APPENDIX F

Hydrology/Drainage Report

WEST YOST ASSOCIATES
Consulting Engineers

TECHNICAL MEMORANDUM

DATE: December 1, 2017 Project No.: 665-10-17-03
SENT VIA: EMAIL

TO: Tom Phillippi, Phillippi Engineering

FROM: Don Jones, PE, RCE #49239
Jeffrey Wanlass, PE, RCE #60930

REVIEWED BY: Mark Kubik, PE, RCE #50963

SUBJECT: The Farm at Alamo Creek Hydrology and Water Quality Evaluation

INTRODUCTION

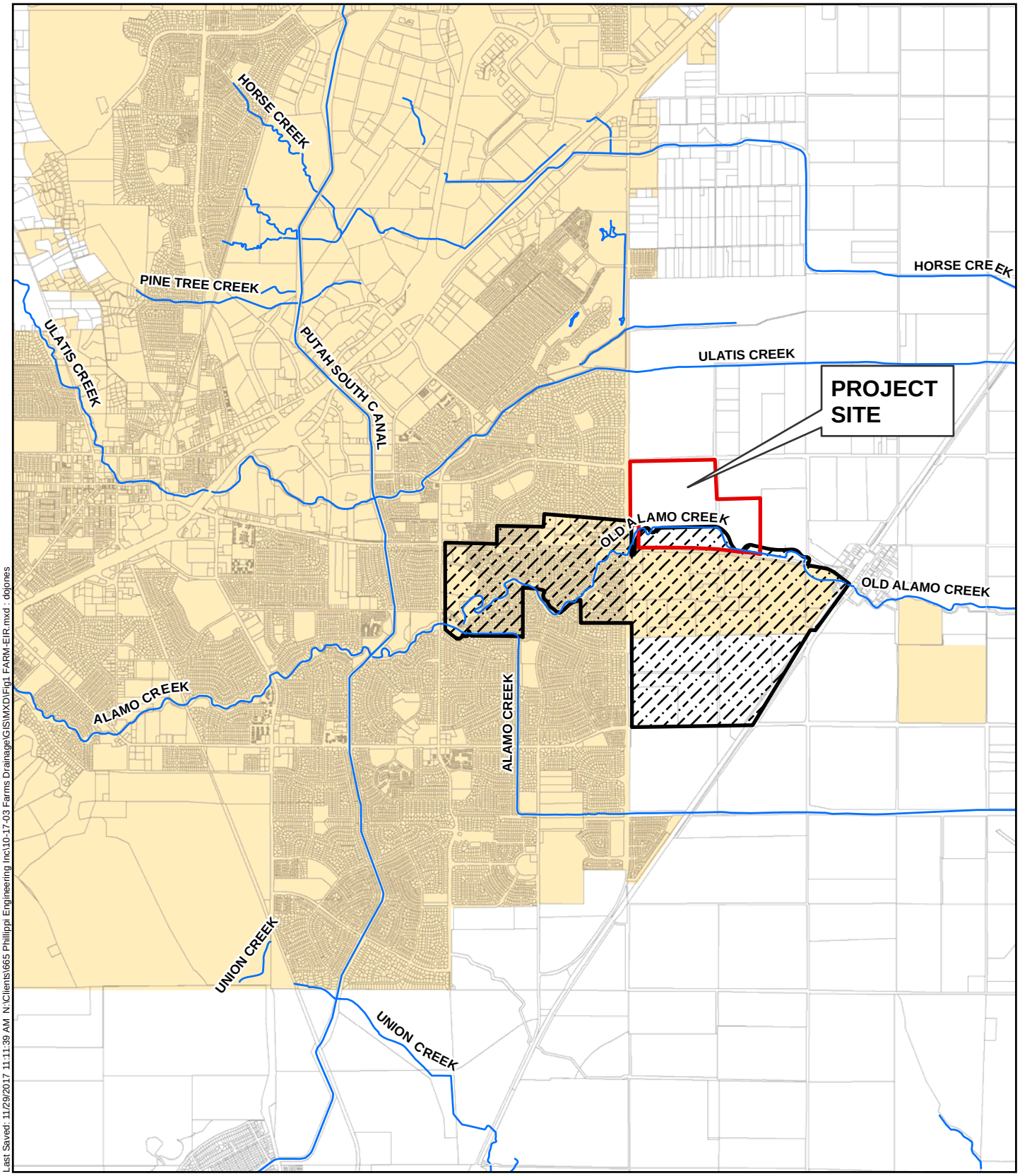
The Farm at Alamo Creek (Farm) project is a proposed development project in the City of Vacaville (City). West Yost Associates (West Yost) is assisting the City with the preparation of an Environmental Impact Report (EIR) for the project. As a part of that work, West Yost has reviewed the project site and other sources of data related to stormwater conditions. In addition, we have conducted drainage modeling of the proposed Farm Project. Based on those activities, we have prepared this Technical Memorandum that describes the existing conditions, discusses the methods and results of the drainage study, describes the potential project impacts on hydrology and water quality, and presents recommended mitigation measures.

EXISTING CONDITIONS

Surface Water Resources

The proposed project site is located in the Old Alamo Creek watershed. Old Alamo Creek is a modified water body that was formerly the downstream portion of Alamo Creek. Alamo Creek originates on the eastern slopes of Mount Vaca and then flows through the City before joining Ulatis Creek roughly six miles downstream (east) of the project site. Ulatis Creek continues flowing to the east and southeast and ultimately drains to the Sacramento River via Cache Slough. Old Alamo Creek is located north of Elmira Road, just south of the project site (see Figure 1).

During the 1960s, several features of the lower Ulatis Creek watershed were modified to protect local agricultural lands from damaging floods, which had historically occurred along several of the major creeks in the area, including Alamo Creek. One of the modifications involved the redirection of flows from Alamo Creek into a new channel along a more southerly alignment. The new channel became known as New Alamo Creek, and the existing channel downstream of the redirection point became known as Old Alamo Creek.



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Symbology

- Creek/Drain
- The Farm at Old Alamo Creek
- Portion of Old Alamo Creek Watershed
- Vacaville Parcels
- Vacaville City Limits

N

0 2,000 4,000

Scale in Feet

WEST YOST ASSOCIATES

Figure 1

SURFACE WATER RESOURCES

THE FARM AT ALAMO CREEK EIR

As a result of the modifications to Alamo Creek, the drainage area to the current Old Alamo Creek was reduced to a localized section of eastern Vacaville plus additional unincorporated areas to the east. The portion of the Old Alamo Creek watershed upstream of the unincorporated Town of Elmira is shown on Figure 1. The tributary area draining to the creek from this area is approximately 990 acres.

Based on historical maps, it appears that a larger area north of the creek drained towards the creek prior to grading operations of the farmers in the area. The Farm's developer is proposing to drain this project to Old Alamo Creek adding about 160-acres to the total watershed area.

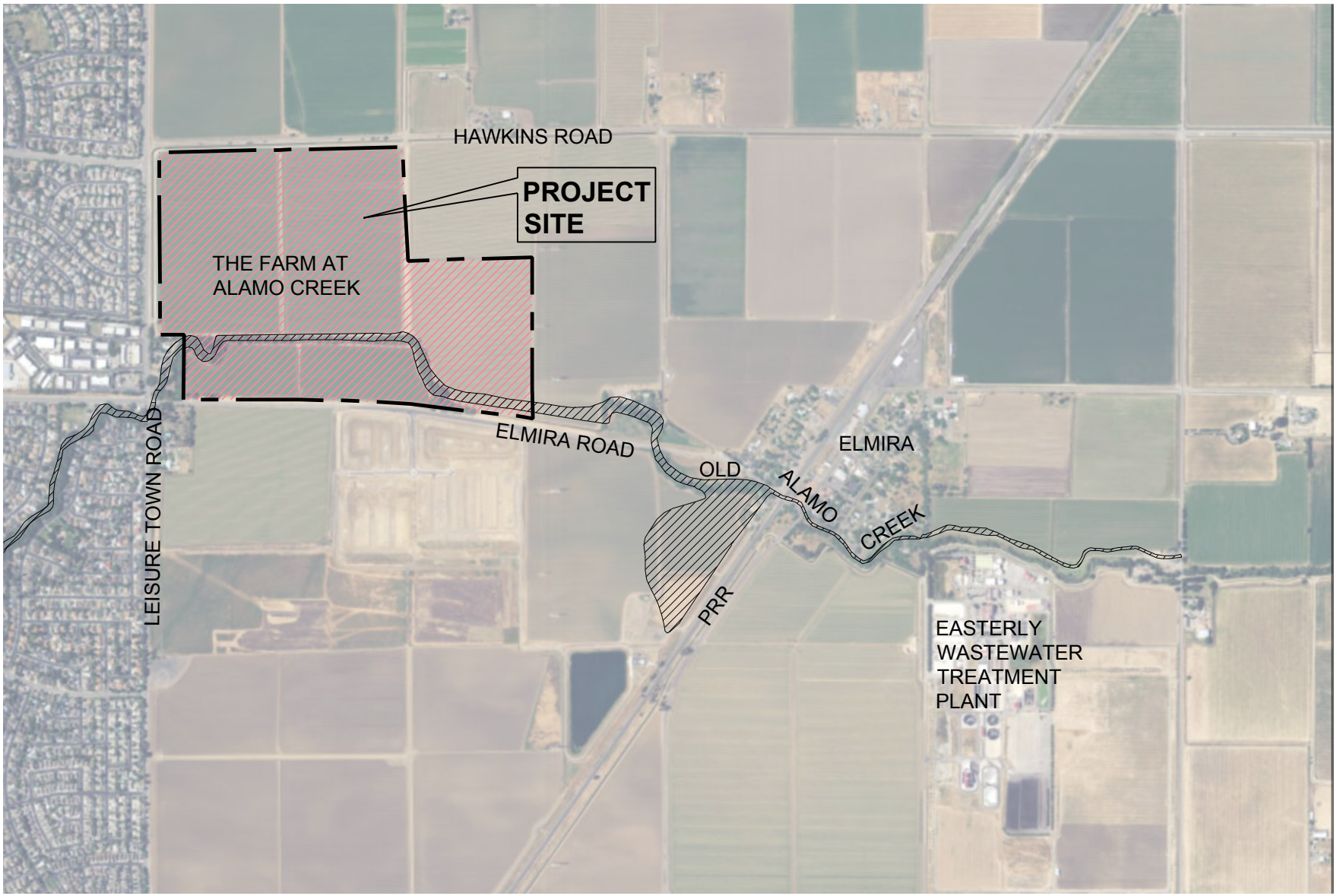
Currently, a majority of the project site drains northeasterly across the site as sheet flow where it is intercepted by two ditches flowing northerly towards Hawkins Road. The Hawkins Road roadside ditches convey runoff easterly to the Union Pacific Railroad (UPRR) embankment where it ponds and eventually infiltrates into the soil. Only that portion of the project site within the tributary area to Old Alamo Creek at Elmira actually drains to Old Alamo Creek under existing conditions.

Topography and Soils

The topography at the project site is flat with slopes ranging from 0.2 to 0.3 to percent. The ground at the site slopes uniformly from west to east. According to soil data from the Natural Resources Conservation Service, the predominant soils at the site include Yolo loam, Brentwood clay loam, Rincon clay loam, and Capay silty clay loam. The soils fall within Hydrologic Soils Groups B and C, which have infiltration capacities ranging from moderate (Group B) to low (Group C).

100-Year Floodplain

According to the Flood Insurance Rate Map 06095C0281E, which was published Federal Emergency Management Agency (FEMA) in May 2009, the project site is subject to flooding during a 100-year storm only along Old Alamo Creek. Flooding has been identified downstream (east) of the project site along the Frost Canal and UPRR (see Figure 2). Runoff from the project site currently does not flow to this floodplain area; therefore, does not contribute to the flooding.



LEGEND

□00-YEAR FEMA FLOODPLAIN

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0 750 1,500

SCALE IN FEET

FIGURE □

THE FARM AT ALAMO CREEK EIR

□00-YEAR FEMA FLOODPLAIN

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Surface Water Quality

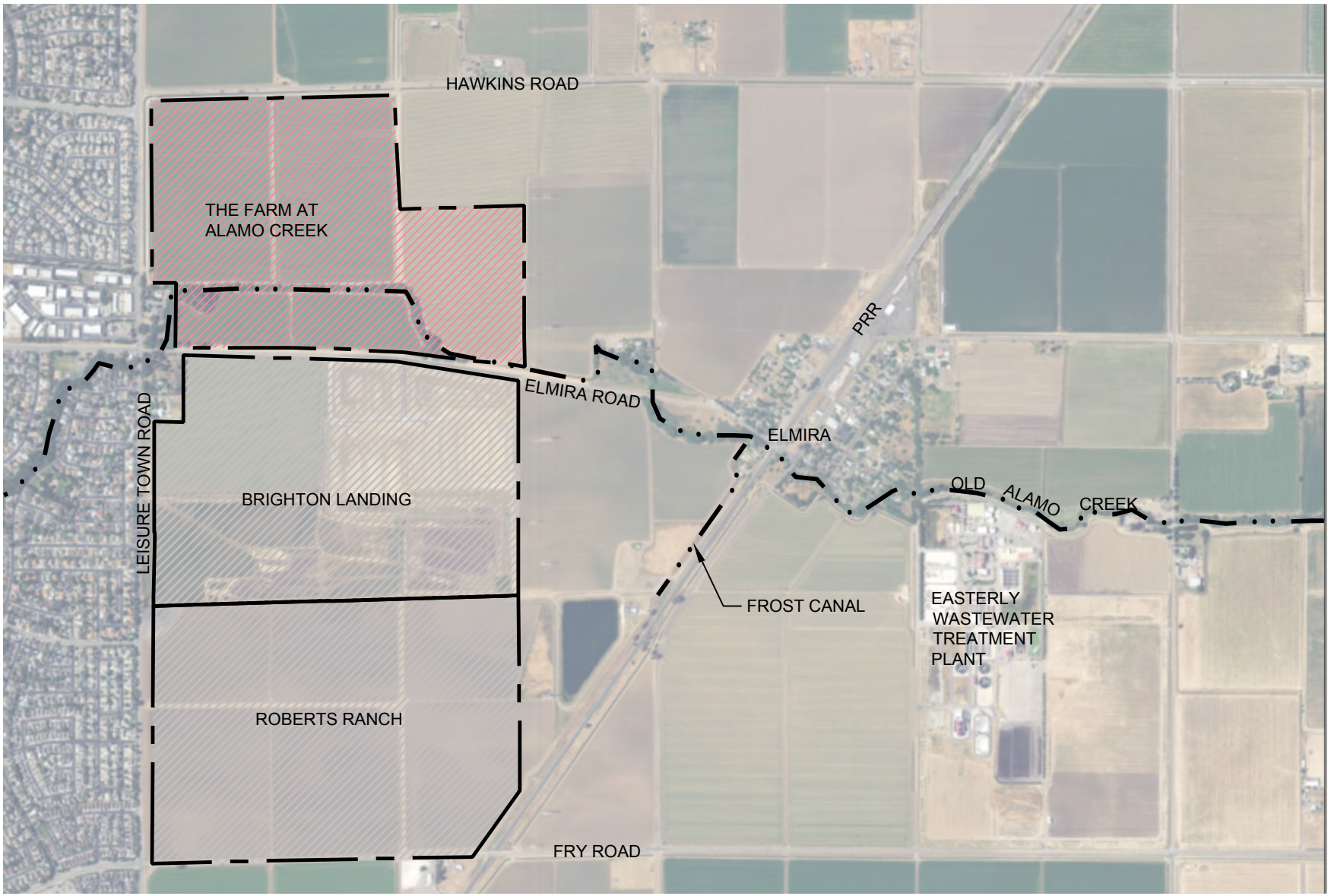
The Sacramento River has been identified as providing a number of beneficial uses including municipal, agricultural, and recreational water supply, and fish and wildlife habitat. Water quality in the river is affected by a number of sources including agricultural runoff, mining activities, stormwater runoff, erosion, and treated wastewater discharges. The Sacramento River is listed as impaired under the 303(d) list for chlordane, DDT, dieldrin, mercury, polychlorinated biphenyls, and unknown toxicity (*State Water Resources Control Board, 2010 Integrated Report (Clean Water Act Section 303(d) List/305(b) Report)*).

Hydrology

The Farm project is a 190-acre proposed development in the area identified in the City's East of Leisure Town Road growth as shown on Figure 3. This analysis was conducted to evaluate drainage improvements necessary to allow development of this project.

The developers of this project have proposed to develop the project in such a way that runoff from the site will drain to Old Alamo Creek. Drainage improvements will include underground pipe systems that will convey runoff to the planned detention pond adjacent to Old Alamo Creek. The detention pond will attenuate flows while discharging directly to the creek. Currently, a majority of the project site drains easterly and eventually ponds at the UPRR embankment. Old Alamo Creek is currently in an un-maintained state and does not have the capacity to convey 100-year flows under even pre-development conditions. This study evaluates the impacts of the project to Old Alamo Creek and the necessary improvements to allow development of this project.

In addition to the Farm project draining to Old Alamo Creek, two other development projects to the south will drain to the creek via the Frost Canal along the UPRR. These projects, Brighton Landing and Roberts Ranch, will be drained to an already constructed detention pond that will be pumped to Old Alamo Creek. The locations of these projects are shown on Figure 3.



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SCALE IN FEET

FIGURE 3

THE FARM AT ALAMO CREEK EIR

STUDY AREA

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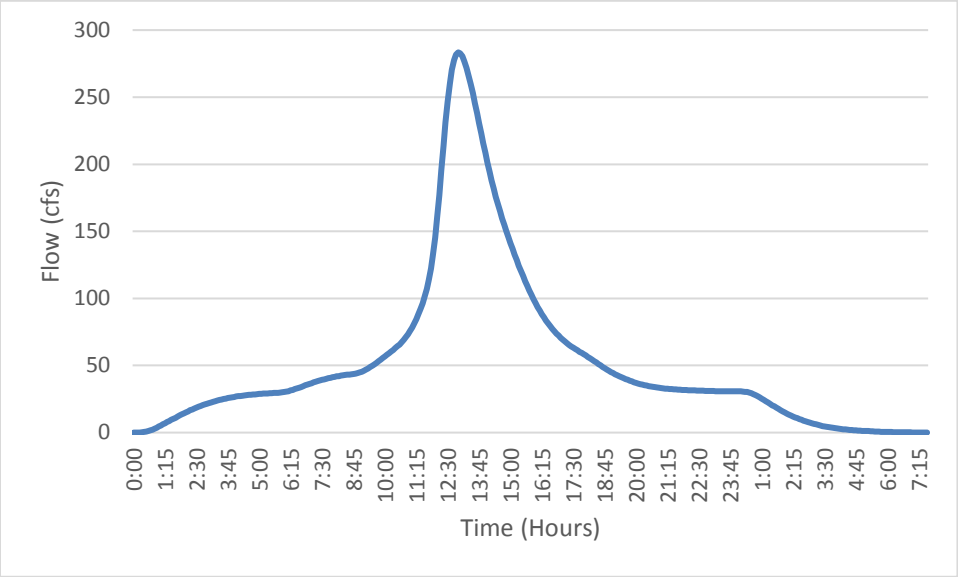
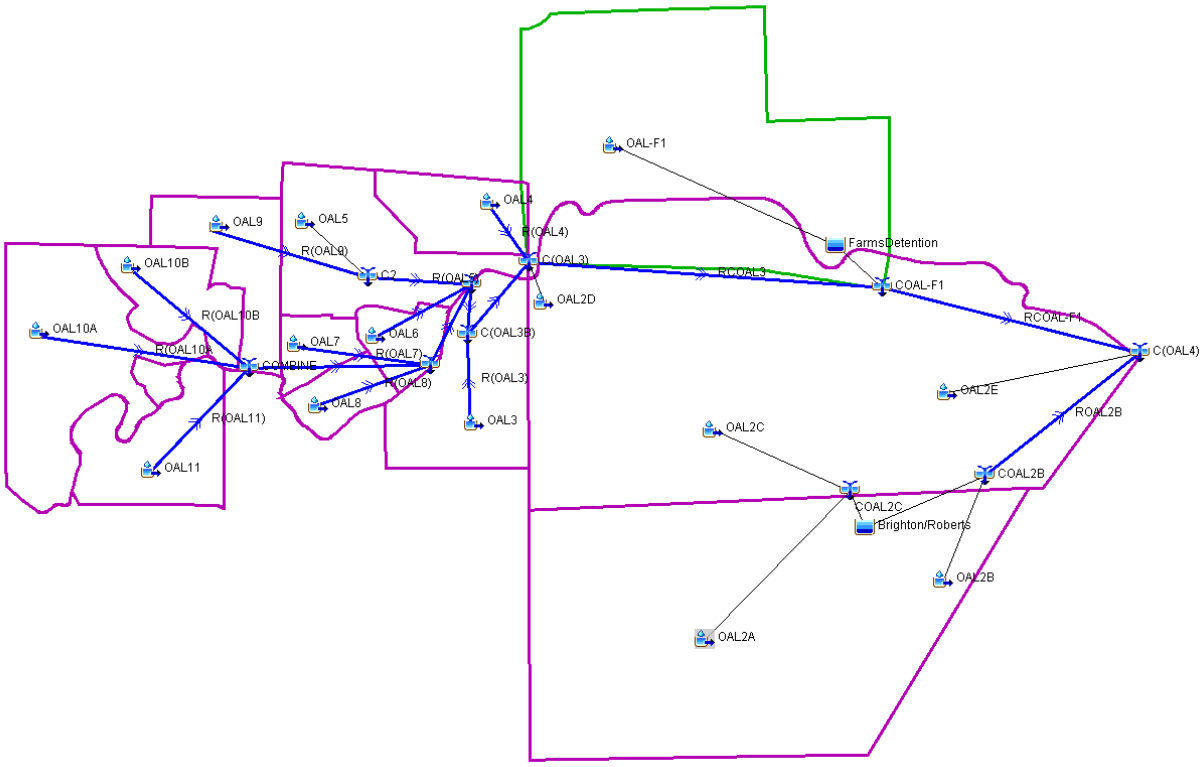
West Yost used the pre-development conditions hydrology for the already developed area west of Leisure Town Road and the undeveloped area east of Leisure Town Road that drain to Old Alamo Creek. The hydrology model was based on the modeling developed by Borcalli and Associates for the FEMA Flood Insurance Study (FIS) conducted in the 1990's, using the United States Army Corps of Engineers' (USACE) HEC-1 software. Figure 4 shows the 100-year runoff hydrograph that was used as input into the Old Alamo Creek hydraulic model at Leisure Town Road. This hydrograph was used in both the pre-development and developed conditions hydrology modeling.

Figure 4. Old Alamo Creek Runoff Hydrograph at Leisure Town Road



The FEMA FIS hydrology models used the Solano County Water Agency's (SCWA) hydrology standards (Hydrology and Drainage Design Procedure – October 1977) in developing this hydrology which includes the Snyder Unit Hydrograph runoff transformation method. The HEC-1 model was converted to the more modern HEC-HMS software and georeferenced as shown on Figure 5. In addition, the precipitation data was updated based on the 1999 SCWA Hydrology Manual and to be consistent with the City's current Drainage Design Standards.

Figure 5. HEC-HMS Model Schematic



West Yost utilized the same methods as the FEMA FIS in determining the developed conditions hydrology. The pre-development conditions HEC-HMS model (Hydrologic Model 1) was then used as a base in developing the following three models for various developed scenarios:

- Pre-development conditions with the Farm developed (Hydrologic Model 2).
- Roberts Ranch, Brighton Landing, and the Farm all developed with the existing Brighton Landing detention pond (Hydrologic Model 3).
- Roberts Ranch, Brighton Landing, and the Farm all developed with the existing Brighton Landing detention pond and a proposed detention pond on the Farm site (Hydrologic Model 4).

West Yost compared peak, 100-year flows at various downstream locations to quantify the impacts of development and detention. The pre-development conditions HEC-1 model shows a 100-year peak flow of about 613 cubic feet per second (cfs) at Elmira (railroad tracks) which was used as the target location to compare flows between different scenarios. The converted HEC-HMS model gives the same results. However, errors were identified in the HEC-1 model (impervious percentages and some constant losses were entered incorrectly). The updated pre-development model then showed about 606 cfs at this location.

The pre-development model was modified to show the effects of the Farm project (Hydrologic Model 2). A developed conditions model was created from the pre-development conditions model by adding another watershed to depict the Farm project. The addition of the Farm project draining to Old Alamo Creek would increase the peak flow to about 713 cfs at Elmira. The peak, 100-year runoff from the Farm project site is about 164 cfs.

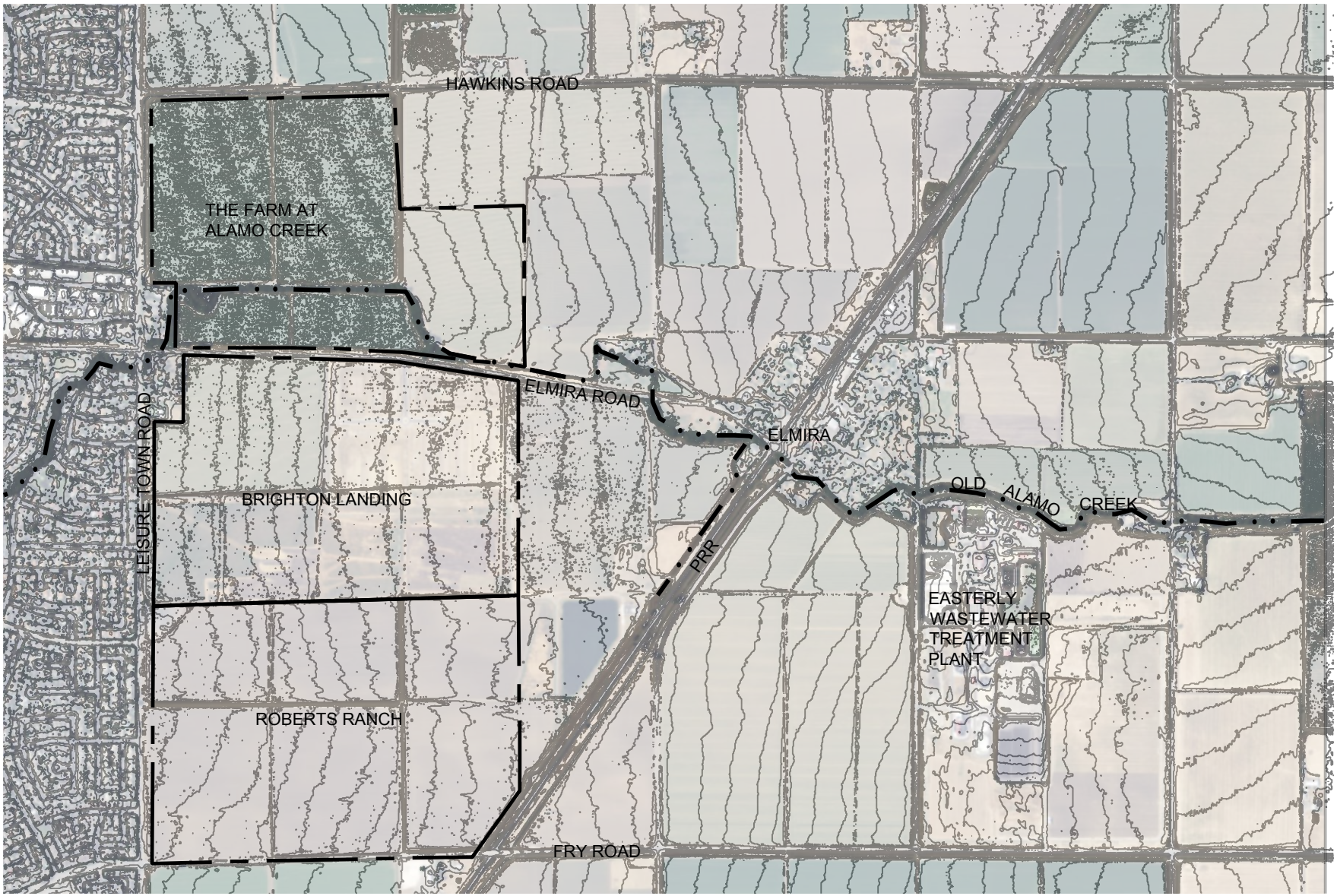
This model was then updated to reflect the Brighton Landing and Roberts Ranch developments (Hydrologic Model 3) with those developments detention pond which is already constructed. The peak flow at our target location is reduced to about 547 cfs.

West Yost then added detention to the Farm model to evaluate how the proposed detention pond could reduce peak flows from the site. Since a majority of the Farm project does not currently drain to Old Alamo Creek, all the runoff from this site would have to be mitigated to not increase peak flows downstream. West Yost assumed a detention pond that had one-half of the capacity and discharge capability of the already constructed Brighton Landing and Roberts Ranch pond. The Farm pond reduced the peak flows from 164 cfs to 40 cfs. This reduced the target flows to 427 cfs, a reduction of about 180 cfs.

Hydraulics

West Yost developed a steady state, one dimensional model of Old Alamo Creek to evaluate its actual capacity using USACE's HEC-RAS software. The capacity of the creek varies significantly with the upstream portion (Leisure Town Road to about where it leaves the Farm project site on the east) having about a 100-year capacity and gradually decreasing all the way downstream to just west of Elmira where it can only carry about 20 cfs. Much of the creek has been filled-in by farming activities or is heavily vegetated reducing its capacity.

Based on the runoff hydrographs developed in HEC-HMS, combination one-dimensional and two-dimensional HEC-RAS models were developed to map the resulting flooding based on each development scenario. The underlying terrain was developed using the Light Detection and Ranging (LiDAR) topographic survey provided to West Yost by the City. This topographic survey was developed in 2008 and has an accuracy of 0.6-feet vertical and 3.5-feet horizontal and its vertical datum is the North American Vertical Datum of 1988 (NAVD 88) and its horizontal coordinate system is the California State Plane System, Zone 2 (NAD83). Figure 6 shows the topography of the study area based on this survey.



LEGEND

□-FOOT CONTOURS

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SCALE IN FEET

FIGURE 6

THE FARM AT ALAMO CREEK EIR

TOPOGRAPHIC SURVEY

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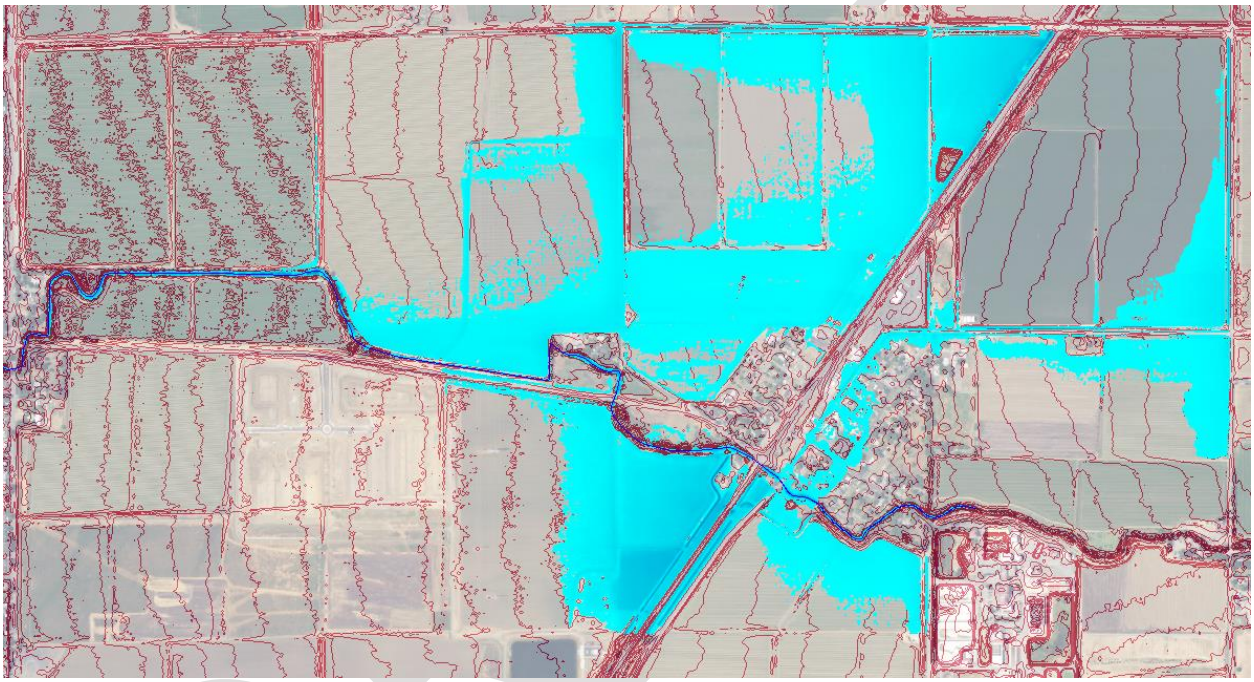
A maximum size 30-foot by 30-foot grid was used for the study area in HEC-RAS and was modified in some places utilizing break lines to ensure the two-dimensional grids did not cross some features such as channels and berms. The limits of the two-dimensional study area on the downstream end were treated as boundary conditions at normal depth. The models were run at a five-second computational time step. The pre-development conditions model (Hydraulic Model 1) shows that flows in the creek would spill to the agricultural land to the north and spread out as shown on Figure 7. Also shown on Figure 7 is significant flooding occurring south of the creek, in Elmira, and south of Elmira.

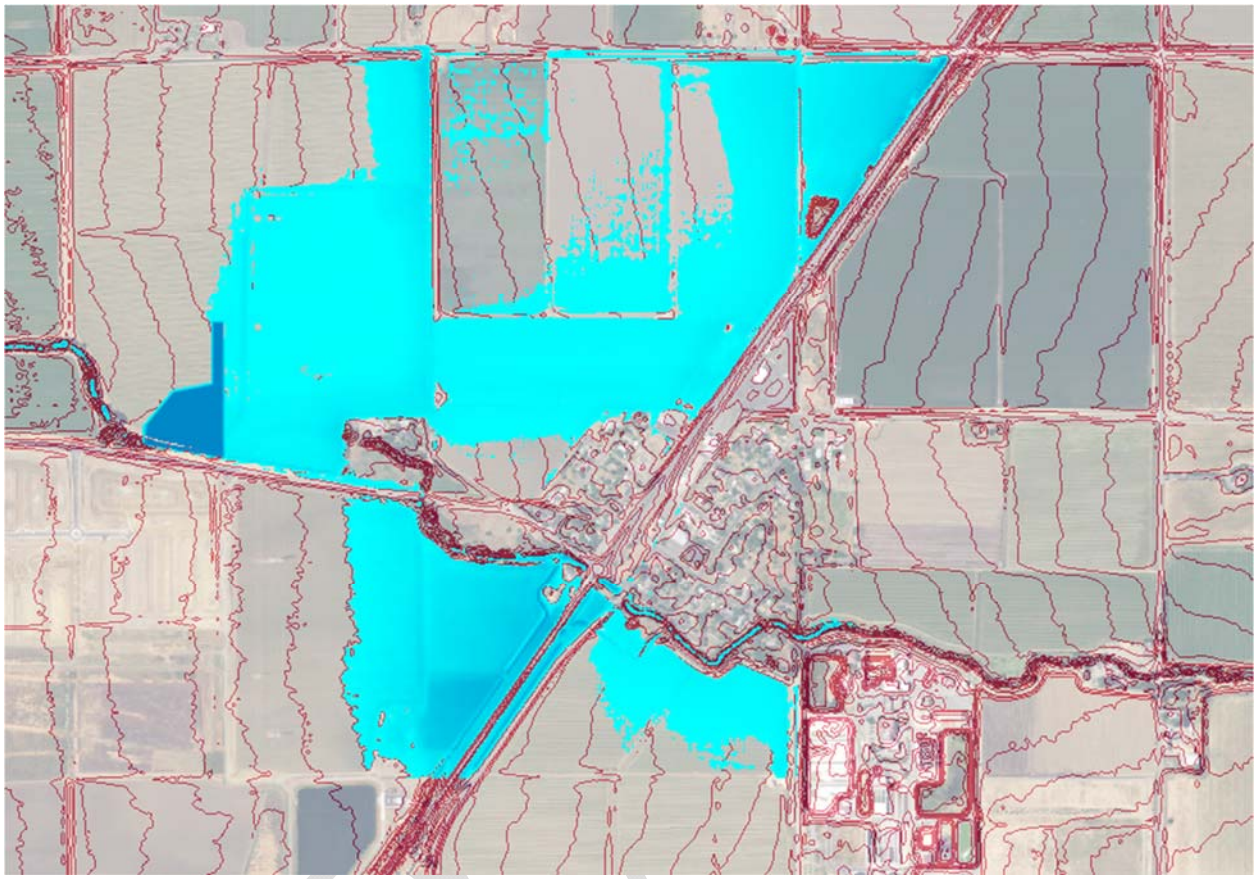
Figure 7. Existing Conditions Flood Extents



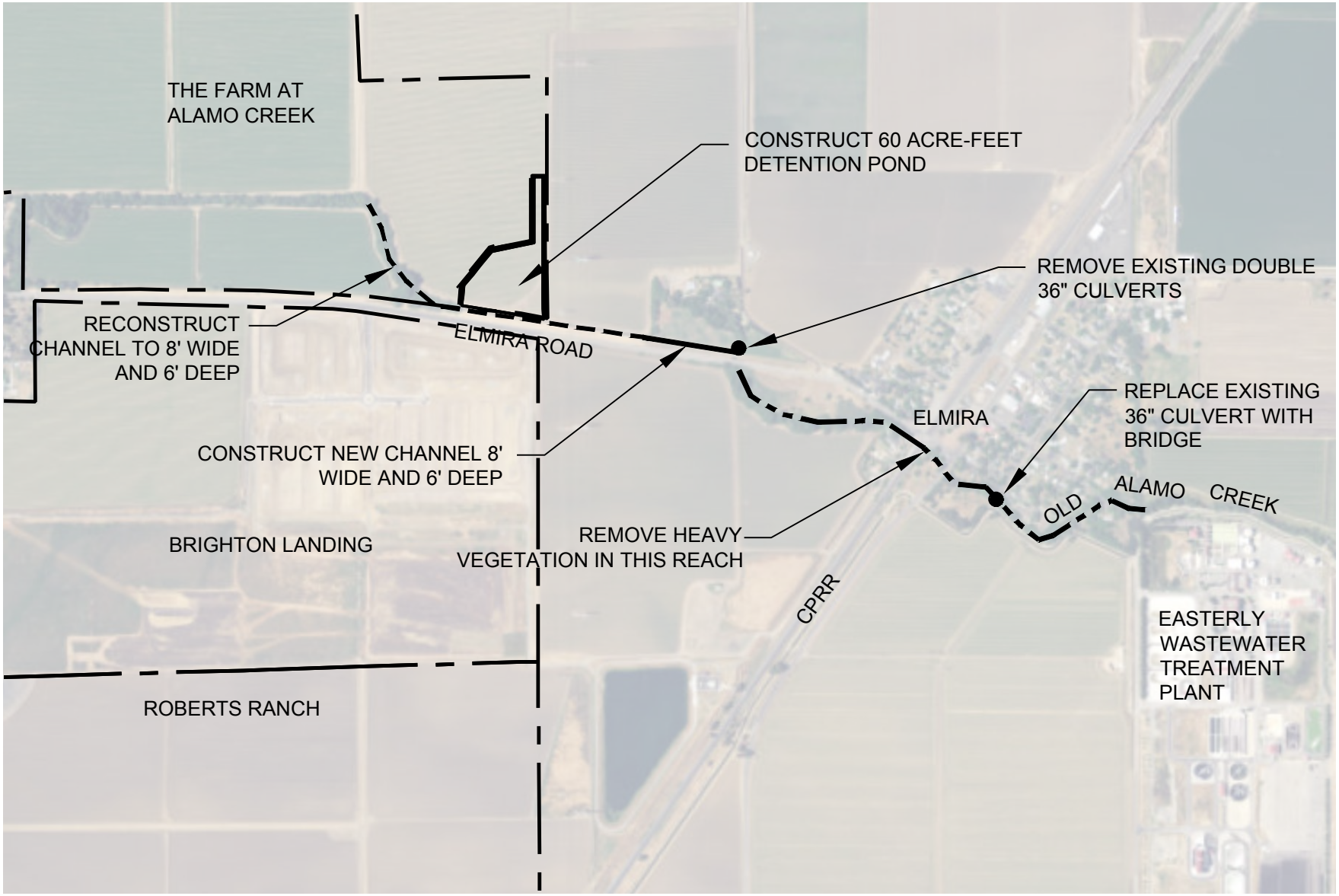
The pre-development conditions hydraulic model was modified to assess the effects on Old Alamo Creek flooding by adding the Roberts Ranch, Brighton Landing, and the Farm projects in developed condition with the existing Brighton Landing detention pond (Hydraulic Model 2).

Hydraulic Model 2 was then modified by adding the proposed Farm detention pond (Hydraulic Model 3). This model shows the effects of adding the Farm project to the other developments resulting in reduced peak flows, and therefore flooding, downstream. Figure 8 shows these extents.

Figure 8. Developed Conditions Flood Extents



Hydraulic Model 3 was then updated to include improvements to Old Alamo Creek (Hydraulic Model 4) as shown on Figure 9. These improvements are planned to alleviate some of the flooding downstream, primarily in Elmira. Figure 10 shows the limits of flooding with these improvements. Figure 11 was developed to compare the existing conditions flooding with the proposed conditions. As shown on Figure 11, the extent of flooding in Elmira and downstream of Elmira is eliminated. The flooding west of the UPRR embankment is changed slightly due to the location of the detention pond and where it will release flows when overtopped. The depth of flooding is about 3-inches in most areas of west of the UPRR embankment, so these changes are not considered significant.



LEGEND

- WIDEN EXISTING CHANNEL
- CONSTRUCT NEW CHANNEL
- REMOVE VEGETATION IN CHANNEL

N

0 750 1,500

SCALE IN FEET

FIGURE 9

THE FARM AT ALAMO CREEK EIR

PROPOSED IMPROVEMENTS

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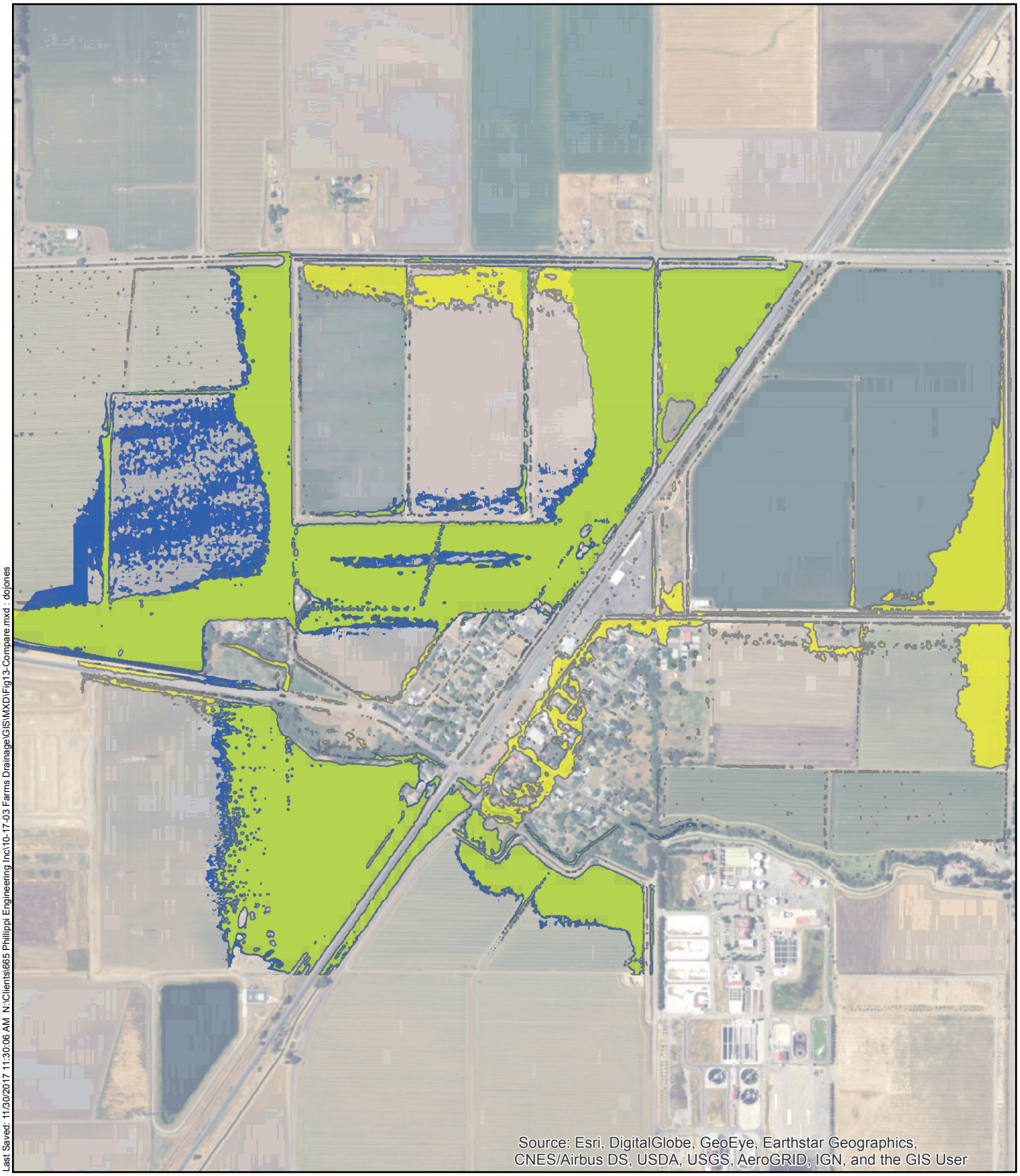

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Symbology

- Existing Limits
- Proposed Limits

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Scale in Feet

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Figure 10

EXTENT OF FLOODING COMPARISON

THE FARM AT ALAMO CREEK EIR

POTENTIAL PROJECT IMPACTS AND RECOMMENDED MITIGATION MEASURES

West Yost evaluated the proposed project to determine the potential impacts of the project related to hydrology and water quality. Our findings are provided below.

1. Violates Water Quality Standards or Waste Discharge Requirements

Construction of the project would result in earth-disturbing activities such as site clearing and grading for construction of roads, parking areas, building pads, and park areas. Disturbed areas exposed to rainfall could lead to an increase in erosion and the discharge of sediment to receiving waters resulting in a degradation of water quality. Additional pollutants can be introduced during construction from vehicular use, construction materials, and construction waste products. These activities can introduce pollutants such as nutrients, metals, pesticides, oils and grease, and trash. The potential impacts of the project on water quality during construction are considered significant and could result in a violation of water quality standards.

Implementation of the proposed project would convert the existing agricultural lands to urban uses. Urban development creates new pollution sources including higher levels of vehicle emissions, vehicle maintenance wastes, pesticides, fertilizers, household hazardous wastes, and pet wastes. As a result, the runoff from an urban area may have a higher concentration of pollutants than the pre-development runoff from the same area. This project plans to convey runoff to a detention basin that will provide both stormwater quality treatment and flood control storage for the runoff from the project. To provide stormwater quality treatment, a detention basin must detain stormwater for a period of time before it is discharged to the downstream receiving waters. The detention time allows particles and the associated pollutants to settle out. The minimum detention time required to achieve sufficient pollutant settling typically ranges from 24 to 48 hours. The proposed detention basin will be configured to provide sufficient settling time to achieve adequate stormwater quality treatment by including "dead" storage below the outlet from the pond.

- **Impact HYDRO-1.1**: Construction activities could substantially degrade water quality resulting in a violation of water quality standards.

  Mitigation Measure HYDRO-1.1: The applicant shall comply with the National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges of Storm Water Discharge Associated with Construction Activities issued by the SWRCB. The Construction General Permit requires the development and implementation of a SWPPP. The SWPPP must contain a site map(s) which shows the construction site perimeter, existing and proposed buildings, lots, roadways, storm water collection and discharge points, general topography both before and after construction, and drainage patterns across the project. The SWPPP must list Best Management Practices (BMPs) the discharger will use to protect storm water runoff and the placement of those BMPs. Additionally, the SWPPP must contain a visual monitoring program; a chemical monitoring program for "non-visible" pollutants to be implemented if there is a failure of BMPs; and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment.

BMPs to prevent or reduce potential erosion control could include mulch covering, temporary seeding, soil stabilizers, binders, fiber rolls, temporary vegetation, and permanent seeding. BMPs to control sediment that may be introduced into runoff could include silt fences, straw wattles, and sediment basins. BMPs for controlling run-on and runoff include could control berms and swales that direct runoff away from sensitive areas. Source control BMPs that prevent pollutants from entering runoff could include establishment of vehicle fueling and maintenance areas and material storage areas that are either covered or are designed to control runoff.

Significance After Mitigation: Provided that appropriate BMPs are implemented to prevent erosion, control sediment, control runoff, and prevent pollutants from entering runoff during construction of the project, the impact would be reduced to *Less-Than-Significant*.

- **Impact HYDRO-1.2**: Runoff generated from the urban land-uses proposed with the project could substantially degrade water quality resulting in a violation of water quality standards.

  Mitigation Measure HYDRO-1.2: The applicant shall incorporate BMPs into the project design to reduce urban pollutants in runoff in accordance with the requirements of the City's Storm Drain Design Standards, the City's Stormwater Management Plan, and the City's NPDES stormwater permit. The applicant may use the proposed detention basin as a BMP to provide stormwater quality treatment if it is configured to meet the design requirements of an extended detention basin in accordance with the California Storm Water Best Management Practices Handbook, which is referenced by the City's design standards.

  Extended detention basins reduce pollutants in runoff by allowing particles and associated pollutants to settle. Other viable BMPs include infiltration techniques such as infiltration trenches and infiltration basins. Infiltration-type BMPs reduce pollutants by allowing runoff to infiltrate into the underlying soil, which filters out pollutants. Infiltration techniques are most appropriate in areas with highly pervious soils (Hydrologic Soils Types A and B), so the suitability of infiltration techniques at the project will be depend on specific soil conditions. Biofiltration BMPs include vegetated swales and buffer strips and bioretention. These types of BMPs reduce pollutants in runoff through filtering by the vegetation and subsoil and infiltration into the underlying soils. Source control BMPs, which prevent pollutants from entering runoff, include directing roof spouts to pervious areas, use of porous pavements, enclosing trash storage areas, and providing signs at storm drain inlets to educate the public.

  Significance After Mitigation: Provided that BMPs are followed to reduce the potential for pollutants to enter runoff and to remove pollutants from runoff to the Maximum Extent Practicable, the impact would be reduced to *Less-Than-Significant.*

2. Substantially Depletes Groundwater Supplies or Substantially Interferes with Groundwater Recharge

Groundwater impacts were not evaluated by West Yost.

3. Substantially Alters Existing Drainage Pattern Resulting in Substantial Erosion or Siltation

The proposed project will convert the existing agricultural lands to residential, commercial, school, and park land uses. This will increase the impervious surfaces on the site and will significantly alter the existing drainage pattern, which will cause an increase in the peak flows and volumes discharged from the site during storm events. Without construction of the detention basin, the proposed development of the watershed could increase the 10-year peak flow from 445 cfs to 560 cfs and the 100-year peak flow from 606 cfs to 713 cfs. The increased flows could result in substantial erosion or siltation downstream if they were discharged directly to the downstream receiving water. However, the project will construct the 60 acre-feet detention basin that will attenuate storm flows. Flows from the project are to be conveyed into the detention basin via an underground pipe network for storms up to the 10-year event. For larger storms, flows in excess of the pipe system capacity will be conveyed overland in the streets and directed into the detention basin. The detention basin will discharge flows from the basin at rates well below the pre-development peak flow rates. According to the hydrologic modeling, with the detention basin, the 10-year and 100-year peak flows from the watershed will be 300 cfs and 425 cfs, respectively. As a result, the detention basin would prevent the project from causing a significant impact due to an increase in erosion or siltation downstream. Therefore, the possibility for increased downstream erosion or siltation is considered *Less-Than-Significant*.

- **Impact HYDRO-3.1:** Increased runoff generated from the urban land-uses proposed with the project could cause an increase in erosion or siltation downstream of the project if runoff is not adequately conveyed to the proposed detention basin.

  Mitigation Measure HYDRO-3.1: See Mitigation Measure HYDRO-5.1.

  Significance After Mitigation: Provided that a Storm Drain Master Plan (SDMP) is prepared to meet the requirements specified in Mitigation Measure HYDRO-5, the impact would be *potentially significant*.

4. Substantially Alters Existing Drainage Pattern or Increases the Rate or Amount of Surface Runoff Resulting in Flooding

As discussed previously, development of the project would significantly increase the stormwater runoff rates in the watershed without construction of the detention basin. The 10-year peak flow would be increased from 445 cfs to 560 cfs and 100-year peak flow from 600 cfs to 710 cfs. These flow increases could exacerbate the existing flooding problem downstream of the project that has been identified by FEMA. However, the project will use the detention basin at the downstream end of the project to detain storm flows and discharge at a rate well below the 10-year peak flow. This is an acceptable approach for mitigating the potential impacts of the project on downstream flooding. However, sufficient detail was not provided to determine whether the project drainage facilities will adequately direct all flows, including overland flows during the 100-year storm, into

the basin. As a result, the possibility of increasing the area subject to flooding downstream is considered a potentially significant impact.

Although peak discharges from the project site are proposed to be reduced significantly with construction of the detention basin, the duration of high discharges will be extended substantially, from about 18 hours under pre-development conditions to about 30 hours under post-development conditions. The proposed improvements, including the detention basin and Old Alamo Creek improvements such as replacing culverts, channel widening, and vegetation removal, will significantly reduce the amount of flooding in Elmira and downstream of Elmira. The extent of flooding in the agricultural land north and east of the project will stay nearly the same.

- **Impact HYDRO-4.1**: Increased runoff generated from the urban land-uses proposed with the project could cause an increase in the area subject to flooding downstream of the project if runoff is not adequately conveyed to the detention basin.
- Mitigation Measure HYDRO-4.1: See Mitigation Measure HYDRO-5.1.

5. Creates or Contributes Runoff Water Exceeding Stormwater Drainage System Capacity or Provides Substantial Additional Polluted Runoff

The proposed project will significantly increase the amount of impervious cover on the site, which will cause a significant increase in runoff rates compared to pre-development rates. The project will include a detention basin downstream of the project boundary that will mitigate for potential increases in flow and will also provide stormwater quality treatment. On-site runoff from the project will be conveyed to the detention basin via an underground pipe network that will be constructed in accordance with the City's Standard Specifications and Drawings (PEI, 2015). The proposed pipe network will be sized to convey the peak flow from the 10-year storm in accordance with the City standards. Flows from storms larger than the 10-year event must be safely conveyed overland in the streets to the detention basin. City standards require the flow from the 100-year storm water surface elevation to be no more than 0.5 feet above the centerline elevation of a road and must be at least 1.0 foot below building pads. Detailed pipe sizing calculations and overland release calculations are not included in the project drainage report and the adequacy of the proposed on-site systems could not be evaluated. Therefore, the possibility for the proposed on-site stormwater system to be exceeded by a storm event is considered a potentially significant impact.

- **Impact HYDRO-5.1**: The proposed project could create runoff water that exceeds the proposed storm drain system and the existing downstream system.

  Mitigation Measure HYDRO-5.1: The project applicant shall have a SDMP, prepared by a registered civil engineer, that identifies the specific improvements that will that adequately collect and convey storm water from proposed project and convey those flows downstream within increasing the area subject to flooding under pre-project conditions. The SDMP shall provide the necessary calculations to adequately demonstrate that the proposed drainage facilities adequately convey the design runoff from the project and adequately mitigate the impacts of increased runoff. In accordance with the City's Storm Drain Design Standards, the SDMP shall be prepared prior to the approval of the tentative map and shall include, but is not limited to, the following items:

A topographic map of the drainage shed and adjacent areas as necessary to define the study boundary. The map shall show existing and proposed ground elevations (including preliminary building pads), with drainage sub-shed areas in acres, and the layout of the proposed drainage improvements.

- A map showing analysis points, proposed street grades, storm drainage facilities, and overland release paths with required easement locations for overland flow across private property.
- Preliminary pipe sizes with hydraulic grade lines, design flows, inverts, and proposed ground elevations at analysis points. This information is to be provided on the map showing the layout of the proposed drainage facilities.
- Downstream improvements and maintenance activities necessary to convey storm flows such that the area subject to flooding will not increase with the proposed project.
- Proposed alteration required to avoid any increase in peak flow or areas subject to flooding. An example of such alterations could include the following, or others:
  - Adjustment to grading plans
  - Adjustment to storm drainage system
  - Downstream improvements along the existing conveyance (Old Alamo Creek)

Significance After Mitigation: *Less-Than-Significant.*

6. Substantially Degrades Water Quality

Construction activities could lead to an increase in erosion and the discharge of sediment from the site. Construction activities also introduce other pollution sources that could increase the concentration of pollutants in site runoff. Therefore, construction activities could result in a temporary degradation of water quality, which is potentially significant impact.

Urban development can cause an increase in the pollutant concentration of runoff from a watershed compared to pre-developed conditions. The proposed project intends to mitigate for the potential stormwater quality impacts by constructing a detention basin downstream of the project. However, the proposed configuration of the detention basin would not provide a sufficient detention time to achieve adequate treatment. Therefore, the possibility of the project to degrade water quality is considered a potentially significant impact.

- **Impact HYDRO-6.1**: Runoff generated from the urban land-uses proposed with the project could substantially degrade water quality.

  Mitigation Measure HYDRO-6.1: See Mitigation Measure HYDRO 1.2.

  Significance After Mitigation: Provided that BMPs are followed as described in Mitigation Measure HYDRO-2, the impact would be reduced to *Less-Than-Significant.*

7. Places Housing within a 100-year Flood Hazard Area

Based on the FEMA Flood Insurance Rate Map (Panel 06095C0281E, May 4, 2009), the proposed project will not place housing with a 100-year flood hazard area.

8. Places Structures within a 100-year Flood Hazard Area Resulting in Impeded or Redirected Flood Flows

Based on the FEMA Flood Insurance Rate Map (Panel 06095C0281E, May 4, 2009), the proposed project will not place structures within a 100-year flood hazard area.

9. Exposes People or Structures to Significant Risks Involving Flooding

In response to SB 5, the California Department of Water Resources has prepared preliminary (i.e., Best Available) maps depicting the estimated 200-year floodplain for the Sacramento-San Joaquin Valley. These best available maps were reviewed and the project site was determined to be outside of a known 200-year floodplain.

The proposed project will increase peak flows and runoff volumes generated within the project site. On-site flows will be collected in an underground storm drain system and conveyed to a detention basin. Flows in excess of the pipe system will flow to the detention basin in streets. The detention basin will provide flood control storage that will serve to mitigate for the project's potential impacts downstream. The storm drainage study for the project lacks sufficient detail to determine if the proposed storm drainage pipe system and overland flow paths will effectively deliver runoff to the detention basin without producing flooding within the project. Therefore, the possibility that the project exposes people to flooding within and downstream of the project is considered a potentially significant impact.

- **Impact HYDRO-9.1**: The project could expose people or structures to significant flood risks.

  Mitigation Measure HYDRO-9.1: See Mitigation Measure HYDRO 5.1.

  Significance After Mitigation: Provided that a SDMP is prepared to meet the requirements specified in Mitigation Measure HYDRO-5, the impact would be *Less-Than-Significant.*

10. Inundation by Seiche, Tsunami, or Mudflow

The project site is not located in an area that is subject to inundation by seiche, tsunami, or mudflow.

POTENTIAL CUMULATIVE IMPACTS

The proposed project and other potential cumulative projects in the vicinity of the project site, including growth resulting from build-out of the City's General Plan, will be required to comply with the NPDES General Permit for Discharges of Storm Water Discharge Associated with Construction Activities issued by the State Water Resources Control Board. This permit requires projects to implement measures to prevent impacts, individual and cumulative, to water quality during construction. In addition, projects would also be required to comply with the City's NPDES stormwater permit from the Central Valley Regional Water Quality Board (CVRWQCB) and their Stormwater Management Plan which prevent impacts to water quality after construction of a project. Therefore, the potential for cumulative impacts to water quality is less than significant.

The proposed project and other potential projects that could contribute to cumulative impacts would also be subject to local, state, and federal regulations designed to minimize individual and cumulative impacts related to stormwater runoff rates and flooding. The implementation of mitigation measures for the proposed project and anticipated mitigation measures for other projects that will be required to maintain compliance with these regulations and will reduce the potential cumulative impacts to a less than significant level.