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SEWERS AND PIPELINES EXPERIENCE

City of Vacaville. Elmira Road Trunk Sewer Replacement. Design of 3,500 feet of 54-inch sewer to replace an existing sewer which was damaged by hydrogen sulfide corrosion. To protect the new sewer, PVC lined concrete pipe was specified.

City of National City. Design of 1,300 feet of sewer, including two jack and bores. During the study phase, inversion lining and slip lining were considered for parts of the sewer project. The project also included replacement of pumping equipment and installation of a new radio alarm system in four pump stations.

Placer County Bell Road Subdivision. Design and construction services on 24,000 feet of sanitary sewers and forcemains, and two new sewage pumping stations for the Bell Road Subdivision.

City of El Segundo. Feasibility study and design of a storm water pump station modification project. The feasibility study analyzed the alternatives of two separate pump stations versus a single pump station connected by 1,300 feet of 60 inch sewer. The single pump station alternative was selected. Because the sewer will be at depths of up to 35 feet, much of it will be constructed by jacking and boring. The design included six submersible pumps with a design capacity of 105 CFS (68 MGD) and 1,400 total installed horsepower.

City of San Leandro. Investigated the technical feasibility of providing a gravity bypass between the influent manhole and the effluent manhole of the Wicks Extension Pump Station. The gravity bypass was found to be technically feasible, i.e., if the pump station fails, the upstream sewer system will fill up but before it spills, flow will bypass by gravity to the downstream sewer system. The use of this simple 10-foot long gravity bypass avoided installing a stationary standby generator at this pump station.

City of Mill Valley, CA. Evaluated the alternatives of improving the Enchanted Knolls Pump Station versus replacing the station with a gravity line connected to a force main leading to the wastewater treatment plant. The feasibility of using a gravity line depended upon the actual height of the hydraulic gradeline in the force main during periods of peak flow. A program to investigate the actual height of the hydraulic gradeline was developed as a part of the work. The gravity sewer line proved to be technically feasible, if provided with several safeguards, and was designed and constructed, allowing the City to abandon the pump station.

City of Point Arena. Capacity study of the wastewater system to determine whether it is sufficient to handle the growth envisioned in the General Plan. The study compared the cost and probability of success of reducing infiltration/inflow into the sewer system versus treating and disposing of the excess flows. The capacities of the sewer system, treatment plant, and percolation pond disposal areas were analyzed to determine which was the controlling factor in the overall capacity of the system.

Santa Cruz County Sanitation District, Aptos Transmission Main Relocation. Participated in an analysis of relocating a major transmission main from a beach to an inland location. The original main had been damaged by movement of the beach sand during major storms. The alternative location required pumps with greater heads but it was found that these pumps would fit in the existing pump station.

Santa Cruz County Sanitation District, Aptos Transmission Main Relocation Project. (Aptos Esplanade Pump Station Upgrade and Upper Tannery Gulch, Lower Tannery Gulch, New Brighton State Beach Campground and New Brighton State Beach Toilet Pump Stations). Project Engineer on the relocation of a 20-inch pressure pipeline in the beach to an inland route. The new pressure pipeline system includes 17,000-feet of 16-inch and 18-inch plastic force mains.

Santa Cruz County Sanitation District. Served as the lead project engineer on the design of rehabilitation of 25,000 linear feet of sewer pipe for the Santa Cruz County Sanitation District to correct excessive leakage (infiltration and inflow). The project rehabilitated the building laterals from the sewers up to the edge of the public right-of-way. More than 500 laterals with a total length of approximately 10,000 feet are included in the project. The rehabilitation options include replace and repair, pipe-bursting, and lining by various technologies. The construction cost of the project was \$3.3 million. The project was done on an expedited basis to prevent a recurrence of overflows from a pump station. The complete design took just seven weeks.

Point Arena, CA Sewer System Extension. Assisted this small City in evaluating alternatives for extending the existing sewer system to serve a California Department of Forestry compound. Alternatives that were considered included a conventional gravity sewer and a small diameter pressure sewer following a septic tank.

Monrovia Canyon Park Wastewater Disposal. Analyzed three alternatives for disposing of wastewater from a remote canyon park: (a) over a mile of conventional sanitary sewer to connect to the City sewer system; (b) septic tanks with a small diameter variable grade effluent sewer (VGES) to the City sewer system; and (c) septic tanks with soil absorption systems. The innovative VGES system cost only 40 percent of the conventional sewer alternative, but provided the same degree of service and reliability. It has been selected for implementation, saving the City an estimated \$155,000.

City of San Leandro On-Call Engineering Services. Project and peer review engineer. Was retained for a one year period to provide advice on various engineering matters at the City's wastewater treatment plant. The contract was renewed twice. Assignments included review of a seismic study of the wastewater treatment plant and review of a proposed design of a hypochlorite disinfection system.

City Of Sunnyvale, CA. Provided technical advice on the effect of sewer blockages on the escape of PCE from the City sewer system. The blockages were due to grease from "restaurant row", which was just downstream from the sites of several dry cleaners. Issues included, sags in the sewer, the effect of surcharging the sewer on the sealing layer (colmation) that tends to build up at the joints and leaks in sewer pipes and whether releases due to surcharging are sudden and accidental.

Homeowner v. City. Evaluated a situation in which a private sewer serving several residences in a court was found to be backing up. The City, which owned the public sewer to which the private sewer connected, inspected their portion of the piping and found that it was not blocked. The City then required the homeowner to replace the private sewer. After construction of the replacement sewer was complete, it was found that it again was not flowing freely. My investigation revealed that the City sewer was not low enough to serve the private sewer and that the system had been built with a sag in it.

Stonehurst Subdivision. Served as District Engineer for a subdivision which has its own small diameter pressure collection system and wastewater treatment and disposal system.

Flooding Of A Mobile Home, San Bernardino County, CA. Served as an expert witness in a case where sewage backed up from the sewer system into a mobile home. After an initial site visit, the mobile home park disclosed that it did in fact have plans of the sewer system, which previously they denied having. Made a second site inspection. Determined that in most places, the sewer system had cleanouts rather than manholes and that no maintenance had been performed on the sewer system.

Illegal Sewer Connection, Bakersfield, CA. Provided technical support in a case where the seller of an apartment complex illegally connected the complex to the public sewer when the onsite septic system failed and failed to disclose this to the buyer. Determined that connection to the public sewer system was not allowed because the property was not within the service area of the public sewer system. Provided a preliminary design of a repair of the onsite system and estimated the cost of constructing the required improvements.

Point Arena Residence Connection to a Sewage Force Main. Reviewed a proposal to allow a residence to connect to the force main from the cove to the wastewater treatment plant. Concluded that the proposed connection would not interfere with the operation of the force main. Made recommendations to protect the house from flooding and to minimize the probability of spills from the force main.

Connection of a Lot to an Existing Small Sewer System. Evaluated the connection of an additional lot, on which the leach field had failed, to an existing small sewer system. Considered whether other lots should also be connected or allowed to connect, required facilities and optimum sewer routing, right-of-way issues, regulatory requirements, and procedures of the Local Agency Formation Committee (LAFCO). Calculated a fair buy-in price.

Point Arena Sewer Master Plan Evaluation. Was asked by the City to visit the site as the first step in preparing a sewer master plan. While on site with the City officials, determined that the real problems were: (1) where to locate a relief sewer; (2) how to serve a currently undeveloped area; and (3) how to address some marginal sewer facilities. Advised the City that a sewer master plan would be difficult and expensive to prepare, that such a plan probably would be inaccurate because most of the problem was inflow and infiltration for which few measurements existed, and that the problems could be addressed without a master plan. Prepared a brief letter report advising the City on how to deal with each problem.

Placer County. Conducted an investigation of the technical feasibility of transporting alum sludge from a water treatment plant through a long gravity sewer, pump station, forcemain and siphon to a wastewater treatment plant. Focus was on practical problems likely to be caused by the alum sludge, especially in the sewer system and in the anaerobic digesters and sludge dewatering press. Prepared a revenue plan type of cost analysis to determine a fair monthly user charge and a connection fee for the water treatment plant.

City of Morgan Hill. Analyzed the existing rate structure to determine whether it fairly allocated the costs of service among three classes of residential users and among commercial users. Analyzed a proposed surcharge on customers who were served by pumping rather than by gravity. In an update of the earlier study included consideration of the fairness of the three residential tiers, the division of costs between residential and commercial users, and the use of a special surcharge for those users served by pumping stations rather than by gravity.

Point Arena Residence Connection to a Sewage Force Main. Reviewed a proposal to allow a residence to connect to the force main from the cove to the wastewater treatment plant. Concluded that the proposed connection would not interfere with the operation of the force main. Made recommendations to protect the house from flooding and to minimize the probability of spills from the force main.

Water Damage From Cross Bore. Served as expert witness in a case where a contractor installing fiber optic lines by horizontal directional drilling punctured a water line, causing extensive damage to the street. The water utility company had marked the site of the water line but had failed to mark an abandoned water line or to disclose that it was present. The drilling contractor located the abandoned line, assumed it was the marked line, and arranged his drilling route to miss the abandoned pipe. Unfortunately, it then hit the live pipe.

East Bay Dischargers Authority (EBDA). Analyzed whether an existing 60-inch force main could withstand an additional surcharge of 4-feet of soil and storage of modular buildings above it. The analysis indicated that the existing pipe was sufficiently strong to allow the proposed development above it. In a second project, analyzed the impact of a construction project in which three 42-inch storm drain culverts were constructed on top of the Authority's 60-inch effluent force main. Determined that the force main had adequate structural strength for the additional load but recommended some modifications and corrections to the contract drawings to clarify the details of the pipe crossing and minimize the probability of problems during construction.

In a second project, analyzed the impact of a construction project in which three 42-inch storm drain culverts were constructed on top of the Authority's 60-inch effluent force main. Determined that the force main had adequate structural strength for the additional load but recommended some modifications and corrections to the contract drawings to clarify the details of the pipe crossing and minimize the probability of problems during construction.

Stonehurst Subdivision Wastewater Facilities Evaluation. Evaluated the condition of the entire wastewater collection, treatment and disposal facilities for a subdivision. The facilities consisted of septic tanks on each lot, small diameter pressure and gravity sewers, a recirculating gravel filter, and community leach fields. The Homeowners Association was reluctant to accept ownership of the wastewater facilities because of numerous failures that were being experienced, especially failures of the force main piping allegedly due to water hammer. Determined that the force main failures were just as frequent on low pressure piping as on high pressure piping and that water hammer apparently was not a factor. It was further found that all of the force main breaks had occurred at places where fittings or loose couplings had been used and that none of the joints with integrally molded bells had failed. Since there were relatively few fittings and loose couplings, it was concluded that most of the problems had already been fixed and that the whole piping systems did not need to be replaced.

Mariposa County. Design of small diameter variable grade effluent sewers and mound disposal systems for three rural communities. The work included a review of available technical literature on these innovative technology systems and discussions with experts throughout the United States. At the time of the design, it was the largest mound system ever designed for a California community.

Portola Valley Sewer Alternatives Evaluation Study. Conducted a major study of how best to serve an unsewered area that was experiencing scattered failures of leach fields. The report considered: conventional gravity sewers; on-site grinder pumps and pressure sewers; septic tank effluent pump (STEP) systems; and septic tank effluent gravity (STEG) systems. A detailed estimate was made of the actual operation and maintenance cost of existing STEP systems and a survey was conducted of how other agencies handled such systems. Alternative financing arrangements for sewer improvements were evaluated.

High Pressure Reclaimed Water Line Failure. Provided expert advice in a case in which a gasket blew out in a 600 PSI reclaimed water line. Reviewed previous reports by the agency and by outside consultants. Issues in the case included the substitution of gaskets and possible stretching of stainless steel bolts in this extremely high pressure application.

Handicapped Housing Development, Monterey County. Provided a conceptual design for an on-site wastewater collection, treatment and disposal system for a 129-unit garden apartment complex for handicapped persons. The design called for a septic tank for each cluster of apartments with a variable grade effluent sewer (VGES) system to convey the septic tank effluent to a package treatment plant. The treatment plant was designed to achieve a high degree of nitrogen removal since nitrate concentrations in the groundwater were an issue in this location. A grinder pump station with a small diameter force main was used. Disposal was designed to include sub-surface drip irrigation and a conventional leach field. The estimated total cost of the system was approximately \$750,000.

Lake Ellis Park, Concord, CA. As part of a lake restoration project, reviewed proposal by the contractor to install electrical conduits for park lighting by horizontal directional drilling rather than by open cut. Evaluated the situation and warned the contractor that the park had been the site of undocumented fill, including concrete rubble. The contractor chose to proceed with horizontal directional drilling and was successful in installing the conduits by this method.

Apartment Complex, Marin County, CA. Assisted an apartment complex in changing from pumped discharge of sewage to a gravity discharge. Although the apartments could reach the public sewer by gravity, for unknown reasons they were fitted with pump stations. The pump stations required repeated expensive maintenance. Prepared a design report comparing the costs of continuing to use the pump stations with the cost of connecting to the public sewer. Designed the gravity sewer connections.

Southern California City. Provided expert opinions in a case where several homes along a street in a Southern California city flooded with sewage over the course of a few weeks. Discovered that the flooding was due to the City's sewer being clogged with broken shards of vitrified clay pipe. Determined that the shards were the result of crossbores that were created by the local cable company while installing cable by horizontal directional drilling.

Flooding Of A House From A Septic System, Atlanta, GA. A plumbing contractor installed a new septic system for an expensive home. A few weeks later, the basement of the home was flooded. Possible sources of the water included: a leaking downstairs toilet; upstairs toilets; heavy rains; and a leak at the cornice of the building. Discovered that during the course of construction, the plumbing contractor had cut two irrigation lines in the vicinity of the leach field and that leakage from the irrigation lines had overwhelmed the septic system and allowed water to flow back into the house. Identified several plumbing code violations in the contractor's work.

Sewer Design Standard of Care. Expert witness on a case involving delay claims caused by problems with the design of the sewer system for a large apartment complex. Prepared a certificate for use in filing suit against the design engineer.

Air Release Valve Failure. Expert analysis and advice. When a worker attempted to work on an air release valve, the valve blew loose from a high pressure reclaimed water line severely injuring the worker. Reviewed the reports from OSHA, the agency and other parties. Observed in photographs taken just before the accident occurred that the air release valve was leaning. Noted that the valve was located immediately adjacent to a road through the construction site and concluded that the valve had been struck by a vehicle.

City of San Leandro. Conducted a lift station overflow analysis for ten pump stations. The project included estimating the flows at the pump stations and comparing the flows to the actual capacities of the pumps to determine if the hydraulic capacities of the stations are adequate. The need for stationary or mobile generators and other reliability improvements was evaluated. The City's preparedness for non-routine pump station failures was reviewed and a response plan for a prolonged, area-wide power failure (the "major earthquake scenario") was developed.

City of San Leandro. Estimated the costs of a five-year capital improvement program for the City's 16 sewage and stormwater pump stations for use as input in the budgeting process.

Placer County SMD No. 3. Prepared a listing of all foreseeable repairs, replacements and improvements needed at this wastewater treatment plant for the next twenty years so that a capital budget can be prepared. The plant was built twenty years ago with a capacity of 1 MGD to serve new development in a large area. The development did not occur and flow at the plant is only five percent of the design flow. Past expenditures on the plant have been very limited due to the small customer base.

Wild Wings County Service Area, Yolo County. Working with Harris & Associates, reviewed the proposed wastewater facilities for this new development and estimated staffing requirements and reserve requirements.

Rocklin-Loomis Municipal Utility District. Sewer master plan for a 66 square mile region. The district had been in one geographic basin for 25 years, but had recently been given responsibility for a much expanded area and two new trunk sewer systems. The work of projecting growth rates and land use patterns was complicated by the fact that most of the existing land use planning documents were seriously out of date. The findings of the report were presented and defended at a series of public meetings. On-going district consulting engineering services were also provided.

City of Oakdale. Assisted the City in documenting industrial discharges of high strength wastewater to the municipal sewer system, and in devising plant improvements to deal with these discharges. Other projects for the City of Oakdale included expansion of the wastewater treatment plant capacity, an Infiltration/Inflow study of the sewer system, and a financing plan and revenue program.

City of San Leandro. Field advice on alternative pumping arrangements during repair of a forcemain leak. Responded within an hour to advise on alternative measures for disposing of raw wastewater if the leaking forcemain collapsed during repair. Suggested letting the collection system flood sufficiently to allow a manhole on the periphery of the system to be used as a wetwell from which mobile pumps could pump to another collection system without crossing or interfering with major streets.

City of San Leandro. Evaluation of clogging air valve problem on effluent force main. Reviewed the reported problem, and several corrective measures including: a mechanical screen on the plant effluent; control of bypassed flows; and replacement of the air valves. Concluded that the most effective course of action was to continue with the same maintenance program, i.e., that it was more cost effective to clear the valves periodically than to try to cure the problem with additional facilities.

City of San Leandro. Estimated the costs of a five-year capital improvement program for the City's 16 sewage and stormwater pump stations for use as input in the budgeting process.

CSD 2-3 of Santa Clara County. Provided technical assistance to legal counsel for this sewer district. Analyzed a large increase in rates for the use of joint facilities that was proposed by the City of San Jose. Provided technical input in the preparation of legal documents seeking injunctive relief.

Santa Cruz County Sanitation District. Analyzed water hammer problems in a 4.17 mile long, 36-inch diameter steel force main. Reviewed the effectiveness of an existing surge relief valve and made recommendations on how to prevent the check valves from slamming.

Oro Loma Sanitary District. Designed modifications to the digester gas piping system to separate it from electrical facilities and thus bring it into compliance with National Fire Protection Association Standard 820 and the National Fuel Gas Code.

City of San Leandro. Evaluation of clogging air valve problem on effluent force main. Reviewed the reported problem, and several proposed corrective measures including: a mechanical screen on the plant effluent; control of bypassed flows; and replacement of the air valves. Concluded that the most effective course of action was to continue with the same maintenance program, i.e., that it was more cost effective to clear the valves periodically than to try to cure the problem with additional facilities.

City of San Leandro. Provided a technical evaluation of the feasibility of restoring a buried methane gas line to use. Due to settlement of the soft bay muds at the treatment plant site, there were numerous dips in the gas line, which formed water traps that interfered with the use of the line.

Lawrence Livermore Laboratory Grease Interceptor Odor Evaluation. Evaluated odor problems at the grease interceptors at three cafeterias. Recommended a program for systematically developing odor complaint data and various odor control improvements.

Chemonics International, Inc. Spent three and one-half weeks in Tunis, Tunisia leading a team that evaluated the El Menzah pilot project, which is the first project in a program that involves the privatization of a portion of the wastewater collection and treatment facilities in the country. Interviewed Tunisian and U.S. Agency for International Development officials, and the French contractor who is operating the sewerage system.

Corrosion Failure of Concrete Trunk Sewers, Pima County, AZ. Provided expert advice in a case where sink holes developed suddenly at three locations along a large concrete trunk sewer. Rebutted a theory that the sinkholes were caused by a broken water main.

Point Arena, CA HDPE Pipe Evaluation. As a part of evaluating the need for a sewer master plan, evaluated the effect of fins left inside HDPE sewers that serve part of the town. Determined that the reduction in hydraulic capacity caused by the fins was not relevant and identified means of cutting the fins out of the HDPE piping if necessary.

Southern California Sewer Dispute. Served as expert witness on project in which an HDPE sewer was placed through a large parcel that the owner wished to develop. There was a spill from the sewer system that the owner attributed to the use of the wrong size of pipes.

Mobile Home Park Sewage Overflow, San Jose, CA. Represented the owner of a mobile home in a park where the sewer system regularly overflowed under his unit. Determined that the previous overflows were due to problems with the pump station that served the mobile home park. These problems were fixed but another overflow occurred. Determined that there was also a problem with roots clogging the sewage line that served the unit. Noted that there were no manholes in the park, thus there was very limited access to the sewer system.

Mobile Home Park, San Joaquin County, CA. Investigated a situation where the sewer system in a mobile home park was failing. The park had been more or less abandoned by the owner and much of it was occupied by squatters. Police reports showed that the police had been called to the park approximately once per week.

Permit Application for Mobile Home Park, Placer County, CA. Provided technical advice and an engineer's report for permitting the wastewater system in a mobile home park. Estimated the flow, evaluated the sewer system and pumping station, and analyzed the treatment performance of the wastewater lagoon. Provided a water balance for the disposal system. Evaluated the potential for contamination of the well by percolating treated effluent.

Mobile Home Park Sewage Overflow, Mountain County, CA. Evaluated the source and causes of a sewage overflow into a mobile home. Analyzed the damages that were claimed to have been caused by the sewage overflow.

Water System Contamination in Mobile Home Park, Butte County, CA. As an expert witness, evaluated alleged coliform contamination of the water supply to a mobile home park. The issues in the case involved the sampling techniques, the significance of the coliform laboratory analyses, the adequacy of the supply of water from the water well, and the operation of the chlorine disinfection system.

Mobile Home Park Contamination, North Bay. Technical expert on a case north of San Francisco Bay where the residents sued the owner alleging that the water supply was contaminated and that they had been exposed to sewage.

Contaminated Water Supply In Mobile Home Park, Sonoma County, CA. Provided technical expertise on a case in which a tenant in a mobile home on an agricultural property sued due to a contaminated water supply and an overflowing septic tank/leach field system. Determined that the property owner's house was being served with the same water supply that was claimed to be contaminated, that no health official had seen the septic tank overflow, and that the surface discharge was from a kitchen sink that the tenant had plumbed to flow onto a nearby field.

High Desert Mobile Home Park, Rural Los Angeles County. Technical expert in a case where the leach fields in a rural mobile home park began to fail. Determined that the owner of the park had stopped pumping the septic tanks some years previously, which led to clogging of the leach fields.

Rancho Garcia Mobile Home Park Wastewater System Report. Working with law students from UC Irvine and the Rural Assistance program, prepared a preliminary engineering report on how the wastewater facilities within the mobile home park should be improved. Evaluated four alternatives.

South San Joaquin Valley, CA. Served as a technical consultant in a case where large diameter plastic storm drain piping had failed. The design called for the pipe to be bedded in "select material" but a subcontractor persuaded the inspector to allow him to use native material. The native material did not provide adequate lateral support for the plastic pipes. The pipes flattened, which caused the joints to pull apart.

San Bruno, CA Sweeney Ridge Waterline Evaluation. Evaluated the alternatives for dealing with a waterline that may be failing. The waterline delivers water to and from a ground level reservoir on Sweeney Ridge and is the only source of water for fire fighting in one zone of the City. The line has sprung a leak each year for the past three years. Determined that all three leaks were in one area. Recommended that corrosion investigation be done of the pipe in the area where the failures occurred, before a decision to replace the entire pipeline is made.

Castlewood Subdivision and Country Club. Worked on the design of two potable water pump stations and associated pressure piping for this development near Pleasanton, CA.

Santa Cruz County Sanitation District. Analyzed water hammer problems in a 4.17 mile long, 36-inch diameter steel force main. Reviewed the effectiveness of an existing surge relief valve and made recommendations on how to prevent the check valves from slamming.

City of Salinas. Designed a water well and associated PVC piping system for irrigation of a new City golf course. Designed the pipeline system to connect the well to the rest of the golf course irrigation system.

High Pressure Reclaimed Water Line Failure. Provided expert advice in a case in which a gasket blew out in a 600 PSI reclaimed water line. Reviewed previous reports by the agency and by outside consultants. Issues in the case included the substitution of gaskets and possible stretching of stainless steel bolts in this extremely high pressure application.

Gavilan College Water Supply Evaluation. Prepared a report evaluating the water supply system of Gavilan College, Gilroy, CA.

City of Brisbane Zone 4 Pumping Station. Designed a new 500,000 gallon steel water storage tank, rehabilitation of the existing pump station, and the associated pressure piping around the storage tank.

City of Burlingame. Evaluated improvements needed to the Marsten Road Stormwater Pump Station to enable it to discharge the design storm reliably. Recommended a 60-inch diameter pressure pipeline running approximately one mile to San Francisco Bay in parallel to the gravity creek channel.

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Benicia Wastewater Treatment Plant Wraparound Pipeline. Designed a wrap around pipeline to return treated wastewater from the end of the treatment plant to a holding basin if the effluent does not meet the discharge requirements.

Reclaimed Water System, Soledad, CA. Evaluated the recommended storage basin and pump station for reclaimed water. Determined that the existing plant water pump station could be used and that a storage basin was unnecessary. The savings to the City was about \$350,000. Designed the connection of the new reclaimed water system to the existing plant water system.

Santa Cruz County Sanitation District, Moran Lake Pump Station Upgrade. Designed an upgrade for an existing pump station, which had inadequate hydraulic capacity and a parallel force main to the discharge point.

Edgewood Pump Station, County Of Placer. Project manager on a project that converted this wet pit/dry pit pump station into a submersible pump station and replaced the asbestos cement force main piping with a PVC piping.

Santa Cruz County Sanitation District Rodeo Pump Station. Designed improvements to increase the capacity and reliability of the existing pump station and replacing the existing force main with a larger, new PVC force main. The part of the force main that passed under a creek was installed by horizontal directional drilling.

City of Burlingame, California-Grove Stormwater Pump Station. Designed a 28 CFS (18 MGD) stormwater pump station and its discharge force main.

Large Residence, Lafayette, CA. Prepared a preliminary design of a booster pump station to supply potable water to a large residence located high on a hill. In addition prepared a preliminary design of a pump station to provide fire flow to the residence. Each water system includes approximately 900-feet of pressure piping.

Oakland Zoo Pump Station. Prepared a preliminary design of a submersible pump station to serve an expansion of the Oakland, CA zoo. The capacity of the pump station was controlled by the rate at which the pond in the grizzly bear enclosure would be drained. Approximately 600-feet of pressure piping is included in the project.

Eden Landing Salt Pond Restoration Project Pump Station. Designed a pump station to supply brackish water to a wildlife pond restoration project. Each of the two pumps has its own 18-inch HDPE discharge line.

Destruction Of A Pump Station Force Main In An Easement On Private Property. Served as an expert witness in a case where the owner of a private property removed a section of a force main that was in an easement through the property. The force main had not been used for a considerable period because the property that it served had been shut down. When the force main was put back in service, wastewater spilled on to the private property where the force main had been removed.

Water System Contamination In A City In Utah. Served as an expert witness in a case where a municipal water system was contaminated by a cross connection to an untreated irrigation water system. The untreated irrigated water system had been supplied with potable water for several years until the untreated irrigation water system became available. The connections between the two systems were removed but one interconnection was overlooked. This allowed the untreated irrigation water to contaminate the potable water system.

Failure Of Horizontal Directional Drilled Pipeline To Meet The Slope Requirements For A Gravity Sewer. Provided technical advice in a case where a contractor who had great experience installing electrical and communication conduits and pressure pipes by horizontal directional drilling (HDD) used this technology to install a gravity sewer pipe. Determined that HDD is not sufficiently accurate to install gravity piping on very flat slopes.

Telecommunications Company v. Water District. Provided technical analysis and advice in a case where a telecommunications company bored into a water main while doing horizontal directional drilling. The high rate of flow from the punctured water line damaged the roadway. Issues in the case involved whether the water main had been correctly marked by the water district personnel, the length of time that passed before the water district personnel could shut off the flow of water due to inoperative or concealed valves, the standard of care for exercising valves in the water system, and the reasonableness of the repairs that were done to the roadway.