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San Luis Obispo County
Los Osos Wastewater Project Development

TECHNICAL MEMORANDUM

OUT OF TOWN CONVEYANCE

FINAL
July 2008

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San Luis Obispo County
Los Osos Wastewater Project Development

TECHNICAL MEMORANDUM

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1.0 INTRODUCTION

The purpose of this technical memorandum (TM) is to evaluate out of town conveyance options to alternative sites for the proposed Los Osos wastewater treatment facility as discussed in the Viable Project Alternatives Fine Screening Analysis (Carollo, August 2007). A centralized pump station either located along Los Osos Valley Road from Pecho Road to South Bay Boulevard or along South Bay Boulevard from Santa Ysabel Avenue to Los Osos Valley Road is assumed to collect and pump wastewater from the entire Prohibition Zone to the wastewater treatment facility anticipated to be east of town. Potential sites for the wastewater treatment plant include Giacomazzi, Cemetery, Branin, Tonini Ranch, Turri Road, Gorby, Morosin, Andre 2, and Robbins 1 and 2, among others.

For the purposes of this memorandum, gravity collection will be assumed for a conveyance and pump station analysis. STEP conveyance would likely follow the same route but would not require a central pump station.

This TM is intended to provide further information on potential out of town conveyance options in order to 1) support the Environmental Review Process, and 2) further develop the project cost estimate.

2.0 PIPELINE ROUTES

2.1 Giacomazzi Area Sites

Figure 1 identifies potential pipeline routes for sewage to be conveyed to a site east of town (represented by the Giacomazzi property for the purposes of this TM). This property represents one of the high priority sites discussed in Chapter 6 of the Fine Screening Analysis (Carollo, August 2007) and lies in the middle of two other high priority sites, Branin and Cemetery. A central pump station is assumed either along Los Osos Valley Road or South Bay Boulevard to collect wastewater and transfer it to an out of town wastewater facility. Figure 1 illustrates eight routes from Los Osos Valley Road and South Bay Boulevard to the Giacomazzi area. The routes traveling through Hollister Lane, Nipomo Avenue, and Eto Lane will require tunneling or open-cut trenching construction methods to cross Los Osos Creek. The routes traveling to sites along Los Osos Valley Road may be hung from the bridge as well as tunneled or open-cut.

2.2 Tonini Ranch Site

Figure 2 builds upon Figure 1 and illustrates eight routes from Los Osos Valley Road and South Bay Boulevard to the Tonini Ranch site. Several combinations of routes could

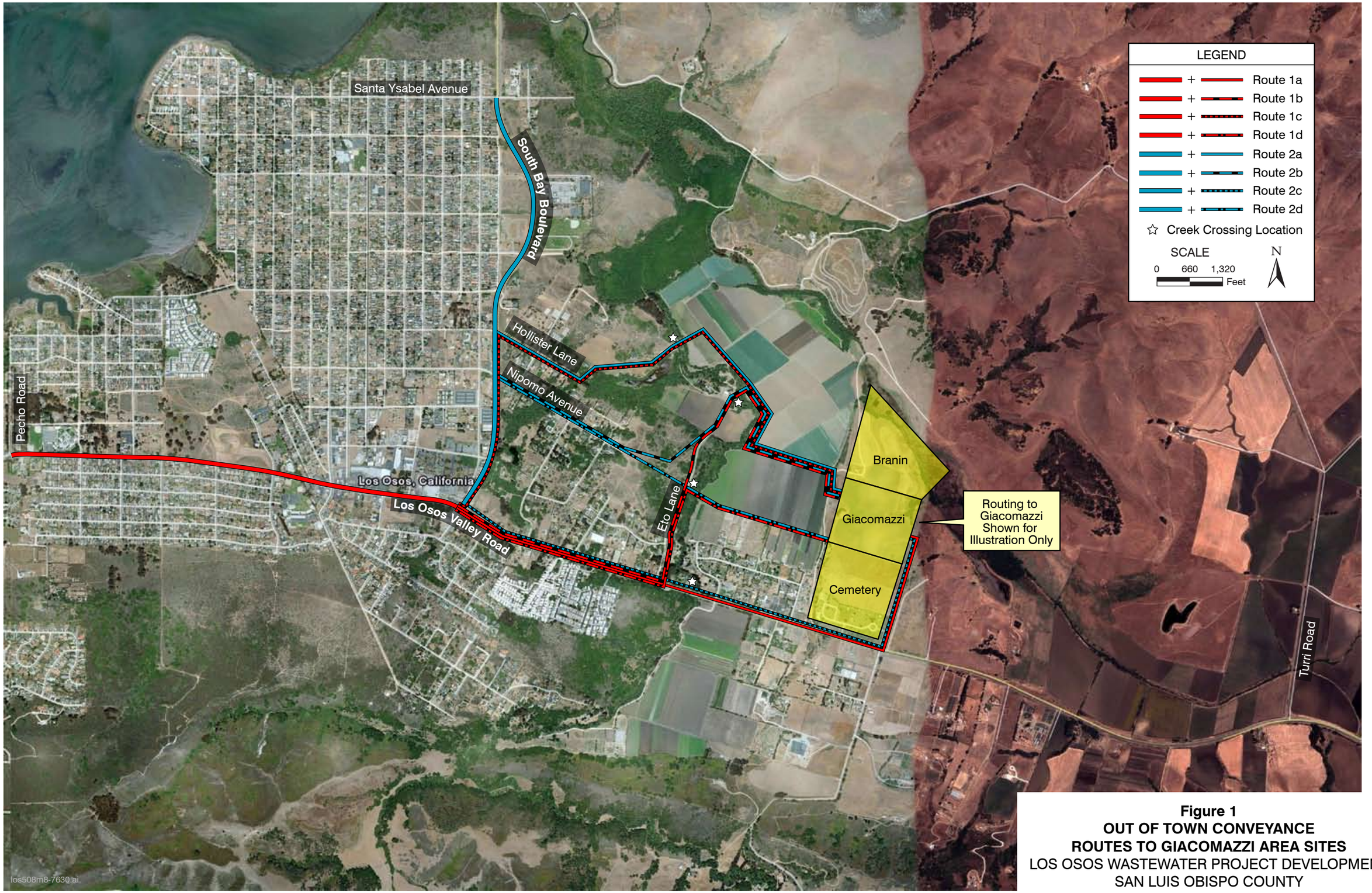


Figure 1
OUT OF TOWN CONVEYANCE
ROUTES TO GIACOMAZZI AREA SITES
LOS OSOS WASTEWATER PROJECT DEVELOPMENT
SAN LUIS OBISPO COUNTY

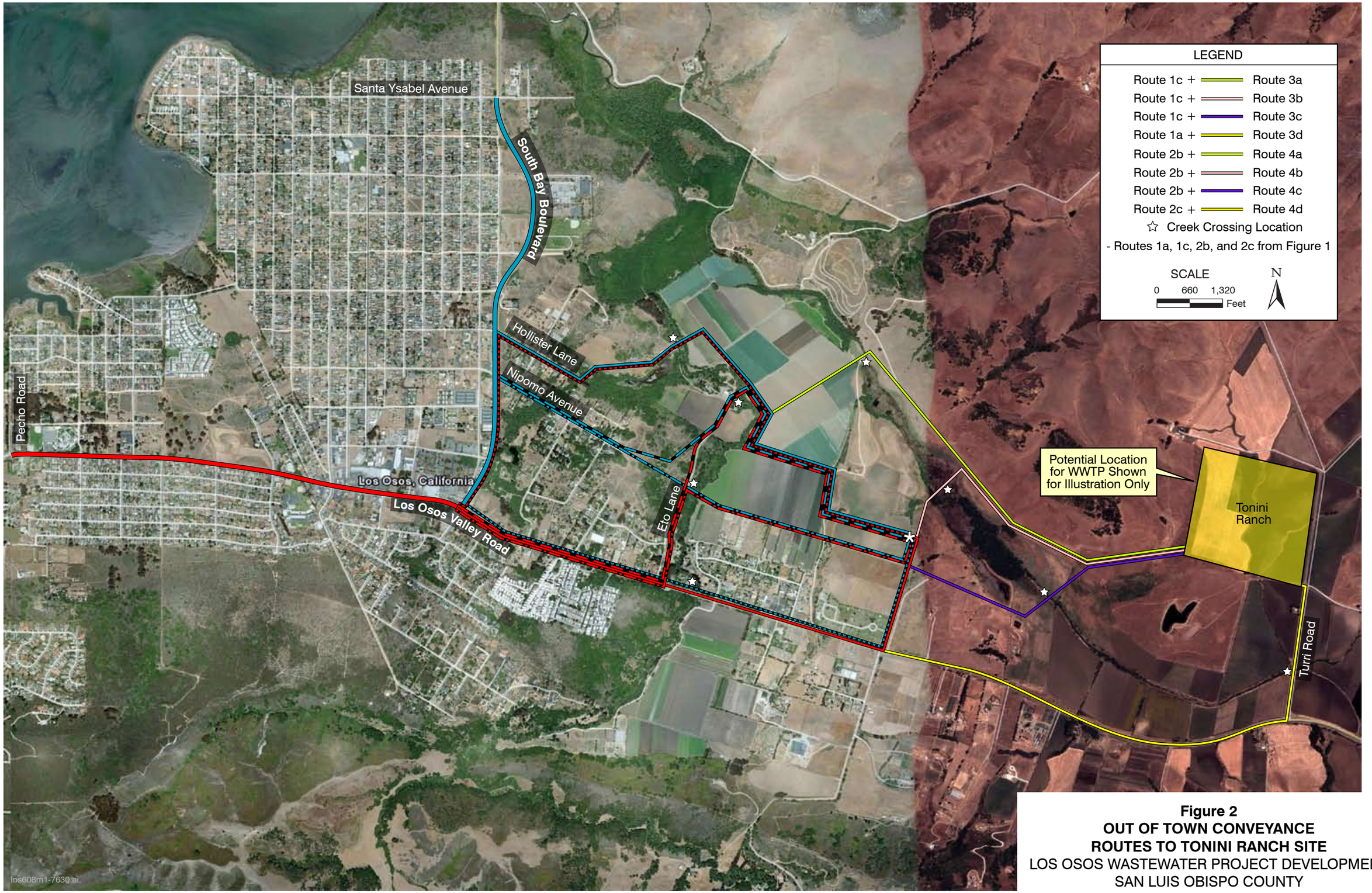


Figure 2
OUT OF TOWN CONVEYANCE
ROUTES TO TONINI RANCH SITE
LOS OSOS WASTEWATER PROJECT DEVELOPMENT
SAN LUIS OBISPO COUNTY

★ Termination point for illustration only. Actual conveyance route through Giacomazzi area sites will vary. Refer to Figure 1 for reference.

potentially be taken for conveyance to the Tonini Ranch site; however, for the purpose of this memorandum, the routes illustrated represent the most conservative conveyance routes based on total pipe length. Similar to conveyance to the Giacomazzi sites, routes traveling through Hollister Lane, Nipomo Avenue, and Eto Lane will require tunneling or open-cut trenching construction methods to cross Los Osos Creek. The routes traveling to sites along Los Osos Valley Road may be hung from the bridge as well as tunneled or open-cut. All routes to the Tonini Ranch site will require the crossing of an additional creek called Warden Creek. This creek is dry during the summer months thus tunneling or open-cut trenching would be possible options to cross the creek. In addition to tunneling or open-cut trenching, conveyance Routes 3d and 4d also have the option of hanging on an existing bridge on Turri Road to cross Warden Creek.

It is important to note that Tonini Ranch is a much larger site than what is depicted on Figure 2; however, treatment plant location options are limited as much of the site is characterized by high relief terrain. The location shown is representative of a potential treatment plant location and should be further evaluated as this site is considered in the future.

2.3 Alternate Sites

Figure 3 illustrates eight potential routes from Los Osos Valley Road and South Bay Boulevard to alternate sites including Turri Road, Gorby, Morosin, Andre 2, and Robbins 1 and 2. Routes to the Turri Road site will require tunneling under Los Osos Creek while routes to Gorby, Morosin, Andre 2, and Robbins 1 and 2 provide the same alternatives to cross Los Osos Creek on Los Osos Valley Road as the Giacomazzi area. All routes presented appear to be viable options; however, several factors such as cost, environmental impacts, location of the pump station and treatment facility, and construction/community impacts will play a role in selecting a final conveyance route.

3.0 PIPELINE CONSTRUCTION TECHNIQUES

Out of town conveyance will consist of a raw sewage or STEP effluent force main, however, a second reclaimed water pipeline returning from the treatment facility to the community will also potentially be required and likely cross the creek(s) at the same location as the raw sewage or STEP effluent pipeline.

Conveyance from the central pump station site to the wastewater facility will likely require a 12 to 14-inch diameter (PVC or high density polyethylene) force main, depending on the specific routing of the pipeline. The force main is assumed to follow along the side of the road and may be installed using either traditional pipe trenching methods or directional drilling. In addition, because the pipe is pressurized, the installation can follow the natural

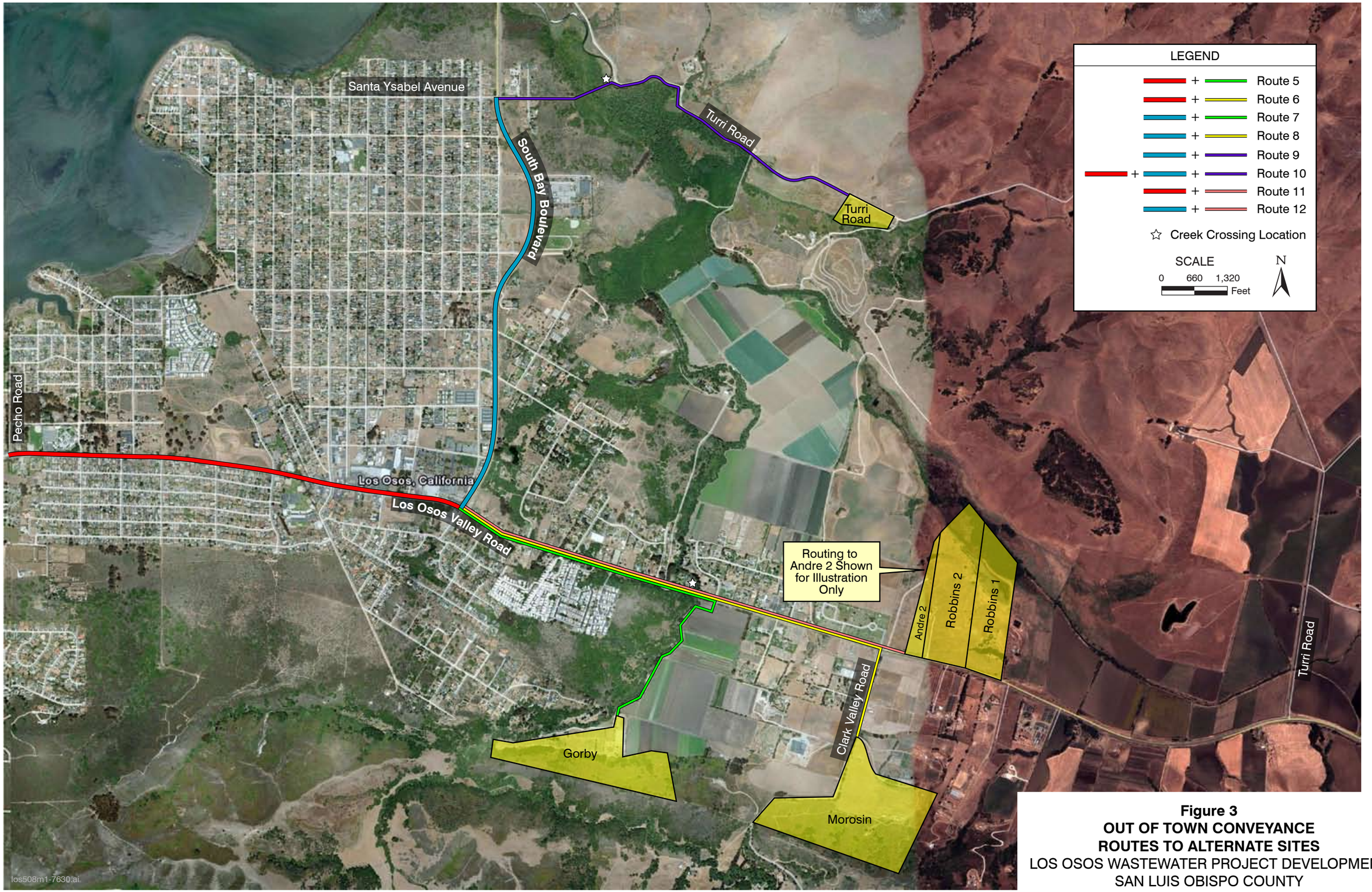


Figure 3
OUT OF TOWN CONVEYANCE ROUTES TO ALTERNATE SITES
LOS OSOS WASTEWATER PROJECT DEVELOPMENT
SAN LUIS OBISPO COUNTY

contouring of the ground to minimize the excavation depth. Directional drilling has been successfully utilized under heavily traveled roads and driveways to minimize disruption, however, this construction method typically results in higher installation costs. In most locations, open-cut trenching is a typical and economical way to install the sewer mains. A combination of both methods will likely be used to minimize costs and community and environmental impacts.

4.0 ENVIRONMENTAL ISSUES

4.1 Pipeline Routes

Conveyance to an out of town treatment facility will require work on high traffic volume streets including Los Osos Valley Road and South Bay Boulevard. Several of the routes depicted on Figures 1 through 3 will also border residential, agricultural, and sensitive habitat areas. All out of town conveyance routes will likely encounter the following environmental issues which will carefully be addressed in the Environmental Impact Report (EIR):

- Roadway disruptions during construction of force mains. Traffic will likely be rerouted and access to individual homes constrained for short periods. Careful noticing will be required.
- Dewatering is required in low-lying areas. This water may require treatment or other special handling.
- Archaeological resources are located throughout the community and may require pipeline route modification, or possible reburials.
- Monitoring for and relocation of endangered species may be required in some areas of the community.
- Pump stations and standby power facilities may require visual mitigation depending upon location.
- Odor control facilities will be required at the pump station.
- Force main installation may be close to some areas of wetlands and sensitive habitat areas, possibly requiring special permitting and mitigation. The force main will likely have impacts on landscaping and native habitat. Best Management Practices (BMP) will be required.
- Permitting and regulatory requirements for crossing the creek(s) will be required. Options for avoiding construction in the creek(s) are possible.
- Planning to mitigate the long-term risks of a potential force main failure that could result in impacts to creeks, wetlands, and/or the estuary.

5.0 CREEK CROSSING OPTIONS

Locating the treatment and disposal facilities east of the Los Osos urban area will necessitate crossing Los Osos Creek and potentially Warden Creek with a raw sewage force main and possibly a reclaimed water pipeline. There are at least three options for crossing the creek(s): tunneling under, trenching through, and hanging the pipes on an existing bridge (where applicable).

5.1 Tunneling

Tunneling is considered a potential option at all creek crossing locations, however, due to site specific conditions, some locations present one or two alternate options to cross the creek(s). Tunneling is generally considered the highest cost option of the three discussed; however, environmental conditions at each crossing location will likely dictate this construction method for crossing the creek(s).

Two options for tunneling include microtunneling and horizontal directional drilling (HDD). Microtunneling is a higher cost option but extremely accurate using a pressure-balanced, laser-guided, slurry removal system; however, microtunneling is typically not used for small diameter pipelines. HDD drills the pipeline from a boring pit but has increased sensitivity to soil type and has led to pipeline hydrofracture and installation slow downs and failure. However, HDD costs are comparable to open-cut trenching.

One of the first wastewater systems proposed for Los Osos included crossing Los Osos Creek on the easterly extension of the Santa Ysabel Street alignment. This crossing would include all routes to the Turri Road treatment site (Routes 9 and 10 on Figure 3). The approach chosen for crossing Los Osos Creek was to tunnel under the creek at the location of an abandoned roadway bridge. Tunneling was considered superior to trenching with respect to minimizing disturbance to the creek since it is tidally influenced at that point and does not dry up in the summer months.

Although trenchless technology offers a feasible alternative for creek crossing, this approach still requires compliance with regulatory and permitting requirements. Installation of pipelines under the creek(s) will be carefully addressed in the EIR and will require:

- A federal Clean Water Act section 404 permit from the US Army Corps of Engineers.
- A federal Clean Water Act section 401 water quality certification from the Regional Water Quality Control Board.
- A federal consistency certification from the CA Coastal Commission.
- A Section 7 consultation with the US Fish and Wildlife Service and with the National Marine Fisheries Service.

- Compliance with relevant provisions of the California Coastal Act relating to the protection of Environmentally Sensitive Habitat Areas.
- A CA Fish and Game Code section 1600 permit from the CA Department of Fish and Game.

5.2 Trenching

Open-cut trenching may be feasible in some locations during the summer months when there is no flowing water in the stream(s). Open-cut trenching is generally considered the lowest cost option of the three but will again depend on the environmental requirements associated with each crossing location.

This particular method is considered viable for routes traveling on Hollister Lane, Nipomo Avenue, Eto Lane, and Los Osos Valley Road where the creek beds are dry in the summer. The only routes not able to use this construction method for crossing the creek(s) would be routes to the Turri Road site (Routes 9 and 10 on Figure 3) due to year round flowing water in Los Osos Creek.

Trenching requires the same regulatory permits and consultations listed above for tunneling. In addition, trenching would require full restoration of the disturbed streambed and banks. Although permitting a trenched crossing would trigger greater scrutiny from regulatory agencies, the approach appears feasible depending on the specific resource constraints found at the sites.

5.3 Bridge-Mounted Crossing

A third approach would be to hang the pipeline under the existing bridge on Los Osos Valley Road and Turri Road (where applicable). This approach minimizes potential impacts to the creek(s) from construction since the pipe would be suspended above the creek. However, the regulatory requirements would be similar to tunneling depending on the amount of disturbance of the creek bank on either side of the bridge where the pipe re-enters the ground.

This option may increase traffic impacts due to the required construction work on and around the bridge. Because the piping would be exposed, this reach across the bridge would likely be ductile iron or steel pipe.

Bridge-mount crossing is a potential option for all routes traveling over the Los Osos Valley Road bridge.

6.0 PUMP STATION

6.1 Flow Determination

Table 1 summarizes the results of the Flow and Loading TM for gravity conveyance. Design criteria for a central pump station is not presented for a STEP system because the STEP effluent can be pumped to an out of town facility from each individual residence thus a central pump station is not required.

Table 1 Flow and Loading Summary for Gravity Conveyance
Los Osos Wastewater Project Development
San Luis Obispo County

Flow Type	Flow (mgd)	Notes
ADDWF	1.1	Average daily dry weather flow
ADWWF	1.4	Average daily wet weather flow
PHDWF	2.0	Peak hour dry weather flow
PHWWF	2.5	Peak hour wet weather flow

The pump station is assumed to be designed for a maximum flow of 2.5 million gallons per day (mgd) (1,740 gallons per minute [gpm]).

6.2 Pump Station Alternatives

The pump station itself can be designed with several different types and numbers of pumps (triplex, duplex, etc.). Potential sewage pump stations and a description of each are listed in Table 2.

The first three pump station options, submersible non-clog, submersible grinder, and wet well mounted consist of a single, below grade wet well; however, the submersible pump stations also require a separate valve box located next to the wet well. The submersible pumps are located in the sewage, whereas the pumps in the wet well mounted pump station are located at grade similar to a vertical turbine suction pump. These three options generally have the smallest footprint. Operation and maintenance is more difficult at submersible pump stations because the pumps have to be hoisted out of the wet well. In a wet well mounted pump station, all mechanical and electrical appurtenances are easily accessible at grade; however, this convenience and layout is reflected in higher capital costs.

The other two pump station options summarized in Table 2 include a factory-built dry pit station with separate wet well and a built-in-place station with separate wet well. The major difference between the two is a prefabricated dry pit versus the entire pump station being constructed on site. In both pump stations, the pumps are housed in a separate dry-pit below grade and pump the sewage from an adjacent wet well. The electrical equipment is

Table 2 Advantages and Disadvantages of Potential Sewage Pump Stations/Configurations
Los Osos Wastewater Project Development
San Luis Obispo County

Option	Description	Advantages	Disadvantages
Submersible Non-Clog	• Pumps are located in a wet well submersed in the sewage • Control panel is located on posts at grade and typically, a separate valve box houses the isolation valves on the force main	• Pumps can pass large solids the size of a baseball without clogging • Small footprint • Generally lowest capital cost	• Low pump efficiency • Larger force main discharge piping • Control panel is in the open • O&M: Pumps have to be lifted out of the wet well by a hoist at grade for maintenance
Submersible Grinder	• Grinder pumps are located in a wet well submersed in the sewage • Grinder pump grinds the sewage into a slurry and conveys to the next location • Control panel is located on posts at grade and typically, a separate valve box houses the isolation valves on the force main	• Smaller diameter discharge piping • Small footprint • Low capital cost compared to alternatives	• Multiple pumps required (May not be feasible) • Control panel is in the open • O&M: Pumps have to be lifted out of the wet well by a hoist at grade for maintenance
Wet Well Mounted (Vacuum or Self-primed)	• Pumps are located at grade above the wet well and use vertical suction to pump the sewage out of the wet well • Pumps can be primed with a small vacuum or be self-priming • The control panel, pumps, and valves are typically located in a removable, insulated and heated fiberglass enclosure	• Protective enclosure for control panel, pumps and valves • O&M: All equipment is located at grade • Smallest footprint	• Higher capital cost • Larger force main discharge piping
Factory-Built Dry Pit Station with Separate Wet Well	• Control panel, pumps, and valves are housed in a cylindrical steel chamber separate from the wet well • Pumps are typically non-clog and have the motor located on the top of the pump similar to a vertical turbine pump • A cylindrical hatch, similar to a manhole provides access to the pump chamber from grade	• In the case of a power failure, the wet well can be accessed at grade and sewage pumped around the pump chamber to the force main using a portable, engine-driven pump • O&M: All equipment is totally enclosed in a dry-pit/well • Pump chamber is prefabricated and installed below grade	• High capital cost • Maintenance is below grade • Larger force main discharge piping
Built-in-Place Station with Separate Wet Well	• A below grade dry well houses the pumps • The dry and wet well is constructed of reinforced concrete while the control room structure is usually brick and block • Pumps are typically non-clog and have the motor located on the top of the pump similar to a vertical turbine pump	• An engine-driven generator can be installed in the control room to power the pumps in case of a power failure • O&M: All equipment is totally enclosed in a dry-pit/well	• Below grade wet well and above grade control room are constructed on-site • Highest capital cost • Larger footprint • Larger force main discharge piping

Notes:
Reference: A. A. Schrage P.E., Inc. Professional Sanitary Engineer. http://www.sewer1.com/sewage-pump-stations.asp#type2

either located with the pumps in the dry pit or in an enclosed structure at grade. The full enclosure of all pump station equipment allows for ease of operation and maintenance. These pump stations generally require more space and yield higher capital costs.

A submersible non-clog pump station is normally considered the lowest capital cost of the described options and was proposed in the previous project design for the Los Osos Community Services District (LOCSD). A triplex pump station consisting of submersible non-clog pumps will serve as the basis for design and cost estimation in this memorandum. The layout will be similar to the triplex layout for the Lupine and West Paso Pump Stations shown on Drawings BC-M-201, AD-M-202, and B-A-200 (see Appendix) in the previous project. In these details, the pump station consists of a 12-foot diameter cylindrical wet well 13 to 19 feet deep, a 7 by 7 by 6-foot deep valve box, and a 28 by 18 by 16-foot tall standby power building along with other small electrical and mechanical appurtenances. The entire facility can be located within a 60 foot by 60-foot square parcel (0.1 acre). Drawing B-C-201 (see Appendix) shows a plan view of the Lupine Pump Station within this footprint.

6.3 Design Criteria

Pump station design criteria for three conveyance options (Option 1 to Giacomazzi sites, Option 2 to Tonini Ranch, and Option 3 to alternate sites) are presented in this memorandum. The criteria for the three options are presented as the most conservative design. All conveyance routes start from the intersection of Pecho Road and Los Osos Valley Road as this location presents the highest static elevation head. For cost comparison purposes, a consistent force main diameter of 14-inches was used to determine head losses between the three options. The force main could potentially be reduced to 12-inches in diameter for shorter conveyance routes; however, larger pumps would be required resulting in higher pumping costs.

Option 1 design criterion illustrates the most conservative conveyance route to the Giacomazzi sites (Route 1c on Figure 1). Due to Giacomazzi's close proximity to Los Osos and small pumping elevation change, this option presents the lowest head loss of the three options. Option 2 design criterion illustrates the most conservative conveyance route to the Tonini Ranch site (Route 3b or 3c on Figure 2). This option includes the longest force main length; however, due to the relatively low physical elevation difference between pumping locations, results in the second highest head loss option. Option 3 design criterion illustrates the most conservative route to an alternate site (Route 6 on Figure 3). This option includes pumping to a high elevation site and is the highest head loss option. Design criteria for the three options are listed in Table 3.

The design criterion for each option was developed assuming a typical triplex submersible pump station with two duty and one standby pump. Total dynamic head (TDH), which includes pipe friction and fitting loss and static elevation change are the factors determining

Table 3	**Most Conservative Triplex Pump Station Design Criteria for Three Options Los Osos Wastewater Project Development San Luis Obispo County**		
Description	**Option 1[6]**	**Option 2[7]**	**Option 3[8]**
Number of Pumps	3[9]	3[9]	3[9]
Design Flow Each Pump (gpm)	875	875	875
Design TDH[1] (ft)	104	135	170
Pump HP[2]	50	60	75
Wet Well Depth[3] (ft)	20	20	20
Wet Well Diameter[4] (ft)	12	12	12
Force Main Size (in)	14	14	14
Force Main Length (ft)	19,600	28,000	18,700
Required Pump Station Area[3,5] (acre)	0.1	0.1	0.1

Notes:
(1) Hazen Williams Equation was used with C = 130 per Civil Engineering Reference Manual, 8th ed. 10 percent fitting loss assumed.
(2) Based on 60 percent pump efficiency. Rated horsepower includes safety factor.
(3) Assumed based on previous design of triplex pump station for LOCSD project.
(4) Based on previous project design for LOCSD.
(5) Additional area for emergency storage pond not included.
(6) Los Osos Valley Road to Giacomazzi sites (Route 1c on Figure 1).
(7) Los Osos Valley Road to Tonini Ranch (Route 3b or 3c on Figure 2).
(8) Los Osos Valley Road to Morosin (Route 6 on Figure 3).
(9) Includes 2 duty and 1 standby pump.

the most conservative cases. Elevations of potential pump station locations and out of town conveyance sites were based on topographic maps of the community of Los Osos.

The triplex pump station will operate in a fill and draw mode utilizing constant speed pumps. Typical operation is the wet well will fill up with sewage to a set level and then one pump will turn on. If the sewage level continues to rise in the wet well, a second pump will turn on so that the two pumps will operate together. In the case of a pump failure, a standby pump will turn on to provide and maintain maximum flow.

In Table 3, the entire pump facility is assumed to require a 0.1-acre footprint similar to the pump stations in the previous project design for LOCSD; however, additional area for an emergency storage pond may be required if permitting and other conditions dictate.

6.3.1 Tonini Ranch Site

As depicted in Figure 2, conveyance to the Tonini Ranch site presents the longest pipeline routes of all potential treatment plant locations. However, because the elevation difference between the pump station and treatment facility is small, conveyance to this site does not result in the highest head loss. Thus, pump station size will be similar to the other options presented.

7.0 COST ESTIMATE

7.1 Operation and Maintenance (O&M)

Operation and maintenance costs are presented as costs associated to all conveyance routes. The costs are estimates based on percentages of total construction costs for various elements for out of town conveyance. Operation and maintenance costs for out of town conveyance can vary depending on the length of the force main, and the location and elevation of the pump station and treatment facility. Estimated annual O&M costs common to all routes depicted in Figures 1 through 3 are presented in Table 4. The estimated annual O&M costs for conveyance to an out of town treatment facility is $75,000. Estimated annual electrical costs specific to each route are presented in Table 5.

Table 4 Estimated Common O&M Costs for Potential Out of Town Routes Los Osos Wastewater Project Development San Luis Obispo County

Item	Units	Quantity	Unit Price ($)	Annual O&M ($)
Labor	Hrs/yr	520(1)	40(2)	20,000
Equipment Maintenance/ Replacement	%/yr	2(3)	Pump Station, Power Facility and Misc. Facility Requirements Construction Costs	35,000
Odor Control Maintenance/Replacement	%/yr	20(3)	Pump Station Odor Control Construction Costs	20,000
Total Common Costs	--	--	--	$75,000

Notes:
(1) Based on 0.25 full-time employees and 2,080 hours per year. Employee time is based on approximately 10 percent of total gravity system infrastructure.
(2) From Basis of Cost Evaluation Technical Memorandum.
(3) Based on Tables 3.19 and 3.20 in Fine Screening Analysis (Carollo, August 2007).

Table 5	Estimated Annual Electrical Costs for Potential Out of Town Routes Los Osos Wastewater Project Development San Luis Obispo County	
Route[1]	**Electrical Requirements[2,3] (kWh/yr)**	**Annual Cost[4] ($)**
1a	130,000	16,000
1b	130,000	16,000
1c	130,000	16,000
1d	120,000	15,000
2a	60,000	8,000
2b	65,000	8,000
2c	75,000	9,000
2d	60,000	8,000
3a	150,000	18,000
3b	150,000	18,000
3c	150,000	18,000
3d	150,000	18,000
4a	85,000	11,000
4b	85,000	11,000
4c	85,000	11,000
4d	100,000	12,000
5	250,000	30,000
6	300,000	36,000
7	200,000	24,000
8	250,000	30,000
9	Gravity[5]	--
10	40,000	5,000
11	150,000	18,000
12	100,000	12,000

Notes:
(1) Routes depicted in Figures 1, 2, and 3.
(2) Based on energy required to convey an average 1.3 mgd to an out of town treatment facility. 1.3 mgd based on average of ADDWF and ADWWF in Table 1.
(3) Based on 14-inch diameter force main and 60 percent pump efficiency.
(4) From Basis of Cost Evaluation Technical Memorandum, $0.12/kWh.
(5) Sewage can be conveyed by gravity at average flow condition of 1.3 mgd.

The total O&M costs for the potential routes do not differ greatly. It is important to note that the costs are based on an average flow of 1.3 mgd. Due to the hydraulic losses and physical elevations of the pump station and treatment facility, sewage can be conveyed by gravity on Route 9 for an average flow condition; however, pumps will be required to convey maximum flow requirements. This low O&M cost has the potential to be offset by pumping requirements for the treated effluent being conveyed back to the community whereas other conveyance alternatives may have the ability to convey the treated effluent to the community of Los Osos by gravity.

7.1.1 Tonini Ranch Site

Although conveyance to the Tonini Ranch site requires additional force main length, it does not require larger pumps based on TDH requirements listed in Table 3. Thus, O&M costs for conveyance to the Tonini Ranch site are assumed to be consistent with the costs presented in Table 4.

7.2 Creek Crossing

Three options for crossing the creek(s) include open-cut trenching, tunneling, and hanging across an existing bridge (where applicable). Costs for each option have been developed in Table 6 specific to Los Osos Creek crossing. At this stage, the costs are conceptual and include a wide range of variability.

Generally speaking, open-cut trenching is the least expensive option. Hanging the pipe on the bridge is a competitive cost option, however, more variability exists due to accessibility for construction methods and structural characteristics of the bridge. HDD is a lower cost option than microtunneling if geotechnical and site specific conditions allow. Environmental parameters at each location will likely dictate the overall cost and feasibility of each method.

7.2.1 Tonini Ranch Site

Conveyance to the Tonini Ranch site includes crossing Warden Creek. Open-cut trenching is a likely construction method for crossing the creek; however, the EIR will include further evaluation of Warden Creek and the feasibility of crossing at this location. Open-cut trenching costs and low-end bridge hanging costs are assumed to be similar to the costs presented in Table 6 for crossing Warden Creek.

7.3 Total Construction Cost

The costs presented in Table 7 are based on Tables 3.1 and 3.9 of the Fine Screening Analysis (Carollo, August 2007) and Table 6 of this memorandum. The construction cost for conveyance to an out of town treatment facility is estimated to be between $2.7 and $6.7 million.

Table 6	Range of Probable Costs for Los Osos Creek Crossing Options Los Osos Wastewater Project Development San Luis Obispo County			
Crossing Option	Quantity	Range of Probable Costs[1,5]		Notes on Development of Range
		Low ($)	High ($)	
Open-Cut Trenching	200 LF	35,000	90,000	High estimate includes factor for allowances[2]
Tunneling				
- Microtunneling[3]	500 LF	410,000	500,000	High estimate includes factor for allowances[2]
- HDD	500 LF	160,000	200,000	
Hanging On Bridge	100 LF	35,000	110,000	High estimate includes factor for allowances[4]

Notes:
(1) All costs include 15% contractor overhead and profit and 8% sales tax on materials.
(2) Allowances included for location of creek crossing, clearing and restoration requirements, and other site specific conditions.
(3) Based on Ripley Pacific Team estimate in 2004 dollars escalated at 5% per year to April 2007.
(4) Allowances include clearing and restoration requirements at pipe re-entrance, miscellaneous support requirements, installation methods, bridge reinforcement, and secondary encasement requirements.
(5) Costs do not include land and easement acquisition costs and unknown costs associated with environmental requirements.

8.0 SUMMARY

This memorandum has presented several options for conveyance to an out of town treatment facility. Based on the triplex pump station, the construction cost for conveyance to an out of town treatment facility is estimated to be between $2.7 and $6.7 million. A recommendation for a specific route will be developed based on the environmental review and community input.

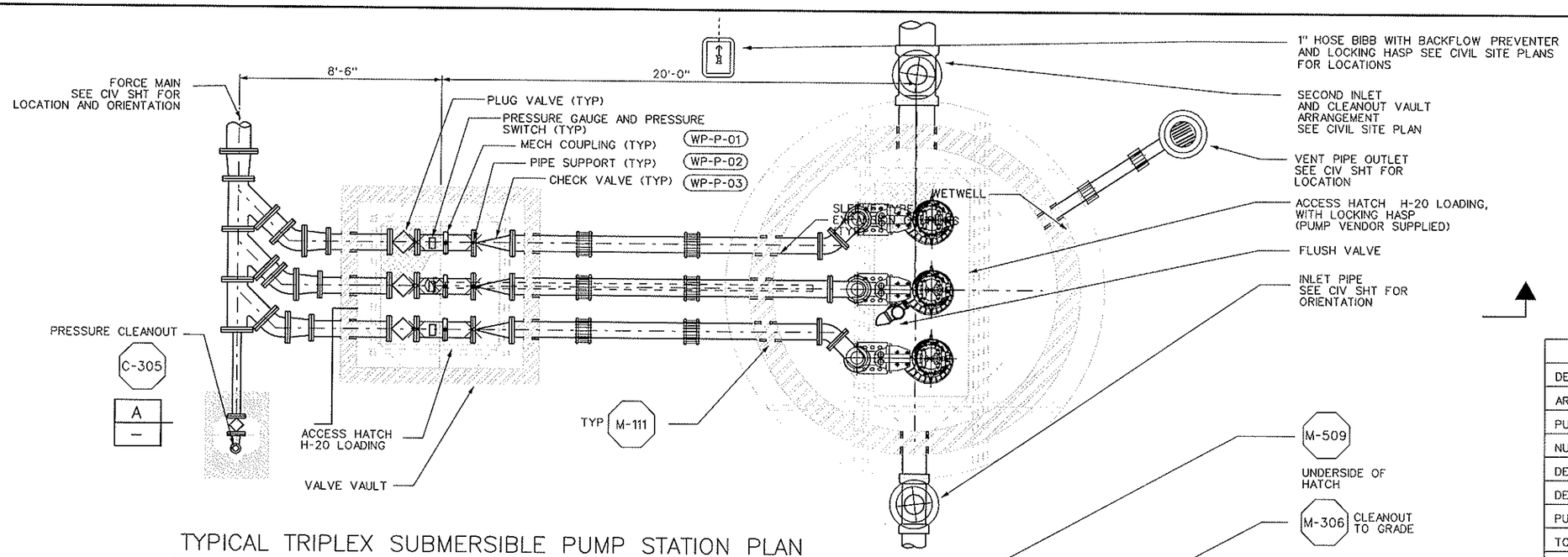
The memorandum has also presented preliminary design criteria for a central pump station (most conservative scenarios) to collect and transfer wastewater from the Prohibition Zone to an out of town treatment facility for a gravity collection system. Several different pump station configurations were discussed as potential options, each with their advantages and disadvantages. For the community of Los Osos it is recommended that a triplex pump station containing submersible non-clog pumps be used. This pump station is typically the lowest capital cost and the design would be similar to other pump stations planned as part of the previous gravity collection system for LOCSD.

Table 7 Range of Probable Costs for Conveyance to Out of Town Treatment Facility
Los Osos Wastewater Project Development
San Luis Obispo County

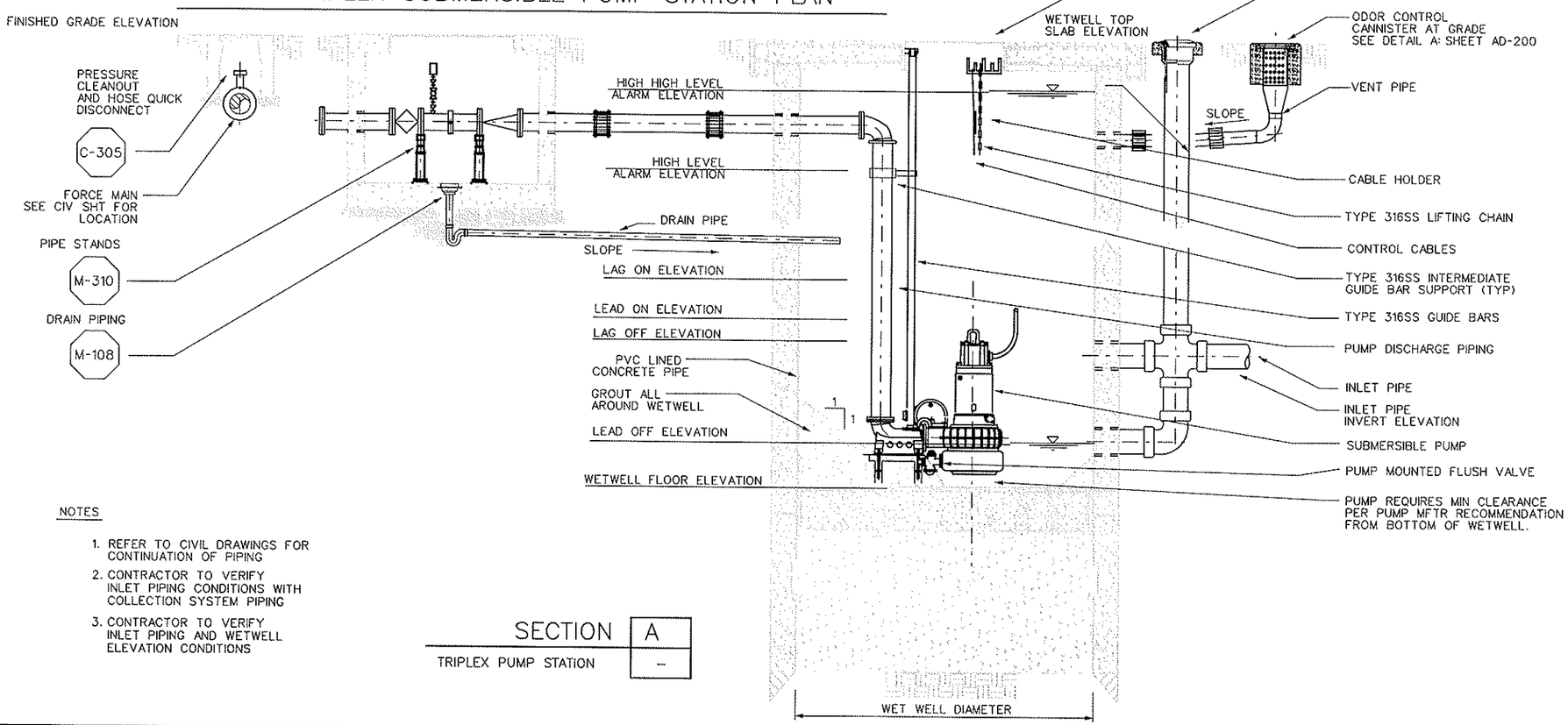
Item	Quantity	Range of Probable Costs		Notes on Development of Range
		Low ($M)[1]	High ($M)[1]	
Triplex Pump Station[2]	Lump Sum	0.6	0.8	High estimate includes 30% contingency
Standby Power Facility[2]	Lump Sum	0.4	0.6	High estimate includes 30% contingency
Pump Station Odor Control[3]	Lump Sum	0.1	0.2	High estimate includes 30% contingency
Miscellaneous Facility Requirements	Lump Sum	0.2	0.3	Assumed 15% of items cost, excludes force main
Force Main	Low - 8,500 LF[4]	1.1	--	High estimate includes microtunneling of 500 LF under Los Osos Creek, open-cut trenching across Warden Creek, and 28,000 LF of force main
	High - 28,000 LF[5]	--	4.0	
Subtotal		$2.4	$5.9	
Overhead and Profit (15%)[6]		$0.2	$0.6	
Subtotal		$2.6	$6.5	
Sales Tax (8%)[7]		$0.1	$0.2	
TOTAL CONSTRUCTION COST[8]		$2.7	$6.7	

Notes:
(1) All costs in April 2007 dollars, based on an ENR of 7879.
(2) Based on Barnard Construction bid tab estimate (February 2005) escalated at 5% per year to April 2007. Assumed to include Overhead and Profit and sales tax.
(3) Based on Ripley Pacific Team estimate in 2004 dollars escalated at 5% per year to April 2007.
(4) Force main length based on Route 5 or 7 presented in Figure 3. Assumes a pump station can be located within 1,000 feet of the intersection of Los Osos Valley Road and South Bay Boulevard. High end open-cut trenching assumed.
(5) Force main length based on Route 3b or 3c presented in Figure 2. Assumes a pump station is located at the intersection of Pecho Road and Los Osos Valley Boulevard.
(6) Overhead and Profit on Pump Station Odor Control and Force Main only. Assumed to be included in bid tab estimates for other line items.
(7) Sales tax included on materials for Pump Station Odor Control and Force Main only. Assumed to be included in bid tab estimates for other line items.
(8) Land and Easement acquisition costs not included.

APPENDIX - MECHANICAL SUBMERSIBLE PUMP STATIONS



TYPICAL TRIPLEX SUBMERSIBLE PUMP STATION PLAN



TRIPLEX PUMP STATION SCHEDULE	
DESCRIPTION	LUPINE
AREA	B
PUMP NO.	LP-P-01, 02 & 03
NUMBER OF PUMPS	3
DESIGN FLOW EACH PUMP (GPM)	500
DESIGN TDH (FT)	139.0
PUMP HP (HP)	30
TOP WETWELL SLAB ELEVATION (FT)	13.6
WETWELL FLOOR ELEVATION (FT)	-4.9
WETWELL DEPTH (FT)	18.50
WETWELL DIAMETER (FT)	12.00
INLET PIPING SIZE (IN)	15
NUMBER OF INLETS	1
INLET PIPING INVERT ELEVATION (FT)	0.12
DISCHARGE PIPING SIZE (IN)	6
FORCE MAIN SIZE (IN)	10
FORCE MAIN CENTERLINE ELEVATION (FT)	-10.10
HIGH HIGH ALARM HEIGHT (FT)	11
HIGH ALARM HEIGHT (FT)	7

NOTES

1. REFER TO CIVIL DRAWINGS FOR CONTINUATION OF PIPING
2. CONTRACTOR TO VERIFY INLET PIPING CONDITIONS WITH COLLECTION SYSTEM PIPING
3. CONTRACTOR TO VERIFY INLET PIPING AND WETWELL ELEVATION CONDITIONS

SECTION	A
TRIPLEX PUMP STATION	--

REGISTERED PROFESSIONAL ENGINEER JACK OSBORN RCE 43171 Exp. 12-31-05 MECHANICAL STATE OF CALIFORNIA

REV	DATE	BY	DESCRIPTION

SCALE: 3/8" = 1'-0"

WARNING: 0 1/2 1 — IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

DESIGNED J. OSBORN
DRAWN J. OSBORN
CHECKED R. GONZALEZ

SUBMITTED BY
JOHN A. BERGEN — C31069 LICENSE NO. — 2/16/2004 DATE
STEVE J. HYLAND — C23892 LICENSE NO. — 2/16/2004 DATE

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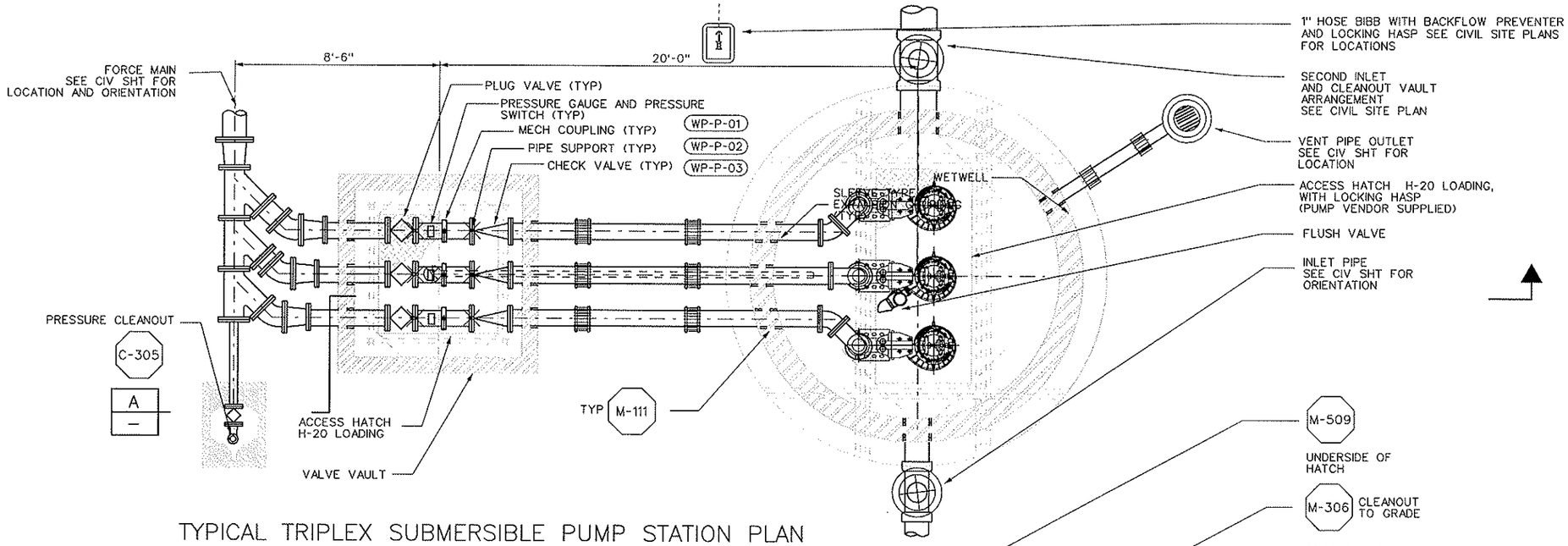
LOS OSOS COMMUNITY SERVICES DISTRICT

MWH Walnut Creek, California

LOS OSOS WASTEWATER PROJECT
MECHANICAL
SUBMERSIBLE PUMP STATIONS
TRIPLEX LAYOUT – PLAN & SECTION

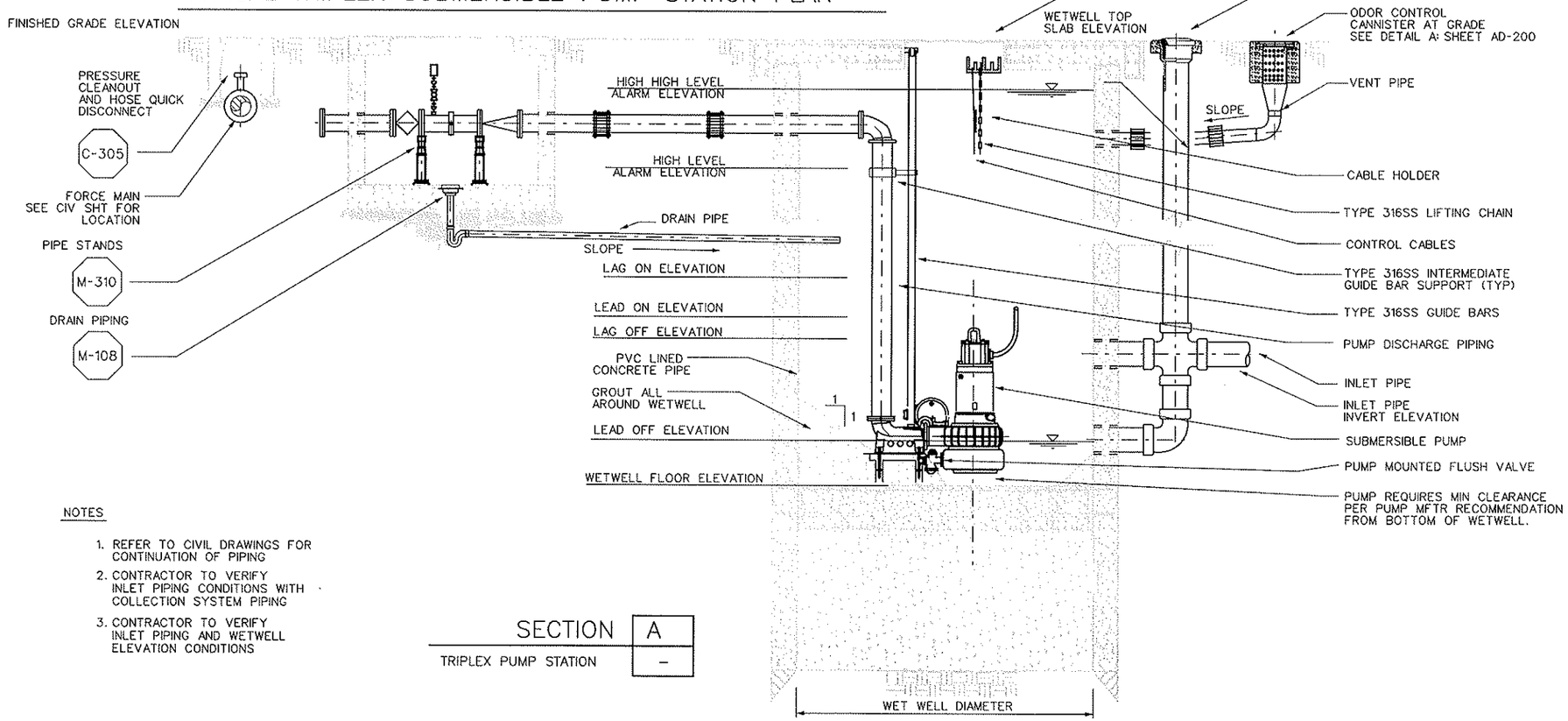
SHEET BC-M-201

Job No: 1481166 File: N:\Projects\los_osos\Collect_Sys\PS\mec\BC-M-201.dgn Plot Date: 09-FEB-2004 17:21



TYPICAL TRIPLEX SUBMERSIBLE PUMP STATION PLAN

TRIPLEX PUMP STATION SCHEDULE	
DESCRIPTION	WEST PASO
AREA	A
PUMP NO.	WP-P-01, 02 & 03
NUMBER OF PUMPS	3
DESIGN FLOW EACH PUMP (GPM)	950
DESIGN TDH (FT)	157.0
PUMP HP (HP)	60
TOP WETWELL SLAB ELEVATION (FT)	17.04
WETWELL FLOOR ELEVATION (FT)	4.04
WETWELL DEPTH (FT)	13.00
WETWELL DIAMETER (FT)	12.00
INLET PIPING SIZE (IN)	18
NUMBER OF INLETS	1
INLET PIPING INVERT ELEVATION (FT)	7.80
DISCHARGE PIPING SIZE (IN)	8
FORCE MAIN SIZE (IN)	12
FORCE MAIN CENTERLINE ELEVATION (FT)	13.5
HIGH HIGH ALARM HEIGHT (FT)	11
HIGH ALARM HEIGHT (FT)	7



NOTES

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2. CONTRACTOR TO VERIFY INLET PIPING CONDITIONS WITH COLLECTION SYSTEM PIPING
3. CONTRACTOR TO VERIFY INLET PIPING AND WETWELL ELEVATION CONDITIONS

SECTION A
TRIPLEX PUMP STATION –

REGISTERED PROFESSIONAL ENGINEER
JACK OSBORN
No. M31171
Exp. 12-31-05
MECHANICAL
STATE OF CALIFORNIA

REV	DATE	BY	DESCRIPTION

SCALE: 3/8" = 1'-0"

WARNING: 0 1/2 1 — IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

DESIGNED J. OSBORN
DRAWN J. OSBORN
CHECKED R. GONZALEZ

SUBMITTED BY
JOHN A. BERGEN — C31069 LICENSE NO. — 2/16/2004 DATE
STEVE J. HYLAND — C23892 LICENSE NO. — 2/16/2004 DATE

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LOS OSOS COMMUNITY SERVICES DISTRICT

MWH Walnut Creek, California

LOS OSOS WASTEWATER PROJECT
MECHANICAL
SUBMERSIBLE PUMP STATIONS
TRIPLEX LAYOUT – PLAN & SECTION

SHEET AD–M–202

Job No: 14811166 File: M:\Projects\los_osos\Collect_Sys\PS\mec\AD-M-202.dgn Plot Date: 09-FEB-2004 17:15

DIMENSION TABLE

STANDBY POWER FACILITY	BUILDING DIMENSIONS
LUPINE	25'-4" X 14'-8"
WEST PASO/BAYWOOD	28'-0" X 17'-4"
EAST YSABEL	24'-8" X 14'-8"
EAST PASO	25'-4" X 14'-8"
MOUNTAIN VIEW	25'-4" X 14'-8"
SUNNY OAKS	24'-8" X 14'-8"

SYMBOLS AND LEGENDS

5 / A-8.0 — DETAIL NUMBER / SHEET NUMBER

5 / A-6.1 — SECTION NUMBER / SHEET NUMBER

ROOF VENT 07720 — ITEM DESCRIPTION / SPEC SECTION(S)

GENERAL NOTES

1 Applicable Codes and Standards:

Part 1 2001 California Building Standards Administrative Code, Title 24 C.C.R.
Part 2 2001 California Building Code, Title C.C.R.
(1997 Uniform Building Code Volumes 1-3 of the International Conference of Building Officials, with California Amendments)
Part 3 2001 California Electrical Code, Title 24 C.C.R.
(1999 National Electrical Code of the National Fire Protection Association, NFPA)
Part 4 2001 California Mechanical Code, Title 24 C.C.R.
(2000 Uniform Mechanical Code of the International Association of Plumbing and Mechanical Officials, IAPMO)
Part 5 2001 California Plumbing Code, Title 24 C.C.R.
(2000 Uniform Plumbing Code of the International Association of Plumbing and Mechanical Officials, IAPMO)
Part 6 2001 California Energy Code, Title 24 C.C.R.
Part 7 2001 California Elevator Safety Construction Code, Title 24 C.C.R.
Part 8 2001 California Fire Code, Title 24 C.C.R.
(2000 Uniform Fire Code of the Western Fire Chiefs Association)
Part 10 2001 California Code for Building Conservation, Title 24 C.C.R.
(1997 Uniform Code for Building Conservation of the International Conference of Building Officials, with amendments)
Part 12 2001 California Reference Standards Code, Title 24 C.C.R.

2 All work described in the drawings shall be verified for dimension, grade, extent and compatibility with existing site/building conditions. Any discrepancies and unexpected conditions that affect or change the work described in the contract documents shall be brought to the Architect's attention immediately. Do not proceed with the work in the area of discrepancies until all such discrepancies are resolved. If the contractor chooses to do so, he/she shall be proceeding at his/her own risk.

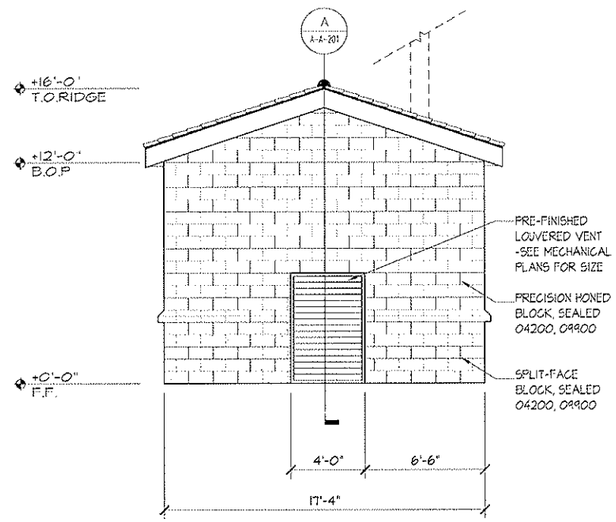
3 Omissions made in these drawings and specifications or the mis-description of the work which is manifestly necessary to carry out the intent of the drawings and specifications, or which is customarily performed shall not relieve the Contractor from performing such omitted or described details of the work as if fully and completely set forth and described in the drawings and specifications.

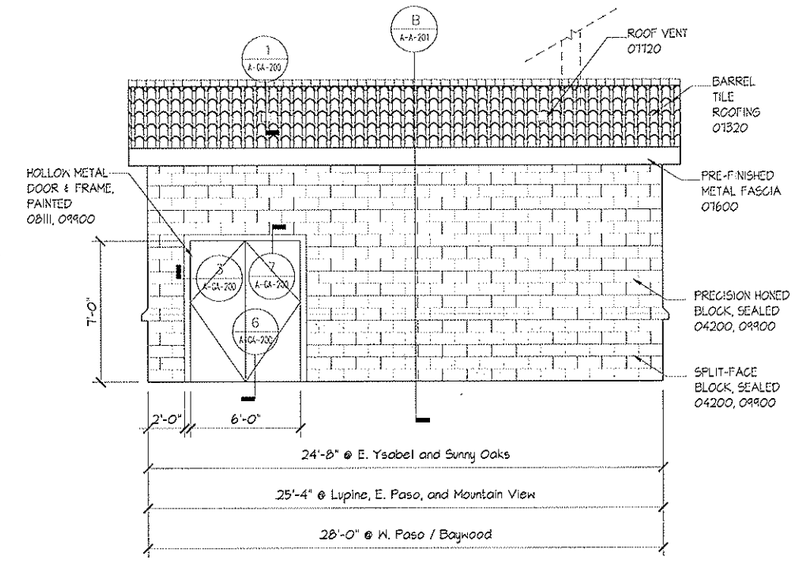
4 Dimensions shown shall take precedence over drawing scale or proportion. Larger scale drawings shall take precedence over smaller scale drawings.

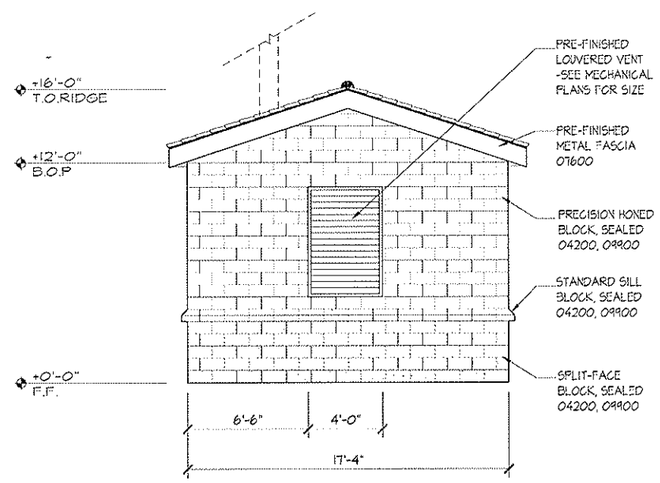
5 In the event of the unforeseen encounter of materials suspected to be of an archaeological or paleontological nature, all grading and excavation shall cease in the immediate area and the appropriate authorities are to be notified by the Contractor. The find shall be left untouched until an evaluation by a qualified Archaeologist or Paleontologist is made.

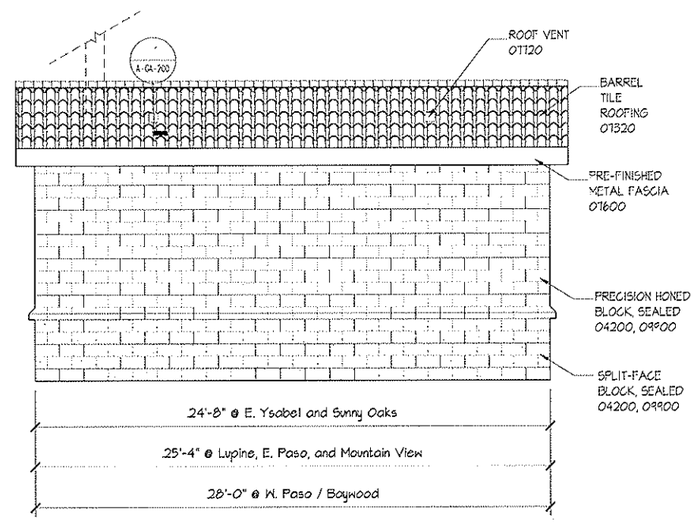
6 Contractor is to be responsible for being familiar with these documents including all contract requirements.

7 Grading plans, drainage improvements, road and access requirements and environmental health considerations shall comply with all local ordinances.









ELEVATIONS

Licensed Architect
Kyle L. Harris
License No. C-29272
Expires 7/05
State of California

REV	DATE	BY	DESCRIPTION

SCALE: 1/4" = 1'-0"

WARNING: 0 1/2 1 — IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

DESIGNED Kyle Harris
DRAWN Ryan Brockett
CHECKED Kyle Harris

SUBMITTED BY
JOHN A. BERGEN — C31069 LICENSE NO. — 2/16/2004 DATE
STEVE J. HYLAND — C23892 LICENSE NO. — 2/16/2004 DATE

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LOS OSOS COMMUNITY SERVICES DISTRICT

MWH Walnut Creek, California

RRM DESIGN GROUP
Creating Environments People Enjoy
745 South Mission Street, Suite 102 • San Luis Obispo, California 93401
Phone: 805/543-1794 • Fax: 805/543-1803 • info@rrmdesign.com

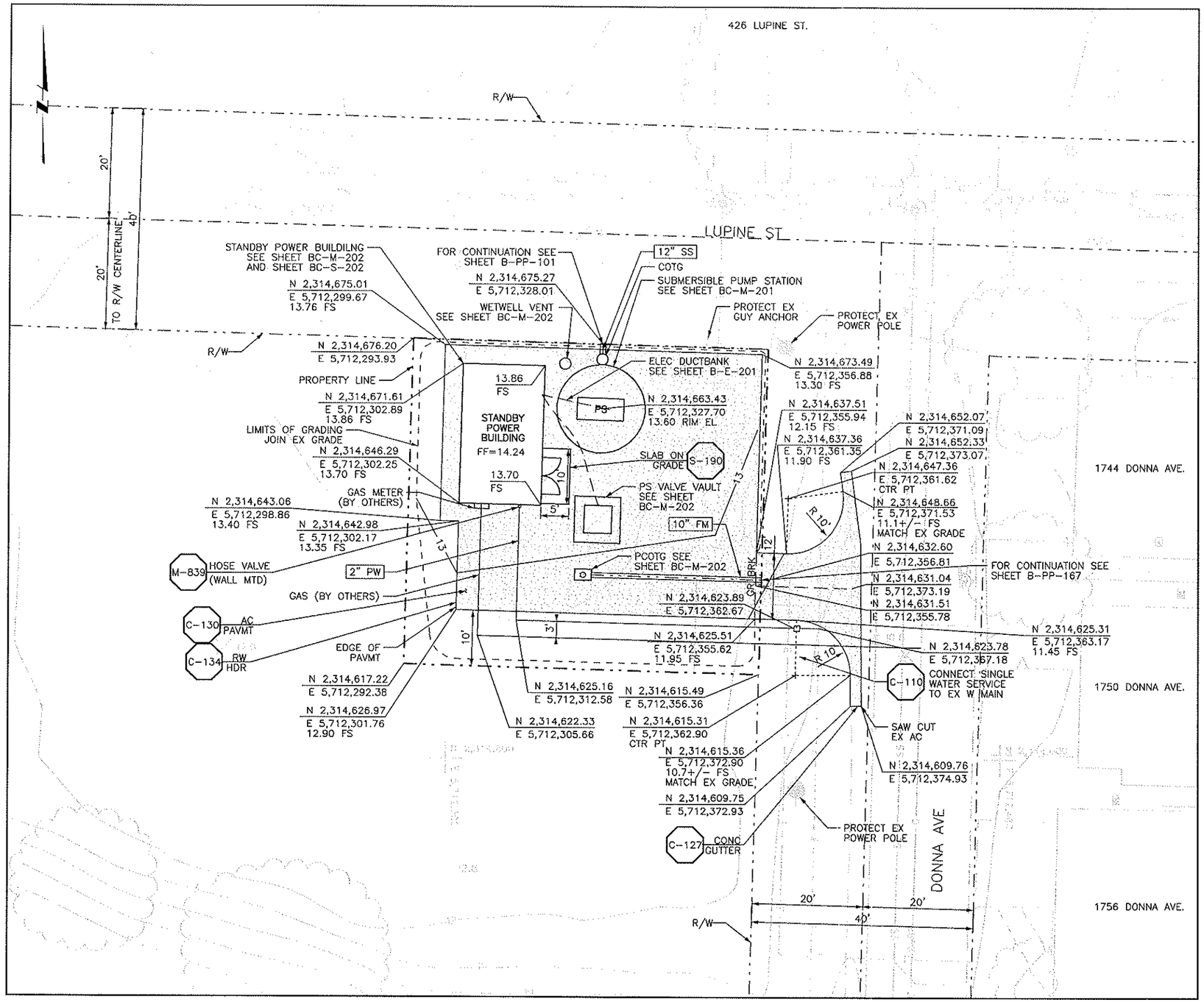
LOS OSOS WASTEWATER PROJECT
ARCHITECTURAL
STANDBY POWER BUILDINGS
ELEVATIONS

SHEET B-A-200 OF

N:\2002\1002208 Los Osos WWTP\Arch\Product\CAD files\PumpStations\1002K.dwg, ELEVATIONS B - SP, Feb 06, 2004 10:18am, SANrain

NOTES:

1. LIDS AND VAULTS TO BE TRAFFIC RATED FOR H-20 LOADING
2. COORDINATE ELECTRICAL DUCTBANK DEPTH AND LOCATION BEFORE INSTALLATION OF PROCESS PIPING. SEE SHEET B-E-201.
3. CONTRACTOR SHALL COORDINATE AND SCHEDULE GAS LINE CONNECTION AND INSTALLATION WITH PACIFIC GAS AND ELECTRIC.



LUPINE PS SITE PLAN

REV	DATE	BY	DESCRIPTION

SCALE: 1"=10'

WARNING: 0 1/2 1 — IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

DESIGNED M RACKOW
DRAWN M RACKOW
CHECKED R BUI

SUBMITTED BY
JOHN A. BERGEN — C31069 LICENSE NO. — 2/16/2004 DATE
STEVE J. HYLAND — C23892 LICENSE NO. — 2/16/2004 DATE

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LOS OSOS COMMUNITY SERVICES DISTRICT

MWH Walnut Creek, California

LOS OSOS WASTEWATER PROJECT
CIVIL
LUPINE PS & STANDBY POWER SITE PLAN

SHEET B-C-201

REGISTERED PROFESSIONAL ENGINEER — STEVEN J. HYLAND — No. C 48027 — Exp. 12-31-05 — CIVIL — STATE OF CALIFORNIA

Job No: 1481166 :: N:\Projects\los_osos\Collect_Sys\PS\civ\B-C-201.dgn Plot Date: 09-FEB-2005 12:16