



TECHNICAL MEMORANDUM

DATE: July 29, 2016 Project No.: 693-20-16-01
SENT VIA: EMAIL

TO: SRWA Technical Advisory Committee

FROM: Nancy McWilliams, PE, RCE #68331

REVIEWED BY: Gerry Nakano, PE, RCE #29524

SUBJECT: SRWA Surface Water Supply Project Alignment Evaluation

OVERVIEW

This Technical Memorandum (TM) presents West Yost Associates' alignment evaluation for the Stanislaus Regional Water Authority (SRWA) Surface Water Supply Project (Project) pipelines. Figure 1 shows the raw water pipeline from the Tuolumne River to the Water Treatment Plant (WTP) and the two finished water pipelines commencing at the WTP to the connection points of project participants, the Cities of Ceres and Turlock. The pipelines will be referred to by their use and or destination as follows: Raw Water Transmission Main (RWTM), Ceres Finished Water Transmission Main (CFWTM), and Turlock Finished Water Transmission Main (TFWTM). This evaluation is based on review of previous materials, field reconnaissance, and input provided by the SRWA Technical Advisory Committee at workshops held May 19 and June 16, 2016.

This TM is organized in the following Sections:

- General Considerations for Pipeline Alignments
- Raw Water Alignment
- Ceres Alignment
- Turlock Alignment

GENERAL CONSIDERATIONS FOR PIPELINE ALIGNMENTS

General considerations for evaluating pipeline alignments include cost, schedule, traffic, and constructability. Cost is primarily a function of pipe diameter and length, but can also include necessary road repairs and rate of pipeline installation. Therefore, it is usually most cost effective to take the most direct route. Open fields can allow for faster construction, but often require easements to be acquired and may have environmental implications which can significantly impact schedule.

For this Project it has been recommended that the transmission facilities and pipelines be placed in existing road right-of-way wherever possible because it eliminates the need for easements. Also, according to Stanislaus County (County) staff, pipelines placed parallel to County roads may require relocation if the road is widened in the future. Eliminating the need for easements avoids the time and cost associated with obtaining easements, and if the property owner is an unwilling seller the Authority would need to prove that the easement is necessary. It is much more challenging to prove necessity if public right-of-way exists in virtually the same location.

The majority of the CFWTM and all of the TFWTM is within the jurisdiction of Stanislaus County. A portion of the CFWTM, between Santa Fe Avenue and Euclid Avenue, is in the City of Hughson.

The fee structure the County currently has in place will have an impact on the transmission facilities construction costs. For narrow roads (less than ~30 feet), where detours are anticipated to be needed the County charges \$500 per day per 1,000 vehicles measured as Average Daily Traffic (ADT). Most of the small county roads are in fair condition, however, some are substandard in width. Based on our knowledge of construction along county roads that are in fair condition, it is anticipated that construction will damage the roads to such an extent that full reconstruction will be required. The County staff have indicated that repairing damaged roads would also require widening them to minimum 22 feet. In general, road reconstruction (22 feet wide) cost can be estimated at approximately \$110 per linear foot. On larger roads where the pavement is in good condition, the County charges a trench cut fee of \$7.50 per square foot of trench, measured after the trench is restored. Based on discussions with the City of Hughson Community Development Director, the majority of Hatch Road within the City limits was recently overlaid and would be subject to the City's trench cut fee which is currently \$7.30 per square foot. Assuming a 36-inch diameter pipeline, with 12-inches of space each side of the pipe and a 12-inch tee section for repair, this equates to \$52.50 per linear foot of pipeline in County right-of-way and \$51.50 within City right-of-way. If we assume that the full five miles of CFWTM requires trench cut fee and the 7.25 miles of TFWM requires full width reconstruction, the total cost for trenching (not including detour charges or pipe installation costs) would be approximately \$5.4 million.

It may be possible to negotiate the trench cut fees, as the SRWA Surface Water Supply Project is a regional project. The County may be able to provide some matching funds for road reconstruction if a sales tax measure on the November 2016 ballot is approved by voters. Although the proposed County and City fees are high, they constitute about 22 percent of the installation when road reconstruction and detours are required and about 10 percent of the cost where trench cut fee is required. Both are much less than the cost of an additional mile of pipeline. Where there is a TID parcel adjacent to the road, such as along Hatch Road, it may be more cost-effective to place the pipeline in the TID right-of-way rather than the County right-of-way, if the topographic conditions allow for it.

Traffic can be a significant consideration, however, this project is located mostly in rural County and City roads which are spaced at one half to one mile apart. Major changes in alignment, running the pipe along a parallel road, would require one to two miles of additional pipeline. Therefore, traffic impacts are considered only for alternatives along small portions of the alignments. Constructability is also an important consideration. For this project, the major challenges regarding constructability are discussed as part of the Ceres Water Alignment.

RAW WATER ALIGNMENT

The RWTM will convey raw water from the Raw Water Pump Station near the Tuolumne River to the WTP and the Ceres Main Canal. The RWTM will be 60-inch diameter and approximately 3,900 feet long. The majority of the RWTM will be owned and operated by Turlock Irrigation District (TID). A Flow Split Vault, located within the treatment plant property, will provide a branch to a pipeline that will serve the Project, see Figure 2.

The RWTM alignment would extend the pipeline from the raw water pump station under the Geer Road bridge, across Fox Grove Park, then run south east of and parallel to the WTP parcel line, turn east across the southern portion of the WTP parcel, then south in Aldrich Road with an outlet structure just west of Aldrich Road. This entire alignment including the flow split vault will be under TID's jurisdiction. Only the pipeline extending north from the flow split vault will be owned and operated by the Authority. Right-of-way was partially acquired and design documents were prepared in January 2009 for the TID portion of the RWTM. Due to reconstruction of the Geer Road bridge, the alignment will have to be modified slightly to avoid a pier associated with the new Geer Road bridge. Additional easements will still need to be acquired from the State of California and from two private property owners.

CERES ALIGNMENT

The CFWTM will convey finished water from the WTP to a City-owned terminal tank located north of Hatch Road at the Ceres River Bluff Regional Park (Park) at the west edge of Ceres, see Figure 1. There are no through roads running between Geer Road and the Park, so the majority of the pipeline will run along Hatch Road. The following topics are discussed in this section:

- Alignment alternatives
- Benefits and drawbacks of alignment alternatives
- Recommended alignment

Alignment Alternatives

The majority of the alignment will run along Hatch Road either in the road right-of-way or in the TID right-of-way immediately south of the road. If the pavement is cut in Hatch Road the trench cut fee will be triggered. If the pipeline is placed in the TID right-of-way, it will be subject to their annual licensing fee of \$250 for the first 1,000 feet and \$25 per 100 feet thereafter, which equates to \$13,250 per year per mile. Therefore, the best option would be to run the pipeline in sandy (unpaved) areas within the county road as much as possible. The exact locations of the pipeline will be refined during the pre-design phase when topographic information is available.

As shown on Figure 3, eight alternative alignments for the initial 2,500 feet of the pipeline between the WTP and the intersection of Hatch Road and Geer Road must be evaluated:

- Alternative A, the selected alignment included in the 2007 Predesign Report, would extend the pipeline south along Aldrich Road parallel to the Turlock finished water pipeline, then head west and southwest along the north edge of the Ceres Main Canal to the intersection of Hatch Road and Geer Road.
- Alternative B would extend the pipeline from the WTP back parallel to the Raw Water alignment then up the Park access road, then south along Geer Road to Hatch Road.
- Alternative C would extend the pipeline from the WTP through an easement on private property then south along the Park access road, then south along Geer Road to Hatch Road.
- Alternative D would extend the pipeline from the WTP through an easement on private property to Geer Road, then south on Geer Road to Hatch Road.
- Alternative E would extend the pipeline south along Aldrich Road, under Ceres Main Canal, then head west along the south side of Ceres Main Canal, north under Ceres Main Canal to Hatch Road.
- Alternative F would extend the pipeline south along Aldrich Road, under Ceres Main Canal, then head west through an easement on private property, then head north along Geer Road, under Ceres Main Canal to Hatch Road.
- Alternative G would extend the pipeline south along Aldrich Road, under Ceres Main Canal, then head west along Fox Road, then head north along Geer Road, under Ceres Main Canal to Hatch Road.
- Alternative H would extend the pipeline south along Aldrich Road, then head west and southwest along the north edge of the Ceres Main Canal and turn west through an orchard to Geer Road, then head south along Geer Road to Hatch Road.

Benefits and Drawbacks of Alignment Alternatives

Alternative A has two challenges: a narrow construction corridor and an existing power line easement. The corridor is restricted by the Ceres Main Canal to the south and the transmission towers to the north. Figure 4 shows a typical cross section at a transmission tower along the access road. The second restriction is in front of the residence adjacent to the Tuolumne Substation. The access road turns to the east, and a tower exists at the inside of the curve. The tower has a guy wire that extends across the canal. Figure 5 shows a plan view, and Figure 6 shows a cross section at this location. The corridor constrictions could cause some portions of the pipeline to be constructed linearly (trucks cannot pass each other), will require special construction at the turning point, and special equipment may be necessary to excavate the trench adjacent to the canal.

Table 1 summarizes the benefits and drawbacks of each of the eight alignments.

Table 1. Ceres Alignment Alternatives Benefits and Drawbacks

Alternative	Benefits	Drawbacks
Alternative A (3,100 LF)	<ul style="list-style-type: none"> • Low impact to public for pipeline construction • Does not require crossing Ceres Main Canal 	<ul style="list-style-type: none"> • Requires easement from one private property owner that will coincide with existing TID power line easement • Construction limited to winter when canal is empty • Construction constraints with limited width and overhead power lines
Alternative B (3,950 LF)	<ul style="list-style-type: none"> • Does not require crossing Ceres Main Canal 	<ul style="list-style-type: none"> • Would require that a portion of Raw Water Pipeline easement be within a joint easement for TID and SRWA in State Property • High impact to public for construction along Geer Road and Park access road • Additional cost due to County trench repair fee on Geer Road
Alternative C (3,400 LF)	<ul style="list-style-type: none"> • Does not require crossing Ceres Main Canal 	<ul style="list-style-type: none"> • Requires easement from one private property owner • High impact to public for construction along Geer Road and Park access road • Additional cost due to trench repair fee on Geer Road
Alternative D (3,100 LF)	<ul style="list-style-type: none"> • Low impact to public for pipeline construction • Does not require crossing Ceres Main Canal 	<ul style="list-style-type: none"> • Requires easement from one private property owner • High impact to public for construction along Geer Road
Alternative E (3,500 LF)	<ul style="list-style-type: none"> • Low impact to public for pipeline construction 	<ul style="list-style-type: none"> • Requires crossing Ceres Main Canal twice • Very constrained construction space • Large guy wire blocks approximately 400 feet east of Geer Road – which would most likely require an easement through private property • This alternative is not feasible without obtaining additional easements through the orchard for construction purposes and to avoid guy wire blocks.
Alternative F (6,000 LF)	<ul style="list-style-type: none"> • Low impact to public for pipeline construction through easement 	<ul style="list-style-type: none"> • Requires crossing Ceres Main Canal twice • Requires easement from one private property owner • High impact to public for construction along Geer Road • About 5,500 feet longer than Alternatives A, B, C, or D
Alternative G (9,600 LF)	<ul style="list-style-type: none"> • All construction in existing public right-of-way 	<ul style="list-style-type: none"> • Requires crossing Ceres Main Canal twice • High impact to public for construction along Geer Road • About 9,500 feet longer than Alternatives A, B, C, or D
Alternative H (3,300 LF)	<ul style="list-style-type: none"> • Low impact to public for pipeline construction • Does not require crossing Ceres Main Canal 	<ul style="list-style-type: none"> • Requires easement from one private property owner that will coincide with existing TID power line easement, and then run cross country through the orchard • Construction limited to winter when canal is empty • Construction constraints with limited width and overhead power lines

Recommended Alignment

Alternative A is recommended because it has the least impact to traffic, does not require crossing the Ceres Main Canal, and will exit the Project treatment plant at the same location as the Turlock pipeline. If it is not possible to procure a new pipeline easement that will overlap with the existing electrical power line easement, or there are prohibitive construction or maintenance issues, then Alternative D or Alternative H is recommended because they do not impact the Fox Grove Access Road and are relatively the same length as Alternative A. Both Alignment D and Alternative H follow Geer Road which is a heavily traveled truck route. Therefore, further refinement will be required at the pre-design stage to determine the feasibility of Alternative A, as well as whether the CFWTM should be installed in the edge of Geer Road or parallel to and west of Geer Road.

TURLOCK ALIGNMENT

The TFWTM will convey finished water from the WTP to a City-owned terminal tank located east of North Quincy Road between East Zeering Road and East Monte Vista Avenue, and near the north east corner of Turlock. The following topics will be discussed in this section:

- Alignment alternatives
- Benefits and drawbacks of alignment alternatives
- Recommended alignment

Alignment Alternatives

Figure 7 shows two alignments: Alternative A, which is included in the 2007 predesign report and Alternative B shown in the Regional Surface Water Supply White Paper. Alternative A would extend the finished water pipeline from the WTP south along Aldrich Road, west on Fox Road, south on Euclid Avenue, west on Service Road then south along Griffin Road to Taylor Road. Since that time, the City of Turlock has determined that the terminal tank will be placed on the eastern edge of the city. Alternative B is the most direct route to the revised terminal tank location and heads south on Aldrich Road, east on John Fox Road, south on Berkeley Road, east on Taylor Road, then south on North Quincy Avenue.

Although there is less traffic impact with Alternative A, the pipeline would be approximately two miles (~28 percent) longer which would increase construction costs significantly.

It was requested that two alternatives along Alternative B be evaluated: whether to use Fox Road or John Fox Road between Aldrich Road and Berkeley Road, and whether to cross the irrigation canal and railroad tracks at Berkeley Road, or cross the TID canal along Santa Fe Avenue and cross the railroad at the intersection of Santa Fe Avenue and Keyes Road. These alternatives are shown on Figure 8.

Benefits and Drawbacks of Alignment Alternatives

Table 2 summarizes the benefits and drawbacks of each of the three alignment alternatives.

Table 2. Turlock Water Alignment Alternative Benefits and Drawbacks		
Alternative	Benefits	Drawbacks
Alternative A	<ul style="list-style-type: none"> • Less traffic impact 	<ul style="list-style-type: none"> • Two miles longer
Alternative B	<ul style="list-style-type: none"> • Most direct route to revised terminal tank location 	
Fox Road Segment		<ul style="list-style-type: none"> • High voltage power lines • More traffic impact
John Fox Road Segment	<ul style="list-style-type: none"> • No high voltage power lines • Less traffic impact 	<ul style="list-style-type: none"> • Road is currently less than 22 feet of pavement
Canal and Railroad Crossing at Berkeley	<ul style="list-style-type: none"> • Less impact to traffic • Localized crossing of both the canal and the railroad at essentially the same location will minimize impact to public 	<ul style="list-style-type: none"> • Easement through private property required
Canal crossing at parallel to Santa Fe		<ul style="list-style-type: none"> • More impact to traffic • Easements would likely be necessary for canal crossing
Railroad crossing at Santa Fe and Keyes		<ul style="list-style-type: none"> • More impact to traffic • Due to constrained and busy intersection, easements would likely be necessary for trenchless construction • Longer pipeline

Recommended Alignment Alternative

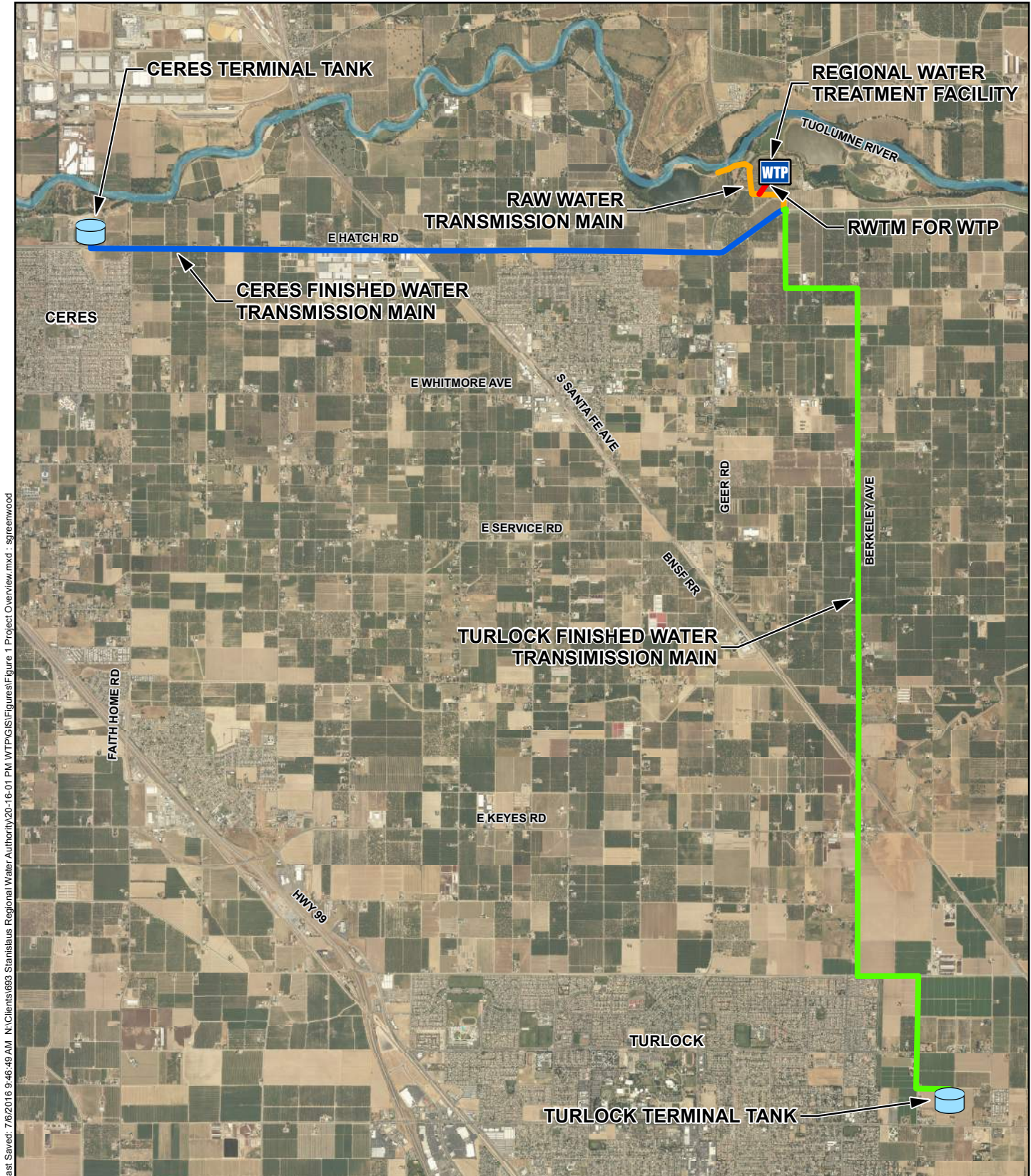
Alternative B is recommended because it is the shortest and most direct route to the proposed terminal tank. John Fox Road is preferred over Fox Road because it has less traffic and no high voltage electric transmission mains. Crossing the railroad and canal at a single location that has less traffic impact is preferred to making two separate crossings along Santa Fe Avenue.

SUMMARY

It is recommended that SRWA move forward with the recommended alignments for detailed evaluation of significant crossings and right-of-way acquisition.







REFERENCES

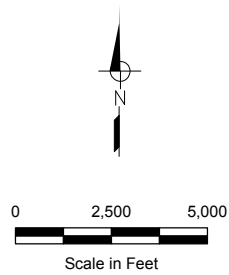
- Brown and Caldwell, 2007. Regional Surface Water Supply Project Finished Water Transmission Pipeline Draft Preliminary Design Report. October 2007.
- Cities of Ceres, Modesto, and Turlock, 2011. Regional Surface Water Supply Project White Paper, January 21, 2011.
- EDAW Inc., 2001. Infiltration Gallery Project in Special Run Pool 9, February 2001.



Last Saved: 7/6/2016 9:46:49 AM N:\Clients\683 Stanislaus Regional Water Authority\20-16-01 PM WTP\GIS\Figures\Figure 1 Project Overview.mxd : sgreenwood

Symbology

-  Regional Water Treatment Facility
-  Tank
-  Raw Water Transmission Main
-  Turlock Finished Water Transmission Main
-  Ceres Finished Water Transmission Main
-  RWTM FOR WTP








**Figure 1
Project Overview**

Stanislaus Regional Water Authority
Surface Water Supply Project

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Symbology

-  Regional Water Treatment Facility
-  Pump Station
-  Flow Split Vault
-  Outlet Structure
-  TID Property Area

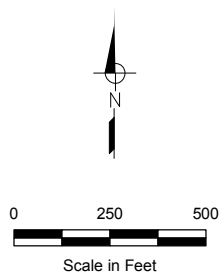
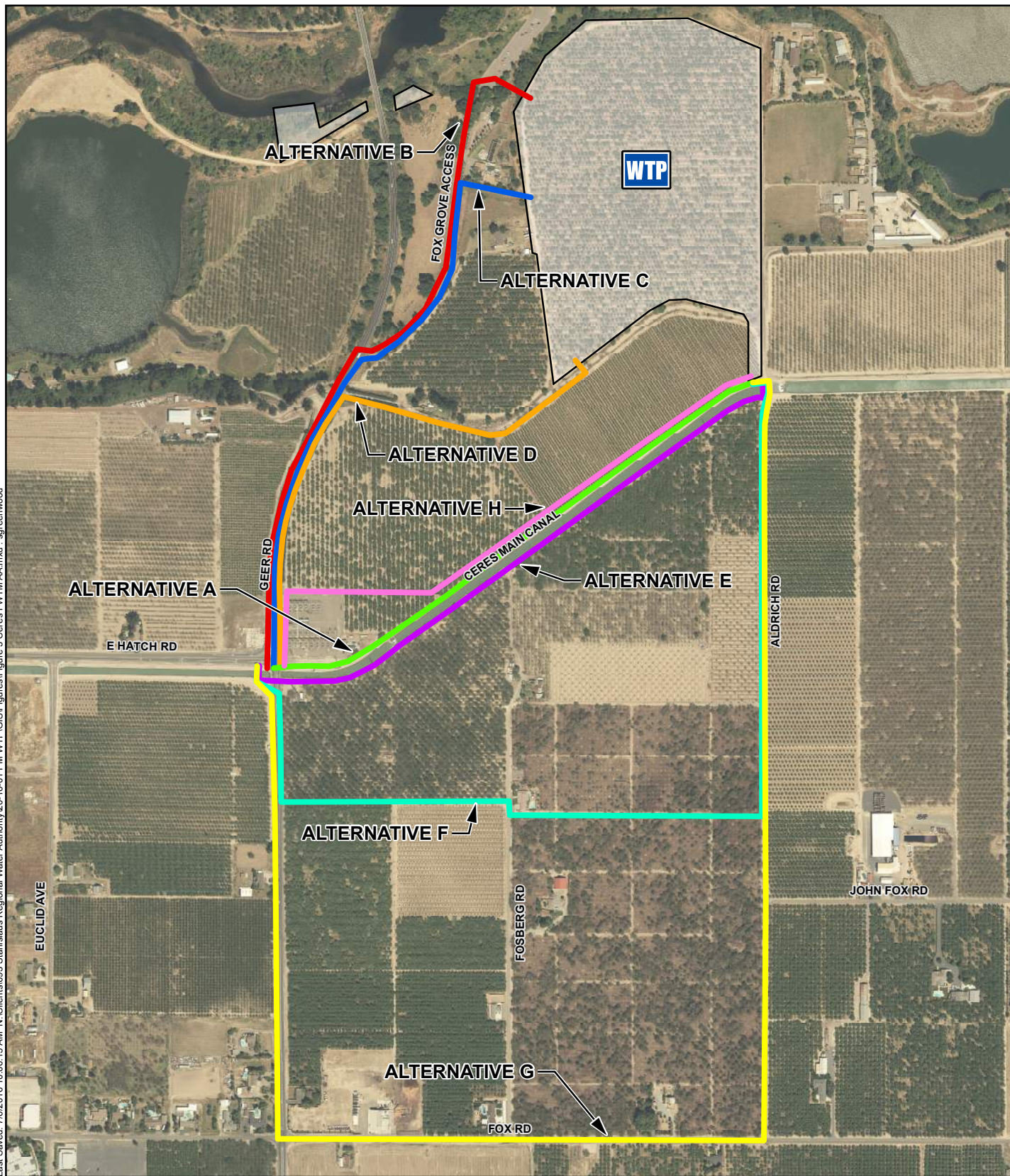







Figure 2
Raw Water Alignment

Stanislaus Regional Water Authority
Surface Water Supply Project

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Symbology

-  Regional Water Treatment Facility
-  TID Property Area
-  Alternative A
-  Alternative B
-  Alternative C

-  Alternative D
-  Alternative E
-  Alternative F
-  Alternative G
-  Alternative H

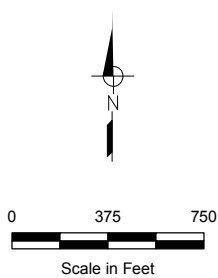
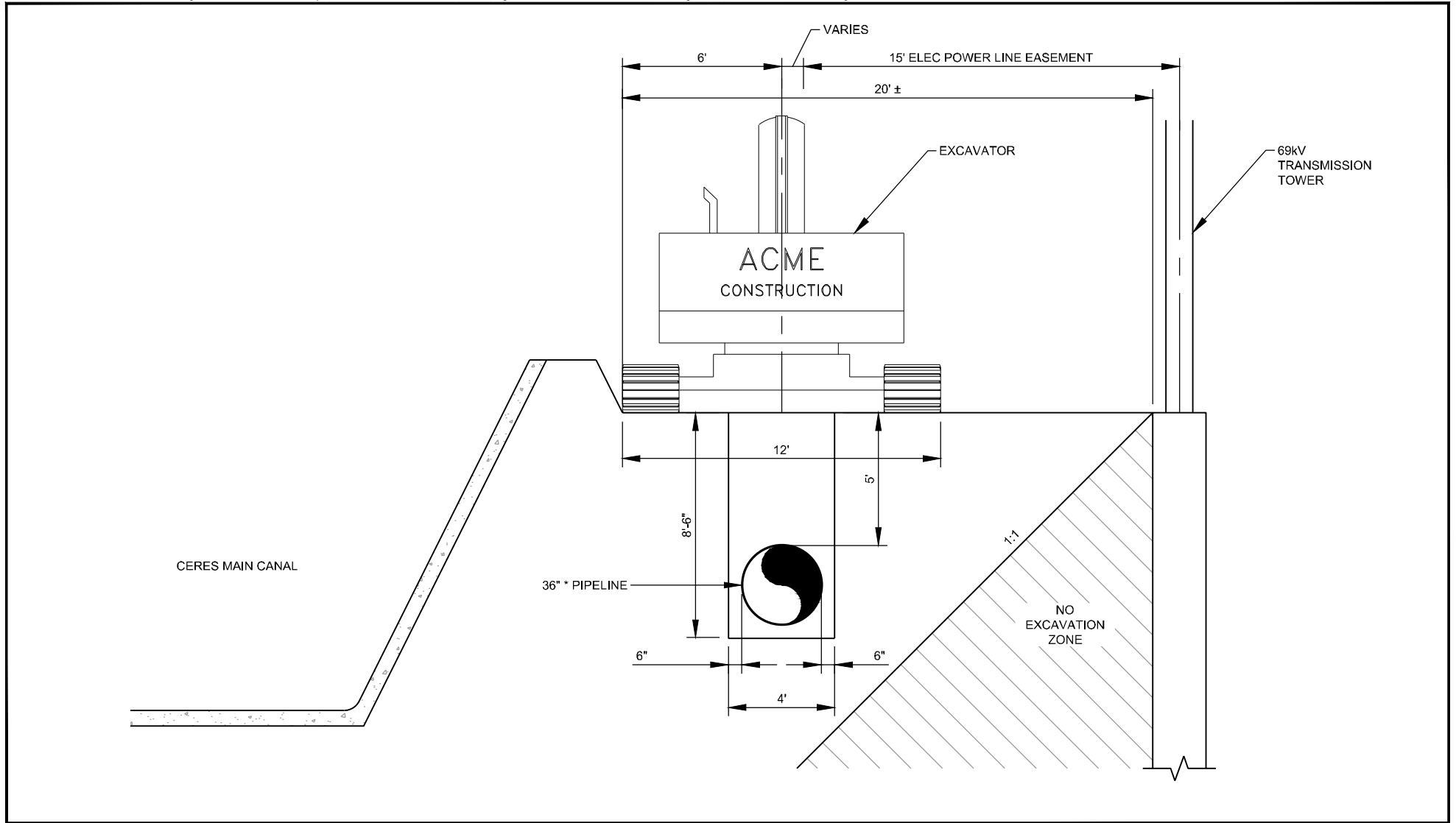


Figure 3
Ceres FWTM
Alignment Alternatives

Stanislaus Regional Water Authority
Surface Water Supply Project



Notes

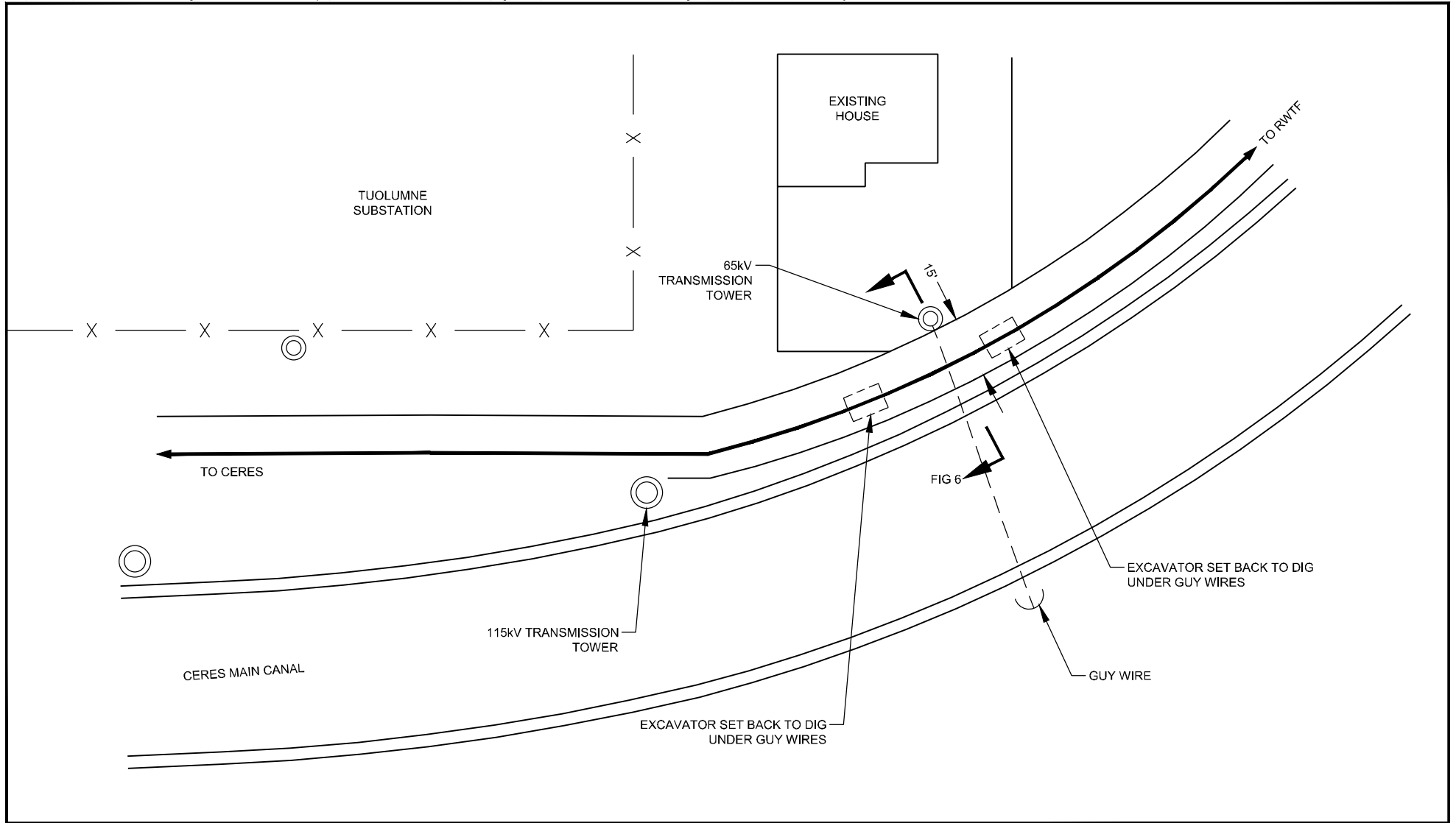
* Pipeline diameter subject to change pending hydraulic analysis.



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Figure 4
Typical Construction
Cross Section

Stanislaus Regional Water Authority
Surface Water Supply Project

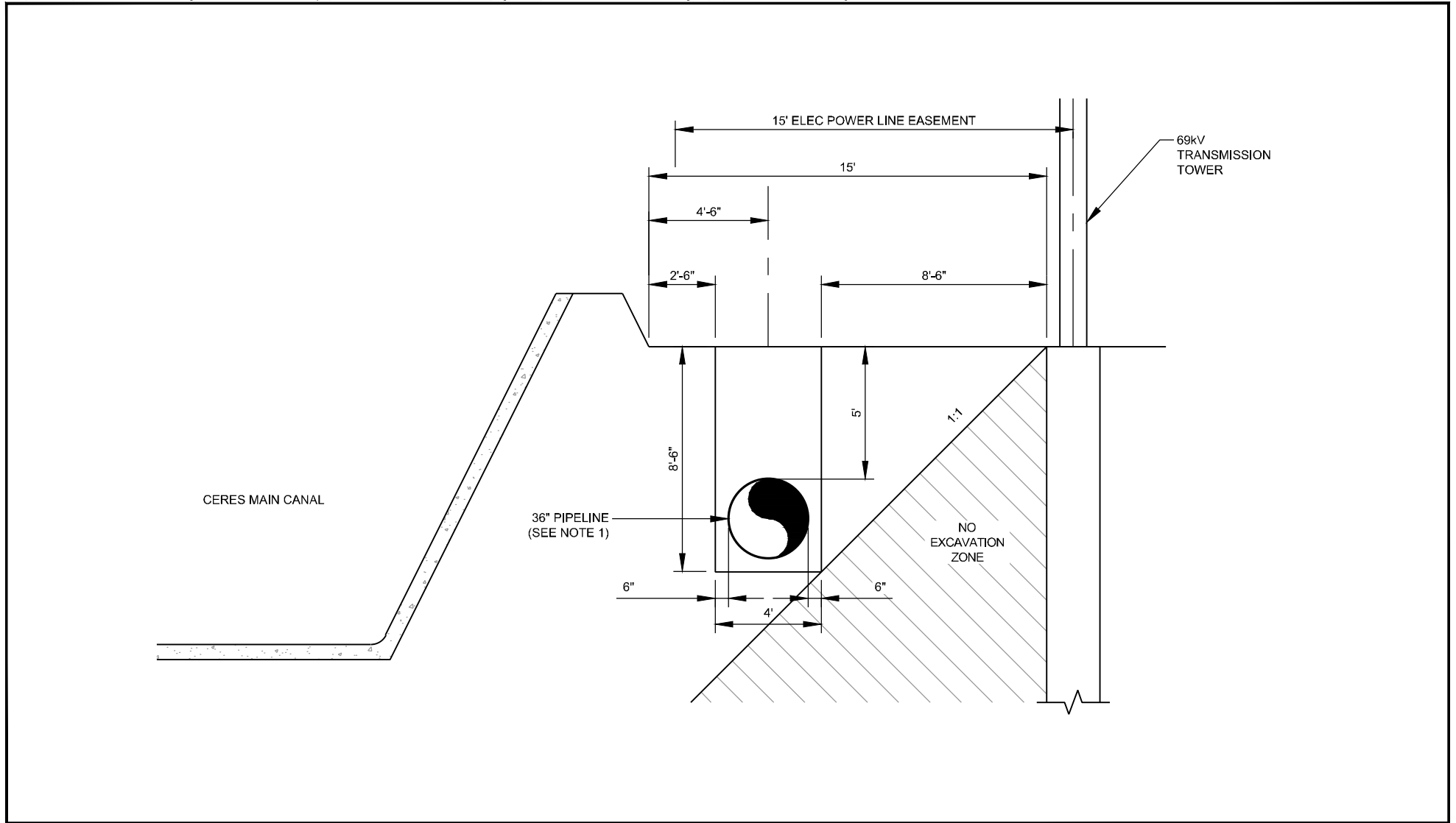


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Figure 5
Plan View Narrow Construction Near
Tuolumne Substation

Stanislaus Regional Water Authority
Surface Water Supply Project



Notes

1. Pipeline diameter subject to change pending hydraulic analysis.
2. Access restricted at this location, special equipment or construction methods will be required.

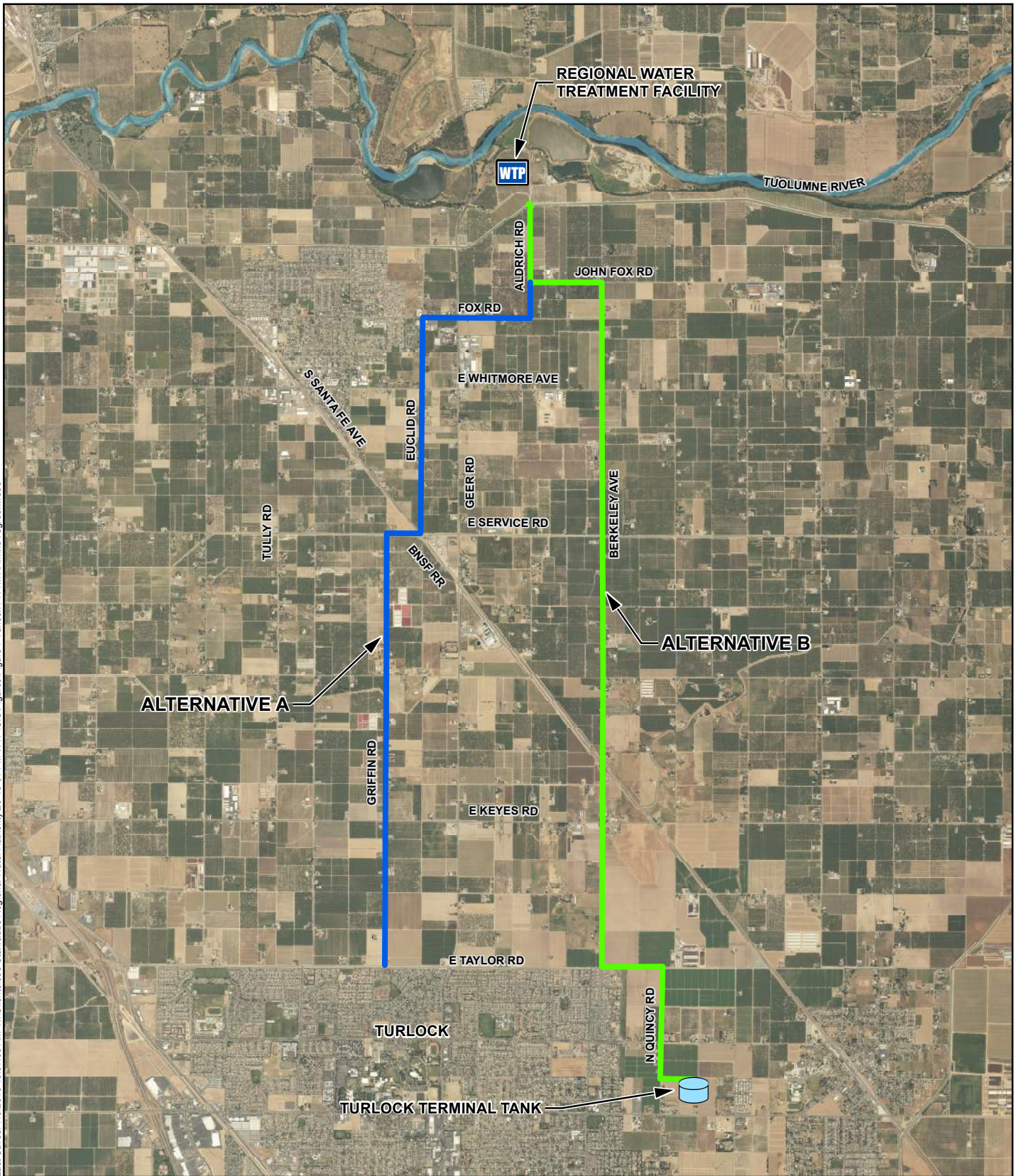
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Figure 6
Section View Narrow Construction
Near Tuolumne Substation

Stanislaus Regional Water Authority
Surface Water Supply Project

Last Saved: 7/6/2016 10:07:56 AM N:\Clients\693 Stanislaus Regional Water Authority\20-16-01 PM WTP\GIS\Figures\Figure 7_Turlock FWTM AA.mxd : sgreenwood



Symbology

-  Regional Water Treatment Facility
-  Tank
-  Alternative A
-  Alternative B

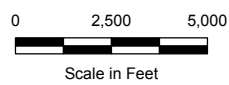
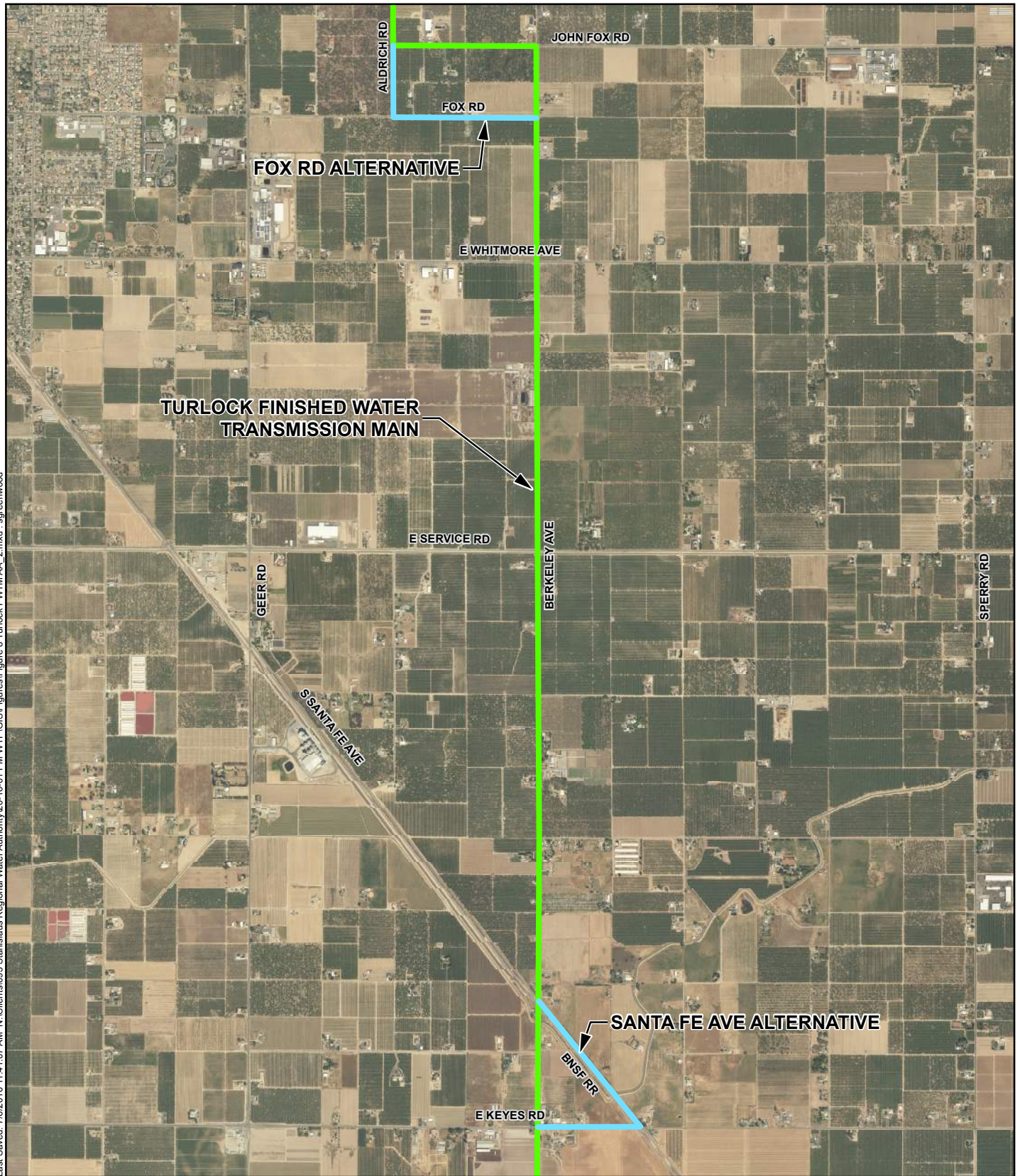


Figure 7
Turlock FWTM
Alignment Alternatives

Stanislaus Regional Water Authority
 Surface Water Supply Project

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Symbology

- █ Turlock Finished Water Transmission Main
- █ Alternative Alignments



Figure 8
Turlock FWTM
Alignment Alternatives

Stanislaus Regional Water Authority
 Surface Water Supply Project