Figure 50 — Kiosk Incorporating a Bench at Laguna Stonelake Park in Elk Grove, CA

Figure 51 — Interpretive Signage Incorporating Directional Map at Lake Natoma, Folsom, CA

Figure 52 — Vactor Truck Used to Clean Sewerline

In addition to interpretive signage, directional signage should be provided at the southern end of the project site, just east of the Quartz Drive interchange, near where the Locksley trail connects to Locksley Lane and at the intersection of the Locksley trail with the primary trail. Signage should direct trail users entering and exiting the project site to major destinations such as the Auburn Regional Park, Bell Road and Locksley Lane. Additional signage should be incorporated into the commercial site, when and if that site is developed.

Utility Relocation

The proposed relocation of the Placer County sewerline is shown in Figure 30. It parallels the proposed bike/pedestrian trail to allow for Vactor truck maintenance. The sewerline relocation should happen concurrent with creek channel relocation work to limit the overall impacts to the creek channel. The new sewerline must be placed sufficiently deep where it crosses the creek, so that it does not become a barrier to creek flow if some down-cutting of the bed occurs in the future.

The current plan for the replacement is to abandon the old sewerline in place, primarily because it contains asbestos and removal would be difficult and expensive. If the old sewerline impacts the new channel shown in Figure 42, this section should be removed and disposed of properly during either the sewerline relocation or the channel restoration phase, whichever is performed first.

Implementation

Phasing

Before this project can be built, several key milestones must be met, including:

- Obtain funding for construction and maintenance.
- Secure easements for trail and channel work in conjunction with sewerline relocation.
- Obtain clearance under CEQA. A Categorical Exemption (CE) may apply under Class 33 (Small Habitat Restoration Projects, CEQA Section 15333). If not, a Mitigated Negative Declaration will likely be needed.
- Perform wetland delineation and receive verification from Army Corps of Engineers (the Corps). Neither of these are required if the project is submitted under the Nationwide 27 permit program; however, a delineation would be prudent prior to undertaking any site work in order to understand the precise limits of the wetlands on-site.
- Obtain a Corps permit. This project should fit under the umbrella of the Nationwide 27 permit, which covers stream and wetland restoration activities. This permit does require Corps notification in accordance with General Condition 13.
- Complete construction drawings, cost estimate and specifications, and bid package.

Invasive species control should be done throughout the project duration, concentrating on removal of all major infestations of exotic invasive plants, predominantly yellow star thistle and Himalayan blackberry, and following up with removal of new plants yearly until no new infestations occur. Control of annual or perennial weeds should be done just prior to the species setting flower. Control of blackberry should be done as resprouts occur. The site should be inspected annually by a qualified biologist to determine the effectiveness of current eradication efforts and extent of new infestations.

Creek channel realignment should be undertaken at the start of the project, due to the disruptive nature of the heavy machinery utilized in this activity. It should be done in conjunction with sewer realignment and invasive species removal, particularly in the area just downstream of Rock Creek Road where the sewer goes underneath the channel. In-channel structures such as open rock weirs, check dams or woody debris should be placed as a part of channel realignment activities.

As sewer realignment progresses, trail construction can begin in the areas where the new sewerline is complete. Bridge construction for the Locksley connection should occur following channel work for that segment of the creek. This can be done as part of the extension of Quartz Drive, if the County decides to undertake that effort. A geotechnical report will be needed prior to design of the bridge abutments. Construction of the connection between the project site and Auburn Regional Park, west of Highway 49 on the south bank of the creek, should be undertaken as a separate project. The trail south of Rock Creek Road will be built as a part of the Pacific Properties development. Interpretive signage and kiosk construction can occur as trail construction nears completion, or shortly after the trails are finished. Design of these elements should happen during the early phases of the restoration work.

Revegetation of riparian areas should occur following completion of channel work. As with invasive species control, a monitoring biologist should perform yearly inspections to evaluate the health of the riparian vegetation and recommend remediation actions if problems arise. If sufficient time exists prior to revegetation activities, the County should consider having riparian tree and shrub species contract grown from seed harvested from the restoration site, or just downstream of the restoration site in the Regional Park, if suitable seed stock does not exist on-site.

The mixed-use commercial development could be built concurrent with any of the other activities. Ideally it would be done following trail construction to facilitate connection of the development with the trail system. Filtration wetlands should be constructed during site work for the mixed-use development and PacLand property.

Funding and Grants

Construction of the improvements recommended by this Restoration Plan and ongoing operations and maintenance will require a commitment by County agencies and local landowners to be successful. While grants are often available for construction of trails and creek restoration projects, grant funding is usually not available for ongoing maintenance. Maintenance costs often must be paid by the local jurisdictions responsible for maintaining public open space, parks and recreation facilities. Individual elements of this plan, such as invasive species management, channel improvements or trails, should not be constructed until funding is secured for maintaining those elements.

Resources for Recurring Costs

Local assessments already in place provide revenues for the General Funds of Placer County. Special districts and Home Owners' Associations also collect assessments that fund their obligations. These are the primary sources of funding for police, fire, parks, trails, public utility, and flood management services within the County. Some local governments also assess a dedicated open space tax to help fund the costs specifically associated with open space management, and others may wish to implement a similar assessment. Ongoing funds for habitat management of preserves or mitigation sites are also potentially available from endowments that are created in perpetuity as a condition of development or under the terms of a conservation easement. Development on the adjacent commercial sites may be required to fund some of all of the improvements through their section of property as a condition of approval.

Operations and maintenance of existing trails, facilities, and dedicated preserves areas within the County are currently being funded through these various mechanisms, and it is expected that the same sources might be relied upon for maintenance of this section of open space. If operations and maintenance for the project site are not already included in existing budget items, a level of subsidy should be committed to this site, and potentially future restoration sites, from General Fund monies to guarantee at least a minimum annual budget for operations and maintenance of open space areas.

Grants

A number of grants have been available in the past for construction of open space trails and creek restoration projects. The California Rivers Parkway Grant, a Proposition 50 funded program, funds projects that meet five criteria:

1. Provide recreation opportunities such as trails along rivers and streams;
2. Protect, improve or restore riverine or riparian habitat;
3. Maintain or restore open space compatible with flooding;
4. Convert existing river uses to parkways; and
5. Support or interpret river or stream restoration activities.

The Rock Creek Restoration Plan meets goals 1, 2, 3 and 5. Two rounds of funding for the River Parkways Grant program have already occurred, with initial submissions in late 2005 and 2006, but a third round of funding is anticipated.

Additional grant funding that may be available is as follows:

FEDERAL

1. **Department of Transportation Intermodal Surface Transportation Efficiency Act (ISTEA)**
   The Act allows a portion of the transportation funds to be used to build bicycle paths along federal-aid highways, roads, trails or parkways.

2. **Wildlife Conservation and Appreciate (Partnership For Wildlife)**
   Granted by the U.S. Fish and Wildlife Service. Available for actions to conserve fish and wildlife species and their habitats; and to provide opportunities for the public to use and enjoy fish and wildlife through nonconsumptive activities. Eligible for any fish and wildlife agency in partnership with State agencies and private organizations and individuals. Up to 33 percent of program costs may be received and private funding match required.

3. **Water Banks Program**
   Granted by the Department of Agriculture's Natural Resources Conservation Service, landowners are eligible for funds to conserve surface waters; preserve and improve wetlands and preserve important nesting, breeding and feeding areas of migratory waterfowl. Annual payments for 10 years will be made for $7 to $75 per acre.

4. **Wetlands Grants**
   Granted by the EPA's Office of Water, funds are available to States, local government and not-for-profit organizations to develop the capacity to protect, manage and restore wetlands and riparian resources. Minimum match of 25 percent of total project cost is required.

5. **Urban Park and Recreation Recovery Program**
   Funded by the National Park Service, funds are available for the rehabilitation of recreation areas and facilities, demonstration of innovative approaches to improving recreation opportunities, and development of improved recreation planning. These grants are matching grants (50 percent Federal – 50 percent local).

6. **Recreational Trails Program**
   Granted by the Department of Transportation's Federal Highway Administration, this grant is available to develop and maintain recreational trails and trail-related facilities for both non-motorized and motorized recreational trail uses. A State agency must be designated by the Governor to receive the funds.

7. **Outdoor Recreation Acquisition, Development and Planning (Land and Water Conservation Fund Grants)**
   Grants provided by the National Park Service to acquire and develop outdoor recreation areas and facilities for the general public, to meet current and future needs. Not more than 50 percent of the project cost may be federally financed.

8. **Environmental Protection Agency Targeted Watersheds Grants Program (TWG)**

   Promotes successful community-based approaches and management techniques to protect and restore the nation's waters. Implementation awards are announced annually. Amount of individual grants vary; for FY 2006, awards were anticipated to range from approximately $600K to $900K. Total amount expected to be awarded in 2006 was between $7.1M and $16M. The EPA anticipates additional funding for the TWG Program in FY 2007

9. **Environmental Education Grants (EEG)**
   For grants provided by the EPA's Office of Environmental Education, funds are available to support projects to design, demonstrate, or disseminate practices, methods, or techniques related to environmental education and training. Federal funds will not exceed 75 percent of the project cost.

STATE

1. **California Bay Delta Authority/CALFED**

   Proposition 13 – Set aside $70M for the Flood Protection Corridor Program, which can be used for flood control projects including acquisition, restoration, enhancement and protection of property for the purposes of flood control protection, agricultural land preservation and wildlife habitat protection.

   Proposition 50 – Provides $100M for acquisition from willing sellers, restoration, protection, and development of river parkways. Two rounds of river parkways grants have already been allocated; however, a third round is expected in 2007/08.

2. **California's Department of Conservation Resource Conservation District (RCD) Assistance Program/Grants**
   This grant annually provides $120,000 to support conservation education and on-the-ground projects promoting conservation with landowners and communities within watersheds. Land restoration, fish and wildlife habitat enhancement, water quality conservation, and public outreach and education are all eligible actions supported with this grant. A 25 percent local match is required.

2. **State Lands Commission**
   Can acquire land through Land Bank funds and/or exchange.

3. **Department of Transportation**
   Proposition 116 – The Clean Air and Transportation Improvement Act, provides $2.0 billion in GO bonds from 1990 to 2010 for transportation projects, of which $20M was allocated for bicycle trails that benefit commuters.

4. **Resources Agency**
   State Environmental License Plate Funds - Grants are offered to state agencies, city or county agencies, or private non-profit organizations to support a variety of projects that help to preserve or protect environment. Eligible projects include acquisition, restoration or enhancement of resource lands and endangered species, and development of interpretive facilities. Projects are funded in one-year increments and each must be a separate, distinct project with a clearly defined benefit.

Environmental Enhancement and Mitigation Program (EEMP)- Grants offered to local, state or federal agencies or non-profit entities to provide enhancement or additional mitigation related to eligible transportation facilities. Eligible projects include highway landscaping and urban forestry, acquisition restoration or enhancement of resource lands, and acquisition and/or development of roadside recreation opportunities. The program, established in 1989 (Section 164.56 of the Streets and Highways Code) provides funding from fuel taxes and weight fees.

5. **Department of Fish and Game**
Inland Fisheries Division Grant Project provides funds for fishery restoration work. Funds for this program come from a variety of sources.

The Cigarette and Tobacco Tax Benefit Fund (Proposition 99) provides funds to restore fish habitat.

6. **Wildlife Conservation Board (Generally administers the Federal Land and Water Conservation Fund)**
Proposition 19 (1984 Fish and Wildlife Enhancement Bond Act) provides funds to correct the more severe deficiencies in fish and wildlife habitat. Funds may be used only by public agencies to enhance, develop or restore flowing waterways for the management of fish outside the coastal zone. Proposition 70 funds are available for endangered species and for native trout habitat restoration.

7. **Department of Water Resources**
Urban Streams Restoration Program offers grants for local street restoration projects for prevention of property damage by floods and bank erosion and to restore the natural value of streams. Under the Proposition 13 - Safe Drinking Water, Clean Water, Watershed Protection and Flood Protection Act, the grants can fund simple projects such as organizing volunteer help to monitor and clean up streams or can fund complex stream restoration work. Cities, counties, districts and nonprofit organizations may apply for grants. Small unincorporated community organizations or consulting firms may apply but must find a non-profit organization or a local government to sponsor this proposal. This grant program stresses community participation. Therefore, any proposal submitted by a government agency must be cosponsored by a logical local group with an interest in the problems or streams to be addressed by the proposal. Likewise, projects submitted by nonprofit organizations must be co-sponsored by an appropriate local agency.

8. **Department of Forestry and Fire Protection**
The Urban Forestry Grant Program (Proposition 12 Tree Planting Grant) was created by the Watershed, Wildlife, and Parks Improvement Bond Act. Cities, counties, districts and nonprofit organizations may apply for grants. Eligible projects include planting trees along streets, in dedicated open space areas, and in public parking lots and school yards.

Forest Stewardship Program - Funded by Federal dollars and administered by the State for private land owners only. Grants provided to protect, restore and improve wetlands and riparian areas to maintain water quality and enhance habitat. Eligibility is for private landowners as well as public jurisdictions. Small acreage from 20 to 299 acres of land.

9. **State Water Resources Control Board**
The Nonpoint Source Pollution Control Program - Non-point sources (NPS) are the major cause of water pollution in California. As the state agency charged with protecting water quality in the State of California, the State Water Resources Control Board (State Board) is committed to promoting implementation projects that reduce NPS pollution in water bodies of the State. The February 1987 amendments to the federal Clean Water Act (CWA) include Section 319, which establishes the framework for non-point sources (NPS) activities on the State level. The CWA provides funding for the states' NPS programs, including grants for NPS implementation projects. Implementation projects to reduce NPS loading from various sources are eligible for grant funding. NPS implementation activities include demonstration projects, technology transfer, training, public education technical assistance, ordinance development, and other similar activities associated with control of NPS pollution. The amount of funds available is dependent upon Congressional appropriations.

Water Quality Planning - The State Water Resources Control Board provides water quality management planning grants to state, local, and regional agencies to address a wide variety of surface and ground water quality problems. These funds are provided by the federal government under Sections 205 and 604(b) of the Clean Water Act. These grants require a 25 percent non-federal match. The funding emphasis is on projects that focus directly on corrective or preventive actions for water bodies identified as "impacted" in the State's Water Quality Assessment. However, projects that focus on other water quality problems will also be considered. Projects which are primarily research-oriented will not normally be funded.

EPA's State Wetland Program Development
Under the Clean Water Act (CWA) Section 104 (b)(3), grants are given to various wetland projects include "multi-objective river corridor management" projects that address multiple use of rivers and adjacent areas, such as recreation habitat protection, water quality and open space. Funds available to assist states, and local government in implementing new programs relating to wetlands preservation and enhancement. Range of financial assistance for these project grants is generally $25,000 to $500,000.

10. **Department of Parks and Recreation**
Land and Water Conservation Fund - This program has funds available for the acquisition or development of neighborhood, community or regional parks or facilities supporting outdoor recreation activities. Eligible applicants include counties, cities, recreation and park districts, special districts with public park and recreation areas. This is a 50/50 matching program. The applicant is expected to finance the entire project and will be reimbursed 50 percent of the costs, up to the amount of the grant. The amount of funds available varies from year to year.

Riparian and Riverine Habitat Grant Program To provide funds on a competitive basis to increase public recreational access, awareness, understanding, enjoyment, protection, and restoration of California's irreplaceable rivers and streams. Includes the acquisition, development, or improvement of recreation areas, open space, parks, and trails in close proximity to rivers and streams. All projects must include a Riparian or Riverine habitat enhancement element and also provide for public access. The minimum is $20,000, and the maximum is $400,000.

Habitat Conservation Fund- This program provides funds for a variety of habitat conservation projects. Eligible applicants include counties, cities, cities and counties, or districts as defined in Subdivision(b) of the Public Resources Code. Eligible projects include: deer and lion habitat, including oak woodlands; habitat for rare and endangered, threatened and fully protected species; wildlife corridors and urban trails; wetlands; aquatic habitat for spawning and rearing of anadromous salmonids and trout species; and riparian habitat. This is a 50/50 matching program. The match must come from a non-State source.

Non-Motorized Trails Grant Program Eligible applicants include cities, counties, eligible districts, and eligible local agencies formed for park purposes, and federally recognized California Indian tribes. This competitive grant program funds the development, improvement, rehabilitation, restoration, and enhancement of non-motorized trails and associated interpretive facilities for the purpose of increasing public access to, and enjoyment of, public areas for increased recreational opportunities.

PRIVATE

1. **The Conservation Fund - American Greenways Grant Program**
   Provides grants in recognition of accomplishments in successful and creative approaches to developing California Greenways, particularly through overcoming obstacles and creative problem-solving. ($500 - $2,500)

2. **National Fish and Wildlife Foundation's Grants**
   A private non-profit established by Congress in 1984, the foundation fosters cooperative partnerships to conserve fish, wildlife, plants, and the habitats on which they depend. The Foundation works with its grantees and conservation partners to stimulate private, state, and local funding for conservation through challenge grants. Through a challenge grant, each dollar awarded by the Foundation must be matched with one non-federal dollar. Projects that benefit multiple species, achieve a variety of resource management objectives, and/or lead to revised management practices that reduce the causes of habitat degradation. A special emphasis is placed on larger projects that demonstrate a landscape-level approach and produce lasting, broad-based results on the ground. Numerous grants would apply to the Dry Creek Parkway including "Bring Back the Natives", "Native Plant Conservation Initiative", and habitat conservation plans focusing on migratory bird populations.

LOW COST SERVICES/MATERIALS

1. **U. S. Department of Agriculture, Soil Conservation Service, Resource Conservation District**
   Interest is in preserving site-specific plants. Will collect and propagate seeds if project approved by local Resource Conservation District.

2. **California Conservation Corps**
   Provides low cost services for brush clearance and trail building. Sponsor must provide materials, but Corps provides supervision and some tools, and crews often work alongside volunteers. Provides plant materials to any public agency at cost. Prefer 1 to 1-1/2 year lead time for preparation of plant materials. Planting projects do not have to have Corps workers.

3. **National Parks Service**
   Rivers and Trails Conservation Assistance Program - Under the National Center for Recreation and Conservation. The program provides technical assistance for corridor conservation plans, statewide assessments, conservation workshops, consultation and information exchange. Rivers & Trails staff work on the grassroots level with local citizens groups and state and local governments to revitalize nearby rivers, preserve valuable open space, and develop trail and greenway networks. All Rivers & Trails projects are locally led and managed, and begin with an invitation from local agencies and/or organizations to help.

4. **California Department of Forestry**
   Sells low-cost native trees. Must be purchased in quantities of 10, habitat and erosion control, but not for landscaping. Can also provide discounts if jurisdiction provides own seed. Ordering requires advance planning for availability during proper season.

Volunteerism and Donations

Citizen volunteerism is an excellent method for constructing projects that do not require contractors. Implementing projects with volunteer help invests the community in the project and can lead to better long-term success through citizen monitoring and support. Opportunities for volunteerism in the Rock Creek Restoration Project include manual removal of invasive plants; planting of riparian trees, shrubs and groundcover; periodic creek clean-ups and post-construction monitoring.

Local businesses or community organizations can also donate goods and services to help offset costs of regular maintenance. Significant donations could be acknowledged through recognition on interpretive signage or site amenities or through other means.

Figure 53 — Training volunteers for stream monitoring

Maintenance and Management

Adaptive Management

The purpose of an adaptive management strategy is to be able to respond positively to changing conditions. At the Rock Creek Restoration site, the importance is placed on mutually beneficial commercial assets and providing recreational opportunity, but more importantly improving and maintaining the ecological integrity of the riparian corridor to reduce negative cumulative effects of stormwater discharge and water quality pollution. Many indicators of biological health can be monitored on-site that are diagnostic of up stream system conditions. As the surrounding businesses and people interact with the landscape and environment, the changes to the health of this system must be assessed. Therefore, this plan should be re-evaluated every three to five years, which may lead to necessary management changes that benefit the long-term sustainability of the site and surrounding community. Any revision to the plan should be consistent with the primary goals of improving recreational opportunities in a natural setting, enhancing habitat for wildlife and aquatic species, and maintaining a stable hydrologic system within the creek.

Performance Criteria

The following criteria will be used to measure project success. These criteria should be evaluated periodically to ensure long-term functionality of the restoration design. Performance criteria should be revised as necessary to respond to changing goals and objectives for the project site.

Biological, physical and chemical integrity

- Is the creek channel stable? Is there evidence of erosion, sedimentation, aggradation or degradation, excessive channel movement, etc.?
- Are non-native species being managed such that native plant communities are not compromised?
- Are the following habitat types represented on-site: aquatic/riverine, riparian, oak woodland/savannah, seasonal wetland?
- Are beaver being managed such that their activities do not compromise other project objectives or target habitats?
- Are other nuisance wildlife such as skunks, raccoons, feral cats and dogs being managed such that they do not cause conflicts with project objectives or users?
- Are trash and fine grained sediments being managed so as not to degrade water or habitat quality or stream function?
- Is there visual evidence of water quality issues such as oil or grease on the water surface, foul odor, abnormal color, or excessive foam?
- Has the restoration design met flood management objectives?
- Are the filtration wetlands functioning as designed and removing targeted levels of pollutants?

Recreational connections

- Do the recreational trail connections provide safe and accessible pedestrian passage between the following locations: Auburn District Regional Park and Target (Bell & Highway 49), Locksley and Auburn District Regional Park, Locksley and Target (Bell & Highway 49)?
- Is the trail usable by Placer County Facility Services to maintain the sewer line?
- Is the trail wide enough to allow safe passage of pedestrians, bicycles and maintenance vehicles?
- Is there sufficient visual access so that trail users have a sense safety?
- Are trails sufficiently setback from the creek to reduce the risk of accidents involving the creek?
- Has increased usage of project trails discouraged use of the site by transients?
- Is the trail maintained in an aesthetically pleasing manner?

Educational Opportunities

- Does the project provide opportunities for education such as interpretive signage?
- Are local school groups or watershed groups involved in projects on the site?

Long-term sustainability

- Has outreach been extended to involve appropriate stakeholders, particularly residents and potential site users, in the design process as well as involve groups in the finished project?
- Are volunteers active in project management functions such as bird counts, trash pick-up, revegetation activities, or vegetation management?
- Are project capital and maintenance costs within County means and expectations?
- Are the restored creek and habitats sustainable?
- Has the project enhanced adjacent private property values?

Monitoring

Periodic monitoring will be required to ensure long-term success of the restoration site. Created habitats should be monitored to verify that they provide functions and values for which they were designed. The creek channel should be monitored to ensure that it is stable and not contributing excessive erosion to downstream spawning areas on Coon Creek.

Maintenance and Management

Rock Creek Restoration

Monitoring will also be required to measure success of the filtration wetlands. Periodic water sampling of wetland inlets and outfalls should provide an assessment of the success of wetlands in removing pollutants.

Monitoring should begin after the first growing season following construction. Monitoring should include aerial photographic documentation and site-specific vegetation observations. A Restoration Site Manager should be designated among County or consultant staff. Additionally, a Monitoring Biologist should be employed to assess vegetation and habitat. The Site Manager should submit a summary report of monitoring results to Placer County Planning by January 30th of the following year in which monitoring took place. The reports should compare the establishment of the created habitats to the performance standards to determine the level of success of the mitigation effort.

First-year monitoring data should be used as the baseline to judge yearly success of created habitats during the monitoring period. The hydrologic and floristic data for the project site should be compared to its baseline data and previous year(s) data, if applicable. If the monitoring data does not demonstrate progress toward established performance criteria, the County may decide that remediation is warranted or other contingency measures are needed.

Monitoring Methodology

Hydrologic and vegetation monitoring should be conducted for five (5) years during the appropriate seasons and should be reviewed by Placer County in the form of annual monitoring reports. The goal of this monitoring is to proactively evaluate site conditions in order to assess items before they become a problem. As such the project biologist should perform qualitative horticultural monitoring, which will focus on soil conditions (e.g., moisture and fertility), plant health and growth, shrub and tree regeneration and growth rates, presence of native and nonnative plant species, any significant disease or pest problems, and any significant erosion problems. An important feature of this monitoring is to coordinate with County maintenance personnel to exchange information, provide feedback, and agree on priority maintenance items and potential remedial measures during different stages of the plant establishment.

Quantitative botanical monitoring should consist of plant survival counts. Cover development should be documented with visual assessments and photographs. Plant survival counts should be conducted annually in the late summer, so there is sufficient time to obtain replacements and install them in the ensuing fall/winter. As part of the survival counts, all plugs, tree cuttings and container plants should be inspected and a list of dead or diseased plants provided to the County and/or general contractor (if plants are still under the warranty period) along with an inventory of failed seeded or bare earth areas. Results will be incorporated in the Annual Report.

During each monitoring site visit a general inspection of the restoration area should be made to document the occurrence of potentially detrimental conditions such as:

- Erosion or sedimentation, especially in areas that threaten riparian or downstream salmonid habitat.
- Evidence of unauthorized trespass, off-road vehicle damage, etc.
- Excessive trash or litter.

In the event that such conditions are encountered, the monitor should note the location and extent of the detrimental condition and notify the responsible party to initiate remediation measures.

Photo-Documentation

Photo-documentation should be an integral part of the monitoring efforts on this site. Four to five photo points should be established throughout the project area such that an appropriate overview of the restoration area can be obtained and tracked throughout the five year monitoring period. Photo points should be permanently marked using permanent stakes, stainless steel tags and Global Positioning System (GPS) locations, with the direction of the photographs noted using degrees from true north. Photo locations should be included in a table in the yearly monitoring report.

Monitoring Schedule

As a guideline, the project biologist should perform botanical monitoring monthly during the 90-day plant establishment period, once every 2 months during year 1, quarterly during year 2, and biannually during years 3, 4, and 5. The monitoring biologist and the site manager should conduct General Inspections twice annually in May and November to review overall site status, observe creek hydrology, note the presence or absence of trash and signs of damage from trespass. Additional inspections may be conducted as needed to respond to specific issues or concerns.

Site Management

Regular maintenance of the restoration area including intensive weeding and remedial plantings should be performed during the construction year and subsequent five-year monitoring period. Maintenance activities should include but are not limited to the following:

- Removal of aggressive non-native weeds shall be implemented during the five-year monitoring periods for the restoration areas. All weeding should be done by hand in the wetlands and within the creek banks. If hand weeding proves ineffective against invasive exotic weeds, the Site Manager may choose to use biological controls, and if these are ineffective, herbicides may be employed. The Preserve Manager should consult with the local Weed Management Area (WMA) or California Exotic Pest Control Council (CalEPPC) to determine which substances or techniques should be applied. In riparian, upland and grassland communities, weeds should be controlled through use of approved herbicide, hand tools, or a line trimmer. The frequency and amount of weeding will depend on the rainfall patterns and other contributing factors. Until non-native invasive plants are under control, the site should be weeded at a minimum of twice annually: once following initial germination of nonnative seedlings and again prior to non-native weeds setting seed as directed by the project biologist. Additional weeding should be conducted if success criteria are not met.
- The Monitoring Biologist should direct weeding crews to remove weeds that require control during the five-year monitoring period. The need for weeding is expected to decrease substantially by the end of the monitoring period provided successful habitat restoration has been achieved.

Maintenance and Management

Rock Creek Restoration

- Downed woody vegetation within the channel banks, such as willows and cottonwoods, can hinder the capacity of the channel to carry floodwater. In order to continue functioning as part of a storm water system and protect human health and safety from flooding, the Placer County Flood Control and Water Conservation District (PCFCWCD) should conduct regular assessments of the flood carrying capacity of the channel and take remedial actions if large woody debris (LWD) becomes a hindrance to flood control objectives.

  The biological benefits of LWD to aquatic health and as an important element for stormwater routing on small streams are well documented. With a properly functioning floodplain, down woody vegetation promotes a healthier riparian environment and has minor effects on flood carrying capacity.

  LWD management can be important at under-sized public works structures. These structures, such as at the Highway 49 Rock Creek crossing, through design modifications can provide LWD management sites where the material can be removed and the integrity of the structures maintained.

  For many small streams in the proper setting LWD and standing trees roots provide the channel bed and bank stability. Often when these elements are removed, channels have major negative responses that are cumulative. It is important that minimum "debris" clearing in undertaken when such action is needed to maintain flood capacity.

- If it becomes necessary to remove live standing trees that are growing within the channel or within the riparian area to preserve public health and safety, the Monitoring Biologist or other qualified individual shall be consulted to determine which trees can be removed without adversely affecting the Project Goals and Objectives (Section 1). It will be the biologist's responsibility to maximize the benefits to habitat while still maintaining storm water capacity requirements of the creek as determined by PCFCWCD and maintaining the public health and safety.

- The condition of trails and signs should be checked once every month and repaired as necessary.

- Trash in the restoration areas should be removed.

- Any persons found willfully damaging the habitat within the project site, including but not restricted to trash dumping, off-road-vehicle activity, plant removal, and vandalism should be prosecuted to the full extent of the law.

- Other site problems such as vehicle damage and erosion shall be reported to Placer County with recommendations for remedial measures.

Pest Species Control

The Monitoring Biologist and the Site Manager should refer to the species found on the CalEPPC List A, List B, and Red Alert List to assist them in determining if a plant is an exotic plant species of concern, and which species should be given priority for management.

In addition to looking for non-native species during inspections, the Monitoring Biologist should assess the presence of any newly introduced exotic pest plant species and recommend removal as needed. Three methods of removing or controlling these species are outlined below:

1) Hand/Mechanical Removal

Hand removal or use of small hand powered or handheld equipment (such as a Weed Wrench or a chainsaw) should be the preferred method of removing exotic pest plant species from the project site. If hand removal methods are tried and found to be ineffective, or the problem is too widespread for hand removal to be practical, then mechanical methods (use of larger equipment with motors such as mowers) or biological controls as described below can be implemented.

2) Biological Controls

The County Agricultural Commissioner should be the point of contact for use of any biological controls within the Preserve. There are several natural enemies of yellow star thistle as discussed earlier in this plan. The local WMA should be consulted as to the effectiveness and acquisition of biological controls.

If biological control methods are tried and found to be ineffective or if biological control methods are not available for the target species, then herbicides may be used as outlined below.

3) Use of Herbicides for Non-Native/Exotic Pest Plant Management

Herbicides must be applied according to the label. This approval does not obviate the need for the Site Manager to obtain any other applicable approvals for the use of these chemicals. Herbicides may be needed to control exotic weed species, such as water hyacinth, Himalayan blackberry, Arundo or Red sesbania. The Site Manager will follow all applicable guidelines and directives from state and federal resource agencies with regard to application of herbicides near wetland habitats.

The use of herbicides and their effectiveness should be described in the Annual Report.

Beavers and Other Nuisance Wildlife

Beaver have been previously identified as a problem for this area by Placer County Facility Services. Past predation permits have been sufficient to keep the population under control. At the time of the site assessment, there was evidence of past beaver habitation. Placer County has determined that beaver activity in this area is currently unacceptable due to the proximity of the sewerline manholes to the creek and the possibility of inundation of manholes due to beaver activity. Beaver management is currently the responsibility of the Placer County Agriculture Commissioner.

Once the sewerline is relocated further from the creek, it is possible that this area could support beaver without adversely impacting surrounding land uses or riparian vegetation. If this were the case, acceptable beaver populations would need to be defined, and populations would need to be maintained at this level. Controls would need to be installed to prevent beaver harvesting of desirable trees. Effective controls usually employ wire screens to limit beaver access to trunks, though research is ongoing in effective beaver management techniques. Additional controls may include beaver pond leveler devices, which maintain beaver ponds at pre-determined acceptable levels. The devices consist of a screened inlet inside the pond and piping to an outlet sufficiently below the pond so that the beaver cannot hear the running water, which triggers their dam-building instinct. The outlet is set at the acceptable height of the water behind the dam. Further studies are needed to fully determine beaver carrying capacities vis-à-vis sewerline relocation.

Some wildlife in addition to beavers, such as skunks and raccoons are considered a nuisance when encountered in an urban setting. These types of wildlife can be attracted by open space areas and become problems with adjacent residents. Such problems are usually best dealt with on a case-by-case basis by local animal control; however, if a significant number of similar problems arise, such as a substantial population of skunks, Placer County should be contacted to develop a plan for remediation of the problem through trapping and relocating, predation or other methods. As with beaver, it will be important to determine the carry capacity of the system for the species in question and to manage animal populations to those limits.

Feral cats and dogs can have a significant impact on wildlife in urban areas through predation of native species. Placer County Animal Services should be contacted if feral cats or dogs are noted during site inspections. Interpretive signage on-site could include warnings for site visitors to contact Animal Services if feral species are seen.

Erosion Control

Within the scope of this study, every effort has been made to determine the long-term steady state hydrology of the creek; however not all hydrologic impacts can be predicted. Significant increases or decreases in impervious surfacing that are not mitigated at the site-scale could result in changes to the hydrogeomorphic regime of the creek, which could lead to erosion or deposition within the channel. The creek should be inspected yearly for erosion problems and issues should be corrected promptly. If the problems appear to be arising due to hydrogeomorphic changes, further study should be done to determine the new state of the watershed, and this Restoration Plan should be revised to reflect the changes. Other erosion problems should be corrected promptly before they significantly impact downstream salmonid habitat. Bioremediation techniques should be favored over traditional engineering in correcting problems. Acceptable techniques include use of willow cuttings, wattles and mats to stabilize slopes, V and W weirs to direct creek flows and root wads and LWD to protect banks. It is unlikely, given the small size of this watershed, that harder engineering techniques such as gabions would be needed to protect bed and bank; however, if such are necessary, they should be designed with planting areas to soften their appearance and improve habitat and creek shading.

Trails

Trail repair should occur as needed to maintain public safety. This includes weed removal on shoulders, asphalt repair and replacement, and bridge maintenance. Additionally, directional and interpretive signage and rest stop furnishings should be inspected and maintained twice yearly or when damage is noted. Bi-yearly inspections should occur in springtime prior to heavy use and mid-summer. More frequent maintenance or inspections may be required if directed by the Placer County Department of Park and Recreation.

Cost Estimate

The cost estimate presented here is based upon costs from projects conducted in 2006. If the cost of construction appreciates significantly between planning and implementation, this estimate should be revised and updated prior to securing grants or other funding for the project to ensure that a sufficient amount is available for construction.

Table 10 presents the projected costs to implement the restoration and recreation elements presented in this plan. It does not include the following costs:

- Planning, designing or constructing the proposed mixed-use commercial structures or associated parking lots and amenities, including associated formal landscaping.
- Relocating or demolishing the existing residential structure on-site.
- Planning for the sewer realignment.
- Decommissioning Rock Creek Road and bridge.
- Planning, designing or constructing the commercial development south of Rock Creek Road.
- Planning for the improvements recommended by this Feasibility Study, including construction documents, environmental documentation (CEQA) or permitting.

Table 10 — Estimate of Probable Cost

Rock Creek Restoration Master Plan
Rock Creek Tributary Enhancement Measures
Opinion of Probable Construction Costs

Item	Quantity	Unit	Unit Cost	Amount	Total
Mobilization @ 5%	1	LS	$73,373	$73,373	$73,373
Erosion / Dust Control @ 1%	1	LS	$14,675	$14,675	$14,675
Diversion Channel and Dewatering @ 2%	1	LS	$29,349	$29,349	$29,349
Earthwork					$267,381
Construction Staking and Surveying	1	LS	$30,000	$30,000	
Demo Rock Creek Road Asphalt	370	CY	$10	$3,700	
Demo and Haul INSS1 (60 in CMP)	1	LS	$3,500	$3,500	
Demo and Haul INSS2 (bridge and abutments)	1	LS	$7,500	$7,500	
Demo and Haul INSS3 (Rock Creek Rd CMP)	1	LS	$5,000	$5,000	
Demo and Haul SW4 (abandoned 18 in CMP)	1	LS	$7,500	$7,500	
Clearing and Grubbing	9	AC	$5,000	$45,000	
Strip Topsoil & Stockpile (15% expansion)	5,175	CY	$7	$36,225	
Remove/Stockpile Debris (15% Expansion)	3,335	CY	$8	$26,680	
Cut and Fill to Finish Grade (less topsoil) (5% loss)	6,501	CY	$6	$39,006	
Import Bulk Fill and Place to Grade (10% loss)	264	CY	$35	$9,240	
Scarify areas to receive topsoil	9	AC	$600	$5,400	
Import Select Topsoil (10% loss)	176	CY	$50	$8,800	
Apply Topsoil where required to finish grade (10% loss)	5,690	AC	$7	$39,830	
Sewer Realignment					$580,000
Decomission Current Sewer Line	1	LS	$0	$80,000	
Realign 1,500 ft of Sewer to County Specs	1,500	FT	$250	$500,000	
Features					$116,332
Riffle Structures					
Quarry Spalls	16	EA	$1,680	$26,880	
Root Wad Structure w/ Rocks	22	EA	$2,000	$44,000	
Boulder Cluster Placement	16	EA	$1,500	$24,000	
Overflow Wetland (mimic existing)					
Lateral Weir (leaky rock vane)	70	CUY	$150	$10,500	
Filter Fabric	1,200	SQFT	$4	$4,800	

Stormwater					
Primary Target Parking Outfall					
Gravel Receiving (select 1" Drain Rock)	12	CUY	$60.00	$711	
Filter Fabric	173	SQFT	$4.00	$691	
Tailwater Pool Control Weir	4	CUY	$150.00	$600	
SW1 (Connect to Rock Creek)	1	LS	$0.00	$0	
SW2 (Connect to SW1 Outfall)	1	LS	$0.00	$0	
SW3 (Connect to seasonal wetland)	1	LS	$0.00	$0	
SW4 (Removed)	1	LS	$0.00	$0	
SW5 (Connect to new alignment)					
Flared Outfall Flange	1	EA	$400.00	$400	
Rock Runout (Select quarry spalls)	15	CUY	$150.00	$2,250	
Boulder Cluster Placement at Outfall	1	EA	$1,500.00	$1,500	
Trash Receptacle	2	EA	$550.00	$1,100	
Bench	2	EA	$1,200.00	$2,400	
Fold-down bollards	6	EA	$565.00	$3,390	
Site Access					$264,455
Access Roads					
3" Asphaultic Concrete	26,100	SQFT	$6.00	$156,600	
9" Aggregate Base (10% loss)	814	CUY	$50.00	$40,700	
Trails					
3" Asphaultic Concrete	8,800	SQFT	$6.00	$52,800	
6" Aggreagate Base (10% loss)	187	CUY	$50.00	$9,350	
Decomposed Granite on Shoulders (10% loss)	143	CUY	$35.00	$5,005	
Landscaping					$792,260
Tree/Shrub plantings	335,674	SF	$0.40	$134,270	
Drill seeding	575,254	SF	$0.05	$28,763	
Browse protection	335,674	SF	$0.15	$50,351	
25% replacement (plantings & browse cages)	1	JOB	$46,155.18	$46,155	
Temporary irrigation	335,674	SF	$1.00	$335,674	
Follow-up on invasive species removal	1	LS	$30,000.00	$30,000	
Filtration wetland plantings (plugs)	35,403	SF	$2.60	$92,048	
Interim Erosion Control Measures	30	AC	$2,500.00	$75,000	

Structures					$630,400
Bridge (H20 Load Rating)	1,980	sq ft	$300.00	$594,000	
Bridge Abutments	52	cuy	$700.00	$36,400	
Signage					$17,380
Interpretive Kiosk	2	EA	$6,000.00	$12,000	
Interpretive Signs	4	EA	$845.00	$3,380	
Directional Signs	4	EA	$500.00	$2,000	
Subtotal Construction Costs					$2,837,284
Contingency (20%)					$567,457
Total with Contingency					$3,404,741
Other Project Costs					480,474
Permitting	1	LS	$65,000.00	$65,000	
Design @ 10% Construction Cost	1	LS	$340,474.10	$340,474	
Surveying and Mapping	1	LS	$35,000.00	$35,000	
Right of Way and Acquisition Documents	1	LS	$40,000.00	$40,000	
Total Project Cost					$3,885,215

Structures					$630,400
Bridge (H20 Load Rating)	1,980	sq ft	$300.00	$594,000	
Bridge Abutments	52	cuy	$700.00	$36,400	
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Interpretive Kiosk	2	EA	$6,000.00	$12,000	
Interpretive Signs	4	EA	$845.00	$3,380	
Directional Signs	4	EA	$500.00	$2,000	
Subtotal Construction Costs					$2,837,284
Contingency (20%)					$567,457
Total with Contingency					$3,404,741
Other Project Costs					480,474
Permitting	1	LS	$65,000.00	$65,000	
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Surveying and Mapping	1	LS	$35,000.00	$35,000	
Right of Way and Acquisition Documents	1	LS	$40,000.00	$40,000	
Total Project Cost					$3,885,215

Cost Estimate

Rock Creek Restoration

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Appendix A

Rock Creek Restoration

Appendix A Pre and Post Hydraulic Evaluation

Introduction

Appendix A presents the methods and findings of a hydraulic impact evaluation prepared for the proposed restoration and rehabilitation activities expected to occur on the Rock Creek Tributary as part of the Rock Creek Restoration Master Plan (Master Plan). The purpose of this document is to summarize the results of calculations conducted to estimate the potential for impact to water surface elevation and velocity of the Rock Creek Tributary subject to implementation of the Rock Creek Restoration Master Plan. The results presented in this report will also be used during the channel and riparian terrace design process to establish native woody and herbaceous plantings subject to various inundation frequencies. This work effort is developed for the Placer County Planning Department to provide a basis of hydraulic design and framework for restoration of the Rock Creek Tributary.

Scope of Work

The scope of work conducted while preparing this hydraulic evaluation is presented in Table 1.

Table 1 Scope of Work Associated with the Preparation of This Document

TASK	DESCRIPTION
Site Survey	A site survey was conducted along the Rock Creek Tributary to capture existing overbank topography and bathymetry along project site. Existing survey information was collected to fill in creek and overbank topography upstream and where possible, downstream of the project site.
Site Reconnaissance	Site reconnaissance was performed by design engineer on February 4, 2005. Site reconnaissance included a site inspection, visual evaluation of substrate, visual evaluation of geomorphic characteristics, observation of existing hydraulic structures, identification of local scour and erosion potential, and examination of local reference streams.
Development of Hydrology	Existing hydrology was obtained from previous engineering related studies conducted for Rock Creek.
Model Development	A one-dimensional HEC-RAS hydraulic model was developed to reflect existing conditions. A second geometry file was created to reflect proposed project conditions. Proposed conditions were developed based upon the design criteria developed for this project.
Estimate Existing and Proposed Hydraulics	Estimates of water surface elevation and average velocity throughout the subject river reach were calculated using “existing” and “proposed” HEC-RAS model runs.
Evaluation of Hydraulic Impacts	Results from the “existing” and “proposed” model runs were compared. Deviations from existing conditions were noted and evaluated.
Summary of Results	Conclusions resulting from the activities conducted in preparation of this report are summarized.

Existing Conditions

Survey Data

Existing topography for used to develop model geometry was obtained from new survey information. Upstream and downstream topography was developed using several supplemental data sources. These sources are described in the following paragraphs.

Existing overbank and creek topography and was performed for the immediate project site by Placer County personnel in December of 2005. Mapping was prepared by HDR in June of 2006. Survey data were referenced to a local coordinate datum and were transformed to NAD83 California Zone III during mapping. The vertical datum is assumed to be NAVD88.

Supplemental survey data representing Rock Creek and Rock Creek Tributary topography was obtained from several existing sources. Rock Creek topography downstream of the Rock Creek Tributary was obtained from an existing HEC-RAS model developed for the Quartz Drive extension project prepared for Placer County (HDR, 2004). These data provided topography downstream of the Rock Creek Tributary confluence to the west side of State Highway 49. These data also provided Rock Creek topography upstream of the Rock Creek Tributary for a main channel distance of 1,180 ft. Pacland Properties provided HDR with topographic data representing existing conditions upstream of the Rock Creek Tributary at Rock Creek Road crossing. These data were used to establish the existing geometry for Rock Creek Tributary from Rock Creek Road to the Target Shopping Center. Table 2 provides a summary of these data sources and their respective extent of application.

Table 2 Summary of Data Sources Used to Develop Topography Data Reflecting Existing Conditions

INFORMATION SOURCE	TYPE OF DATA	APPLICATION EXTENT
Placer County, 2005	Topographic Survey	Rock Creek Tributary Main Channel Distance 0+00 to 16+33 ft.
Pacland Properties LLC., 2005	Topographic Survey	Rock Creek Tributary Main Channel Distance 16+33 to 22+00 ft.
HDR Engineering Inc., 2004	Hydraulic Model	Rock Creek Main Channel Distance 78+00 to 81+00 ft and 83+50 to 102+30 ft.

Hydrology

Peak flood discharges were computed using HEC-1 and application of the guidelines presented in the Placer County Flood Control District Storm Water Management Manual. An existing Army Corps of Engineers HEC-1 Model was obtained and was modified to create calculation nodes at three locations occurring within the boundaries of the proposed project site. These calculation nodes are located at the following locations:

1. Rock Creek at it’s confluence with Rock Creek Tributary
2. Rock Creek at State Highway 49
3. Rock Creek Tributary at it’s confluence with Rock Creek

The 100-year, 25-year, 10-year, and 2-year storms were evaluated. For development of the design storms, the Placer County HEC-1 Preprocessor (Placpre) was utilized. For HEC-1 input parameters, see the Hydrologic Evaluation Results section of HDR, 2004.

Hydrologic criteria were established using the Placer County Flood Control District Storm Water Management Manual. The kinematic wave method was utilized to model the routing of flow through the sub-basins. Sub-basins were determined by analyzing the topographic data available from the USGS Quadrangle. Each sub-basin was divided into three types of flow regimes: overland flow, collector channels, and the main channel. As more flow accumulates and concentrates in small drainage swales, it is modeled as collector channels. As multiple collector channels are combined and the flow becomes more intense in a defined channel, it is then considered the main channel for the sub-basin. Once the flow was concentrated at the focal point of each of the sub-basins, the muskingum-cunge method was used to route the flow through the system.

Estimated Instantaneous Peak Flow Events for the 2, 10, 25, and 100-year event are shown in Table 3.

Table 3 Calculated Peak Flow Discharges for Rock Creek and Rock Creek Tributary

PEAK FLOOD EVENT	ESTIMATED DISCHARGE, cfs
Rock Creek at Rock Creek Tributary	
100-YR	1,655
25-YR	1,076
10-YR	911
2-YR	565
Rock Creek at State Highway 49	
100-YR	2,407
25-YR	1,798
10-YR	1,448
2-YR	867
Rock Creek Tributary at Rock Creek	
100-YR	982
25-YR	746
10-YR	584
2-YR	309

The Peak flow discharges summarized in Table 3 were used for the basis of hydraulic comparison in this report. Figure 1 provides the reoccurrence vs. discharge relationship reflecting instantaneous peak flows for the Rock Creek Tributary.

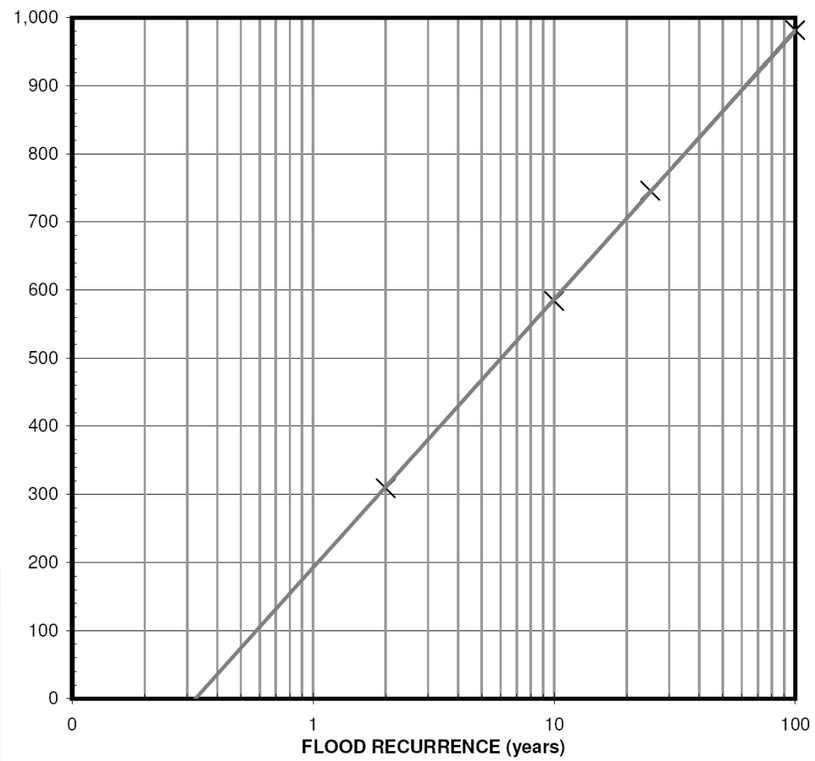


Figure 1 Discharge vs Flood Recurrence Relationship for Rock Creek Tributary

In-Stream Hydraulic Structures

Five primary hydraulic structures exist within the project vicinity having potential impact to local hydraulics. Two such structures exist on Rock Creek and impact local hydraulics by backing up flows into the lower section of Rock Creek Tributary and by altering velocities entering their respective confluence. Three structures exist along the existing alignment of Rock Creek Tributary and are within the proposed project boundary. These four hydraulic structures are summarized in Table 4.

Table 4 Summary of In-Stream Hydraulic Structures

STRUCTURE ID	APPROXIMATE STATION	STRUCTURE TYPE	DETAILS	APPROXIMATE SIZE
Rock Creek Tributary				
1	3+25 ft	Culvert	Corrugated Metal Pipe	72-inch, embedded 27-inches.
2	4+72 ft	Bridge	Natural bottom with concrete vertical abutments. Wooden deck.	12-feet wide x 3-feet tall
3	16+08 ft	Culvert	Corrugated Metal Arch Pipe	72-inches wide x 45-inches tall
Rock Creek				
4	79+95	Box Culvert	Triple Box Configuration	10.5 ft tall x 5 ft wide
5	86+65	Box Culvert	Triple Box Configuration	12 ft tall x 7 ft wide

Data reflecting existing structure size and configuration was obtained from the information sources provided previously in Table 2. A site visit was performed by the design engineer to verify structure size, condition, presence of debris, and potential for obstruction.

Existing Hydraulics

Existing water surface elevations and average velocities were estimated using the HEC-RAS hydraulic model under steady-flow simulation. Development of the existing conditions model is described in the following paragraphs.

Existing Geometry

Existing geometry was obtained from the multiple data sources summarized in the section titled Survey Data located previously in Appendix A. From these data, a total of 52 cross-sections representing existing conditions were developed.

Structure locations were identified using the survey information used to develop existing conditions. Their size, configuration, and hydraulic characteristics were added into the existing geometry files.

Figure 2 provides a hydraulic basemap summarizing the locations at which cross sections were developed for the existing conditions model geometry.

Existing Manning's n Roughness Calculations

Calculations were performed to estimate existing Manning's roughness coefficients for the main channel and overbank areas along the Rock Creek Tributary using U.S. Geological Survey Water Supply Paper 2339 (USGS, 1990). Due to the lack of uniformity for roughness throughout the project reach, two separate n values were calculated for the left overbank. One roughness value was calculated for the main channel and for the right overbank. Existing conditions Manning's-n values were calculated to be 0.031 for the main channel and 0.055 for the right overbank areas. Left overbank Manning's-n values were calculated to be 0.077 for overbank areas downstream of main channel distance 6+50 ft and 0.047 for overbank areas upstream of 6+50 ft. See attachment A-1: Calculations for Manning's Roughness Coefficients.

Boundary Conditions

A mixed flow regime calculation methodology was used for this evaluation due to the steepness of the channel and the potential of water surface elevations dropping below critical depth. The upstream and downstream boundary conditions were set to a normal depth calculation using the average channel gradient. Channel gradient for the model was determined by calculating the average gradient between several channel inverts at each end of the model. The resulting downstream channel gradient near State Highway 49 (Rock Creek main channel distance 79+00) was estimated to be 0.015 ft/ft. The resulting upstream channel gradient near the existing Target Center (Rock Creek Tributary main channel distance 22+00 ft) was estimated to be 0.009 ft/ft.

Proposed Hydraulics

Proposed water surface elevations and average velocities were estimated using the HEC-RAS hydraulic model under steady-flow conditions. Development of the proposed conditions model is described in the following paragraphs.

Proposed Geometry

Cross-sectional geometry was modified to reflect proposed project conditions. Modifications included the development of a compound channel, removal of Rock Creek Road, removal of two in-stream structures, and replacement of one in-stream structure with a prefabricated single span bridge section. Design criteria for each of these activities are presented in the Rock Creek Restoration Master Plan. Hydraulic design criteria included in the proposed geometry in addition to those already presented, include the following:

1. No increase in 100-YR water surface elevations,
2. Provide 1-ft of freeboard above 100-YR water surface elevations for upper terraces and bridges,

Modified cross-sections are provided in Appendix A-2: Cross-Sectional Geometry Reflecting Proposed Conditions. A hydraulic basemap indicating the cross sections used to develop the proposed geometry is provided as Figure 4.

At the main channel distance of 5+00 ft, the existing bridge structure was replaced with a prefabricated single span bridge section. The adjacent abutments were lain at a 3H:1V slope from an elevation representing the 2-year flood discharge to an elevation residing 1-ft above the calculated 100-year flood discharge. The bridges bottom-chord was lain atop the resulting abutment and spans from the left to right abutment with an assumed overlap of 5 ft on each side to provide a short weight bearing surface on its concrete footings. The resulting bridge length was calculated to be 100 ft. The compound channel, abutments, and bridge section are provided in Appendix A-2.

Proposed Manning's n Roughness Calculations

Manning's n roughness coefficients were modified to reflect proposed project conditions. It is anticipated that riparian vegetation cover and composition may change as a result of project implementation, thus, left and right overbank values were recalculated per USGS, 2000. Calculations are provided in Appendix A-1: Calculations for Manning's Roughness Coefficients. The resulting roughness values were calculated to be 0.055 for the left and right overbank areas. It is assumed that roughness is uniform along the entire project reach. The main channel roughness remained the same due to the expected use of existing native materials in its construction. Thus, the main channel roughness is not expected to change and a value of 0.031 was used.

Boundary Conditions

Modifications to boundary conditions to reflect proposed conditions were not required. Boundary conditions remained the same.

Evaluation of Hydraulic Impacts

The calculated existing and proposed conditions water surface profiles and velocities were compared to evaluate the extent of hydraulic impact. These comparisons are described in the following paragraphs.

Water Surface Profile

Estimated water surface elevations reflecting existing and proposed conditions are overlaid on a single profile for each flow and provided as Figure 5 through Figure 8. Water surface profiles provide water surface elevations for existing and proposed water surface elevations along the entire project reach for a single flow. Rating curves are provided for Rock Creek Main Channel Distance 79+75 ft and Rock Creek Tributary Main Channel Distances 6+00 ft and 15+85 ft as Figure 9. The rating curves display the water surface elevation as a function of discharge at Rock Creek and Highway 49, Rock Creek Tributary and the proposed bridge, and Rock Creek Tributary at Rock Creek Road. Comparisons of the data presented in Figure 5 through Figure 9 illustrate that the proposed project is predicted to result in an overall decrease in water surface elevations along the project site. Decrease in water surface elevations over the project reach range from -0.37 ft to as much as -4.02 ft. The results are summarized in Table 5.

Table 5 Summary of Calculated Existing and Proposed Water Surface Elevations

SECTION	EXISTING WSELEV, ft	PROPOSED WSELEV, ft	DEVIATION, ft
Rock Creek Section 79+75			
100-YR	1,337.27	1,337.27	0
25-YR	1,337.02	1,337.02	0
10-YR	1,336.65	1,336.65	0
2-YR	1,334.53	1,334.53	0
Rock Creek Tributary Section 6+00			
100-YR	1,339.09	1,338.72	-0.37
25-YR	1,338.8	1,338.27	-0.53
10-YR	1,338.55	1,337.94	-0.61
2-YR	1,338.16	1,337.24	-0.92
Rock Creek Tributary Section 16+33			
100-YR	1,351.77	1,348.29	-3.48
25-YR	1,351.55	1,347.9	-3.65
10-YR	1,351.36	1,347.58	-3.78
2-YR	1,350.95	1,346.93	-4.02

Velocity

Maximum average channel velocities reflecting existing and proposed conditions are overlaid on single longitudinal profiles for each flow and are provided in Figure 10 through Figure 13. Comparisons of the calculated results predict that the proposed project may result in a change of average flow velocities ranging from 0.00 ft/s at the State Highway 49/Rock Creek crossing to +6.24 ft/s at the Rock Creek Road/Rock Creek Tributary Crossing. The results are summarized in Table 6.

Table 6 Summary of Calculated Existing and Proposed Flow Velocities

SECTION	EXISTING WSELEV, ft/s	PROPOSED WSELEV, ft/s	DEVIATION, ft/s
Rock Creek Section 79+75			
100-YR	3.23	3.23	0
25-YR	2.55	2.55	0
10-YR	2.24	2.24	0
2-YR	2.56	2.56	0
Rock Creek Tributary Section 6+00			
100-YR	7.5	6.93	-0.57
25-YR	6.7	6.55	-0.15
10-YR	6.09	6.25	+0.16
2-YR	4.18	5.49	+1.31
Rock Creek Tributary Section 16+33			
100-YR	1.12	6.89	+5.77
25-YR	0.92	6.86	+5.94
10-YR	0.76	7	+6.24
2-YR	0.46	6.55	+6.09

As shown in Table 5, Cross Section 16+33 will realize significant increases in velocity due to project implementation. This impact is due to the proposed removal of the Rock Creek Road. The modification and removal of the Rock Creek Road crossing eliminates the current backwater condition imposed by the existing culvert. Thus, the proposed project will return this reach of Rock Creek Tributary to conditions that effectively mimic conditions observed throughout the remaining portion of the project reach.

Summary of Conclusions

From the results of this evaluation the following conclusions can be made:

1. The proposed project will decrease water surface elevations associated with the 100-year peak flood discharge by a range of 0.37 to 4.0 ft.
2. The proposed project will increase velocities at the current Rock Creek Road crossing by as much as 6.09 ft/s. These velocities mimic conditions present throughout the rest of the project reach.
3. Impacts to velocities along the remaining project reach vary. Velocities may increase by as much as 1 ft/s and may decrease by as much as 0.57 ft/s. These impacts are not significant.
4. From the results of this study, impacts to water surface elevations and velocity are confined the project site.

Limitations

Downstream hydrologic impacts associated with the removal of Rock Creek Road are beyond the scope of this report. It is possible that removal of this area of detention will affect the downstream peak discharge and time to peak discharge. Thus, it is unknown at this time how the removal of backwater conditions present upstream of the existing culvert will affect the hydrograph downstream of the site.

References

HDR Engineering Inc., 2004. “Hydrology and Hydraulics Report for the Quartz Drive Extension.” Prepared for Placer County, April 26, 2004.

Pacland Properties, LLC, 2005. Topographic Survey of Rock Creek Tributary and Target Shopping Center. Approximate date of survey, March 14, 2005.

Placer County, 2005. ASCII Text File Containing Topographic Survey Points. Approximate date of survey, December 14, 2005.

U.S. Geological Survey, 1990. “Water Supply Paper 2339: Guide for Selecting Manning’s Roughness Coefficients for Natural Channels and Flood Plains.”

Figures

Figure 2 Summary of the Reoccurrence vs. Discharge Relationship for Rock Creek Tributary

Figure 3 Hydraulic Basemap Summarizing Existing Conditions Geometry

Figure 4 Hydraulic Basemap Summarizing Proposed Conditions Geometry

Figure 5 Water Surface Profile, 2-Year Flood Event

Figure 6 Water Surface Profile, 10-year Flood Event

Figure 7 Water Surface Profile, 25-Year Flood Event

Figure 8 Water Surface Profile, 100-Year Flood Event

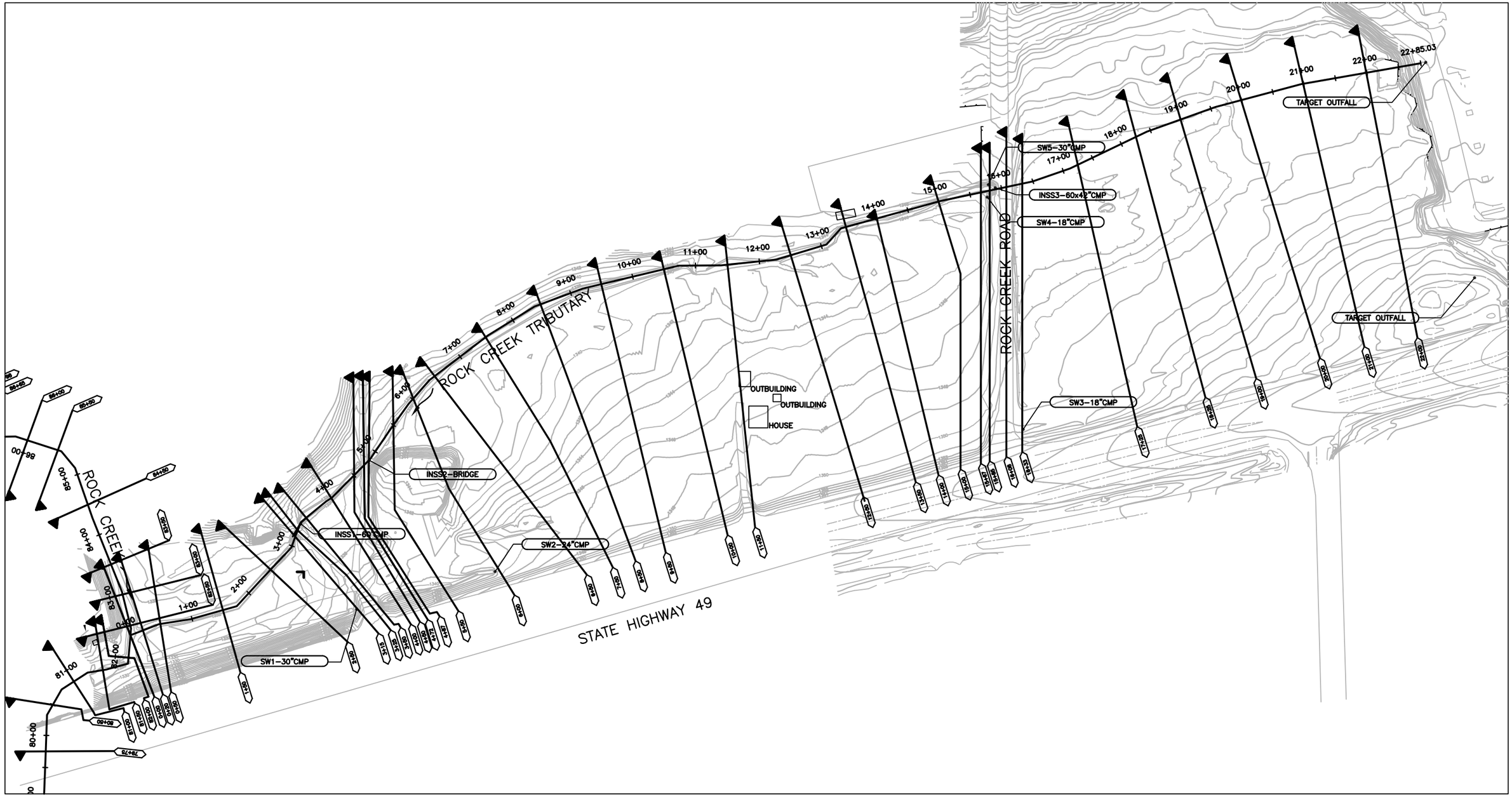
Figure 9 Rating Curves at Cross Sections 78+00, 6+00, and 16+33

Figure 10 Velocity Profile, 2-Year Flood Event

Figure 11 Velocity Profile, 10-Year Flood Event

Figure 12 Velocity Profile, 25-Year Flood Event

Figure 13 Velocity Profile, 100-Year Flood Event



1"=150'

LEGEND

SWX–XX	STORMWATER DISCHARGE
INSSX–XX	INSTREAM STRUCTURE

N

75 0 75 150
SCALE: 1"=150'

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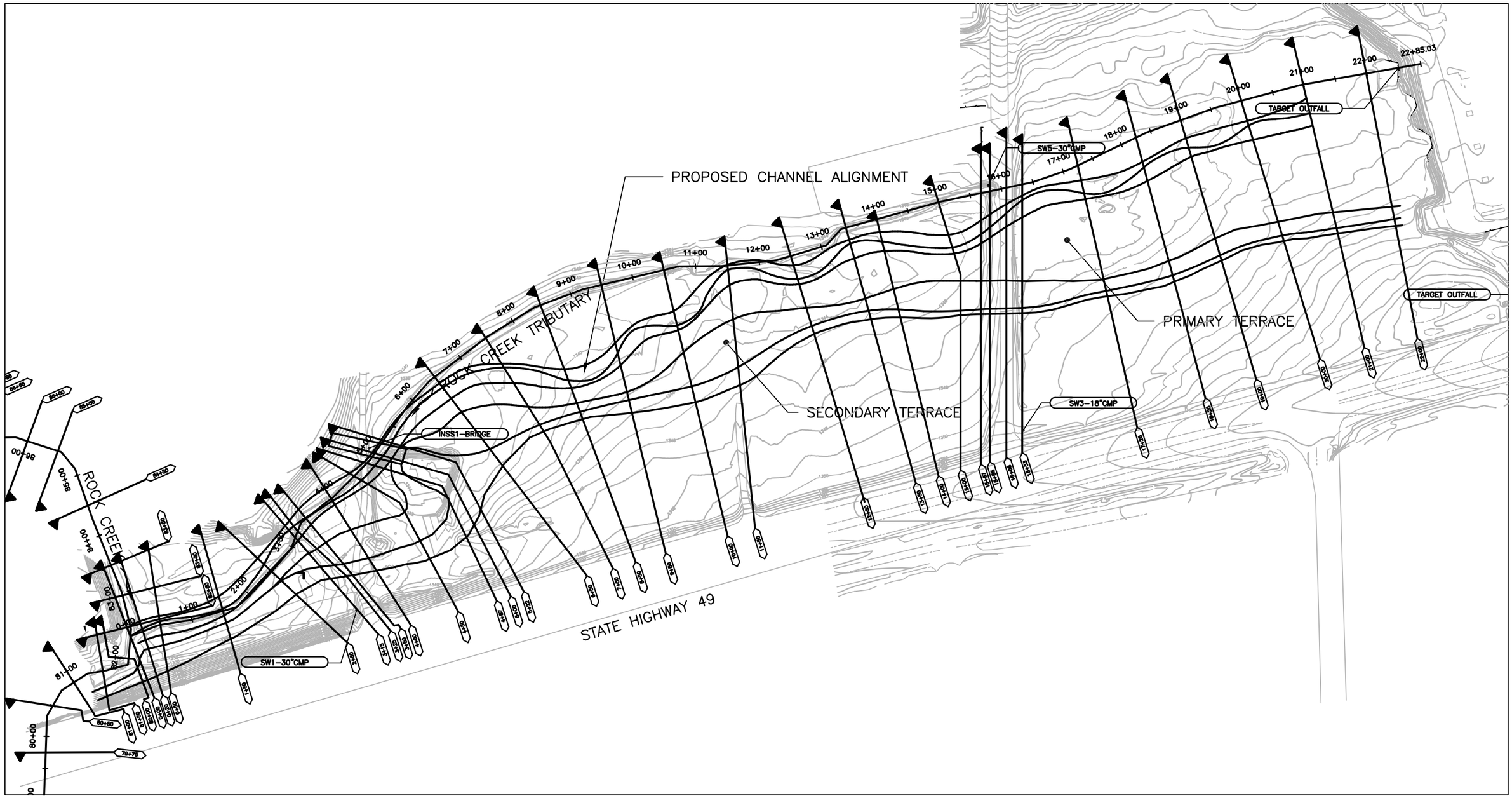
HYDRAULIC BASEMAP
EXISTING CONDITIONS
ROCK CREEK TRIBUTARY

ROCK CREEK RESTORATION MASTER PLAN

Date
AUG 06

Sheet
FIGURE 2



1"=150'

LEGEND

SWX–XX	STORMWATER DISCHARGE
INSSX–XX	INSTREAM STRUCTURE

N

75 0 75 150

SCALE: 1"=150'

HDR

HDR Engineering, Inc.

HYDRAULIC BASEMAP
PROPSED CONDITIONS
ROCK CREEK TRIBUTARY

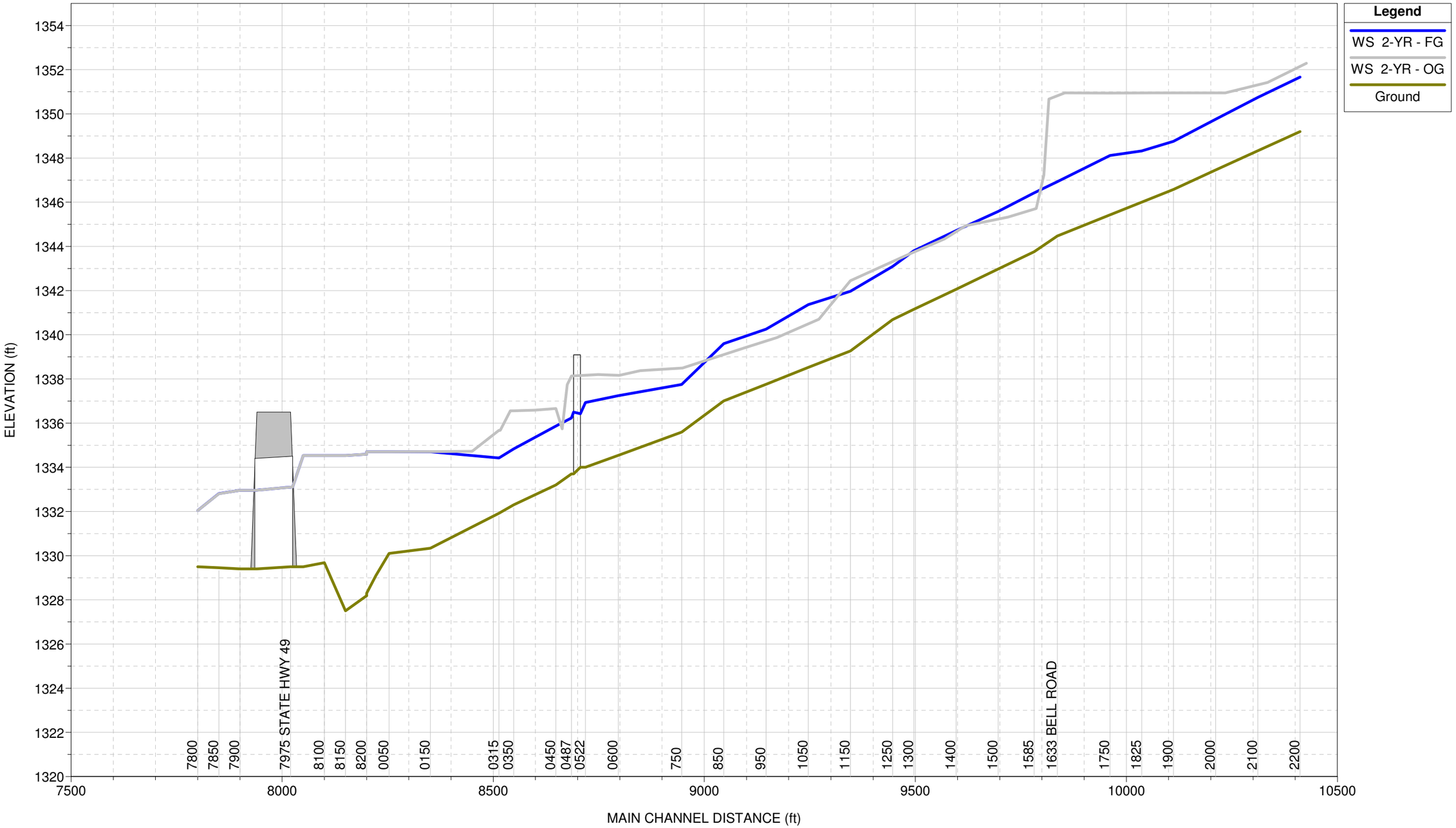
ROCK CREEK RESTORATION MASTER PLAN

Date
AUG 06

Sheet
FIGURE 3

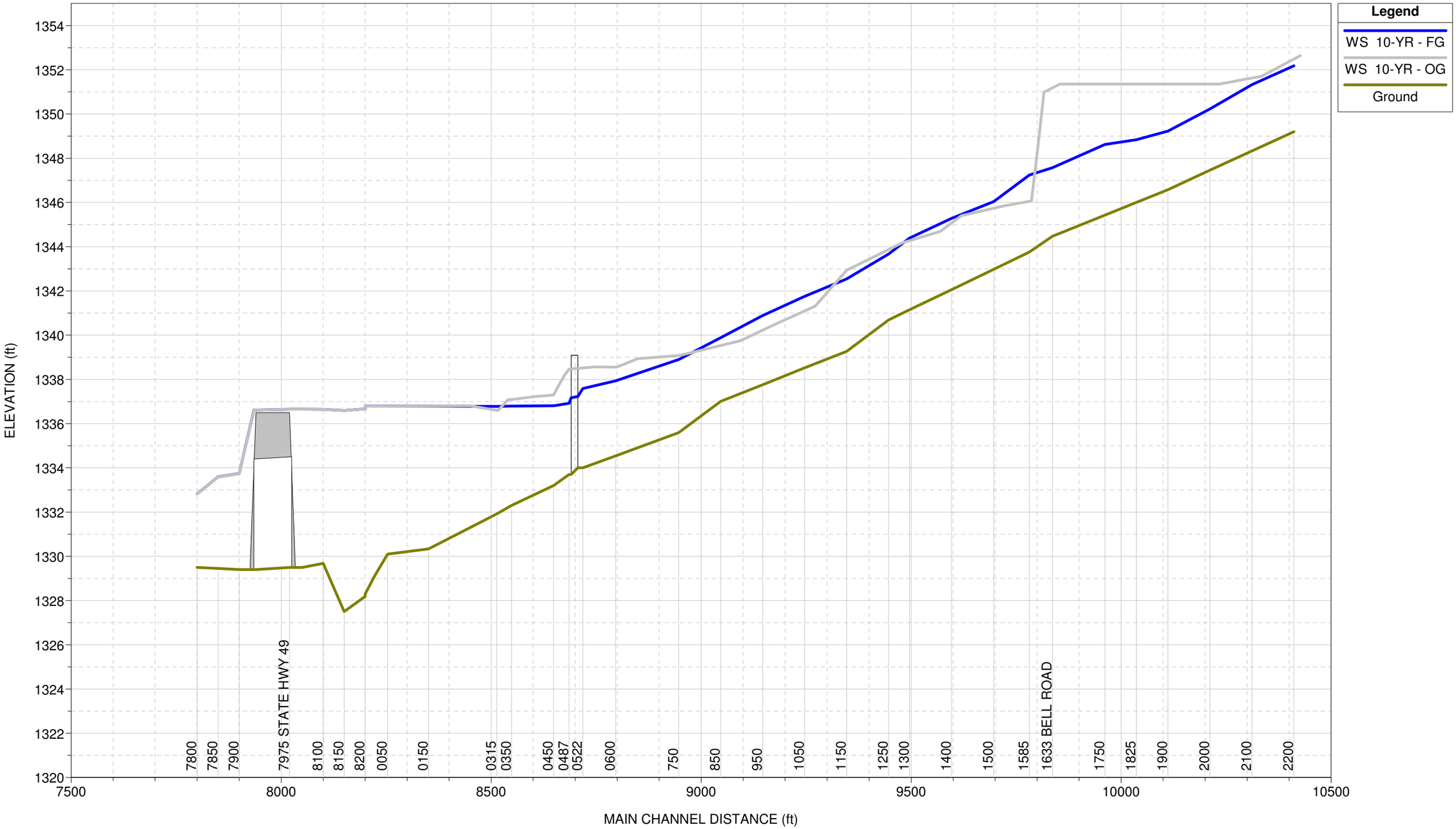
Rock Creek Tributary

FIGURE 4 - WS PROFILE COMPARISON OF PRE- AND POST- PROJECT CONDITION, 2-YR



Rock Creek Tributary

FIGURE 5 - WS PROFILE COMPARISON OF PRE- AND POST- PROJECT CONDITION, 10-YR



Rock Creek Tributary

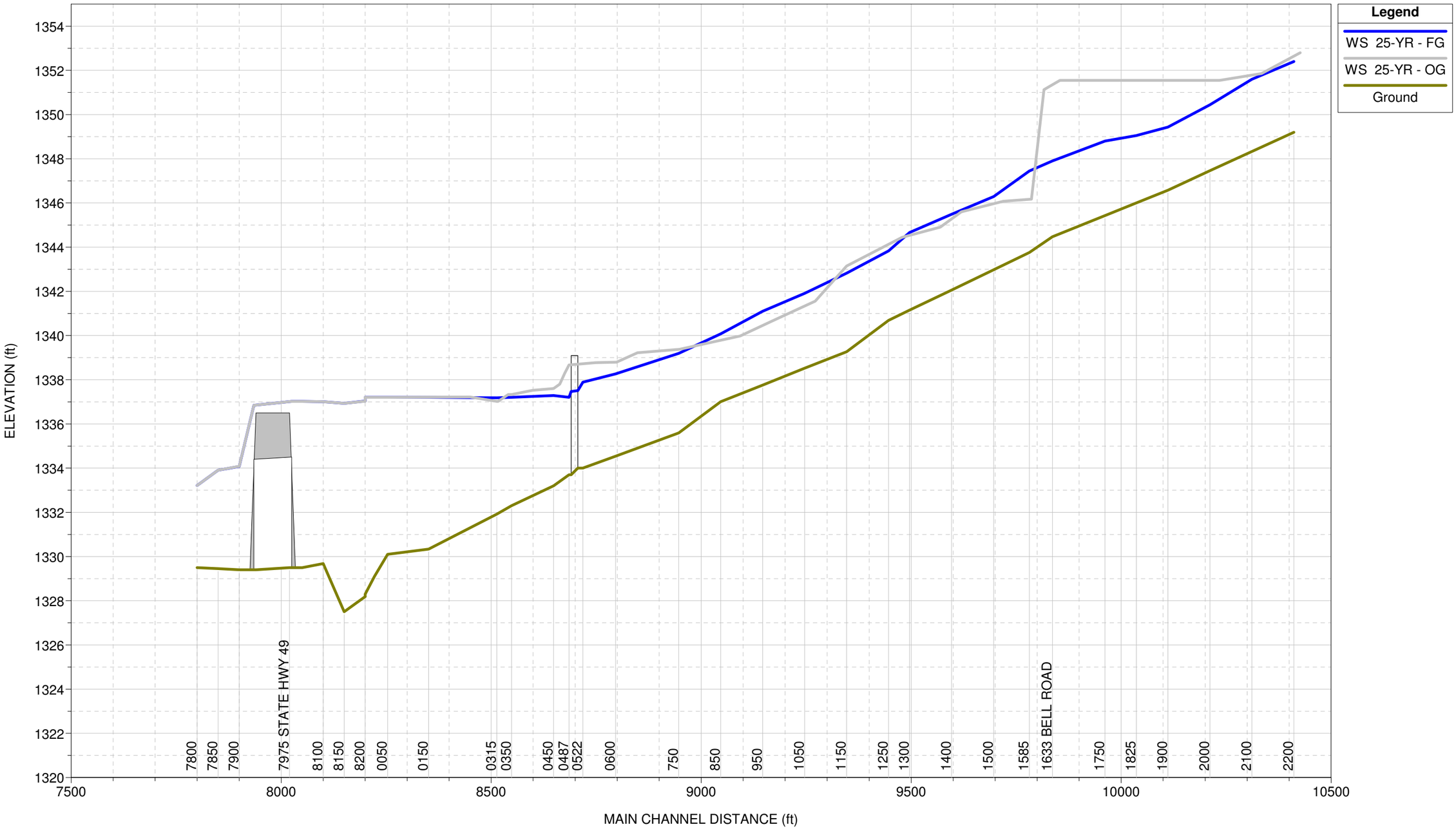



FIGURE 6 - WS PROFILE COMPARISON OF PRE- AND POST- PROJECT CONDITION, 25-YR