Golden Valley Estates Final Design

Created by Placer Ridge Engineering (Team 1)

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For CEE 427
We recommend that the thesis prepared under our supervision by

WILLIAM PATRICK LINCOLN ZIMMERMAN

entitled

A Phase 1 Construction of Golden Valley Estates

be accepted in partial fulfillment of the requirements for the degree of

BACHELOR OF SCIENCE, CIVIL ENGINEERING

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May, 2019
Letter of Transmittal

Placer Ridge Engineering

April 19, 2019

CEE 427 - Capstone Design Project

To Dr. Dennett and Dr. Wieser,

This report has been prepared for CEE 427 as a complete submittal for Placer Ridge Engineerings design project of the Golden Valley Estates subdivision.

Thank you for your time,

______________________________  ________________________________
Thomas Schwartz                 Lincoln Zimmerman

______________________________  ________________________________
Ashton Hunter                   Austen Plank
# Table of Contents

**Letter of Transmittal**  
1

**Introduction**  
4

**Site Location and Layout**  
4  
1.1) Site Sizing  
5  
1.2) Site Location  
5  
1.3) Topography  
9  
1.4) Access  
11  
1.5) Utilities Access  
11  
1.6) Site Layout  
12

**Permitting**  
18  
2.1) Environmental  
18  
2.2) County  
18  
2.3) Stormwater  
19  
2.4) Roadway Right of Way  
19  
2.5) Utility Easements  
19

**Traffic**  
20  
3.1) Traffic Volumes  
20  
3.2) Sight Distance and Turn Lanes  
24  
3.3) Signal Warrant Analysis  
24

**Utilities**  
25  
4.1) Water Demands  
25  
4.2) Water Rights  
27  
4.3) Wastewater Collection  
27  
4.4) Power/Gas and other utilities  
28  
4.5) Reclaimed Water  
28  
4.6) Pumping Systems  
28

**Hydrology**  
29  
5.1) Watershed Analysis  
29  
5.2) Stormwater Sewer  
31  
5.3) Stormwater Design  
31

**Roadway Design**  
33

Placer Ridge Engineering - 2
Introduction

This document serves as a complete submittal for Placer Ridge Engineering’s design of the Golden Valley Estates residential subdivision to be located in the Northern section of Reno known as Golden Valley. The subdivision consists of about 200 medium density housing units with roadways and respective utilities to service them. This new subdivision is being built in an expanding area of Reno, a city which also has a booming economy. Due to the prospering economy these affordable yet spacious lots will be in high demand.

This report contains an updated site layout which includes locations of existing roadways that will be impacted by the development, proposed new roadways, individual lots for the construction of medium density residential housing, locations of potable water and sewer lines, as well as a detention basin to serve the communities stormwater needs. The permits and processes in order to continue with the design and construction of this subdivision are also outlined in the section following the layout. Following these sections are the preliminary designs for the hydrology study, traffic study, water demands, and roadway designs.

Site Location and Layout

This section contains the location of the site in the Golden Valley area that is a combination of three separate properties that total to 153.24 acres. The subdivision layout contains 200 medium density lots which have a minimum area of 12,000 square feet or about 0.275 acres each as well as the roadways that will serve these news houses that have a width of
42 ft which includes portland cement concrete (PCC) sidewalk on both sides of the road as well as an additional 7.5 ft of right of way on each side in the form of an easement on each lot. A detention basin has also been designed and placed to deal with stormwater runoff that is produced by the subdivision as well as the runoff coming from nearby areas such as the North Valleys High School. As a site has already been selected and a site layout has been created Task 1 is fully complete. The site layout has also been included into Task 1 as Task 1.6 due to its relevance and importance to understanding the rest of the document sections. The site layout is a combination of components from several sections but will primarily be explained in Task 1.6.

1.1) Site Sizing

The scope of work called for a site large enough to accommodate 200 medium density lots. A total site size of at least 100 acres was deemed necessary to achieve this. The selected three combined sites in Golden Valley are 150 acres, giving ample room for the required units along with open space. These sites, as will be shown in Task 1.3, have unusable land in the form of hills in the northern site making the total usable area closer to the original desired size.

1.2) Site Location

The Golden Valley Estates subdivision will be located in the Northern area of Reno known as Golden Valley off of US 395 or Martin Luther King Jr Memorial Highway which can be seen in Fig. 1. The Golden Valley and nearby Lemmon Valley areas have several elementary schools that residents can choose from as well as North Valleys High School, which is located directly across Golden Valley Rd from the new subdivision site.
Fig. 1: The Northern Reno and Sparks area with the location of the Golden Valley Estates subdivision.

This region of Reno has been expanding in recent years with the addition of several larger industrial buildings being built and currently being constructed along Military Road. The commercial and shopping areas have also been expanding within the region to provide residential areas with nearby shopping options. In response to both of these expansions, more houses are being built in the area with several other subdivisions being built or finished in the
last year. This shows that the area is in need of housing for residents that find work in the nearby area as well as other expanding areas in Reno. Medium density housing was chosen to allow for higher density than the surrounding areas without creating a clear separation between the community. This will allow the subdivision to better blend in with the preexisting housing and follows the direction of several other subdivisions in the area. In Fig. 2 the specific sites that will be developed for the Golden Valley Estates can be seen.
Fig. 2: The properties lines and surrounding area for the Golden Valley Estates.

This development site is a combination of three separate pieces of property which are all owned by Moonlight Hills Estates, two of these properties make up site A and site B is the third.
1.3) Topography

The topography of the site has a large impact on the constructability, pipe systems, and runoff water considerations. The topography for site B can be found in Fig. 3 and the topography for site A in Fig. 4.

Fig. 3: The topography for site B of the subdivision site, the picture is configured so that north is pointing to the top of the figure.

For the northern portion of the site or site B, the topography shows that the elevation decreases from north to south or top to bottom in the figure. Specifically, the site slopes to the bottom west corner of the site to a runoff water trench located between Estates Rd and the houses
facing Estates Rd. The existing slopes will be satisfactory for gravity conveyance of both the sewer and storm waters which will need to flow to the southern portions of site A. Also, the site contains a large rocky hill in the top portion of the site that will be left in place with some slight earthwork to allow for a road next to it. Removing this hill would be costly and therefore it is desirable to leave it in place.

Fig. 4: Topographic map of site A or the southern portion of the subdivision.
The southern portion of the subdivision or site A is a little bit less complicated than site B, it is mostly flat but does have some portions that will require some cut and fill. Elevation change over this site is less than 4 feet from south to north. The current elevations show that the east side of site A is higher than the west side which is desired for the gravity flow of both the storm and sewer systems.

1.4) Access

Site A and site B had many options for possible access with site A having possible access points located on all sides of the site and site B having possible access points on the south, east, and west sides of the site. The possible access points on the southern and western side of site A are favorable as main access points for site A and up into site B even. These access points will have the highest traffic levels. The chosen site can easily be connected to the surrounding area. The specific access points selected are shown in Task 1.6 and commented on in Task 3 along with needed signalling and design.

1.5) Utilities Access

The selected sites are within the Truckee Meadows Water Authority (TMWA) area of service and will be connected to their existing system. They also have access to existing wastewater facilities. These are discussed further in Task 4.
1.6) Site Layout

The site layout has been designed in AutoCad that contains 200 medium density lots and has room for more expansion in the future. Figure 5 is a drawing of site A or the portion of the subdivision that is south of Indian Lane and Fig. 6, a drawing of site B, the section that is north of Indian Lane. A majority of the 200 medium density lots are located in the southern portion of the subdivision although it is the smaller of the two parcels. The northern portion has been left mostly as open space and for future expansion, this free space can hold an additional 100 plus homes if the population and economy of Reno continue to expand.
Fig. 5: The southern portion of the subdivision showing the property lines of the individual lots, proposed new roads, and a detention basin.
In Fig. 5 the red lines represent the already existing roads with Estates Rd being road to the west, Indian Ln being the road to the north, Rain Dance Wy on the east, and Golden Valley Rd being to the south. In this portion of the subdivision, the new road will connect to the existing roads in four different places. One will be on Rain Dance Wy expanding the road south by 800 feet, another will be at the corner of Rain Dance Wy and Deer Foot Ln, another will be to Indian Ln, and the most important will be the connection to Golden Valley Rd which will be a right-in and right-out intersection. Another important part of this site is the detention basin located in light blue that is designed to hold the stormwater from the new houses, the existing houses near the subdivision, and the overflow from the detention basin for the North Valleys High School. The specifics of the detention basin will be discussed in the hydrology section later in the report.
Fig. 6: The northern portion of Golden Valley Estates which includes large amounts of open space and room for expansion if needed.
The area north of Indian Ln contains fewer houses than site A but still contains 80 plus lots and plenty of empty space for more lots or a detention basin if the need arises. The new roads will connect to existing roads in 2 places which are Indian Ln at the south of Fig. 6 and to Estates Rd on the west side of the figure. Figure 7 show both sites together.
Fig. 7: Combined drawing of both sites.
Permitting

A top priority in the planning, design, and construction of the Golden Valley Estates subdivision is that all aspects of the project meet the local and federal regulations. All environmental laws and impacts must be taken into consideration during all phases of this project. The permitting jurisdiction of this subdivision will undoubtedly be Washoe County so all permits must be filed in an accurate and timely manner to ensure no delays.

2.1) Environmental

The site location of Golden Valley Estates will be assessed by a third party organization to determine if there is a presence of any species currently on the endangered species list. The endangered species that are present in Washoe County are the Cui-ui, the Carson wandering skipper, and Steamboat buckwheat. If any of the species on the endangered species list appear within the site location of Golden Valley, work will be halted until mitigation measures are in place. As this site is in an already developed area and contains no water features, this should not be an issue.

2.2) County

Since the site for the Golden Valley Estates subdivision is not apart of the city of Reno, the main permitting jurisdiction of this project will be Washoe County. The County sets forth certain permits, standard design and construction details, and submittal instructions that must be followed dutifully. The first set of documents that must be submitted are for the design review
that is conducted by the Washoe County Engineering and Capital Projects Division. After the proposed plans are reviewed and approved by the County the construction process can proceed and the next set of papers that will need to be submitted are the dust and grading permits. The checklist for the design review submittals and both the permits are shown in Appendix A.

2.3) Stormwater

The existing stormwater system has been identified. This section relates to hydrology (Task 5) and the exact details of where water will end up going during storm events and how much is still in development. The existing stormwater system in the area is robust with channels leading to large detention basins that are preexisting and presumed to be sized for future development.

2.4) Roadway Right of Way

Roadway access is needed only from Washoe County. The required paperwork has been identified to be filled out for construction and creation of new road accesses.

2.5) Utility Easements

The appropriate paperwork for NV energy and TMWA have been located. TMWA requires completed designs of new additions to be submitted with construction plans. As these tasks (Task 4.1 and Task 4.3) have not been completed, neither can this paperwork.
Traffic

This section includes details on the current traffic conditions and volumes, the 10 year projected traffic conditions and volumes, and the plan for the addition of a signal at Golden Valley Rd and Estates Rd.

3.1) Traffic Volumes

With the initial traffic volumes collected, the current Level of Service (LoS) of the roadways surrounding Golden Valley Estates would be calculated using Synchro. If the current LoS of the existing roadways falls below the minimum level of D, measures will be taken to increase the LoS. A Level of Service D means that traffic flows are starting to reach an unstable flow and traffic speeds are decreased slightly and traffic volumes start to increase.

The current traffic volumes were recorded at two predetermined intersections that Placer Ridge Engineering felt would adequately represent the area of Golden Valley Estates. Those two intersections are Golden Valley Road with Estates Road and Estates Road with Indian Lane. The current traffic volumes are documented in the following tables.

A 10 year design timeline was used to estimate the future traffic volumes. This 10 years includes the period of time where the project is being developed in phases. If there was no traffic data collected for a certain direction, due to lack of traffic, a value of one was assumed for the calculations of future traffic volumes.
Table 1: Morning peak traffic volumes at Golden Valley and Estates.

<table>
<thead>
<tr>
<th>Golden Valley and Estates</th>
<th>West Bound</th>
<th>East Bound</th>
<th>North Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>E-&gt;W</td>
<td>N-&gt;W</td>
<td>W-&gt;E</td>
</tr>
<tr>
<td>7:00 AM to 7:15 AM</td>
<td>16.0</td>
<td>4.0</td>
<td>0.0</td>
</tr>
<tr>
<td>7:15 AM to 7:30 AM</td>
<td>14.0</td>
<td>1.0</td>
<td>0.0</td>
</tr>
<tr>
<td>7:30 AM to 7:45 AM</td>
<td>28.0</td>
<td>0.0</td>
<td>2.0</td>
</tr>
<tr>
<td>7:45 AM to 8:00 AM</td>
<td>16.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Total</td>
<td>74.0</td>
<td>6.0</td>
<td>3.0</td>
</tr>
</tbody>
</table>

PHF 0.7 0.4 0.4 0.5
DHV 2019 112.0 16.0 8.0 60.0
DHV 2029 136.5 19.5 9.8 73.1
Volume 2029 137 20 10 74

No traffic data was collected for the through traffic traveling on Golden Valley Road during the peak morning hour traffic; however, the data collected on traffic heading in the east and west directions gives the understanding that many people are heading west towards US-395.

Table 2: Evening peak traffic volumes at Golden Valley and Estates.

<table>
<thead>
<tr>
<th>Golden Valley and Estates</th>
<th>West Bound</th>
<th>East Bound</th>
<th>North Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>E-&gt;W</td>
<td>N-&gt;W</td>
<td>W-&gt;E</td>
</tr>
<tr>
<td>4:05 PM to 4:20 PM</td>
<td>83.0</td>
<td>12.0</td>
<td>142.0</td>
</tr>
<tr>
<td>4:20 PM to 4:35 PM</td>
<td>88.0</td>
<td>7.0</td>
<td>129.0</td>
</tr>
<tr>
<td>4:35 PM to 4:50 PM</td>
<td>99.0</td>
<td>9.0</td>
<td>140.0</td>
</tr>
<tr>
<td>4:50 PM to 5:05 PM</td>
<td>110.0</td>
<td>16.0</td>
<td>145.0</td>
</tr>
<tr>
<td>Total</td>
<td>380.0</td>
<td>44.0</td>
<td>556.0</td>
</tr>
</tbody>
</table>

PHF 0.9 0.7 1.0 0.4 0.6 0.8
DHV 2019 440.0 64.0 580.0 12.0 16.0 120.0
DHV 2029 536.4 78.0 707.0 14.6 19.5 146.3
Volume 2029 537.0 79.0 708.0 15.0 20.0 147.0
From the data collected of traffic traveling through, straight on Golden Valley, a fair amount of vehicles traverse through the analyzed intersection. In glancing at the total estimated traffic volumes for 2029, a signalized intersection may need to be implemented at Golden Valley and Estates.

Table 3: Morning peak traffic volumes at Estates and Indian.

<table>
<thead>
<tr>
<th>Estates and Indian</th>
<th>South Bound</th>
<th>East Bound</th>
<th>North Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>E-&gt;S</td>
<td>N-&gt;S</td>
<td>S-&gt;E</td>
</tr>
<tr>
<td>7:00 AM to 7:15 AM</td>
<td>3.0</td>
<td>5.0</td>
<td>0.0</td>
</tr>
<tr>
<td>7:15 AM to 7:30 AM</td>
<td>6.0</td>
<td>5.0</td>
<td>0.0</td>
</tr>
<tr>
<td>7:30 AM to 7:45 AM</td>
<td>8.0</td>
<td>5.0</td>
<td>0.0</td>
</tr>
<tr>
<td>7:45 AM to 8:00 AM</td>
<td>6.0</td>
<td>8.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Total</td>
<td>23.0</td>
<td>23.0</td>
<td>3.0</td>
</tr>
<tr>
<td>PHF</td>
<td>0.7</td>
<td>0.7</td>
<td>0.3</td>
</tr>
<tr>
<td>DHV 2019</td>
<td>32.0</td>
<td>32.0</td>
<td>12.0</td>
</tr>
<tr>
<td>DHV 2029</td>
<td>39.0</td>
<td>39.0</td>
<td>14.6</td>
</tr>
<tr>
<td>Volume 2029</td>
<td>40.0</td>
<td>40.0</td>
<td>15.0</td>
</tr>
</tbody>
</table>

Ideally multiple hours would be recorded for each intersection and with the addition of more hours, there is a better likelihood that volumes would travel the path from north to east. Without having any traffic data in that direction, a value of one was assumed to allow for future projections. From Table 3, the data collected does not support the need for a signalized intersection with the construction of Golden Valley Estates. A four-way stop at the intersection would adequately control the intersection.
Table 4: Evening peak traffic volumes at Estates and Indian.

<table>
<thead>
<tr>
<th></th>
<th>South Bound</th>
<th></th>
<th>East Bound</th>
<th></th>
<th>North Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>E-&gt;S</td>
<td>N-&gt;S</td>
<td>S-&gt;E</td>
<td>N-&gt;E</td>
<td>E-&gt;N</td>
</tr>
<tr>
<td>4:05 PM to 4:20 PM</td>
<td>4.0</td>
<td>2.0</td>
<td>9.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>4:20 PM to 4:35 PM</td>
<td>4.0</td>
<td>3.0</td>
<td>8.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>4:35 PM to 4:50 PM</td>
<td>4.0</td>
<td>3.0</td>
<td>8.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>4:50 PM to 5:05 PM</td>
<td>4.0</td>
<td>4.0</td>
<td>8.0</td>
<td>1.0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16.0</strong></td>
<td><strong>12.0</strong></td>
<td><strong>33.0</strong></td>
<td><strong>1.0</strong></td>
<td><strong>0.0</strong></td>
</tr>
<tr>
<td><strong>PHF</strong></td>
<td><strong>1.0</strong></td>
<td><strong>0.8</strong></td>
<td><strong>0.9</strong></td>
<td><strong>0.3</strong></td>
<td><strong>0.0</strong></td>
</tr>
<tr>
<td><strong>DHV 2019</strong></td>
<td><strong>16.0</strong></td>
<td><strong>16.0</strong></td>
<td><strong>36.0</strong></td>
<td><strong>4.0</strong></td>
<td><strong>0.0</strong></td>
</tr>
<tr>
<td><strong>DHV 2029</strong></td>
<td><strong>19.5</strong></td>
<td><strong>19.5</strong></td>
<td><strong>43.9</strong></td>
<td><strong>4.9</strong></td>
<td><strong>4.9</strong></td>
</tr>
<tr>
<td><strong>Volume 2029</strong></td>
<td><strong>20.0</strong></td>
<td><strong>20.0</strong></td>
<td><strong>44.0</strong></td>
<td><strong>5.0</strong></td>
<td><strong>5.0</strong></td>
</tr>
</tbody>
</table>

In comparing the AM and PM peak hour traffic volumes traveling through Estates and Indian, the main differences are that the flows of traffic switched directions. The collected data for the PM peak hour further supports the recommendation to control the intersection with a four-way stop.

With the present traffic volumes calculated for the surrounding area, Synchro will be used to estimate the traffic volumes created by Golden Valley Estates. This volume estimation will be combine with the forecasted traffic volumes of the current infrastructure to assess the future LoS for the surrounding roads. The forecasted traffic volumes will be used to determine what roadway designs will be implemented to increase the LoS to a accepted level.
3.2) Sight Distance and Turn Lanes

An initial inspection of the sight distance for turning from Estates onto Golden Valley presents no obstacles obstructing the minimum distance requirement for vehicles with a speed of 45 miles per hour turning onto Estates road. With the addition of a signal, to control the intersection, a minimum sight distance would only be required for those turning right on a red light.

Upon inspection, there is enough space for the required stopping distance for the right-in, right-out entrance/exit located at the south end of the site A.

3.3) Signal Warrant Analysis

With calculated current and estimated future traffic volumes obtained, a recommendation of a signal warrant at Golden Valley and Estates is encouraged. The signal warrant for Golden Valley and Estates will be outsourced to be conducted in Synchro. The estimated traffic volumes of Estates Rd and Indian Ln do not support the recommendation of a signal, and therefore Place Ridge Engineering recommends that Estates and Indian be controlled by a four-way stop.
Utilities

This section includes details on the water, wastewater, and other utility requirements for the site.

4.1) Water Demands

Both TMWA and Washoe County provide methods for determining water demands for new developments. The formula from TMWA for each unit, \[ \text{Demand} = 0.009 \times \text{sqrt}(\text{lot size}) \], was initially looked at and provided a peak demand of 0.3 mgd and an average demand of 0.2 mgd for all 200 units. The County’s guidelines for water demand were also used to find needed water demand and peak water demand. While the TMWA method was higher for average demand, the County’s method was higher for peak demand at 0.4 mgd. These calculations can be found in Appendix B. These values were then used in creating a pipe network for the site as demands spread across multiple nodes in EPANET. All pipes have been designed as the minimum allowable size of 8 inches in diameter and out of PVC material.

TMWA states that their system will have pressures between 45 and 100 psi and all new development must be within this range. The existing water system below site was assumed to have a pressure in the middle of this range. The designed pipe network will maintain enough pressure during peak demands as long as pressure coming into the system stays above 57 psi. The system with this pressure and the peak demands is shown in Fig. 8. The system has not been tested if it can handle the required fire flows but, the required pressure in the system with that demand is only 20 psi. Drawings showing the pipe network on site can be found in Appendix C.
Fig. 8: System with incoming pressure of 57 psi.
4.2) Water Rights

TMWA requires the allocation of 100 acre-feet of water in water rights for a development of this size. Water rights will need to be purchased for future stages of this project.

4.3) Wastewater Collection

Wastewater requirements per lot were found to 270 gallons per day for Washoe County which adds up to 54,000 gallons per day for the whole site. The County uses a peak factor of 1.5 making the maximum flow 81,000 gallons per day. With such a low flow, the minimum allowable pipe diameter for collection pipes, 8 inches, will be used for the entire network with 4 inch pipes for laterals. Washoe County standard plans for sewers were followed for this project, they can be found on the County's website. Drawings with the locations of sewer lines and manholes can be found in Appendix C. Along with this, Washoe County standard plans for sewers are presented in Appendix E. The sewer system maintains a 10 foot horizontal distance from the potable water system as this is the required distance by Washoe County. A minimum vertical separation of 18 inches will be allowed for at each crossing between potable water and the sewer system.

This sewer system can be installed at the same time as the potable water system with relative ease as their will be only two existing roads that will be need to excavated. These two roads are where the system crosses Indian Ln which is a very minor road with little traffic and where the system crosses Golden Valley Rd to connect with the existing sewer system leaving North Valleys High School. The excavation of Golden Valley Rd poses the largest construction
issue of this sewer system as it is a high traffic area, especially during drop off and pick up times for the high school. It is the recommendation of Placer Ridge Engineering that this portion of the sewer system be constructed during the summertime to minimize the traffic that will be impacted by the excavation.

4.4) Power/Gas and other utilities

NV Energy normally does their own utilities design. These utilities were not included in the scope of work completed by Placer Ridge Engineering.

4.5) Reclaimed Water

It has been determined that using reclaimed water is not practical for this project due to its size and the amount of open space that could use it along with the large costs associated with the needed pipelines and storage.

4.6) Pumping Systems

As the potable water system has enough pressure without the addition of a storage tank, pumping for the system will not be needed. The site is above the wastewater treatment plant elevation wise and should not need a lift station for wastewater either.
5.1) Watershed Analysis

The site’s watershed analysis will mainly focus on the site property based on the intensity of a 100 year 24 hour storm event. The surrounding areas have been sufficiently designed to handle the stormwater for the area. The watershed of the site is around 1,000 acres with an intensity of 3.94 inches per 24 hours (reference), and for the most part all water gets diverted around the property, and the surrounding areas have been sufficiently designed to handle the stormwater for the area.

In the southern site there are three stormdrain channels that cross the property. The North Valley High School’s detention basin drains into the southwestern corner of this property, which will be improved and lined with crushed aggregate. This channel’s dimensions will be based off of the maximum flow the colvert entering the Southern site. The other two drainage channels enter the property on the Eastern side of the Southern site and cross to the Western exit channel. These two channels have been given a specific watershed for each and will tie into each other before exiting the property. The Northern channel has a watershed area of 131 acres (Fig. 9) and the Southern channel’s area is 80 acres (Fig. 10). In result, the calculated flows for the Northern and Southern channels are 22 cubic feet per second (cfs) and 13.5 (cfs).
Fig. 9: Watershed area of the Northern drainage channel

Fig. 10: Watershed area of the Southern drainage channel
5.2) Stormwater Sewer

The Stormwater Sewer system will have a collection points as specified in the site layout drawings. Each roadway will have one or more collection type three drop inlets. Which allows the stormwater to enter a series of pipelines that direct all the water to the detention basin. The slope of these pipes will be a minimum slope of 0.5% and flowing septic lines with a minimum distance of four feet of clearance of septic pipes. The pipe that will drain into the detention basin is an 36 inch, which will be able to handle the flow of all the sites 100 year 24 hour storm event. The property was divided into 12 different watershed areas that will drain into the inlets. For each watershed the pipe will be a minimum of 12 inches. For pipes that hold 2 to 3 watershed’s runoff will require an 18 inch pipe. A 24 inch pipe will be used for pipes that are affected by 4 or more watersheds. At the top of the property there will be a 24 inch pipe capped off placed to tie into for future expansion.

5.3) Stormwater Design

Dimensions for the detention basin have been based off of a 100 year 24 hour storm. The detention basin can hold all water from one of theses storm events. The detention basin will be rectangular in shape with the maximum width being 200 feet and the length running north to south 350 feet. The side walls shall be sloped 3 feet horizontal for every 1 foot vertical and the depth of the basin should be no less than 7 feet. There will also be room for expansion of detention basin incase need of more water collection.
The two drainage channels entering from the East side of the Southern Site has been designed with the same storm event as the detention basin. The depth of each of the two channels will be no less than 3 foot 5 inches, and the base width of the channel will be no less than 1 foot 9 inches as well. The wall slope of these two drainage ditches shall be 2.5 feet horizontal for every 1 foot vertical. These dimensions will also be used to improve the channel from the High School’s detention basin. Where the channels combine, the width of the base shall be no less than 2 foot 6 inches. The lining of the channels shall be crushed aggregate no less than 50 mm in diameter (1.97 inches). These dimensions and aggregate size were all based off Tractive Force Method. Culverts will placed where these channels cross roadways. These culverts will be corrugated metal pipe and will be sized using HY-8. For the Northern channel will be a 30 inch and the southern channel will be a 24 inch. Rip Rap at the minimum size of 6 inches will be placed 10 feet before and after the culverts.
6.1) Asphalt Pavement Design

Washoe County Standard require that the roadways for a suburban area such as this subdivision be at least 3” of asphalt pavement over 6” of Type II Class A base for local streets and 4” of asphalt pavement over 6” of Type II Class A base for collector streets. Since all of the streets in this subdivision will be local streets all of the roadways will be 3” of asphalt pavement and 8” of Type II Class A base. In order to analyze the stresses that this pavement will be under this pavement was analyzed under a dual tire axle load of 18 kips, this analysis was performed using 3D Move software and the outcomes of this analysis are attached in Appendix D.

The pavement was analyzed at four different points, the first point was at the surface of the pavement in the middle of the tire, the second point is the center of the tire at the bottom of the asphalt, the third point was in the middle of the tire load but at the top of the subgrade, and the fourth point is between the two dual tires at the top of the subgrade. The results of this analysis showed very normal results, the stresses, strains, and displacements are all within reasonable limits even when being subjected to a large dual tire axle load of 18 kips which is a standard axle for 18 wheel trucks which will most likely never or very seldom use these roadways.
6.2) Curb and Gutter

The design of the curb and gutters for all roadways that will convey runoff to the storm sewer system is controlled by Washoe Counties standard plans which can be found in Appendix E. These details require Type I P.C.C curb and gutter which consists of 6” inch tall curb and also includes polypropylene fibers for reinforcing within the concrete.

6.3) Utility Access

Prior to the construction of the roadway pavement, utility trenches will be dug traversing the proposed road layout. These trenches will house the public utilities running to each lot. Multiple trenches will be required due to the requirement of minimum space distance between certain utilities, e.g. water line and wastewater line.

6.4) ADA Compliance

In an effort to comply with Americans with Disabilities Act (ADA) requirements, accessible routes connecting to building entrances will be provided for pedestrians. The accessible routes that are planned to be implemented within Golden Valley Estates will be concrete sidewalks that travel along the roadway. ADA requires the slope of the sidewalk to follow the profile grade of the roadway for any sidewalk along a roadway. Adequate signage will also be implemented to allow drivers to be aware of areas where pedestrians frequently cross the road. Signalized crosswalks will be implemented in places where high pedestrian traffic is predicted to be crossing the roadway in the mid-stretch of a roadway.
Timeline

The timeline for tasks to be completed is in the Gantt chart shown in Fig. 11. Tasks that have been completed are shown in green (if in black and white it’s the darker gray) and tasks that are being worked on or will be worked on are shown in orange (lighter gray).
Fig. 12: Chart showing timelines of tasks to be completed (Green), tasks in process (Yellow), and sub-tasks being worked on (Blue).
Appendix A

Title: Washoe County Submittal

Instructions and Permits
WASHOE COUNTY
ENGINEERING AND CAPITAL PROJECTS DIVISION
FINAL SUBDIVISION MAP SUBMITTAL

Subdivision Name: ____________________________  # of Residential Parcels ________
APN: ____________________________  # of Common Area Parcels ________
Total # of Parcels: ________
Application Date: ________

- Initial Submittal items are due to Washoe County Community Services Department by 5:00 p.m. of the desired Initial Submittal Date. Incomplete submittals may delay the Construction Plan Review Meeting.
- Submittal items delivered to the Engineering and Capital Projects Division are for use by the Engineering, Planning, Parks, and Utility Services.
- This form applies to subdivisions located in the unincorporated areas of Washoe County.
- Stamped & signed boundary and lot closure calculations may be required after the Initial Submittal date.
- Contact other County and State agencies for their submittal deadlines and requirements.

INITIAL SUBMITTAL REQUIREMENTS
Submit to Washoe County Engineering and Capital Projects Division:
- 2 Sets Final Subdivision Map & Jurat, Stamped & Signed
- Digital Submittal of Final Map (Disk or E-mail to mgump@washoecounty.us)
- Community Services Department - Development Services Application
  - Fee (separate check): ☐ Technical Map Check Fee ($378 + $26/parcel) x 1.045 = $ ________
  - Fee (separate check): ☐ Utility Fee Inspection Deposit = $1,500.00
  - Fee (separate check): ☐ Final Subdivision Map & Construction Plan Review Fees (per latest Development Code Master Fee Schedule published by Planning and Development) = $ ________
- 2 Preliminary Copies of Easement Documents* (as required)
- 4 Sets Construction Plans, Including Final Subdivision Map & Jurat, Stamped & Signed
- 1 Engineer’s Cost Estimate, Stamped & Signed
- 1 Geotechnical Report w/Fault Study, Stamped & Signed
- 1 Master/Phase Hydrology/Hydraulic Report(s), Stamped & Signed
- 1 Traffic Report, Stamped & Signed (as required)
- Proposed Haul Route (w/offsite geotechnical evaluation, as required)
- 1 Draft Copy CC&Rs (including supplemental CC&Rs) with conditioned items marked
- Other Items as Required by Tentative Map Conditions

Submit to Washoe County department indicated under separate cover (see agency for submittal requirements):
- Washoe County District Health and Vector Control Submittals
- Truckee Meadows Fire Protection District Submittal

CONSTRUCTION PLAN REVIEW MEETING
Engineering Division will schedule the meeting after the Initial Submittal.

FINAL SUBMITTAL REQUIREMENTS
Submit to Washoe County Engineering and Capital Projects Division:
- Signed Original of Final Subdivision Map & Jurat4
- Financial Guarantee* (Bond, Letter of Credit, CD, Savings or Money Market Account)
  - Fee (separate check): ☐ Engineering Inspection Fee = $ ________
  - Fee (separate check): ☐ Engineering Storm Water Inspection Fee = $ ________
  - Fee (separate check): ☐ Utility Services Fees = Reference Utility Fee Sheet
- 1 Set Final Construction Plans, Stamped & Signed
- Washoe County Parks Construction Plan Approval (as required)
- Signed Original Subdivision Improvement Agreement* 4
- Truckee Meadows Regional Stormwater Quality Management Program Construction Permit Submittal
- Postal Approval
- Signed Original Easements/Agreements (as required) 2,4
- Signed Original CC&R’s* 4
- Return All Redlined Plans & Reports

Upon acceptable completion of final submittal items, the final map will be forwarded to the Planning and Development Director for review and approval.

PRIOR TO PRECONSTRUCTION MEETING AND CONSTRUCTION
Submit to Washoe County Engineering and Capital Projects Division:
- 3 Sets of Final Construction Plans, Stamped & Signed.
- 1 Digital Set of Final Construction Plans, Stamped and Signed (Compressed CCITT Group 4 TIFF Format)
- 1 Digital Set of All Final Reports, Stamped and Signed in PDF A Format
- 1 AutoCAD Design File (Base Map only) in AutoCAD 12 format

Submitted By: ____________________________  Date: ________  Company Name: ____________________________
e-mail address: ____________________________  Phone: ________

* Use Washoe County approved forms available online at https://www.washoecounty.us/csd/engineering_capitalprojects/development_review.php
# New Initial Submittal and Construction Plan Review Fee are required if revised construction plans are not submitted to Engineering and Capital Projects Division within 90 days of the Construction Plan Review Meeting.
4 A Regional Technology Fee (RTF) of 4% applies to Technical Map Check Fees rec’d on or after October 31, 2016.

October 31, 2016
**Washoe County**
**Department of Building & Safety**
1001 E. Ninth Street
P.O. Box 11130
Reno, NV 89520-0027
Phone (775) 328-2020
FAX (775) 328-6132 or FAX (775) 325-8016
www.washoeCounty.us/bldgsafety

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**GRADING**

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**COMPLETE BOTH SIDES**
Revised01/29/2010
Design Professional Information:

Architect’s Name: ___________________________ Phone No.: ___________________________
E-Mail Address ___________________________ Fax No.: ___________________________

Engineer’s Name: ___________________________ Phone No.: ___________________________
E-Mail Address ___________________________ Fax No.: ___________________________

Person To Contact Regarding This Permit

Name and Company ___________________________ Phone No.: ___________________________
E-Mail Address ___________________________ Fax No.: ___________________________

Description of Work:

Applicant (print) ___________________________ Date: ___________________________
Signature ___________________________
DUST CONTROL PERMIT APPLICATION

**FEE as of July 1, 2018:** $229.00 per acre – a one-time $85.00 admin fee per permit

(Less than .5 acres round down; .5 and greater round up)

THE “APPLICANT” IS RESPONSIBLE FOR ALL DUST CONTROL 24 HOURS A DAY, SEVEN DAYS A WEEK, including weekends and holidays, from commencement of project to completion.

The Applicant must be the Property Owner, and signed by the Applicant or his Attorney in Fact. Fill in the application completely or it will be returned for completion.

1. Name of Development: ____________________________________________________________

2. Development Address: ____________________________________________________________

   Please Provide the Parcel #(s): ___________________________ (Required)

3. Size of Project (disturbed acres): _____________

4. Type of Project (choose one):

   - □ Commercial
   - □ Municipal Projects
   - □ Utilities
   - □ New Road/Street/Highway
   - □ Road Rehab/Maintenance
   - □ Residential Sub/Multi-Family
   - □ Single Family Residence

5. If there is an existing Dust Control Permit, list permit number: ________________

   NOTE - - The Dust Control Permit is valid for eighteen (18) months from the date of approval. If the project is not complete or has not commenced by the expiration date, the Applicant must submit a renewal application to the Air Quality Management Division. Failure to do so will result in the Permit expiring and may result in enforcement action.

6. **APPLICANT -- Name and current Address of Property Owner:**

   Owner: ______________________________________ Contact: _____________________________

   Address: _____________________________________________________________

   City: __________________________ State: __________________ Zip: ____________

   Phone Number: __________________________ Email: ____________________________

7. **Name and Address of General Contractor:**

   Contractor: __________________________ Contact: _____________________________

   Address: _____________________________________________________________

   City: __________________________ State: __________________ Zip: ____________

   Phone Number: __________________________ Email: ____________________________

8. **Proposed Construction Dates – Per Phase:** *** provide grading and phasing maps ***

   On-Site Grading/Excavation: Start: _______________ Complete: _______________

   Building Construction: Start: _______________ Complete: _______________
9. Will fill material be required?  Yes □ yd³ □ No □

10. Will there be an excess of native material as a result of excavation?  Yes □ yd³ □ No □

11. Will there be any crushing/screening equipment used during construction?  Yes □ No □
   If yes, Stationary Source Permit #: _______________________

12. Amount of Material to be excavated (yd³): _______________________

13. Is there a soil analysis report available?  Yes □ No □

14. On-Site soil type: _______________________

15. Method of dust control to be utilized (per phase):
   - Water Truck(s) ___________________________ (number of trucks)
   - Chemical Sealant ___________________________ (type – attach MSDS Sheets)
   - Sprinklers/Water Cannons ___________________________ (locations)
   - Compaction ___________________________ (percent)
   - Enclosure ___________________________ (fences, windbreaks)
   - Revegetation ___________________________ (type – attach seeding schedule)
   - Will temporary irrigation be supplied?  Yes □ No □
   - Water Source: ___________________________
   - Speed Limits ___________________________ Other ___________________________

   NOTE - Permanent stabilization methods such as construction/landscaping, revegetation, chemical sealant/palliative, or other approved method(s) of dust suppression must occur “within 30 days of grading completion”. Dust suppression must continue regardless of construction status.

16. Method to control mud and soil being tracked onto adjacent paved roadways: ___________________________

17. Frequency of daily street cleaning: ___________________________

18. Describe the methods (fences, barriers, etc.) to prevent unauthorized traffic on the construction site(s): ___________________________

19. Persons to be contacted, by cell phone, during non-working hours in case of dust problems:
   - Name & Phone no: ___________________________ Email: ___________________________
   - Name & Phone no: ___________________________ Email: ___________________________

20. The Applicant’s (Owner’s) signature or that of his/her Attorney in fact on this application shall constitute agreement by the Applicant to accept responsibility for meeting the “Conditions of Plan” (attached):

   ___________________________ Date ___________________________
   ___________________________ Owner Signature
   ___________________________ ___________________________
   ___________________________ Company Name
   ___________________________ ___________________________
   ___________________________ Print or type name
   ___________________________ ___________________________
   ___________________________ Phone Number
   ___________________________ Title

   ___________________________ ___________________________
   ___________________________ Print or type name
   ___________________________ ___________________________
   ___________________________ Company Name
   ___________________________ ___________________________
   ___________________________ Print or type name
   ___________________________ ___________________________
   ___________________________ Phone Number
   ___________________________ Title
Appendix B

Title: Water Demand Calculations
Number of Lots: 200

Lot sizes: 0.3 acres

Total max day water Demand (TMWA): 206.6821588 gpm
Total area: 60 acres
Total average water Demand (TMWA): 173036.2259 gpd (peaking factor of 1.72)

Total average water Demand (County): 140000 gpd
Total max day water Demand (County): 420000 gpd

Minimum pressure on max day: 45 psi
Max pressure: 100 psi

Required Water Rights: 333.3798044 Acre-feet per year

Pipe size (in): 6 8 10 12
max velocity (fps): 3.309817593 1.861772396 1.191534333 0.8274543981
min velocity (fps): 1.363615107 0.7670334975 0.4909014384 0.3409037766

Wastewater

Water use per lot: 270 gallons/day PF = 3
Total demand: 84000 gallons/day
Peak Demand: 162000 gallons/day
average demand: 37.5 gpm

Pipe size (in): 6 8 10 12
velocity (fps): 1.276643929 0.7181122098 0.4595918143 0.3191609821
Using Mannings
needed area: 0.02785204991 ft^2
wet perimeter: 0.00230220019 0.000496367293 0.0001509905455 0.000057101796
Desired velocity: 2.5 ft/s
n = 0.14
A = 0.1963495408 0.3490658504 0.5454153912 0.7853981634
R = 0.125 0.1666666667 0.2083333333 0.25
Flow (ft/ft) = 0.2289938161 0.04937235305 0.01501863363 0.0080567976608
slope (ft/ft) = 0.00230220019 0.000496367293 0.0001509905455 0.000057101796

Tank size: 1 mgal
pump time: 24 hours
required flow: 814.6444444 gpm

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Appendix C

Title: Water and Sewer System

Drawings
Notes:
1) Manholes are not to scale, all MH are Type III-A
2) Sewer laterals not shown

Legend
- Water System
- Manhole
- Open Space
- Drainage Basin
- Proposed Lots
- Existing Roadways
- New Roadways

Title: Site B Sewer and Water

Placer Ridge Engineering
Page: 1 of 4
Notes:
1) Manholes are not to scale, all MH are Type III-A
2) Sewer laterals not shown

Legend:
- New Roadways
- Existing Roadways
- Proposed Lots
- Open Space
- Drainage Basin
- Manhole
- Water System
Notes:
1) Manholes are not to scale, all MH are Type III-A
2) Sewer laterals not shown

Legend
- Water System
- Manhole
- Open Space
- Drainage Basin
- Proposed Lots
- Existing Roadways
- New Roadways
1) Manholes are not to scale, all MH are Type III-A
2) Sewer laterals not shown

Notes:

Legend:
- Water System
- Manhole
- Open Space
- Drainage Basin
- Proposed Lots
- Existing Roadways
- New Roadways

Golden Valley Rd
Estates Rd
Appendix D

Title: 3D Move Analysis Results
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Appendix E

Title: Washoe County Standard Plans
NOTES:

2. All trenching activities shall conform to O.S.H.A. Regulations. (SSPWC 305.06)
3. Compaction shall be percent relative compaction based on the maximum dry density as determined by ASTM D1557 and within ±2% of optimum moisture content. (SSPWC 305.14)
4. In high groundwater, Class "C" bedding to high groundwater mark topped with Mirafi 140N Filter Fabric (or approved equal) may be used in lieu of Class "A", with the approval of the engineer.
NOTES:
1. TYPE III-A MANHOLE TO BE UTILIZED AS FOLLOWS:
   - FOR DROPS GREATER THAN 2 FEET BUT NOT TO EXCEED 8 FEET.
2. MANHOLE MATERIALS AND CONSTRUCTION SHALL CONFORM TO THE REQUIREMENTS OF
   SECTION 204 "MANHOLES AND CATCH BASINS" OF THE STANDARD SPECIFICATIONS.
3. PORTLAND CEMENT CONCRETE TYPE II (PCC) SHALL HAVE THE FOLLOWING
   CHARACTERISTICS: 3000 PSI MIN.
   - COMPRESSIVE STRENGTH @ 28 DAYS, MIN. 6 SACKS OF CEMENT PER CU.YD. SLUMP @
   - 1-4 INCHES. ALL MATERIALS SHALL CONFORM TO SSPWC SECTION 202.
4. ALL MANHOLES SHALL INCLUDE PINKERTON A--107 FRAMES & COVER ASSEMBLIES, OR EQUAL,
   WITH "WASHOE COUNTY SEWER" CLEARLY STAMPED ON THE COVER.
5. EXCAVATION & BACKFILL SHALL BE AS SPECIFIED FOR "TRENCH EXCAVATION &
   BACKFILL" IN SECTION 305.00 OF THE SSPWC.
6. STEPS WILL BE REQUIRED ON ALL MANHOLES 5 FEET OR MORE IN DEPTH FROM FINISHED
   GRADE TO FLOW LINE.
7. PRECAST MANHOLE SECTIONS, OTHER THAN
   GRADE RINGS, SHALL BE JOINED WITH FLEXIBLE PLASTIC GASKET MATERIAL SUCH
   AS "RAM--NEK" OR EQUAL AS PER MANUFACTURER'S RECOMMENDATIONS.
8. PIPES SHALL NOT PROTRUDE MORE THAN 3" INSIDE OF PRECAST MANHOLE BASES.
9. PIPE PENETRATIONS INTO MANHOLES SHALL BE WATER TIGHT.
10. PRIOR TO BACKFILLING, ALL MANHOLES SHALL BE VACUUM TESTED PER THE
    REQUIREMENTS OF ASTM C--1244.
11. REINFORCING STEEL SHALL BE AS SHOWN, UNLESS OTHERWISE NOTED
12. USE 1"x3/8" STAINLESS STEEL STRAP (TYPICAL)
    TOP, BOTTOM AND EVERY 3 FEET. USE 1/2" SELF TAPPING CONCRETE ANCHORS W/
    3/8"X1 1/4" STAINLESS STEEL BOLT AND STAINLESS STEEL LOCK WASHER.
13. WHEN POSSIBLE, CONSTRUCT MANHOLE SECTIONS SO THAT STEPS ARE OPPOSITE
    OUTLET.
NOTES:
1. SEWER LATERAL MATERIALS AND CONSTRUCTION SHALL CONFORM TO THE REQUIREMENTS OF SECTION 306 "STORM DRAIN, CULVERTS, AND SANITARY SEWER CONSTRUCTION" OF THE STANDARD SPECIFICATIONS.
2. IN NO CASE SHALL A LATERAL CONNECT TO THE SEWER MAIN DIRECTLY ON TOP OF THE PIPE.
3. SEWER LATERALS SHALL HAVE A MINIMUM SLOPE OF 0.02 FT/FT.
4. ALL JOINTS ON SEWER LATERALS SHALL BE COMPRESSION TYPE OR APPROVED SOLVENT WELD.
5. EXCAVATION & BACKFILL SHALL BE AS SPECIFIED FOR "TRENCH EXCAVATION & BACKFILL" IN SECTION 305.00 OF THE SSPWC.
6. THE LETTER ‘S’ SHALL BE STAMPED OR CHISELED IN THE TOP OF THE CURB, NOT LESS THAN 1–1/2" HIGH AND 3/16" DEEP, WHERE THE LATERAL CROSSES THE CURB.
7. ENCASE LATERAL CONNECTION IN CEMENT, STABILIZED SAND OR 2000 PSI CONCRETE FOLLOWING INSTALLATION. CONNECTION MUST BE INSPECTED BY THE COUNTY PRIOR TO BACKFILL.
8. LATERAL SHALL BE CUT BACK TO SOUND MATERIAL FOR COUPLING.
9. NO LATERAL CONNECTIONS SHALL BE MADE TO SANITARY SEWER 'INTERCEPTOR' LINES WITHOUT THE APPROVAL OF THE COUNTY.
DOMESTIC WATER MAIN OR SERVICE

6" MIN
SEWER SDR 35
ASTM D3212

DOMESTIC WATER MAIN OR SERVICE

MECHANICALLY RESTRAINED ALL JOINTS (TYP) 10' BOTH SIDES FROM OUTSIDE DIAMETER

PREFERRED

18" MIN. FOR SEWER MAIN
12" MIN FOR SEWER LATERAL

MITIGATED DESIGN

5' MIN FOR SEWER MAIN.
4' MIN FOR SEWER LATERAL

DOMESTIC WATER MAIN OR SERVICE

18" MIN. FOR SEWER MAIN
12" FOR WATER AND SEWER LATERAL

PREFERRED

SEWER MAIN OR LATERAL

DOMESTIC WATER MAIN OR SERVICE

6' MIN
10' MAX

SEWER MAIN OR LATERAL

DOMESTIC WATER MAIN OR SERVICE

MECHANICALLY RESTRAIN ALL JOINTS,
JOINTLESS PIPE OR APPROVED EQUAL

NON-PRESSURIZED PIPE:
SDR 35 (ASTM D3212),
EXTERNAL JOINT SEALANT (ASTM C877),
JOINTLESS PIPE OR APPROVED EQUAL
PRESSURIZED PIPE:
MECHANICALLY RESTRAIN ALL JOINTS,
JOINTLESS PIPE OR APPROVED EQUAL

Notes:
1. A SEWER IS ANY NON-POTABLE LINE INCLUDING BUT NOT LIMITED TO MAINS AND LATERALS OF SANITARY SEWER, STORM DRAINS, PRESSURIZED FORCE MAINS AND RECLAIMED WASTEWATER.
2. MITIGATED CROSSING DESIGN CAN UTILIZE JOINTLESS PIPE PER SSPWC OR BSDW APPROVED EQUAL FOR WATER AND SEWER. NON-SDR 35 (ASTM D3212) SEWER PIPE MAY UTILIZE JOINTLESS PIPE OR APPROVED JOINT SEALANT MEETING ASTM C877.
3. NO VERTICAL SEPARATION IS REQUIRED IF THERE IS 10 FEET OR MORE SEPARATION BETWEEN WATER AND SEWER LINES.

MITIGATED DESIGN
DOMESTIC WATER PARALLEL SEPARATION

STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION

WATER & SEWER SEPARATIONS

DATE: 1/14 PAGE: 11
Appendix F

Title: Hydrology
Crossing - Crossing 2, Design Discharge - 13.2 cfs

Culvert - Southern Culverts, Culvert Discharge - 13.2 cfs

Tractive Force Method Channel Lining
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