN
- SANITARY SEWER MANHOLE
- 8"SS — SANITARY SEWER (SIZE AND DIRECTION)
- SANITARY SEWER LATERAL (PRIVATE)
- STREET LIGHT
- FIRE HYDRANT
- WATER VALVE
- WATER SERVICE
- WTR — WATER MAIN (SIZE)
- PHASE LINE

NORTH

0 50' 100'

NOTES:

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DANIEL J. MANGUSO — Exp. 12-31-21 — CIVIL — No. 23930 — 3/20/2020

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P 775.502.8552 christynv.com

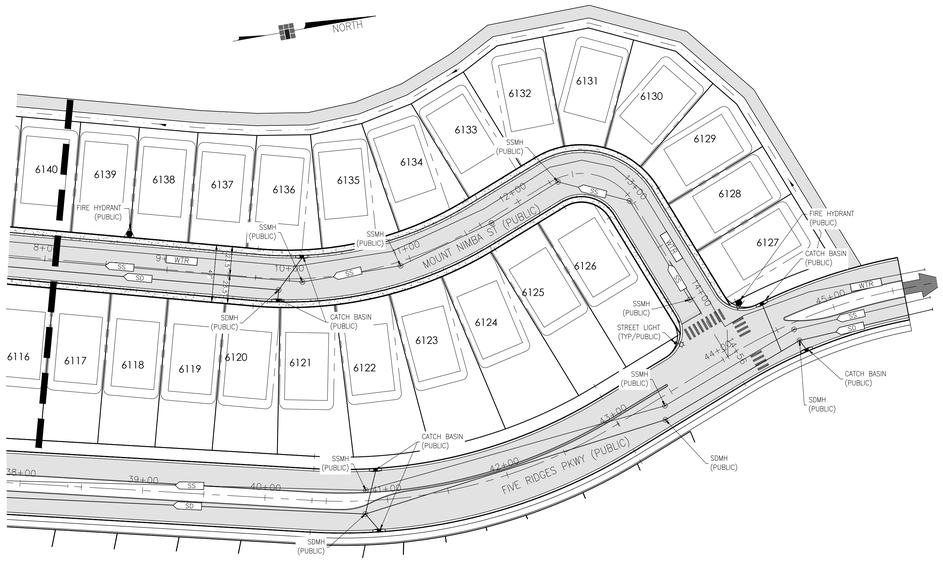
VILLAGE 4 - PRELIMINARY UTILITY PLAN

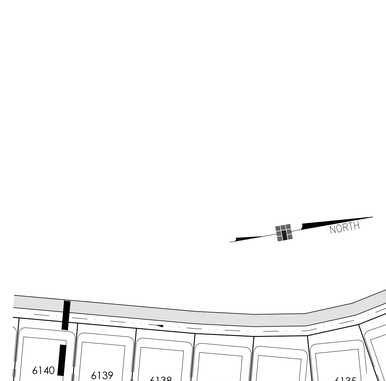
SHEET 19 OF 29

TENTATIVE MAP FOR

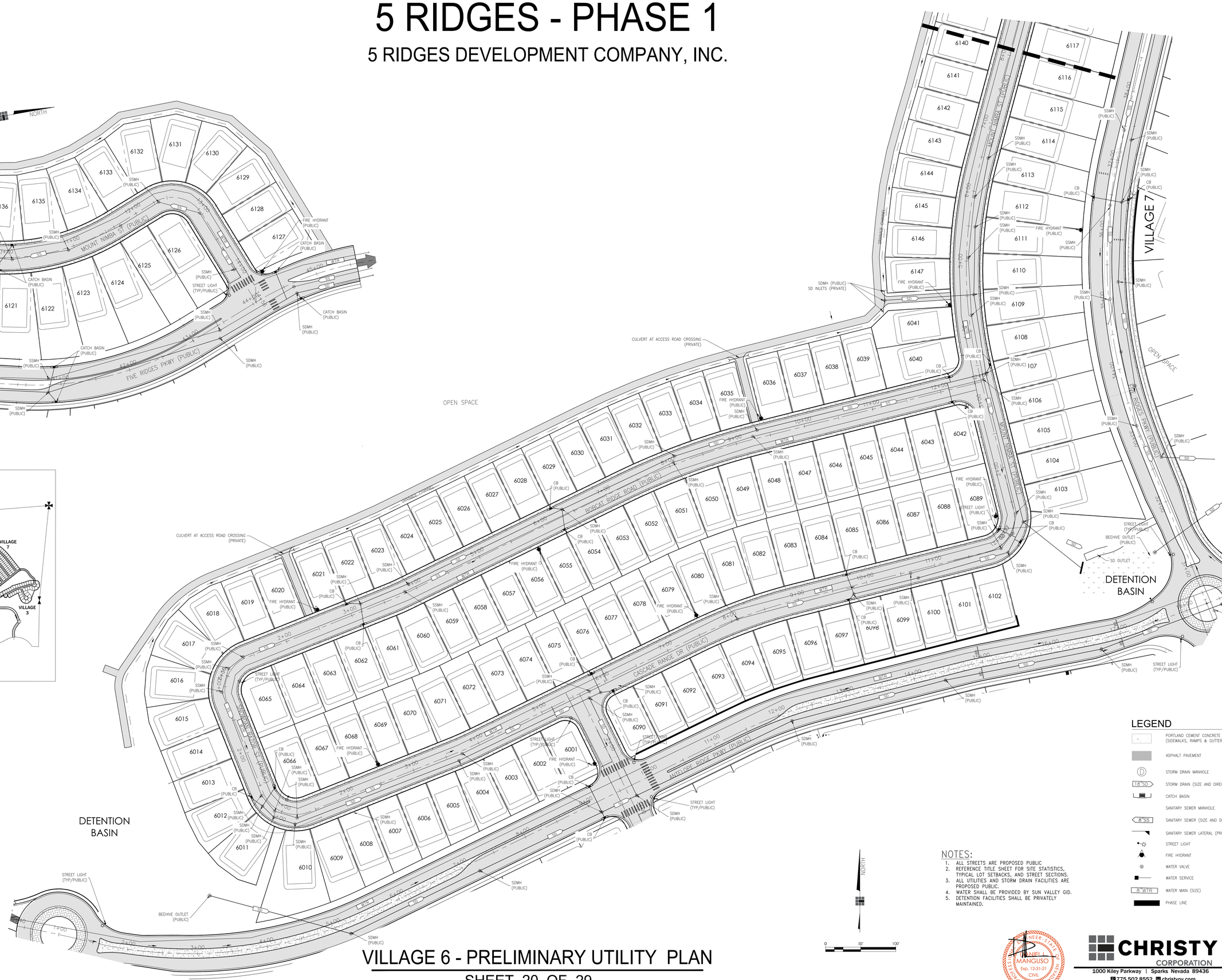
5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.





KEY MAP
N.T.S.



LEGEND

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- STREET LIGHT
- FIRE HYDRANT
- WATER VALVE
- WATER SERVICE
- 8"W/R — WATER MAIN (SIZE)
- PHASE LINE

NORTH

0 50' 100'

NOTES:

1. ALL STREETS ARE PROPOSED PUBLIC
2. REFERENCE TITLE SHEET FOR SITE STATISTICS, TYPICAL LOT SETBACKS, AND STREET SECTIONS.
3. ALL UTILITIES AND STORM DRAIN FACILITIES ARE PROPOSED PUBLIC.
4. WATER SHALL BE PROVIDED BY SUN VALLEY GID.
5. DETENTION FACILITIES SHALL BE PRIVATELY MAINTAINED.

VILLAGE 6 - PRELIMINARY UTILITY PLAN

SHEET 20 OF 29

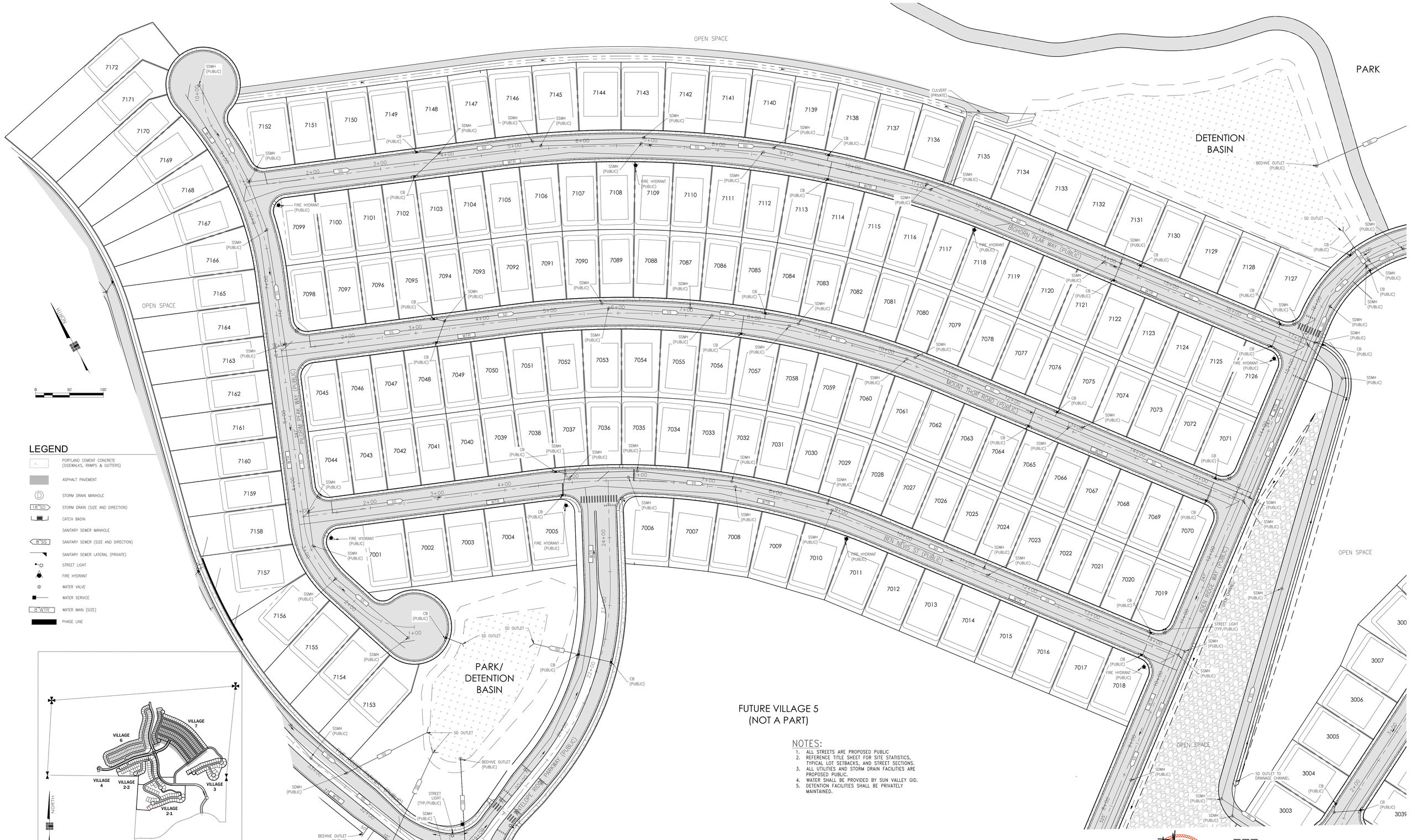
CHRISTOPHER J. MANGUSO — Exp. 12-31-21 — CIVIL — No. 23930 — STATE OF NEVADA — PROFESSIONAL ENGINEER
5/20/2020

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

TENTATIVE MAP FOR

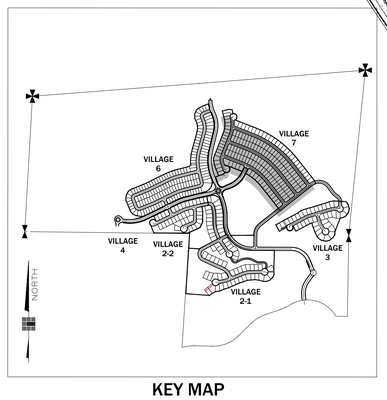
5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.



LEGEND

- PORTLAND CEMENT CONCRETE (SIDEWALKS, RAMPS & GUTTERS)
- ASPHALT PAVEMENT
- STORM DRAIN MANHOLE
- 18"SD — STORM DRAIN (SIZE AND DIRECTION)
- CATCH BASIN
- SANITARY SEWER MANHOLE
- 8"SS — SANITARY SEWER (SIZE AND DIRECTION)
- SANITARY SEWER LATERAL (PRIVATE)
- STREET LIGHT
- FIRE HYDRANT
- WATER VALVE
- WATER SERVICE
- 8"WTR — WATER MAIN (SIZE)
- PHASE LINE



KEY MAP
N.T.S.

NOTES:

1. ALL STREETS ARE PROPOSED PUBLIC.
2. REFERENCE TITLE SHEET FOR SITE STATISTICS, TYPICAL LOT SETBACKS, AND STREET SECTIONS.
3. ALL UTILITIES AND STORM DRAIN FACILITIES ARE PROPOSED PUBLIC.
4. WATER SHALL BE PROVIDED BY SUN VALLEY GID.
5. DETENTION FACILITIES SHALL BE PRIVATELY MAINTAINED.

VILLAGE 7 - PRELIMINARY UTILITY PLAN

SHEET 21 OF 29



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

TENTATIVE MAP FOR

5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.

NOTES:

1. ALL STREETS ARE PROPOSED PUBLIC
2. REFERENCE TITLE SHEET FOR SITE STATISTICS, TYPICAL LOT SETBACKS, AND STREET SECTIONS.

LEGEND

- PORTLAND CEMENT CONCRETE (SIDEWALKS, RAMPS & GUTTERS)
- ASPHALT PAVEMENT
- RIP RAP SLOPE STABILIZATION





PRELIMINARY CROSS SECTION CUT LINES A & B

SHEET 22 OF 29

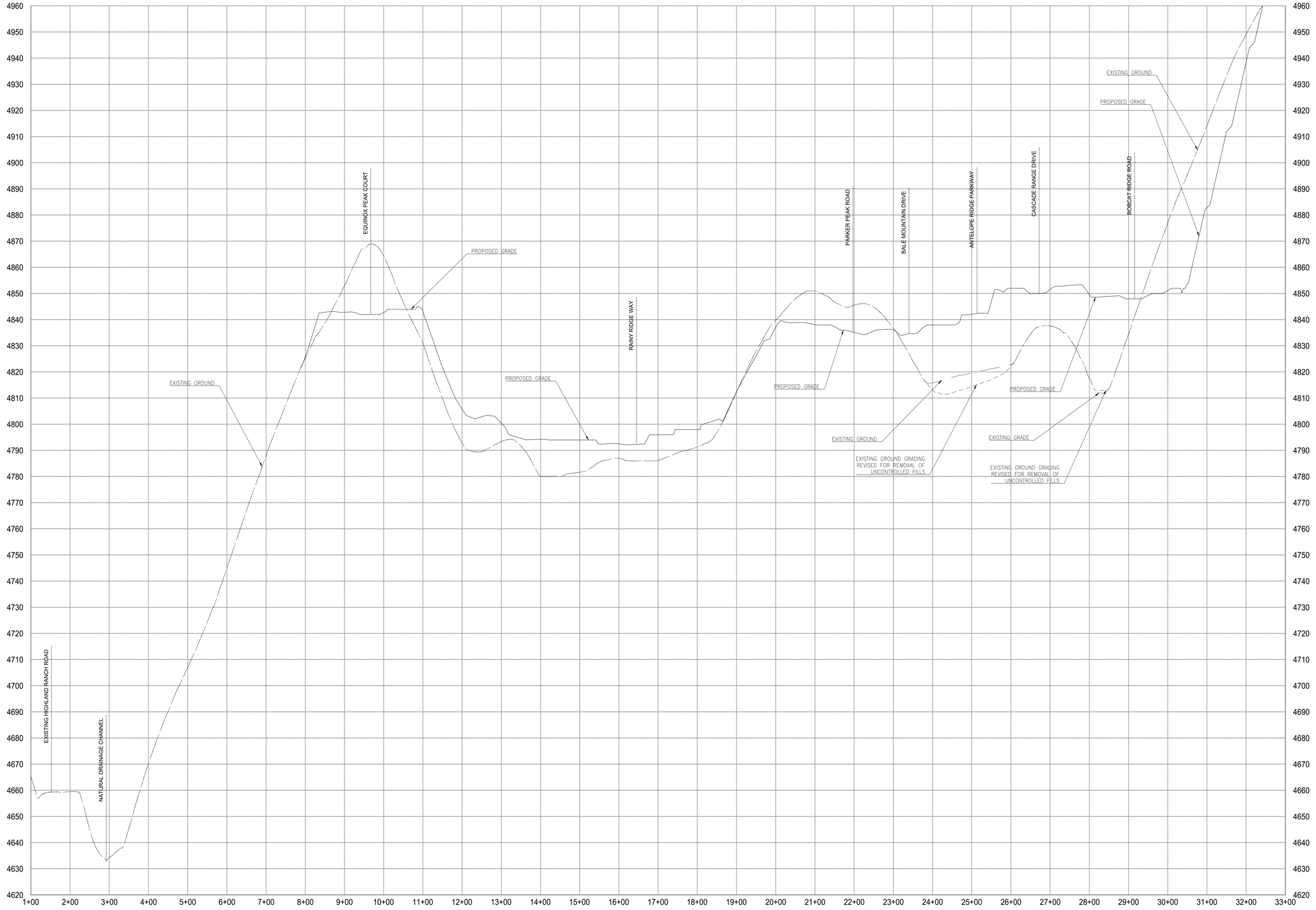
DANIEL L. MARCUSO
Exp. 12-31-21
CIVIL
No. 23020
3/20/2020

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

TENTATIVE MAP FOR

5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.



CROSS SECTION A

SCALE: 1"=100' HORIZ. / 1"=15' VERT.

PRELIMINARY CROSS SECTION A

SHEET 23 OF 29

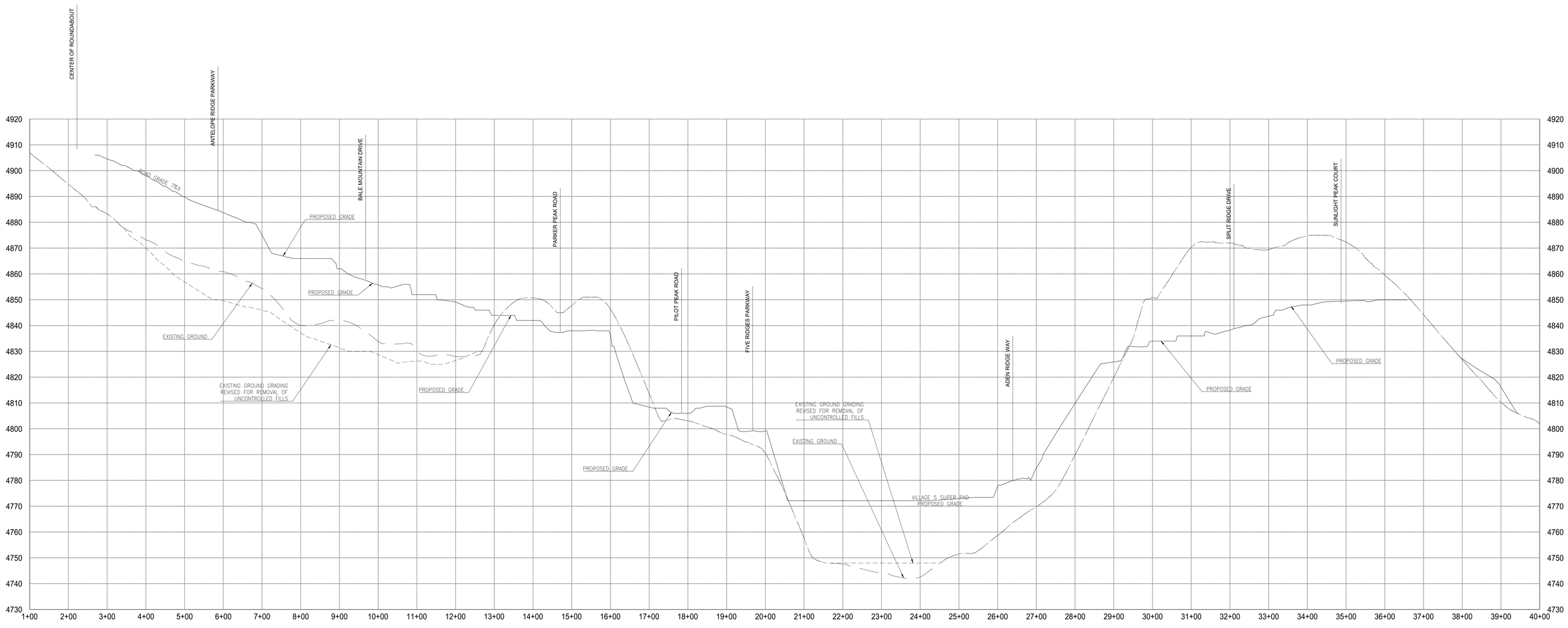
MICHAEL L. MANGUSO
Exp. 12-31-21
CIVIL
No. 23020
3/20/2020

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

TENTATIVE MAP FOR

5 RIDGES - PHASE 1

5 RIDGES DEVELOPMENT COMPANY, INC.



CROSS SECTION B

SCALE: 1"=100' HORIZ. / 1"=15' VERT.

PRELIMINARY CROSS SECTION B

SHEET 24 OF 29

DANIEL L. MANGUSO
Exp. 12-31-21
CIVIL
No. 23920
3/20/2020

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



LANDSCAPE REQUIREMENTS

PER CITY OF SPARKS MUNICIPAL CODE REQUIREMENTS:

RESIDENTIAL STREETS
- ONE (1) 2 INCH CALIPER DECIDUOUS OR 6' HT. EVERGREEN TREE PER LOT

NO TREES SHALL BE INSTALLED WITHIN VEHICULAR SIGHT TRIANGLE PER CITY OF SPARKS.

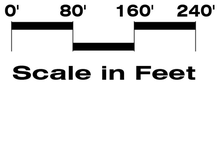
LANDSCAPE LEGEND

FRONT YARD STREET TREES
- TREES SHOWN GRAPHICALLY ON PLAN MAY NOT BE REPRESENTATIVE OF ALL TREES REQUIRED. FINAL TREE COUNT WILL REFLECT REQUIREMENTS LISTED UNDER "LANDSCAPE REQUIREMENTS," THIS SHEET.

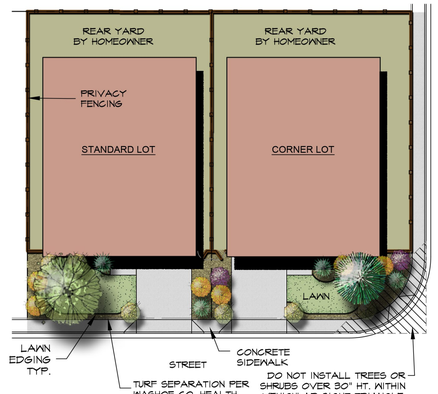
RESIDENTIAL LOTS
- FRONT YARDS TO BE LANDSCAPED BY DEVELOPER & MAINTAINED BY HOMEOWNER
- BACKYARDS TO BE LANDSCAPED BY HOMEOWNER

REVEGETATED SLOPES

UNDISTURBED OPEN SPACE



VILLAGE 2



TYPICAL FRONT YARD PLAN

NOT TO SCALE

FRONT YARD LEGEND

SYM.	DESCRIPTION
	FRONT YARD STREET TREE DECIDUOUS TREE OR EVERGREEN TREE
	SHRUBS
	LAWN (OPTIONAL BY HOMEOWNER)
	MULCH ALL TREE AND SHRUB PLANTING AREAS WITHIN FRONT YARD LANDSCAPE SHALL RECEIVE 4" DEPTH OF MULCH WITH WEED CONTROL.

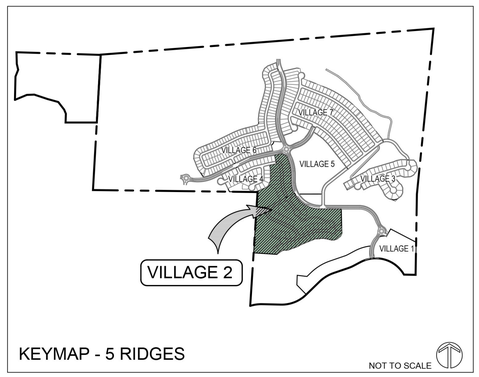
XERISCAPE OPTION (NO LAWN):

INSTALL ADDITIONAL SHRUBS IN FRONT YARDS WHERE NO LAWN IS PROVIDED.

IRRIGATION NOTE:

ALL LANDSCAPING WILL BE AUTOMATICALLY IRRIGATED. TURF GRASS WILL BE IRRIGATED USING LOW ANGLE SPRAY, ROTARY, AND/OR IMPACT HEADS TO REDUCE WIND DRIFT. CONTAINER PLANTINGS WILL BE DRIP IRRIGATED. A VACUUM BREAKER/ BACKFLOW PREVENTOR WILL BE PROVIDED ON THE IRRIGATION SYSTEM AS REQUIRED PER CODE.

TYPICAL FRONT YARD PLAN IS DIAGRAMMATIC OF LANDSCAPING AND IS INTENDED FOR INFORMATIONAL PURPOSES ONLY.



KEYMAP - 5 RIDGES

NOT TO SCALE

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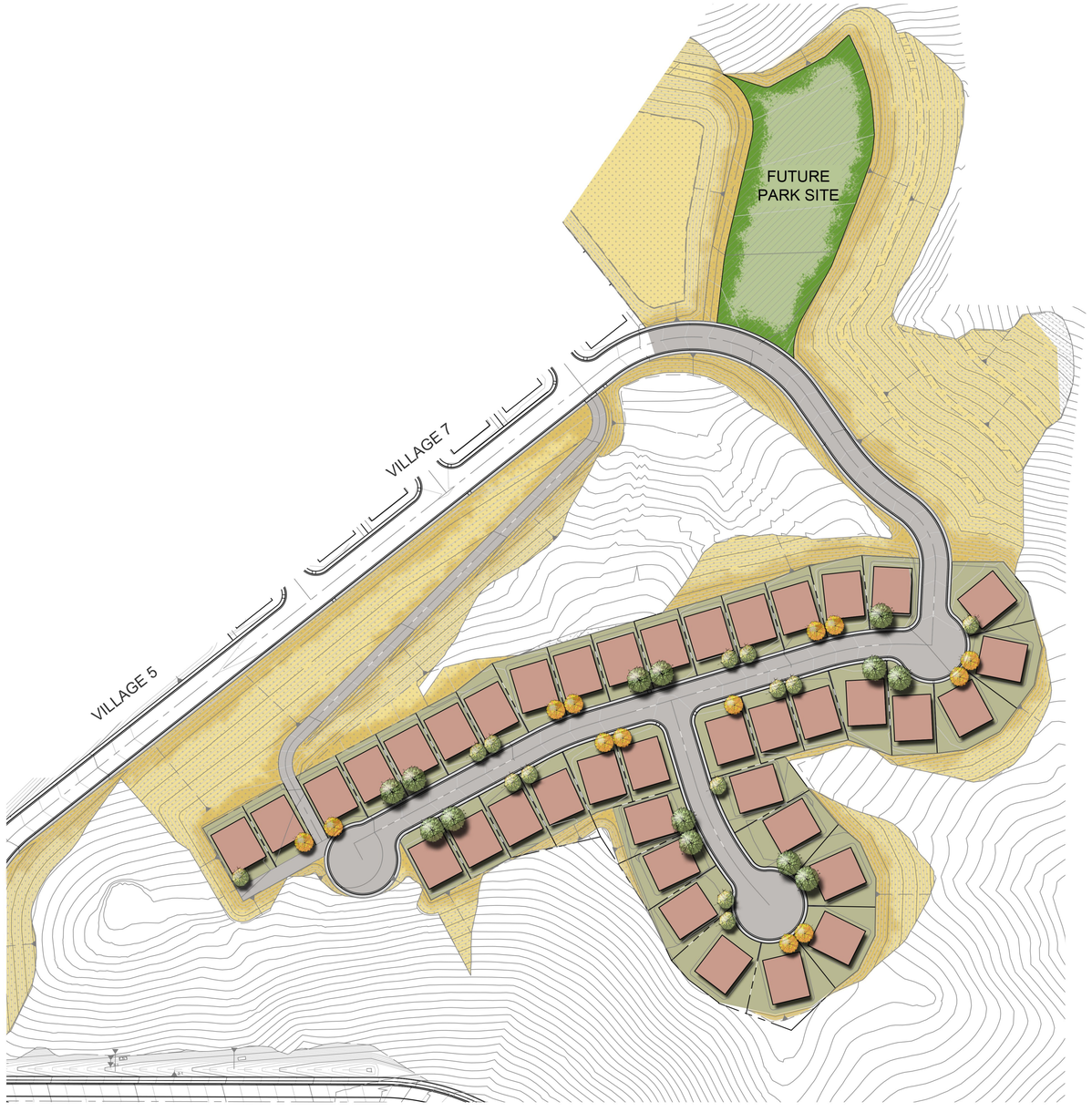
FIVE RIDGES VILLAGE 2
S3 Development
Washoe Co. Nevada
Sparks

Village 2
Landscape Tentative Map

No.	Revision Date

HLA No: 553-504-04-19
Designed: JMH
Drawn: KMK
Checked: RMH
Date: 2/28/2020

Sheet L1 of 5



LANDSCAPE REQUIREMENTS

PER CITY OF SPARKS MUNICIPAL CODE REQUIREMENTS:

RESIDENTIAL STREETS
- ONE (1) 2 INCH CALIPER DECIDUOUS OR 6' HT. EVERGREEN TREE PER LOT

NO TREES SHALL BE INSTALLED WITHIN VEHICULAR SIGHT TRIANGLE PER CITY OF SPARKS.

LANDSCAPE LEGEND

FRONT YARD STREET TREES
- TREES SHOWN GRAPHICALLY ON PLAN MAY NOT BE REPRESENTATIVE OF ALL TREES REQUIRED. FINAL TREE COUNT WILL REFLECT REQUIREMENTS LISTED UNDER "LANDSCAPE REQUIREMENTS," THIS SHEET.

RESIDENTIAL LOTS
- FRONT YARDS TO BE LANDSCAPED BY DEVELOPER & MAINTAINED BY HOMEOWNER
- BACKYARDS TO BE LANDSCAPED BY HOMEOWNER

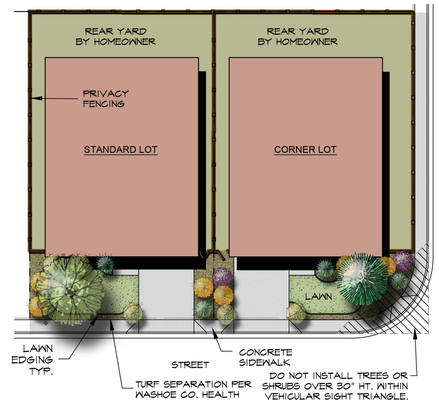
REVEGETATED SLOPES

UNDISTURBED OPEN SPACE

0' 80' 160' 240'

Scale in Feet

VILLAGE 3



TYPICAL FRONT YARD PLAN

NOT TO SCALE

FRONT YARD LEGEND

SYM.	DESCRIPTION
	FRONT YARD STREET TREE DECIDUOUS TREE OR EVERGREEN TREE
	SHRUBS
	LAWN (OPTIONAL BY HOMEOWNER)

MULCH

ALL TREE AND SHRUB PLANTING AREAS WITHIN FRONT YARD LANDSCAPE SHALL RECEIVE 4" DEPTH OF MULCH WITH WEED CONTROL.

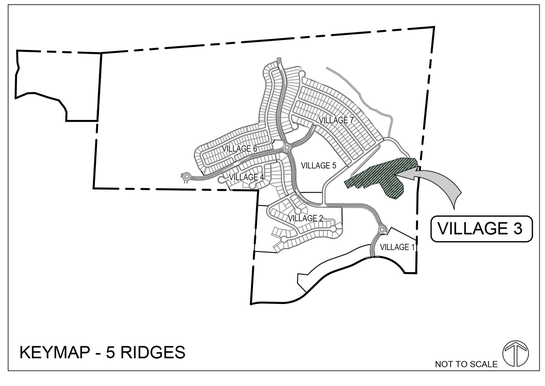
XERISCAPE OPTION (NO LAWN):

INSTALL ADDITIONAL SHRUBS IN FRONT YARDS WHERE NO LAWN IS PROVIDED.

IRRIGATION NOTE:

ALL LANDSCAPING WILL BE AUTOMATICALLY IRRIGATED. TURF GRASS WILL BE IRRIGATED USING LOW ANGLE SPRAY, ROTARY, AND/OR IMPACT HEADS TO REDUCE WIND DRIFT. CONTAINER PLANTINGS WILL BE DRIP IRRIGATED. A VACUUM BREAKER/ BACKFLOW PREVENTOR WILL BE PROVIDED ON THE IRRIGATION SYSTEM AS REQUIRED PER CODE.

TYPICAL FRONT YARD PLAN IS DIAGRAMMATIC OF LANDSCAPING AND IS INTENDED FOR INFORMATIONAL PURPOSES ONLY.



KEYMAP - 5 RIDGES

NOT TO SCALE

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FIVE RIDGES VILLAGE 3
S3 Development
Washoe Co. Nevada
Sparks

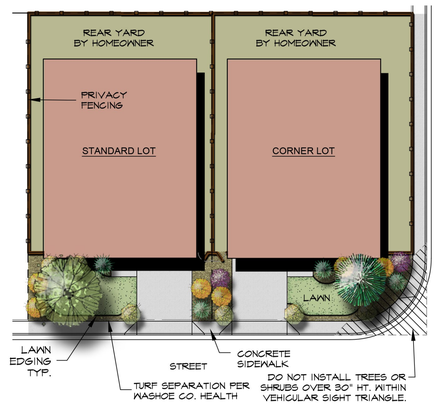
Village 3
Landscape Tentative Map

No.	Revision Date

LA No: 558-504-04-19
Designed: JAH
Drawn: KMK
Checked: RMH
Date: 2/28/2020

Sheet L2 of 5





TYPICAL FRONT YARD PLAN

NOT TO SCALE

FRONT YARD LEGEND

SYM.	DESCRIPTION
	FRONT YARD STREET TREE
	DECIDUOUS TREE OR EVERGREEN TREE
	SHRUBS
	LAWN (OPTIONAL BY HOMEOWNER)

MULCH

ALL TREE AND SHRUB PLANTING AREAS WITHIN FRONT YARD LANDSCAPE SHALL RECEIVE 4" DEPTH OF MULCH WITH WEED CONTROL.

XERISCAPE OPTION (NO LAWN):

INSTALL ADDITIONAL SHRUBS IN FRONT YARDS WHERE NO LAWN IS PROVIDED.

IRRIGATION NOTE:

ALL LANDSCAPING WILL BE AUTOMATICALLY IRRIGATED. TURF GRASS WILL BE IRRIGATED USING LOW ANGLE SPRAY, ROTARY, AND/OR IMPACT HEADS TO REDUCE WIND DRIFT. CONTAINER PLANTINGS WILL BE DRIP IRRIGATED. A VACUUM BREAKER/ BACKFLOW PREVENTOR WILL BE PROVIDED ON THE IRRIGATION SYSTEM AS REQUIRED PER CODE.

TYPICAL FRONT YARD PLAN IS DIAGRAMMATIC OF LANDSCAPING AND IS INTENDED FOR INFORMATIONAL PURPOSES ONLY.

LANDSCAPE REQUIREMENTS

PER CITY OF SPARKS MUNICIPAL CODE REQUIREMENTS:

RESIDENTIAL STREETS
- ONE (1) 2 INCH CALIPER DECIDUOUS OR 6' HT. EVERGREEN TREE PER LOT

NO TREES SHALL BE INSTALLED WITHIN VEHICULAR SIGHT TRIANGLE PER CITY OF SPARKS.

LANDSCAPE LEGEND

FRONT YARD STREET TREES
- TREES SHOWN GRAPHICALLY ON PLAN MAY NOT BE REPRESENTATIVE OF ALL TREES REQUIRED. FINAL TREE COUNT WILL REFLECT REQUIREMENTS LISTED UNDER "LANDSCAPE REQUIREMENTS," THIS SHEET.

RESIDENTIAL LOTS
- FRONT YARDS TO BE LANDSCAPED BY DEVELOPER & MAINTAINED BY HOMEOWNER
- BACKYARDS TO BE LANDSCAPED BY HOMEOWNER

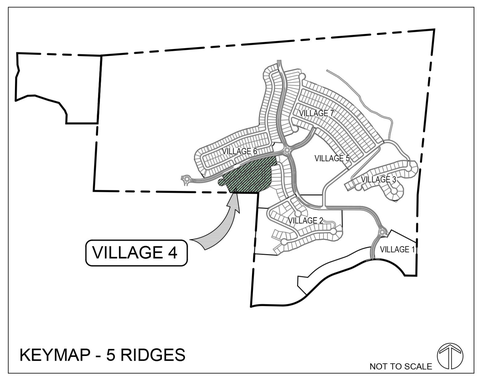
REVEGETATED SLOPES

UNDISTURBED OPEN SPACE

0' 80' 160' 240'

Scale in Feet

VILLAGE 4



KEYMAP - 5 RIDGES

NOT TO SCALE

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FIVE RIDGES VILLAGE 4
S3 Development
Washoe Co. Nevada
Sparks

Village 4
Landscape Tentative Map

No.	Revision Date

HLA No:	555-504-04-19
Designed:	JAH
Drawn:	KMK
Checked:	RAH
Date:	2/28/2020

Sheet L3 of 5

LANDSCAPE LEGEND

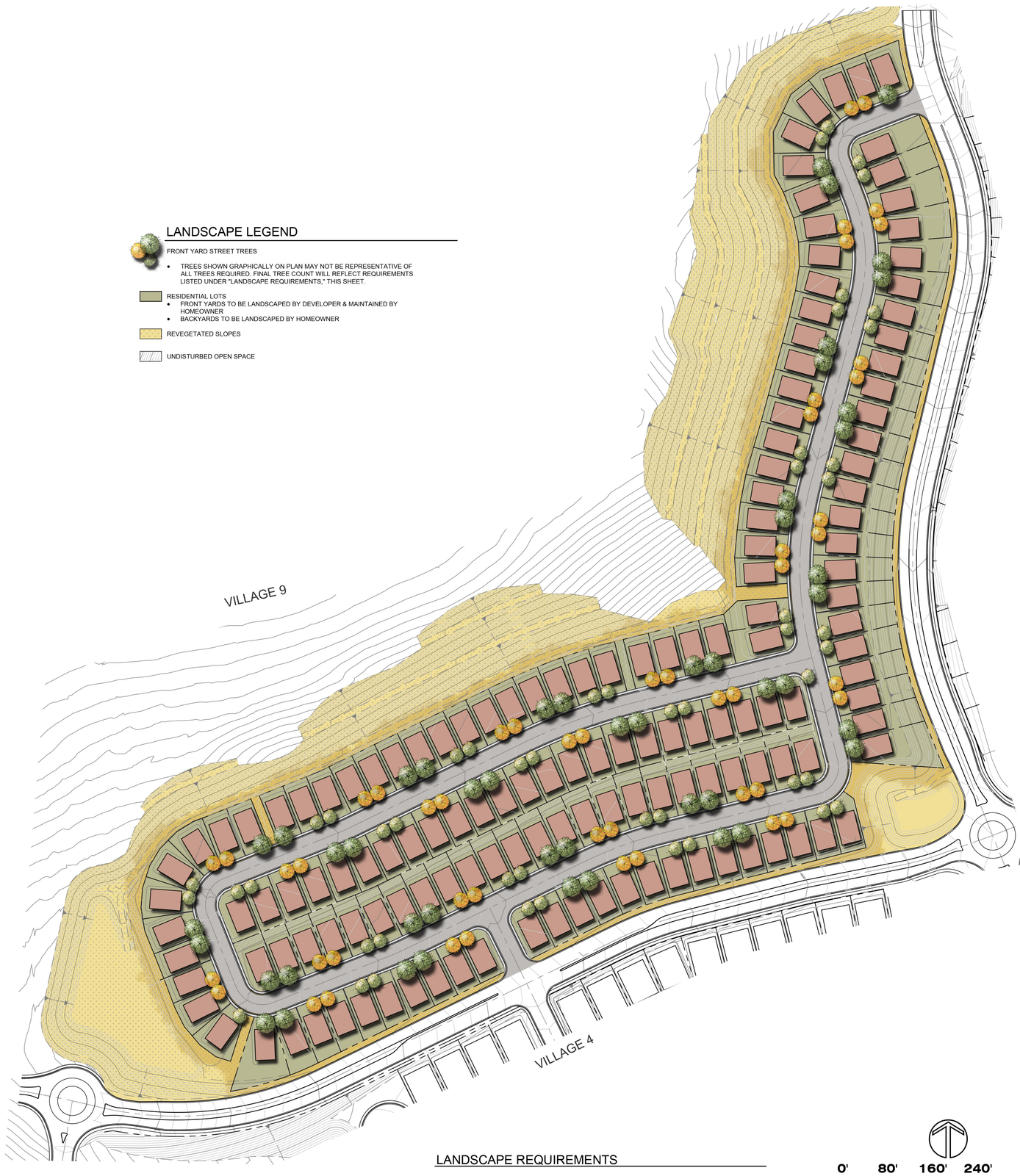
FRONT YARD STREET TREES

- TREES SHOWN GRAPHICALLY ON PLAN MAY NOT BE REPRESENTATIVE OF ALL TREES REQUIRED. FINAL TREE COUNT WILL REFLECT REQUIREMENTS LISTED UNDER "LANDSCAPE REQUIREMENTS," THIS SHEET.

RESIDENTIAL LOTS
- FRONT YARDS TO BE LANDSCAPED BY DEVELOPER & MAINTAINED BY HOMEOWNER
- BACKYARDS TO BE LANDSCAPED BY HOMEOWNER

REVEGETATED SLOPES

UNDISTURBED OPEN SPACE



VILLAGE 6

LANDSCAPE REQUIREMENTS

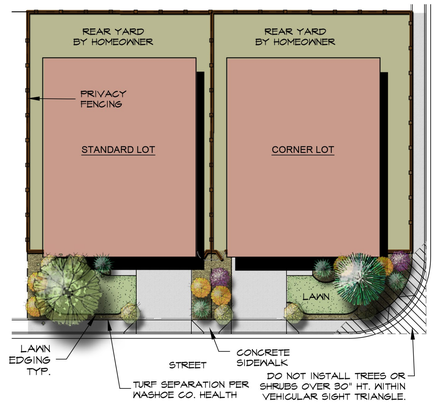
PER CITY OF SPARKS MUNICIPAL CODE REQUIREMENTS:

RESIDENTIAL STREETS
- ONE (1) 2 INCH CALIPER DECIDUOUS OR 6' HT. EVERGREEN TREE PER LOT

NO TREES SHALL BE INSTALLED WITHIN VEHICULAR SIGHT TRIANGLE PER CITY OF SPARKS.

0' 80' 160' 240'

Scale in Feet



TYPICAL FRONT YARD PLAN

NOT TO SCALE

FRONT YARD LEGEND

SYM.	DESCRIPTION
	FRONT YARD STREET TREE DECIDUOUS TREE OR EVERGREEN TREE
SHRUBS	LAWN (OPTIONAL BY HOMEOWNER)

MULCH

ALL TREE AND SHRUB PLANTING AREAS WITHIN FRONT YARD LANDSCAPE SHALL RECEIVE 4" DEPTH OF MULCH WITH WEED CONTROL.

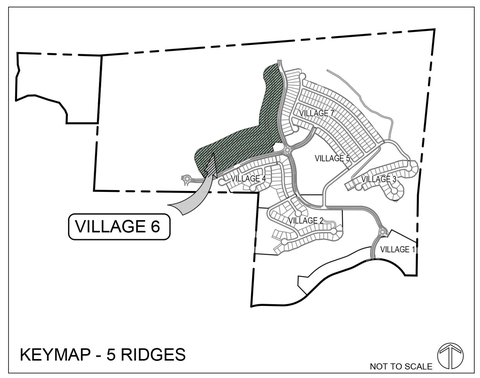
XERISCAPE OPTION (NO LAWN):

INSTALL ADDITIONAL SHRUBS IN FRONT YARDS WHERE NO LAWN IS PROVIDED.

IRRIGATION NOTE:

ALL LANDSCAPING WILL BE AUTOMATICALLY IRRIGATED. TURF GRASS WILL BE IRRIGATED USING LOW ANGLE SPRAY, ROTARY, AND/OR IMPACT HEADS TO REDUCE WIND DRIFT. CONTAINER PLANTINGS WILL BE DRIP IRRIGATED. A VACUUM BREAKER/ BACKFLOW PREVENTOR WILL BE PROVIDED ON THE IRRIGATION SYSTEM AS REQUIRED PER CODE.

TYPICAL FRONT YARD PLAN IS DIAGRAMMATIC OF LANDSCAPING AND IS INTENDED FOR INFORMATIONAL PURPOSES ONLY.



KEYMAP - 5 RIDGES

NOT TO SCALE

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FIVE RIDGES VILLAGE 6
S3 Development
Washoe Co. Nevada

Sparks

Village 6
Landscape Tentative Map

No.	Revision Date

HLA No: 553-504-04-19
Designed: JMH
Drawn: KMK
Checked: RMH
Date: 2/28/2020

Sheet L4 of 5



LANDSCAPE REQUIREMENTS

PER CITY OF SPARKS MUNICIPAL CODE REQUIREMENTS:

RESIDENTIAL STREETS

- ONE (1) 2 INCH CALIPER DECIDUOUS OR 6' HT. EVERGREEN TREE PER LOT

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LANDSCAPE LEGEND

FRONT YARD STREET TREES

- TREES SHOWN GRAPHICALLY ON PLAN MAY NOT BE REPRESENTATIVE OF ALL TREES REQUIRED. FINAL TREE COUNT WILL REFLECT REQUIREMENTS LISTED UNDER "LANDSCAPE REQUIREMENTS," THIS SHEET.

RESIDENTIAL LOTS

- FRONT YARDS TO BE LANDSCAPED BY DEVELOPER & MAINTAINED BY HOMEOWNER
- BACKYARDS TO BE LANDSCAPED BY HOMEOWNER

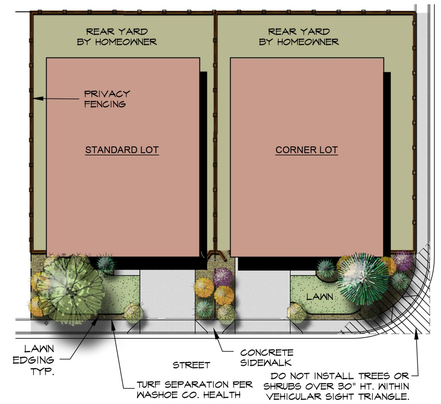
REVEGETATED SLOPES

UNDISTURBED OPEN SPACE

0' 80' 160' 240'

Scale in Feet

VILLAGE 7



TYPICAL FRONT YARD PLAN

NOT TO SCALE

FRONT YARD LEGEND

SYM.	DESCRIPTION
	FRONT YARD STREET TREE DECIDUOUS TREE OR EVERGREEN TREE
	SHRUBS
	LAWN (OPTIONAL BY HOMEOWNER)

MULCH

ALL TREE AND SHRUB PLANTING AREAS WITHIN FRONT YARD LANDSCAPE SHALL RECEIVE 4" DEPTH OF MULCH WITH WEED CONTROL.

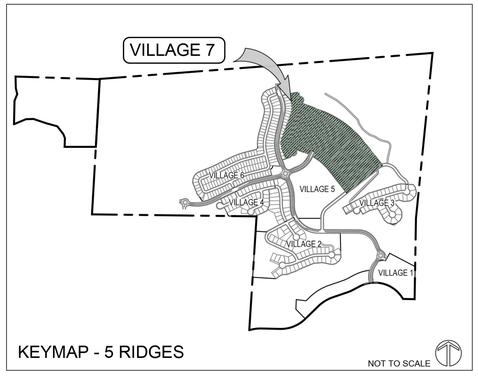
XERISCAPE OPTION (NO LAWN):

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IRRIGATION NOTE:

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FIVE RIDGES VILLAGE 7
S3 Development
Washoe Co. Nevada
Sparks

Village 7
Landscape Tentative Map

No.	Revision Date

LA No: 553-504-04-19
Designed: JPH
Drawn: KMK
Checked: RPH
Date: 2/28/2020

Sheet L5 of 5