



**STAFF REPORT  
TOWN COUNCIL MEETING OF MARCH 10, 2015  
CONSENT ITEM**

**TO: HONORABLE MAYOR AND MEMBERS OF THE TOWN COUNCIL**

**FROM: BRIAN FRAGIAO, DIRECTOR OF PUBLIC WORKS** *[Signature]*

**DATE: MARCH 2, 2015**

**RE: ON-CALL SERVICES FOR DRAINAGE MASTER PLAN UPDATES,  
DRAINAGE SYSTEM INVESTIGATION AND ENGINEERING ANALYSIS  
THROUGHOUT TOWN**

**Recommendation:**

Approve recommendation to use West Yost & Associates to update the Town's Drainage Master Plan and provide drainage system investigation and engineering analysis throughout Town, and direct the Town Manager to enter into an On-Call Services Agreement acceptable to the Town Attorney.

**Issue Statement and Discussion**

In 2001, West Yost & Associates prepared the Town's first Drainage Master Plan document. Four years later, West Yost updated the Master plan document with information and maps of the new drainage improvements in Town. In 2013, the second amended contract not-to-exceed amount of \$50,000 was reached. Since there were no Master plan updates or drainage issue concerns to evaluate, staff had no reason to continue the contract.

On November 1<sup>st</sup>, December 10<sup>th</sup> and February 7<sup>th</sup>, Loomis endured heavy rainstorms that caused road and property damage throughout town. Since West Yost is most familiar with the Town's drainage system, staff would like to re-establish an agreement with West Yost to evaluate the drainage concerns throughout town and try to remedy the problems to prevent additional drainage damages and claims to the Town. West Yost will also provide updates to the Drainage Master Plan as new or modified improvements occur.

During the On-call services, any costs above the Town Manager's signing approval, will be directed to Town Council for consideration and approval.

**CEQA Requirements**

This project is exempt under the California Environmental Quality Act (CEQA) Sections 15301(c&d) (Class 1), "Existing Facilities" of the guidelines.

**Financial and/or Policy Implications**

Funding will come from the excess revenues within the General Fund.

**TOWN OF LOOMIS**  
**RESOLUTION NO. 15-\_\_**

**RESOLUTION OF THE COUNCIL OF THE TOWN OF LOOMIS  
APPROVING AND ADOPTING A RESOLUTION TO USE WEST YOST  
& ASSOCIATES TO UPDATE THE TOWN'S DRAINAGE MASTER  
PLAN AND PROVIDE DRAINAGE SYSTEM INVESTIGATION AND  
ENGINEERING ANALYSIS THROUGHOUT TOWN, AND DIRECT THE  
TOWN MANAGER TO ENTER INTO AN ON-CALL SERVICES  
AGREEMENT ACCEPTABLE TO THE TOWN ATTORNEY**

**WHEREAS**, In 2000, The Town acquired West Yost & Associates to prepare the Town's first Drainage Master Plan dated 2001; and

**WHEREAS**, In 2005, a second amendment to the contract was approved to update the Drainage Master Plan; and

**WHEREAS**, The Town would like to utilize West Yost & Associates to provide future Drainage Master Plan updates; and

**WHEREAS**, The Town would also like to use West Yost & Associates to provide drainage system investigation and engineering analysis throughout the Town; and

**NOW, THEREFORE, IT IS HEREBY RESOLVED** that the Town of Loomis approves and adopting a resolution to use West Yost & Associates to update the Town's Drainage Master Plan and provide drainage system investigation and engineering analysis throughout the Town, and direct the Town Manager to enter into an On-Call Services Agreement acceptable to the Town Attorney.

**PASSED AND ADOPTED** by the Council of the Town of Loomis this 10th day of March, 2015 by the following vote:

**AYES:**

**NOES:**

**ABSENT:**

**ATTEST:**

\_\_\_\_\_  
Mayor

**APPROVED AS TO FORM:**

\_\_\_\_\_  
Town Clerk

\_\_\_\_\_  
Town Attorney



**RECEIVED**

**JAN 20 2015**

**TOWN OF LOOMIS**

January 16, 2015

Mr. Brian Fragio  
Town of Loomis  
Public Works Department  
P.O. Box 1330  
Loomis CA 95650

**SUBJECT: Proposal to Provide On-Call Drainage Engineering Services**

Dear Brian:

As requested, West Yost Associates (West Yost) is providing this proposal to assist the Town of Loomis (Town) with drainage engineering services on an as-needed basis. Included with this proposal is a description of the general type of work anticipated, our current billing rate schedule, a summary of some of our relevant project experience, and a list and resumes of the key staff proposed for the work.

### **SCOPE OF WORK AND COST**

It is anticipated that the required engineering services could include, but are not limited to, the following:

- Meet with Town staff to discuss storm drainage related issues.
- Perform field reviews of areas with known flooding problems.
- Perform hydrologic and hydraulic analyses to determine the causes of flooding problems and to develop alternative solutions.
- Develop cost estimates for alternative drainage solutions.
- Prepare minor updates to the Town Drainage Master Plan, which was previously prepared by West Yost.
- Prepare or assist with submittals to FEMA.
- Provide written documentation of the reviews and analyses.

The work will be performed by West Yost on a time and expense basis in accordance with the billing rate schedule attached as Exhibit A.

## WEST YOST PROJECT EXPERIENCE AND QUALIFICATIONS

West Yost engineers have extensive experience in the planning, analysis, and design associated with storm drainage projects. We have prepared numerous storm drainage master plans for local communities including the Town. A summary of some of West Yost's related project experience is included as Exhibit B. If desired, we can provide more detailed descriptions of our relevant projects and can provide client contact information for those projects.

## KEY STAFF

The West Yost staff members proposed to perform this work are highly experienced in hydrologic and hydraulic analysis including the evaluation of urban drainage systems and natural creek systems. Some of the key staff members anticipated to assist with this work are listed below and their resumes are included as Exhibit C.

- Steve Dalrymple, Principal
- Mark Kubik, Principal Engineer
- Doug Moore, Engineering Manager
- Jeff Wanlass, Principal Engineer
- Jeff Tolentino, Associate Engineer

West Yost appreciates the opportunity to provide these services to Loomis and we look forward to working with you in the future.

Sincerely,

West Yost Associates



Mark O. Kubik  
Principal Engineer

MOK:nmp

attachments



## 2015 Billing Rate Schedule Engineering

(Effective January 1, 2015 through December 31, 2015)

Position	Labor Charges (dollars per hour)
Principal/Vice President	239
Engineering/Scientist/Geologist Manager II	228
Engineering/Scientist/Geologist Manager I	219
Principal Engineer/Scientist/Geologist II	211
Principal Engineer/Scientist/Geologist I	199
Senior Engineer/Scientist/Geologist II	187
Senior Engineer/Scientist/Geologist I	178
Associate Engineer/Scientist/Geologist II	169
Associate Engineer/Scientist/Geologist I	158
Engineer/Scientist/Geologist II	148
Engineer/Scientist/Geologist I	128
Senior GIS Analyst	174
GIS Analyst	164
CAD Supervisor	138
Senior CAD Designer	120
CAD Designer	107
Engineering Aide	72
Technical Specialist IV	135
Technical Specialist III	120
Technical Specialist II	104
Technical Specialist I	87
Administrative IV	109
Administrative III	99
Administrative II	82
Administrative I	65

- Technology and Communication charges including general and CAD computer, software, telephone, routine in-house copies/prints, postage, miscellaneous supplies, and other incidental project expenses will be billed at 6% of West Yost labor.
- Outside Services such as vendor reproductions, prints, shipping, and major West Yost reproduction efforts, as well as Engineering Supplies, Travel, etc. will be billed at actual cost plus 15%.
- Mileage will be billed at the current Federal Rate.
- Subconsultants will be billed at actual cost plus 10%.
- Expert witness, research, technical review, analysis, preparation and meetings billed at 150% of standard hourly rates. Expert witness testimony and depositions billed at 200% of standard hourly rates.
- A Finance Charge of 1.5% per month (an Annual Rate of 18%) on the unpaid balance will be added to invoice amounts if not paid within 45 days from the date of the invoice.

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# 2015 Billing Rate Schedule Engineering

(Effective January 1, 2015 through December 31, 2015)\*

## SURVEYING AND EQUIPMENT CHARGES

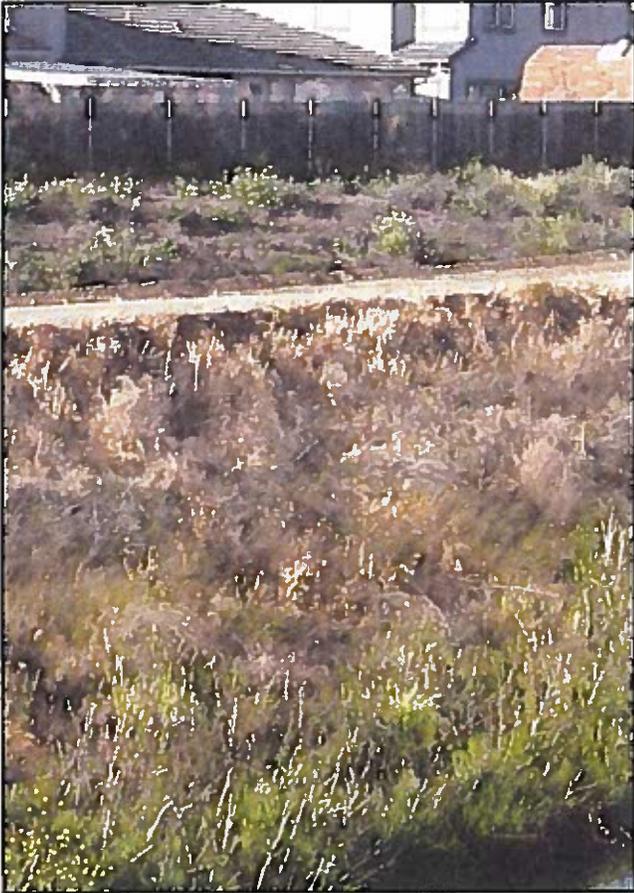
Position	Labor Charges (dollars per hour)
GPS, 3-Person	365
GPS, 2-Person	317
GPS, 1-Person	246
Survey Crew, 2-Person	268
Survey Crew, 1-Person	202

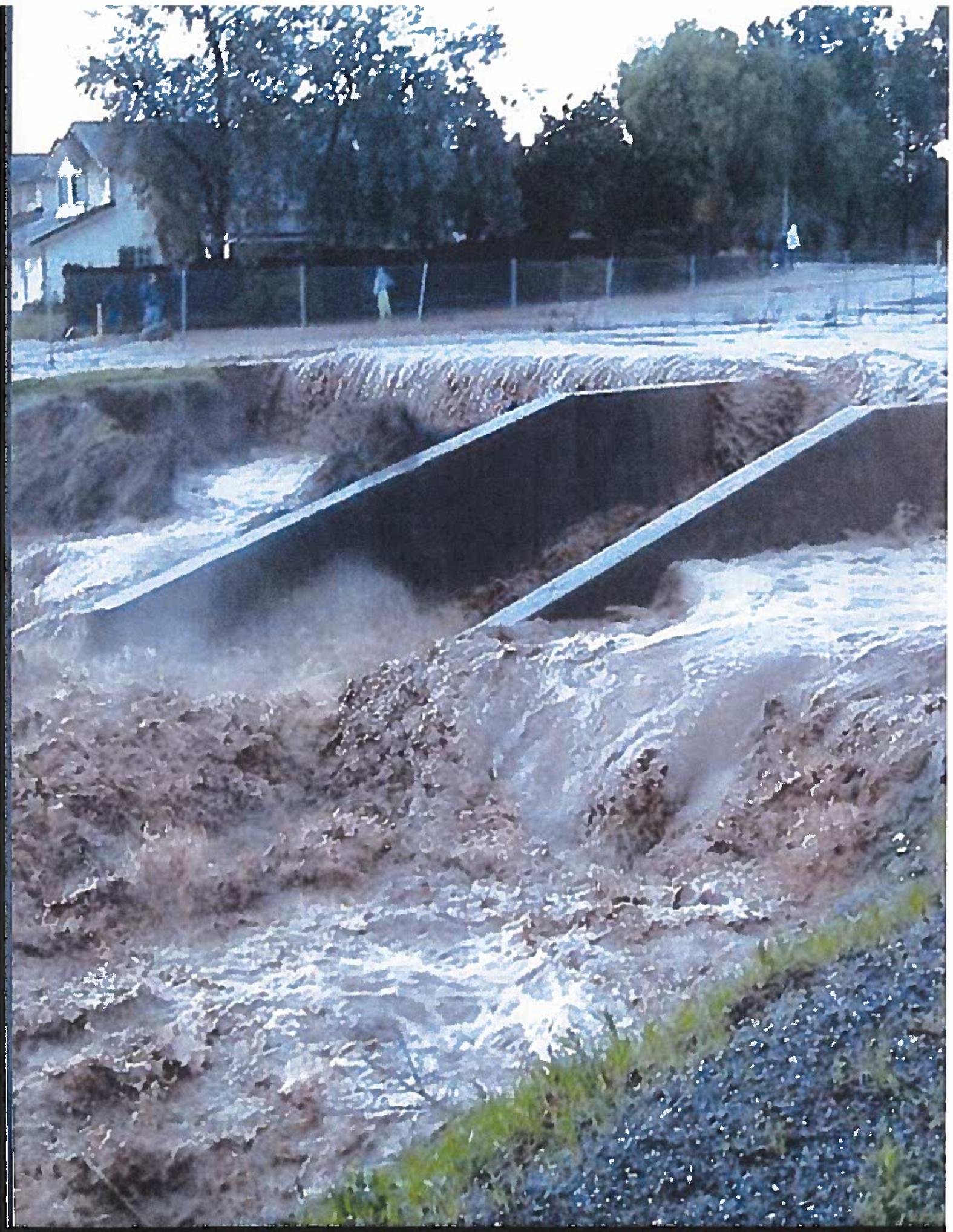
## EQUIPMENT CHARGES

Equipment	Billing Rate (dollars per day)	Billing Rate (dollars per week)
DO Meter	17	83
pH Meter	5	26
Automatic Sampler	130	712
Transducer/Data Logger	41	206
Hydrant Pressure Gage	12	50
Hydrant Pressure Recorder (HPR)	—	206
Hydrant Wrench	5	33
Pilot Diffuser	29	134
Well Sounder	29	134
Ultrasonic Flow Meter	—	269
Vehicle	88	445
Velocity Meter	12	65
Water Quality Multimeter	176	964
Thickness Gage	—	71

\*This schedule is updated annually

STORMWATER ENGINEERING







*West Yost Associates (West Yost) is a consulting engineering firm that was formed in 1990 to provide a high level of client service around a focused area of technical expertise. West Yost's focus is exclusively water, groundwater, wastewater, and stormwater projects. We also provide a broad depth of experience in planning, design, construction management, and program management services.*

*West Yost has seven offices located throughout California and Oregon, including offices in Davis, Pleasanton, Walnut Creek, Santa Rosa, Fresno, and Irvine, California; as well as Eugene, Oregon. We have 125 staff members, including certified or registered professionals in civil and mechanical engineering, geology, engineering geology, and hydrogeology; land surveying; water and wastewater treatment plant operations; GIS; and specialty construction inspection and construction management.*

## Stormwater Related Services

- Stormwater Master Planning
- Storage and Conveyance Facilities Planning and Design
- Pump Station Planning and Design
- Permitting and Regulatory Compliance
- Hydrologic and Hydraulic Modeling
- Hydrologic Modeling and Floodplain Mapping (CLOMRs and LOMRs)
- Engineering Support for Environmental Impact Analyses
- Funding Strategies
- Infrastructure Rehabilitation
- GIS/Mapping and Surveying
- Program Management
- Construction Inspection and Management

The following pages include brief descriptions of recent West Yost projects that highlight our expertise and capabilities in performing stormwater projects.



# Storm Drain Master Plan

## Town of Loomis

West Yost prepared a drainage master plan for the Town of Loomis with three main objectives: evaluating existing flooding problems, identifying potential improvements, and preparing drainage utility maps. The Town of Loomis had not developed storm drain utility maps previously, therefore, significant effort was devoted to developing these maps. This project also included incorporating the 100-year floodplain into the utility mapping, developing flood control facilities, preparing facility cost estimates, and developing a storm drain maintenance program.

The storm drain mapping was based largely on as-built plans supplemented with field verification and surveying. The mapping included invert and rim

elevations, pipe size, structure type, creek and canal locations, detention facilities, and the FEMA 100-year floodplains.

The field survey included surveying some individual structures for direct entry into the utility mapping. Surveying was also performed to allow adjustment of the as-built plans to the same horizontal and vertical datums as the utility mapping. This approach significantly reduced the overall project cost (versus surveying every structure in the City) and still provided a high quality mapping database.

## Dry Creek Levee Relocation

### City of Roseville

West Yost was selected to provide planning, analysis, environmental review, permitting, design, and construction management services for the Dry Creek WWTP Levee Relocation. This project included the hydrologic and hydraulic analyses of Dry Creek in the vicinity of the WWTP. The goal of the project was to provide 100-year protection of the wastewater storage ponds while enhancing the flow carrying capacity of Dry Creek in an environmentally sensitive manner.

In addition to planning, design, and construction phase services for the Dry Creek Levee Project, West Yost managed the CEQA review, public participation, and permitting elements of this project. Permitting efforts included working with the Regional Water Quality Control Board (NPDES Construction permit), Central Valley Flood Protection Board (Encroachment Permit), and the California Department of Fish and



Game (Stream Bed Alteration Agreement). The project was intentionally designed to avoid any construction in the delineated waters/wetlands of the United States, thereby avoiding the need for a Clean Water Act Section 401 State Water Resources Control Board Certification and a Clean Water Act Section 404 US Army Corps of Engineers permit.

# Terling Chateau 5 FEMA LOMR Application City of Vacaville

Using Flo-2D modeling software, West Yost developed a 2-dimensional hydraulic model to evaluate Alamo Creek overflows through a residential neighborhood for several miles and back into Alamo Creek. In addition to the 2-D modeling, the project included compiling county LIDAR data using GIS software, developing hydrographs for the flood flow peaks based on the FEMA HEC-2 and HEC-1 models developed for the City of Vacaville Flood Damage Study, and preparing a FEMA LOMR application for a portion of the floodplain. The floodplain resulting from the 2-D hydraulic model closely matched the actual flooding during the December 2005 flood.



## Dynamic 2-D Modeling

West Yost routinely conducts accurate hydrologic/hydraulic evaluations. This includes using dynamic 2-dimensional surface flow modeling to more accurately predict results and to graphically demonstrate solutions. Recent projects include the Alamo Creek 2D Flood Study for the City of Vacaville, and 2D modeling for a 4,000 acre alluvial fan flooding analysis in the Mojave Desert for the Ivanpah Solar Facility project.

## Central Rocklin Drainage Master Plan

### City of Rocklin

West Yost prepared the Downtown Drainage Master Plan for the City of Rocklin. The Downtown Drainage Master Plan quantified the present runoff from the study area to the creeks; identified drainage problems; determined the capacity of existing drainage facilities; developed drainage policies and design criteria for the master plan; defined alternative solutions for identified problems; defined the needed drainage facilities to serve newly developing areas; addressed City objectives of floodplain management, wetland protection, and habitat enhancement; developed cost estimates for recommended facilities; prioritized the recommended Capital Improvement Program; and provided the master plan report document to the City.

# Lemon Street Flood Control Project Predesign and Design

## Vallejo Sanitation & Flood Control District

After the December 31, 2005 storm occurred, the District decided to proceed with predesign of the Lemon Street Channel Flood Control Project. Several conditions had changed within the watershed since the SDMP was prepared, including construction of a K-rail along Interstate 80 that prevents flood water from crossing the freeway in a 100-year storm event. West Yost developed updated modeling which closely reproduced the actual flooding observed from the December 2005 storm. The project design included clearing sediment and cattails from the Lake Dalwigk detention basin, adding open water and wetlands habitat around the perimeter, and modifying the lake outlet to lower the permanently ponded water within the basin. In support of the environmental review (conducted by others) two alternatives to the proposed project were evaluated, however, neither performed as well as the recommended project, and both alternatives were more costly. A formal benefit to cost evaluation for the proposed project was prepared using the FEMA software.

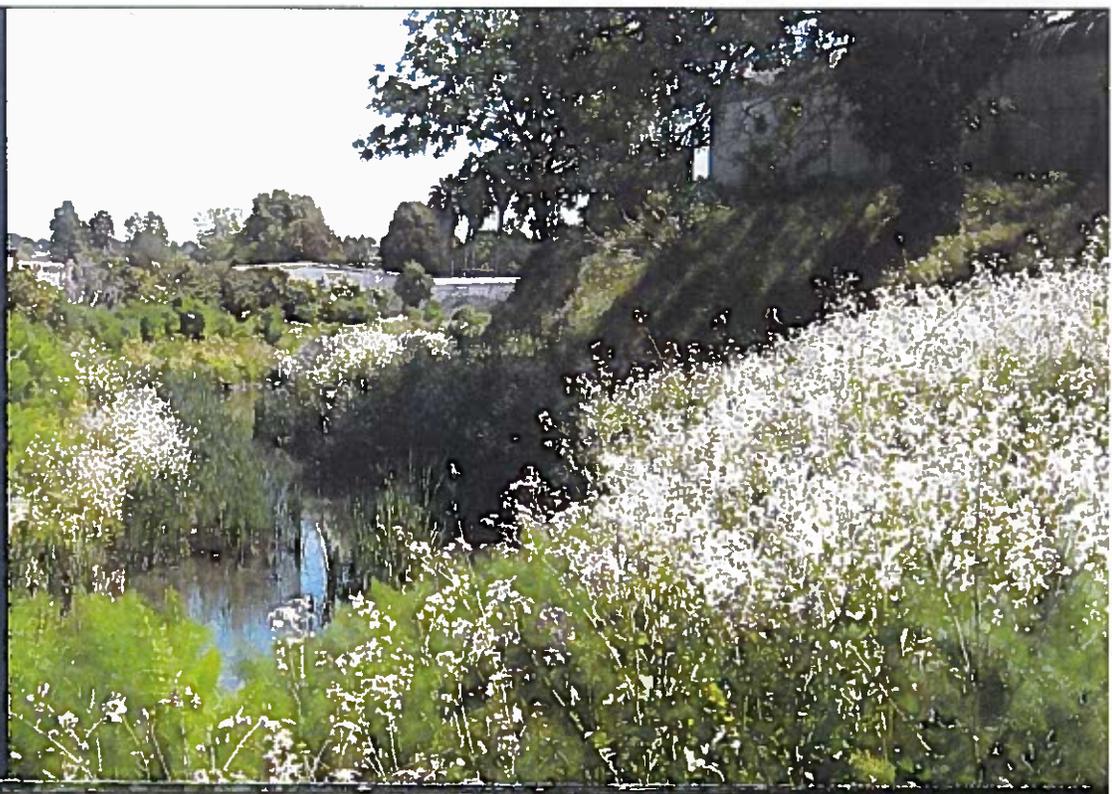
West Yost prepared the detailed design and specifications for the project. The major component included 2,600 feet of 96-inch bypass pipeline through a congested industrial area (in soft bay mud). Other components included a diversion structure, modification of an existing pump station/weir, removal of nuisance vegetation and restoration with suitable native California grasses and trees, replacement of undersized culverts with a 14x7 box culvert, and other culvert and ditch improvements at two sites. West Yost divided the project into three bid packages to allow phasing of the construction and potential coordination of some of the project elements with future redevelopment along Sonoma Boulevard.

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*For the Lemon Street Flood Control Project, a formal benefit to cost evaluation for the proposed project was prepared using the FEMA software.*

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*The improvements designed for the Lemon Street Channel will increase the conveyance capacity and create valuable habitat through use of native California vegetation.*





*Austin Creek, Vallejo Sanitation and Flood Control District*

*West Yost conducted a GPS and Total Station field survey of over 6,000 storm drain facilities. West Yost also evaluated the feasibility of redirecting the highly polluted first flush flows and dry weather flows from the District's storm drain system into the District's sanitary sewer system for treatment at the wastewater treatment plant.*

# Homeacres

## Vallejo Sanitation & Flood Control District

West Yost prepared the design of Phase 1 of the Homeacres Drainage Improvements. These projects included design of 18-inch to 30-inch storm drains through areas congested with other existing underground utilities. A segment of 48-inch storm drain was also designed, including a tailwall and velocity/energy dissipater section of riprap. It included design of curb and gutter at several locations. It also included design of an earth berm 3 feet high and a headwall/drain inlet.

Also included in this project was preparation of an initial study /mitigated negative declaration for the environmental review of the projects. West Yost prepared and gave a public meeting to present the projects to the neighborhood residents, and coordinated the projects with several key private property owners. We prepared a US Army Corps of Engineers-Section 404 permit application, a CDFG streambed alteration agreement application, a RWCQB water quality certification application, and a Caltrans encroachment permit application. West Yost provided coordination with these agencies until all the required permits were acquired.

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# On-Call Modeling & Setterquist Park Design

## Vallejo Sanitation & Flood Control District

As follow-on work from the VSFCD Flood Control Master Plan, West Yost has provided on-call modeling and design services. This work has included preparing the design of a headwall, trash rack, and access road for a VSFCD open channel within Setterquist Park. In addition, West Yost reviewed a Caltrans plan to enlarge three culverts under I-80 in the Skibereen/Monteith neighborhood and developed a low-cost storm drainage improvement plan to address the increased flows through the Caltrans culverts. Causes and solutions to reduce the flooding of a single house on Humboldt Street were also evaluated. These tasks have been completed within the time frame needed for the VSFCD to satisfy its

obligations to the City of Vallejo, Caltrans, and its customers. For a related project, West Yost evaluated the causes of the flooding of several house in the Hampshire Street and Mississippi Street Area from the December 2005 storm (within the Austin Creek watershed). This evaluation included modeling the actual rainfall hyetograph with the MOUSE model of the Austin Creek Watershed. The model was found to closely reproduce the actual observed/reported flooding. From this work, it was determined that the storm exceeded the VSFCD design criteria. This work was summarized in a PowerPoint presentation to the VSFCD Board of Trustees in February 2006.

*Within Setterquist Park, just inside an existing headwall, a vertical drop of 4.5 feet (leading to a 36-inch storm drain) represented a potential safety risk to children playing in the park. West Yost prepared plans and specification for an extension of the existing headwall and installation of a trash rack. West Yost estimated the construction cost to be \$136,000, and the low bid was \$150,000. This project required no addenda during the bid period and no change orders during the construction period.*



# Storm Drain Master Plan and Updated Storm Drain Master Plan

## University of California, Davis

The master plan included the development and use of a GIS based facilities and land use map, survey of pipe sizes and manhole inverts, development of a XP-SWMM model of the entire central campus system including detention storage and pumping facilities, development of drainage system performance criteria, identification of improvements to eliminate existing ponding and flooding areas, and evaluation of the existing maintenance program with recommendations for improved functionality and efficiencies.

The south campus and west campus drainage systems were modeled using HEC-1 for the hydrology and spreadsheets for the hydraulic evaluations. The Master Plan was updated in 2004, and an innovative system of using the existing drains for conveying 10-year storm flows and a system of channels for containing/conveying the 100-year flows was developed.

# Storm Drain Master Plan and Subsequent Facility Designs

## City of Manteca

West Yost prepared a Storm Drain Master Plan for the City of Manteca. This master plan included development of a city-wide dynamic rainfall/runoff model and hydraulic analysis tool of the extensive detention basin, canal, and lateral drainage system. The work included developing criteria and providing design for utilizing multi-use drainage corridors. West Yost developed a \$17.6 Million Capital Improvement Program and led a stormwater management utility fee study to identify the financial needs and revenues to operate and maintain the storm drain facilities, including the newly-identified stormwater quality improvement program according to the City's NPDES Phase II permit.

West Yost subsequently prepared the predesign of a 16 ac-ft detention basin, 4 cfs pump station, 1,500 feet of the 3' x 12' box culvert, and 1,100 feet of 3' x 8' box culvert. West Yost prepared the detailed design and technical specifications for the detention basin and pump station. The construction cost for the pump station, detention basin (and nearby irrigated landscape and hardscape) was \$6.3 million. The construction cost of the box culverts was \$3.5 million, including associated sewer relocations.



# Storm Drain Master Plan Pond A, Lateral 1, Valley Glen Pump Station, and P

## City of Dixon

West Yost performed a master drainage study for the City with complete review and analysis of applicable hydrologic models and development of a recommended Capital Improvement Program. Services included evaluation of existing facilities and review of proposed new drainage facilities as part of assessment districts. Hydraulic design of detention basins, channel improvements and storm drains were also included in the plan development. West Yost assisted with the negotiation of a new discharge agreement with the downstream resource conservation district. A major effort in the study was to identify drainage from upstream agricultural lands. After identification, an evaluation of alternative means to control or bypass these flows through or around the City was conducted.

West Yost performed planning of the expansion of Detention Pond A (from 200 ac-ft to over 600 ac-ft) and the Pond A Outfall (6 miles of open channel and culverts) by developing and evaluating three pond configurations and outfall alignments. Operation and maintenance cost estimates were developed and other non-cost issues were evaluated (such as environmental impacts and feasibility of acquiring right-of-way). An XP-SWMM model of the detention basin, existing and future tributary areas, and 6 miles of downstream channel was developed to provide the optimal final sizing of the pond storage volume, discharge rate, and the downstream channel and culverts. This resulted in implementation of an alternative that was \$1.3 million less than alternatives the City had previously been considering. West Yost prepared the final design of this project and performed the construction inspection and management for the project. West Yost also planned and designed a 160 cfs stormwater pump station for the Valley Glen development that lifts water into Pond A.



Additionally, West Yost prepared both the predesign and the design of Pond C, another detention pond facility that was identified in the original master plan. West Yost helped the City negotiate a revised discharge agreement with the downstream drainage agency, which reduced the required size of Pond C and saved the City about \$600,000 in excavation costs. Based on the revised agreement, West Yost prepared the conceptual and final design for a 27 acre detention basin on a 40 acre site.



*The Pond A Project, including these outlets, complied with all requirements of the California Division of Dam Safety*

## nd C Projects



The project elements included a 160 acre-foot basin, a low flow inlet, a high flow weir, a discharge control structure, pond outlet piping, a maintenance road, headwalls, fencing, riprap, and local area drains. The pond was designed to use native California vegetation to develop aquatic, riparian, and upland habitats to attract a wide variety of wildlife. The project was constructed in two phases. Our cost estimate for both phases was \$2.9 million, and the actual combined bids ranged from \$2.3 million to \$4.6 million. Engineering services during construction were also provided.

*In 1999 West Yost prepared the Dixon Storm Drain Report. Since then, West Yost has provided the following additional services.*

- *Dixon Pond A Predesign and Design (600 ac. ft.)*
- *Sizing and Design of the Dixon Valley Glen Storm Drain Pump Station (160 cfs capacity)*
- *Dixon Pond C predesign and design (160 ac. ft.)*
- *On-Call Engineering Services and Development Plan Review*
- *Core Area Drainage Study*

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*For the Dixon Pond A Storage Project, West Yost modeling and engineering analysis identified optimal facility sizing. This resulted in implementation of an alternative that was \$1.3 million less than alternatives the City was previously considering.*

*For Pond C, West Yost helped the City negotiate a revised discharge agreement with the downstream drainage agency, reducing the size of Pond C and saving the City about \$600,000 in excavation costs.*

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# Ulatis System Drainage Study

## Solano County Water Agency

West Yost updated the flood control master plan for the Ulatis Creek Watershed. The objectives were to determine the City of Vacaville's existing level of flood protection along the major creeks draining through the City, evaluate flood control alternatives to increase the City's level of flood protection, and identify preferred projects for implementation within each watershed. The project included updating the hydrologic models (HEC-1) to current land use conditions, updating existing hydraulic models (HEC-RAS) with detailed surveyed cross-section data, and calibrating the models to stream gages located on several creeks using the 2002 and 2005 storms. The hydrologic modeling encompassed six large subsheds, totaling about 150 square miles; and hydraulic modeling of about 50 miles of open channels. West Yost presented the findings of the master plan to the public, City Council, and the Solano County Water Agency Board:

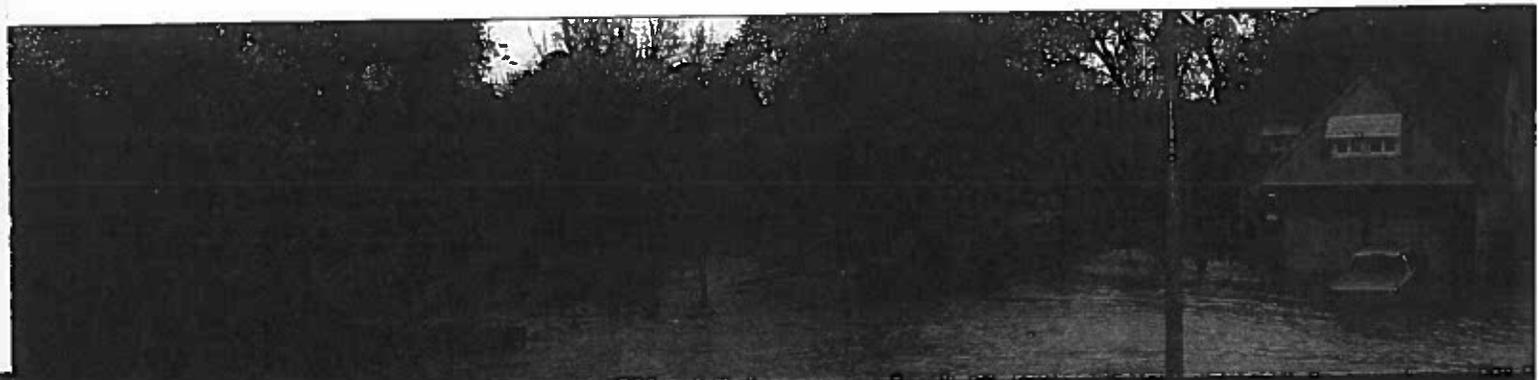
- Updated the hydrologic (HEC-1) and hydraulic (HEC-RAS) models for 150 square miles watershed with current land-use conditions and detention storage facilities (for 2002 and 2005)
- Calibrated the updated models to produce flow and water surface elevation consistent with significant storms that occurred in December 2002 and December 2005
- Evaluated the City of Vacaville's level of flood protection and analyzed flood improvement alternatives to reduce or eliminate flooding within the City

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*Based on results of this study the City has proceeded with pre-design work for the Encinosa Creek, Alamo Creek, and Laguna Creek Regional Detention Basins and secured a \$3.5 million grant from the SCWA and an additional \$6 million from Prop. 84 funding and FEMA.*

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- Using HEC-RAS models, determined that the causes of the extensive flooding were under-capacity creek channels and increased rainfall over the last 30 years
- Evaluated several flood protection alternatives for Ulatis and Alamo Creeks and determined construction and environmental feasibility and costs
- The recommended alternative for Ulatis Creek included a 650 acre-ft regional detention basin, removal of wing walls on a drop structure to increase creek capacity, and construction of 2,000 linear feet of levees
- The recommended alternative for Alamo Creek included three regional detention storage basins totaling 1,610 acre-ft of storage, installing an additional box culvert at an under capacity bridge, and sediment removal in flood-prone creek reaches
- The estimated total cost for the recommended projects was \$46 to \$69 million
- Developed and gave a PowerPoint presentation to the public detailing the causes of flooding, the recommended projects and their progress
- Since the completion of this study, the City of Vacaville has built the 200 acre-ft Encinosa Creek Detention Basin, has received a \$3.5 million grant from SCWA and an additional \$6 million from Prop. 84 funding and FEMA. The City is pursuing the construction of the remaining basins





## Storm Drain Master Plan

### City of Napa

West Yost developed the first storm drain master plan for the City of Napa. The master plan included: the development of updated planning and design criteria for the development standards, preparation of hydrologic and hydraulic evaluations of existing drain facilities, evaluations of documented problem areas, preparation of cost estimates, development of recommended capital improvements, completion of a financial plan and preparation of the initial environmental study on the master plan recommendations. West Yost also worked with City staff to develop the flood mitigation program and funding applications to eliminate flooding of existing properties after the US Army Corps of Engineers Napa River Flood Control Project is completed.

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*Recently, the City selected West Yost to review previously prepared technical studies and schematic-level designs of two technically feasible design alternatives to handle overland drainage in the Soscol Gateway area.*

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# Storm Drainage Master Plan & GPS Survey of Storm Drainage Structures & GIS Mapping

## Vallejo Sanitation & Flood Control District

Because the City of Vallejo is nearly built out, this master plan focused on solving existing flooding problems rather than planning for future growth. The master plan is essentially a series of predesign reports for each of the 30 current flooding problems within the District. The major elements of this Flood Control Master Plan are described below:

West Yost conducted a GPS and Total Station field survey of over 6,000 storm drain facilities, such as catch basins, maintenance holes, culverts, pump stations, and open-channel cross sections. The field survey was performed using a global positioning satellite system and included surveying the location and elevation of the facilities, measuring the depth to the pipe inverts, and measuring the pipe sizes. The field data were processed into an AutoCAD Map GIS database and a Storm Drain Facilities Map Book.

West Yost developed computer models of five watersheds within the District using the MOUSE hydrologic/hydraulic model package. The models included all 36-inch diameter pipes and larger, pipes relevant to all flooding problems, and all major open channels. The models were calibrated to gauged flow records and previously observed flooding, and then they were used to develop solutions to the flooding problems.

Predesign evaluations of the existing flooding problems were developed. These evaluations included developing, evaluating, and comparing alternative solutions to the flooding problems; estimating the construction and capital costs of the alternatives; and recommending a preferred alternative.

West Yost evaluated the feasibility of redirecting the highly polluted first flush flows and dry weather flows from the District's storm drain system into the District's sanitary sewer system for treatment at the wastewater treatment plant. West Yost also developed a Capital Improvement Program and financing plan. All of the work described above was combined into a comprehensive 4-volume storm drain master plan.

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*The community was actively involved in the project through regular meetings with the District's Citizen Advisory Committee and meetings with residents affected by the flooding problems.*

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### VSECD Tide Gates

*These operationally complex tide gates were accurately modeled by West Yost using the MOUSE software.*



# Ivanpah Solar Electric Generating Facility Stormwater Runoff and Sediment Transport Analysis

**BrightSource Energy, Inc.**

West Yost prepared a 2-dimensional storm drainage model for a proposed 400 megawatt solar power project covering 4,000 acres in the Ivanpah Valley of the Mojave Desert in California. The project is situated on an alluvial fan located at the base of the Clark Mountain Range. Flood flows from the mountains are initially confined in incised channels but once arriving on the alluvial fan the flood flows are less confined and can take random paths across the fan. To analyze this complex problem, West Yost prepared a 2 dimensional flood model using the Flo-2D model package. With this model, West Yost was able to show that construction of the mirror arrays would generate only a minimal change in the surface

flooding flows over the alluvial fan. By eliminating construction of major flood control channels and detention basins that had been previously proposed by others, the environmental impacts of the project were greatly reduced and the overall project cost was reduced by \$36 million. West Yost also modeled sediment transport through the project area with the Flo-2D software. West Yost staff participated in technical meetings with Federal Government (BLM) staff by presenting the 2-dimensional modeling results. Use of the model graphics enabled the BLM staff to "visualize" the potential for project related impacts and has helped move the project through the Federal permitting process.



*Ivanpah Valley Alluvial Fan*



# Pleasants Valley Regional Detention Facilities Preliminary Design Report

## City of Vacaville

The Pleasants Valley Regional Detention Basins were identified as one of several regional detention facilities to reduce flooding in the City of Vacaville. This project includes three detention basins. Two basins are located on either side of Encinosa Creek (tributary to Alamo Creek) to reduce peak flows into Alamo Creek. These basins are operated as off-line basins. A third basin is located just of the north and is designed to eliminate a localized flooding problem. This basin operates as an on-line basin. West Yost was contracted to prepare a feasibility study followed by a Preliminary Design Report, which included design of the inlet and outlet structures, and provide technical assistance to the City during design and construction (design and construction management services were provided internally by

City staff). The project work included updating the watershed mapping and hydrologic modeling (HEC-1), surveying and mapping, developing a HEC-RAS model of Encinosa Creek, and developing detailed hydraulic analysis for the basins and their effect on the hydraulics of the other basins, and preparing preliminary grading plans. West Yost also evaluated the downstream storm drain system and assisted City staff in permitting with the Department of Safety of Dams. Several alternative configurations were evaluated and preliminary cost estimates prepared. The recommended detention basins have a combined detention storage capacity of 200 acre-feet. The recommended configurations resulted in part from extensive wetlands and American Indian burial grounds found on the project site.



# Redevelopment Area Drainage Master Plan

## City of Folsom

West Yost prepared a comprehensive drainage master plan for the City of Folsom's historical downtown/redevelopment area that encompassed 970 acres in two major watersheds. The master planning effort included determining the capacity of existing drainage facilities, identifying existing deficiencies, evaluating impacts of future growth, determining required facilities to meet future needs and improve existing deficiencies, and determining maintenance needs.

This drainage study was to identify and verify the existing drainage facilities. To accomplish this we undertook extensive field inspections and surveying to locate existing storm drains, both horizontal and vertically. This work was combined with previous mapping conducted by others, as-built plans, and City's maintenance personnel's knowledge of the storm drain system. This data was then compiled to develop a complete storm drain map for the project area. A GIS data base was also developed for use by the City.

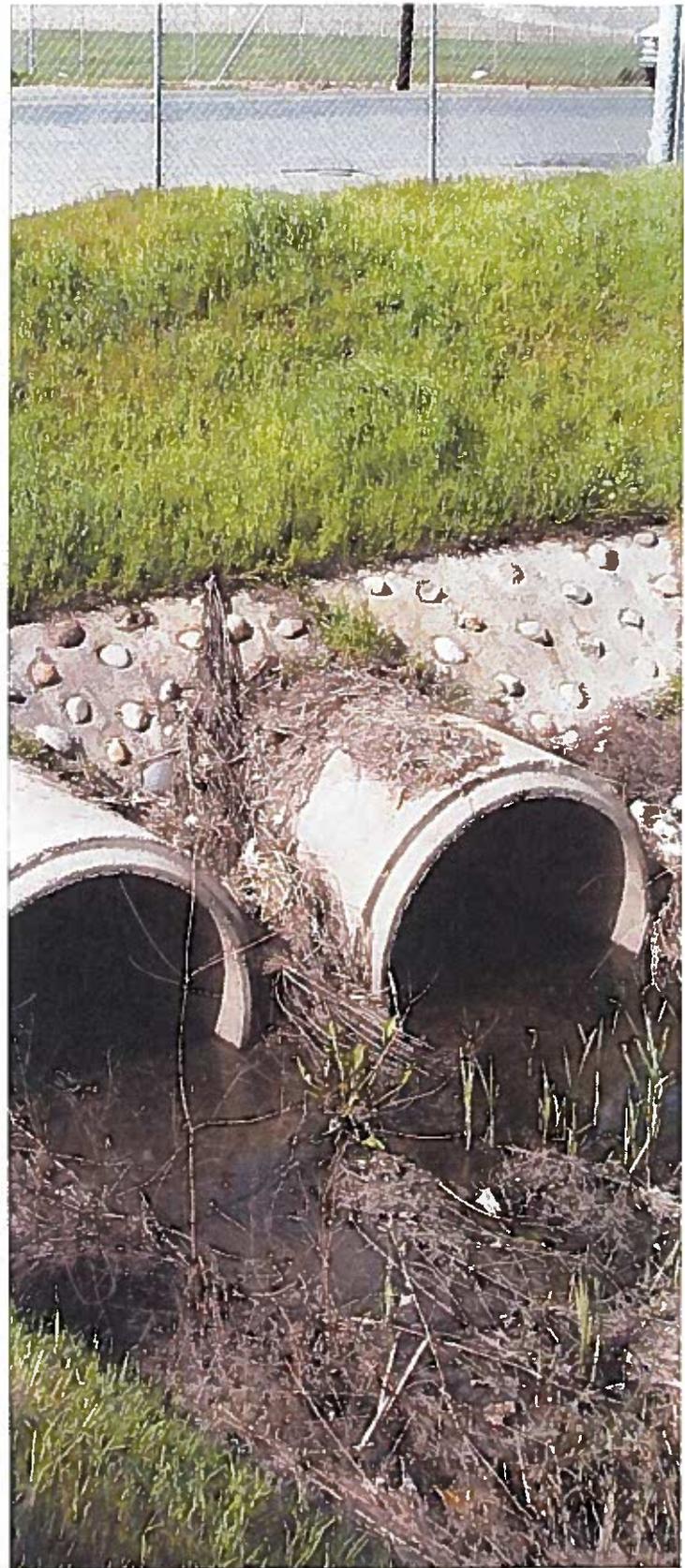


*West Yost developed a GIS database for the City of Folsom for the Redevelopment Area Drainage Master Plan Project.*

# Storm Drainage Master Plan

## City of Elk Grove

West Yost completed a Storm Drainage Master Plan for the City of Elk Grove, which covers approximately 27,000 acres served by a drainage system of more than 30 miles of creeks and channels, 100 miles of underground trunk pipelines, and 4 pump stations. West Yost developed criteria for evaluating facilities; performed hydrologic modeling to determine existing and buildout flood flows; prepared floodplain mapping; identified deficiencies in existing major drainage facilities; evaluated alternatives to eliminate existing deficiencies and identify facilities required for future development; and developed cost estimates for a Capital Improvement Program. West Yost also designed and implemented an ESRI geodatabase and loaded the City's CAD drainage data into the geodatabase.



*West Yost developed a GIS database for the City of Elk Grove as part of the Storm Drainage Master Plan.*

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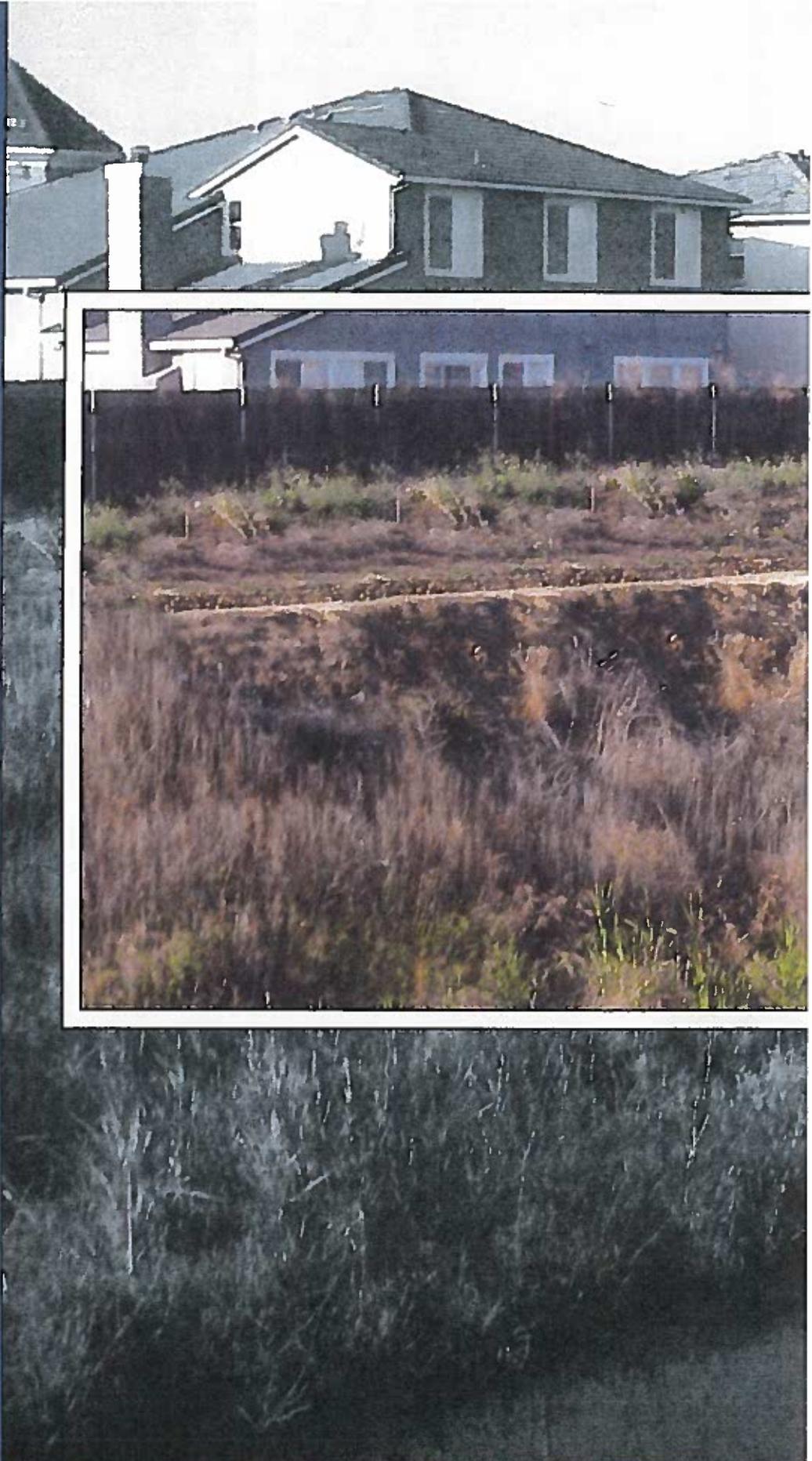
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## Steven Dalrymple, PE

### Principal-in-Charge

Steve Dalrymple has over 47 years of experience in water resource engineering. He has completed numerous studies and master plans for water resource development, wastewater reclamation, and water treatment, storage, transmission and distribution projects. He has also planned and designed many water, sewage and drainage facilities for public and private clients.

### SELECT EXPERIENCE

#### STORM DRAINAGE

**Homeacres Drainage Improvement Projects (Phase 1), Vallejo Sanitation & Flood Control District, Vallejo, California:** Served as Principal-in-Charge of the design of storm drain facilities.

**Detention Basin and Pump Station Planning and Design, City of Sacramento, California:** Completed study of alternative projects for proposed assessment district to rectify current drainage deficiencies of developed industrial property. Alternatives involved the siting of a detention basin and pump station to serve a 300-acre tributary area. A SWMM model was developed of the watershed and existing drainage collection facilities. The SWMM model was used to identify current level of flood protection and improvements with the least cost using various combinations of pumping capacity and detention basin size. The least cost combination of pump station and detention basin facilities was then located at several different locations to identify the preferred alternative for the proposed assessment district improvements. Preliminary design of the improvements and estimated construction cost were prepared.

**Detention Basin Planning and Design, City of Vacaville, California:** Preparing preliminary designs of detention basins as integral part of community park development projects. The work included field surveys and mapping, hydrologic and hydraulic design of detention basin configuration using HEC-1 and HEC-RAS models and preparation of exhibits showing location and design of detention basin and impacts of detention basin volumes on peak downstream flows.

**Drainage System Planning and Design Review, City of Sacramento, California:** Served as project manager for the development and review of drainage master plans for the 14 drainage basins within the 5,000-acre North Natomas development area. The planning assignments include the preparation of master plans and review of plans developed by landowners' engineers. He also oversaw and coordinated the technical review of the pump stations, detention basins, and subdivision drainage improvement plans.



#### Professional Registration

- Professional Civil Engineer; California No. 21188

#### Education

- BS, Civil Engineering, University of California, Berkeley

#### Professional Affiliations

- American Society of Civil Engineers
- Association of California Water Agencies
- American Water Works Association
- Groundwater Resources Association
- Floodplain Management Association



surveys to verify record data, development of rainfall and runoff monitoring system, calibration of computer models, identification of existing system capabilities, development of alternative improvements for 2-, 5-, and 10-year level of service, predesign of a multi-use detention basin facility, and estimation of construction costs for recommended improvements.

## MODELING

**Hydrologic and Hydraulic Computer Modeling, Steve** is experienced in hydrologic and hydraulic investigations and storm drainage and flood control facility planning and design. He is very familiar with the use of the EPA Stormwater Management Model as well as the U.S. COE HEC-1 and HEC-RAS hydrology and hydraulic analysis computer programs. He assisted in the development of the EPA Stormwater Management Model and has used it in hydrology, hydraulic, and water quality studies in Seattle, Washington, San Francisco, Corte Madera and Sacramento, California. He has lectured at training courses on the use of HEC-1 held at UC Davis Extension.

**Hydrologic and Hydraulic Analysis, City of Davis, California:** Performed study of existing H Street pump station tributary area to identify existing facilities' capabilities and potential for the filing of a FEMA LOMR to eliminate an existing area that has been identified as being within the expected 100-year floodplain. The existing pump station discharge channel was surveyed to establish cross sections used in a HEC-2 computer model of the channel. The HEC-2 model was used to estimate the capacity of the existing channel. The tributary watershed and collection system was also modeled using HEC-1 to identify the current level of protection afforded by the existing system and determine if the current FEMA floodplain designation is still warranted after the construction of channel improvements that divert upstream runoff.

**Storm Drainage Facilities Planning, City of Vacaville, California:** Developed hydrologic computer model using the HEC-1 program of watershed tributary to and including the proposed 700-acre development. Developed existing and ultimate land use conditions and identified 10- and 100-year runoff peaks and volumes under the two land use scenarios. Identified required detention facilities to mitigate potential impacts of increased runoff from the proposed development. Incorporated findings into the drainage section of the proposed development's EIR.

**Storm Drainage Facility Design, City of Vacaville, California:** Performed detailed hydrologic and hydraulic analyses of the 100-year flood flows and resulting water surface profiles to be used in the design of drainage improvements to serve the proposed Vaca Valley Business Park development. The investigation included the review

of previous studies and resolved inconsistencies in previous results. Prepared model of existing facilities to determine their flow capability. The results provided the developers with the anticipated upstream off-site flood flows and the limiting downstream flow and hydraulic grade line for use in the design of onsite detention basins and conveyance facilities.

## WATER SYSTEMS

**Distribution System Water Master Plan and Rate Study, City of Ceres, California:** Principal-in-Charge for water distribution system master plan and rate study for the City of Ceres. Overseeing project to developed water demand projections through buildout of the City's General Plan, evaluated supply alternatives to meet future demands; updated the City's hydraulic model, and evaluated capital improvements needed to reliably meet existing and future City needs. The project also includes a rate study for the City's conversion of residential flat rate accounts to metered accounts.

**2010 Urban Water Management Plan Update, City of Ceres, California:** Principal-in-Charge for preparation of the City's 2010 Urban Water Management Plan update for the City of Ceres. As part of the planning process, Ms. Boissevain is responsible for tracking new developments related to compliance with Senate Bill 7x-7 requiring 20 percent reduction in water use (20x2020), and evaluating appropriate methods for establishing baseline use and 20x2020 targets.

**2010 Urban Water Management Plan, Town of Windsor, California:** Principal-in-Charge for the Town of Windsor's 2010 UWMP Update. The Town's previous 2005 UWMP was submitted to DWR for review two years late and then took another eight months to work through DWR comments and gain "DWR acceptance", therefore, schedule and timing are issues of concern. West Yost was selected to prepare the Town's 2010 UWMP Update. The project includes documenting the Town's current and projected population estimates; general plan land uses compared to ABAG projections; determining the most advantageous baseline gpcd calculations for the Town for SB X7-7 compliance purposes; water supply and demands; evaluating water supply reliability under various hydrologic conditions; documenting the Town's efforts in implementing DMMs; and proposing modifications to the Water Shortage Contingency Plan. Work will also include responding to DWR review comments on the submitted UWMP, to obtain a letter of completeness from DWR.

**East Reservoir, City of Folsom, California:** Served as Principal-in-Charge for design of treated water storage tank in the City of Folsom. Project included construction of 3 MG welded steel reservoir; landscaping and drainage improvements; new booster pump station with three

booster pumps; site piping including modification of reservoir inlet piping at two existing reservoirs with the addition of altitude flow control valves.

**San Juan Reservoir and Booster Pump Station, City of Sacramento, California:** Served as Principal-in-Charge for reservoir and pump station pre-design and design services. Project consists of a 3.0 MG buried, pre-stressed concrete reservoir and a 15 mgd million gallon per day booster pump station. The project site is located within an existing storm water detention basin adjacent to existing storm water pump station. The proposed reservoir is a circular tank with an inside diameter of 160 feet and a wall height of 24 feet. The pump station design consists of four 200-horsepower vertical turbine pumps. The pumps will be equipped with variable frequency drives to allow pump operation at varying pressure and pumping rates. The pump station will be located over the reservoir and enclosed within a masonry building. The control building located adjacent to the reservoir site consists of electrical control room, storage room, bathroom, and space for future chemical feed facilities. West Yost completed final design in June 2002.

**Joint Water Storage Facility, City of Roseville and San Juan Water District, California:** Served as Principal-in-Charge for reservoir and pump station pre-design services. The proposed project will construct a 2.2 million gallon, concrete reservoir for San Juan Water District and a 2.9 million gallon, concrete reservoir for the City of Roseville at a Joint Water Storage Facility site located within the City of Roseville. The proposed reservoirs consist of at-grade structures constructed of pre-stressed concrete. The proposed reservoir site is located between an open space preserve and residential lots. Preliminary design topics included site piping, perimeter walls, landscaping, and security measures. The project site would be landscaped to provide a visual barrier between the new storage facility and adjacent residences. Security measures included motion-activated lights, intrusion alarms for the reservoir access hatches and outside enclosures, and surveillance cameras. All alarms and video recordings would be transmitted to a central SCADA computer for monitoring and recording.

**Canal System Improvements, Contra Costa Water District, California:** Served as project manager for a two-year assignment for the planning and design of raw water improvements program associated with the Contra Costa Canal system. Improvements designed included rehabilitation of pumping plants, electrical substation containment structures, canal lining repair and replacement, lateral valve replacements, check structure and trash rack facility improvements and drainage problems elimination. Worked closely with District staff to define problems, identify solutions, and then develop preliminary and final designs of the improvements.

**Pipeline Design, Amador County Water Agency, California:** Provided final planning, design, and services during construction of 38,500 feet of 20-inch and 16-inch diameter ductile iron pipeline from Tanner Reservoir to Ione Reservoir, replacing existing Ione Canal. Designed pressure-reducing stations to provide service to existing customers at locations where the pipeline pressures were over 500 psi. Project was funded from State sources and the final construction cost was within the original estimate of \$3 million.

**Storage Tank and Booster Pump Station Design, City of Sacramento, California:** Designed the 3 million gallon Robla storage tank and booster pumping station. The steel tank design included the construction of a concrete ring wall and the piping and equipment for a 12 mgd booster pump station. The design included incorporation of an artist's recommendation for painting the tank and perimeter landscaping in this urban setting.

**Storage Tank and Pipeline Design, Rancho Murieta Community Services District, California:** Designed a 3 million gallon pre-stressed concrete tank and over three miles of 14- and 16-inch ductile iron transmission and distribution pipeline. Project included extensive evaluation of alternative sites and economic analysis to compare the life cycle costs of a steel tank and a concrete tank. Oversaw services during construction, which included the review of shop drawing submittals, responding to RFIs, and periodic site visits.

**Storage Tank, Pipeline and Access Road, City of Pleasanton, California:** Sited and designed a 3 million gallon storage tank located in steep terrain, including design of access road to tank. Project included design of about 2,000 feet of 20" pipeline to connect tank to water distribution system.

**Water System Engineering, Placer County Water Agency, California:** Served as the Agency Engineer responsible for the direction and supervision of the engineering functions. Oversaw the planning, design, and construction of pipelines, canal structures, pump stations, and treatment facilities. Also analyzed existing system capabilities using computer models and developed master plans for future system expansion.

**Water Treatment and Transmission Main Planning, El Dorado Irrigation District, Placerville, California:** Completed the facility plan for the 75 mgd Bray Water Treatment Plant and Placerville Ridge Conduit. The conduit was proposed to be 35,000 feet of 60-inch diameter pipe serving the Shingle Springs, Cameron Park and El Dorado Hills area in El Dorado County.

## Mark Kubik, PE

### Principal Engineer

Mark Kubik has 26 years of experience as a project manager and team member of surface water management projects. His experience includes storm drainage master planning, floodplain determinations, flood frequency analyses, probable maximum flood studies, dam failure analyses, reservoir yield studies, and project management. He is an experienced stormwater modeler and is proficient in the use of many common computer models including HEC-RAS, HEC-HMS, SWMM, XPSWMM, HEC-DSS, and others. He also has experience with two-dimensional hydraulic modeling using the Flo-2D and XPSWMM-2D models. Other experience includes continuous simulation analyses for evaluating channel stability, storm water quality analyses, detention basin and pipeline design, and infrastructure design for residential and commercial developments. Mark is experienced with Caltrans study requirements, including their Standard Location Hydraulic Study format.

## SELECT EXPERIENCE

### STORM DRAINAGE MASTER PLANNING

#### **Soscol Gateway Interior Drainage Project, City of Napa, California:**

Mark was the Project Manager for this project that included hydrologic/hydraulic modeling of the existing floodplain and alternative improvement projects, coordination with private land owners, and coordination with the CEQA consultant and regulatory agencies (California Department of Fish and Game, etc.). West Yost developed a drainage plan that reduced the total project cost by about 40 percent under the previously considered alternatives. Project tasks included confirmation of the sizing of a proposed USACE detention basin/pump station, evaluation of existing storm drains (sized for a 10-year storm) and channels to partially convey the 100-year storm flows, sizing of a proposed new pump station, and determination of the residual flooding depths and flow directions and velocities through 2-dimensional flood modeling using XP-SWMM. The 2-dimensional flood modeling results were presented in easily understandable maps of floodwater depths (colored shading) and flow vectors (arrows depicting the direction and velocity) for existing conditions. From these existing conditions maps, improvements were developed that reduce the 100-year flooding to a level that will include only minor ponding in the public streets. Flooding depth and vector maps were prepared for the improvement alternatives. By comparing the existing condition and improved conditions maps, the level of flood reduction is easily visualized and the benefit of the proposed improvements is understood.

#### **Neighborhoods 6 and 7 Storm Drainage Master Plan Study, City of**

**Citrus Heights:** Mark was the Project Manager for this Storm Drainage Master Plan Study. For this study, XP-SWMM was used to develop stormwater models to identify and evaluate drainage improvements projects for a citywide capital improvement program. West Yost established and refined analysis procedures to efficiently identify flooding problems and to develop solutions. Key project objectives were to eliminate as many roadside ditches as possible;



### Professional Registration

- Professional Civil Engineer;  
California No. C50963

### Education

- BS, Civil Engineering, California  
Polytechnic State University, San  
Luis Obispo

### Professional Affiliations

- Floodplain Management  
Association
- California Stormwater  
Quality Association

eliminate recurring local flooding, and develop a capital improvement program to help guide the City in implementing future drainage improvements.

**Storm Drainage Master Plan, City of Elk Grove, California:** Project Manager for the City of Elk Grove's City-wide Storm Drainage Master Plan. The City covers approximately 27,000 acres in Sacramento County and is served by a drainage system that includes 400 miles of underground pipelines, 60 miles of creeks or channels, and a number of detention basins. The City's rapid population growth triggered the need for a comprehensive storm drainage master plan to help the City protect its residents from flooding and to develop a Capital Improvement Plan. For this project, Mark managed the analyses to identify existing system deficiencies, define floodplain limits, and define future facility needs to serve the City at buildout. Mark worked closely with the City and a stakeholder committee to develop the technical volume of the City's master plan. The plan included development of a sustainable multi-functional drainage corridor concept that will provide flood control, storm water quality treatment, wetland restoration and hydromodification control in the largest remaining City watershed proposed for development. The analyses were performed using HEC-HMS, HEC-1, HEC-RAS, XP-SWMM, and ArcGIS.

**Basin 157 Storm Drainage Master Planning, City of Sacramento, California:** Project manager for a storm drainage master plan for Basin 157, which covers nearly 2,800 acres in the City of Sacramento. The basin includes large areas of both developed and undeveloped land. For the developed areas, the portions of the existing drainage system not meeting the City's drainage criteria were identified along with the required facility upgrades. For the undeveloped areas, the drainage facilities necessary to safely convey runoff for buildout conditions were identified. Developed an unsteady-state SWMM model of the drainage system and used it to establish existing drainage conditions, predict the potential effects of future development, and evaluate alternative drainage improvement projects. An implementation plan was prepared for a \$66 million improvement plan. Mark has also completed similar studies for City of Sacramento Basins 22, 26, 67, 68, 69, 108, and 139.

**Drainage Master Plan, Reclamation District 784, Yuba County, California:** Managed the preparation of a drainage master plan for Reclamation District 784. Flood hydrographs were calculated for existing and ultimate conditions using HEC-1 and water surface profiles were calculated using an unsteady state (dynamic) computer model. Alternative flood control plans were developed to handle the increased runoff anticipated from future developed. Preferred alternatives were developed and estimates of construction, operation, and maintenance costs were prepared. A presentation of the master plan was delivered at a public meeting.

**Drainage Master Planning:** Performed the hydrologic and hydraulic analyses for the drainage master planning in the Sacramento areas listed below. The work included the analysis and design of drainage channels, flood control detention basins, storm water quality detention basins, culverts, and storm drainage pipe systems. The hydraulic analyses were performed with the use of HEC-1, HEC-2, SACPRE, HEC-RAS, HEC-DSS, and other computer programs. Also developed cost estimates for use in the Capital Improvement Programs. Locations included:

- North Vineyard Station specific plan area (Elder & Gerber Creeks),
- East Elk Grove specific plan area (Elk Grove Creek and tributaries to Laguna and Elk Grove Creeks)
- East Antelope specific plan area (Tributary to Dry Creek)
- Middle Branch of Strawberry Creek
- North Natomas community plan area (Drainage sheds 1 and 2)

## FEMA LETTER OF MAP CHANGE APPLICATIONS

Prepared and processed numerous FEMA Letter of Map Change applications including the following projects:

- Sterling Chateau 5 (LOMR for Alamo Creek, Vacaville, California)
- McClellan Park (CLOMR and LOMR for Magpie Creek, Sacramento County, California)
- Upper Laguna Creek (LOMR for Laguna Creek, Sacramento County, California)
- Longleaf Drive Bridge (CLOMR for Elk Grove Creek, Elk Grove, California)
- Ivywood Subdivision (LOMR for Ulatris Creek, City of Vacaville, California)
- Chestnut Subdivision (CLOMR for Linda Drain, Yuba County, California)
- The Price Club of South Sacramento (LOMR/ Floodway Revision for Union House Creek, Sacramento County, California)
- Tolman Acres (LOMA - Dry Creek, Sacramento County, California)
- Oakcreek Cove (LOMA - Arcade Creek, Sacramento County, California)
- Silver Springs North (CLOMR - Laguna Creek, Sacramento County, California)

## HYDROLOGIC AND HYDRAULIC ANALYSES

**Willow Creek Hydraulic Analyses, City of Folsom, California:** Mark managed the update of the City's HEC-RAS hydraulic model for Willow Creek to assist with the evaluation of a proposed development project (The Islands) near Parkshore Drive and Glenn Drive. There were known deficiencies in the hydraulic model that needed to be corrected to perform a reasonable

evaluation of the project's proposed drainage and flood control plan. One pedestrian bridge over Willow Creek had been constructed after the HEC-RAS model had been prepared and two others had estimated configurations in the model. A field survey was performed to determine the elevations and configurations of the pedestrian bridges and they were added or revised in the HEC-RAS model. In addition, an existing channel that runs along the south side of the proposed project conveys water out of the main reach of the creek and then delivers back to the creek downstream was not represented in the HEC-RAS model. Cross sections and one bridge were surveyed and the diversion channel was added to the model. The revised model was used to define the 10-year and 100-year water surface elevations that the project needed to be designed against. West Yost also reviewed the initial drainage design for the project and recommended revisions to the plan to better protect the project from potential flooding. Field surveying was performed by Baker-Williams Engineering Group. Mark also managed a second phase to extend the analysis upstream to provide information for the design of a new pedestrian bridge.

**Jepson Parkway Drainage Study, City of Vacaville, California:** Project Engineer for this drainage study that supported the Jepson Parkway Road Widening project. Mark performed river scour analyses for the proposed bridge replacements at New Alamo Creek and Old Alamo Creek. This included an evaluation of the bridge history and previous scour issues to help define the potential long-term channel degradation at the bridge site. In addition, hydraulic analyses were performed using HEC-RAS to estimate the potential contraction scour and local pier scour. Mark developed recommended scour protection measures for the bank and creek bed that provided an economical balance between the required abutment and pier depths and the scour protection measures. Scour protection measures were developed following Caltrans and FHWA methodologies.

## INFRASTRUCTURE

**Infrastructure Improvement Plan Designs, Sacramento County, California:** Performed improvement plan design, including the design of storm drainage pipe systems and channels, sanitary sewer systems, water distribution facilities, street lighting systems, and grading plans. Developed cost estimates and bid documents. The following is a list of specific projects, which are all located in Sacramento County, California:

- Northbrook Units 3, 4, and 5
- Larchmont Antelope Creek Units 1 and 2
- Antelope Marketplace Shopping Center
- The Cottages at Antelope Park
- Oakcreek Cove

**Longleaf Drive Bridge Project, Mark Thomas & Company/City of Elk Grove, California:** Project Manager for the hydraulic analysis for a new bridge proposed over Elk Grove Creek to improve vehicular and pedestrian access to local businesses, restaurants, and health facilities. Due to concerns over flooding along the creek, it was critical that the new bridge provide sufficient capacity to pass 100-year flood flows without significantly increasing the water surface elevations along the creek. West Yost performed a hydraulic analysis to assess preliminary bridge alternatives to help guide the selection of an appropriate bridge type and a final hydraulic analysis for the final bridge design. West Yost prepared an HEC-RAS model of the proposed bridge to evaluate the hydraulic performance of the bridge. The HEC-RAS model also served as the basis for a scour analysis to help design the bridge piers. West Yost prepared an application for a Conditional Letter of Map Revision and obtained FEMA's preliminary approval for the project. After the bridge was constructed, West Yost coordinated with FEMA to obtain a final Letter of Map Revision.

**Sheldon Road and Bradshaw Road Bridge Replacement, Willdan/City of Elk Grove, California:** Project Manager for the hydraulic evaluation of bridge replacement alternatives for a proposed intersection widening at Sheldon and Bradshaw Roads. The existing bridge over a tributary to Laguna Creek was considered inadequate. A hydraulic analysis was necessary to define the existing floodplain conditions and to evaluate potential bridge replacement alternatives for both a standard signalized intersection, as well as a roundabout intersection. West Yost used HEC-RAS to develop bridge replacement alternatives that would not significantly increase the flood risk either upstream or downstream of the intersection. Box culverts were determined to be an economical replacement for the existing bridge that would not cause significant flood impacts. The project will be partially funded by Caltrans, therefore the drainage study conformed to their requirements and the drainage report included a Caltrans Location Hydraulic Study. The information prepared by West Yost was used during preparation of the CEQA documentation.

**Napa Interior Drainage Study, Napa County Flood Control and Water Conservation District, Napa, California:** Managed the preparation of updated interior flooding analysis for areas behind proposed Corps of Engineers levee improvements along the Napa River. In coordination with the local Flood Control District and the Corps, West Yost performed hydrologic and hydraulic analyses to insure that the final Corps project did not result in increased interior flooding at any location. West Yost also prepared design plans

for channel and culvert improvements to improve the interior drainage conditions.

**Gasser Property Storm Drainage, Napa County Flood Control and Water Conservation District, Napa, California:** Managed the preparation of design plans and specifications for a project to reduce stormwater ponding between the old and new alignments of the Napa Valley Wine Train near Imola Avenue in the City of Napa. West Yost identified an open ditch and culvert project that would solve the problem for less cost than an original pipeline concept developed by others. For this project, West Yost also performed a peer review of a storm drain pipeline design by others for the Gasser Property.

**Peer Review of Drainage Plan for Napa Valley Wine Train Relocation, TranSystems Corporation, Oakland, California:** Performed a peer review of the proposed storm drainage facilities proposed with the Napa Valley Wine Train Relocation Project. After preparation of the 65 percent plans for the project, TranSystems received questions about whether the project would worsen the drainage on private properties in the area. Based on our experience on other projects in the area, West Yost was able to assist TranSystems by providing data that facilitated the preparation of a detailed drainage study. West Yost provided a peer review of the study and made recommendations that improved the efficiency of the proposed system.

**Ivanpah Solar Electric Generating Facility – Stormwater Runoff and Sediment Transport Analysis, BrightSource Energy, Inc, Oakland, California:** Prepared a storm drainage study for a proposed 400 megawatt solar power project covering 4,000 acres in the Ivanpah Valley of the Mojave Desert in California. The project is situated on an alluvial fan located at the base of the Clark Mountain Range. Flood flows from the mountains are initially confined in incised channels but once arriving on the alluvial fan the flood flows are less confined and can take random paths across the fan. To analyze this complex problem, Mark prepared a two-dimensional flood model using Flo-2D. With this model, West Yost was able to show that a low impact approach to the project design could be accomplished with minimal impacts on flood flows and sediment transport in the watershed. This approach allowed the client to significantly reduce the cost of the project by eliminating large detention basins and channels that had originally been proposed by others.

**Sterling Chateau No. 5 Alamo Creek LOMR, City of Vacaville, California:** Alamo Creek LOMR, City of Vacaville, California: Prepared a two-dimensional hydraulic model to define the 100-year floodplain caused by spill out of Alamo Creek in the City of Vacaville. FEMA mapping did not provide floodplain elevations

and did not appear to depict reasonable floodplain limits within a portion of the City that is subject to flooding from the creek. A two-dimensional model was prepared to route spill flows through an urbanized area within the City and to determine the floodplain elevations and limits. The model was used as the basis of a Letter of Map Revision application that was approved by FEMA.

**Point Pleasant Flood Control, County of Sacramento, California:** Managed the evaluation of flood control alternatives for the Point Pleasant community in southern Sacramento County. Alternatives included a dry dam on the Cosumnes River, conversion of an agricultural island into a flood storage basin, and construction of a ring levee around the community. Hydraulic analyses of the alternatives were performed with an unsteady-state HEC-RAS model covering the complex North Delta region. Cost estimates were prepared for each alternative. The results of the study were summarized in technical memoranda and presented at a public workshop.

**Hazel Avenue Bridge Widening Project, Parsons Brinckerhoff, Sacramento, California:** Managed the hydraulic analysis for the Hazel Avenue bridge-widening project over the American River in Sacramento County. The project consisted of hydraulic calculations with HEC-RAS to evaluate the potential increases in water surface elevations and velocities for several alternative bridge configurations. Potential scour at the bridge was estimated using the Federal Highway Administration's "Hydraulic Engineering Circular No. 18, Evaluating Scour at Bridges" as implemented in HEC-RAS.

**North Stockton Railroad Grade Separation Project, Mark Thomas & Company, Sacramento, California:** This project included drainage evaluations for two new roadway overpasses, one new underpass, and replacement of two bridges in northern Stockton. Mark managed this study to define the required roadway drainage and stormwater quality treatment facilities. This included design of a 5 cfs pump station for the underpass on Lower Sacramento Road. At one overpass, there was no nearby outfall for runoff and a retention basin was developed to store and infiltrate runoff. West Yost performed the hydraulic analyses of the proposed bridges to insure that they were appropriately designed so as not to increase the risk of flooding along the creeks. A Conditional Letter of Map Revision application was prepared and approved by FEMA. The hydraulic analysis also included an evaluation of the scour potential at the bridges to assist with bridge design.

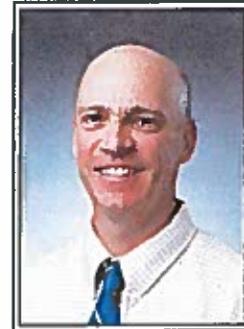
## Douglas Moore, PE Engineering Manager

Doug Moore has 22 years of experience, including storm drainage master planning, stormwater computer modeling, facilities planning, design, cost estimating, project permitting, and project management. He has hydrologic and hydraulic modeling expertise with XP-SWMM (1 and 2 dimensional modeling), Sacramento SWMM, HEC-HMS, HEC-RAS, MIKE URBAN, and RiverFLO-2D. He has provided initial planning, detailed design, and construction period engineering services for four large detention basin projects, each of which created significant wildlife habitat areas. Doug is skilled at preparing potable water, wastewater, and stormwater evaluations for development specific plans, city- and county-wide general plans, and environmental impact reports. Doug is particularly skilled at quickly developing infrastructure concepts and plans that minimize construction costs without compromising system performance.

### SELECT EXPERIENCE

**On-Call Services, Vallejo Sanitation and Flood Control District, Vallejo, California:** As follow on work from the VSFCDD SDMP, Doug is serving as the Project Manager for providing on-call stormwater services to VSFCDD. This work has included preparing the design of a headwall, trash rack, and access road for a VSFCDD open channel within Setterquist Park. He has also reviewed a Caltrans plan to enlarging three culverts under I-80 in the Skibereen/Monteith neighborhood and developed the lowest-cost storm drainage improvement plan to address the increased flows through the Caltrans culverts. He evaluated the causes and developed a solution to reduce the flooding of a single house on Humboldt Street. These tasks have been completed within the schedule needed for the VSFCDD to satisfy its obligations to the City of Vallejo and Caltrans. For a related project, Doug evaluated the causes of the flooding for several houses in the Hampshire and Mississippi Street Area from the December 30-31, 2005 storm (within the Austin Creek watershed). This evaluation included modeling the actual rainfall hyetograph with the MOUSE model of the Austin Creek Watershed. The model was found to closely reproduce the actual observed/reported flooding. From this work, it was determined that the storm exceeded the VSFCDD design criteria. This work was summarized in a PowerPoint presentation to the VSFCDD Board of Trustees on February 13, 2006. Through the on-call contract, the MOUSE models have been updated to Mike Urban software.

**Clover Valley Environmental Impact Report (EIR), Raney Planning and Management, City of Rocklin, California:** Doug prepared the hydrology/flood control, stormwater quality, and groundwater segments of an EIR for the Clover Valley development in the City of Rocklin. The development project originally included two on-line detention basins along Clover Valley Creek by constructing restrictive culverts under proposed roadways. The EIR analysis determined that these on-line basins would cause deposition of sediment within the creek channel upstream of the restrictive culverts and scouring of the channel just downstream of the restrictive culverts. Doug recommended use of off-creek basins and identified potential sites for off-creek basins. These off-creek basins resolved many of the concerns expressed by the Regional Water Quality Control Board and local environmental organizations. Ultimately the on-line basins were selected, but they were modified to eliminate the impacts identified in the EIR analysis. The EIR analysis



### Professional Registration

- Professional Civil Engineer; California No. 58122
- Professional Civil Engineer; Nevada No. 19924

### Education

- MS, Civil Engineering, University of California, Davis
- BS, Geology, University of Oregon

### Professional Affiliations

- North Bay Engineers Club – Membership Chair
- California Stormwater Quality Association
- Floodplain Management Association

also included evaluation of the effectiveness of the proposed water quality treatment vaults, and several additional water quality best management practices were required as mitigation measures. Minimal groundwater impacts were identified and mitigation measures were developed to reduce the impacts to less than significant levels.

**Civic Center Drainage Study, City of Rocklin, California:** This study sized the storm drains and detention basins for the Rocklin Civic Center Development (CC). The CC area is a relatively undeveloped area with minimal storm drainage facilities that is surrounded by commercial and residential areas. West Yost developed a drainage plan is to use the existing on-site rock quarries as detention/retention basins, construct one new detention basin, and construct on site storm drains to convey the peak runoff rates to the basins. The basins reduce the peak flows to not exceed the capacity of the surrounding storm drains.

The following process was used to develop the recommended drainage plan.

- Develop existing conditions runoff hydrographs using HEC-HMS based on the procedures in the Placer County Flood Control and Water Conservation District Storm Water Management Manual.
- Use the XP-SWMM model package with the HEC-HMS hydrographs to simulate the existing conditions hydraulic system.
- Summarize the existing conditions model results.
- Update the HEC-HMS model to represent future developed conditions and resulting runoff hydrographs.
- Use the XP-SWMM model package with the HEC-HMS future hydrographs to simulate the fully developed conditions hydraulic system. Use the model to size the required drainage improvements, including detention basins and storm drains.
- Summarize the fully developed conditions model results.
- Prepare a cost estimate for the required storm drain improvements.

West Yost's plan met the design criteria within the CC Area and resulted in no downstream stormwater impacts. It maximized the use of existing quarry pits for stormwater detention/retention, thus minimizing conveyance facility construction costs and maximizing the land available for development.

**Granit Drive- Sierra Meadows Storm Drain Improvements, City of Rocklin, California:** West Yost Associated prepared plans and technical specifications for the replacement of 900 feet of undersized storm drain. The existing 10-inch and 18-inch pipes were replaced with new 30-inch reinforced concrete storm drain pipes. The new storm drain alignment was located in the bike lane instead of along the existing alignment in the center of the street in order to decrease traffic disruption and surface restoration requirements on two busy streets in Rocklin. West Yost prepared a GPS survey of the project area, researched the location of existing utilities and coordinated potholing at all crossings.

**Emergency Storm Drain Repair, City of Rocklin, California:** When a backyard sinkhole opened up due to the failure of a large diameter corrugated metal storm drain pipe, West Yost Associates worked directly with a contractor to construct the replacement pipeline. West Yost provided pipe installation details to the contractor who began construction within a week of the failure. The project constructed 155 feet of new 60-inch HDPE storm drain pipe including new manholes, existing manhole connections, 48-inch lateral connections, bypass pumping and a new outfall structure.

**Central Rocklin Drainage Improvements (Sucker Ravine), City of Rocklin, California:** The Sierra Lakes Mobile Home Park flooded in 1986, leading to the need to rescue residents under emergency conditions. This Mobile Home Park is in the FEMA Special Flood Hazard Area (100-year flood plain). The goal of the study was to identify a project that could eliminate the flooding of the mobile home park. This study included evaluating three alternative detention basin configurations and locations and identifying a preferred alternative. The modeling was performed using HEC RAS. The capital costs of the alternatives ranged from \$4 million to 20 million (including land costs). However, none of the potential detention basin sites were large enough to completely eliminate the 100-year flooding of the mobile home park. It was recommended that a formal benefit to cost evaluation be prepared prior to constructing the preferred alternative to ensure the preferred alternative would be financially viable.

**Storm Drain Master Plan Peer Review, City of San Bruno, California:** Project Manager for preparation of a peer review of the City of San Bruno's draft Storm Drain Master Plan, including reviewing the draft report, a flow monitoring report, and a financial evaluation spreadsheet. West Yost provided 34 comments that will greatly improve the quality of the master plan and flow monitoring report. The most significant comments addressed the need for the master plan to provide quantitative information related to the magnitude of the predicted flooding. Our concern was that the Master Plan may have identified \$11 million to \$26 million of storm drainage improvements to solve minor ponding of stormwater in parking lanes or streets, but was not the cause of any actual flood damage. This quantification of the level of flooding is essential for City staff to be confident that the recommended major improvements are truly warranted. West Yost also conducted a telephone conference call to discuss our comments with the City and the consultant that prepared the master plan.

**Storm Drainage Master Plan, Vallejo Sanitation & Flood Control District (VSFCD), Vallejo, California:** Project Manager for the Storm Drainage Master Plan (SDMP) and personally performed about 20 percent of the modeling and technical work. The project included field surveys of over 5,000 storm drain facilities using a GPS system; developed computer models of four watersheds using the MOUSE hydrologic/hydraulic model package; developed comparison level alternatives evaluation and selected a preferred project for 32 flooding problems (including cost estimates); developed a capital improvement plan, provided PowerPoint presentation of the SMMP to the

VSFCD Citizens Advisory Committee, and prepared a four volume SDMP.

**Homeacres Drainage Improvement Projects, Vallejo Sanitation & Flood Control District, Vallejo, California:** Project Manager for the design of storm drain facilities for a portion of the Homeacres neighborhood. This project was identified as the highest priority project in the VSFCD SDMP. The Homeacres neighborhood is an unincorporated area within the City of Vallejo, and consequently, it was developed without storm drains or curbs and gutters. Plan and profile drawings were prepared for installation of 4,500 feet of storm drain, curb and gutter, valley gutter, earth ditches, and associated storm drain facility structures and appurtenances. The design avoided impacting extensive existing underground utilities, and helped preserve the rural appearance of the neighborhood. Doug prepared applications for the US Army Corps of Engineers Clean Water Act Section 404 Permit, California Department of Fish and Game Stream Bed Alteration Agreement, RWQCB Water Quality Certification, and a Caltrans encroachment permit. He coordinated the permit processing until the all the permits were received. Doug estimated the construction cost for this project at \$769,000. The low bid was \$747,000, and a total of 5 bids were received ranging up to \$878,000.

**Lemon Street Channel Flood Reduction Design, Vallejo Sanitation and Flood Control District, Vallejo, California:** Doug managed the preparation of the detailed design and specifications for the project, and personally performed about 25 percent of the work. The major component of the project included 2,600 feet of 96-inch bypass pipeline through a congested industrial area (in soft bay mud). Other components included a diversion structure, modification of an existing pump station/weir, removal of nuisance vegetation and restoration with suitable native California grasses and trees, replacement of undersized culverts with a 14'x7' box culvert, and other culvert and ditch improvements at two sites. West Yost divided the project into three bid packages to allow phasing of the construction and potential coordination of some of the project elements with future redevelopment along Sonoma Boulevard. The first component went out for bid for construction in the spring of 2011, and the low bid was \$1.69 million, just below Doug's estimated construction cost of \$1.72 million.

**Woodland-Davis Water Supply Project – Sacramento River Intake Evaluation, Woodland-Davis Clean Water Agency, California:** A preliminary evaluation of the Sacramento River intake was prepared. The Plan intake includes a 100 cfs pump station located on the right bank (looking downstream) of the Sacramento River, upstream of the Interstate 80 bridge. The project included:

- Evaluation of 20-years of hourly flow data to determine the flow exceedance percentages, or the amount of time that the river flow would exceed any given flow rate. This evaluation included a statistical frequency

evaluation of river flow data from 1990 through 2010. Prior to 1990 the river system was operated differently than it is currently, so the older flow data would not be representative of current operations.

- Preparation of a 2-dimensional hydraulic model and a 2-mile segment of the Sacramento River using the RiverFLO-2D software. The model was calibrated using surveyed water levels and gaged flows for a low flow period and the FEMA 100-year water surface profile for high flows.
- Use of the RiverFLO-2D model to convert the flow exceedance data into water surface elevation exceedance levels for establishing the elevation of the pump station intake screens.
- Use of the RiverFLO-2D model to evaluate the impacts of the proposed pump station on the 100-year river water level. It was concluded that the 100-year river water level would increase by a maximum of 0.02 feet, and that by 5,800 feet upstream of the Plan B Intake the water level would be unchanged by the pump station.
- Use of the RiverFLO-2D model to evaluate the changes in the river flow patterns and water velocity near the pump station. It was concluded that the water velocity would decrease near the pump station and increase along the opposite bank, resulting in the potential to increase erosion along the opposite bank.
- A scour evaluation of the intake structure was also prepared, including evaluating the long-term aggradation/degradation of the river bed, the contraction scour caused by the intake structure and the local scour at the intake structure. Scour countermeasures were also recommended.

**Soscol Gateway Interior Drainage Project, City of Napa, California:** Project Engineer and lead computer modeler for this project. He reviewed previously prepared technical studies and schematic-level designs of two alternatives to convey overland drainage in the Soscol Gateway area. The project included hydrologic/hydraulic modeling of the existing floodplain and alternative improvement projects, coordination with private land owners, and coordination with the CEQA consultant and regulatory agencies (California Department of Fish and Game, etc.). He developed a drainage plan that reduced the total project cost by about 40 percent under the previously considered alternatives. Also, the performance of the lower cost project has been verified as better than the performance of the previous plans. Doug performed the engineering evaluations for this project, which included confirmation of the sizing of a proposed USACE detention basin/pump station, evaluation of existing storm drains (sized for a 10-year storm) and channels to partially convey the 100-year storm flows, sizing of a proposed new pump station, and determination of the residual flooding depths and flow directions and velocities through 2-dimensional flood modeling using XP-SWMM. The 2-dimensional flood modeling results were presented in easily understandable maps of floodwater depths (colored shading) and flow vectors (arrows depicting the direction and velocity) for

existing conditions. From these existing conditions maps, improvements were developed that reduce the 100-year flooding to a level that will include only minor ponding in the public streets. Flooding depth and vector maps were prepared for the improvement alternatives. By comparing the existing condition and improved conditions maps, the level of flood reduction is easily visualized and the benefit of the proposed improvements is understood.

**Hydrology Manual, Solano County Water Agency, Vacaville, California:** Project manager for the preparation of a hydrology manual for the County. A new hydrology manual was prepared to replace the 1977 manual. The new manual was developed to incorporate the changes in hydrology brought about by the advent and availability of the personal computer. The underlying organization of the manual was to make it a useful tool for computerized hydrologic evaluations while still being useful for manual hydrologic evaluations. Preparation of the manual also included:

- Update of the rainfall duration-depth-frequency evaluation for the entire county to include the large storm events that occurred in the late 1990's.
- Development of simple to use hydrologic modeling methodologies appropriate to Solano County. The methodologies were "calibrated" to actual gaged flow data from recent storm events.
- Development of one example of the use of the rational method and two examples of use of HEC-1/HEC-HMS. The examples were developed to illustrate the basics of the evaluation methods and to explain common problems that often occur while using these hydrologic methods.
- Inclusion of as much relevant hydrologic information in the manual as possible to simplify hydrologic evaluations. The goal was to reduce the amount of time spent by users of the manual searching for hydrologic data.

**Dixon Watershed Management Plan, Solano County Water Agency, California:** The Dixon area watersheds have experienced significant flooding for many years. Flood control in the region is managed by several (often adversarial) organizations, including the City of Dixon, and several irrigation and water conservation districts. For this WMP, slow, steady consensus building was a critical element. This consensus building was facilitated through several stake holder meetings at which the concerns, ideas, and financial limitations of the stakeholders were identified. Flood improvement plans were developed that incorporated the concerns of the stakeholders but did not exceed their financial limitations. This planning effort has led to design and construction/expansion of two detention basins (Dixon Ponds A and C) and their outfall channels. A third project, the Dixon Main Drain and V-Drain, is currently under design, and construction is anticipated in 2014. This work also led to the formation of the Dixon Joint Powers Authority, which will address watershed flooding problems.

**Sweeney Creek Flood Reduction Study, Solano County, California:** Project manager and Project Engineer for the preparation of Sweeney Creek Flood Reduction Study for the Solano County Water Agency. There was extensive flood damage in the Sweeney Creek watershed during the December 13-16, 2002 storm event. The study identified that the causes of the flooding were the large magnitude of the storm event, dense vegetation in the creek channel, sediment deposition in the channel, and damming of flow by Interstate 505. Based on the rain gages in and near the watershed, the storm event had a return frequency of 2-years to 25-years, however, one gage recorded a 133-year frequency for the 2-hour duration. GPS surveys were conducted to accurately determine the horizontal and vertical locations of critical storm water and creek facilities. The watershed was divided into 40 subwatersheds, and an HEC-1 model was developed. The Channel capacity was evaluated using HEC-RAS. These models were calibrated using the December 13-16, 2002 storm event. The 10-year and 100-year storm events were then simulated. A range of flood reduction alternatives were evaluated, with a goal of reducing or preventing flooding in the 10-year storm event or December 13-16, 2002 storm event. The alternatives included clearing vegetation from the channel, removal of a grade control structure, a bypass channel, and upstream detention storage. The recommended project included specific improvements to two tributary channels along which much of the flood damage occurred. The cost of the recommended project was estimated at \$920,000, and the annual operation and maintenance cost was estimated at \$31,000 per year. Channel scour and sediment deposition evaluations were also prepared for Sweeney Creek. The results of the study were presented to the residents of the watershed at a series of three meetings held from 2003 through 2004. Two of the recommended improvements have been constructed.

**Pond C, City of Dixon, California:** The City of Dixon includes six watersheds that drain into agricultural drains south and east of the City. The runoff from Watershed C flows to the Dixon Resource Conservation District's (DRCD) Lateral 2 Drain. Lateral 2 was designed and constructed in 1965, and a discharge agreement was signed between the City and DRCD which limited the flow from the City to 77.5 cfs. This agreement also granted unlimited drainage rights to several privately owned parcels adjacent to the City. However, since 1965, the City has grown considerably, and the resulting flow rate from the City exceeds 77.5 cfs even in 2-year storms. Doug helped the City negotiate a revised discharge agreement with DRCD. These negotiations led to an increase in the permitted discharge rate from 77 to 125 cfs, which in turn reduced the size the City's Pond C and saved the City about \$600,000 in excavation costs. Based on the revised agreement, he prepared a conceptual design report for a 27 acre detention basin on a 40 acre site that provided 160 acre-feet of storage. The conceptual design was developed to prevent the need for obtaining a California Division of Dam Safety permit. The project required a US Army Corps of Engineers, Clean Water Act (CWA) Section 404 permit, a Regional Water

Quality Control Board CWA Section 401 water quality certification, and a California Department of Fish and Game Section 1600 Stream Bed Alteration Agreement. Doug coordinated with project's permitting consultant. After the conceptual design was approved by the City, Doug prepared the design drawings and technical specifications for the project. The project elements included a 160 acre-foot basin, a low flow inlet, a high flow weir, a discharge control structure, pond outlet piping, a maintenance road, headwalls, fencing, riprap, and local area drains. The pond was designed to use native California vegetation to develop aquatic, riparian, and upland habitats to attract a wide variety of wildlife. The project was constructed in two phases, and our cost estimate for both phases was \$2.9 million. The actual combined bids ranged from \$2.3 million to \$4.6 million. Engineering services during construction were also provided.

**On-Call Engineering Services, City of Dixon, California:** Doug is the Project Manager (and performed about 80 percent of the actual development review work) for the on-call stormwater engineering services for the City of Dixon. These services were initiated in 2004, and were on-going through 2008 when development in the City ceased. Under this contract, Doug has reviewed 12 development projects, including the Southwest Dixon Development (over 450 acres), Valley Glen (over 200 acres), the Parkland Development (about 60 acres), and several others. Doug has reviewed development drainage reports, hydrologic and hydraulic models, improvement plans, and other documents. He has verified that the drainage reports are consistent with the City's stormwater design criteria and with current industry standards. Improvement plans were also reviewed for consistency with City's design criteria/industry standards and for consistency with the facility sizing presented in the approved drainage reports. Doug has summarized the review comments in written letters, and for some development project, he has attended/participated in meetings between the City Public Works and the developers engineers. Doug's involvement in these meetings has streamlined the submittal and review of revised drainage reports and plans. Doug also recommended revision to the City's drainage design criteria and developed a spreadsheet template that is currently used by the development community for sizing stormwater retention basins within the City. West Yost has performed five City sponsored studies to determine how to best (and most cost effectively) address existing flooding problems within the City. Examples of these studies include the South Almond Street Study and the Core Area Study.

**Master Drainage Study, City of Yuba City, California:** Prepared a Master Drainage Study (MDS) to provide drainage for the 6,500 acre West Yuba City Area (WYCA). The WYCA is planned for significant additional development including residential, commercial, industrial and urban parks. The WYCA drains into the Live Oak Canal (LOC), which flows southwest through Sutter County to the State-owned O'Banion Pump Station (720 cfs) along the Sutter Bypass. Existing conditions XP-SWMM model of the LOC watershed was prepared and calibrated to the

rational method peak runoff rates from Sutter County's Engineering Standards. The 2-year, 10-year, and 100-year storms were simulated with the existing conditions model and the 2-year results appeared to reproduce the minor flooding that is known to occur within the watershed. The model was then updated to the buildout land uses, and was used to evaluate 4 alternatives plans for draining the WYCA. These alternatives ranged from conveying/pumping all the runoff (no detention storage) to a balance of detention storage and reduced conveyance/pumping. Alternative 4 included separating the LOC watershed into northern and southern subwatersheds (with an emergency connection) to provide the greatest level of reliability and redundancy. Each subwatershed included two new detention basins and one new pump station. Cost estimates were prepared for each alternative, and the capital costs of the alternatives ranged from \$76 million to \$102 million. Reliability and Redundancy is particularly important in this watershed because all of the runoff must be pumped out of the watershed into leveed rivers/bypass channels. Although not the lowest cost alternative, Alternative 4 (\$96 million) was selected because it provided the greatest level of reliability and redundancy. A capital improvement plan was developed which served as the basis for a storm drainage development impact fee study. In subsequent work performed for Sutter County, an alternative was developed with the goal of minimizing the overall project cost. An alternative was developed and evaluated that provided an equivalent level of flood protection, but used open channels rather than large diameter storm drains in several areas within the City. This alternative reduced the total project cost to \$39 million.

**Master Drainage Study, City of Live Oak, Sutter County, California:** Doug prepared a joint Master Drainage Study (MDS) for RD 777 and the City of Live Oak. The City of Live Oak is completely within the RD 777 service area. The MDS was prepared to ensure the development identified in the update of the City's General Plan would not increase flooding within the City or in the agricultural areas upstream or downstream of the City. The goal for preparing a joint document was to ensure that the two agencies did not develop conflicting drainage plans.

Doug reviewed the design criteria for several communities in the Central Valley of California and recommended appropriate design criteria for use in the MDS, including the 10-year, 4-day storm for storm drains, and the 100-year, 4-day storm for detention basin and open channels (with 1 foot of freeboard). An existing conditions XP-SWMM model of the City's storm drain system and the Districts open channel/culvert system was developed. The model data was based mostly on GPS surveys of open channel cross sections, culverts, and storm drains, but record drawings of facilities within the City were also used. The model was calibrated by running the 2-year and 10-year storms, and comparing the results with known flooding problems. The 100-year storm was also run. Improvements to solve six existing

City flooding problems were developed. The cost of these improvements was estimated at \$5.4 million.

Four alternative drainage plans were evaluated to eliminate the increased flooding from the growth identified in the updated General Plan. Alternative 1 included use of detention basins within the City and had a total capital cost of \$37.9 million. Alternative 2 included enlarging the channels through the City to direct the peak flows to a single, regional detention basin downstream of the City. The capital cost of Alternative 2 was \$57.9 million. Alternative 3 was developed from Alternative 1, but the channels and basins were configured to provide detention storage and other joint uses such as linear parks, pedestrian paths, athletic fields, parks, and wildlife habitat. The cost for Alternative 3 was \$40.1 million. Alternative 4 was a refinement of Alternative 3 intended to improve the performance of the system and lower the total cost. The cost of Alternative 4 was estimated at \$35.6 million. A life cycle cost evaluation of the alternatives was also prepared.

A PowerPoint presentation describing and comparing the alternatives was given to a joint City Council and Planning Commission workshop. After receiving their informal input, Alternative 4 was selected as the preferred project and a development impact fee study was prepared based on Alternative 4. The MDS and new impact fees were adopted by the Live Oak City Council in the summer and fall of 2011.

#### **Drainage Pump Station and Detention Basin Improvements, City of Sacramento, California:**

Developed a Sacramento Storm Water Management Model (SSWMM) and master plan of the Sump 151 watershed and existing drainage collection, detention, and pumping facilities. Identified the current level of flood protection as less than 2-year. Used the SSWMM to evaluate alternative improvement scenarios to provide a 10-year level of protection. Estimated the costs of the alternatives and used the SSWMM to minimize the costs associated with pumping and detention storage. Also estimated facilities construction costs of \$2 million to \$4 million over previously proposed plans while providing the same level of flood protection.

#### **Storm Drain Capacity Evaluation, Vallejo Sanitation and Flood Control District, California:**

Evaluated the cause of recurring flooding along the Roleen Drive storm drain in Vallejo. Assisted with field surveying of drainage facilities, development of photogrammetric mapping used for design of drainage improvements, development of a hydrologic computer model of the Roleen Drive watershed using HEC-1, and a hydraulic computer model of the Roleen Drive storm drain using StormCAD. Developed and evaluated improvements to the storm drainage system to eliminate flooding for the 15-year storm event.

**Storm Drainage Master Planning, City of American Canyon, California:** Developed sections of a storm drainage master plan for the City of American Canyon. Performed field evaluations of channel, culvert, and bridge configurations, estimation of Manning's N values, and identification of overland release points. Developed HEC-1 and HEC-2 computer models for 5 creeks flowing through the City of American Canyon.

**Stormwater Modeling, City of Vacaville, California:** Refined existing HEC-1 and HEC-2 computer models to accurately simulate performance of several flow diversion structures including weirs, orifices, detention basins and dams. Developed models of multiple creek systems to evaluate floodwater breaking out of one creek and spilling into another. Used the models to evaluate the impacts of proposed development and to identify appropriate mitigation measures.

**Stormwater Modeling, City of Sacramento, California:** Performed computer modeling of 2-, 5-, 10-, and 100-year flood events of an urban watershed. Developed input files for the Sacramento Storm Water Management Model (SSWMM, a modification of the EPA's SWMM model) and evaluated model results. Developed and evaluated drainage system and pump station improvements necessary to prevent property damage from a 100-year storm event.

**Sump 151, City of Sacramento, California:** Prepared a storm drainage master plan for the Sump 151 watershed (City of Sacramento) and assisted with the subsequent design of improvements to the pump station. Developed computer models of the hydrology and hydraulics of the watershed. Performed computer modeling of 2-, 5-, 10-, and 100-year flood events. Evaluated and sized water quality improvement basins. Identified drainage facility deficiencies within the watershed. Developed facilities improvement to resolve the deficiencies; the planned improvements resulted in a reduction in estimated facilities construction costs of \$2 million to \$4 million over previously proposed plans while providing the same level of flood protection.

## Jeffrey Wanlass, PE

### Principal Engineer

Jeff Wanlass has over 16 years of experience as project manager and team member of water facilities planning and design and surface water management projects. Jeff has performed various design duties on water projects, including pump station design, steel and concrete reservoir design, and pipeline design. He has experience developing hydrologic and hydraulic models for storm drainage master plans, floodplain delineations. Jeff is particularly experienced in modeling, planning, analysis, and design of detention/water quality basins. He is familiar with many of the commonly used surface water computer models including HEC-1, HEC-HMS, HEC-2, HEC-RAS, XPSWMM, StormCAD, MOUSE, and others. Other experience includes design services during construction, NPDES stormwater quality analysis, and infrastructure design for residential and commercial projects.

## SELECT EXPERIENCE

### STORMWATER

**Drainage Master Plan, Town of Loomis, California:** Project Engineer responsible for developing database and base map of existing drainage facilities. Project work also included evaluation of existing storm drainage facilities and drainage problems, and development of capital improvement program.

**Jepson Parkway Drainage Study, City of Vacaville, California:** Project Manager responsible for preparing a Drainage Study for the Jepson Parkway Road Widening project. The project work included conducting hydrologic, hydraulic, and river scour analysis for the proposed bridge replacements at New Alamo Creek and Old Alamo Creek related to Jepson Parkway road widening project. A hydrologic analysis was conducted to determine flow rates and volumes of runoff that the drainage facilities will be required to convey or control. These flow rates were compared with stream gage data and other historical site information and adjustments made to modeling parameters. A hydraulic analysis was performed for Old Alamo Creek and New Alamo Creek to determine bridge/culvert capacities, 100-year water surface elevations, velocities, available freeboard, channel geometry. The project also included a scour analysis to provide an estimate of potential scour depths at the future bridge/culverts and provide recommendations on scour protection measures.

**Ulatis Creek Detailed Hydraulic Analysis, Solano County Water Agency, California:** Project Manager responsible for conducting a detailed hydraulic analysis of a 3.5-mile reach of Ulatis Creek in Vacaville, California. The project included developing a detailed HEC-1 hydrologic model, field evaluation of channel conditions and flow patterns, developing a HEC-RAS model, evaluating overbank losses, and determining the benefits of proposed channel improvements. The detailed hydraulic analysis included developing an unsteady state HEC-RAS simulation; which included five bridges, two drop structures, and an off-line detention basin. Prepared a summary technical memorandum.

West Yost used the Ulatis Creek hydraulic model to evaluate potential impacts to flooding resulting from constructing a new bike path along the north side of Ulatis



### Professional Registration

- Professional Civil Engineer, California No. 60930

### Education

- MS, Civil and Environmental Engineering, Brigham Young University
- BS, Civil and Environmental Engineering, Brigham Young University

### Professional Affiliations

- Floodplain Management Association

Creek. The proposed bike would raise the elevation of the creek bank along various reaches of the creek; thereby potentially blocking overbank flooding that occurs under existing conditions during large storm events. As a result, the water surface elevation in the creek could increase downstream, increasing the potential for flooding downstream of the proposed project.

#### **Sterling Chateau No. 5 FEMA LOMR Application and 2-D Modeling, City of Vacaville, California:**

Project Manager responsible for preparing an FEMA LOMR application for a proposed development located in a Special Flood Hazard Area – Zone A. The project included using Flo-2D modeling software to develop a 2-dimensional hydraulic model to route Alamo Creek overflows through residential neighborhoods for several miles and back into Alamo Creek. In addition to the 2-D modeling the project included compiling county LIDAR data using GIS software, developing hydrographs for the outbreaks based on the FEMA HEC-2 and HEC-1 models developed for the City of Vacaville Flood Insurance Study, and preparing a FEMA LOMR application for a portion of the floodplain. The floodplain resulting from the 2-D hydraulic model closely matches the flooding experienced during a recent large storm event.

#### **Alamo Creek Regional Detention Basin Pre-Design Report, City of Vacaville, California:**

Project Manager responsible for preparing the preliminary design report. The project work included updating the watershed mapping and hydrologic modeling (HEC-1), developing an unsteady-state HEC-RAS model of Alamo Creek, evaluating several alternative detention basin configurations, preparing preliminary grading plans, preparing planning level construction cost estimates, and assisting City staff in preparing an application with California Department of Safety of Dams. The recommended detention basin is an earthen off-line basin with an operational capacity of 625 acre-feet, a 300-foot wide inlet weir with 3,600 cfs capacity, twin 42-inch outlet pipes, and 28-foot high embankment. The proposed detention basin will reduce design peak flows in Alamo Creek by about half resulting in a reduction of downstream flooding by about 60 percent during a 10-year storm and 20 percent during a 100-year storm.

#### **Neighborhoods 6 and 7 Storm Drainage Master Plan Study, City of Citrus Heights:**

Project Engineer using XP-SWMM to develop stormwater models to identify and evaluate drainage improvements projects for a citywide capital improvement program. West Yost established and refined analysis procedures to efficiently identify flooding problems and to develop solutions. Key project objectives were to eliminate as many roadside ditches as possible; eliminate recurring local flooding, and develop a capital improvement program

to help guide the City in implementing future drainage improvements.

#### **Laguna Creek Regional Detention Basin Pre-Design Report, City of Vacaville, California:**

Project Manager responsible for preparing a preliminary design report for a large regional detention basin critical to reducing frequent flooding within the City of Vacaville. The project work included updating the watershed mapping and hydrologic modeling (HEC-1), surveying and mapping, developing a HEC-RAS model of Laguna Creek, and determining overbank losses and extent of flooding within the watershed. The recommended detention basin is an earthen off-line basin with an operational capacity of 950 acre-feet, an inlet channel to collect and divert flood flows into the proposed detention basin, multiple outlets to two different receiving creeks, and 24-foot high embankment. The proposed detention basin will reduce design peak flows in Laguna Creek by about half resulting in a reduction of downstream flooding by nearly 50 percent.

#### **Encinosa Creek Regional Detention Basin Pre-Design Report, City of Vacaville, California:**

Project Manager responsible for preparing a preliminary design report for large regional detention basins critical to reducing frequent flooding within the City of Vacaville. This project consisted of three detention basins separated by various geological features. Two of the basins were for regional flood reduction and one to alleviate a localized flooding problem. The project included a feasibility study followed by a pre-design report. The project work included updating the watershed mapping and hydrologic modeling (HEC-1), surveying and mapping, developing a HEC-RAS model of Encinosa Creek, and developing detailed hydraulic analysis for the basins and their effect on the hydraulics of the other basins. Several alternative configurations were evaluated and preliminary cost estimates prepared. The recommended project consisted of two off-line type basins on either side of Encinosa Creek with a combine storage capacity of 140 acre-feet and an on-line basin with a storage capacity of 50 acre-feet. The recommended configurations resulted in part from extensive wetlands and American Indian burial grounds found on the project site. Jeff also assisted City staff preparing application with California Department of Safety of Dams.

#### **Ulatis System Drainage Study, Solano County Water Agency, California:**

Project Manager for the watershed-wide hydrologic and hydraulic model update and evaluation of regional flood control improvements. The objectives were to determine the City of Vacaville's level of flood protection along the major creeks draining through the City, evaluate flood control alternatives to increase the City's level of flood protection, and develop recommendations for implementation. Project included updating hydrologic models (HEC-1) to current land use

conditions, updating existing hydraulic models (HEC-RAS) with detailed surveyed cross-section data, and calibrating models to stream gages located on several creeks. The hydrologic modeling encompassed six large subsheds, totaling about 150 square miles; and hydraulic modeling of about 50 miles of open channels. Jeff presented the study findings at a public meeting, to City Council, and to the SCWA Board. Based on results of this study the City has proceeded with pre-design reports for the Encinosa Creek, Alamo Creek, and Laguna Creek Regional Detention Basins and was able to secure a \$3.5 million grant from SCWA and an additional \$6 million from Proposition 84 funding and FEMA.

**Florence/Ulatis Detention Basin Pre-Design Report, City of Vacaville, California:** Project Manager responsible for preparing a preliminary design report for a small detention basin that will alleviate flooding of a residential neighborhood. The project included delineating and updating the watershed boundaries, developing updated hydrologic modeling (HEC-1) to develop hydrographs and estimate peak flows for the 10-year and 100-year storm events, evaluate capacity of existing storm drain used the XP-SWMM model (model included 15,700 feet of storm drains), evaluating alternative detention basin configurations, and prepare preliminary cost estimates. The recommended basin configuration consisted of 16 acre-feet of storage with a 30-inch RCP outlet; and resulted in an estimated reduction of flooding during the 10-year storm of about 65 percent and about 36 percent during a 100-year storm.

**Southeast Vanden Drainage Master Plan, City of Vacaville, California:** Project Manager responsible for preparing drainage master plan for proposed mixed use development encompassing 290 acres. The objectives of this project was to determine impacts on the existing upstream storm drain system by converting an existing open channel to a piped system and to determine the detention storage required to mitigate for loss of floodplain storage. Major project tasks included developing StormCAD model of the existing and proposed drainage facilities for an 850-acre watershed that included over 21,000 linear feet of storm drains, coordinating surveying work, preparing watershed maps, develop hydrologic models (HEC-1) for both existing and proposed land uses, conducted hydraulic analysis (HEC-RAS) of 6 miles of open channel, and evaluating detention basin alternatives. Jeff also conducted hydraulic analysis of proposed twin 60-inch and twin 72-inch storm drain for the proposed development project.

**Southtown Development EIR, City of Vacaville, California:** Project Manager responsible to preparing the EIR Surface Hydrology and Water Quality chapter. The proposed development project included developing approximately 290 acres of existing agricultural land into 1,410 housing units, 30,000 square feet commercial,

20 acres of parks, and 14 acres of open space. Jeff evaluated the existing drainage facilities that included the existing upstream storm drain system and an existing creek and culverts that run through the proposed project site. The project included developing HEC-1 models to compare existing and proposed design flows and to evaluate proposed on-site detention storage; and developing HEC-RAS model to evaluate the capacity of the existing creek and culverts. The resulting mitigation measures included: construction of a 110 acre-foot detention basin to reduce post-project flows to below pre-project flows, preparation of SWPPP and Storm Water Management Plan, and a requirement to build future building pads above the 100-year water surface elevation in the adjacent creek.

**Rice McMurtry Development EIR, City of Vacaville, California:** Project Manager responsible for preparing the EIR Surface Hydrology and Water Quality chapter. The proposed development project included developing approximately 200 acres of existing agricultural and open space land into single-family residential. Jeff evaluated the existing drainage facilities that included the existing downstream storm drain system and an existing creek and culverts downstream of the project. The project included developing HEC-1 models to compare existing and proposed design flows and to evaluate the proposed on-site detention storage; and developing a HEC-RAS model to evaluate the capacity of the existing creek and culverts. The resulting mitigation measures included: construction of 50 acre-foot detention basin to reduce post-project flows to below pre-project flows and preparation of SWPPP and Storm Water Management Plan.

**Lower Lagoon Valley Development EIR, City of Vacaville, California:** Project Manager responsible to preparing the EIR Surface Hydrology and Water Quality chapter. The proposed development project included developing approximately 860 acres of existing grazing, open space, parkland, commercial, and agricultural land uses to residential, commercial, and recreational land uses. Jeff developed HEC-1 models to compare existing and proposed design flows and evaluated proposed on-site detention storage. The resulting mitigation measures included: construction of 135 acre-foot detention basin that would reduce post-project flows to 10% below pre-project flows, preparation of SWPPP and Storm Water Management Plan, build future building pads above the 100-year water surface elevation in the adjacent creek, and preparation of comprehensive Sediment Control Management Plan.

**Al Patch Park Storm Drain Analysis, City of Vacaville, California:** Project Manager responsible for developing a StormCAD model of existing storm drain system for a 350-acre watershed that included over 14,000 linear feet of storm drains. Evaluated alternatives

for routing runoff from a proposed public park, located in the upper portion of the watershed, through the existing downstream storm drain system.

**Redevelopment Area Drainage Master Plan, City of Folsom, California:** Conducted field inspections to compile an inventory of existing drainage facilities and to assess their condition. Evaluated existing drainage facilities to convey the design flows. Identified and evaluated alternative drainage improvements for areas that were prone to flooding problems. Prepared cost estimates and developed CIP of recommended drainage improvements. City staff reviewed analysis results and concurred matched closely with historical flooding.

**Basin 157, City of Sacramento, Department of Utilities, California:** Project Engineer responsible for developing a Storm Drainage Master Plan for Basin 157, which covers nearly 2,800 acres in the City of Sacramento. The storm drain facilities include several miles of open channels and storm drain pipe, and a 590 cfs pump station. The basin includes large areas of both developed and undeveloped land. For the developed areas, the portions of the existing drainage system not meeting the City's drainage criteria were identified along with the required facility upgrades. For the undeveloped areas, the drainage facilities necessary to safely convey runoff for buildout conditions were identified. Developed an unsteady-state SWMM model of the drainage system and used it to establish existing drainage conditions, predict the potential effects of future development, and evaluate alternative drainage improvement projects.

**Horse Creek Detention Basin No. 2 Pre-Design Report, City of Vacaville, California:** Project Engineer responsible for evaluating the available detention storage within a 6,400 acre watershed located in northern Vacaville, and to assess the detention storage necessary to mitigate for current and future development. This project included updating the City's HEC-1 model for the watershed, developing a HEC-RAS model, developing a preliminary grading plan, and preparing details for the outlet control structure, and preparing cost estimates. The recommended detention basin is an on-line basin with a detention storage capacity of 33 acre-feet on 11 acres of land with a 12' x 12' standpipe type outlet structure with a 36-inch orifice.

**Northeast Section of Vacaville Drainage Study, City of Vacaville, California:** This area of Vacaville is undergoing intensive development with over 800 acres of commercial and residential development, and an I-80 Interchange project. This was a multifaceted project that included review of storm drain master planning for the development projects, evaluation of existing drainage conveyance facilities, evaluation of existing detention storage facilities, and providing recommendations on the improvements necessary to convey the design flows and reduce the potential for flooding hazards.

**Austin Creek Watershed Drainage Study, Vallejo Sanitation and Flood Control District, California:** Project Engineer responsible for developing a MOUSE model of the Austin Creek Watershed (3.2 square miles) to evaluate the existing drainage system and to analysis flood control improvement alternatives. The modeling included two pump stations, 1.4 miles of open channel, 5.5 miles of storm drains ranging in size from 30- to 108-inch), and tidal effects of the White Slough. Also prepared summary report and cost estimates.

**Zone 7 Flood Control Master Plan, Zone 7 Water Agency, California:** Project Engineer responsible for evaluating the condition of several miles of flood control channels, conducting hydraulic analyses using HEC-RAS of over 13 miles of flood control channels, and evaluating flood control improvement alternatives. Assisted preparing drainage report.

**Alamo Creek Detention Basin No. 2 Pre-design Report, City of Vacaville, California:** Project Engineer responsible for preparing preliminary design report for a small detention basin designed to mitigate for increased flow caused by future development within the Alamo Creek Watershed. The project work included developing a detailed HEC-RAS model of Alamo Creek, analyzed and prepared details for the inlet and outlet control structures, and prepared a preliminary grading plan and construction cost estimate. The recommended detention basin is an earthen off-line basin with a detention storage capacity of 16 acre-feet on 3.6 acres of land, inlet structure is a single 48-inch culvert, and outlet structure is a 24-inch culvert. The basin was configured with avoid several old growth oak trees. Preliminary cost estimate was 38% higher than low bid and 15% lower than high bid.

**Tulare/Alamo Drive Drainage System Study, City of Vacaville, California:** Project Engineer responsible for evaluating frequent flooding within two adjacent watersheds. The evaluation included determining 10-year peak flows using Rational Method; conduct hydraulic analysis of the storm drains (consisting of 4,500 feet of 30- to 48-inch RCP, and 3,200 feet of 24- to 48-inch RCP); identify the cause(s) of the flooding; and identify and evaluate potential improvements to alleviate the flooding. It was determined that much of the flooding resulted from high water levels in receiving creek and inadequate overland release to creek. Potential alternatives included rerouting outfall, redirecting upper portions of watershed to an adjacent storm drain system, developing overland release path, or construction large upstream regional detention basins to reduce peak flow in the creek that drains through the area. Ultimately, large regional detention basins were determined to be the most feasible option.

## Jeffrey Tolentino, PE

### Associate Engineer

Jeff Tolentino has five years of civil engineering experience with West Yost Associates. He has worked on a variety of wastewater, and storm drainage infrastructure projects, including wastewater modeling, I&I studies and tertiary wastewater treatment facility design. He is proficient in InfoWorks CS, XP-SWMM, ArcGIS, and AutoCAD.

### SELECT EXPERIENCE

**Dry Creek Trunk Sewer Bank Stabilization Project, City of Roseville:** Project Engineer for the planning and design of creek bank stabilization along the "at risk" segment of Dry Creek adjacent to the 39-inch sewer. West Yost developed a HEC-RAS model of the creek and evaluated several alternatives for stabilizing the creek bank. Jeff helped prepare the design for the recommended alternative which included partial removal of the at-risk bank and application of Vegetated Rock Slope Protection (VRSP). The VRSP consisted of 800 cubic yards of rock and approximately 5,100 square feet of hydroseeding. Jeff developed plans and specs for the design, and provided bid period services for the project. Jeff will continue to provide construction services as part of the West Yost team during the construction period scheduled for late summer of 2014. This project has required a rapid turnaround to assist the client in repairing the bank before the 2014/2015 wet season, and the design team has successfully maintained project milestones to meet that goal.

**Neighborhoods 6 & 7 Storm Drainage Master Plan Study, City of Citrus Heights:** Assisted in stormwater model development for the City including model scenarios for 21 areas of the City to address recurring local flooding using XP-SWMM and SacCalc. Used model to identify and evaluate improvement projects. Provided field investigation to fill data-gaps and verify as-built information provided by the City.

**Neighborhoods 8, 9 & 10 Drainage Master Plan Study, City of Citrus Heights:** Follow-up project awarded to West Yost after successful completion of Auburn Sunrise Storm Drain Master Plan Study listed above. Additional stormwater model development and scenarios was conducted for 17 new areas of the City with XP-SWMM and SacCalc. Similar to the Auburn Sunrise project, modeling was used to identify and evaluate improvement projects. Field investigations were included to fill data-gaps and verify as-built information provided by the City.

**On-Call Modeling Services, Vallejo Sanitation and Flood Control District, California:** Provided a storm drain and sanitary sewer model comparison of software updates for MIKE URBAN. Ran three models on different versions of modeling software and identified discrepancies, allowing the District to have confidence in their model upgrade and avoid complications in migrating to the new platform.



### Professional Registration

- Professional Civil Engineer; California No. 80688
- Leadership in Energy and Environmental Design (LEED®) Certified, Green Associate

### Education

- BS, Civil Engineering, University of California, Davis

**Drainage Project Feasibility Study, Sutter County, California:** Compiled a GIS database for the County, including review of existing as-built information and consolidation information on existing facilities into the new GIS format. Converted an XP-SWMM stormwater model into GIS data to facilitate the evaluation of new infrastructure alternatives to meet growth needs.

**Permitting Assistance, Department of General Services, City of Sacramento, California:** Project Engineer for ongoing water quality monitoring for the Department of General Services. Assistance included quarterly outfall sampling, and monthly and quarterly report preparation for Sacramento County Regional Sewer District discharge permit; as well as quarterly groundwater sampling and quarterly report preparation for the Underground Fuel Tank Program with the Sacramento County Environmental Management Department.

**Sanitary Sewer Infiltration and Inflow (I&I) Program, City of Vacaville, California:** Project Manager for an annual, city-wide sanitary sewer I&I program with the goal of identifying and mitigating I&I sources. Services include project management, data analysis, annual reporting, data retrieval and field crew supervision during flow meter installations and maintenance.

**Hydraulic Model Update & 2010 Capacity Analysis, Veolia Water and City of Richmond, California:** Updated an existing hydraulic model for Veolia Water with the goal of developing a capital improvements project to eliminate all sanitary sewer overflows in the City of Richmond by 2014. Delineated over 850 subcatchments for the model, and developed a system for managing over 65 separate flow factors during calibration. In addition to the wastewater and rainfall loads typical of collection system models, this project also required consideration of tidal inflows and infiltration specific to the City of Richmond. Jeff developed geographically distributed infiltration loads and time-varying inflow loadings representing the tidal influences within the collection system service area. He helped calibrate the model to both dry and wet weather metering data collected in 2010 and 2012. Once the model was validated, Jeff tested a variety of capital improvement alternatives, including a 3.6 MG storage pond aimed at capturing storm flows, and development of over 4,500 linear feet of wet weather flow bypass facilities, among other solutions.

**Hydraulic Model Development, City of Sausalito, California:** Jeff assisted in hydraulic model construction for the City of Sausalito's wastewater collection system, with the goal of identifying future capital improvement projects. Jeff worked with a combination of ArcGIS and survey data to develop the model network. He

also generated loads from land use, tidal, and rainfall data; and calibrated the model for dry weather and wet weather flows based on recent flow metering data. The model was developed in InfoWorks CS. In addition to model development, Jeff also wrote chapters describing the city's existing sewer system and model flows, including ArcGIS maps, for a final report.

**West Bay Sanitary District Wastewater Collection System Master Plan and Rate Study, West Bay Sanitary District, California:** Jeff assisted in hydraulic model construction for the West Bay Sanitary District wastewater collection system. The purpose of the model was to provide a basis for the district's new wastewater collection system master plan and rate study. Jeff worked with ArcGIS data to develop the model network, and calibrated the model for dry weather and wet weather flows based on 2010 flow metering data. The model was developed in InfoWorks CS.

**Easterly Wastewater Treatment Plant Conformed Design Report, City of Vacaville, California:** Project Engineer for the preparation of a conformed design report for the City's 15 mgd wastewater treatment plant. Report contained up-to-date design criteria for the plant, providing plant staff with ready access to the basis of design associated with unit processes. Included brief description of each unit process, current design data, provision for future modifications and modes of operation. Updates to the report are planned as future changes to plant facilities are introduced.

**General Plan Update, City of Turlock, California:** Assisted in the planning level design for sewer trunk lines for four alternatives to serve new growth areas this included analysis of peak flow projections, pipeline alignment alternatives based on land-use, and cost estimating and provided conceptual sizing for pump stations to convey flows to the City's wastewater treatment plant.

**Midland Environmental Assessment, City of Midland, Texas:** For this project, Jeff assisted in the creation of a database containing all private, city, county, and state well log information, and performed rigorous QA/QC over the entire data set. The database was used to create a 3-dimensional texture map of the material underlying Midland County. Additionally, Jeff built FEMFLOW3D models of wells and calibrated to field data using PEST with the goal of obtaining soil conductivity parameters.

**Tertiary Filtration & UV Disinfection, Easterly Wastewater Treatment Plant, City of Vacaville, California:** Provided piping profiles for conveyance facilities within the treatment plant including a 60-inch filter effluent pipeline. Assisted in design for site civil and storm drainage facilities.