

Appendix H

Groundwater Anti-degradation Analysis



Willow Creek Community Services District

Downtown Wastewater Development Groundwater Anti-degradation Analysis

May 2015

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Appendices

Appendix A – Soils Investigation

1. Introduction

1.1 Project Overview

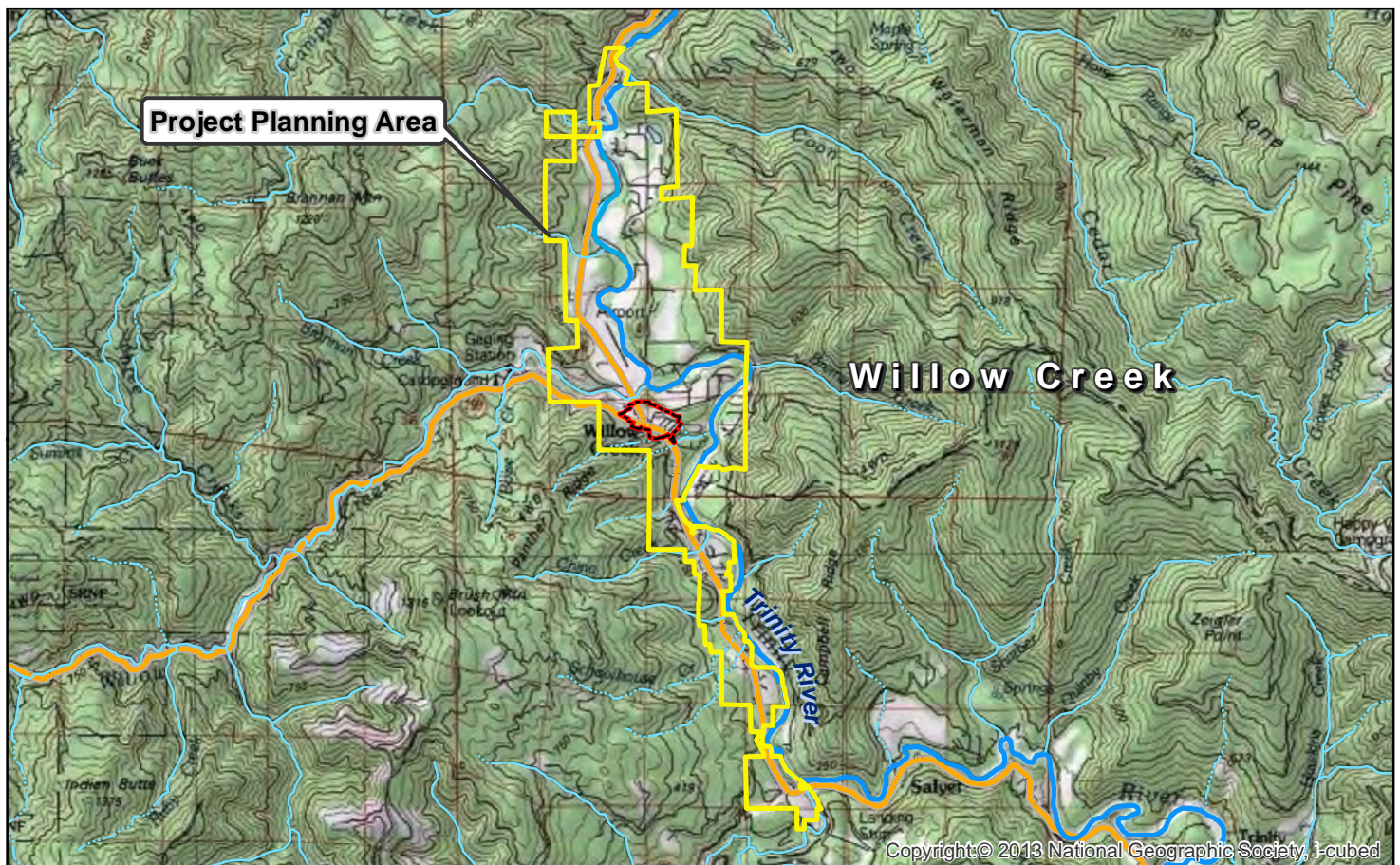
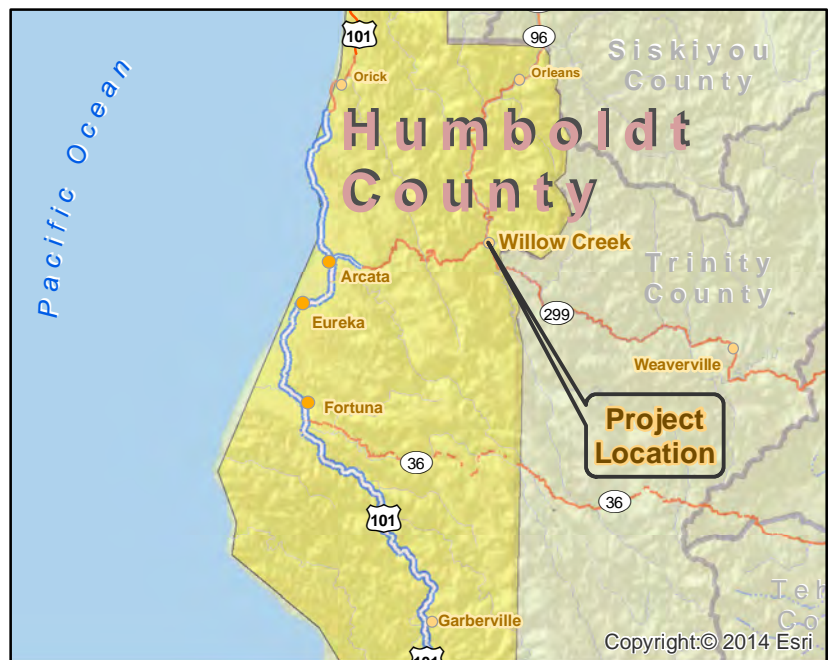
The unincorporated community of Willow Creek, CA (see Figure 1: Location map) does not currently have a community-wide wastewater collection system, and all of the residences and businesses rely solely on individual septic systems to provide for their wastewater needs. Many of these septic systems are decades old, and some are beginning to fail, impacting ground and surface water in the area and negatively affecting public health and the environment.








To improve public health and increase the opportunity for economic development in the downtown Willow Creek area, the Willow Creek Community Services District (WCCSD or District) is proposing to construct a new wastewater collection, treatment, and disposal system. The proposed project includes a gravity collection system of wastewater in the downtown Willow Creek area, conveyance to a recirculating gravel filter (RGF) treatment plant, and disposal through a subsurface leach field at the Mill Site (see Figure 2: Collection, treatment, and disposal system site plan). The proposed project service area will consist of an estimated 103 total connections to the wastewater system (57 commercial and 46 residential).

1.1.1 Recirculating Gravel Filter System

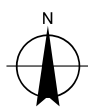
A RGF system is a non-proprietary system that uses a community septic tank for primary treatment. After the initial settling of solids, the pre-treated wastewater flows into a recirculation tank. It is pumped from there and intermittently applied uniformly to pea gravel filters. This alternately rests and loads the gravel media, resulting in the development of a microbiological film. As the wastewater percolates down through the gravel filter, it comes into contact with this film, which oxidizes the waste by using it as a food source. It also gets aerated which nitrifies the wastewater. The filtered wastewater is collected at the bottom by an impermeable liner, and the filtrate is then piped back to the recirculation tank and mixed with the effluent from the septic tank. A portion of the flow is split back to the beginning of the septic tank where it is mixed with the raw sewage for denitrification. The recirculation process is designed so that on average, the wastewater flows through the media and then is retained in the recirculation tank for 5 cycles. This alternates the flow from being aerobic to anoxic/anaerobic, which results in very good rates of BOD, TSS, ammonia, and nitrate removal. When the recirculation tank becomes full, a control valve closes and the returning flow from the filter is discharged as effluent. A general flow diagram of this process is illustrated in Figure 3.

This process has been implemented in the community of Weott, and the community of Miranda also has a similar facility that uses sand as the media instead of pea gravel. Both of these systems are of similar size to the proposed Willow Creek system and have produced excellent quality effluent for over 25 years (Miranda was constructed in 1980 and Weott in 1990.)



- | | | |
|--|---|--|
|  U.S. Highway |  Potential Service Area |  Perennial Stream |
|  California State Highway |  Willow Creek Community Services District Boundary |  Intermittent Stream |
| | |  Trinity River |

Paper Size 8.5" x 11" (ANSI A)
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 Miles
 Map Projection: Mercator Auxiliary Sphere
 Horizontal Datum: WGS 1984
 Grid: WGS 1984 Web Mercator Auxiliary Sphere

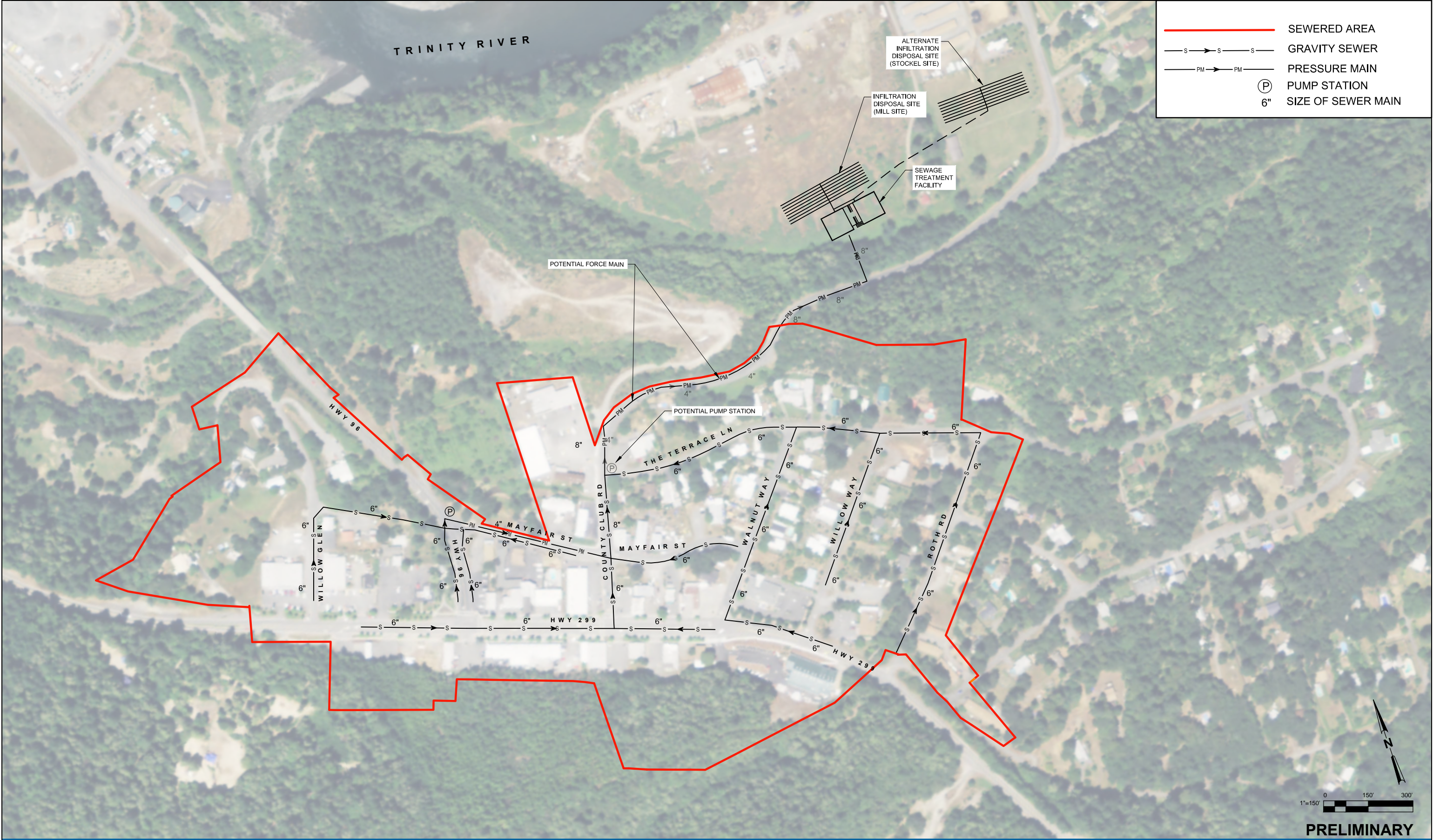


Willow Creek Community Services District

Job Number 8410746.01
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Location Map

Figure 1



SEWERED AREA

S

GRAVITY SEWER

PM

PRESSURE MAIN

P

PUMP STATION

6"

SIZE OF SEWER MAIN

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PRELIMINARY

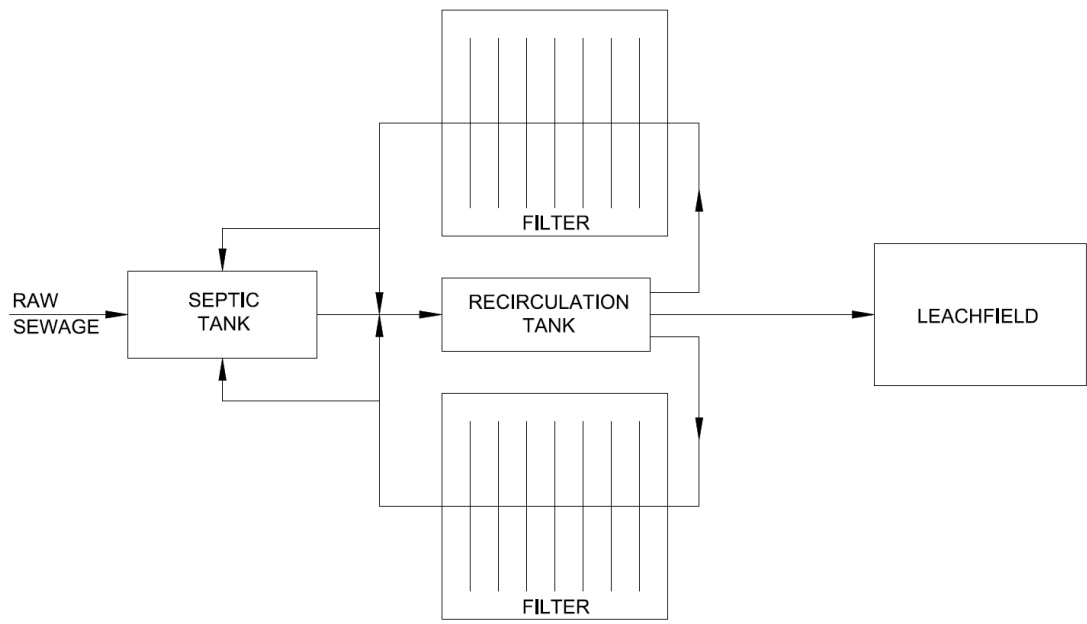


Figure 3: General flow diagram of recirculating gravel filter system

1.2 Purpose of Analysis

This *Groundwater Anti-degradation Analysis* has been prepared for the WCCSD Downtown Wastewater Development Project to ensure that the proposed leach field disposal at the Mill Site or the alternate disposal site, the Stockel Site, will not result in degradation to the beneficial uses of groundwater at the site or the beneficial uses of the nearby Trinity River. All of the effluent from the wastewater treatment plant will be disposed of via a subsurface leachfield. Because of this, nitrate is the key constituent of concern, and other constituents (e.g. BOD, TSS, etc.) are not considered in this analysis. The analysis compares water quality objectives for nitrate with the projected nitrate concentrations in the groundwater upon mixing with infiltrated treated effluent. The degradation determination is made by comparing the projected commingled concentration of the groundwater with the most stringent water quality objectives.

This analysis will also be used to confirm that substantial groundwater mounding will not occur, and that an acceptable groundwater clearance beneath the system will be maintained.

1.3 Beneficial Uses

Protection of water quality is based on maintenance of beneficial uses. Section 13050(f) of California's Porter-Cologne Water Quality Control Act states the following:

"Beneficial uses" of the waters of the state that may be protected against quality degradation include, but are not limited to, domestic, municipal, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves."

The 2011 *Water Quality Control Plan for the North Coast Region* (Basin Plan) lists the following as existing (E) or potential (P) beneficial uses of groundwater:

- Municipal and Domestic Supply (E)
- Agricultural Supply (E)

- Industrial Service Supply (E)
- Industrial Process Supply (P)
- Native American Culture (E)
- Aquaculture (P)

The Basin Plan also lists the following as existing or potential beneficial uses of the Willow Creek Hydrologic Subarea of the Trinity River:

- Municipal and Domestic Supply (E)
- Agricultural Supply (E)
- Industrial Service Supply (E)
- Industrial Process Supply (P)
- Groundwater Recharge (E)
- Freshwater Replenishment (E)
- Navigation (E)
- Hydropower Generation (E)
- Water Contact Recreation (E)
- Non-Contact Water Recreation (E)
- Commercial and Sport Fishing (E)
- Cold Freshwater Habitat (E)
- Wildlife Habitat (E)
- Rare, Threatened, or Endangered Species (E)
- Migration of Aquatic Organisms (E)
- Spawning, Reproduction, and/or Early Development (E)
- Shellfish Harvesting (P)
- Aquaculture (P)

These existing and potential beneficial uses are each taken into consideration when assessing the potential for degradation to groundwater and surface water resources.

2. Background Data

There are several factors to consider when determining the potential for groundwater degradation and mounding. Pertinent data has been gathered to characterize the soils and the groundwater at the Mill Site and Stockel Site. Where data has not been gathered (e.g. for treatment plant effluent flows), assumptions have been made to arrive at reasonable conclusions.

2.1 Soils Investigation and Groundwater Monitoring

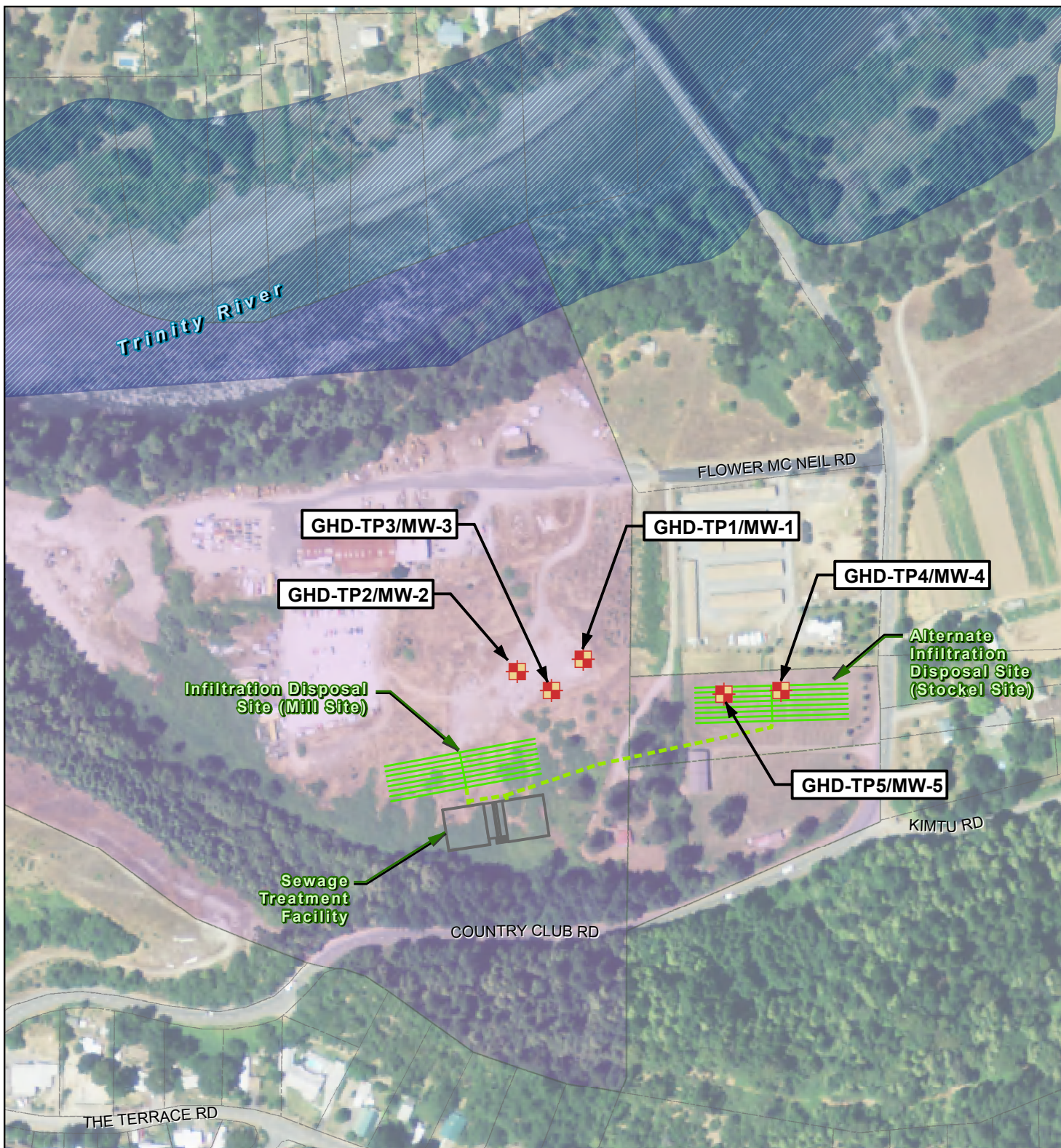
In 2014, GHD investigated the soils and groundwater at the Mill Site and Stockel Site (see Appendix A for the report, including soil boring logs, lab results, and depth to groundwater measurement data). Three test pits (GHD-TP1 through GHD-TP3) were constructed at the Mill Site (Figure 4), and depths ranged from approximately 13 feet below ground surface (bgs) to 16.5 ft bgs (where groundwater was encountered). Soils encountered were generally alluvial deposits, and they ranged from sand to sandy loam. All of the Mill Site samples fell into Zone 1 of the USDA Soil Percolation Suitability Chart.








Two test pits (GHD-TP4 and GHD-TP5) were constructed at the Stockel Site (Figure 4) at depths of 12 ft and 13 ft bgs, respectively. Groundwater was not encountered in either of these test pits. Soils encountered at this site were generally silty loam. The sample gathered from GHD-TP4 fell into Zone 2 of the USDA Soil Percolation Suitability Chart, and the sample from GHD-TP5 fell into Zone 1.

Three monitoring wells (MW-1 through MW-3) were installed in the test pits at the Mill Site (Figure 4). Depth to groundwater measurements were collected on a weekly basis for approximately 11 weeks, from the end of March through mid-June 2014. Approximately 0.5 inches of rainfall was recorded during this time, and depth to groundwater measurements generally varied from approximately 11 feet bgs to 13 feet bgs. Two monitoring wells (MW-4 and MW-5) were also installed in the test pits at the Stockel Site (Figure 4). These monitoring wells were dry for every depth to groundwater measurement.

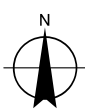
2.2 Effluent Flows

As WCCSD does not currently have a community wastewater system, there is no data pertaining to effluent flows. However, GHD developed preliminary design flows in our 2015 Preliminary Engineering Report (PER) titled *Willow Creek Community Services District Downtown Wastewater Development, Preliminary Engineering Report – Wastewater Facilities*. In this PER, GHD developed an estimated average dry weather flow (ADWF) for this system of 38,000 gallons per day. This estimate includes projections for growth and expansion of the community.



- | | | |
|--|---|--|
|  Test Pit/Monitoring Well |  Treatment Facility |  FEMA 100 Year Floodplain |
|  Parcel Boundaries |  Sanitary Sewer Pipeline |  Approximation of the 520 foot Elevation for Non-FEMA Mapped Portion of the Trinity River |
| |  Disposal Sites | |

Paper Size ANSI A
 0 100 200 300 400
 Feet
 Map Projection: Lambert Conformal Conic
 Horizontal Datum: North American 1983
 Grid: NAD 1983 StatePlane California I FIPS 0401 Feet



Willow Creek Community Services District
 Willow Creek Downtown Wastewater Development

Job Number 8410746.01
 Revision A
 Date 12 May 2015

Test Pit and Monitoring Well Locations

Figure 4

G:\12057 WillowCreekCSD\8410746 WCCSD-WWTP Planning\08-GIS\Maps\Figures\DischargePermit\F4_TP_MW_Locations.mxd 718 Third Street Eureka CA 95501 USA T 707 443 8326 F 707 444 8330 E eureka@ghd.com W www.ghd.com

© 2015. Whilst every care has been taken to prepare this map, GHD and Willow Creek Community Services District make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.
 Data source: County of Humboldt: Parcels, Data Custodian, Data Set Name/Title, Version/Date. Created by: gldavidson

3. Projected Nitrate Concentrations

The Basin Plan states that effluent disposal “shall not cause the groundwater nitrate concentration to exceed 10.0 mg/L as N at any source of drinking water on the property nor on any off-site potential drinking water source.” Because groundwater is a potential drinking water source, the Regional Water Board will require that the nitrate concentration of the treatment plant effluent be at or below 10.0 mg/L by the time it reaches groundwater. It should be noted that all of the properties at and surrounding the potential effluent disposal sites are on the WCCSD public water system, and there are currently no groundwater wells in the immediate vicinity. It is also unlikely that groundwater wells would be installed downgradient of the sites in the future given the industrial nature of these sites, the lack of dependable available groundwater, and the availability of the public water system.

3.1 Nitrate Loading Analysis

The analysis of nitrate loading effects was based on an estimate of an annual chemical-water mass balance. The assumptions and equations given in this section were used to project what the nitrate concentration will be in the groundwater immediately adjacent to the site.

3.1.1 Groundwater Gradient

While the groundwater gradient for the area has not been quantitatively characterized, it is reasonable to assume, based upon site topography, that groundwater in the area is flowing toward the Trinity River, in a northerly direction (see Figure 5: Treatment and disposal site).

3.1.2 Wastewater Loading

As discussed in Section 2.2, the estimated ADWF for this system is 38,000 gpd. Ramlit (1982) states that an average flow, rather than anticipated peak flows, should be used for this type of mass balance calculation (see Section 6 for reference). The PER discusses a preliminary leach trench design of 18 inches wide and 6 feet deep with 1 foot of cover over the leach pipe. This trench design results in 11.5 square feet of exposed trench area per linear foot of trench. Using this number in conjunction with a design clean water loading rate of 1.5 gpd/ft² (discussed in the PER) and the estimated ADWF of 38,000 gpd, approximately 2,200 feet of leach field trench would be required. This distance of trench can be achieved by digging eight parallel trenches, 10 feet on center, that are each 300 feet long. To facilitate the highest achievable dilution, the proposed leach field will be oriented so that the leach lines are generally perpendicular to the groundwater gradient (parallel to the Trinity River). The width of the disposal field normal to the groundwater gradient would then be 300 feet.



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3.1.3 Nitrate Loading

The community of Weott, CA has a wastewater treatment plant that is very similar in size and design to what is proposed for WCCSD. Data from the Weott plant was used as a basis for predicting what the effluent nitrate concentration will be at the WCCSD plant. The effluent from the Weott treatment plant has been measured at 13 mg/L, so the assumption was made that the effluent from the WCCSD plant will have this same nitrate concentration of 13 mg/L on average.

It should be noted that the design of the Weott system did not include returning a portion of the filter effluent back into the septic tank, which the WCCSD design will include. Given that this will increase denitrification, it is reasonable to assume that the nitrate concentrations in the Willow Creek system effluent will generally be lower than 13 mg/L.

3.1.4 Denitrification Losses in the Soil Column

Ramlit (1982) states that nitrate reduction by means of soil denitrification is typically within the range of 15 to 25%. A denitrification ratio of 25% was used for this analysis based on favorable soil conditions.

To account for denitrification losses in the soil column, the nitrate concentration of wastewater percolate draining to groundwater can be calculated as follows (Ramlit Associates, 1982):

$$N_p = N(1 - DN) \quad \text{Eqn. 1}$$

where:

- N_p is the wastewater percolate nitrate concentration (mg/L)
- N is the assumed effluent nitrate concentration (13 mg/L)
- DN is the denitrification value (assumed to be 0.25)

Using the values mentioned above, the wastewater percolate nitrate concentration is calculated to be 9.75 mg/L at the point where the percolate reaches groundwater.

4. Groundwater Mounding

The Basin Plan states that a “groundwater mounding analysis shall be used to predict the highest rise of the water table and shall account for background groundwater conditions during the wet weather season.” It also mentions that a minimum groundwater clearance of 24 inches shall be maintained beneath an infiltration system such as what is proposed for this project. With the preliminary 6-foot-deep trench design and the shallowest observed depth to groundwater being 11 feet, along with minimal potential for groundwater mounding, issues with meeting this minimum clearance are not anticipated.

The potential for significant groundwater mounding at the site is anticipated to be very low, as the soil samples taken from this site were all classified as sand, and treatment plant effluent will percolate quickly. The total leach field area has been preliminarily sized to be 300 feet by 70 feet (21,000 square feet). An average dry weather flow of 38,000 gpd (5,080 cubic feet per day) and an assumed soil porosity of 0.4 would result in 7.3 inches per day of percolate over the leach field area. The measured long-term percolation rate at the site was 30 gpd/ft² (see Appendix A), which correlates to approximately 10.0 feet of percolation per day. Because the long-term percolation rate is much higher than the amount of percolate that will be generated, significant groundwater mounding is not anticipated.

5. Conclusion

To improve public health and increase the opportunity for economic development in the downtown Willow Creek area, the Willow Creek Community Services District (WCCSD or District) is proposing to construct a new wastewater collection, treatment, and disposal system. The proposed project includes a gravity collection system of wastewater in the downtown Willow Creek area, conveyance to a recirculating gravel filter (RGF) treatment plant, and disposal through a subsurface leach field

Using previous information that has been gathered at the Weott treatment plant (similar system to the proposed in design and scale), nitrate levels are anticipated to be at or below 13 mg/L coming out of the treatment plant. Further nitrate reduction occurs naturally in the soil column. By the time the wastewater percolate reaches groundwater, it can be assumed that 25% denitrification will occur, and the nitrate concentration in the percolate at this point will be less than 10.0 mg/L.

Furthermore, considering the expected leach field loading rate and the natural long-term percolation rate at the site, significant groundwater mounding is not anticipated. This analysis has documented that the proposed treatment and disposal system will not impact groundwater or the Trinity River in a manner that will be in violation with the Basin Plan.

6. Works Cited

GHD Inc. (2015). *Downtown Wastewater Development, Preliminary Engineering Report - Wastewater Facilities*. Eureka, CA.

North Coast Regional Water Quality Control Board. (2011). *Water Quality Control Plan for the North Coast Region*. Santa Rosa, CA.

Ramlit Associates. (1982). *Assessment of Cumulative Impacts of Individual Waste Treatment and Disposal Systems*. Berkeley, CA.

Appendices

Appendix **A** – Soils Investigation



Willow Creek Community Services District

Willow Creek Downtown Wastewater Development Disposal Site Investigation

October 2014

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Figure index (attached)

1	Project Planning Area Map
2	Potential Disposal Sites
3	Old Mill Site – Stockel Property
4	Trinity Valley Elementary School
5	Veterans Park

Appendices

Appendix A – Trinity Valley Consulting Engineers Veterans Memorial Park Soils Report

Appendix B – GHD Test Pit Logs

Appendix C – Materials Testing Data Sheets

Appendix D – Groundwater Monitoring Well Log

1. Introduction

The Willow Creek Community Services District (Willow Creek CSD) evaluated four potential disposal locations for a community wide wastewater disposal system. The project planning area is shown on Figure 1. Potential disposal site locations are shown on Figure 2 and include areas within Veterans Memorial Park, the former mill site, Stockel, and Trinity Valley Elementary School properties. An evaluation of soils located at Veterans Memorial Park was completed by Trinity Valley Consulting Engineers (TVCE). A copy of the TVCE soil report for Veterans Memorial Park is included in Appendix A. GHD oversaw the completion of test pits at three of the potential wastewater disposal sites; the former mill site (Figure 3), Stockel (Figure 3), and Trinity Valley Elementary School (Figure 4) properties.

2. Soil Investigation

2.1 Soil Investigation Methodology

In order to characterize soil type and collect samples for laboratory analysis, eight test pits (GHD-TP1 through GHD-TP8) were completed using either a backhoe or excavator at the three potential disposal sites evaluated by GHD. The test pits were completed to varying depths from approximately 12 to 18 feet below ground surface (bgs). Soils were logged from the ground surface to approximately four feet bgs from the sidewalls of the test pit. Soil excavated from depths greater than four feet bgs were characterized through observation and samples obtained from the backhoe or excavator bucket. Soils were logged following the United States Department of Agriculture (USDA) Soil Survey Manual (Soil Survey Division Staff, 1993). Soil color was noted using Munsell Soil-Color Charts. Logs for the test pits completed at the former mill site (GHD-TP1 through GHD-TP3), Stockel (GHD-TP4 and GHD-TP5), and Trinity Valley Elementary School (GHD-TP6 through GHD-TP8) properties are included in Appendix B.

2.2 Potential Disposal Site Soils

Generally, soils encountered at each of the potential disposal locations are alluvial deposits either within the floodplain (Trinity Valley Elementary School property) or on the uplifted, raised terraces above the Trinity River. Soils at the three disposal sites varied from silt loam observed at the Stockel property to sand and sandy loam at the former mill site, to gravelly sands at the Trinity Valley Elementary School property. Generally, soils were finer (silts and clays) at the Stockel property and increased in grain size with proximity to and elevation relative to the Trinity River.

The test pits completed at the Trinity Valley Elementary School property (GHD-TP6 through GHD-TP8) were generally coarser and included cobbles up to approximately 18 inches in diameter from approximately 8 feet bgs to the completed depths of 14 feet bgs, 16.5 feet bgs, and 18 feet bgs. The location of the potential disposal system at the Trinity Valley Elementary School is approximately 1,000 feet from the Trinity River and is not located within the Federal Emergency Management Agency (FEMA) 100-year flood zone. However, anecdotal evidence of community members and staff at the Willow Creek CSD indicates that this location was inundated in the 1964 flood (500-year flood event). The former mill site and Stockel properties are located approximately 40 and 50 feet, respectively, above the Trinity River.

Groundwater was encountered at the former mill site at approximately 13 feet bgs in test pits GHD-TP1 and GHD-TP3 and 16.5 feet bgs in test pit GHD-TP2. Groundwater was not encountered in the excavations completed on the Stockel and Trinity Valley Elementary School properties.

2.3 Material Testing

Representative samples of soil encountered in the test pit were collected and retained for grain size analysis. GHD completed grain size analysis via the American Society for Testing and Materials (ASTM) Standard Test Method for Particle-Size Analysis of Soils (ASTM D422) for nine soil samples. Grain size percentages were plotted on the USDA Soil Percolation Suitability Chart. The results of grain size analysis are presented in Table A (below). Copies of the materials testing data sheets are included in Appendix C.

Table A – Potential Disposal Sites Soil Classification and Percolation Suitability Zone

Potential Disposal Site	Sample Location	Sample Depth (feet bgs)	Soil Classification and Soil Percolation Suitability Chart Zone
Former Mill site	GHD-TP1	5 to 5.5	Sand- Zone 1
Former Mill site	GHD-TP2	5 to 5.5	Sand- Zone 1
Former Mill Site	GHD-TP3	8 to 8.5	Sand- Zone 1
Stockel Property	GHD-TP4	7 to 7.5	Loamy Sand- Zone 2
Stockel Property	GHD-TP5	5 to 5.5	Sand- Zone 1
Trinity Valley Elementary School Property	GHD-TP6	3 to 3.5	Sand- Zone 1
Trinity Valley Elementary School Property	GHD-TP7	4 to 4.5	Sand- Zone 1
Trinity Valley Elementary School Property	GHD-TP7	16 to 16.5	Sand- Zone 1
Trinity Valley Elementary School Property	GHD-TP8	4 to 4.5	Loamy Sand- Zone 2

2.4 Monitoring Well Construction

Seven monitoring wells were installed in test pits completed at the former mill site, Stockel, and Trinity Valley Elementary School properties. Three monitoring wells, GHD-MW-1 through GHD-MW-3 were completed at the former mill site property. Two monitoring wells (at each property) were completed in the test pits excavated at the Stockel (GHD-MW-4 and GHD-MW-5) and Trinity Valley Elementary School (GHD-MW-6 and GHD-MW-7) properties.

The monitoring wells were constructed using two inch diameter blank and factory slotted (0.010 inch) poly vinyl chloride pipe (PVC) which was placed along the sidewall and the test pit was backfilled with the excavated soils. The top of the casing for each well was completed above the ground surface (ags) to facilitate depth to water measurements, locating, and provide visibility for vegetation maintenance (grass cutting) at each of the properties. Well construction details are included on the test pit logs (Appendix B) and presented in Table B (on the following page).

Table B – Monitoring Well Construction- Former Mill Site, Stockel, and Trinity Valley Elementary School Properties

Monitoring Well	Total Depth (feet bgs)	Screen Interval (feet bgs)	Top of Casing Elevation (inches ags)
GHD-MW-1	13	8 to 13	30
GHD-MW-2	16.5	11.5 to 16.5	29
GHD-MW-3	14	10 to 14	14
GHD-MW-4	12	7 to 12	38
GHD-MW-5	13	8 to 13	21
GHD-MW-6	14	4 to 14	32
GHD-MW-7	16.5	6.5 to 15.5	31

2.5 Groundwater Monitoring

Depth to groundwater measurements were collected on a weekly basis for approximately eleven weeks from the time of well construction in monitoring wells GHD-MW-1 through GHD-MW-5. Approximately 0.5 inches of rainfall was recorded during the time period of depth to water measurement collection. Depth to water measurements in monitoring wells GHD-MW-6 and GHD-MW-7 were collected on a weekly basis for three weeks from the time of well construction. Depth to water measurements collected from the monitoring wells are presented in Table 1, included in Appendix D.

Generally, groundwater was not observed in monitoring wells at the Stockel and Trinity Valley Elementary School properties. Groundwater was encountered at the former mill site property at depths varying from approximately 11 feet bgs to 13 feet bgs.

3. Percolation Test

A long term percolation test was completed at Veterans Park, the last week of May, 2014, to determine the clean water loading rates and develop an estimate of the hydraulic gradient for the site. The location of the percolation pit is shown on Figure 5.

A backhoe was used to dig an approximately 56 inch long, 20 inch wide, and 28 inch deep trench. The depth of trench was chosen such that the bottom of the trench was at the most restrictive soil layer.

A wooden frame was constructed, on to which a float valve was attached. The frame was smaller in dimension than the trench so that an air gap existed between the frame and the trench side walls. The float valve was then attached to a hose which was connected to a District water value. The float valve was orientated to spray water downward, and to prevent scour or disturbance to the soil at the bottom of the trench, the wooden frame including a horizontal flat member below the water flow to dissipate the spray.

The water was turned on, and the trench filled approximate 14 inches deep with water until the float valve shut the flow off. At this time, the meter was read and reordered. Each day the meter was again read to determine the amount of water that was percolated in the trench each day.

The test was run for seven days. The average flow per day was determined to be 675 gallons per day. Given the total exposed trench area, including the sides and the bottom was 22.6 square foot; the clean water loading rate was determined to be 30 gallons per day per square foot.

Figure 1 – Photo of percolation test pit



Before restoring the site, a backhoe was used to dig a trench perpendicular to the test pit, extending about 8 feet each side of the test pit and about 4 feet deeper than the percolation test pit. During excavation of this trench, a water line was severed and GHD staff had to immediately evacuate the trench as the rate of water flow was extreme and it was impossible to safely measure the depth to saturated soil. GHD's initial measurement of the slope of the wetted interface was at a depth of approximately 11 inches bgs at a distance of approximately two feet from the eastern edge of the percolation test pit. Despite the accuracy of the measurement, GHD is using the slope of the wetted surface as an assumption to the value of hydraulic gradient (i) in Darcy's Law equation ($Q=CiA$).

4. Conclusions

Based on the data collected from the installation of test pits, grain size analysis of potential disposal site soils, depth to water measurements, and evaluation of the percolation test, GHD has the following conclusions:

- Soils at the three disposal sites varied from silt loam observed at the Stockel property to sand and sandy loam at the former mill site, to gravelly sands at the Trinity Valley Elementary School property.
- Material testing of selected soil samples indicates that soils at the potential disposal sites consist of Sand (Zone 1) and Loamy Sand (Zone 2).
- All of these sites have soils that are suitable for use as disposal site leach fields.

5. Recommendations

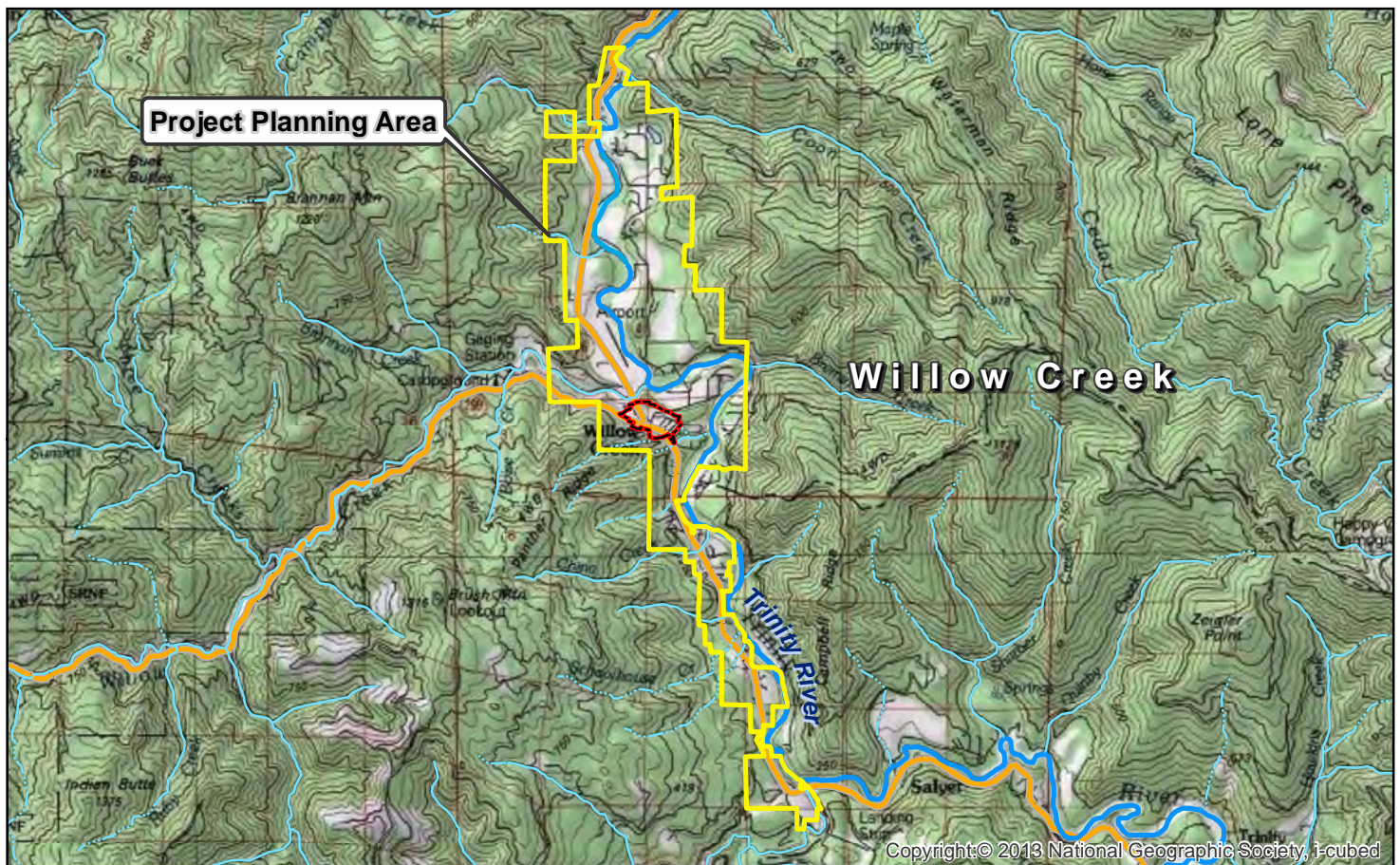
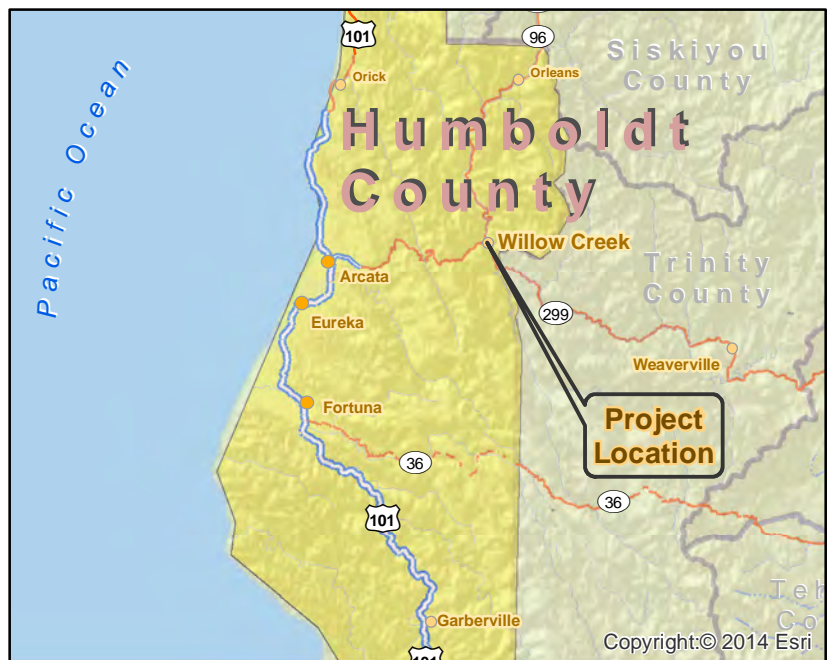
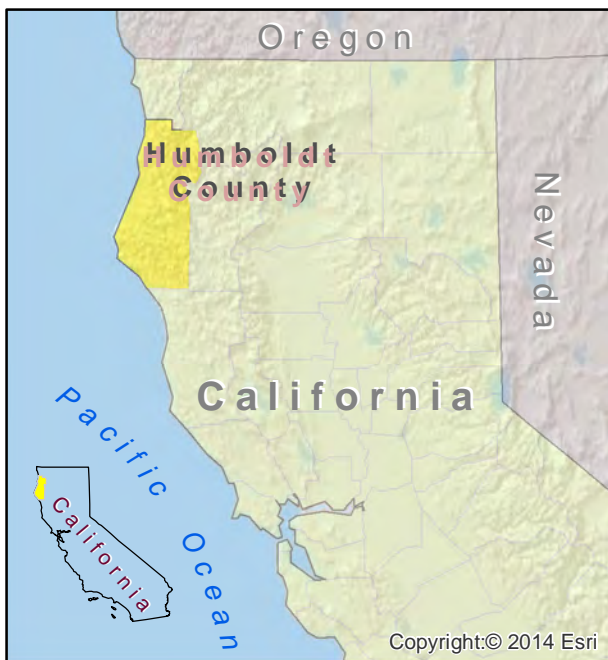
Based on the soils investigation completed at the three potential disposal sites, it appears that the soils and location of the former Mill Site property is most suitable for the potential Willow Creek CSD Disposal Site. The soils at the adjacent Stockel site are also suitable. GHD recommends moving forward with the former Mill Site as the future disposal location for the Willow Creek CSD wastewater project. The Stockel site could be used if issues develop with land acquisition of the former Mill Site property.








6. References

Soil Survey Division Staff, Soil Survey Manual. Soil Conservation Service, United States Department of Agriculture, Handbook 18, 1993.

American Society for Testing and Materials, Standard Test Method for Particle-Size Analysis of Soils ASTM D422-63(2007).

Figures



- | | | |
|--|---|--|
|  U.S. Highway |  Potential Service Area |  Perennial Stream |
|  California State Highway |  Willow Creek Community Services District Boundary |  Intermittent Stream |
| | |  Trinity River |

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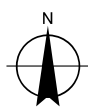
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Miles

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Horizontal Datum: WGS 1984

Grid: WGS 1984 Web Mercator Auxiliary Sphere

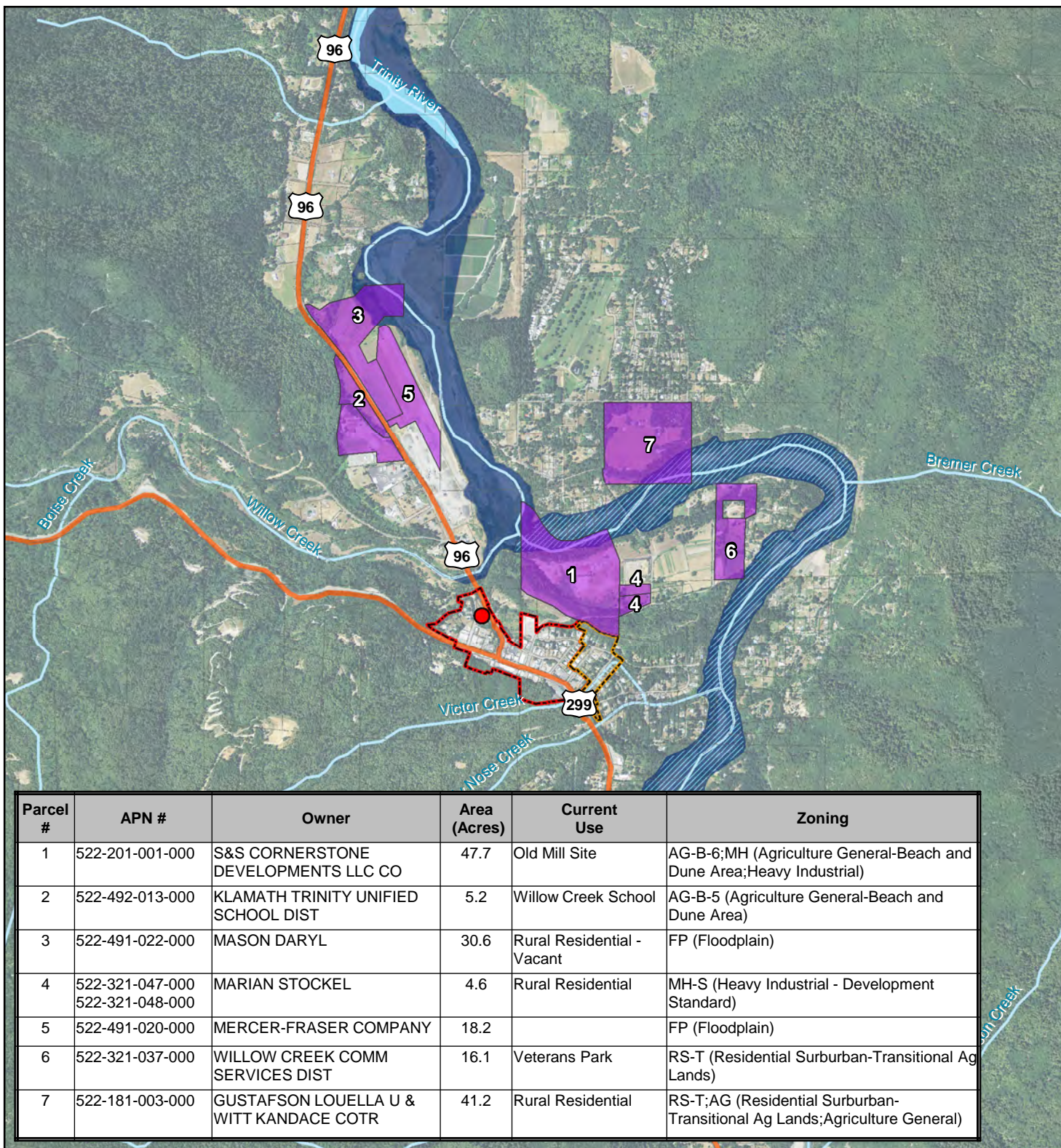


Willow Creek Community Services District

Job Number 8410746.01
Revision A
Date 14 Oct 2014

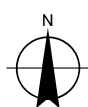
Project Planning Area Map

Figure 1



- Potential_Disposal_Sites...
- Willow Creek Community Services District HQ
- Proposed Service Area**
- Core
- Expanded
- FEMA 100 Year Floodplain
- Approximation of the 520 foot Elevation for Non-FEMA Mapped Portion of the Trinity River
- Parcel Boundaries
- Highway
- River

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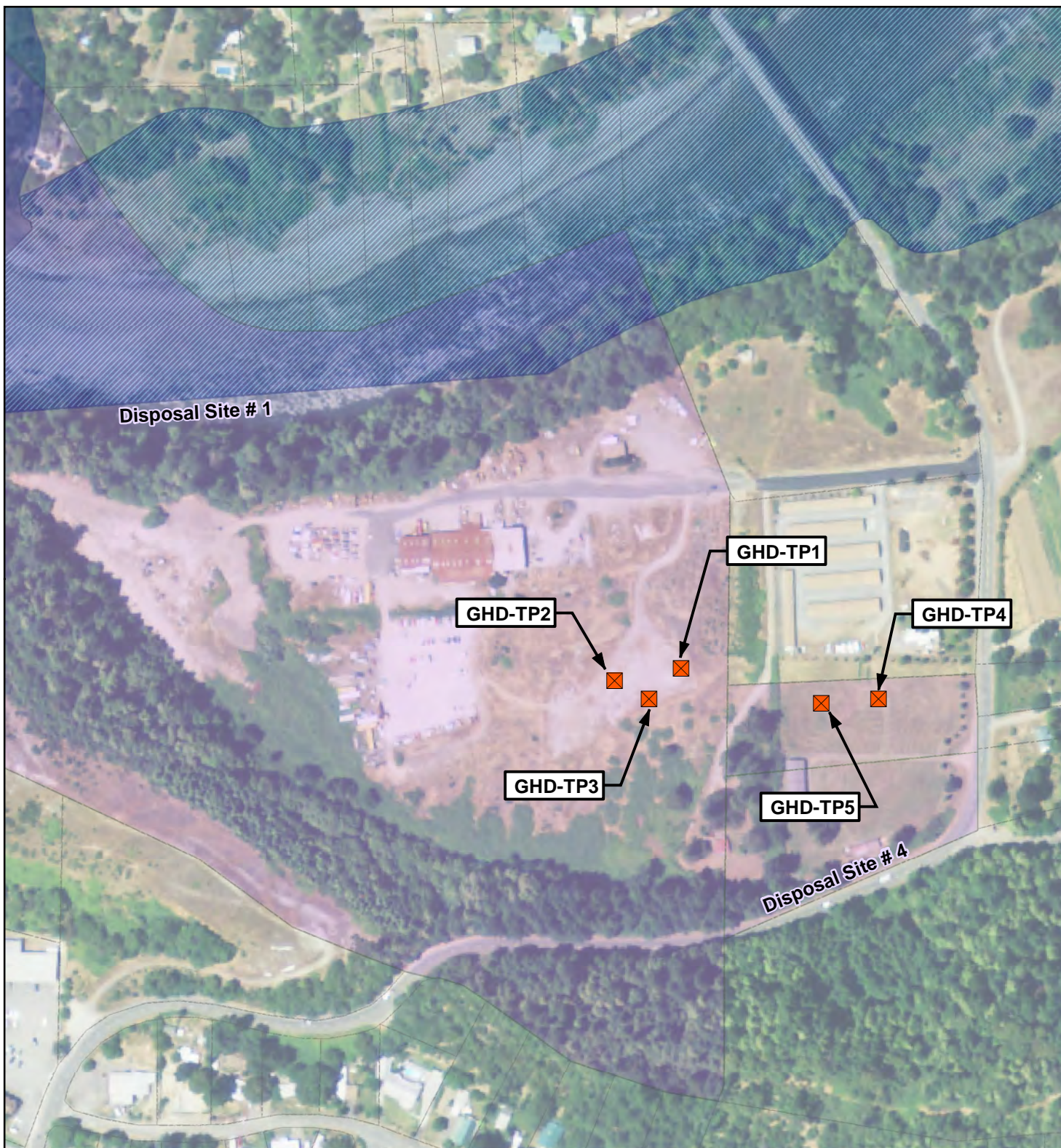







Willow Creek Community Services District
Willow Creek Downtown Wastewater Development

Job Number 8410746
Revision A
Date 14 Oct 2014

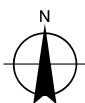
Potential Disposal Sites

Figure 2



-  Test Pit
-  FEMA 100 Year Floodplain
-  Potential Disposal Site
-  Approximation of the 520 foot Elevation for Non-FEMA Mapped Portion of the Trinity River
-  Parcel Boundaries

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 Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

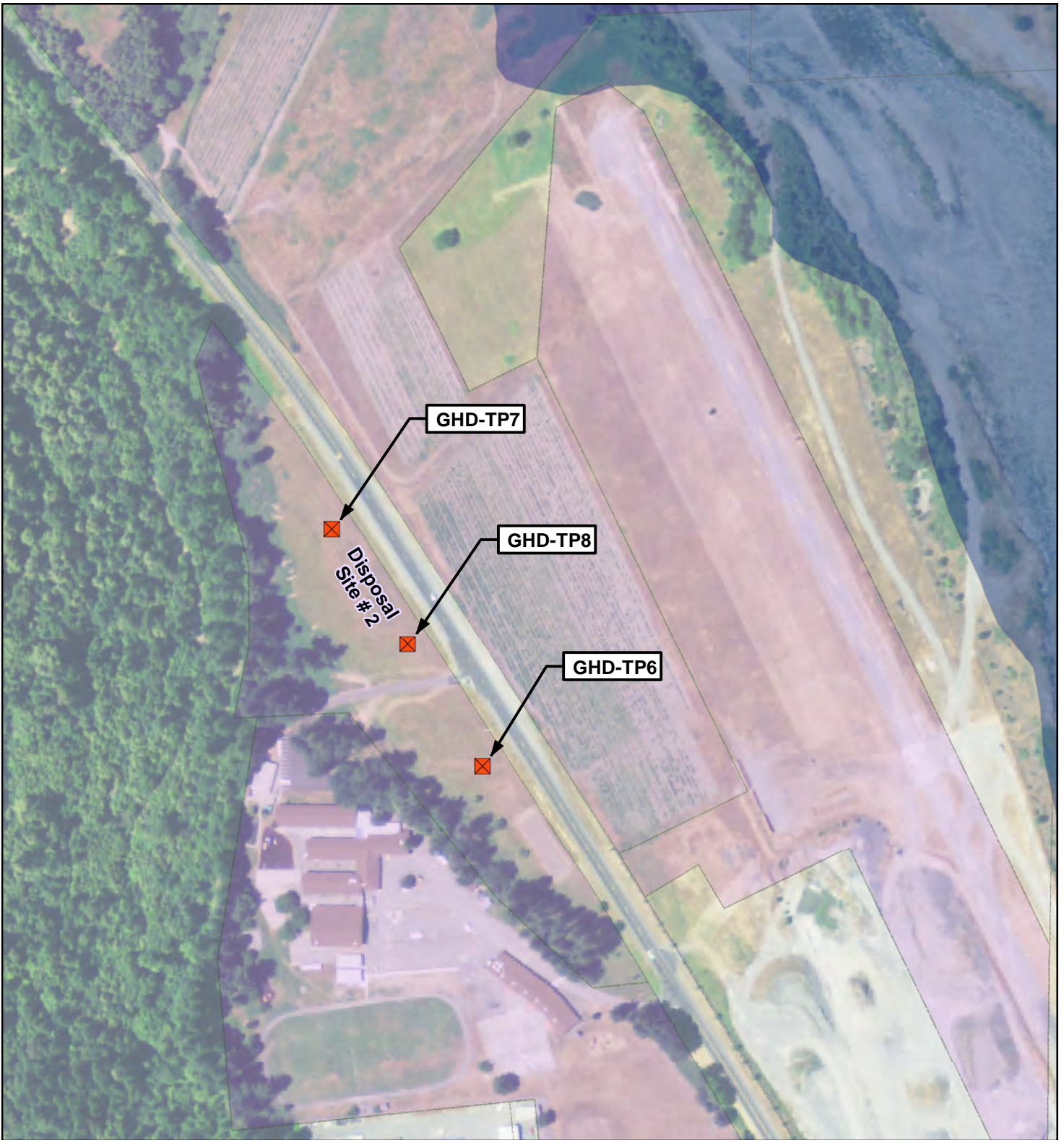


Willow Creek Community Services District
 Willow Creek Downtown Wastewater Development

Job Number 8410746.01
 Revision A
 Date 14 Oct 2014

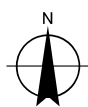
Old Mill Site - Stockel Property

Figure 3



- Test Pit
- Parcel Boundaries
- Potential Disposal Site
- FEMA 100 Year Floodplain

Paper Size ANSI A
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 Feet
 Map Projection: Lambert Conformal Conic
 Horizontal Datum: North American 1983
 Grid: NAD 1983 StatePlane California I FIPS 0401 Feet



Willow Creek Community Services District
 Willow Creek Downtown Wastewater Development

Job Number 8410746.01
 Revision A
 Date 20 Oct 2014

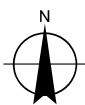
Trinity Valley Elementary School

Figure 4



- PERC Pit
- Parcel Boundaries
- Potential Disposal Site
- FEMA 100 Year Floodplain

Paper Size ANSI A
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 Feet
 Map Projection: Lambert Conformal Conic
 Horizontal Datum: North American 1983
 Grid: NAD 1983 StatePlane California I FIPS 0401 Feet



Willow Creek Community Services District
 Willow Creek Downtown Wastewater Development

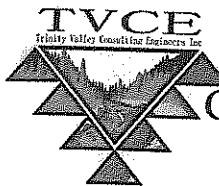
Job Number	8410746.01
Revision	A
Date	14 Oct 2014

Veterans Park

Figure 5

Appendices

Appendix A – Trinity Valley Consulting Engineers Veterans Memorial Park Soils Report



TRINITY VALLEY
CONSULTING ENGINEERS, INC

Joshua T. McKnight CE 60687

ONSITE WASTEWATER INVESTIGATION REPORT

For

VETERANS PARK
WILLOW CREEK, CALIFORNIA
APN: 522-321-037

Report Provided for:

Willow Creek Community Services District
Post Office Box 8
Willow Creek, California 95573

Report Provided By:

Trinity Valley Consulting Engineers, Inc.
67 Walnut Way / Post Office Box 1567
Willow Creek, California 95573
(530) 629-3000 Fax: (530) 629-3011



March 2012
Project Number: 209

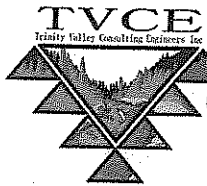


Table of Contents

SITE CONDITIONS:.....	2
PROPOSED PROJECT:	2
SOIL INSPECTIONS:.....	2

ATTACHMENTS:

1. SITE LOCATION MAP
2. SOIL PROFILE LOGS
3. SOIL TEXTURAL ANALYSIS

Site Conditions:

The proposed project site is located at Veterans Park in Willow Creek, California in the County of Humboldt (attached location map). Latitude and Longitude of the project sites are N 40.9396° and W -123.6174° per Google Earth. The approximate elevation of the property is 521 feet above mean sea level.

The proposed project site is a large grass field currently being used as a soccer field.

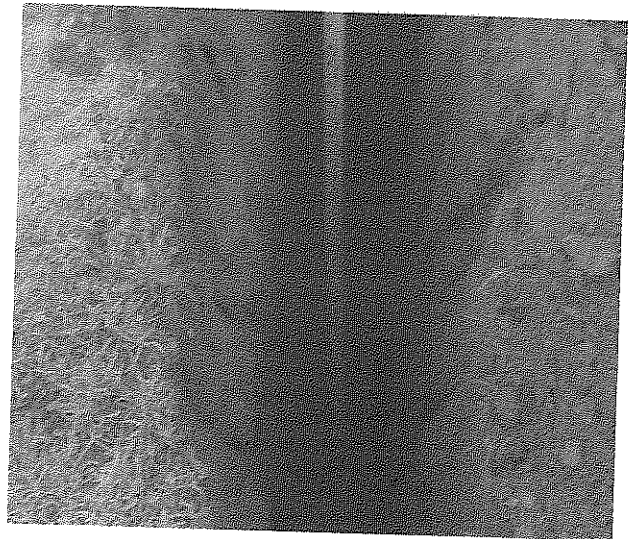
Proposed Project:

The proposed project for this parcel would be to install a treatment and disposal system for a community wastewater system.

Soil Inspections:

The site soils were investigated on January 12, 2012. Investigation consisted of excavation of three backhoe test pits, soil sampling, and laboratory analysis (see attached layout for test pit locations). Findings were as follows:

Test Pit #1: Soils found in this test pit consisted of a shallow layer of topsoil (less than one foot) followed by a layer of light brown loamy sand to depth of approximately five feet. The bottom five feet of the test pit consisted of a grey sandy gravel (see attached soil log). No groundwater or bedrock was encountered in the investigation. Soil samples were taken at four feet and seven feet, and tested to be Loamy Sand (zone 1), and Sand (zone 1) respectively (see attached test results).



Test Pit #2: Soils found in this test pit consisted of a shallow layer of topsoil (less than one foot) followed by a layer of light brown loamy sand to depth of approximately five feet. The bottom five feet of the test pit consisted of a grey sandy gravel (see attached soil log). No groundwater or bedrock was encountered in the investigation. Soil samples were taken at two feet and six feet, and tested to be Loamy Sand (zone 2), and Sand (zone 1) respectively (see attached test results).



Test Pit #3: Soils found in this test pit consisted of a shallow layer of topsoil (less than one foot) followed by a layer of light brown loamy sand to depth of approximately four feet. The bottom five feet of the test pit consisted of a grey sand with gravels and cobbles (see attached soil log). Excavation was ceased at a depth of eight feet due to trench caving. No groundwater or bedrock was encountered in the investigation. Soil samples were taken at two feet and six feet, and tested to be Sandy Loam (zone 2), and Sand (zone 1) respectively (see attached test results).



Attachment 1

Site Location Map





WILLOW CREEK COMMUNITY SERVICES DISTRICT



Attachment 2

Soil Profile Logs



SOIL EXPLORATION LOG

Project Name: WC Wastewater

Project No: 209.10

Date: 1/12/12

APN: 522-321-37

Hole Size: 3'X6'

Excavation Method: Backhoe

Test Hole #: TP-1

Logged by: J. McKnight

DESCRIPTION & REMARKS	COLOR	MOISTURE	CONSIST.	SOIL TYPE - USCS	DEPTH	PROFILE	SAMPLE TYPE / NUMBER	BLOWS / FT	WATER CONTENT %	UNIT DRY WEIGHT, PSF
Topsoil w/ Roots & Organics	DK BRN	Damp	Soft							
Loamy Sand	BRN	Moist	Med	SM	-1					
					-2					
					-3					
					-4		TP-1A			
Sandy Gravel	Grey	Moist	Med	GS	-5					
					-6					
					-7		TP-1B			
					-8					
					-9					
No Bedrock Observed					-10					

SOIL EXPLORATION LOG

Project Name: WC Wastewater

Project No: 209.10

Date: 1/12/12

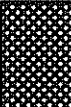
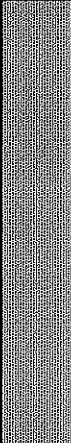



APN: 522-321-37

Hole Size: 3'X6'

Excavation Method: Backhoe

Test Hole #: TP-2

Logged by: J. McKnight

DESCRIPTION & REMARKS	COLOR	MOISTURE	CONSIST.	SOIL TYPE - USCS	DEPTH	PROFILE	SAMPLE TYPE / NUMBER	BLOWS / FT	WATER CONTENT %	UNIT DRY WEIGHT, PSF
Topsoil w/ Roots & Organics	DK BRN	Damp	Soft							
Loamy Sand	BRN	Moist	Med	SM	-1 -2 -3 -4 -5		 TP-2A			
Sandy Gravel	Grey	Moist	Med	GS	-5 -6 -7 -8 -9 -10		 TP-2B			
No Bedrock Observed										

SOIL EXPLORATION LOG

Project Name: WC Wastewater

Project No: 209.10

Date: 1/12/12

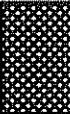
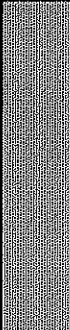



APN: 522-321-37

Hole Size: 3'X6'

Excavation Method: Backhoe

Test Hole #: TP-3

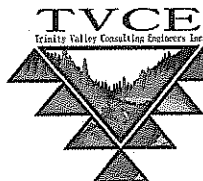
Logged by: J. McKnight

DESCRIPTION & REMARKS	COLOR	MOISTURE	CONSIST.	SOIL TYPE - USCS	DEPTH	PROFILE	SAMPLE TYPE / NUMBER	BLOWS / FT	WATER CONTENT %	UNIT DRY WEIGHT, PSF
Topsoil w/ Roots & Organics	DK BRN	Damp	Soft							
Sandy Loam	BRN	Moist	Med	SM	-1 -2 -3 -4		 TP-3A			
Sandy Gravel with rounded cobbles to 6" in diameter	Grey	Moist	Med	GS GS	-4 -5 -6 -7 -8 -9 -10		 TP-3B			
No Bedrock Observed										

Attachment 3

Soil Textural Analysis





Date: 01/18/2012

Report to: Willow Creek Community Services District
Post Office Box 8
Willow Creek, CA 95573

RE: Veteran's Park – Kimtu Road
Willow Creek, California 95573

APN: 522-321-37 Hole #: TP-1A & 1B Depth: 4' & 7' Sample Description: Soil

Sampled By: J. McKnight Date Tested: 01/18/2012 Date Sampled: 01/12/2012

SOILS EXAMINATION FOR SOIL PERCOLATION SUITABILITY

Textural Analysis		TP-1A	TP-1B
	Sand:	86%	88%
	Clay:	02%	05%
	Silt:	12%	07%
	Zone Classification:	1	1

Bulk Density: N/A

Comments:

Zone 1 - Soils in this zone are very high in sand content. They readily accept effluent, but because of their low silt and clay content, they provide minimal filtration. These soils demand greater separation distances from ground water.

Zone 2 - Soils in this zone provide adequate percolation rates and filtration to effluent. They are suitable for use of a conventional system without further testing.

Zone 3 - Soils in this zone are expected to provide filtration of effluent, but their ability at a suitable rate is questionable. These soils require wet-weather percolation tests to verify their suitability for effluent disposal by conventional leachfield methods.

Zone 4 - Soils in this zone are unsuitable for a conventional leachfield because of their severe limitations for accepting effluent.


Josh McKnight, P.E.

Soil Texture Analysis Worksheet

Job Name: Willow Creek Community Services District

Location: Veterans Park

Performed By: J. McKnight

Hole #	TP-1A	TP-1B
Depth (ft)	4'	7'
Oven Dry Weight (g)	99.9	99.9
Starting Time	1150	1145
Temp @ 40 Sec	65	63
Hydrometer Reading @ 40 sec	21	19
Composite Correction	7.1	7.5
True Density @ 40 sec	13.9	11.5
Temp @ 2 Hours	67	67
Hydrometer Reading @ 2 Hours	08	11
Composite Correction	6.5	6.5
True Density @ 2 hours	1.5	4.5
% Sand	86	88
% Clay	2	5
% Silt	12	7
Soil Zone	1	1
Classification	Loamy Sand	Sand

Job Name: Willow Creek Community Services District
Location: Veterans Park

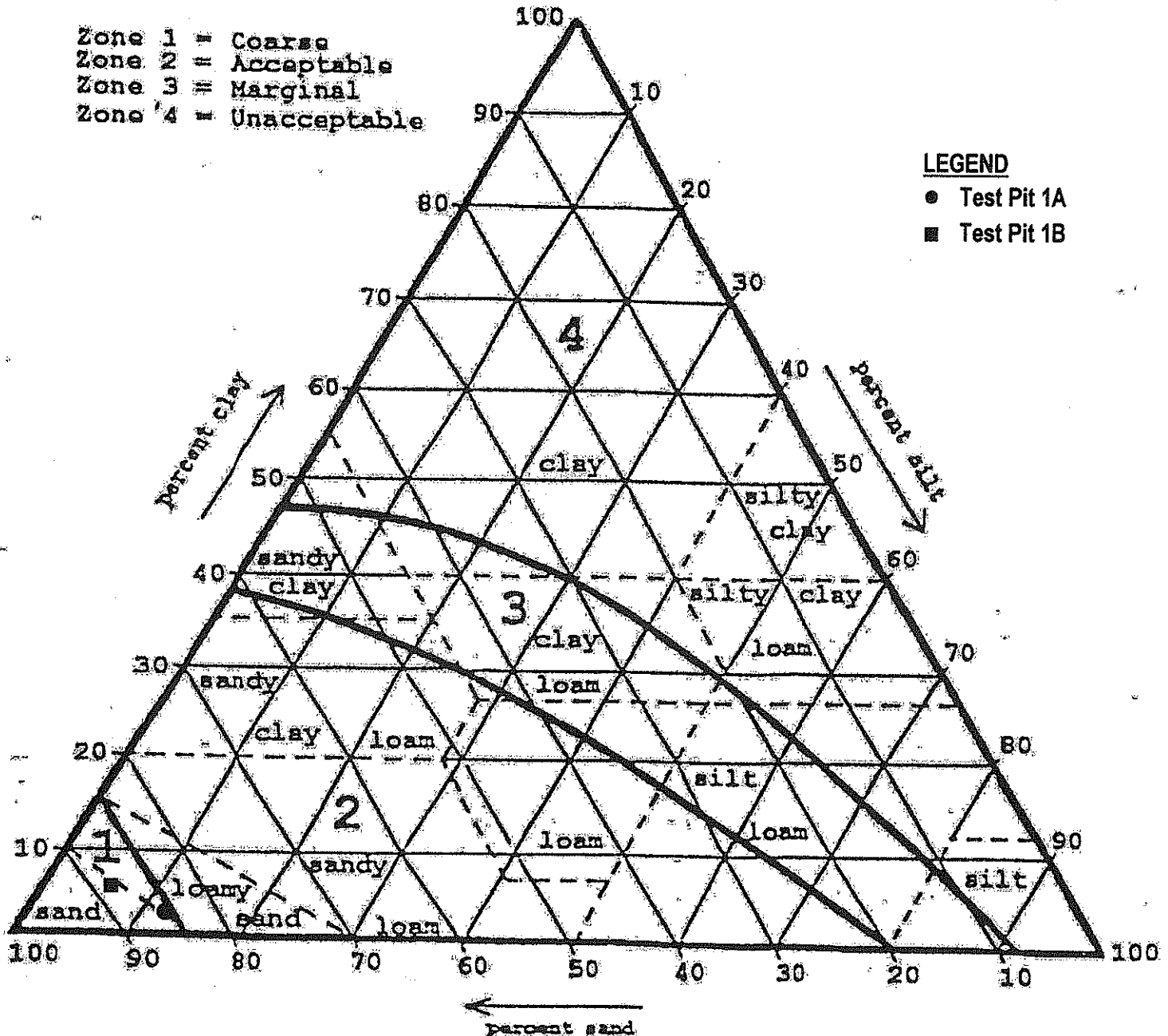
Test Pit Number	TP-1A	TP-1B
Percolation Rate (minutes per inch)	15	6
Application Rate (gallons per day per square foot)	0.8	1.1

Willow Creek Community Services District
Location: Veterans Park

Zone 1 = Coarse
Zone 2 = Acceptable
Zone 3 = Marginal
Zone 4 = Unacceptable

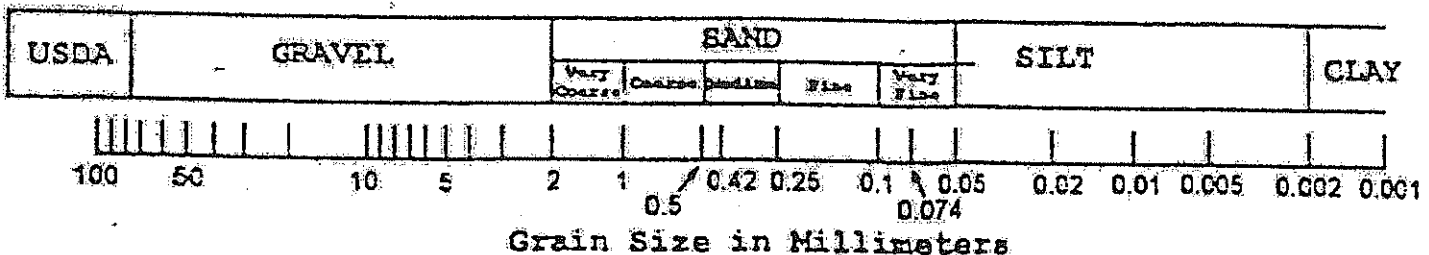
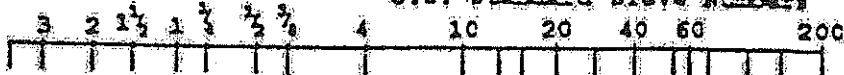
LEGEND

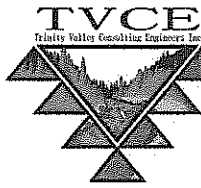
● Test Pit 1A
■ Test Pit 1B



Sieve Openings in Inches

U.S. Standard Sieve Numbers





Date: 01/18/2012

Report to: Willow Creek Community Services District
Post Office Box 8
Willow Creek, CA 95573

RE: Veteran's Park – Kimtu Road
Willow Creek, California 95573

APN: 522-321-37 Hole #: TP-2A & 2B Depth: 2' & 6' Sample Description: Soil

Sampled By: J. McKnight Date Tested: 01/18/2012 Date Sampled: 01/12/2012

SOILS EXAMINATION FOR SOIL PERCOLATION SUITABILITY

Textural Analysis	TP-2A	TP-2B
Sand:	80%	91%
Clay:	05%	02%
Silt:	15%	07%
Zone Classification:	2	1

Bulk Density: N/A

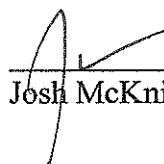
Comments:

Zone 1 - Soils in this zone are very high in sand content. They readily accept effluent, but because of their low silt and clay content, they provide minimal filtration. These soils demand greater separation distances from ground water.

Zone 2 - Soils in this zone provide adequate percolation rates and filtration to effluent. They are suitable for use of a conventional system without further testing.

Zone 3 - Soils in this zone are expected to provide filtration of effluent, but their ability at a suitable rate is questionable. These soils require wet-weather percolation tests to verify their suitability for effluent disposal by conventional leachfield methods.

Zone 4 - Soils in this zone are unsuitable for a conventional leachfield because of their severe limitations for accepting effluent.


Josh McKnight, P.E.

Soil Texture Analysis Worksheet

Job Name: Willow Creek Community Services District

Location: Veterans Park

Performed By: J. McKnight

Hole #	TP-2A	TP-2B
Depth (ft)	2'	6'
Oven Dry Weight (g)	99.9	99.9
Starting Time	1255	1245
Temp @ 40 Sec	67	66
Hydrometer Reading @ 40 sec	26	16
Composite Correction	6.5	6.9
True Density @ 40 sec	19.5	9.1
Temp @ 2 Hours	72	71
Hydrometer Reading @ 2 Hours	11	08
Composite Correction	5.7	5.9
True Density @ 2 hours	5.3	2.1
% Sand	80	91
% Clay	5	2
% Silt	15	7
Soil Zone	2	1
Classification	Loamy Sand	Sand

Job Name: Willow Creek Community Services District
Location: Veterans Park

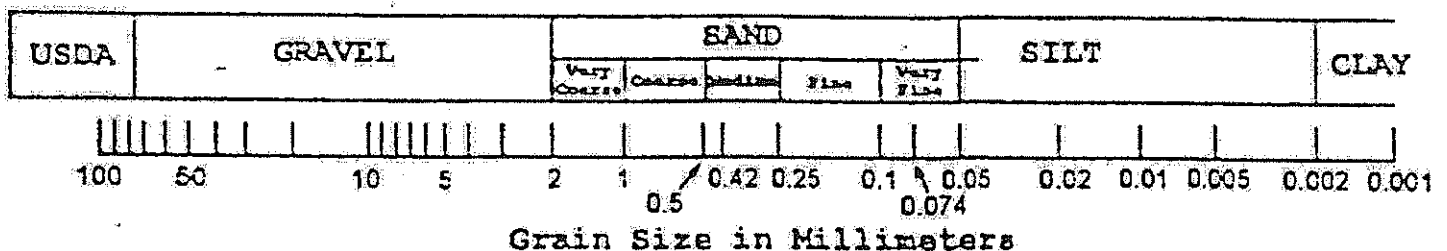
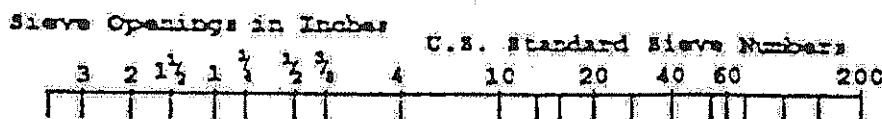
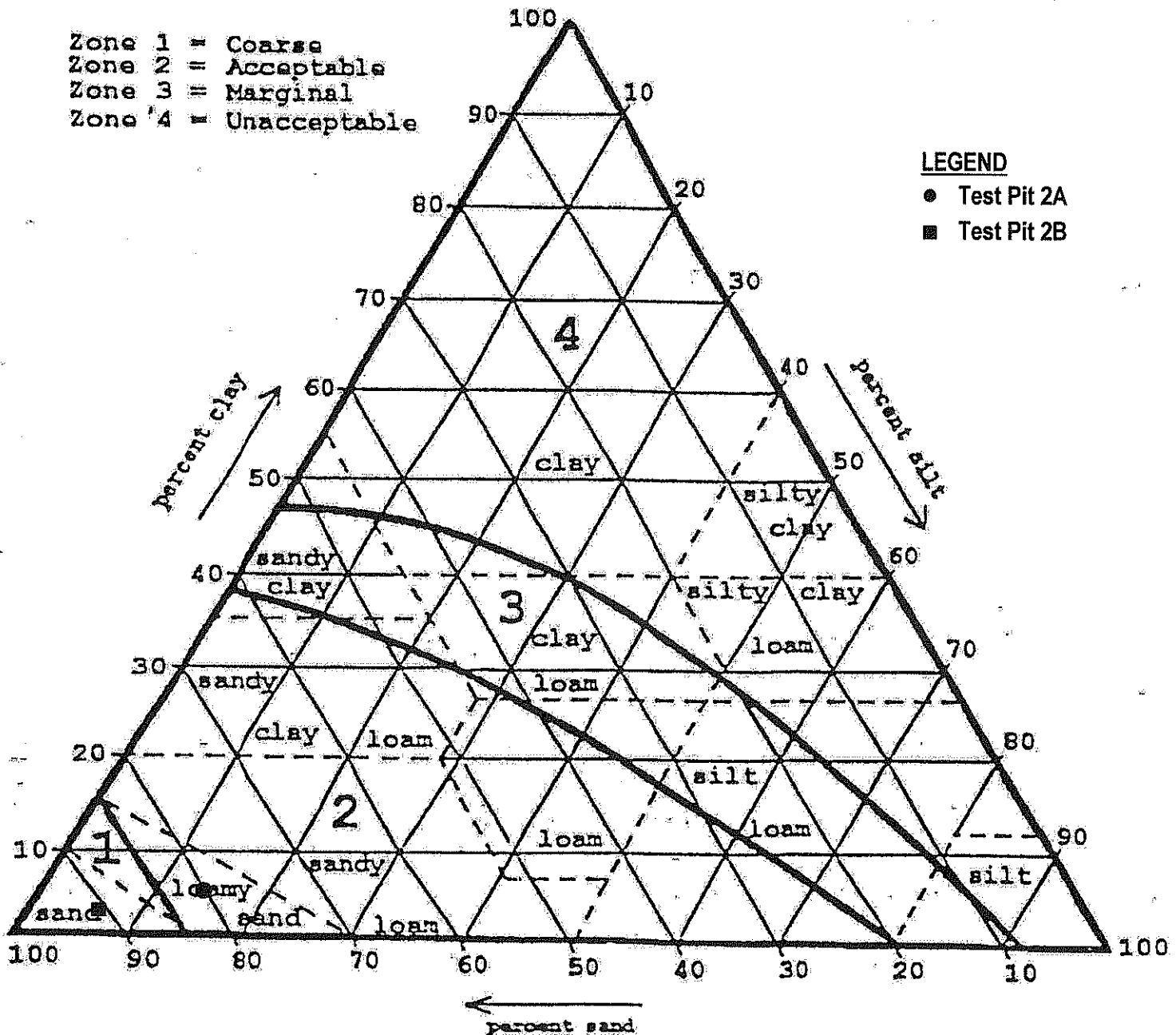
Test Pit Number	TP-2A	TP-2B
Percolation Rate (minutes per inch)	15	6
Application Rate (gallons per day per square foot)	0.8	1.1

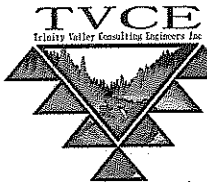
Willow Creek Community Services District
Location: Veterans Park

Zone 1 = Coarse
Zone 2 = Acceptable
Zone 3 = Marginal
Zone 4 = Unacceptable

LEGEND

- Test Pit 2A
- Test Pit 2B





Date: 01/18/2012

Report to: Willow Creek Community Services District
Post Office Box 8
Willow Creek, CA 95573

RE: Veteran's Park – Kimtu Road
Willow Creek, California 95573

APN: 522-321-37 Hole #: TP-3A & 3B Depth: 2' & 6' Sample Description: Soil

Sampled By: J. McKnight Date Tested: 01/18/2012 Date Sampled: 01/12/2012

SOILS EXAMINATION FOR SOIL PERCOLATION SUITABILITY

Textural Analysis

	TP-3A	TP-3B
Sand:	69%	91%
Clay:	11%	02%
Silt:	20%	07%
Zone Classification:	2	1

Bulk Density: N/A

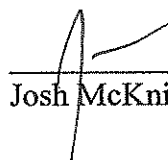
Comments:

Zone 1 - Soils in this zone are very high in sand content. They readily accept effluent, but because of their low silt and clay content, they provide minimal filtration. These soils demand greater separation distances from ground water.

Zone 2 - Soils in this zone provide adequate percolation rates and filtration to effluent. They are suitable for use of a conventional system without further testing.

Zone 3 - Soils in this zone are expected to provide filtration of effluent, but their ability at a suitable rate is questionable. These soils require wet-weather percolation tests to verify their suitability for effluent disposal by conventional leachfield methods.

Zone 4 - Soils in this zone are unsuitable for a conventional leachfield because of their severe limitations for accepting effluent.


Josh McKnight, P.E.

Soil Texture Analysis Worksheet

Job Name: Willow Creek Community Services District

Location: Veterans Park

Performed By: J. McKnight

Hole #	TP-3A	TP-3B
Depth (ft)	2'	6'
Oven Dry Weight (g)	99.9	99.9
Starting Time	1140	1250
Temp @ 40 Sec	69	67
Hydrometer Reading @ 40 sec	37	15
Composite Correction	6.3	6.5
True Density @ 40 sec	30.7	8.5
Temp @ 2 Hours	67	71
Hydrometer Reading @ 2 Hours	17	08
Composite Correction	6.5	5.9
True Density @ 2 hours	10.5	2.1
% Sand	69	91
% Clay	11	2
% Silt	20	7
Soil Zone	2	1
Classification	Sandy Loam	Sand

Job Name: Willow Creek Community Services District
Location: Veterans Park

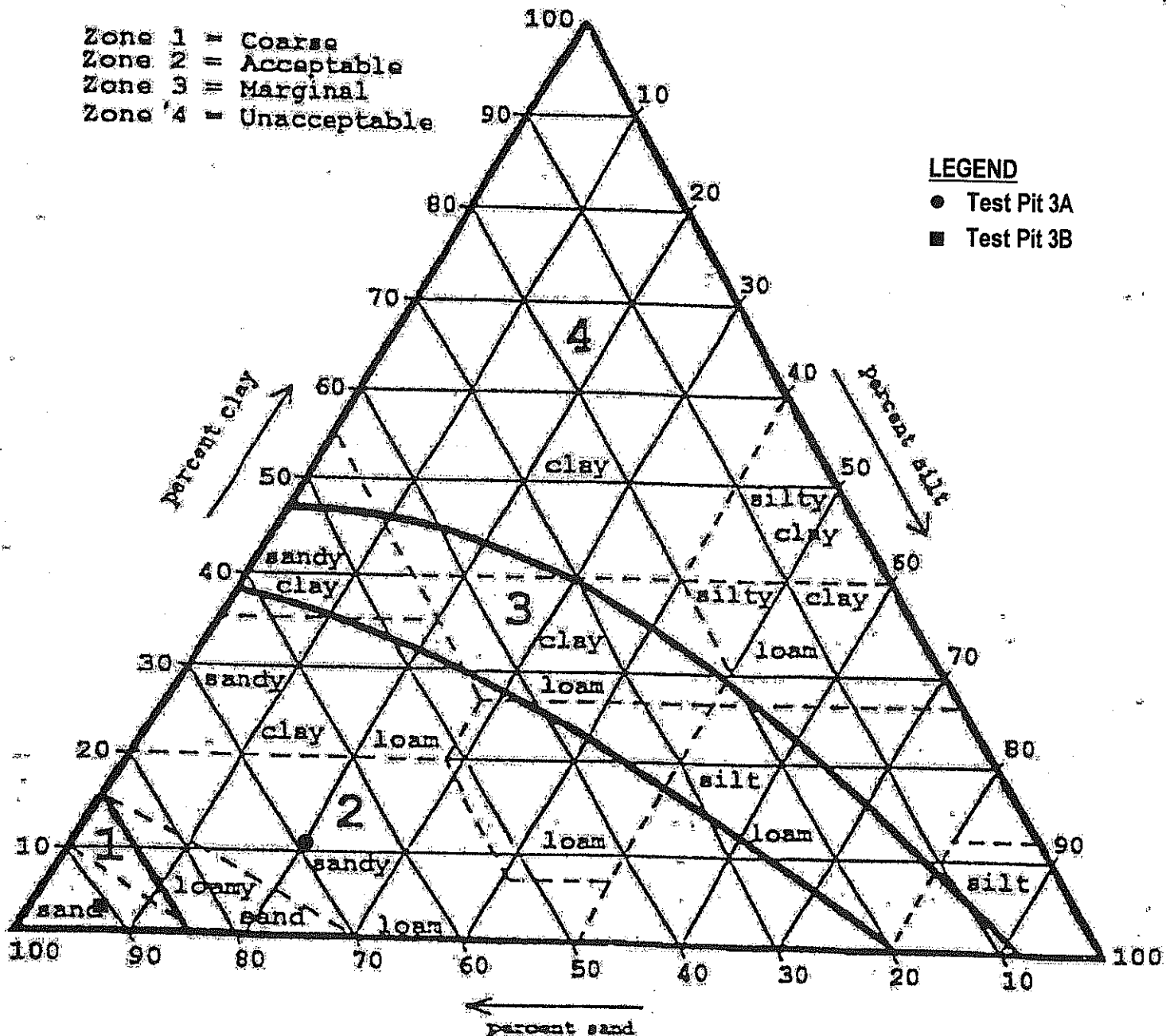
Test Pit Number	TP-3A	TP-3B
Percolation Rate (minutes per inch)	16	6
Application Rate (gallons per day per square foot)	0.7	1.1

Willow Creek Community Services District
Location: Veterans Park

Zone 1 = Coarse
Zone 2 = Acceptable
Zone 3 = Marginal
Zone 4 = Unacceptable

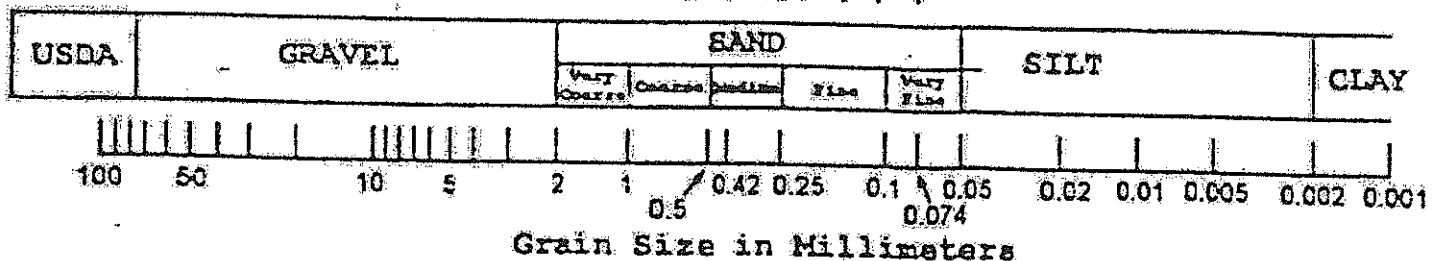
LEGEND

- Test Pit 3A
- Test Pit 3B



Sieve Openings in Inches

U.S. Standard Sieve Numbers



Appendix B – GHD Test Pit Logs

FIELD SOIL BORING AND WELL LOG

GHD-TPI

Project Name: <u>WILLOW CREEK CSD</u>	Project No.: <u>8410746.04</u>	Sheet of <u>1</u>
Method of Drill: <u>EXCAVATOR</u>	Location: <u>MILL SITE</u>	
Boring Diameter: <u>TEST PIT = APPROX 4 FEET WIDE</u>	Logged By: <u>ANNA GROWER</u>	
Drilling Co: <u>KEN SMITH</u>	Total Depth of Hole: <u>13 FEET BGS</u>	
Vegetation: <u>BARE GROUND / SPARSE GRASS</u>	Date: <u>25 MARCH 2014</u>	
Aspect: <u>~ 2%</u>	Depth to Groundwater: <u>APPROXIMATELY 13 FEET BGS</u>	
Slope: <u>SAMPLES AT 5 FEET BGS AND 13 FEET BGS</u>		

Soil Description				Comments	Depth	GHD-MW-1 Well Diagram TOC: 30" AGS
Description & Remarks	Color (moist)	Moisture	Structure			
GRAVELLY LOAMY SAND	7.5Y 4/2	DRY	MASSIVE COMPACTED		1'	
SANDY LOAM	7.5Y 3/1	DRY	MASSIVE COMPACTED		2'	
					3'	
					4'	
SANDY LOAM	7.5Y 4/2	DRY	SINGLE GRAIN		5'	2" BLANK PIC FROM 30" AGS TO 8 FEET BGS
	7.5Y 4/2	DRY	SINGLE GRAIN	* SAMPLE	6'	
GRAVELLY SAND					7'	
	7.5Y 4/2	DRY	SINGLE GRAIN	SUBROUND GRAVEL (~20%)	8'	
					9'	2" FACTORY SLOTTED PIC FROM 8-13 FEET BGS
	5YR 4/6	DRY → MOIST	SINGLE GRAIN	APPROX. 70% SUBROUND GRAVEL	10'	
				* SAMPLE	11'	
					12'	
BEDROCK				GROUNDWATER ENCOUNTERED AT APPROX. 13 FEET BGS	13'	
					14'	ENDCAP W/ HOLE WRAPPED IN GEOFABRIC
					15'	





FIELD SOIL BORING AND WELL LOG

Pit ID: GHD-TP2

Sheet 1 of 2

Project Name: Willow Creek CSD

Project No.: 8410746-04

Method of Drill: excavator

Location: Mill Site

Boring Diameter: pit

Logged By: LLW

Drilling Co.: Kers Water Tender

Date: 3/25/14

Driller Name: Kenny Smith

Total Depth of Hole: 16.5' bgs

Vegetation: bare ground / grass

Depth to Groundwater: 16.5' bgs

Slope/Aspect: < 2%

Soil Map Unit:

Samples: 5-5.5' and 8-8.5'

Matches Map Unit ☐ Yes ☐ No ☐ Maybe

Soil Description

Description & Remarks	Color (moist)	Moisture	Structure	Comments	Depth	GHD-MW2 Well Diagram
gravelly loamy sand	2.5Y3/2	dry	massive compacted	Gravel 30% Cobbles 10% Color mixed from source	1'	TOC = 29% →
sandy loam	10YR2/2		"	gravel 5% wood debris 50%	2'	0-11.5' 2" SCH 40 Solid PVC →
sand	5Y3/2		single grain	gravel 20%	4'	
sand	2.5Y3/3		to 1 fsk	gravel 20%	5'	* Sample →
course sand	5Y5/1			gravel 20%	7'	
				* Sample →	8'	
					9'	
					10'	
					11'	
					12'	11.5-16.5' 2" factory slotted PVC →
					13'	
					14'	
					15'	

[illegible]



FIELD SOIL BORING AND WELL LOG

Project Name: Willow Creek CSD		Project No.: 8410746-04		Pit ID: GHD-TP3	
Method of Drill: excavator		Location: Mill Site		Sheet 1 of 1	
Boring Diameter: pit		Logged By: LLW			
Drilling Co.: Kensi Water Tender		Date: 3/25/14			
Driller Name: Kenny Smith (owner)		Total Depth of Hole: 14.0' bgs			
Vegetation: bare / sparse grass		Depth to Groundwater: 13.0' bgs			
Slope/Aspect: <2%		Soil Map Unit:			
Samples: 6-6.5' and 10-10.5'		Matches Map Unit		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Maybe	

Soil Description				Comments	Depth	GHD-MW3 Well Diagram TOC = 14' bgs →
Description & Remarks	Color (moist)	Moisture	Structure			
gravelly Sandy clay loam	2.5Y4/2	dry	massive to lf sbk	20% gravels	1'	
					2'	
					3'	
					4'	
					5'	
Sandy loam	2.5Y3/2		lf sbk	10% gravels	6'	* Sampled →
					7'	
					8'	
gravelly Sandy clay loam	2.5Y3/2		lf sbk	20% gravels 5-10% cobbles	9'	* Sampled →
					10'	
					11'	
					12'	
					13'	
					14'	endcap w/ hole wrapped in geofabric →
		terminated at 14.0'		groundwater encountered ~13' bgs	15'	

FIELD SOIL BORING AND WELL LOG

GHD-TP4

Project Name: <u>WILLOW CREEK CSD</u>	Project No.: <u>8410746.04</u>	Sheet 1 of 1
Method of Drill: <u>BACKHOE</u>	Location: <u>STOCKEL PROPERTY</u>	
Boring Diameter: <u>TEST PIT WIDTH = ~4 FEET</u>	Logged By: <u>ANNA GOWER</u>	
Drilling Co: <u>KEN SMITH</u>	Total Depth of Hole: <u>12 FEET BAGS</u>	
Vegetation: <u>GRASS</u>	Date: <u>25 MARCH 2014</u>	
Aspect: <u>< 2%</u>	Depth to Groundwater: <u>NOT ENCOUNTERED</u>	
Slope: <u>SAMPLES AT 3 FEET AND 7 FEET BAGS</u>		

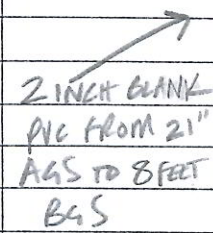
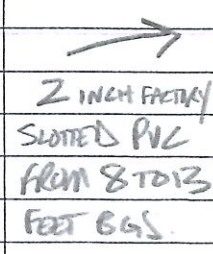
Soil Description				Comments	Depth	GHD-MW4 Well Diagram TOC = 38" A.G.S.
Description & Remarks	Color (moist)	Moisture	Structure			
SILT LOAM	7.5Y 5/10	DRY	1FSBK		1'	
					2'	
					3'	
				* SOIL SAMPLE →	4'	→ 2" BLANK PVC FROM
GRAVELLY SILT LOAM	7.5Y 5/10	DRY	1FSBK	APPROX. 15% SUBROUNDED GRAVEL	5'	38" A.G.S. TO 7 FEET BAGS.
					6'	
GRAVELLY SILT LOAM	7.5Y 4/2	DRY	1FSBK	APPROX. 30% SUBROUNDED GRAVEL	7'	
				* SOIL SAMPLE →	8'	
					9'	→ 2" FACTORY SLOTTED PVC FROM 7 FEET TO 12 FEET BAGS.
					10'	
					11'	
					12'	
					13'	ENDCAP w/ HOLE WRAPPED IN GEO FABRIC
					14'	
					15'	



FIELD SOIL BORING AND WELL LOG

GHD-TPS

Project Name: <u>WILLOW CREEK CSD</u>	Project No.: <u>8410746.04</u>	Sheet of <u>1</u>
Method of Drill: <u>BACKHOE</u>	Location: <u>STOCKEL PROPERTY</u>	
Boring Diameter: <u>TEST PIT WIDTH: 4 FEET</u>	Logged By: <u>ANNA GOWER</u>	
Drilling Co: <u>KEN SMITH</u>	Total Depth of Hole: <u>13 FEET BGS</u>	
Vegetation: <u>GRASS</u>	Date: <u>25 MARCH 2014</u>	
Aspect: <u>< 2°D</u>	Depth to Groundwater: <u>NOT ENCOUNTERED</u>	
Slope: <u>SAMPLES AT 5 FEET AND 9 FEET BGS</u>		

Soil Description				Comments	Depth	GHD-MWS Well Diagram
Description & Remarks	Color (moist)	Moisture	Structure			
<u>SILT LOAM</u>	<u>7.5Y</u> <u>5/6</u>	<u>DRY</u>	<u>MASSIVE COMPACTED</u>			<u>TOL: 21" AGS</u> 
					1'	
					2'	
					3'	
					4'	
				<u>* SAMPLE</u>	5'	
					6'	
					7'	
<u>GRAVELLY SILT LOAM</u>	<u>7.5Y</u> <u>4/2</u>	<u>DRY</u>	<u>MASSIVE COMPACTED PARTING TO SINGLE GRAIN</u>	<u>APPROX 30% SUBROUNDED GRAVEL</u>		
					8'	
					9'	
				<u>* SAMPLE</u>	10'	
					11'	
					12'	
					13'	
					14'	
	<u>BOTTOM OF EXCAVATION. GROUNDWATER WAS NOT ENCOUNTERED IN THIS TEST PIT.</u>				15'	<u>ENDCAP w/ HOLE WRAPPED IN GHD FABRIC.</u>



FIELD SOIL BORING AND WELL LOG

GHD-TP6

Project Name: <u>WILLOW CREEK CSD</u>	Project No.: <u>8410746.04</u>	Sheet of 1
Method of Drill: <u>BACK HOE</u>	Location: <u>TRINITY VALLEY ELEMENTARY SCHOOL</u>	
Boring Diameter: <u>TEST PIT WIDTH - 4 FEET EGS</u>	Logged By: <u>ANNA GOWEN</u>	
Drilling Co: <u>TIM LA LONDE CONSTRUCTION</u>	Total Depth of Hole: <u>14 FEET EGS</u>	
Vegetation: <u>GRASS</u>	Date: <u>19 MAY 2014</u>	
Aspect: <u>< 2%</u>	Depth to Groundwater: <u>NOT ENCOUNTERED</u>	
Slope: <u>SAMPLES AT 3 FEET AND 10 FEET EGS</u>		

Soil Description				Comments	Depth	GHD-MW-U Well Diagram TOL = 32" AGS	
Description & Remarks	Color (moist)	Moisture	Structure				
<u>SAND</u>	<u>2.5Y</u> <u>3/3</u>	<u>DRY</u>	<u>MASSIVE</u> <u>COMPACTED</u>		1'		
				<u>CEMENTED GRAVEL LAYER</u>	2'		
<u>CEMENTED GRAVEL LAYER</u>	<u>-</u>	<u>DRY</u>	<u>-</u>				
<u>GRAVELLY SAND</u>	<u>2.5Y</u> <u>3/2</u>	<u>DRY</u>	<u>MASSIVE</u> <u>COMPACTED</u>	<u>APPROX 15% 3/8" - 3/4" SUBROUNDED GRAVEL</u> <u>*SOIL SAMPLE</u>	3'	<u>2" BLANK PIC FROM</u>	
					4'	<u>32" AGS TO</u>	
<u>SANDY GRAVEL</u>	<u>2.5Y</u> <u>3/3</u>	<u>DRY →</u> <u>MOIST</u>	<u>SINGLE GRAIN</u>	<u>APPROX 85% SUBROUNDED GRAVEL w/ COBBLES UP TO 18" IN DIAMETER</u>	5'	<u>4 FEET EGS</u>	
					6'		
					7'		
					8'		
				<u>MOISTURE ON GRAVEL OBSERVED</u>	9'	<u>2" →</u> <u>PROXY SLOTTED PIC FROM 4 TO</u>	
					10'	<u>14 FEET EGS</u>	
				<u>*SOIL SAMPLE</u>	11'		
					12'		
					13'		
					14'		
				<u>BOTTOM OF EXCAVATION WAS NOT ENCOUNTERED</u>	15'	<u>END CAP w/ HOLE WRAPPED IN GEOTEXTILE</u>	



FIELD SOIL BORING AND WELL LOG

GHD TP7

Project Name: <u>WILLOW CREEK CSD</u>	Project No.: <u>8410746.04</u>	Sheet 1 of 1
Method of Drill: <u>BACK HOE</u>	Location: <u>TRINITY VALLEY ELEMENTARY SCHOOL</u>	
Boring Diameter: <u>APPROX 4 FEET WIDE</u>	Logged By: <u>ANNA GROWER</u>	
Drilling Co: <u>TIM LALONBE CONSTRUCTION</u>	Total Depth of Hole: <u>18 FEET BGS</u>	
Vegetation: <u>GRASS</u>	Date: <u>19 MAY 2014</u>	
Aspect: <u>< 2%</u>	Depth to Groundwater: <u>NOT ENCOUNTERED</u>	
Slope: <u>SAMPLES AT 4 FEET BGS</u>		

Soil Description				Comments	Depth	Well Diagram NO WELL COMPLETED
Description & Remarks	Color (moist)	Moisture	Structure			
<u>SAND</u>	<u>2.5Y 3/2</u>	<u>DRY</u>	<u>MASSIVE COMPACTED</u>		1'	
<u>SAND w/ GRAVEL</u>	<u>2.5Y 3/3</u>	<u>DRY</u>	<u>SINGLE GRAIN</u>	<u>APPROX 15% 3/8" TO 3/4" SUBROUND GRAVEL</u>	2'	
<u>GRAVELLY SAND</u>	<u>2.5Y 3/3</u>	<u>DRY</u>	<u>SINGLE GRAIN</u>	<u>APPROX 25% 3/8" TO 3/4" SUBROUND GRAVEL</u>	3'	
					4'	
					5'	
					6'	
					7'	
					8'	
				<u>COBBLES (UP TO 10" DIAMETER) AT APPROX 8 FEET BGS</u>	9'	
					10'	
					11'	
					12'	
					13'	
					14'	
<u>SAND</u>	<u>2.5Y 3/2</u>	<u>DRY-MOIST</u>	<u>SINGLE GRAIN</u>		15'	

BOTTOM OF EXCAVATION AT APPROXIMATELY 18 FEET BGS. GROUNDWATER WAS NOT ENCOUNTERED. A WELL WAS NOT COMPLETED IN THIS TEST PIT.



FIELD SOIL BORING AND WELL LOG

GHD-TP8

Project Name: <u>WILLOW CREEK CSD</u>	Project No.: <u>8410746.04</u>	Sheet 1 of 1
Method of Drill: <u>BACKHOE</u>	Location: <u>TRINITY VALLEY ELEMENTARY SCHOOL</u>	
Boring Diameter: <u>APPROX 4 FEET WIDE</u>	Logged By: <u>ANNA GROWER</u>	
Drilling Co: <u>TIM LALANDE CONSTRUCTION</u>	Total Depth of Hole: <u>16.5 FEET BGS</u>	
Vegetation: <u>GRASS</u>	Date: <u>19 MAY 2014</u>	
Aspect: <u>< 2%</u>	Depth to Groundwater: <u>NOT ENCOUNTERED</u>	
Slope: <u>SAMPLES AT 4 FEET, 10 FEET, AND 16.5 FEET BGS</u>		

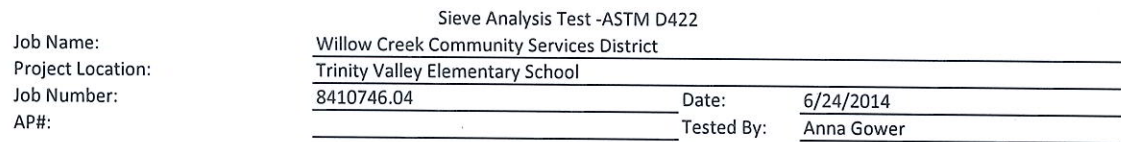
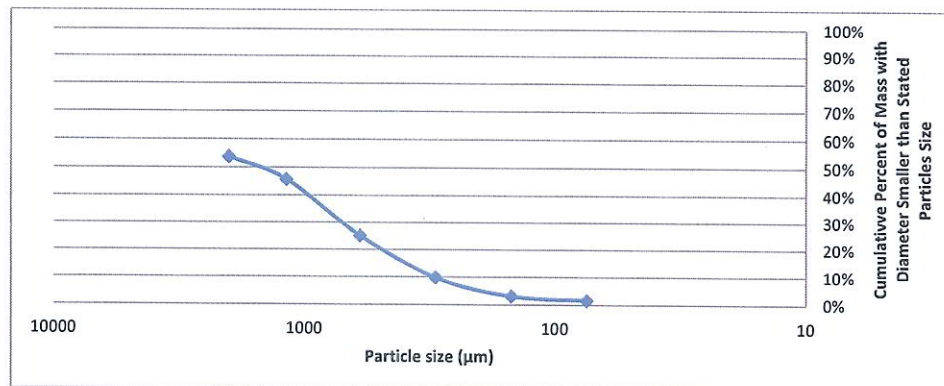
Soil Description				Comments	Depth	GHD-MW-1 Well Diagram	
Description & Remarks	Color (moist)	Moisture	Structure			TDC: 2.8' AQS	
<u>SAND</u>	<u>2.5Y</u> <u>3/3</u>	<u>DRY</u>	<u>MASSIVE COMPACTED</u>	<u>APPROX 5% SUBROUNDED GRAVEL</u>	1'		
<u>GRAVELLY SAND</u>	<u>2.5Y</u> <u>3/3</u>	<u>DRY</u>	<u>SINGLE GRAIN</u>	<u>APPROX 25% 3/8" - 3/4" SUBROUNDED GRAVEL</u>	2'		
					3'		
					4'		
<u>SANDY GRAVEL</u>	<u>2.5Y</u> <u>3/3</u>	<u>DRY</u>	<u>SINGLE GRAIN</u>	<u>* SOIL SAMPLE →</u> <u>APPROX 60% SUBROUNDED GRAVEL</u>	5'	<u>2" BLANK PIC FROM 2.8' AQS TO 16.5 FEET BGS</u>	
					6'		
					7'		
					8'		
					9'		
					10'		
				<u>* SOIL SAMPLE →</u>	11'		
					12'	<u>2" FACTORY SLOTTED PIC FROM 16.5 FEET TO 16.5 FEET BGS</u>	
					13'		
					14'		
				<u>SAMPLE AT 16.5 FEET</u>	15'		
		<u>MOIST AT 16 FEET</u>		<u>APPROX AT 16.5 FEET (7.5Y 4/10)</u>			

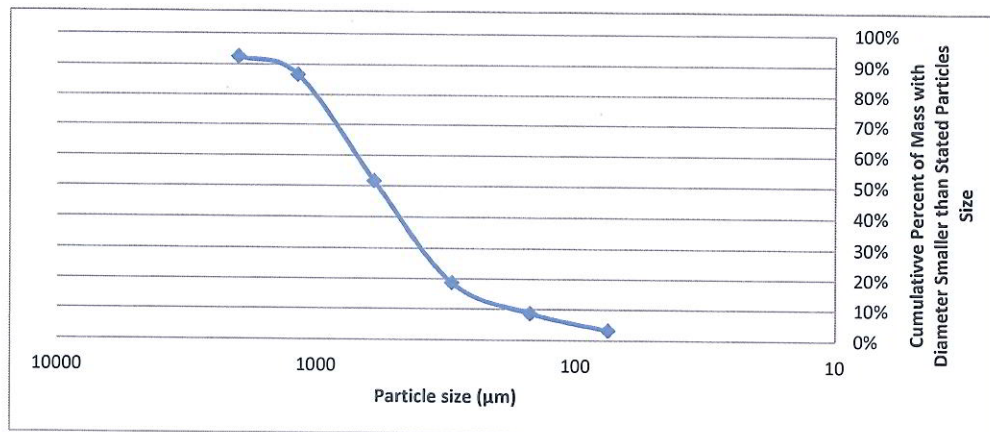
BOTTOM OF EXPLORATION AT 16.5 FEET BGS
GROUND WATER WAS NOT ENCOUNTERED.

ENDCAP w/ HOLE
WRAPPING GEOFABRIC
AT 16.5 FEET BGS



Appendix C – Materials Testing Data Sheets

[illegible]





Sieve Analysis Test -ASTM D422

Job Name:
Project Location:
Job Number:
AP#:

Willow Creek Community Services District

Mill Site

8410746.04

Date: 6/24/2014

Tested By: Anna Gower

Sample #: GHD-TP2 from 5 to 5.5 feet bgs

Soil Description:

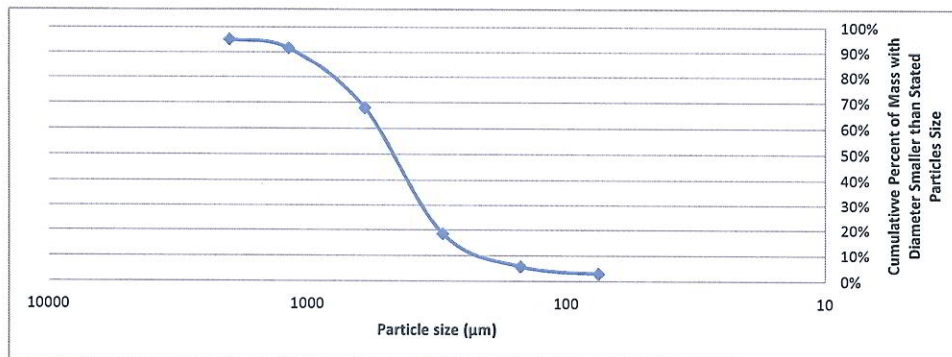
Sand- Soil Percolation Suitability Chart Zone 1

Sample Wt. (dry): 1287.0
grams

Sample Location:

Test pit GHD-TP2 from approximately 5 to 5.5 feet bgs

Sieve Size	Particle Size (μm)	Grams Retained	Cumulative % Retained	Grams Passing	Cumulative % Passing	Comments
10	2000	60.89	5%	1226.11	95%	
16	1180	45.90	8%	1180.21	92%	
30	600	305.34	32%	874.87	68%	
50	300	634.80	81%	240.07	19%	
100	150	166.53	94%	73.54	6%	
200	75	36.67	97%	36.87	3%	



Job Name:
Project Location:
Job Number:
AP#:

Sieve Analysis Test -ASTM D422

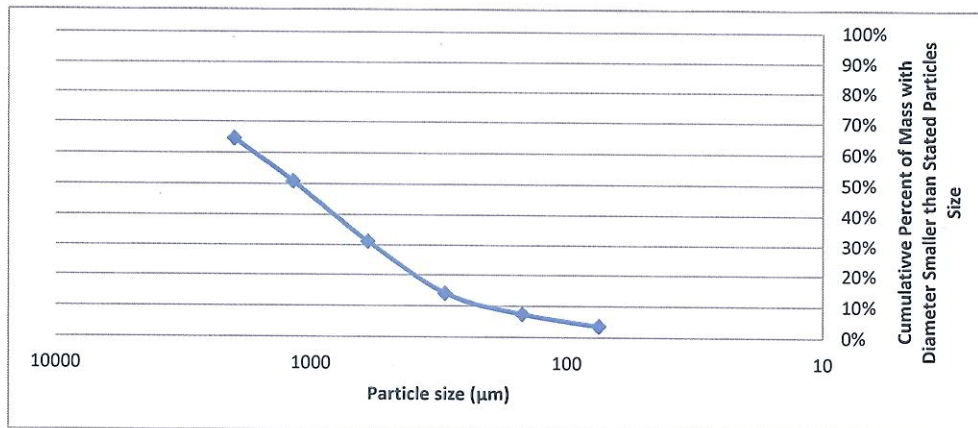
Willow Creek Community Services District
Mill site

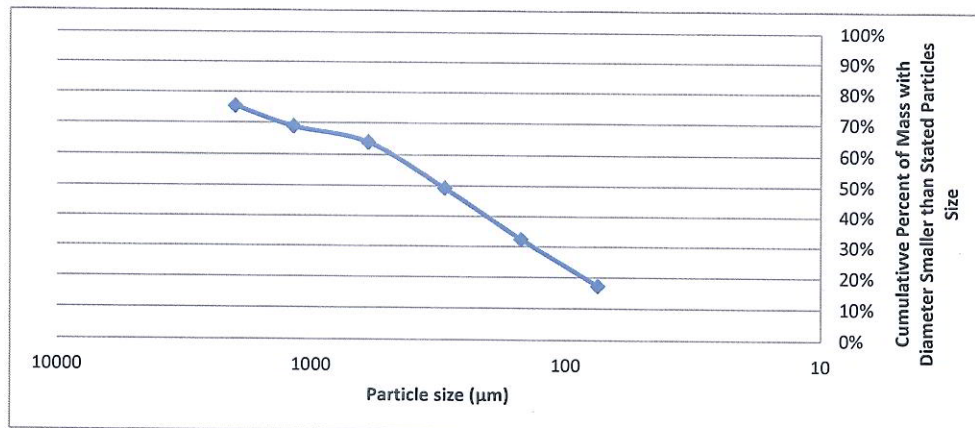
8410746.04

Date: 6/24/2014

Tested By: Anna Gower

Sample #:	GHD-TP3 at 8 feet bgs	Soil Description:	Sand- Soil Percolation Suitability Chart Zone 1
Sample Wt. (dry):	1135.7 grams	Sample Location:	Test pit GHD-TP3 at approximately 8 feet bgs

[illegible]



Sieve Analysis Test -ASTM D422

Job Name:
Project Location:
Job Number:
AP#:

Willow Creek Community Services District
Stockel property

8410746.04

Date: 6/25/2014

Tested By: Anna Gower

Sample #: GHD-TP5 at 5 feet bgs

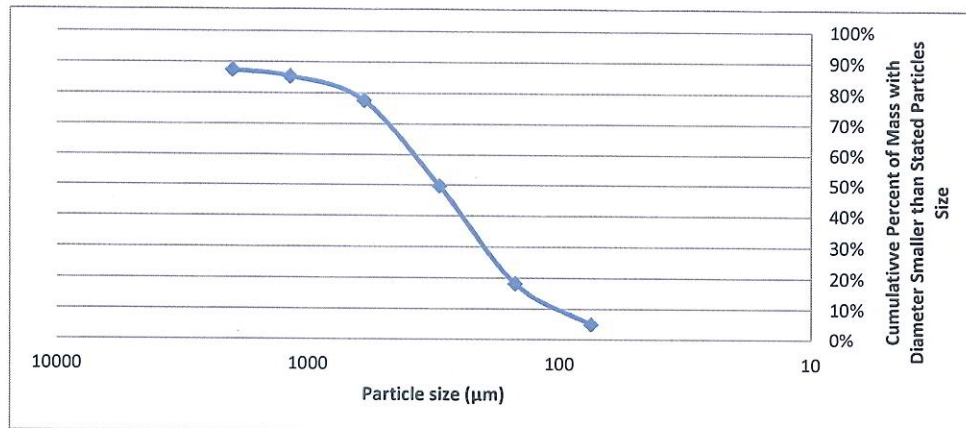
Soil Description:

Sand- Soil Percolation Suitability Chart Zone 1

Sample Wt. (dry):	1311.4
	grams

Sample Location:

Test pit GHD-TP5 at approximately 5 feet bgs

[illegible]

Sieve Analysis Test -ASTM D422

Job Name:

Willow Creek Community Services District

Project Location:

Trinity Valley Elementary School

Job Number:

8410746.04

Date: _____

6/23/2014

AP#:

Tested By:

Anna Gower

Sample #:

GHD-TP8 at 4 feet bgs

Soil Description:

Loamy Sand- Soil Percolation Suitability Chart Zone 2

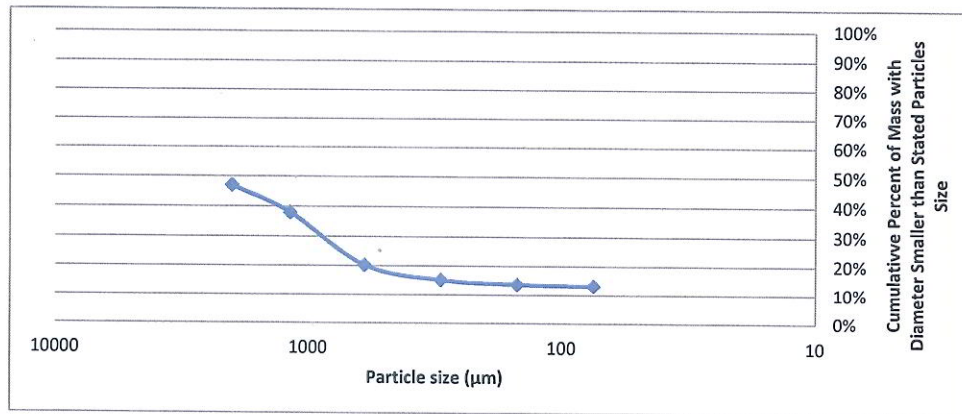
Sample Wt. (dry):

5327.6

Sample Location:

Test pit GHD-TP8 at approximately 4 feet bgs

grams

[illegible]

Appendix D – Groundwater Monitoring Well Log

TABLE 1: Groundwater Monitoring Well Log
Willow Creek CSD Potential Wastewater Disposal Sites



Project: Willow Creek Wastewater
Job No: 12057 / 8410746-04
Site:

Groundwater Monitoring Well Log

Well #/ID	Week	Date	Time	Well Depth ¹ (feet bgs)	TOC ² (feet ags)	DTW ³ (feet)	Water Level ⁴ (feet bgs)	Ground Elevation (feet)	Water Elevation (feet)	Rainfall Past 24 hours	Rainfall >0.6" Past Week	Notes and Initials
GHD-MW1	1	3/28/2014	1530	13.0	2.5	14.5	12.0	531.6	519.7			
	2	4/4/2014	1020	13.0	2.5	14.3	11.8	531.6	519.9	0.02	0.3	
	3	4/11/2014	745	13.0	2.5	DRY	>13	531.6	UNKOWN	0.0	0.0	
	4	4/18/2014	740	13.0	2.5	DRY	>13	531.6	UNKOWN			
	5	4/25/2014	735	13.0	2.5	DRY	>13	531.6	UNKOWN			
	6	5/2/2014	1610	13.0	2.5	DRY	>13	531.6	UNKOWN			
	7	5/9/2014	745	13.0	2.5	DRY	>13	531.6	UNKOWN			
	8	5/16/2014	730	13.0	2.5	DRY	>13	531.6	UNKOWN			
		5/23/2014	725	13.0	2.5	DRY	>13	531.6	UNKOWN			
		5/30/2014	730	13.0	2.5	DRY	>13	531.6	UNKOWN			
GHD-MW2	1	3/28/2014	1530	16.5	2.4	15.4	13.0	532.8	519.8			
	2	4/4/2014	1020	16.5	2.4	15.1	12.7	532.8	520.1	0.02	0.3	
	3	4/11/2014	745	16.5	2.4	15.4	13.0	532.8	519.8	0.0	0.0	
	4	4/18/2014	740	16.5	2.4	DRY	>16.5	532.8	UNKOWN	0.0	0.0	
	5	4/25/2014	735	16.5	2.4	DRY	>16.5	532.8	UNKOWN			
	6	5/2/2014	1610	16.5	2.4	DRY	>16.5	532.8	UNKOWN			
	7	5/9/2014	745	16.5	2.4	16.5	14.0	532.8	518.7			
	8	5/16/2014	730	16.5	2.4	DRY	>16.5	532.8	UNKOWN			
		5/23/2014	725	16.5	2.4	DRY	>16.5	532.8	UNKOWN			
		5/30/2014	730	16.5	2.4	16.9	14.5	532.8	518.3			
GHD-MW3	1	3/28/2014	1530	14.0	1.2	12.3	11.1	530.9	519.8			
	2	4/4/2014	1020	14.0	1.2	12.0	10.9	530.9	520.0	0.02	0.3	
	3	4/11/2014	745	14.0	1.2	DRY	>14	530.9	UNKOWN	0.0	0.0	
	4	4/18/2014	740	14.0	1.2	DRY	>14	530.9	UNKOWN	0.0	0.0	
	5	4/25/2014	735	14.0	1.2	DRY	>14	530.9	UNKOWN			
	6	5/2/2014	1610	14.0	1.2	DRY	>14	530.9	UNKOWN			
	7	5/9/2014	745	14.0	1.2	13.4	12.2	530.9	518.7			
	8	5/16/2014	730	14.0	1.2	DRY	>14	530.9	UNKOWN			
		5/23/2014	725	14.0	1.2	DRY	>14	530.9	UNKOWN			
		5/30/2014	730	14.0	1.2	14.8	13.6	530.9	517.3			
GHD-MW4	1	3/28/2014	1530	12.0	2.5	DRY	>12	538.8	UNKOWN			
	2	4/4/2014	1030	12.0	2.5	DRY	>12	538.8	UNKOWN	0.02	0.3	
	3	4/11/2014	745	12.0	2.5	DRY	>12	538.8	UNKOWN	0.0	0.0	
	4	4/18/2014	740	12.0	2.5	DRY	>12	538.8	UNKOWN	0.0	0.0	
	5	4/25/2014	735	12.0	2.5	DRY	>12	538.8	UNKOWN			
	6	5/2/2014	1610	12.0	2.5	DRY	>12	538.8	UNKOWN			
	7	5/9/2014	745	12.0	2.5	DRY	>12	538.8	UNKOWN			
	8	5/16/2014	730	12.0	2.5	DRY	>12	538.8	UNKOWN			
		5/23/2014	725	12.0	2.5	DRY	>12	538.8	UNKOWN			
		5/30/2014	730	12.0	2.5	DRY	>12	538.8	UNKOWN			
GHD-MW5	1	3/28/2014	1530	13.0	1.8	DRY	>13	533.3	UNKOWN			
	2	4/4/2014	1030	13.0	1.8	DRY	>13	533.3	UNKOWN	0.02	0.3	
	3	4/11/2014	745	13.0	1.8	DRY	>13	533.3	UNKOWN	0.0	0.0	
	4	4/18/2014	740	13.0	1.8	DRY	>13	533.3	UNKOWN	0.0	0.0	
	5	4/25/2014	735	13.0	1.8	DRY	>13	533.3	UNKOWN			
	6	5/2/2014	1610	13.0	1.8	DRY	>13	533.3	UNKOWN			
	7	5/9/2014	745	13.0	1.8	DRY	>13	533.3	UNKOWN			
	8	5/16/2014	730	13.0	1.8	DRY	>13	533.3	UNKOWN			
		5/23/2014	725	13.0	1.8	DRY	>13	533.3	UNKOWN			
		5/30/2014	730	13.0	1.8	DRY	>13	533.3	UNKOWN			
GHD-MW-6	1	5/23/2014	725	14.0	2.7	DRY	>14	Not surveyed	UNKOWN			
	2	5/30/2014	730	14.0	2.7	DRY	>14	Not surveyed	UNKOWN			
	3	6/13/2014	1345	14.0	2.7	DRY	>14	Not surveyed	UNKOWN			
	4											
	5											
	6											
GHD-MW-7	1	5/23/2014	725	16.5	2.8	DRY	>16.5	Not surveyed	UNKOWN			
	2	5/30/2014	730	16.5	2.8	DRY	>16.5	Not surveyed	UNKOWN			
	3	6/13/2014	1345	16.5	2.8	DRY	>16.5	Not surveyed	UNKOWN			
	4											
	5											
	6											

Comments:

- Well depth = measurement from surface to total depth below ground surface (bgs).
- TOC = "Top of Casing", measurement of the above ground portion of top of well casing.
- DTW = "Depth To Water", measurement (in feet) from TOC to groundwater surface.
- Water Level = DTW - TOC



Willow Creek Community Services District

Trinity Valley Elementary School

8410746.04

Date: 6/23/2014

Not applicable

Tested By: Anna Gower

Soil Description:

Sand- Soil Percolation Suitability Chart Zone 1

Sample Location:

Test Pit GHD-TP7 at approximately 4 feet bgs

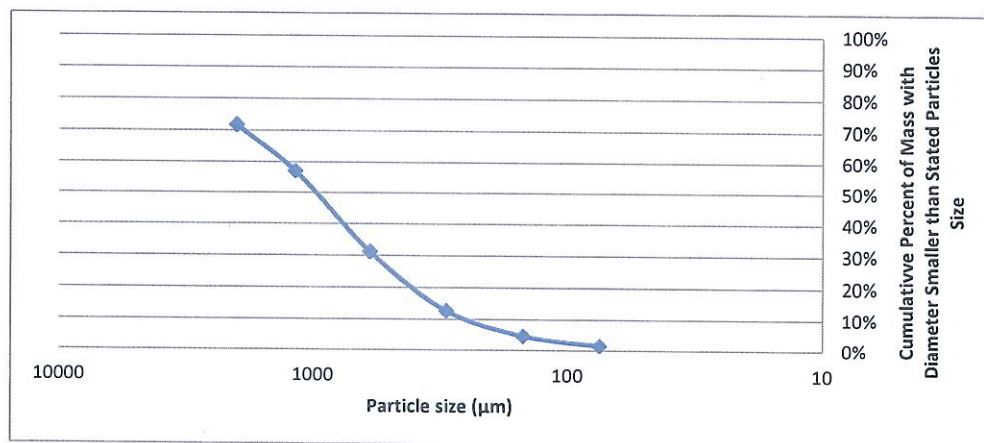


TABLE 1: Groundwater Monitoring Well Log
Willow Creek CSD Potential Waste Disposal Sites



Project:

Willow Creek Wastewater

Job No:

12057 / 8410746-04

Site:

Groundwater Monitoring Well Log

Well #ID	Week	Date	Time	Well Depth ¹ (feet bgs)	TOC ² (feet ags)	DTW ³ (feet)	Water Level ⁴ (feet bgs)	Ground Elevation (feet)	Water Elevation (feet)	Rainfall Past 24 hours	Rainfall >0.5" Past Week	Notes and Initials
GHD-MW1	1	3/28/2014	1530	13.0	2.5	14.5	12.0	531.6	519.7			
	2	4/4/2014	1020	13.0	2.5	14.3	11.8	531.6	519.9	0.02	0.3	
	3	4/11/2014	745	13.0	2.5	DRY	>13	531.6	UNKNOWN	0.0	0.0	
	4	4/18/2014	740	13.0	2.5	DRY	>13	531.6	UNKNOWN			
	5	4/25/2014	735	13.0	2.5	DRY	>13	531.6	UNKNOWN			
	6	5/2/2014	1610	13.0	2.5	DRY	>13	531.6	UNKNOWN			
	7	5/9/2014	745	13.0	2.5	DRY	>13	531.6	UNKNOWN			
	8	5/16/2014	730	13.0	2.5	DRY	>13	531.6	UNKNOWN			
		5/23/2014	725	13.0	2.5	DRY	>13	531.6	UNKNOWN			
		5/30/2014	730	13.0	2.5	DRY	>13	531.6	UNKNOWN			
GHD-MW2		6/13/2014	1545	13.0	2.5	DRY	>13	531.6	UNKNOWN			
	1	3/28/2014	1530	16.5	2.4	15.4	13.0	532.8	519.8			
	2	4/4/2014	1020	16.5	2.4	15.1	12.7	532.8	520.1	0.02	0.3	
	3	4/11/2014	745	16.5	2.4	15.4	13.0	532.8	519.8	0.0	0.0	
	4	4/18/2014	740	16.5	2.4	DRY	>16.5	532.8	UNKNOWN	0.0	0.0	
	5	4/25/2014	735	16.5	2.4	DRY	>16.5	532.8	UNKNOWN			
	6	5/2/2014	1610	16.5	2.4	DRY	>16.5	532.8	UNKNOWN			
	7	5/9/2014	745	16.5	2.4	16.5	14.0	532.8	518.7			
	8	5/16/2014	730	16.5	2.4	DRY	>16.5	532.8	UNKNOWN			
		5/23/2014	725	16.5	2.4	DRY	>16.5	532.8	UNKNOWN			
GHD-MW3		5/30/2014	730	16.5	2.4	16.9	14.5	532.8	518.3			
		6/13/2014	1545	16.5	2.4	17.2	14.8	532.8	518.0			
	1	3/28/2014	1530	14.0	1.2	12.3	11.1	530.9	519.8			
	2	4/4/2014	1020	14.0	1.2	12.0	10.9	530.9	520.0	0.02	0.3	
	3	4/11/2014	745	14.0	1.2	DRY	>14	530.9	UNKNOWN	0.0	0.0	
	4	4/18/2014	740	14.0	1.2	DRY	>14	530.9	UNKNOWN	0.0	0.0	
	5	4/25/2014	735	14.0	1.2	DRY	>14	530.9	UNKNOWN			
	6	5/2/2014	1610	14.0	1.2	DRY	>14	530.9	UNKNOWN			
	7	5/9/2014	745	14.0	1.2	13.4	12.2	530.9	518.7			
	8	5/16/2014	730	14.0	1.2	DRY	>14	530.9	UNKNOWN			
GHD-MW4		5/23/2014	725	14.0	1.2	DRY	>14	530.9	UNKNOWN			
		5/30/2014	730	14.0	1.2	14.8	13.6	530.9	517.3			
		6/13/2014	1345	14.0	1.2	14.1	12.9	530.9	518.0			
	1	3/28/2014	1530	12.0	2.5	DRY	>12	538.8	UNKNOWN			
	2	4/4/2014	1030	12.0	2.5	DRY	>12	538.8	UNKNOWN	0.02	0.3	
	3	4/11/2014	745	12.0	2.5	DRY	>12	538.8	UNKNOWN	0.0	0.0	
	4	4/18/2014	740	12.0	2.5	DRY	>12	538.8	UNKNOWN	0.0	0.0	
	5	4/25/2014	735	12.0	2.5	DRY	>12	538.8	UNKNOWN			
	6	5/2/2014	1610	12.0	2.5	DRY	>12	538.8	UNKNOWN			
	7	5/9/2014	745	12.0	2.5	DRY	>12	538.8	UNKNOWN			
GHD-MW5	8	5/16/2014	730	12.0	2.5	DRY	>12	538.8	UNKNOWN			
		5/23/2014	725	12.0	2.5	DRY	>12	538.8	UNKNOWN			
		5/30/2014	730	12.0	2.5	DRY	>12	538.8	UNKNOWN			
		6/15/2014	730	12.0	2.5	DRY	>12	538.8	UNKNOWN			
	1	3/28/2014	1530	13.0	1.8	DRY	>13	533.3	UNKNOWN			
	2	4/4/2014	1030	13.0	1.8	DRY	>13	533.3	UNKNOWN	0.02	0.3	
	3	4/11/2014	745	13.0	1.8	DRY	>13	533.3	UNKNOWN	0.0	0.0	
	4	4/18/2014	740	13.0	1.8	DRY	>13	533.3	UNKNOWN	0.0	0.0	
	5	4/25/2014	735	13.0	1.8	DRY	>13	533.3	UNKNOWN			
	6	5/2/2014	1610	13.0	1.8	DRY	>13	533.3	UNKNOWN			
GHD-MW6	7	5/9/2014	745	13.0	1.8	DRY	>13	533.3	UNKNOWN			
	8	5/16/2014	730	13.0	1.8	DRY	>13	533.3	UNKNOWN			
		5/23/2014	725	13.0	1.8	DRY	>13	533.3	UNKNOWN			
		5/30/2014	730	13.0	1.8	DRY	>13	533.3	UNKNOWN			
		6/13/2014	730	13.0	1.8	DRY	>13	533.3	UNKNOWN			
	1	5/23/2014	725	14.0	2.7	DRY	>14	Not surveyed	UNKNOWN			
	2	5/30/2014	730	14.0	2.7	DRY	>14	Not surveyed	UNKNOWN			
	3	6/13/2014	1345	14.0	2.7	DRY	>14	Not surveyed	UNKNOWN			
	4											
	5											
GHD-MW7	6											
	1	5/23/2014	725	16.5	2.8	DRY	>16.5	Not surveyed	UNKNOWN			
	2	5/30/2014	730	16.5	2.8	DRY	>16.5	Not surveyed	UNKNOWN			
	3	6/13/2014	1345	16.5	2.8	DRY	>16.5	Not surveyed	UNKNOWN			
	4											
	5											

Comments:

- Well depth = measurement from surface to total depth below ground surface (bgs).
- TOC = "Top of Casing", measurement of the above ground portion of top of well casing.
- DTW = "Depth To Water", measurement (in feet) from TOC to groundwater surface.
- Water Level = DTW - TOC.

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