Lower Stanislaus Low Impact Development (LID) Alternative Compliance Plan

City of Riverbank, California

May 30, 2015

AECOM

Local Government Commission

Lotus Water

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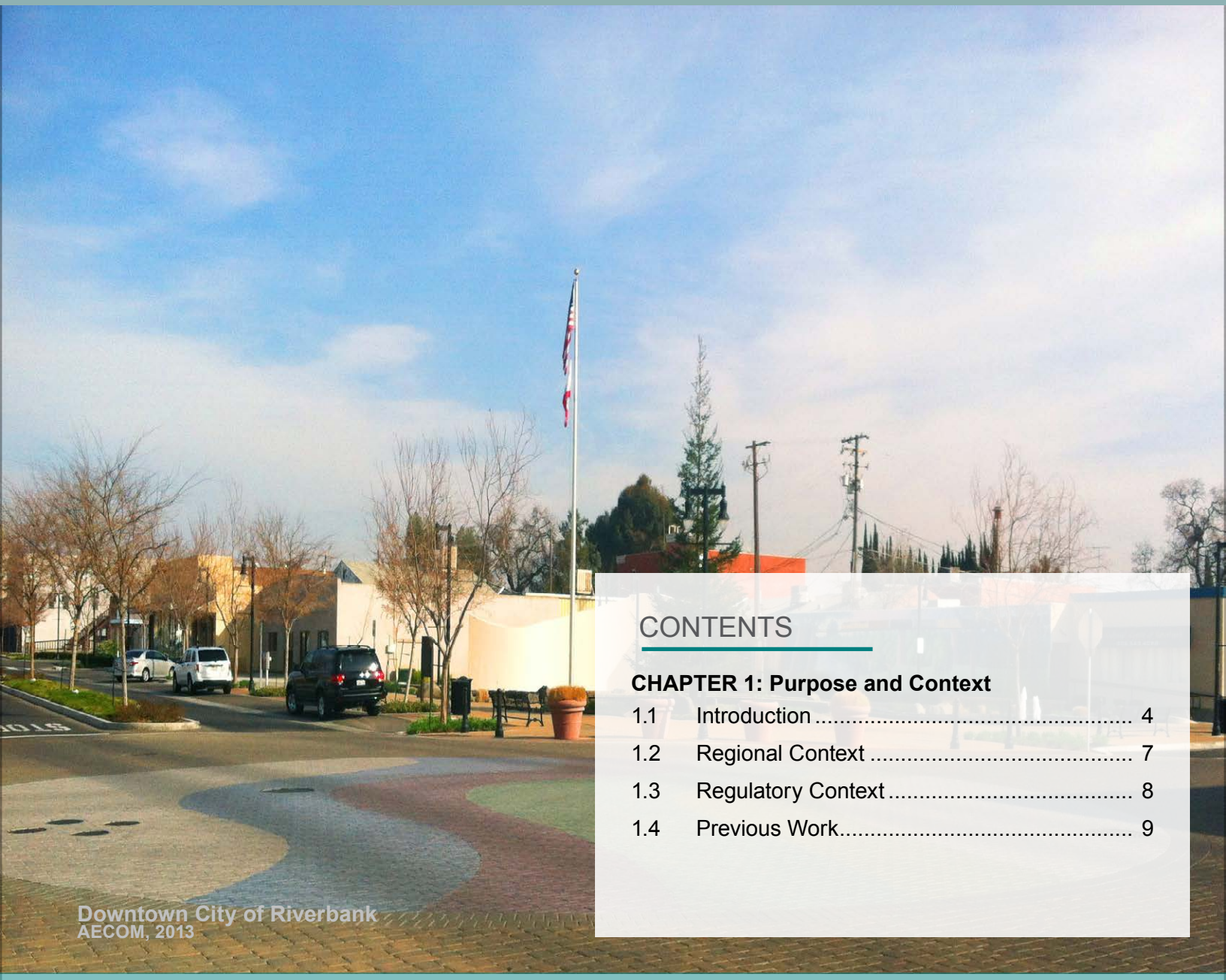
1.0

PURPOSE AND CONTEXT



Downtown City of Riverbank
AECOM, 2013

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1.1 Introduction

Low Impact Development (LID) designs and strategies seek to provide solutions to urban stormwater management by mimicking nature. They assist in mitigating the harmful effects of impervious development (roads, sidewalks, parking lots, rooftops and other impervious surfaces) on water quality. Stormwater runoff from impervious areas can contain sediment, nutrients, road salts, heavy metals, bacteria, petroleum hydrocarbons, and other pollutants detrimental to surface and even sub-surface water quality.[1]

Although a robust set of LID approaches and tools exist at a variety of scales (streetscape rain gardens to large treatment wetlands), the standard site-by-site or project-by-project approach to LID implementation can sometimes interfere with other sustainable principles, such as compact and infill development. Specifically, the space requirements associated with LID features can encourage more sprawling suburban development. A distributed LID network, which may rely on individual property owners for maintenance, can also be difficult for a municipality to manage, monitor performance, and maintain over time.

Thus, an alternative compliance (AC) approach to development-specific, on-site LID systems would include comparable off-site mitigations and/or financial contributions (in-lieu fees) toward watershed-scaled features in priority reinvestment areas that mitigate stormwater impacts of multiple disparate projects in a centralized manner.

Several cities, counties, and even States are recognizing the need to provide developers and agencies AC mechanisms if physical, geotechnical, or other conditions prevent the implementation of on-site source control facilities. In some cases, AC programs may even provide higher environmental and public benefits to the community. Table 1–1 summarizes the benefits and challenges of conventional LID and the AC approach.

The intent of this Lower Stanislaus Low Impact Development Alternative Compliance Study ("Study") is to inform an AC approach by conceptually designing and costing water quality facilities to provide data for the development of appropriate in-lieu fees. These centralized facilities would be located, scaled, and designed to align with the goals of the City of Riverbank General Plan and the requirements of National Pollutant Discharge Elimination System (NPDES) General Permit for Small Municipal Separate Storm Sewer systems (MS4s) (2013-0001-DWQ). The primary objectives of these facilities would be to protect and improve water quality in the Stanislaus River, with secondary objectives of promoting infill redevelopment, groundwater recharge and achieving broader community goals/benefits.

1. http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=92

	On-Site Treatment (Conventional LID)	Centralized Treatment (Alternative Compliance [AC] LID)
Benefits	Source-control Clear ownership	Flexibility Ease of monitoring Potential community benefit (e.g., multifunctional open space)
Challenges	Uses valuable space within properties Difficult in highly developed areas Piecemeal approach Problematic maintenance	Difficult in highly developed areas Additional burden placed on City to locate, design, and maintain systems

Table 1–1 Approaches to Stormwater Treatment

Funding for this Study came from the 2006 passage of Proposition 84 (The Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act [Prop 84]), which authorized $90 million in matching grant funds through the Stormwater Grant Program. Prop 84 has funded a wide-array of LID studies including planning, optimization, design, and monitoring, the results of which will make LID more visible and viable for municipalities across the State.

The Local Government Commission (LGC), a nonprofit organization cultivating innovative local approaches to improving communities, served as the project manager of the Study (Figure 1–1). In this role, they coordinated all technical and administrative services, served as the liaison between the consultant team (AECOM) and relevant stakeholders, and led the outreach efforts. A team of experts from AECOM performed the research, technical analysis, and developed the fee structure.

A Technical Advisory Committee (TAC) was responsible for providing overall direction, guidance, and feedback to the project team (LGC and AECOM). The TAC was comprised of representatives from the City of Riverbank, along with the State Water Resources Control Board (SWRCB), the Regional Water Quality Control Board (RWQCB), and community stakeholders. Representatives from the U.S. Fish and Wildlife Service (USFWS) and the U.S. Army of Corps of Engineers were also included, as needed.

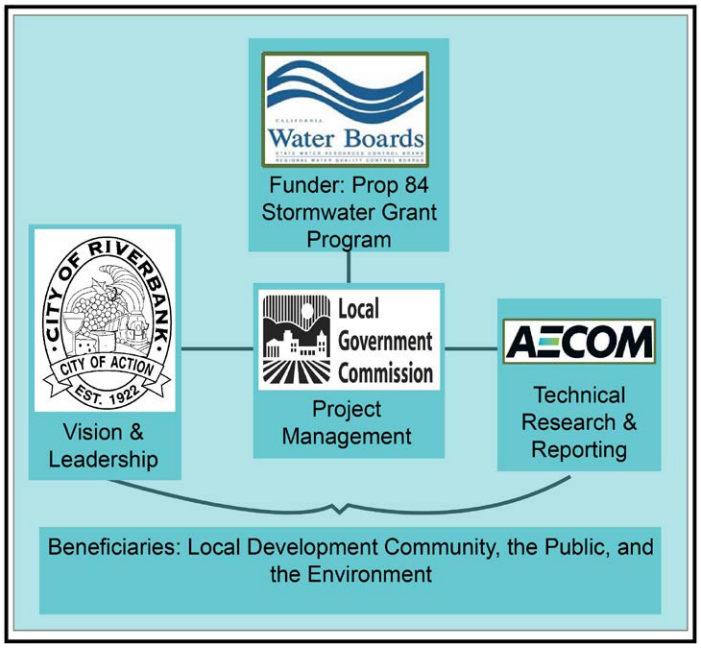

Figure 1–1 Organizational Structure

While the project locations, concept designs, and fee structure results of this Study were developed in the context of the City of Riverbank, the information and conclusions are relevant for small Phase II MS4s across the region with similar redevelopment goals and facing the same regulatory challenges. To encourage the dissemination of these ideas, an ongoing component throughout the Study has been education, outreach, and training. Regular meetings with the TAC complemented meetings and workshops with regional stakeholders, including the Modesto Engineering Club (MEC), nearby jurisdictions, and members of the local development community.

The scope of the study was as follows:

1. Alternative Compliance Review

- Compile and analyze policy and case studies pertaining to AC to develop recommendations and best practices relevant to the City of Riverbank.

2. Watershed Characterization

- Perform an existing conditions and needs analysis for the study area related to hydrology, infrastructure, land use, and physical conditions.
- Identify and delineate the boundaries of sub-watersheds within the study area and their connectivity in order to group projects within potential reinvestment areas.
- Develop a prioritization of sub-watersheds that have the greatest need and reinvestment potential.

3. Watershed Opportunities

- Identify stormwater management opportunity locations matched with the prioritized sub-watersheds.
- Use performance criteria specified by the 2013 General Phase II Permit to design water quality facilities that meet both existing needs and the needs of anticipated/encouraged future redevelopment.

- Develop conceptual level project designs that demonstrate performance and develop an order of magnitude cost estimate for each project.

4. In-Lieu Fee Structure Recommendations

- Develop unit cost per size and relative impact of developments, identify the specific thresholds for the in-lieu development fees, determine the appropriate units for assessing those fees, and identify AC opportunities for developments that may incur unusually high relative fees or have other unique conditions.
- Create a draft in-lieu fee plan summarizing the findings and providing recommendations for the project development and associated fee structure.

1.2 Regional Context

The City of Riverbank occupies approximately four square miles in Stanislaus County in California's Central Valley. The City is located in the northern portion of the San Joaquin Valley adjacent to the Stanislaus River, one of the largest tributaries of the San Joaquin River, and a few miles from Modesto (Figure 1–2). Much of the woodland and riparian habitat in the Riverbank area is located along the Lower Stanislaus River corridor. Agricultural fields, orchards, and grassland habitats comprise much of the rest of the non-urban environment in the vicinity.

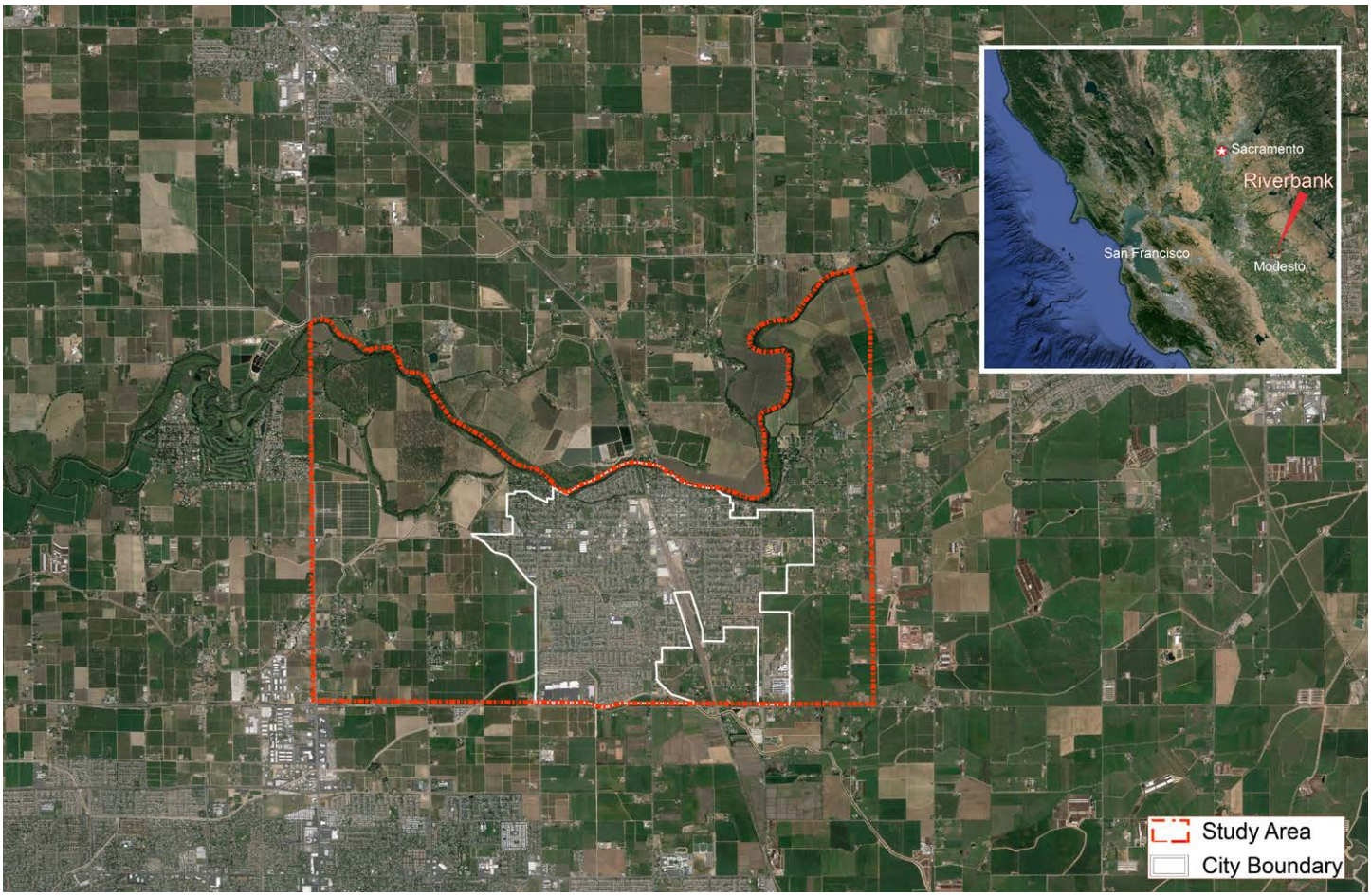

Figure 1–2 Regional Map

1.3 Regulatory Context

This Study was conducted as part of the State Water Board's greater Stormwater Grant Program. The statewide program (initiated by Proposition 40 and expanded by Proposition 84) aims to reduce and prevent stormwater contamination of rivers, lakes and streams. Stormwater regulation dates back to 1972 when the U.S. Environmental Protection Agency (EPA) introduced the National Pollutant Discharge Elimination System (NPDES) permit program, with the primary goal to control water pollution and reduce the degradation of the nation's surface waters by regulating point source discharges of wastewater and stormwater. Applicable discharges of stormwater include those from MS4s, construction activities, and industrial activities.

For MS4s, the NPDES permit was developed in two phases. Phase I was issued in 1990 and required medium and large cities (serving between 100,000 to 250,000 people) to file for permits. Phase II, introduced in 1999, extended the permit requirement to smaller urbanized areas (≤ 100,000 people) (40 CFR Part 122 et seq., Phase II, Porter-Cologne Water Quality Control Act 13376). The City of Riverbank falls into the Phase II classification.

In February 2013, the General Permit for Phase II MS4s was revised (Order No. 2013-0001-DWQ) to increase its effectiveness beyond the original six minimum control measures: public education and outreach, public participation, illicit discharge detection and elimination, construction site runoff control, post-construction runoff, and pollution prevention/good housekeeping. The new provisions focus on the permit's ability to improve the water quality of stormwater discharges as summarized in the following list:

- Implementation of Low Impact Development (LID) Principles
- Areas of Special Biological Significance (ASBS)
- Total Maximum Daily Load (TMDL) Implementation Requirements
- Specific Management Measures
- Elimination of Storm Water Management Plans (SWMP) in exchange for more flexible Guidance Document
- Water Quality Monitoring for ASBS and TMDL
- Designation Criteria & Waiver Certification
- Program Effectiveness Assessments
- Program Management Personnel
- Stormwater Multi-Application Reporting and Tracking System (SMARTS)

A more detailed regulatory background, description of relevance to the Central Valley, and summary of future regulatory drivers for this Study are provided in Appendix A.1.

1.4 Previous Work

This Study builds on work conducted for the January 2013 Model Standards & Specifications for Low Impact Development Practices manual ("Stanislaus County LID Manual" or "manual")[1] (Figure 1–3), which provides guidance for implementing LID solutions that are customized to the local context of the City of Riverbank and Stanislaus County. The manual has been promoted as a useful guide for the regions' cities and developers as NDPES stormwater discharge regulations continue to evolve and become more stringent.

Changing from traditional stormwater management techniques to a more ecological approach requires a deeper understanding of biology and geology beyond what is typically included in developers and engineers training. Unlike a pipe network, a design element such as bioretention is not universally applicable and is dependent upon site conditions including (but not limited to) topography, soils, and land uses. For this reason, many LID guidance manuals are now widely available for specific geographies. What separates the Riverbank manual from other LID guidance manuals is that it provides targeted design guidance within the context of the San Joaquin Valley's unique environment, and, importantly, the City of Riverbank's existing and future planned development patterns.

The manual begins with a clear and concise set of steps and instructions intended to allow anyone (developers, designers, city staff) to utilize the information effectively. The manual leads the user through an extensive site assessment specific to the City of Riverbank in order to identify the LID techniques that are most likely to be effective. Fact sheets for these LID techniques include a description, relevant and useful design and siting criteria, and examples of appropriate components. The manual is available on the City of Riverbank's website.

While the manual describes stormwater control measures (SCMs) that apply at many scales and for various land uses, LID solutions generally stem from a source-control approach to stormwater management. This Study will apply the LID solutions described in the manual within the context of a more centralized, AC, approach.

1. City of Riverbank. 2013 (January). Model Standards & Specifications for Low Impact Development Practices manual. Prepared by AECOM. Available at: http://www.stancounty.com/planning/cdbg/StanRST-Docs/Riverbank/MODEL%20LID%20STANDARDS.pdf

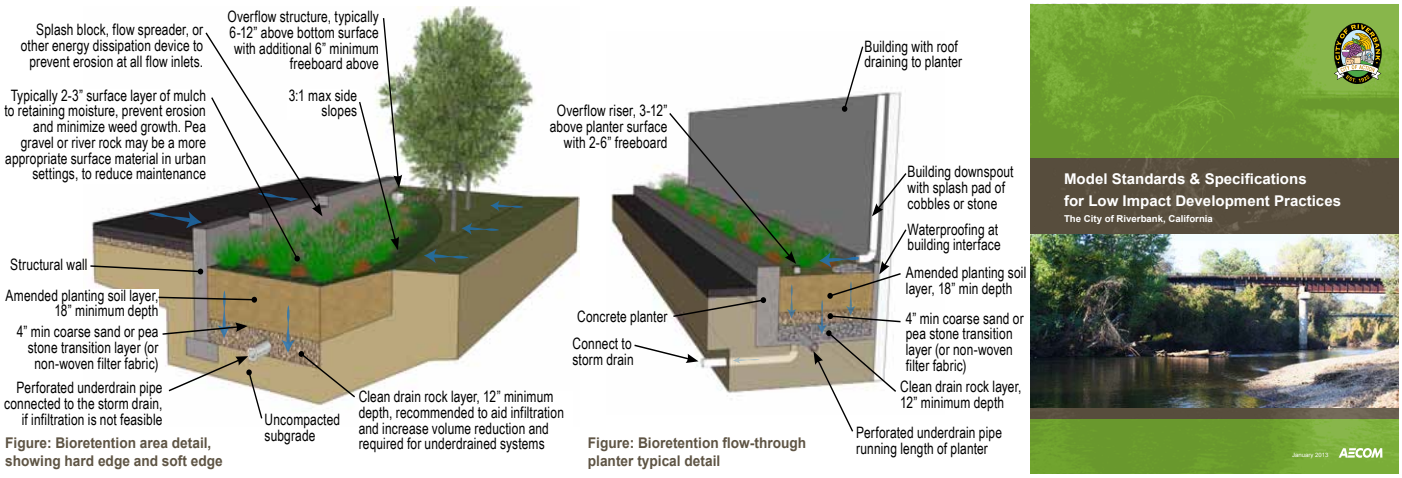

Figure 1–3 Cover and facility detail excerpt from LID guidance manual

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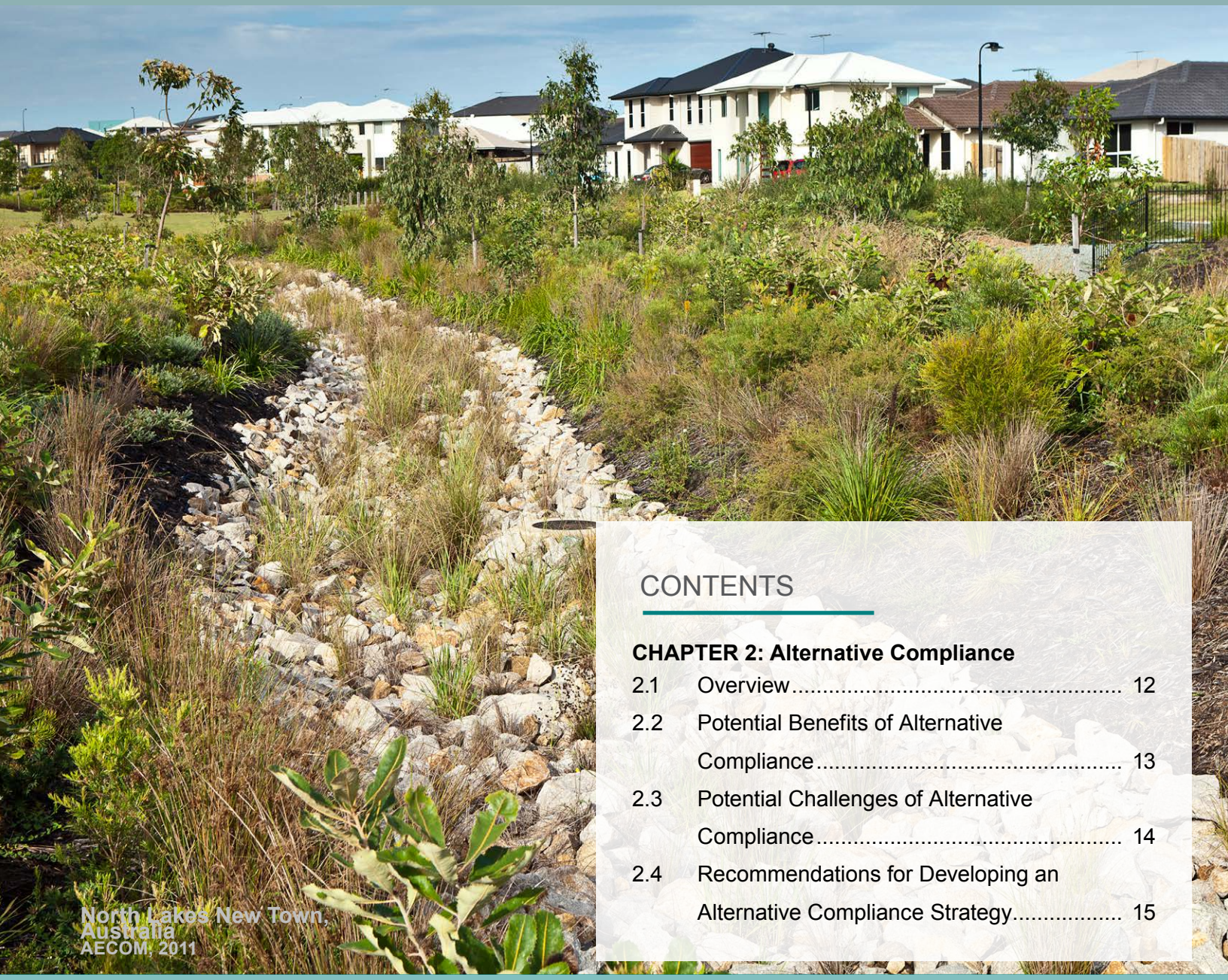
2.0

ALTERNATIVE COMPLIANCE



North Lakes New Town, Australia
AECOM, 2011

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2.1 Overview

In order to illustrate AC options for the City of Riverbank, this section outlines the salient characteristics of AC policies and approaches. Various cities, counties, and states that employ some version of an AC program were reviewed and assessed. Information was gleaned from each program in regard to: potential projects and on-site impacts, off-site mitigations, size, setting, challenges, benefits, risks, in-lieu fees, trading currencies, and the effectiveness of stormwater control mechanisms.

A comprehensive list of the programs considered is provided below. The four most applicable case studies (shown in bold) were examined more thoroughly; summary descriptions and notable characteristics of each program are presented in Appendix A.3.

- California:
  - **Los Angeles County**
  - **Ventura County**
  - City of Modesto (Stanislaus County)
  - City of Watsonville (Santa Cruz County)
  - Lake Tahoe (Placer and El Dorado counties)
  - San Diego County
- Maryland:
  - Prince George's County
- Virginia:
  - Frederick County
  - Henrico County
- West Virginia (Department of the Environment)
- Washington, DC

Although each program contains unique parameters and elements according to their specific geographic and business/political realities, they each follow the 2008 EPA / Army Corps of Engineers joint Section 404 guidelines for 12 fundamental programmatic elements to improve the effectiveness of compensatory mitigation.[1]

As illustrated in Figure 2–1, it is recommended that municipalities pursuing AC start by setting clear objectives. Then, the six activities shown on the left in blue are pursued, sometimes in parallel, to establish the program foundation. Next, the four items shown on the right in green are established on a case-by-case basis for each development permit, and together provide the financial assurance that the required mitigations will occur.

1. http://water.epa.gov/lawsregs/guidance/wetlands/upload/2008_04_10_wetlands_wetlands_mitigation_final_rule_4_10_08.pdf

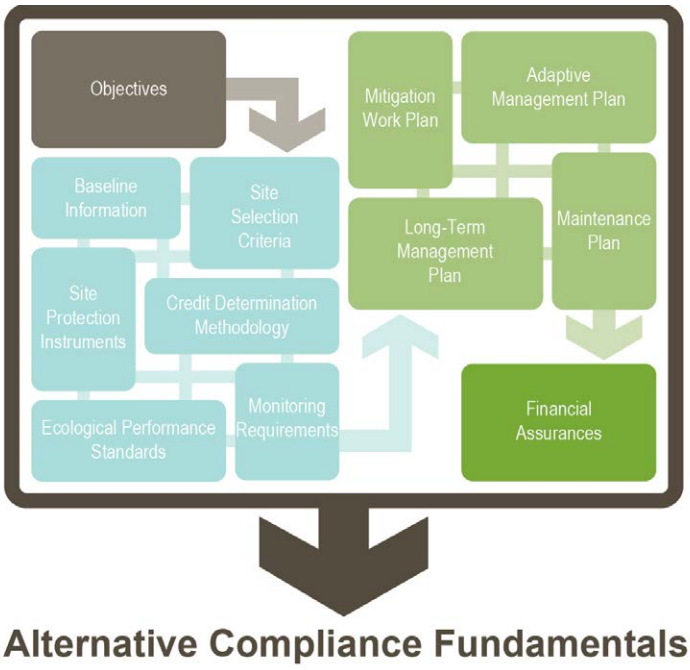

Figure 2–1 Diagram of Alternative Compliance Implementation

2.2 Potential Benefits of Alternative Compliance

AC programs for successful off-site, centralized SCMs are in their early phases of implementation, and a growing body of evidence supports the following potential benefits of AC:

- Offers flexibility in terms of location and timing of mitigation, which allows the municipality to place regional facilities in areas that would have the largest community and environmental benefits (Figure 2–2), in a timeframe that would best align with other local priorities and/or projects.
- Increases potential success with access to a larger tool kit of both on-site (in-kind) and off-site (out-of-kind) mitigation SCMs (i.e., stream mitigation can be considered an out-of-kind mitigation for projects that do not have on-site streams).
- Provides municipalities with greater control to direct SCM facilities in ways that best meet watershed-level needs.
- Allows for community input on ways in which centralized SCM facilities might fill other public needs (e.g., recreation) that would not be possible within a private development site.
- Larger, centralized SCM facilities may make better use of continuous simulation hydrologic modeling, which the NPDES permit recommends.
- Rationalizes trading ratios greater than one, which help offset risks (facility effectiveness and mitigation equivalencies) and enhance or even exceed environmental benefit requirements.
- Can be evaluated using the same runoff reduction spreadsheet models established for on-site mitigations, in order to provide common metrics for evaluating SCMs (i.e., treatment volume) across the board and in turn assist with optimizing SCM selection.
- Fine-grained metrics can create incentives to conserve natural vegetation and reduce mass grading by providing a defensible basis for computing runoff reduction volume per action.
- Can be modified to suit unique conditions and water resources protection objectives (e.g., the District of Columbia, Maryland, Pennsylvania and West Virginia have each adopted a unique framework).

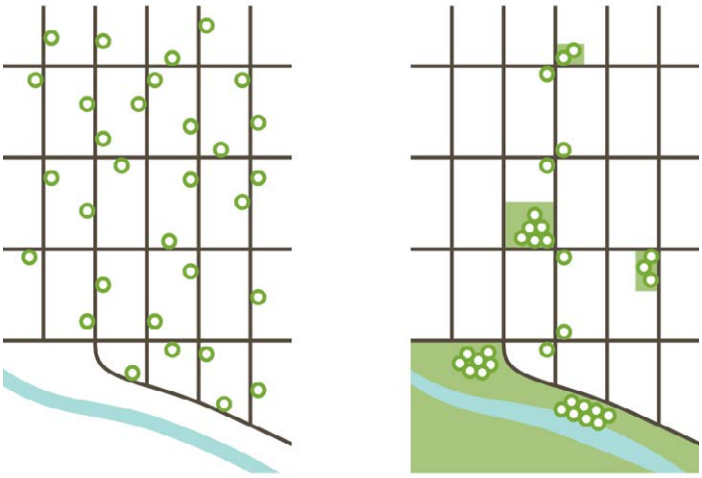

Figure 2–2 Compliance vs. Alternative Compliance - Alternative Compliance can lead to clustered LID projects that provide greater community-wide benefits; e.g., several rain gardens grouped together can form an aesthetic and functioning wetland surrounded by a recreation trail.

2.3 Potential Challenges of Alternative Compliance

Conversely to the benefits identified in Section 2.2, the following issues may arise when planning or implementing AC policies and programs:

- Municipalities often need to take a more active role in planning and maintaining centralized SCM facilities, sometimes assigning and/or taking on the responsibility of successful permit compliance.
- Difficulty establishing on-site / off-site performance equivalencies due to lack of standard methods for calculating trading ratios.
- Confusion and distrust among applicants and/or the community if AC programs are unclear or perceived as inconsistent/unfair from applicant to applicant (i.e. mixed messaging).
- NPDES requirements might vary from an on-site development area to its off-site receiving area (e.g., on-site mitigation may require 1/16th of an acre, but off-site may require 1/8th of an acre (or vice-versa) due to receiving waters have different mitigation requirements depending on their characteristics (wetlands, riparian areas, soil types, etc.)).
- Vague mitigation requirements from the State and Federal level, such as lack of specific program standards, implementation criteria, and/or definition of Maximum Extent Practicable (MEP).
- Difficultly quantifying and comparing success at different locations, which can inhibit permit compliance as well as discourage community and stakeholder support.
- Difficulty establishing fair equivalencies for off-site mitigations, especially in terms of out-of-kind projects.[1]
- Under funding capital costs of off-site SCM facilities, in part because of constant fluctuation of construction and land costs, but also because of development time frames.
- Insufficient funds and operational plans for ongoing maintenance.
- Mismatched timing of development project and construction of off-site mitigations (lag time).
- Lack of careful planning resulting in centralized SCM facilities located in an inequitable way that benefits specific neighborhood or community groups and not others; i.e., some facilities (recreation areas, street beautification/rain gardens, etc.) might be inaccessible or void for certain populations.

1. Pristel, Violetta. An Alternative Compliance Framework for Stormwater Management in the Central Coast Region. California State University Monterey Bay, Fall 2013, page 34.

2.4 Recommendations for Developing an Alternative Compliance Strategy

This Study was developed for the needs of the City of Riverbank, but is an appropriate and manageable path for similarily sized cities across the lower Stanislaus region. Taking cues from the researched national AC programs, the project team came up with the following recommendations for developing an AC strategy:

- Review existing case studies for assistance with developing in-lieu fee programs, as well as legal agreements between alternative compliance parties (e.g., Municipality and developer, municipality and other municipalities).
- Recognize unmitigated runoff at both the site scale and watershed scale.
- Establish clear criteria and zones within urban areas for alternative compliance programs that are flexible enough to encourage infill and high density development.
- Confirm appropriate “currencies” to evaluate mitigation success; e.g., runoff volume, impervious surface area, stream restoration.
    - Establish region-specific mitigation units into common trading currency (e.g. X amount of stormwater volume equals Y amount of riparian restoration).
- Understand cost data for different AC scenarios (e.g. for new development, redevelopment, different soils) and methodologies to determine cost-benefits of out-of-kind mitigation (e.g. trading ratios).
- Include conservative design and cost estimates in AC programs to ensure that in-lieu fee levels are sufficient to cover design, construction, and maintenance.
    - Focus on SCMs with known costs.
    - Delineate funding into project phases (design, construction, maintenance).
    - While the cost of design and construction may have to be met by a one-time payment, consider annual fee schedules to cover maintenance
- Build safeguards that reduce environmental and socioeconomic risks (trading ratios greater than 1:1).
    - Establish more stringent requirements for development within sensitive areas.
    - Ensure that off-site projects and associated SCMs comply with drainage management areas (DMAs), especially in regards to out-of-kind mitigations.
- Establish legal agreements between AC parties (e.g. municipality and developer, municipality and other municipalities).

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WATERSHED CHARACTERIZATION

First Street Basin, Riverbank
AECOM, 2013

CONTENTS

3.1 Overview

Based on current and probable future land use, and potential watershed health improvement opportunities, the Study Area boundary was determined using the “Planning Area” from the City of Riverbank General Plan. The Planning Area is the geographic area identified within the City of Riverbank General Plan land use designations. This area is distinct from the City limits and Sphere of Influence and consists of the City of Riverbank and unincorporated areas just west and east of the City. The Planning Area's southern terminus, like the City limits, is at Claribel Road. The Planning Area stretches east past Eleanor Avenue and as far west as McHenry Avenue, beyond the City limits.

The project team performed a comprehensive characterization of the entire Planning Area (hereafter 'Study Area') to provide a greater understanding of the degree of impact different areas may have on this Study’s final recommendations.

The characterization process can be summarized as follows:

1. Compiling and organizing available data
2. Utilizing this data to understand existing conditions and needs
3. Delineating sub-watershed boundaries within the Study Area
4. Prioritizing the sub-watersheds according to need and development potential

As a result of this process, certain portions of the Study Area were determined to be irrelevant to achieving the objectives of this Study, and consequently were not carried forward beyond the watershed characterization phase.

3.2 Data Assessment

Completing the characterization process required a comprehensive assessment of available data. The project team compiled, organized, and evaluated available physical, spatial, and water quality data within the General Plan boundary of the City of Riverbank. Information was gathered from a variety of sources, including regional data accessible through government agencies such as the Natural Resources Conservation Service (NRCS) and U.S. Geological Survey (USGS); local data and plans provided by the City of Riverbank; and publicly available reports and regulations. The project team catalogued and organized the following types of data:

- GIS Spatial Data
- Environmental Reports
- Regulations (Permits, Basin Plans, and Specifications)
- Land Use and Development Plans

A complete list of all reviewed data and documents is detailed in Appendix A.4.

To complement the data gathering and desktop analysis, the project team made an initial site visit to the City of Riverbank on February 14, 2014. The site visit was an opportunity to meet with local officials, gather field data, and inspect relevant infrastructure and facilities. The visit began with a short meeting with City officials (including: Senior Management Analyst Kathleen Cleek, Public Works Department Supervisor Daren Martin, Public Works Inspector Peter Lolonis, and City Engineer William Kull) regarding the intent of the site visit and important locations to visit.

Following the meeting, Mr. Martin led the project team on an infrastructure tour that included the City's seven stormwater outfalls to the Stanislaus River and the 1st Street Basin. After this, the project team visited other key locations including Jacob Meyer Regional Park, the Castleberg Basin, the Patterson Road corridor, and the recently developed Crossroads neighborhood (Figure 3–1).

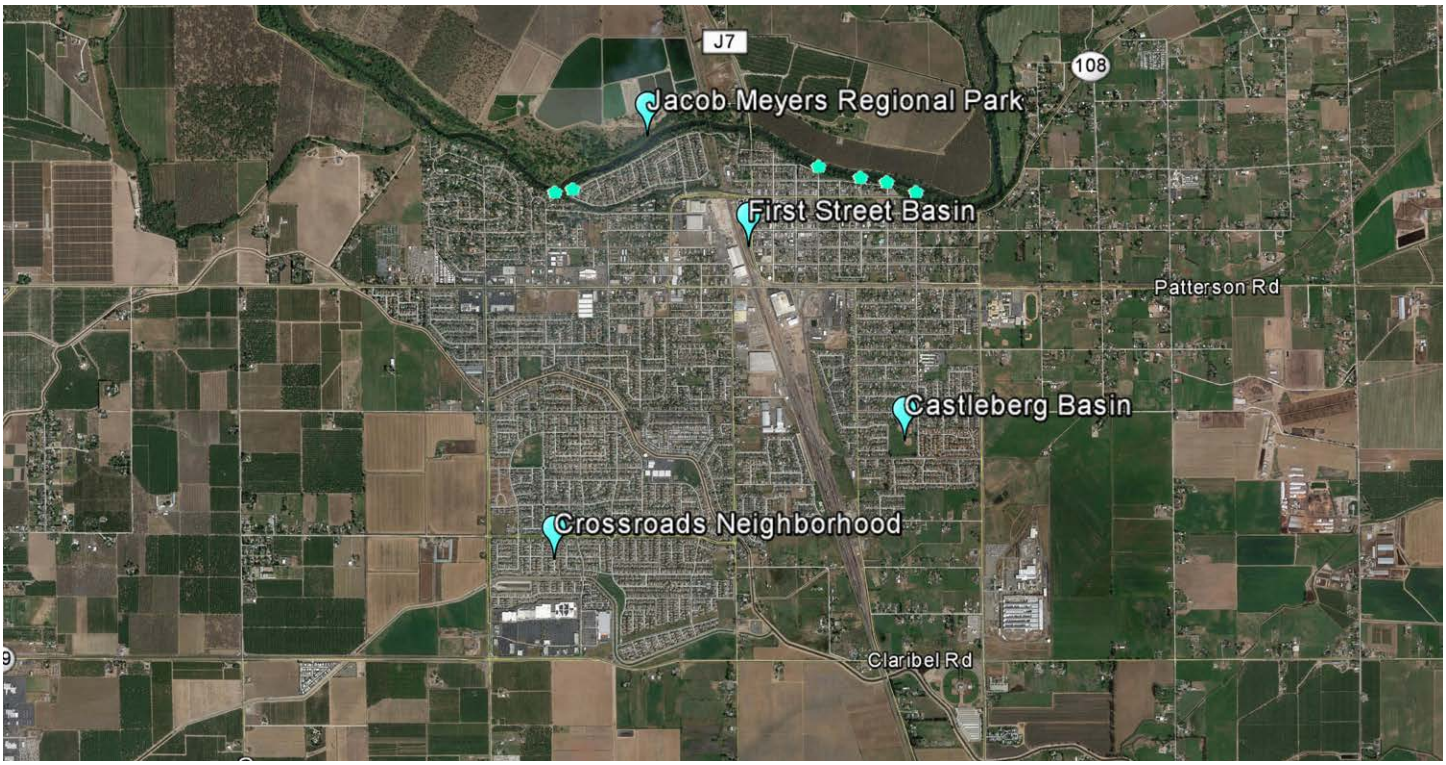

Figure 3–1 Land Use Designations from 2005-2025 General Plan

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3.3 Existing Conditions Analysis

Land Use & Development Patterns

The project team compiled and reviewed the City's current planning documents and utilized relevant land use data referenced within these documents to inform the anticipated development patterns within the Study Area (Table 3–1). All land within the Study Area was characterized according to general development areas (Agricultural Conservation, Very Low Density Development, Greenfield Development, Developed, Redevelopment, Infill Opportunity, and Downtown Specific Plan Opportunity Sites) based on the existing land uses and anticipated future land use, as shown in Figure 3–2. Additional development categories referenced in Figure 3–2 capture parcels and boundaries that are highly likely to redevelop and/or are planned for development. All development patterns / categories are described in detail on the following pages.

Data	Description
Boundaries	2013 City Boundary, 2013 Sphere of Influence, 2009 General Plan
Parcels	Lot lines, size, age, owner
Land Use	Land use designations within the City and regionally
Redevelopment Area	2009 Redevelopment Area
Opportunity Sites	2010 Downtown Specific Plan Opportunity Sites
Neighborhoods	Neighborhood designations within the City

Table 3–1 Summary of Geographic Information System (GIS) Land-use Data Provided by City of Riverbank.

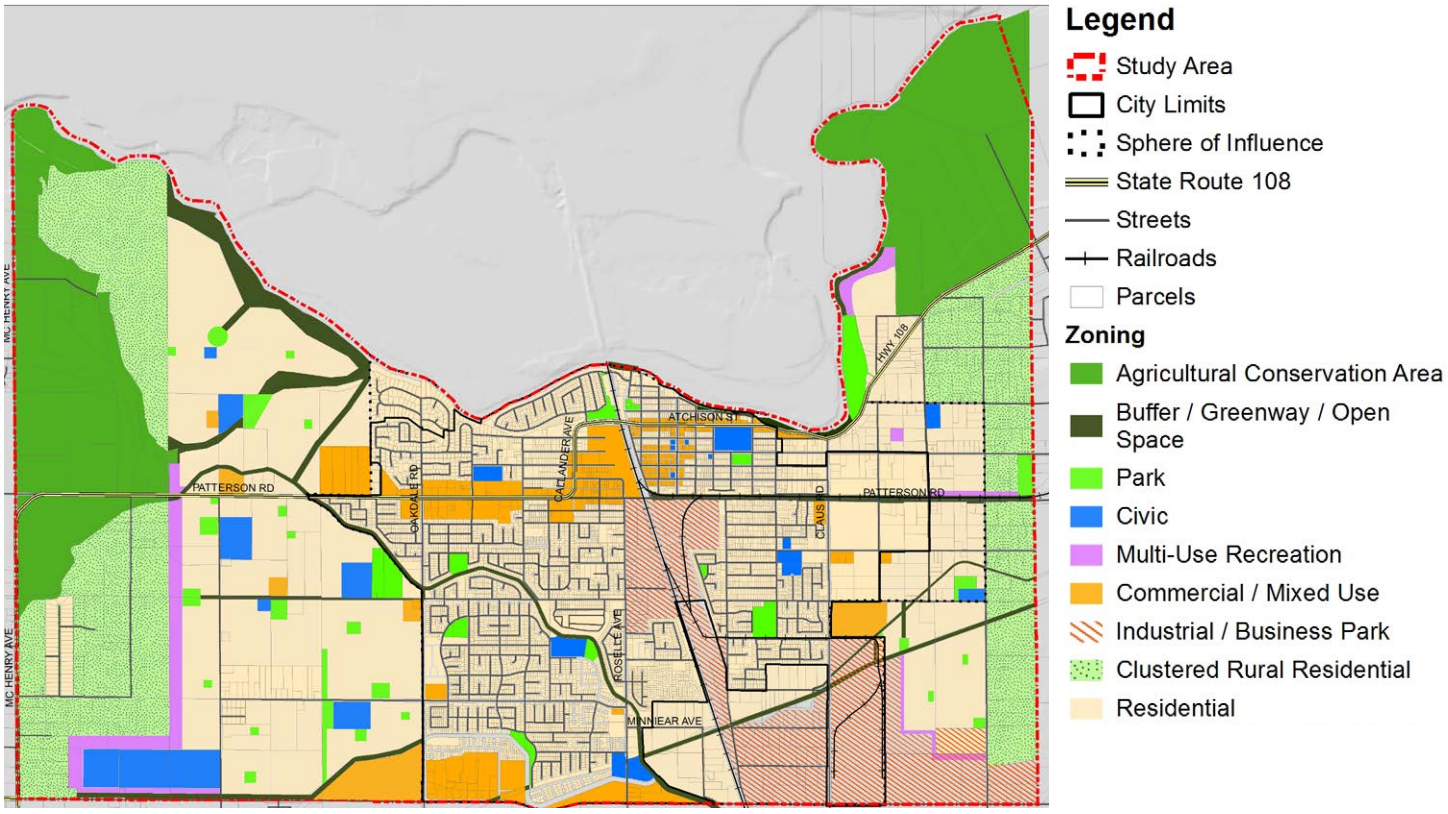

Figure 3–2 Land Use Designations from 2005-2025 General Plan

In 2010, the City of Riverbank was home to 22,678 people[1]. The age of development within the City Limits is shown in Figure 3–3. The City's annual growth rate has fallen in the past decade from an average of 3.6% down to 1.9%. A 1.9% growth rate translates to approximately 10,000 new residents by the year 2030[2]. To accommodate this growth, the City has planned for development in both infill and greenfield settings.

The City of Riverbank General Plan 2005-2025 was adopted in 2009 and establishes that Riverbank in 2025 will be a pleasant, quiet, friendly community with a distinct small-town character where Riverbank's unique qualities will be enhanced through a balance between the built environment, the natural environment, and the working agricultural landscape. To ensure that the City continues to develop in harmony with this vision, the General Plan lays out numerous goals and policies. The General Plan contains 14 different land use categories, representing the assumed Planning Area characteristics at buildout.

Nearly all of the area within the City Boundary has been developed into a variety of urban land uses (residential, commercial, industrial, mixed use, etc.). However, many areas have opportunities for redevelopment. These locations are primarily found within the delineated Redevelopment Area, Infill Opportunity Area, and vacant and underutilized lots identified in the Downtown Specific Plan (Figure 3–4).

The land outside the City Boundary is predominantly agricultural, with some rural residential and open space. Large areas at the east and west edges of the Planning Area are intended to remain undeveloped and rural in order to maintain a buffer with neighboring communities. To accommodate future growth, a significant portion of existing undeveloped land may convert to urban use. This transition will result in increased levels of stormwater runoff and a shift from

1. U.S. Census Bureau
2. LAFCO, 2013

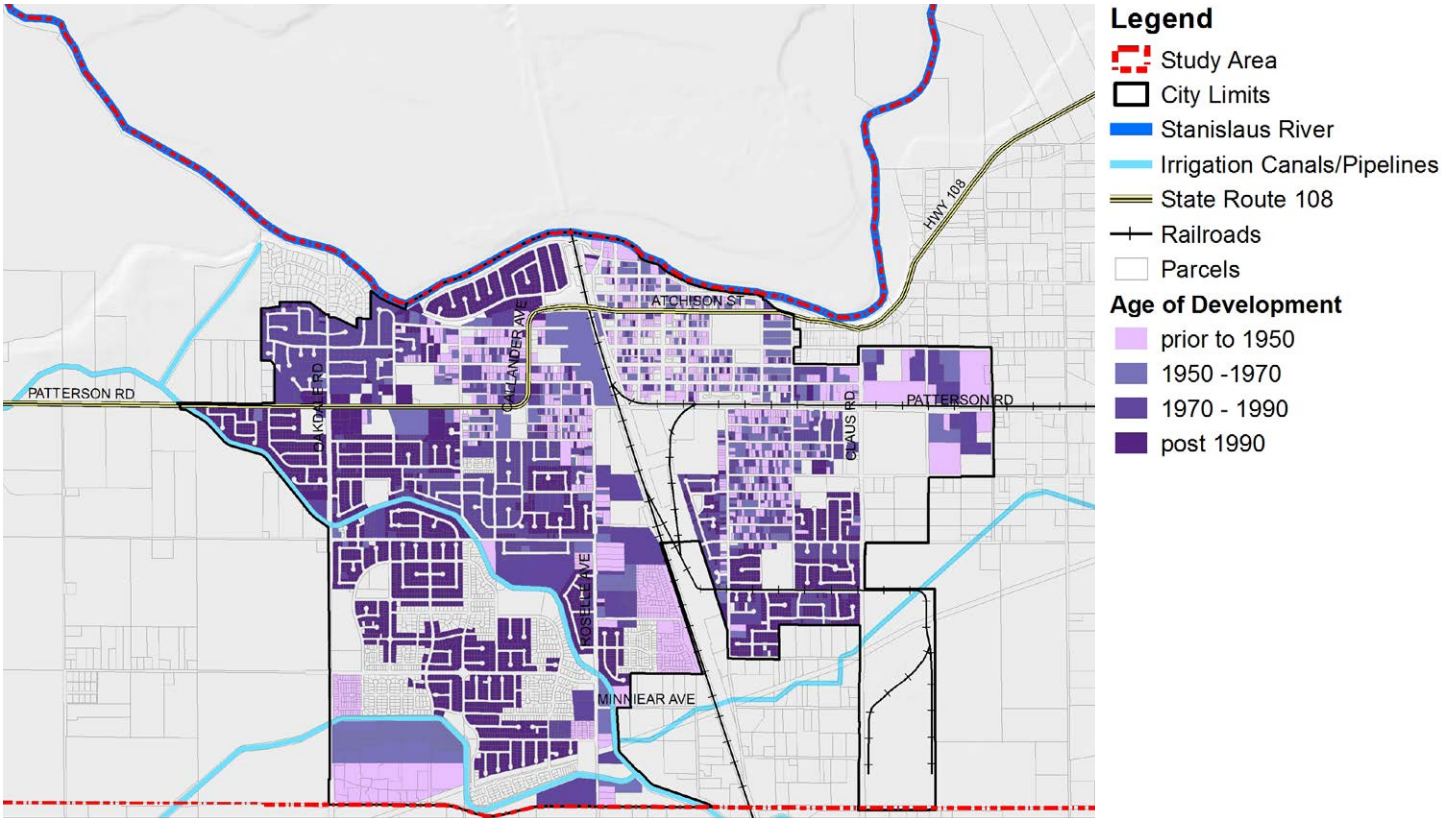

Figure 3–3 Age of development within City Limits

the pollutants of concern typically found in agricultural runoff to those found in urban runoff.

Anticipated development patterns within the Study Area are displayed in Figure 3–4 and are described in detail in the following sections.

Redevelopment Area

This designation, identified on the Riverbank online GIS portal, represents the portions of the Study Area that have the most opportunity to develop within the City, and includes vacant lots, the Infill Opportunity Area and Downtown Specific Plan Opportunity Sites (described below), neighborhoods with reinvestment opportunity, and large vacated industrial sites. Land use changes may occur in this area, such as the conversion of a large industrial area to a residential or mixed use development; however, much of the area will likely retain current land uses following redevelopment. Unless the redevelopment of these parcels incorporates LID or off-site mitigation, this area will remain highly impervious and the stormwater captured by the existing drainage system will continue to carry urban pollutants to the Stanislaus River and contribute to large peak flows.

Infill Opportunity Area

This designation refers to an already developed portion of the Redevelopment Area where properties are vacant or otherwise underutilized. As described in the General Plan, this is the area that will be the focus of reinvestment, redevelopment, and revitalization efforts through 2025. In order to encourage development, the City plans to employ a vast array of strategies including public-private partnerships, strategic public investment, and infill incentives. The Infill Opportunity Area encompasses many urban land uses and the City envisions parking and defunct industrial lots turning over to high-density residential and mixed use land uses that prioritize foot and bike travel.

One major change that may affect the area's circulation would be the re-designation of the current State Route 108 (SR108) Caltrans right-of-way alignment from Patterson Road/Callander Avenue/Atchison Street (through the north end of the City) to Claribel Road (on the southern edge) into a City right-of-way by creating a bypass to the south of the City. If the highway alignment is moved south, the City plans to transform the existing highway corridor into a pedestrian- and bicycle-friendly environment. The transformation of a four-lane road and accompanying elimination of surface parking lots may result in a large reduction of impervious area, which in turn would reduce the stormwater volume and urban pollutants in this dense area near the river. The roadway conversion may also offer great potential for synergies with LID stormwater management techniques, providing further opportunity for water quality benefit.

Downtown Specific Plan Opportunity Sites

This designation refers to sites identified in the 2010 Downtown Riverbank Specific Plan. The Plan focuses on the approximately 218-acre historic core of the City and is intended to guide long-term downtown revitalization through infill, redevelopment, and adaptive re-use. Within this core area, specific sites have been identified as those most likely to undergo redevelopment in the near future. The most significant opportunity site identified in the Plan is the 32-acre Cannery parcel, which currently discharges all of its stormwater into the sanitary sewer system.

Greenfield Development Area

This designation includes current greenfield areas (predominantly agricultural and rural residential) that may undergo development as the urban zone of the City pushes out to the east and west. Conversion of this area from highly pervious, undeveloped open space to more impervious neighborhoods would have a significant impact on stormwater quantity and quality, and would necessitate the development of stormwater management systems.

Very Low Density Development Area

This area at the eastern and western sides of the Study Area may undergo limited redevelopment, but would maintain a very rural character in order to preserve open space and act as a buffer between urban areas. New residential development would be low density (clustered rural residential) and open spaces could be naturalized or maintain current uses, including agricultural operations or grazing activities. The intent is to preserve large and continuous parcels to promote habitat connectivity and allow for groundwater recharge and open space oriented recreation. Development trends in this area may not have a significant impact on the need for additional future stormwater management. However, given the agricultural uses in this area, it may be important to consider the potential water quality impacts that pesticides, fertilizer, and animal manure have on runoff.

Agricultural Conservation Area

These areas in the northwest and northeast provide for ongoing agricultural operations that will undergo little to no land use change. As indicated in the General Plan, properties within this area are generally quite large and have high-quality soils. As previously mentioned, when considering stormwater management projects in and around this area, it will be important to consider the potential water quality impacts that agricultural activities have on runoff.

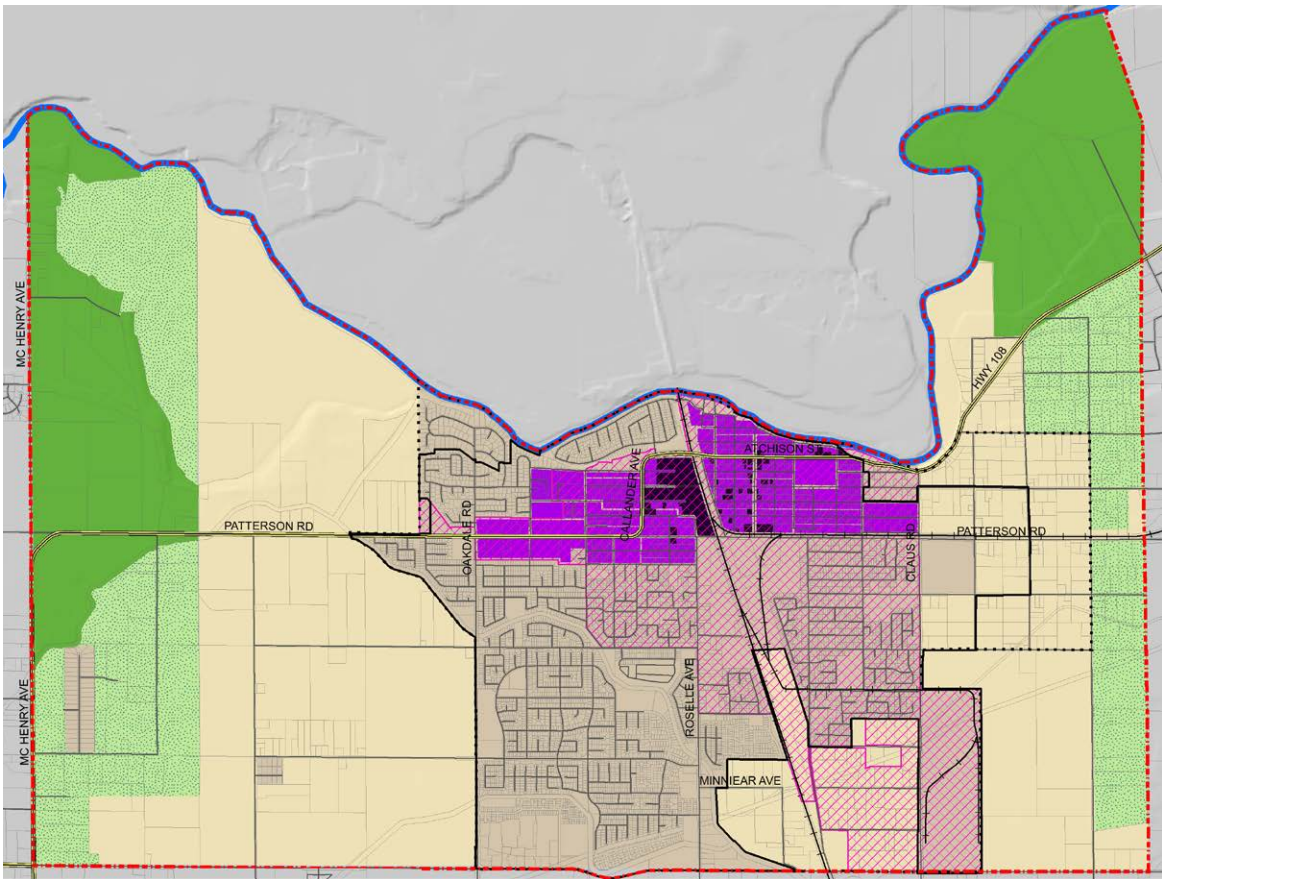

Figure 3–4 Anticipated Development Patterns within the Study Area

Physical Conditions

Topography

The entire Study Area is relatively flat, with slopes typically less than 2%. There is a gradual decline in elevation from east to west that results in surface water predominantly flowing in a southwestern direction (Figure 3–5). The exception to this occurs along the Stanislaus River, particularly in the large historic floodplain in the northwest, where the land slopes toward the river.

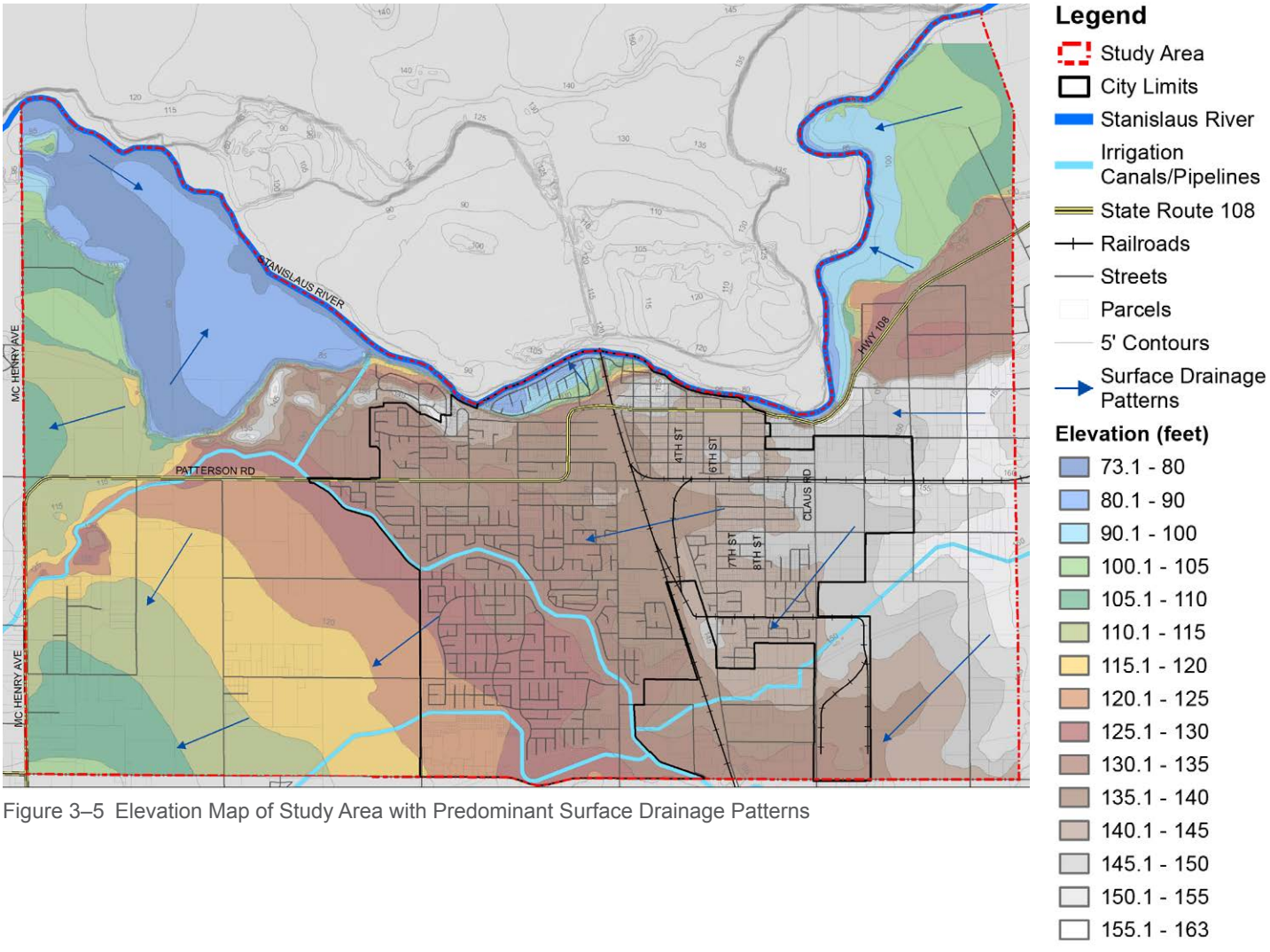

Figure 3–5 Elevation Map of Study Area with Predominant Surface Drainage Patterns

Soils

As displayed in Figure 3–6, the southeastern region of the Study Area, and much of the area within the City Boundary, is underlain by Group D soil, which is characterized by low infiltration and high runoff potential. Better infiltrating Group A and B soils are present in the less developed western and northeastern areas.[1]

Hardpan

Infiltration strategies will also be affected by the shallow hardpan condition found throughout much of the southeast portion of the Study Area, as shown in Figure 3–7. The hardpan, a thick layer of dense soil found beneath the topsoil layer, is most likely very impervious and will require special design considerations in regard to stormwater management.

1. Soils information came from USDA NRCS, which provides access to the largest natural resource information system in the world. Soils are classified into four groups according to their performance under given set of physical conditions: Group A (gravel, sand, sandy loam) are highly permeable and produce the least surface runoff; Group B soils (silt loam, loam) have good permeability; Group C soils (sandy clay loam) offer fair to poor drainage; and Group D soils (clay loam, sandy clay, silty clay, clay) have very little infiltration potential and produce the greatest surface runoff.

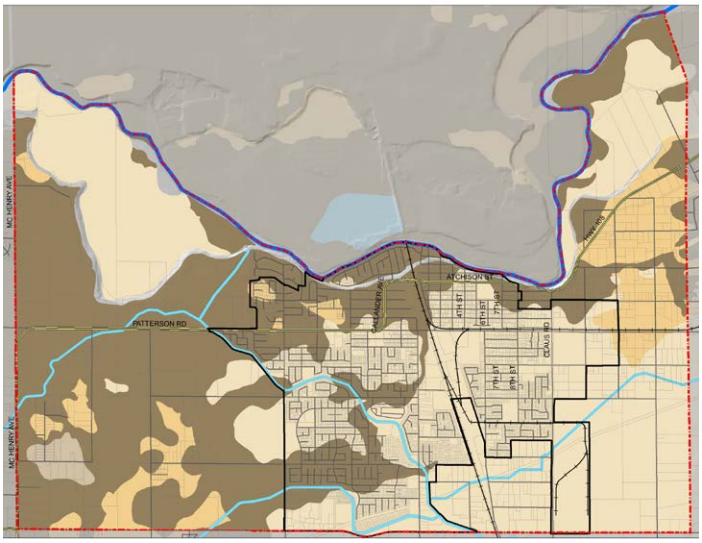

Figure 3–6 Sub-surface Soils

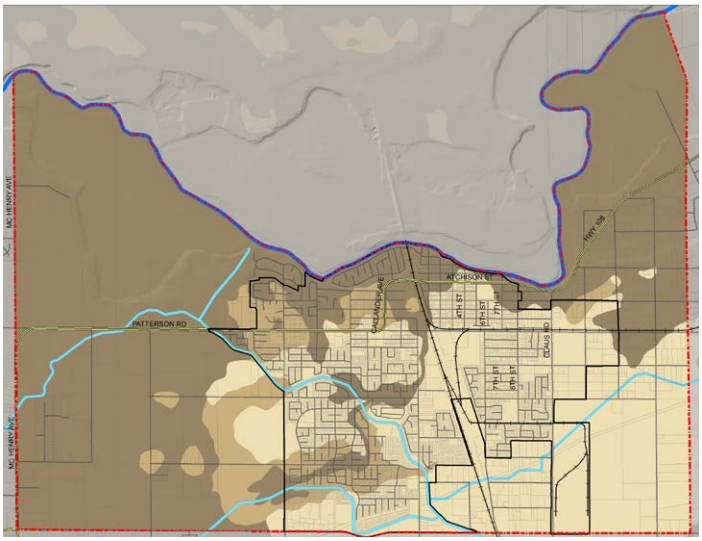

Figure 3–7 Depth to Hardpan Condition

Legend

- Study Area
- City Limits
- Stanislaus River
- Irrigation Canals/Pipelines
- State Route 108
- Railroads
- Streets
- Parcels

Depth to Hardpan

- 1.5' - 3'
- 3' - 5'
- > 5'

Hydrologic Soil Group

- A - Highest Infiltration Potential
- B - Good Infiltration Potential
- C - Poor Infiltration Potential
- D - Lowest Infiltration Potential
- Wastewater Treatment Plant

Floodplain and Wetlands

The 100-year floodplain covers minor areas along the narrow band of the river corridor, as shown in Figure 3–8. In the northeast and northwest, there are large zones within the 500-year floodplain that extend further out from the river. Wetland areas, as mapped in the National Wetland Inventory, are located along the river corridor as well.

Groundwater

Groundwater plays a significant role in the hydrologic process and can influence the design of stormwater management facilities. A high groundwater table (i.e., shallow groundwater) that is close the surface must be protected from contaminants that may be present in surface runoff. However, promoting groundwater recharge maintains local water tables, provides base flow to streams and rivers during dry periods, and maintains the integrity of riparian habitats. Shallow groundwater is generally only present in the lower elevation areas adjacent to the river and within the floodplain. The expected depth to groundwater is shown in Figure 3–9.

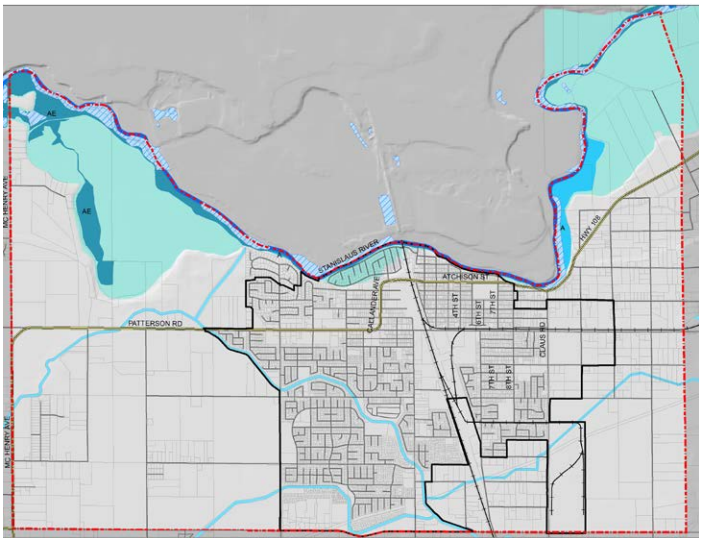

Figure 3–8 Flood Zones and Wetlands

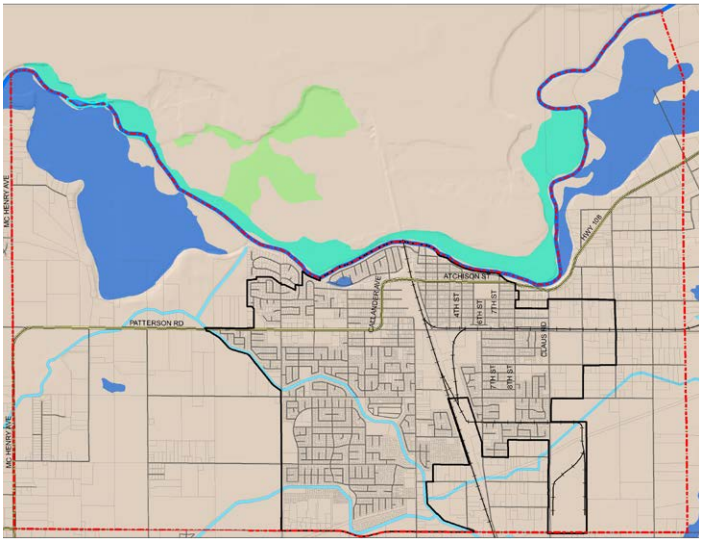

Figure 3–9 Expected Depth to Groundwater

Legend

- Study Area
- City Limits
- Stanislaus River
- Irrigation Canals/Pipelines
- State Route 108
- Railroads
- Streets
- Parcels

Flood Zones

- Base Floodplain
- 100 Year Floodplain
- 500 Year Floodplain
- National Wetland Inventory

Depth to Groundwater

- < 3'
- 3' - 5'
- 5' - 7'
- > 7'

Infrastructure

A network of existing underground stormwater drainage pipes ranging in size from six inches to sixty inches serves many of the developed portions of the City. These systems flow to detention basins or directly to outfalls (at both the river and Modesto Irrigation District (MID) canals). Stormwater captured within the storm drain system is ultimately discharged to either the Stanislaus River or the MID canals.

In total, there are six outfalls to the Stanislaus River, five outfalls to MID canals, and nine detention basins. Outside of the City Limits, the only existing stormwater infrastructure is associated with the Riverbank Industrial Complex. Figure 3–10 shows existing storm drain infrastructure, as obtained from the 2008 Storm Drain System Master Plan (SDSMP)[1].

Multiple studies previous to this similarly propose new storm drain infrastructure in and around the City. Most notable is the 2008 SDSMP. Proposed storm drain system improvements are summarized in Figure 3–11.

1. Nolte Beyond Engineering. 2008 (June). City of Riverbank Storm Drain System Master Plan.

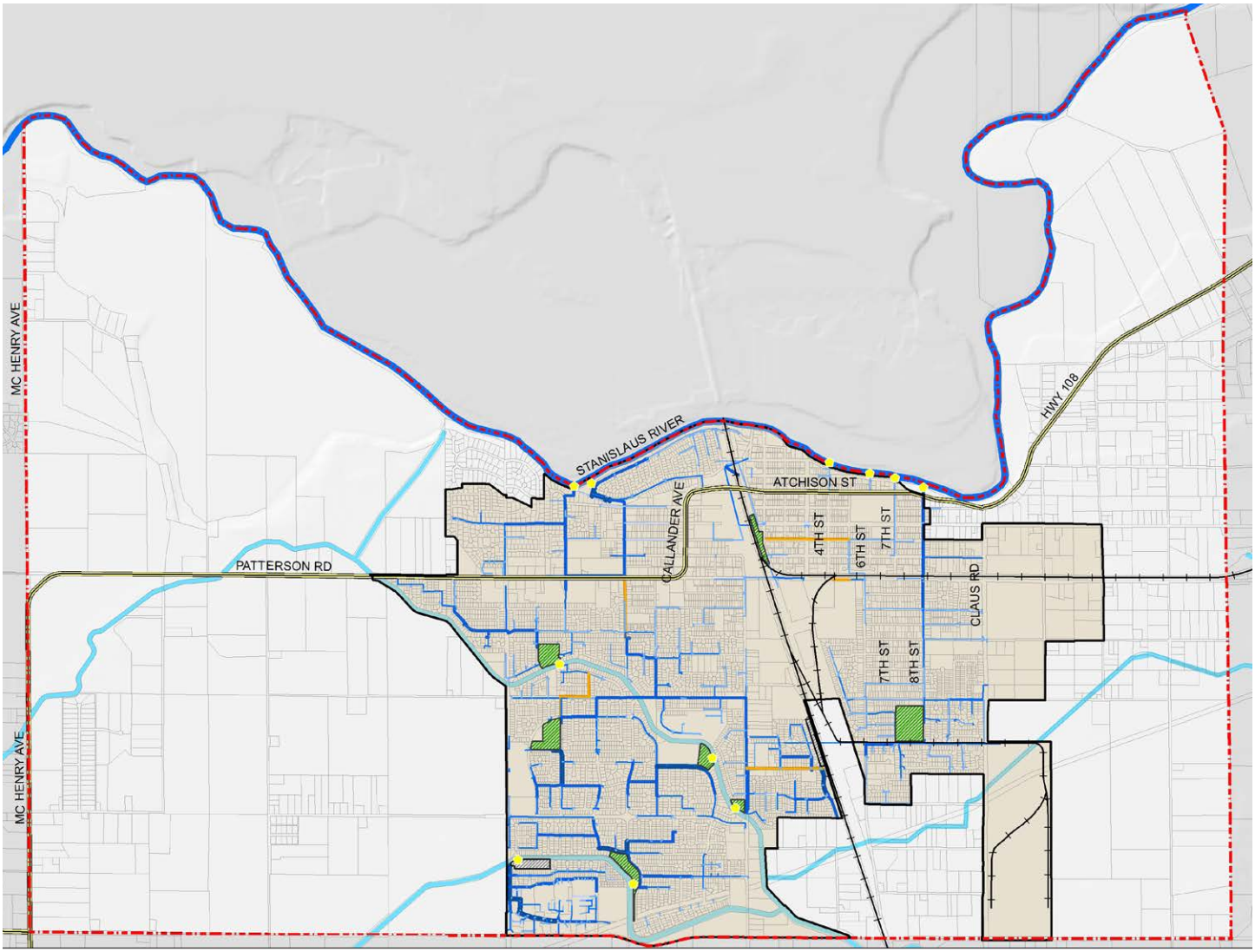

Figure 3–10 Existing Storm Drain System Infrastructure

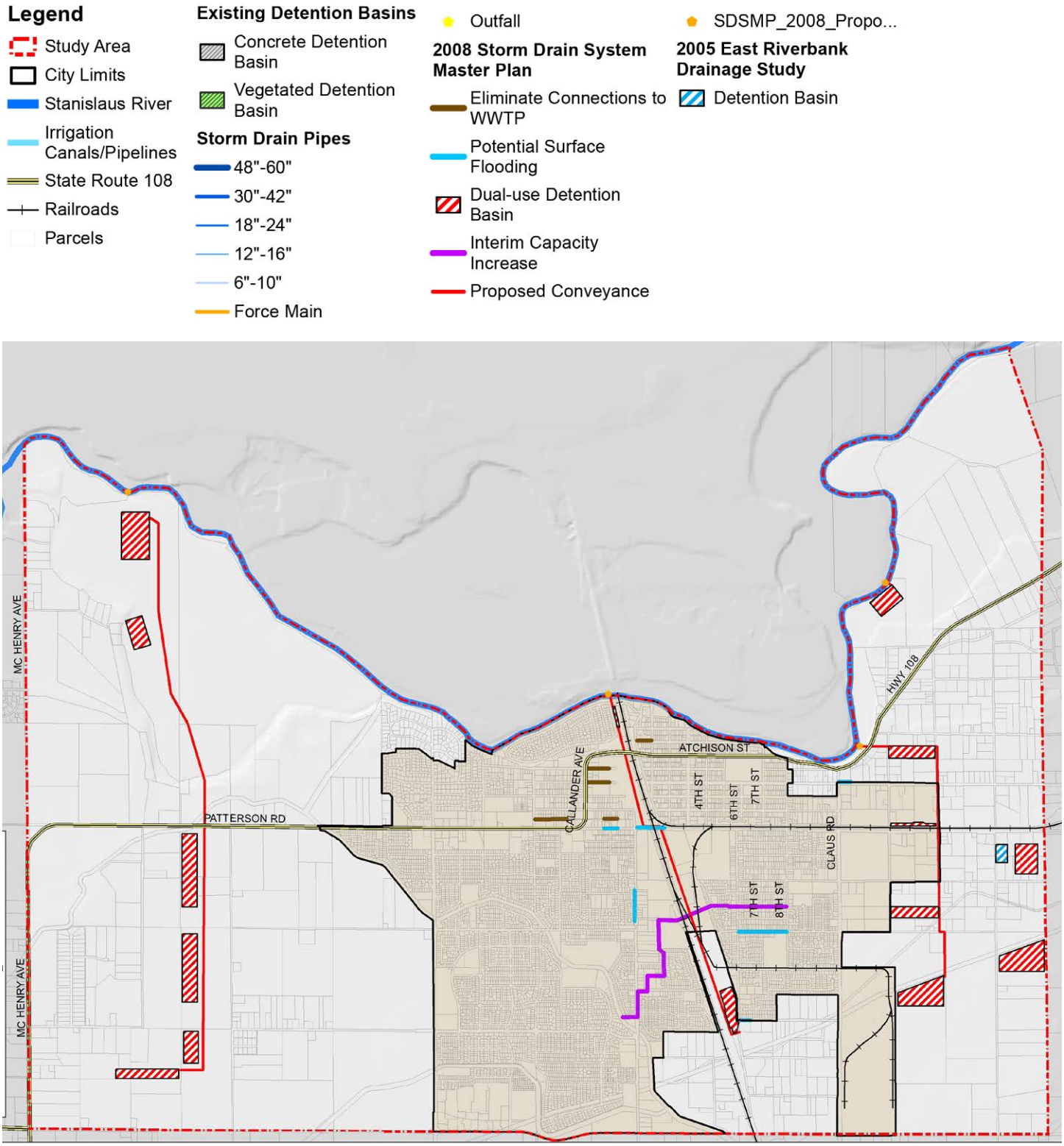

Figure 3–11 Storm Drain System Infrastructure Already Proposed

3.4 Sub-watershed Delineation

The project team identified 20 distinct sub-watersheds within the Study Area through an analysis of USGS surface topography data, along with available data on existing storm drain infrastructure and field investigations. These sub-watersheds were delineated as the catchment area for each outfall (at both the river and MID canals). For those areas that did not drain to the storm drain system or any outfall (typically outside of the existing City Limits), the sub-watershed was determined by the fate of runoff at the edge of the Study Area. To the north, this drainage was overland flow to the Stanislaus River, and to the south, this drainage was overland flow off-site. Two areas, the Riverbank Industrial Complex and the zone around the vacant Cannery parcel, do not follow any of these trends (Figure 3–12). The Riverbank Industrial Complex captures and treats runoff on-site while the runoff from the zone around the vacant Cannery parcel is conveyed to the City's Wastewater Treatment Plant.

Missing or incomplete information for the storm drain system made it difficult to determine drainage patterns in some areas of the City. In these situations, the project team made assumptions based on information from the 2008 SDSMP, relevant development plans, and engineering judgment. Figure 3–13 and Figure 3–14 show the 20 delineated sub-watersheds. Figure 3–13 includes areas within the Candlewood, 7th Street, and 8th Street Sub-watersheds that had no information and required assumptions regarding where to connect and route drainage. The final sub-watershed boundaries as utilized for the remainder of the Study are shown in Figure 3–14.

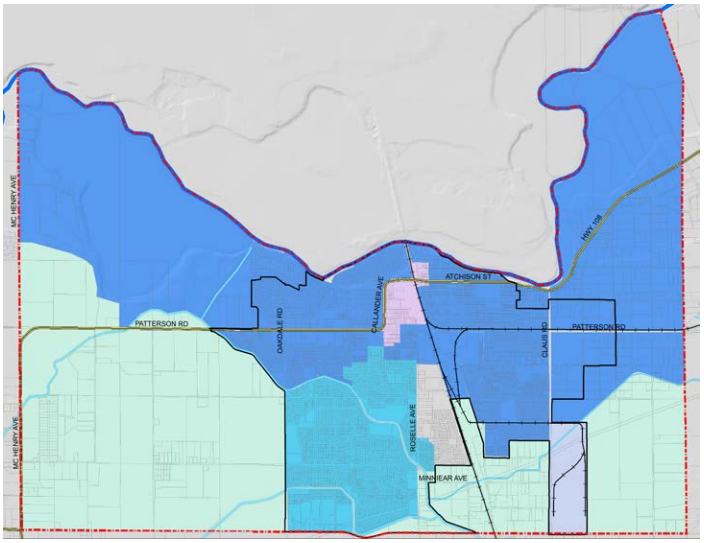

Figure 3–12 Runoff Destination within the Study Area - see Legend on pg.25

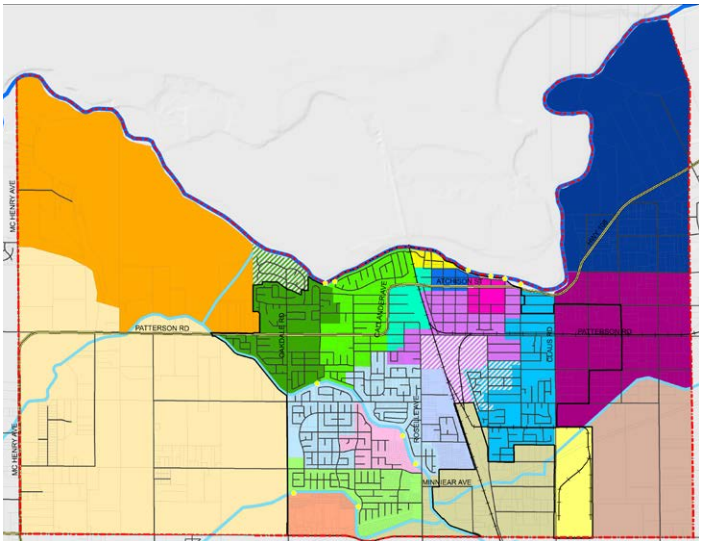

Figure 3–13 Sub-watershed Delineation with Major Assumption Areas - see Legend on pg.25

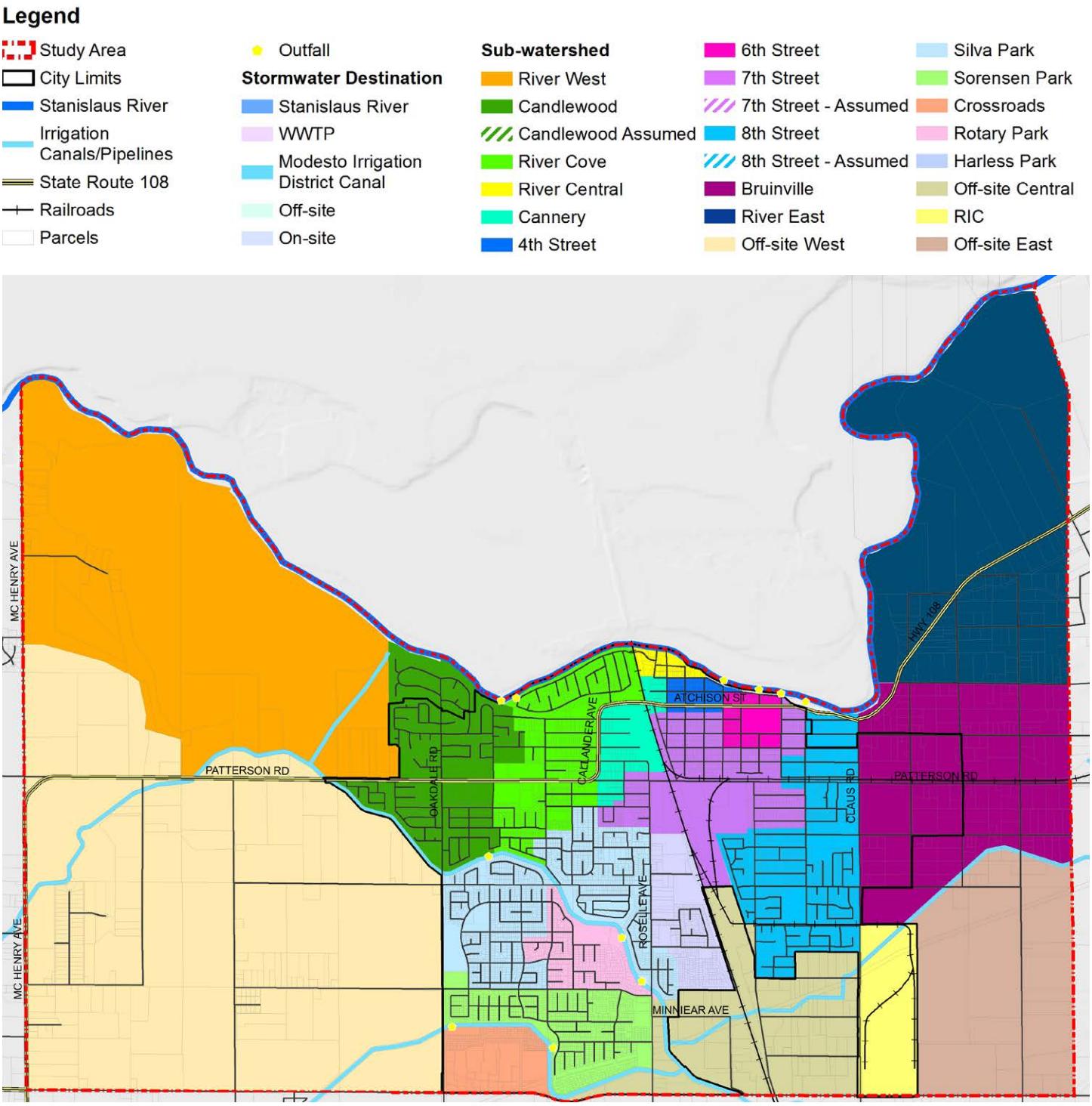

Figure 3–14 Final Sub-watershed Boundaries Used for the Study

3.5 Sub-watershed Descriptions

The delineated sub-watersheds exhibit a diverse set of existing characteristics, encompassing a range of sizes, physical conditions, and development patterns. Table 3–2 summarizes the sub-watershed characteristics most relevant to this Study. The project team analysed the documented sub-watershed conditions in order to identify potential needs and issues related to drainage and water quality. The primary needs and site constraints that emerged within various sub-watersheds include:

- Developed areas that directly discharge to the Stanislaus River
- Existing soil conditions that inhibit infiltration (clay and hardpan)
- Stormwater pipes that drain to the sewer system (i.e. cross-connection areas)
- Hydraulic capacity issues (i.e. surface flooding and undersized existing basins)
- Erosion at several of the outfall locations
- Limited space for additional stormwater management

	Existing Characteristics		River West	Candlewood	River Cove	River Central	Cannery	4th Street	6th Street	7th Street	8th Street	Bruinville	River East	Off-site West	Silva Park	Sorensen Park	Crossroads	Rotary Park	Harless Park	Off-site Central	RIC	Off-site East
PHYSICAL CONDITIONS	**Size** (acres)		1260	329	249	21	83	29	47	280	342	613	937	2120	368	205	104	105	124	421	151	529
	Mean Slope [1]		2.32%	2.5%	2.5%	5.0%	0.8%	2.7%	0.4%	0.6%	0.8%	1.1%	1.7%	0.4%	0.43%	0.4%	0.3%	0.5%	0.4%	0.5%	0.8%	0.7%
	Dominant Soil Group		D / A	A	D / A	A	A	A / D	D / A	D	D	D / C	D / A	A	D	A / D	D	D / A	D	D	D	D
	Probable Hardpan Condition		Deep to None	Deep to None	Shallow to Deep	Deep to None	Shallow to Deep	Deep	Shallow	Shallow	Shallow	Shallow to Deep	Deep to None	Deep to None	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
	Runoff Curve Number (composite) [2]		69	83	78	82	88	90	95	93	92	77	58	54	88	84	93	85	92	85	92	83
STORM DRAINAGE	**Storm Drain Pipe Network**		-	12 - 42"	10 - 42"	12"	12 - 24"	8 -1 2"	8 - 12"	4 - 21"	12 - 30"	-	-	-	12 - 54"	12 - 54"	6 - 48"	12 - 72"	12 - 48"	-	-	-
	Detention Basins		2 - Proposed	1 - Vegetated with Lift Station	1 - Proposed	-	1 - Proposed	-	-	1 - Vegetated with Lift Station	1 - Vegetated with Lift Station	4 - Proposed	1 - Proposed	4 - Proposed	2 - Vegetated with Lift Station	1 - Vegetated	1 - Concrete	1 - Vegetated	1 - Concrete with Lift Station	1 - Proposed	1 -Vegetated with Lift Station	2 - Proposed
	Runoff to Basin [3]		-	45%	-	-	-	-	-	64%	35%	-	-	-	100%	100%	100%	100%	100%	-	100%	-
	Direct Runoff [4]		100%	56%	100%	100%	100%	100%	100%	36%	65%	100%	100%	100%	-	-	-	-	-	100%	-	100%
	Discharge Type		Overland flow	Outfall pipe	Outfall pipe	Overland flow	Combined sewer	Outfall pipe	Outfall pipe	Outfall pipe	Outfall pipe	Overland Flow	Overland flow	Overland flow	Outfall pipe	Outfall pipe	Outfall pipe	Outfall pipe	Outfall pipe	Overland flow	Contained on-site	Overland flow
	Runoff Destination		Stanislaus River	Stanislaus River	Stanislaus River	Stanislaus River	WWTP	Stanislaus River	Stanislaus River	Stanislaus River	Stanislaus River	Stanislaus River	Stanislaus River	Off-site	Irrigation canal	Irrigation canal	Irrigation canal	Irrigation canal	Irrigation canal	Off-site		Off-site
	Total Runoff Depth (in)		0.02	0.22	0.12	0.19	0.39	0.44	0.73	0.61	0.56	0.10	0.01	0.03	0.39	0.25	0.63	0.28	0.56	0.28	0.56	0.22
	Direct Runoff Volume (acre-feet)		2.0	3.3	2.5	0.3	2.7	1.1	2.8	5.1	10.3	5.0	0.6	5.6	-	-	-	-	-	9.7	-	9.6
	Total Runoff Volume (acre-feet) 6		2.0	5.9	2.5	0.3	2.7	1.1	2.8	14.2	15.8	5.0	0.6	5.6	11.9	4.3	5.5	2.4	5.7	9.7	7.0	9.6
LAND USE	**Portion Currently Developed**		-	100%	100%	100%	100%	100%	100%	100%	100%	7%	-	2%	100%	100%	100%	100%	100%	14%	100%	-
	Development Potential	**Redevelopment**	-	21%	56%	100%	98%	100%	100%	100%	100%	-	-	-	27%	-	-	-	75%	-	100%	-
		New Development	50%	-	-	-	-	-	-	-	-	74%	17%	60%	-	-	-	-	-	86%	-	73%
	Developed Area with Identified Redevelopment Potential	Specific Plan Opp. Sites	-	-	-	-	38%	7%	5%	4%	-	-	-	-	-	-	-	-	-	-	-	-
		Infill Opportunity Area	-	16%	45%	41%	50%	90%	90%	29%	8%	-	-	-	-	-	-	-	-	-	-	-
		Redevelopment Area	-	5%	11%	59%	10%	4%	5%	67%	92%	-	-	-	27%	-	-	-	75%	-	100%	-
	Developed Area Less Likely to Redevelop		-	79%	44%	-	2%	-	-	-	-	7%	-	2%	73%	100%	100%	100%	25%	14%	-	-
	Greenfield Development Area		50%	-	-	-	-	-	-	-	-	74%	17%	60%	-	-	-	-	-	86%	-	73%
	Greenfield Area Less Likely to Develop	Very Low Density Development Area	26%	-	-	-	-	-	-	-	-	19%	22%	21%	-	-	-	-	-	-	-	27%
		Agricultural Conservation Area	24%	-	-	-	-	-	-	-	-	-	61%	17%	-	-	-	-	-	-	-	-

Table 3–2 Summary of Sub-watershed Characteristics

Table Notes

1. ‘Mean Slope’ determined through GIS analysis of USGS topography data
2. ‘Runoff Curve Number’ is an empirical parameter developed by USDA to estimate the approximate amount of direct runoff from a rainfall event that will occur in small catchments characterized by different landscapes (concrete, park land, farm land, etc.)
3. ‘Runoff to Basin’ is the portion of the sub-watershed that drains to a detention basin before discharging off-site (to the Stanislaus River or a MID canal)
4. ‘Direct Runoff’ is the portion of the sub-watershed that drains directly to the runoff destination (either through sub-surface conveyance pipes or surface overland flow) without going through any retention/detention facility
5. Total runoff was calculated using the NRCS method and a 2-year, 24-hour, Type-1 storm (1.2”), as given by IDF curves from Modesto County

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Sub-watersheds Draining to the Stanislaus River

Of the twenty sub-watersheds delineated within the Study Area, ten drain to the Stanislaus River. In some of these sub-watersheds, portions drain first to vegetated detention basins that attenuate stormwater flows before pumping to a river outfall. It is likely that stormwater passing through detention basins receives some water quality treatment through physical processes (i.e., filtration or settling) and/or biological processes prior to discharge into the River. The degree of treatment, however, depends on a variety of factors, including: retention time in the basin, distance from the river, and specific basin characteristics (e.g., vegetation type, size, slope, etc.). Brief descriptions of each sub-watershed draining to the Stanislaus River are presented below.

River West – The River West Sub-watershed is the second largest sub-watershed in the Study Area and encompasses the western area outside the existing City Limits. Runoff from this sub-watershed ultimately reaches the Stanislaus River via overland flow; however, as the sub-watershed has very low density land uses and is predominantly vegetated and pervious, it generates minimal runoff. Future development of the sub-watershed will occur as the City pushes west into the Greenfield Development Area. However, based on recent development patterns and discussions with City staff, it is expected that the pace of development in this area will be gradual. To accommodate the increase in stormwater runoff from new development, the 2008 SDSMP proposed two new dual-use detention basins with discharge to a new river outfall.

Candlewood Area – The Candlewood Area Sub-watershed is located in the northwest corner of the City Limits and contains a mix of residential neighborhoods, as well as a commercial corridor along Patterson Road (SR108). With the exception of the properties along Patterson Road, minimal re-development is anticipated in these areas.

The northern portion of the sub-watershed is a fully developed residential neighborhood that drains directly to a river outfall. This sub-watershed has more vegetation and tree cover than many other areas of the city and thus storm events result in relatively low runoff depths. The southern portion of the sub-watershed drains to the stormwater basin at Safreno Park, a vegetated multi-use detention basin. Stormwater is pumped from the basin into the storm drain system at Patterson Road, where it then flows by gravity to the river outfall (Figure 3–15). The 2008 SDSMP recommends that the 15” outfall pipe be replaced with an appropriately sized pipe (~36”) and to further study the effects of possible stormwater cross connections to the wastewater treatment plant (WWTP). The location of the outfall pipe was not accessible to the project team for inspection.

Figure 3–15 Approximate Location of the Candlewood Sub-watershed Outfall

River Cove – The River Cove Sub-watershed is similar to the Candlewood Area Sub-watershed in that it is a developed residential neighborhood that generates less runoff compared to other sub-watersheds within the City. It is the only developed area with a significant portion of land area (~20%) within the 500-year floodplain. A few areas have stormwater cross-connections to the WWTP that the City would like to disconnect (namely at Parsely Street between Jackson and Callander Avenues). Runoff discharges to the Stanislaus River at an outfall located near the western edge of the City Limits. A substantial pumping system accompanies this discharge point, which is to be used if the river overtops the levee, thereby protecting the portions of the neighborhood located in the floodplain.

River Central – The River Central Sub-watershed is the smallest sub-watershed within the Study Area, draining only 20 acres. Though it is located within the Redevelopment Area, the larger parcels appear to be recently developed. No underground storm drain system infrastructure appears to be located in the area, with runoff either infiltrating or routing as overland flow. Beneath the First Street bridge, a culvert and rock-lined swale convey flow from an adjacent senior housing development and park toward the river. The catchment area routed to the swale is small and flows appear to be adequately controlled and dispersed before reaching the river.

Figure 3–16 Top - Control structures at River Cove Sub-watershed Outfall; Bottom - River Cove Sub-watershed Pumping Station

Figure 3–17 Top - Culvert Beginning at Swale in River Central Sub-watershed; Bottom - Rock-lined Swale Toward the Stanislaus River in River Central Sub-watershed

4th Street – This relatively small sub-watershed is a fully developed older residential neighborhood. Though the area appears to have soil conditions amenable to infiltration (Group A with deep/no hardpan condition), the lots in this sub-watershed are relatively small, and the proportion of impervious area is high, with limited space available where stormwater can infiltrate. The outfall pipe is located at the end of 4th Street, and though not very accessible for inspection, the project team observed no signs of erosion. There is also a large, flat, benched area located below the outfall and above the bank of the river.

6th Street – The 6th Street Sub-watershed is fully developed residential and mixed use, and is located almost entirely within the Infill Opportunity Area. The sub-watershed is largely impervious, a condition that results in high runoff depths. Existing drainage infrastructure consists of a small diameter (12" and less) storm drain pipe network that discharges runoff directly to the river. The discharge point is located at the end of 6th Street, and includes both an outfall pipe within the hillside, as well as a surface discharge point that conveys street runoff over the bank. The outfall pipe appears to be functioning adequately, though the overland discharge is causing significant erosion to the hillside, as the layout indicates that substantial runoff is bypassing an inlet intended to convey surface flow to the outfall pipe.

Figure 3–18 Upper Left - The 4th Street Sub-watershed Outfall Pipe; Lower Left - The Flat, Benched, Area beneath the 4th Street Sub-watershed Outfall; Top Right - The 6th Street Sub-watershed Outfall Pipe

7th Street – This mid-sized sub-watershed encompasses the area that discharges to the river through the outfall at 7th Street. This includes both the area draining initially to the 1st Street Basin, as well as additional area that discharges directly to the river. Over 60% of the sub-watershed area routes through the basin, located across the railroad tracks from the vacant Cannery, before being pumped to the river. The basin is vegetated; however, it exhibits erosion, poor slope, and poor soil conditions, and it is not designated as a multi-use space (i.e., is not used as a park, or similar). A concern described in the 2008 SDSMP is the inability of the basin to drain during long duration or back-to-back storms. As such, the 2008 SDSMP proposed a new outfall specifically for water from the basin and/or to upsize the existing discharge pipe to 24".

Much of the land that drains to the basin is industrial and mixed use, while the land downstream of the basin is largely residential.

The outfall pipe is located just over the hillside at the 7th Street and Atchison Street (SR108) intersection. There is significant scour at the end of the outfall pipe (which is in poor condition) and an eroded channel has formed down to the river, with extensive sediment deposits where the flow path flattens out. The channel appears to have been filled with rock and rubble to provide erosion protection.

8th Street – The 8th Street Sub-watershed is nearly all residential and is similar in condition and function to the 7th Street Sub-watershed. The southern third of the sub-watershed drains to Castleberg Park, a multi-use detention basin, before being pumped to the river outfall. The vegetated basin doubles as a recreational area that includes two baseball fields. The basin has some impervious surfaces (sidewalks, parking lot, and concession stand), but is primarily pervious. The 2008 SDSMP found the basin volume to be half of what is necessary, and that even a 2-year storm could force runoff into an overland release pattern. The SDSMP proposed further analysis of the drainage area with possible solutions including a parallel pipe, additional detention, or providing a dedicated outfall pipe just for Castleberg Basin.

The outfall pipe for this sub-watershed is the easternmost discharge point to the Stanislaus River within the Study Area. The outfall is located midway down the hillside below the 8th Street and Atchison

Figure 3–19 Upper Left - The 7th Street Sub-watershed Outfall Pipe and Eroded Hillside; Lower Left - 7th Street Sub-watershed Outfall Drainage Path with Rubble; Lower Right - Castleberg Basin with Sports Facilities (8th Street Sub-watershed)

Street (SR108) intersection. A large, thinly forested, flat, benched area is located below the outfall and above the bank of the river. The 8th Street Outfall seems to be in good working order, effectively draining a large area. The project team saw no signs of channelization or pronounced erosion.

Bruinville - The Bruinville Sub-watershed is an agricultural and rural residential area, located just East of the City Limits. This sub-watershed has minimal impervious surface and no existing stormwater system or infrastructure, with runoff simply routing overland and infiltrating. This sub-watershed is of particular interest for private development. To accommodate this anticipated development, the 2008 SDSMP proposed four new detention basins and one new outfall.

River East – This sub-watershed is located north of Bruinville and is primarily agricultural land, with some rural residential development. River East will likely retain its agricultural character, with less than 20% identified as Greenfield Development Area and with the timeframe for any new development likely to be after Bruinville has built out. The 2008 SDSMP proposed the development of one dual-use detention basin to accommodate additional stormwater flow within this area.

Sub-watershed Draining to the Riverbank Wastewater Treatment Plant

Cannery Area – This mid-sized sub-watershed is primarily comprised of the parcel that formerly housed the Sun Garden Gangi Canning Company, along with some surrounding area. Though available storm drain system information indicates the potential for a connection to the 1st Street Basin, per the 2008 SDSMP and discussion with stakeholders, the project team assumes that the stormwater collection system in this sub-watershed discharges to the sanitary sewer system near Dunbar Lane. The City would like to disconnect the flow and route it to a new or existing stormwater system in order to lower costs and energy usage at the WWTP. This sub-watershed has the highest large-scale redevelopment potential.

Sub-watershed Managing Runoff On-Site

Riverbank Industrial Complex (RIC) – The RIC (formerly known as the Riverbank Army Ammunition Plant) is a 146-acre site located in the southeast corner of the City Limits. Industrial use of the land dates back to 1943 when the site was operated primarily as an aluminium reduction plant for the U.S. Army. Groundwater and soil contaminated with chromium, arsenic, zinc, and petroleum was discovered at the RIC and groundwater was extracted and pumped to a 27-acre evaporation/percolation pond to the north (not within this sub-watershed). The site is in the process of being redeveloped, with potential for a variety of uses including industrial, retail, and office. Stormwater is collected and managed on-site using a system of underground pipes, above-ground storage tanks, pumps, and a retention basin.

Sub-watersheds Draining to Modesto Irrigation District Canals

Five sub-watersheds drain to detention basins that then release into MID canals. Although stormwater from these sub-watersheds does not directly discharge into the Stanislaus River, water within the MID canals eventually makes its way into the Stanislaus River at various locations downstream of the City. While in the detention basins, stormwater receives some form of physical (settling) and biological treatment depending on the nature of the basin (vegetated/concrete, size, slope, etc.) and retention time. To comply with agreements with MID, the City conducts water quality monitoring of stormwater that is released to the canals to ensure it meets certain discharge requirements and is acceptable to use for irrigation.

Silva Park – The Silva Park Sub-watershed is the large area in the southern part of the City that drains to the vegetated detention basin that doubles as Silva Park. This lower-density residential area produces moderate runoff depths, and the detention basin provides some stormwater treatment, particularly for lower-intensity storms. Larger volumes of runoff are pumped to a discharge point in a MID canal.

Sorenson Park – This sub-watershed is very similar to Silva Park, with minimal redevelopment potential and an existing vegetated basin that captures all stormwater runoff before it reaches the MID canal.

Crossroads – The Crossroads Sub-watershed is located in the southwestern corner of the City Limits and is the smallest sub-watershed that drains to a MID canal. The neighborhood was one of the most recently developed and is unique within the city, as it mostly consists of commercial uses, with expansive surface

parking lots and large-scale retail development. A concrete detention basin attenuates the large amount of runoff that results from this mostly impervious area, before releasing to the canal.

Rotary Park – The Rotary Park Sub-watershed is smaller than the Silva and Sorenson Park Sub-watersheds, but its characteristics are the same. It is a residential neighborhood that drains to the dual-use Rotary Park detention basin prior to being released to a MID canal.

Harless Park Basin – This sub-watershed is also a low-density residential area with little redevelopment potential. The initial destination of runoff is the concrete detention basin located just north of Harless Park, which is emptied by a lift station. Though available information is not entirely clear on the destination of pumped water, it appears most likely that stormwater is moved from the Harless Park Basin to the vegetated OID Basin adjacent to a MID canal. From this basin, stormwater is then released into the canal.

Sub-watersheds Draining Off-site

The remaining areas within the Study Area do not have any stormwater infrastructure and do not drain to a single location. Rather, runoff within these sub-watersheds remains as overland flow (either sheet flow or concentrated flow) and natural mechanisms such as infiltration and evapotranspiration disperse and remove the stormwater. Any runoff that crosses the Study Area boundary would simply continue as overland flow and be acted upon by similar natural mechanisms.

Off-site West – This sub-watershed is located in the southwest portion of the Study Area and is the largest of all sub-watersheds. This sub-watershed has minimal slope, appears to have well infiltrating soils, and is currently made up of agricultural and rural residential land uses. These conditions result in minimal surface runoff and it is unlikely that development will exacerbate this condition in the near-term. To manage additional flow, the 2008 SDSMP proposed four new drainage basins with potential discharge to a new river outfall.

Off-site Central – The Off-site Central Sub-watershed is located to the south and east of the City. It is a mix of industrial, agricultural, and rural residential land uses, with poorly infiltrating soils and a likely shallow hardpan condition. Additional runoff resulting from development in this area would likely discharge to the adjacent MID canals.

Off-site East – This sub-watershed, located in the southeast corner of the Study Area, is currently agricultural. The City's General Plan envisions a mix of industrial and residential uses for this area. The increased imperviousness of new development, combined with poorly infiltrating soils and shallow hardpan, would result in an increase in runoff from the area. To accommodate this additional flow, the 2008 SDSMP proposed two drainage basins that would be pumped north through a common outfall pipeline with other proposed drainage basins.

3.6 Sub-watershed Prioritization

Based on the existing conditions and challenges found within the Study Area, the project team prioritized the sub-watersheds with the greatest need based on water quality considerations and development potential (Figure 3–21). This process involved comparison of key characteristics in order to identify the sub-watersheds that should be the focus of AC programs (Figure 3–20). Within each priority sub-watershed, the project team identified opportunity location(s) for stormwater management and developed a conceptual project design for each opportunity site.

Runoff Destination

Sub-watersheds that drain directly to the Stanislaus River are of greatest importance in this Study. The Stanislaus River is listed as an impaired water body (California 303(d) list, 2010). Furthermore, the City of Riverbank was assigned a waste load allocation for the 'organic enrichment and low dissolved oxygen' of the river (Attachment G of the 2013 General Permit). Consequently, any development, whether new or infill, must ensure that existing water quality issues are not exacerbated. Much of runoff that currently reaches the river is captured in the storm drain system and routed directly to outfall pipes. A smaller portion of runoff initially passes through detention basins before being pumped to the river, a process that provides some water quality treatment.

Of lower priority are the sub-watersheds that drain through outfalls to the MID irrigation canals, as well as overland flow off-site to the south. All of the sub-watersheds that drain to the MID canals first route stormwater through a detention basin, typically vegetated, that effectively provides centralized treatment. Water released from the basins into the canals typically remains there and is utilized for irrigation on surrounding agricultural lands. Only in rare occurrences will these sub-watersheds discharge runoff to the river, and any stormwater that reaches the river will have undergone a series of processes (passing first through the basins and canals) that improve water quality. The sub-watersheds that drain off-site have minimal identified issues and influence related to existing or future water quality concerns and an AC approach in these areas would have a negligible influence on improving water quality discharges to the river.

The following characteristics were used as the basis for prioritizing the sub-watersheds:

- Runoff Destination
- Development Potential
- Identified Hydrology and Water Quality Issues

The highest priority sub-watersheds within the Study Area are those that have:

- The need to manage and treat runoff directed to the Stanislaus River
- Feasibility for funding an AC Project based on high potential for future development
- Potential for negative water quality impacts based on potential pollutant loading (urban and agricultural) and/or identified flooding/capacity issues

Figure 3–20 Sub-watershed Prioritization Methodology

Two unique sub-watersheds are the RIC and the Cannery. The RIC Sub-watershed is a single parcel redevelopment, from the old ammunition plant to a modern industrial complex, and has undergone extensive environmental assessment and master planning. A stormwater system is in place to manage all stormwater on the site and any additional stormwater needs will be the responsibility of the Local Redevelopment Authority in charge of the site. Considering the extensive developments and master planning, this sub-watershed is therefore a low priority for additional stormwater planning at this time.

The stormwater collection system within the Cannery Sub-watershed currently connects to the sanitary sewer system and drains runoff to the WWTP; although discussions with stakeholders revealed great uncertainty over how exactly this occurs. Thus, the city would like to survey the existing drainage infrastructure and ultimately disconnect stormwater runoff from the sanitary sewer network and manage it separately through a new detention basin and/or outfall. The Cannery Sub-watershed as a whole is therefore a high priority for further study.

A summary of sub-watershed priority based on runoff destination is provided in Table 3–3.

Sub-watershed	Runoff Destination	Priority
River West	Overland flow to Stanislaus River	High
Candlewood	Outfall pipe to Stanislaus River	High
River Cove	Outfall pipe to Stanislaus River	High
River Central	Overland flow to Stanislaus River	High
Cannery	Combined Sewer to Wastewater Treatment Plant	High
4th Street	Outfall pipe to Stanislaus River	High
6th Street	Outfall pipe to Stanislaus River	High
7th Street	Outfall pipe to Stanislaus River	High
8th Street	Outfall pipe to Stanislaus River	High
Bruinville	Overland flow to Stanislaus River	High
River East	Overland flow to Stanislaus River	High
Off-site West	Overland flow to off-site	Low
Silva Park	Outfall pipe to irrigation canal	Low
Sorenson Park	Outfall pipe to irrigation canal	Low
Crossroads	Outfall pipe to irrigation canal	Low
Rotary Park	Outfall pipe to irrigation canal	Low
Harless Park	Outfall pipe to irrigation canal	Low
Off-site Central	Overland flow to off-site	Low
RIC	Contained on-site	Low
Off-site East	Overland flow to off-site	Low

Table 3–3 Sub-watershed Prioritization Based on Runoff Destination

Development Potential

The potential for reinvestment in a sub-watershed is critical to the feasibility of an AC approach. This investment can be through redevelopment of commercial and residential areas or new development within currently agricultural or rural areas. Fees associated with development within that sub-watershed will fund and manage the centralized stormwater facility to treat runoff from the entire sub-watershed. To identify development potential within this Study Area, the project team first filtered the overall sub-watershed list by runoff destination, and then screened the remaining eleven sub-watersheds based on more specific criteria. It may be preferable for new development in rural areas to comply with the General Permit on-site, as there is more space and flexibility to efficiently incorporate LID techniques that manage runoff at the source, rather than at a centralized location via Alternative Compliance.

The City of Riverbank's planning and development goals include revitalize the historic downtown core and smart growth strategies, such as infill and compact development, to accommodate population growth. The City's policy framework encourages development in Infill Opportunity Areas, as identified in their General Plan and Downtown Specific Plan.

Many sub-watersheds identified as higher priority based on runoff destination are also high priority based on development potential. For example, the 4th Street, 6th Street, 7th Street, 8th Street, Cannery, and River Central Sub-watersheds are located downtown in areas with reinvestment potential. By contrast, the River Cove and Candlewood Sub-watersheds, which are generally newer neighborhoods with lower redevelopment potential, have a lower stormwater project priority for the purposes of this Study.

Outside the existing City Limits, the River West and Bruinville Sub-watersheds are very large rural and undeveloped areas. These sub-watersheds will likely undergo new investment as the City Limits push out to the east and west. This development, though, will likely occur over a relatively long time frame, and the area has a less challenging development context (i.e., unconstrained greenfield). In conjunction with the lack of existing stormwater infrastructure, on-site solutions will be more cost effective for these sub-watersheds than the construction of a large centralized facility.

Finally, the River East Sub-watershed has very little development potential of any kind; thus it is a low priority.

A summary of remaining sub-watershed priority based on development potential is provided in Table 3–4.

Sub-watershed	Currently Developed	Redevelopment Potential	New Development Potential	Priority
River West	-	-	50%	Low
Candlewood	100%	18%	-	Low
River Cove	100%	56%	-	Low
River Central	100%	100%	-	High
Cannery	100%	98%	-	High
4th Street	100%	100%	-	High
6th Street	100%	100%	-	High
7th Street	100%	100%	-	High
8th Street	100%	100%	-	High
Bruinville	7%	-	74%	Low
River East	-	-	17%	Low

Table 3–4 Continued Sub-watershed Prioritization Based on Development Potential

Where a '-' implies a value of zero percent.

Identified Hydrology and Water Quality Issues

The 2008 SDSMP includes an analysis of existing storm drain system issues and future needs. Aside from identifying a collection of potential localized flooding locations, the system was generally considered to manage stormwater sufficiently. The most significant conclusions in the 2008 SDSMP are that the Cannery parcel should be disconnected from the sewer system and that the detention basin in Castleberg Park is at capacity.

Many of the sub-watersheds within the Study Area present minimal concerns in terms of runoff quantity or quality. Runoff from sub-watersheds that drain to the MID canals undergo some level of attenuation and treatment both within detention basins, as well as within the canals. The sub-watersheds that are predominantly rural (identified by overland flow paths to the river and off-site) currently produce little runoff that reaches the river due to the minimal amount of impervious area and lack of any formal storm drain infrastructure. These areas, identified as low priority based on runoff destination and redevelopment potential, are considered low priority based on hydrology and water-quality related issues.

The River Central Sub-watershed occupies a very small area with no connection to an existing outfall. This sub-watershed produces only minor runoff volumes during all but extreme storm events and runoff travels as overland flow through the pervious areas at the edge of the river, which serve to slow down and treat the flow. A project in this sub-watershed would have minimal impact and therefore is not considered a priority area for further study.

Sub-watersheds that discharge runoff from developed portions of the City directly to the river, without passing through an intermediate facility such as a detention basin or lift station, have the potential to deliver the highest level of pollutant loading to the water body. This is the situation for the entire 4th Street and 6th Street Sub-watersheds and for portions of the 7th Street and 8th Street Sub-watersheds. Runoff from these areas also causes erosion at the outfall locations, which is significant in some cases, and results in additional sediment and pollutants releasing to the river.

The portions of the 7th Street and 8th Street Sub-watersheds that do not discharge directly to the outfall, but instead route through a basin (the 1st Street and Castleberg Park basins, respectively), represent less of a concern in terms of runoff quantity and quality since the existing basins provide some benefit. These conditions were taken into account when analyzing the sub-watersheds and considering centralized stormwater projects, as the characteristics of runoff at the outfall are a result of the entire upstream area.

The Cannery Sub-watershed does not currently discharge to a river outfall; however, the City is planning to disconnect the storm sewer from the WWTP in the near future. As a result, stormwater will either need to be routed to a new outfall, as mentioned in the 2008 SDSMP, or potentially be routed across the BNSF railway onto the parcel north of the existing 1st Street Basin to ultimately discharge through the 7th Street Outfall.

A summary of remaining sub-watershed priority based on stormwater issues is provided in Table 3–5.

Sub-watershed	Hydrology and Water Quality Issue	Priority
River Central	None, runoff treated passively within vegetated buffer	Low
Cannery	Future disconnection from WWTP with uncertain discharge plan	High
4th Street	Untreated runoff discharges to river	High
6th Street	Untreated runoff discharges to river	High
7th Street	Untreated runoff discharges to river	High
8th Street	Untreated runoff discharges to river	High

Table 3–5 Continued Sub-watershed Prioritization Based on Hydrology and Water Quality Issues

Prioritized Sub-watersheds

The highest priority sub-watersheds are those areas with the greatest need, potential, and feasibility for developing and funding a centralized treatment facility to manage stormwater runoff in a manner consistent with an AC approach. Based on the criteria and rationale provided, the project team prioritized the sub-watersheds shown in Figure 3–21. Within each of these priority sub-watersheds, the project team developed conceptual projects capable of providing the necessary stormwater treatment prior to discharge. The following section documents the process of identifying a preferred opportunity location for stormwater management within each priority sub-watershed.

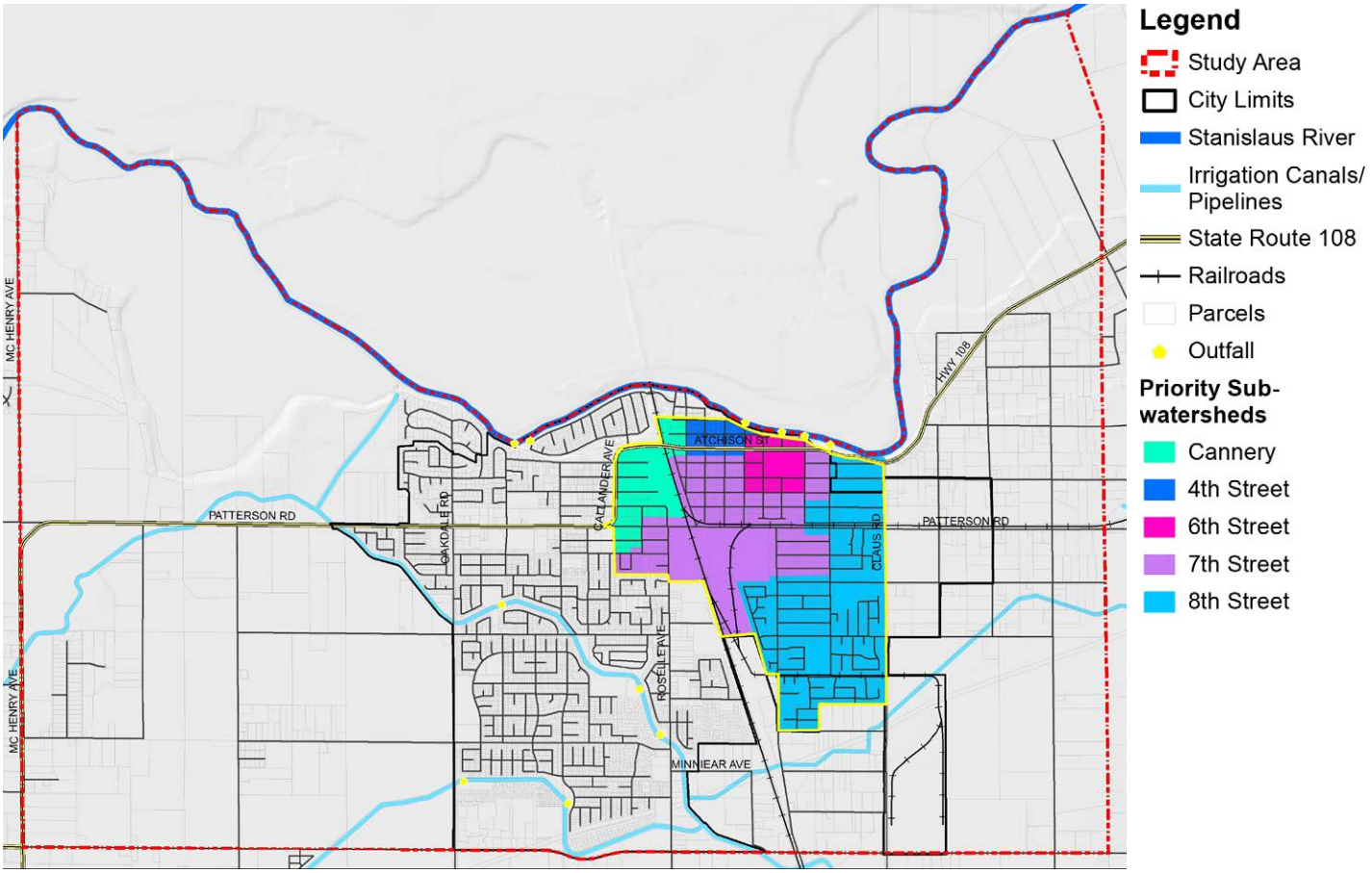

Figure 3–21 Prioritized Sub-watersheds

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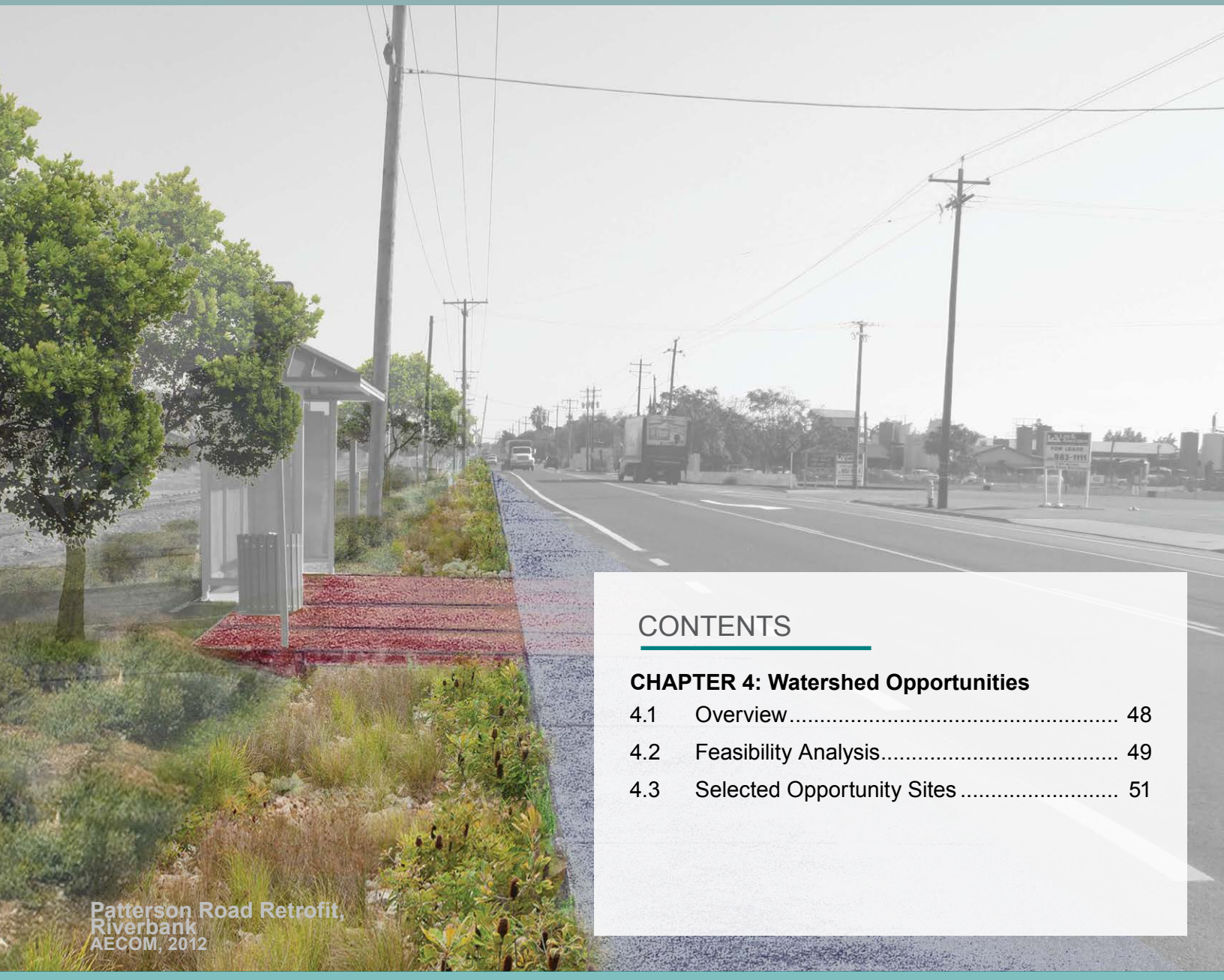
WATERSHED OPPORTUNITIES



Patterson Road Retrofit, Riverbank
AECOM, 2012

CONTENTS

4.1 Overview

For a given sub-watershed, compliance with the General Permit via an AC approach can be achieved by providing stormwater treatment at a centralized location that manages runoff from a large upstream area. The project team studied each of the priority sub-watersheds in order to identify feasible locations where a stormwater management project could be implemented to treat upstream runoff.

Feasible locations considered existing and future land use as well as design-related criteria such as site history, space constraints, topography, soil conditions, groundwater, and existing infrastructure.

Ideally, selected opportunity locations would allow for the design of multiple-benefit projects that would not only provide stormwater treatment, but also provide ancillary benefits such as pedestrian improvements, recreational space, or habitat restoration (Figure 4–1).

These ancillary benefits open the door for external grant funding which will be discussed in Chapter 6.

Figure 4–1 Examples of potential strategies and SCM technologies

4.2 Feasibility Analysis

The first step in identifying opportunity locations was an initial screening of the Study Area to identify sites where a stormwater facility could potentially be located. The project team considered a site to be suitable if it was either publicly owned or undeveloped/underutilized (or both).

The preferred location for stormwater facilities is on publicly owned land; owned by the City of Riverbank or other public agencies such as the school district, Stanislaus County, Caltrans, etc.; with which a management agreement could be formed. Developing projects on public property minimizes or eliminates the need to acquire land, thus lowering associated capital costs. Publicly owned land was identified as follows:

- Land Use Designations – The 2005-2025 General Plan identifies areas that have been or are intended to be developed as Civic, Parks, Greenway/ Open Space, and Multi-use Recreation.
- Right-of-Way – Many streets in the City of Riverbank have excess space; unnecessary lane widths, underutilized street parking, or excess off-street zones. Space within the right-of-way could be converted to a stormwater management function, while potentially improving mobility and safety for pedestrians and cyclists.
- Stakeholder Discussions – To identify additional publicly owned parcels, the project team solicited feedback from City staff and the TAC, along with researching potential parcels online using the Stanislaus County Assessor website.
- Downtown Specific Plan – This 2010 plan was developed for the City of Riverbank to encourage the revitalization of the City's historic downtown and identified ten City-owned opportunity sites that were prime for new investment.

Of privately owned lands considered, the project team considered undeveloped and/or underutilized sites to be the most opportune locations for stormwater facilities. Sites that are vacant or that are highly likely to redevelop represent a more feasible opportunity to incorporate a large stormwater facility than a site with a stable land use and no available space for improvements. It is often more cost-effective to develop a project on undeveloped and/or underutilized sites because there are less constraints or competing interests to manage. Undeveloped and underutilized locations were identified using the following methods/ tools:

- Field investigations – Throughout the Study, the project team made several trips to the City and surrounding area to assess existing conditions and consider potential locations.
- Aerial imagery – Google Earth provided another means of locating potentially underutilized sites based on aerial imagery from March 2014. The project team used this tool to identify sites within the City Limits that appeared vacant or largely undeveloped.
- Planning documents – Planning documents were reviewed for potential opportunity locations. The 2008 SDSMP and 2006 East Riverbank Drainage Feasibility Study identify 14 potential locations for future stormwater detention basins. In addition, the 2010 Downtown Specific Plan and the 2009 update to the city's General Plan identify opportunity sites for redevelopment or new investment.

Through this process, 112 opportunity sites were identified within the prioritized sub-watersheds, as shown in Figure 4–2 and summarized in Table 4–1 complete list in Appendix A.5).

Sub-watershed	Rationale		Total
	Public Ownership	Undeveloped / Underutilized	
Cannery	5	9	14
4th Street	5	4	9
6th Street	4	4	8
7th Street	20	36	56
8th Street	14	11	25
Total	68	93	112

Table 4–1 Opportunity Sites per Priority Sub-watershed and the Rational for Selection

In any given sub-watershed, the ideal site to locate a stormwater facility would be:

- large and flat
- city-owned
- undeveloped
- situated at the downstream end of the sub-watershed

Unfortunately, none of the sites identified in the initial screening met all of these characteristics. Consequently, the project team went through a process of filtering the initial set of opportunity sites to determine which were the most feasible. Within each priority sub-watershed, the initial sites were analyzed along with the sub-watershed hydrology to determine where a stormwater project would be effective (based on location in watershed, available space, soils, and infrastructure) and to identify site challenges (e.g., land uses, ownership, permitting issues).

Through this process, the project team identified one to four sites per priority sub-watershed, 12 sites total, on which an AC project could feasibly be located. Presentation of feasible opportunity sites to the TAC in October of 2014 further reduced the dozen opportunities to six sites that the project team then carried through conceptual level project design (Chapter 5). The process of narrowing down opportunity sites from 112 properties to the selected six is described in more detail in Section 4.3.

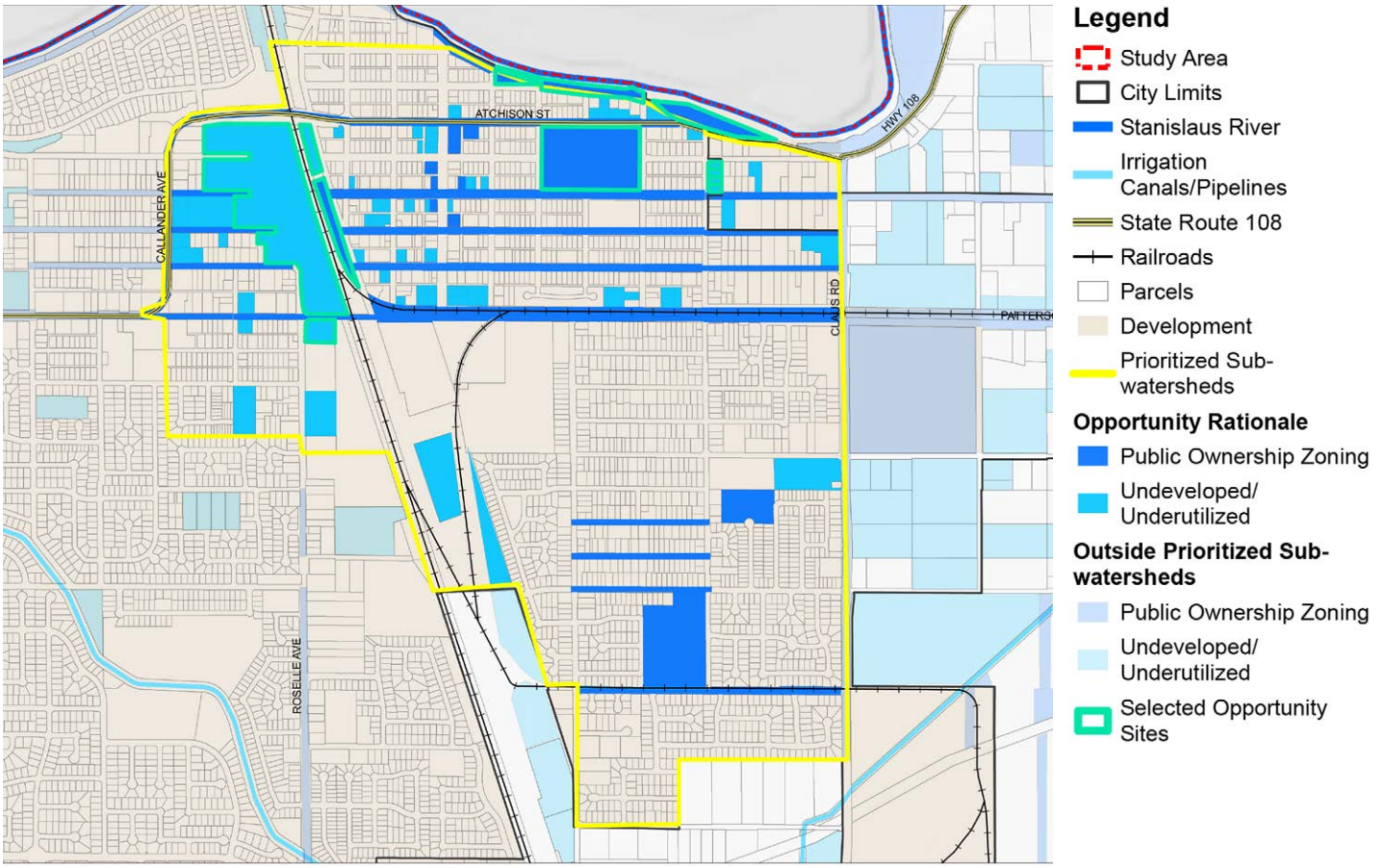


Figure 4–2 Rationale for Selection of Opportunity Sites in Prioritized Sub-watersheds

4.3 Selected Opportunity Sites

Cannery Sub-watershed

There were 14 identified opportunity sites within the Cannery Sub-watershed; nine parcels and five street segments (including a portion of Callander Avenue / SR108). Of the sites identified, the vacant Cannery parcel was selected as the primary opportunity location due to its large size (28 acres), downstream location, and high likelihood of redeveloping. Though the property is privately owned, it is a priority reinvestment site and the City and other stakeholders have expressed interest in its conversion to a mixed-use neighborhood.

Given the sub-watershed's characteristically Group A soils, the large parcel is a good candidate for stormwater treatment in bioretention zones, integrated into public space and/or new streets, followed by flood control within a multi-use detention basin, as proposed by the 2008 SDSMP. A challenge to consider at the Cannery parcel is that the underlying soil likely has contaminants associated with its former uses[1], which may prohibit future stormwater facilities from allowing the infiltration of stormwater.

1. Phase I Environmental Site Assessment Report Sun Garden-Gangi Property; Riverbank, Stanislaus County, California, LFR Inc., 2007.

Figure 4–3 View of former Sun Garden Gangi Canning Company Site from Highway 108

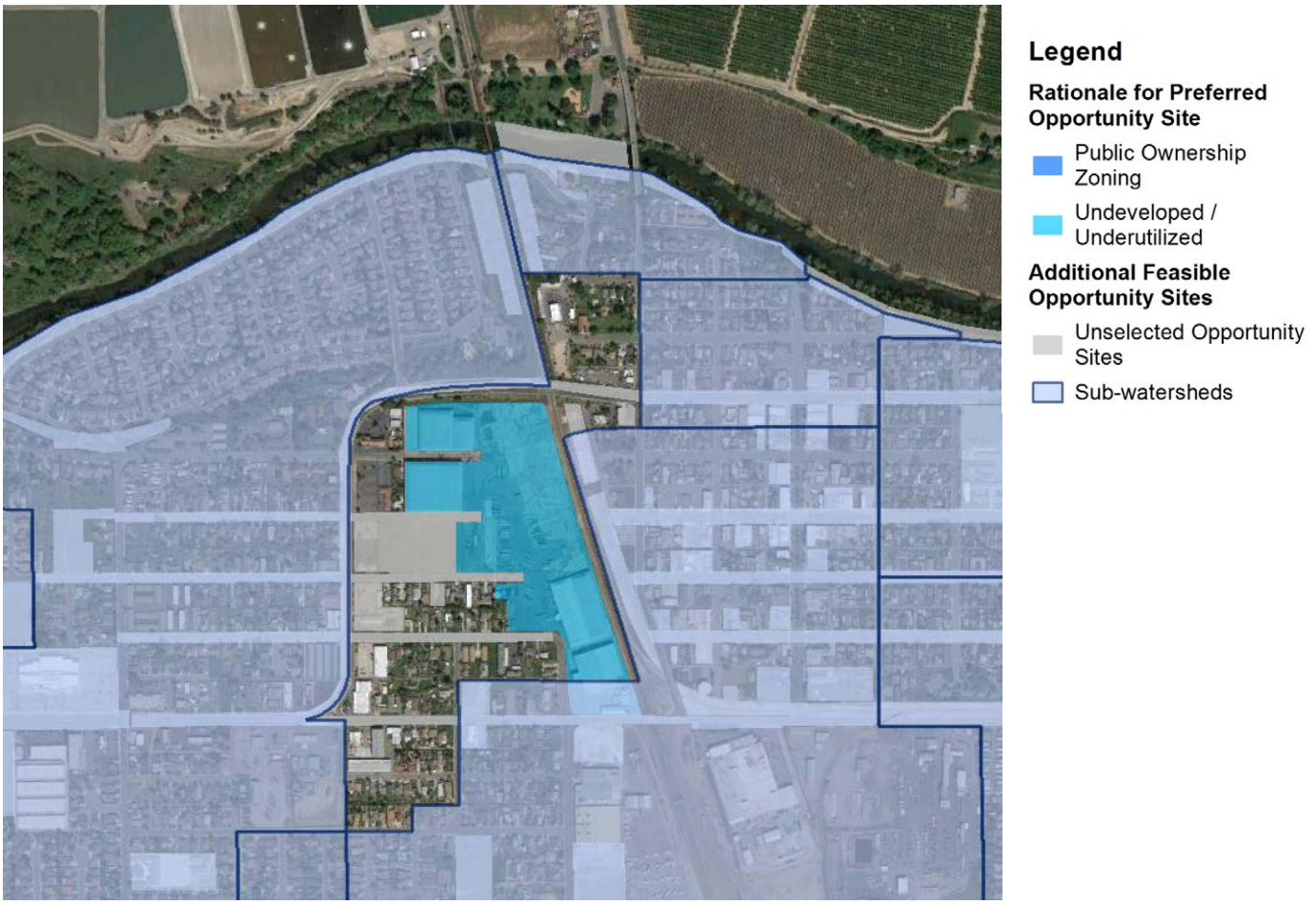


Figure 4–4 Selected Opportunity Site for Cannery Sub-watershed

4th Street Sub-watershed

This is the smallest of the prioritized sub-watersheds and accordingly had the fewest opportunity sites; seven parcels and two street segments. Of the opportunity sites identified, Hutcheson Park was selected as the most feasible. The site is ideally located at the downstream edge of the sub-watershed, adjacent to the main storm drain line and outfall. As the park is City-owned, no ownership barriers would inhibit re-purposing a portion of the park for stormwater treatment. The biggest challenge at this location is that stormwater would need to be diverted from the existing underground storm drain pipe and brought to the surface for treatment, which would require pumping. To mitigate the loss of recreational space, the project team would expand the park into the adjacent underutilized parking strip, since additional diagonal parking is available across High Street.

Figure 4–5 View of Hutcheson Park from corner of High Street & 4th Street

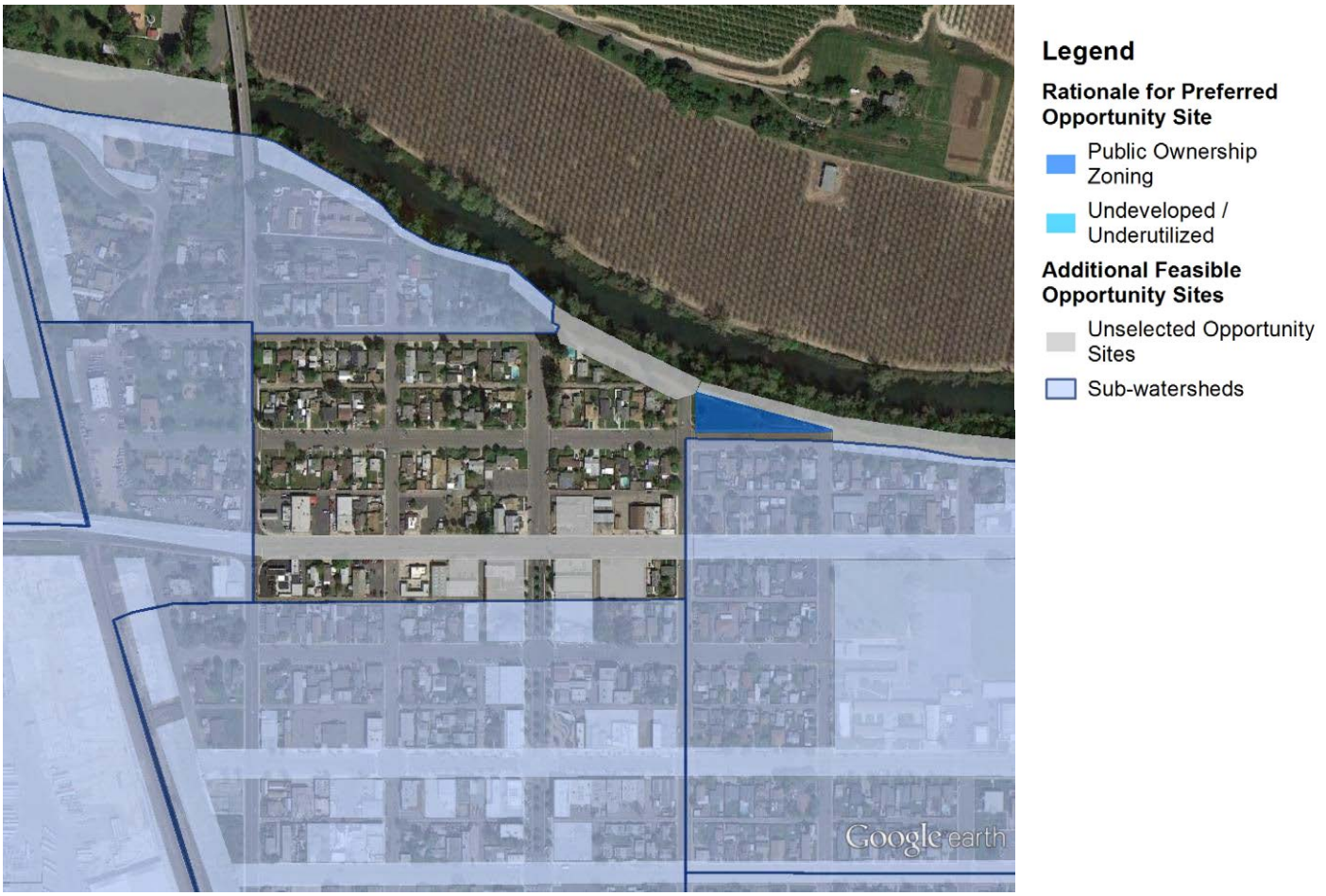


Figure 4–6 Selected Opportunity Site for 4th Street Sub-watershed

6th Street Sub-watershed

Eight opportunity sites were initially identified within this sub-watershed, including five parcels and three street segments. Two opportunity sites were selected: the Cardozo Middle School property and the stretch of Riverside Drive, both of which are public land. Roughly half of the school site is programmed as open space / recreational, within which it would be technically straightforward to incorporate a stormwater facility with minimal effect to school operations or activities.

Though the school is located near the edge of the sub-watershed, a small area north of it would not be located within the catchment area of a potential stormwater treatment project at the site. To manage runoff from this portion of the sub-watershed, Riverside Drive was selected as a second opportunity site.

The street is located along the downstream edge of the sub-watershed along the bluff overlooking the river, and adjacent to the selected opportunity site for the 4th Street Sub-watershed (i.e. Hutcheson Park). The goal at this site would be to intercept and improve the quality of stormwater through a linear vegetated swale within the right-of-way between the street and the existing pathway.

Figure 4–7 View of Cardozo School

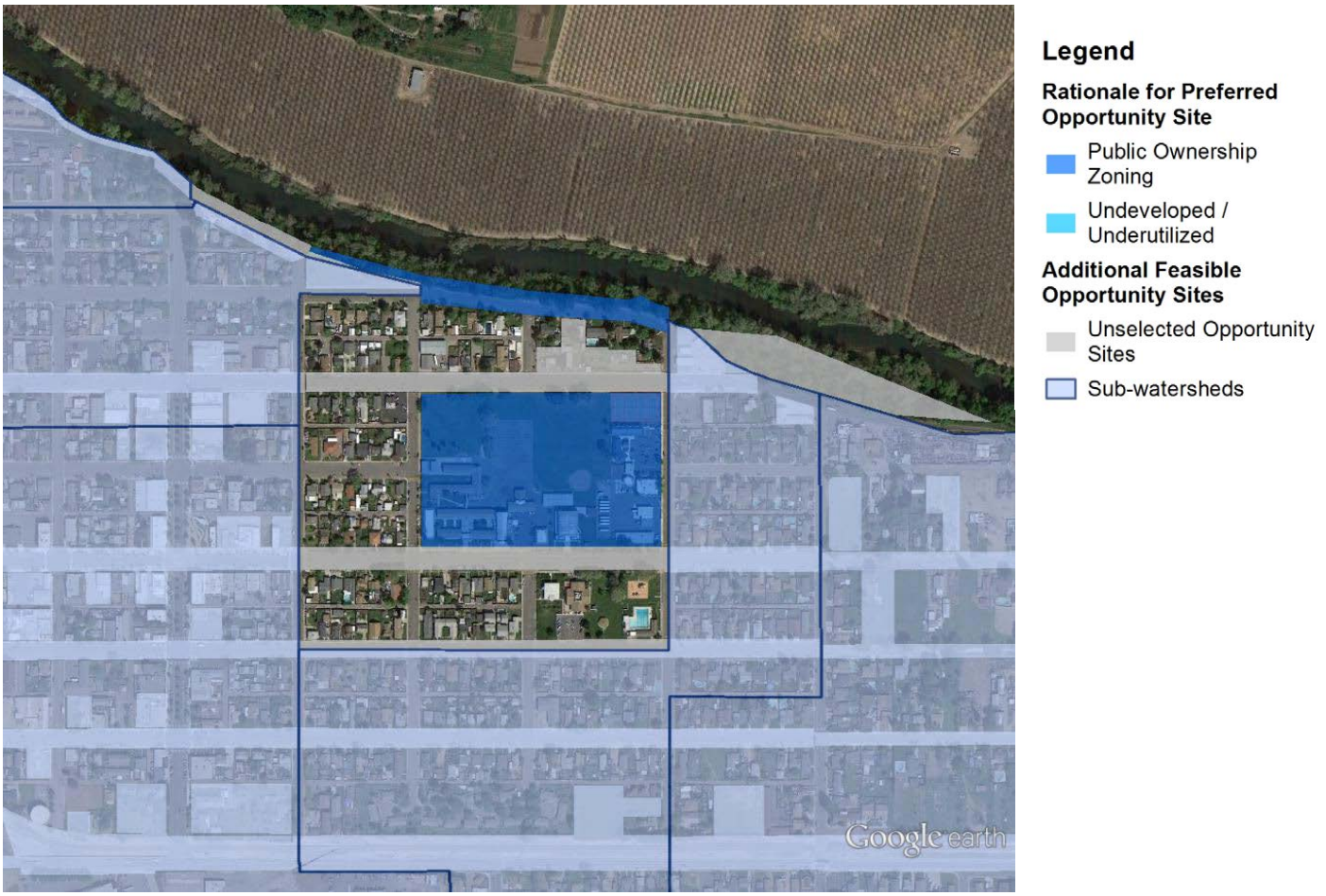


Figure 4–8 Selected Opportunity Sites for 6th Street Sub-watershed

7th Street Sub-watershed (to basin)

About three-quarters of the 7th Street Sub-watershed runoff discharges to the vegetated First Street Basin before being pumped out to drain to the 7th Street outfall; the remaining area drains directly to this outfall through the storm drain system.

For the portion of the sub-watershed that drains to the First Street Basin, 48 opportunity sites were identified, including 44 parcels and four streets segments. Of these, the First Street Basin itself and two nearby parcels were selected as the most feasible project sites. The existing storm drain system already routes runoff to and from the basin, so additional improvements would only be necessary to increase the stormwater treatment capacity. A recent Technical Report on the basin (2013) noted several deficiencies with the basin's existing design and described proposed improvements.

As the basin parcel is City-owned, a reconfiguration and optimization of the space is expected to be less complex than working with other identified sites that are privately held. Given the area's characteristically Group A soils, the preliminary project concept here would be to treat and infiltrate stormwater through a series of bioretention areas integrated into or around the basin.

Figure 4–9 View of First Street Basin Facing Cannery Site

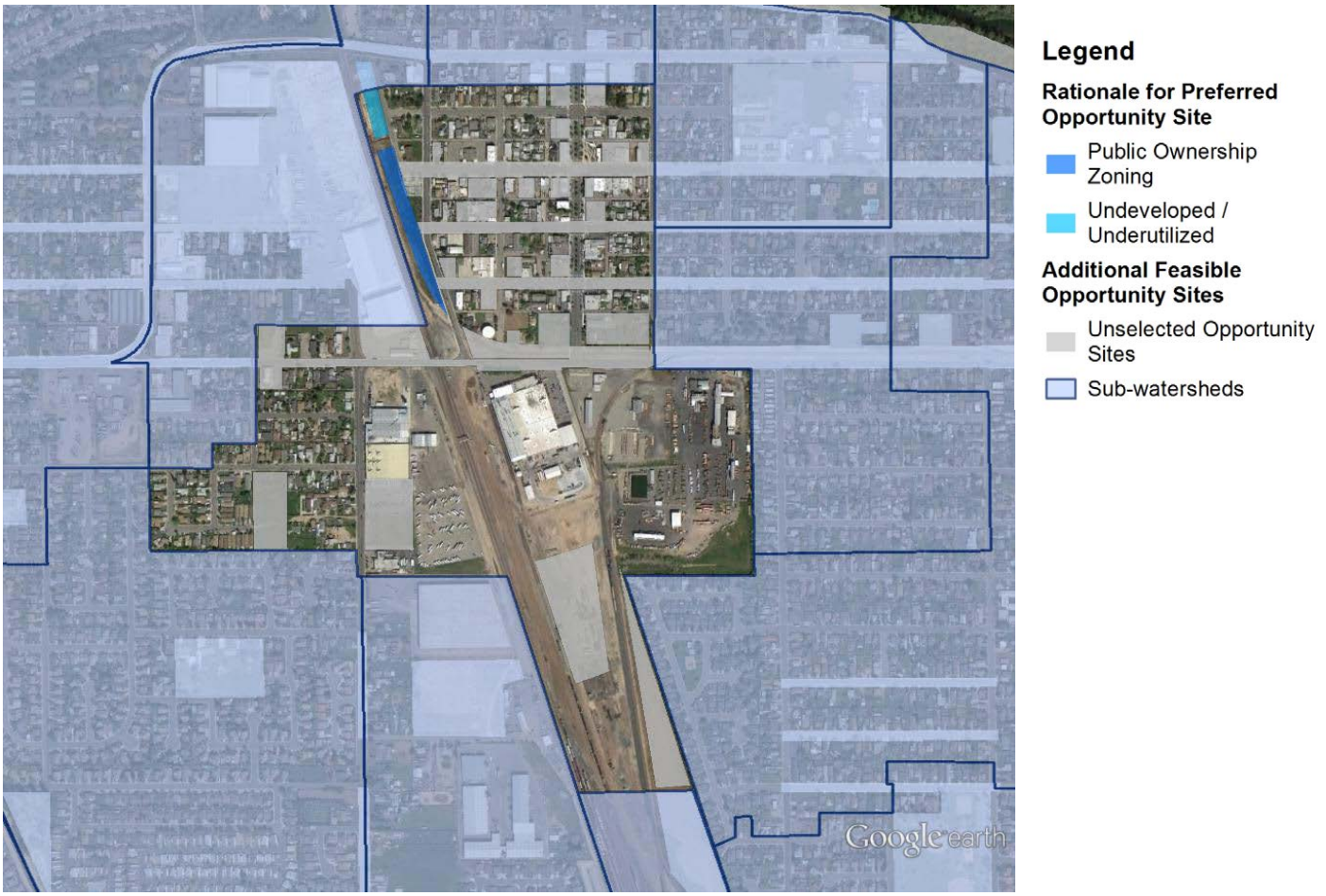


Figure 4–10 Selected Opportunity Sites for portion of 7th Street Sub-watershed to basin

7th Street Sub-watershed (direct to outfall)

The portion of the 7th Street Sub-watershed that drains directly to the 7th Street outfall is more densely developed. The project team identified only eight opportunity sites, including three parcels and five streets segments. From a location and size perspective, the northernmost parcel - a vacant gas station - was identified as feasible; however, stakeholders voiced concerns regarding potential ownership barriers and the presence of contaminated soils. Capturing and treating the same quantity of stormwater further upstream would require multiple projects in parallel, which would likely be cost prohibitive. Therefore, no conceptual project was studied here.

Stakeholders voiced the inability to access the mainline for purposes of inspection and maintenance; ultimately the drainage infrastructure for this portion of the sub-watershed will need to be redesigned in an update to the 2008 SDSMP. This reconfiguration can be an opportunity for the City to consider the incorporation of water quality treatment fixtures such as flow-through filters.

Figure 4–11 View of Gas Station from Highway 108

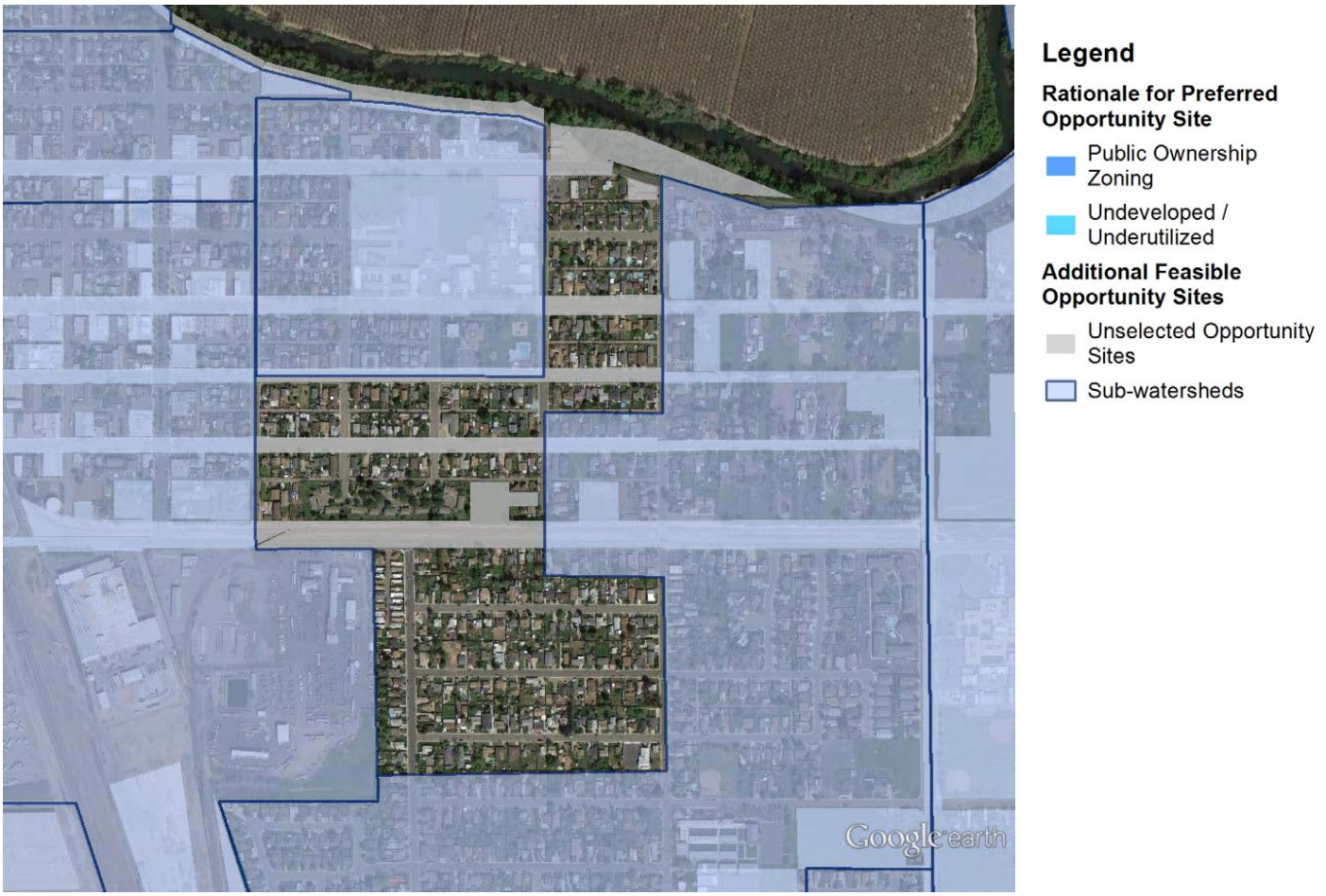


Figure 4–12 No Selected Opportunity Site for direct to outfall portion of 7th Street Sub-watershed

8th Street Sub-watershed (to basin)

Approximately one-third of the 8th Street sub-watershed drains to the vegetated Castleberg Park basin, and the remaining two-thirds drains directly to the 8th Street outfall.

For the portion of the sub-watershed that drains to Castleberg Park, five opportunity sites were identified; one parcel (the existing park) and four street segments, all of which are City-owned. Of these sites, the park was considered the most feasible because the exiting storm drain system already routes water to and from the basin. The park currently houses two ball parks, three small structures, and two parking lots, but a significant portion of the site's perimeter is un-programmed.

Unlike the First Street Basin though, stormwater is routed beneath the park. Enhanced treatment via surface bioretention would require rerouting the existing infrastructure and/or the addition of a pump. The project team ultimately decided against developing a conceptual project for the park in order to focus attention on the portion of the sub-watershed where redevelopment is more likely to occur, and that drains directly to the 8th Street outfall.

Figure 4–13 View of Castleberg Park facing south

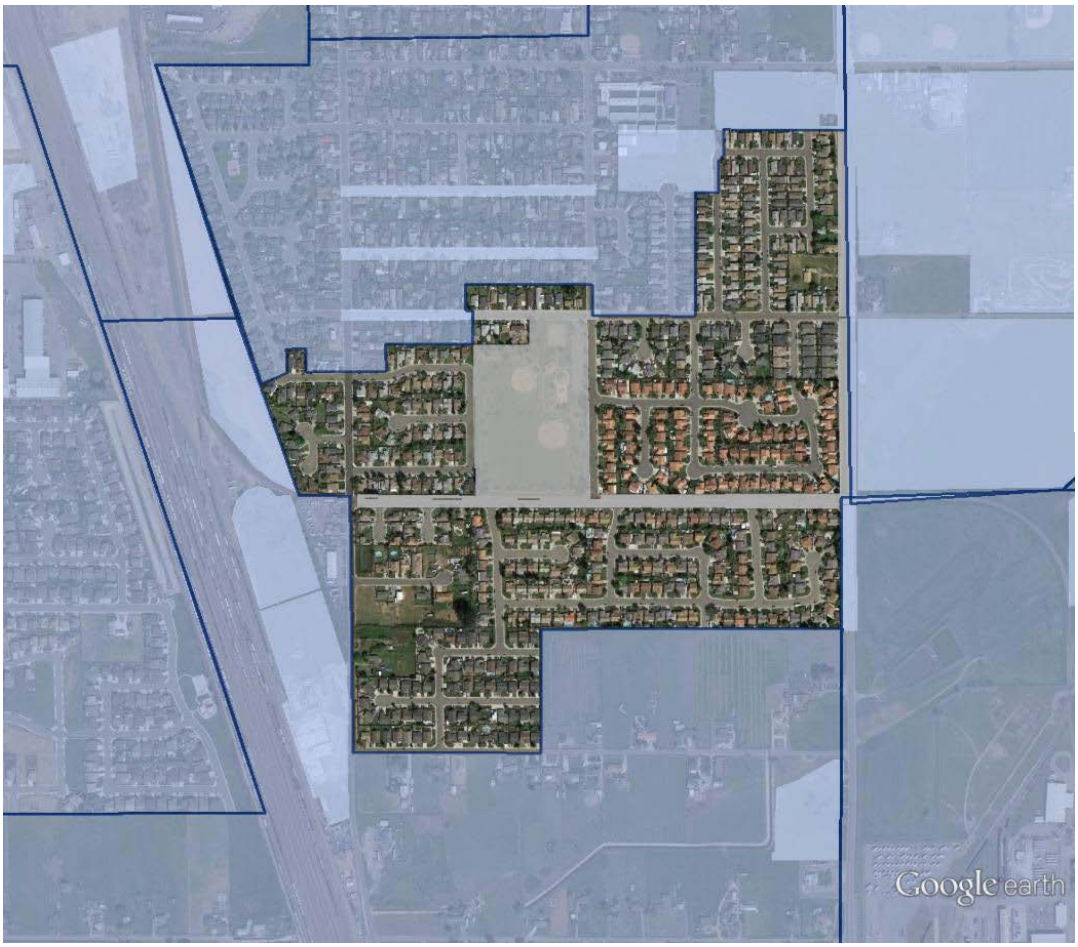


Figure 4–14 No Selected Opportunity Site for portion of 8th Street Sub-watershed to basin

8th Street Sub-watershed (direct to outfall)

Initial screening of the portion of 8th Street that drains directly to the river outfall yielded 20 suitable sites, including 12 parcels and eight street segments. Of the parcels identified, all were private, undeveloped, residential lots but two: a largely undeveloped parcel belonging to the California Avenue Elementary School, and a large wooded bench along the Stanislaus River. The only location where a project could provide stormwater treatment to the entire sub-watershed is the benched area along the river. The site has a number of positive characteristics, including being publicly owned, large, flat, undeveloped, and at a lower elevation than the existing storm drain infrastructure. Challenges of the site are that it is located within the floodplain and riparian habitat may be present.

Any improvements on the parcel may require land acquisition, additional permitting, or more onerous maintenance, all of which would add to the cost of the project. The project team believes the benefits of the site outweigh the challenges. The goal at this site would be an engineered marsh. If surge capacity is needed to manage the volume of stormwater reaching the marsh, an in-line subsurface storage element could be constructed along the 8th Street corridor.

Figure 4–15 View of Bench along Stanislaus River

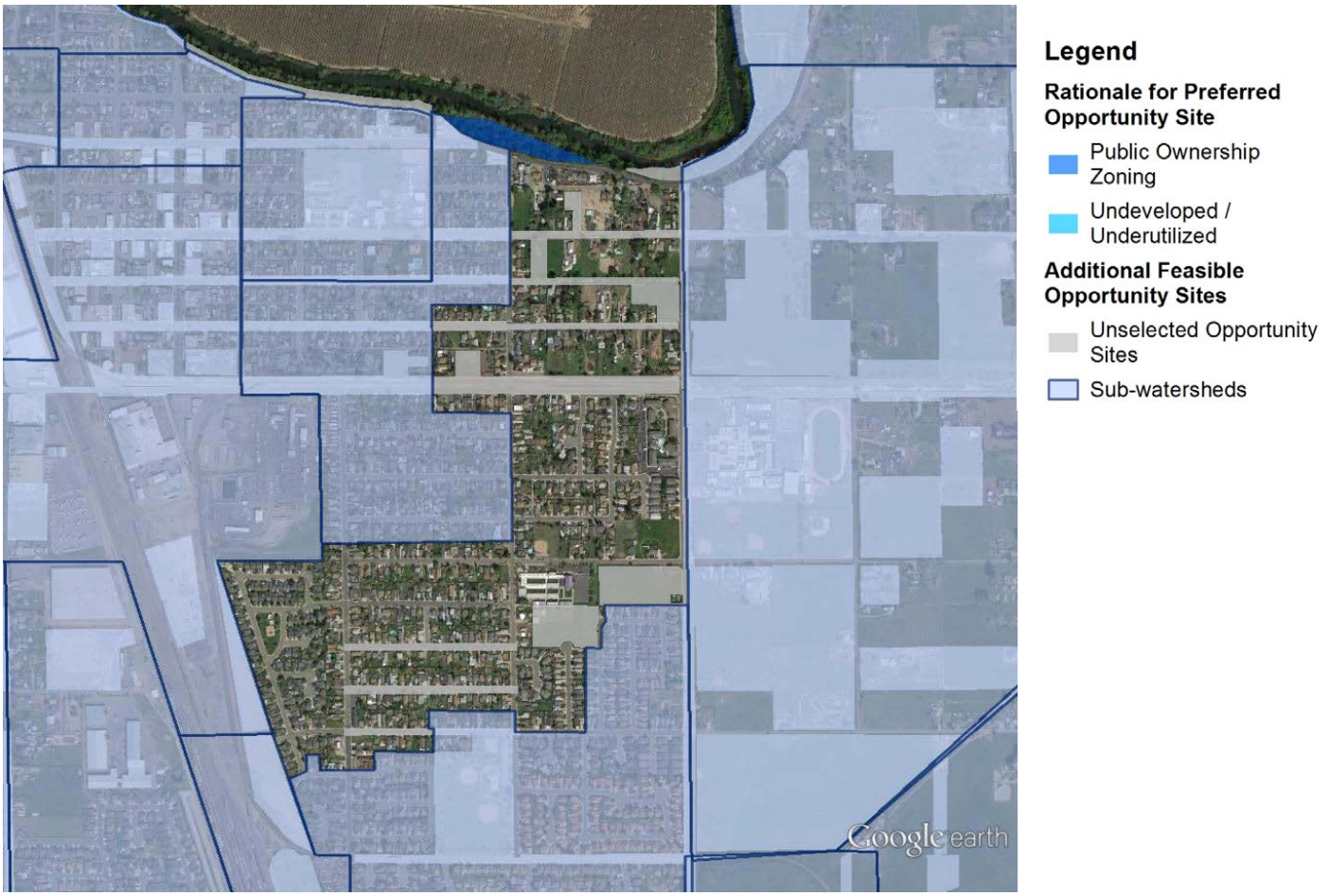


Figure 4–16 No Selected Opportunity Site for direct to outfall portion of 8th Street Sub-watershed

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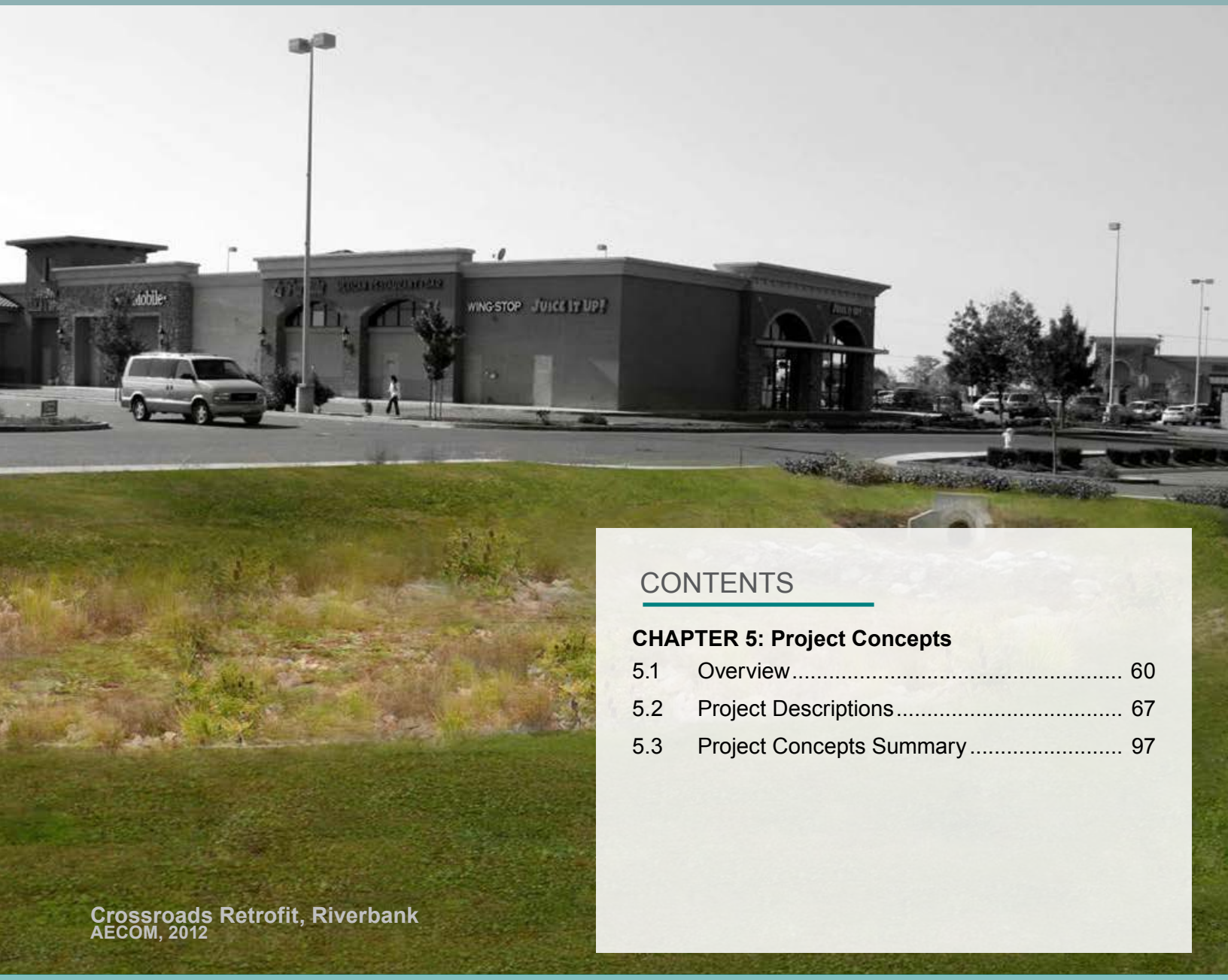
5.0

PROJECT CONCEPTS



Crossroads Retrofit, Riverbank
AECOM, 2012

CONTENTS

5.1 Overview

The City of Riverbank's existing stormwater drainage infrastructure provides limited stormwater treatment. Chapters 3 of this report identified the sub-watersheds within Riverbank that have the greatest need, potential, and feasibility for developing and funding a SCM to treat stormwater in a manner consistent with an AC approach. Chapter 4 then identified six feasible locations within each sub-watershed for these AC projects to be located. This chapter describes conceptual level project designs for the six selected opportunity sites, based on performance criteria relevant to the treatment requirements of the 2013 NPDES General Permit for MS4s.

Design Process

Although LID is typically integrated from a source-control approach, this study considers the effectiveness of LID for treatment in a semi-centralized manner. As previously described, LID uses natural processes to enable filtration, biological uptake, and soil adsorption, thus reducing pollutant loads to downstream waterbodies. Beyond improving water quality, LID has many ancillary benefits such as water quantity control, habitat restoration and public health benefits.

Whether designed for on-site treatment of off-site mitigation, the general approach to design is the same. Accordingly, preliminary project concepts for each site were developed using the framework laid out in the Stanislaus County LID Manual[1] (Figure 5–1).

1. City of Riverbank. 2013 (January). Model Standards & Specifications for Low Impact Development Practices manual. Prepared by AECOM. Available at: http://www.stancounty.com/planning/cdbg/StanRST-Docs/Riverbank/MODEL%20LID%20STANDARDS.pdf

Step 1: Site Assessment

Assess site-level existing conditions.

Step 2: Assess and Define Drainage Management Area (DMA)

Review sub-watershed characteristics to determine how much of the sub-watershed will drain to, or can be feasibly routed to, the selected site.

Step 3: Determine Water Quality Volume

Select method for sizing treatment SCM using one of five methods specified by the General Permit:

- The volume of annual runoff based on unit basin storage water quality volume, to achieve 80% or more volume treatment by the method recommended in California Stormwater Quality Association's (CASQA) California Stormwater BMP Handbook (2003)[1]
- The 85th percentile 24-hour runoff event, from the formula recommended in Urban Runoff Quality Management, WEF Manual of Practice No. 23/ ASCE Manual of Practice No. 87[2]
- The runoff volume produced from a historical-record based reference 24-hour rainfall criterion for “treatment” that achieves similar pollutant reduction to the 85th percentile 24-hour runoff event
- The flow produced from a rain event equal to at least twice the 85th percentile hourly rainfall intensity
- The flow that will result in treatment of the same portion of runoff as treated using volume-sizing.

Step 4: Select and Design SCM technology

Select the most appropriate treatment technology and size it to manage the calculated water quality volume using the Stanislaus County LID Manual and other LID guides.

Step 5: Confirm Water Quality Benefit

Verify the performance objectives were met using EPA's SWMM and a locally representative, moderate, storm.

Figure 5–1 Process Used to Develop Preliminary Project Concepts

1. CASQA. 2003 (January). California Stormwater BMP Handbook. Available at: https://www.casqa.org/sites/default/files/BMPHandbooks/BMP_NewDevRedev_Complete.pdf. .
2. Water Environment Federation and ASCE. 1998 (June). Urban Runoff Quality Management, WEF Manual of Practice No. 23/ ASCE Manual of Practice No. 87.

Step 1: Site Assessment

The project team conducted an initial assessment of each selected site, to evaluate the site's existing conditions. Using site visits, Google Earth, and desktop research, site assessments revealed potential constraints that would influence the site's performance under different design options. For each site, the project team reviewed the following components:

- drainage infrastructure
- topography
- on-site utilities
- pervious hardscape
- impervious hardscape
- vegetation

Step 2: Assess and Define the Drainage Management Area (DMA)

Second to existing and future land use, location was the next most important factor for selecting opportunity sites. In greenfield areas, stormwater treatment controls work best when planned from an upstream, source-control approach. In contrast, when trying to provide centralized stormwater treatment in already developed areas, the best project sites are located downstream. That is, in a developed sub-watershed with existing catch basins and pipes, an upstream project would only capture and treat a small portion of surface runoff. However, not all feasible sites are located in an outmost downstream location. For example, in the Cannery Sub-watershed, the proposed site will only capture water from the portion of the sub-watershed south of SR108.

Step 3: Determine Water Quality Volume

Projects were designed to comply with the 2013 NPDES General Permit for small Phase II MS4s. The permit specifies that SCMs for stormwater treatment can be sized to either a flow-based or volume-based standard, or both. The project team choose to use a volume-based approach as it is thought to be more accurate for larger, AC projects.

The permit specifies three methods for volume-based compliance, of which the project team chose to use the more conservative capture of the 85th percentile 24-hour runoff event (bullet 2 of Step 3 in Figure 5–1).

Using the recommended CASQA Basin Sizer, the project team calculated the depths corresponding to the selected 85th percentile 24-hr storm event. These depths, also known as unit basin storage volumes, were calculated using sub-watershed specific impervious cover (Step 2), a conservative drawdown time of 48 hours, and data from a locally representative storm (Modesto 2 rain gauge). Unit Basin Storage volume was then multiplied by the DMA (Step 2) to arrive at the water quality volume that requires capture and treatment. See Appendix A.6 for detailed sizing information.

Step 4: Select and Design SCM facility

The project team then used information gathered in Step 1 and the LID selection matrix, as adapted from the Stanislaus County LID Manual (Figure 5–2) to identify the most appropriate SCM approach for each site.

Above all, the SCMs were designed with the goal of treating stormwater to the volume specified in Step 3 to improve the quality of water reaching the Stanislaus river. When possible, the team also designed to: 1) reduce the quantity of stormwater reaching the river / maximize groundwater recharge, and 2) reduce the peak flow of water through retention or detention. These and other ancillary benefits are summarized in Figure 5–3.

Appendix A.7 includes a detailed summary of each project's elements, quantities, footprints, etc., along with a glossary of helpful design terminology.

Step 5: Confirm Water Quality Benefit

EPA's SWMM was used to verify project performance. The locally representative storm was a 2-year, 24-hour storm, measured from Modesto, with a total rainfall depth of 1.2in modelled with a SCS Type I rainfall distribution. In some cases, the project's modelled water quality benefit exceeded the water quality volume required by the permit. Due to the many built-in assumptions associated with the early stages of design, the projects are not considered over-sized, so much as flexible to potential challenges/limitations that may arise in later stages of design.

Constraint	Underground Infiltration	Bioretention Area	Vegetated Swale	Filter Strip	Vegetated Basin	Constructed Wetland	Permeable Pavement	Rainwater Harvesting	Green Roof
Located in floodplain?									
Less than 10-foot separation to groundwater table?		With liner and underdrain	With liner		With liner		With liner & underdrain (provides no treatment)		
Sited on steep slope (5-15%)?		If terraced	If installed along contour						
Sited on very steep slope (>15%)?									
Soil type C or D?		With underdrain					With underdrain (provides no treatment)		
Less than 10-foot separation to thin (<4') hardpan layer?	With rock well	With underdrain or rock well					With underdrain or rock well		
Less than 10-foot separation to thick (>4') hardpan layer?		With underdrain					With underdrain (provides no treatment)		
Limited space for BMP facilities?			With adequate length						

Figure 5–2 LID technology Selection Matrix

The table is intended to provide a quick and convenient method of identifying which LID technologies are most appropriate for use on a given site. The left-hand column contains a list of questions that identify a possible site constraint. For any question answered "yes" the project should consider the LID technologies marked with a green box, with any additional requirements for using a LID listed within the green box.

- **Flow Attenuation** - LID can be very effective at mitigating flooding and erosion issues. Stormwater volume can be reduced by capturing runoff in retention systems (which can drain by infiltration), thus lowering flowrate and velocity.
- **Groundwater Recharge** - By increasing pervious land area and managing the runoff from impervious surfaces, LID helps restore water to the aquifer through infiltration.
- **Hydromodification** - The 2013 General Permit notes that future revisions to the permit will incorporate runoff retention and hydromodification control criteria keyed to watershed processes, in order to protect and restore watersheds.
- **Public Health** - Whether replacing turf or impervious surface, adding native vegetation provides air quality improvements and reduces urban heat island effect.
- **Habitat Restoration** - In addition to their hydrologic goals, many LID SCMs can be designed to provide desirable habitat.
- **Aesthetic Improvements** - Landscape-based stormwater management facilities and preservation of natural areas offer development sites unique opportunities to create an appealing character.
- **Community Infrastructure Cost Reductions** - Widespread use of LID can serve a community by helping to reduce costs, such as storm drain upsizing, erosion maintenance, and street repairs.

Figure 5–3 Anciliary Benefits of SCM Designs

Construction Cost Estimates

Preliminary order-of-magnitude construction cost estimates were developed for each project concept (Figure 5–4) based on anticipated project elements and their associated construction costs (Table 5–1). Operations and Maintenance (O&M) were not considered in the cost of the projects, but will be required for the lifetime of the SCMs.

Construction cost estimates are considered AACE Level Class 5, based on the lowest level of project definition and design. These cost estimates are to be used only as a general guideline for more specific and detailed studies. Estimates have been prepared using accepted practices and represent potential construction costs based on the preliminary conceptualization of each project. Actual construction costs will vary depending on design development, labor, materials, equipment, market conditions, and other factors that may affect final bid price. Guidance on how to cover these project costs is presented in Chapter 6.

Project Site	Total Construction Cost ($)[1]
Cannery Site	$3.3 million
Hutcheson Park	$1.1 million
Cardozo School	$1.3 million
Riverside Drive	$1.1 million
First Street Basin	$2.2 million
Riverside Open Space	$4.0 million
Total	$13.4 million

Table 5–1 Project Cost Summary Table

1. Itemized project cost estimates can be found in Appendix A.8.

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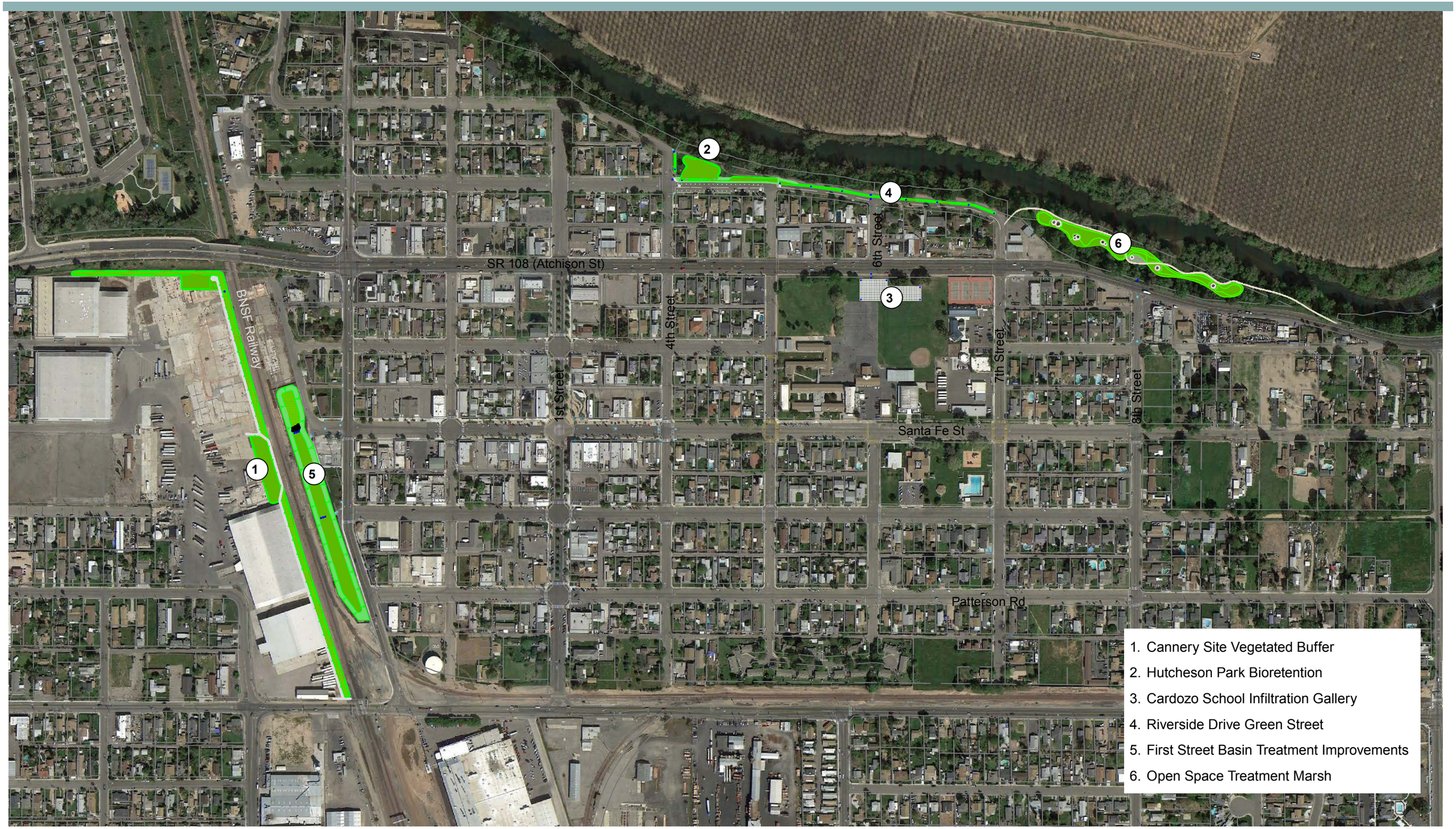

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300 California Street
San Francisco CA 94104

ALTERNATIVE COMPLIANCE PROJECT CONCEPTS

LOW IMPACT DEVELOPMENT ALTERNATIVE COMPLIANCE STUDY
THE CITY OF RIVERBANK, CA

NORTH

SCALE: 1" = 400'
DATE: 1/29/2015

Figure 5–4 Prioritized Sub-watersheds and their Respective Conceptual Projects

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5.2 Project Descriptions

Cannery Sub-watershed

Total Sub-Watershed Area: 82.8 acres

Project Site: Former Cannery parcel

Project Footprint: 1.6 acres

Project Drainage Management Area: 70.3 acres

Water Quality Volume: 2.9 acre-feet

Construction Cost Estimate: $3.3 million

Objective: Project seeks to capture, retain, and provide treatment of stormwater from the Cannery Sub-watershed. The project doubles as a green corridor that will increase bicycle/pedestrian connectivity within the City of Riverbank and serve the site's future occupants as a noise/pollution barrier to SR108 and the BNSF Railway.

Project Description: Two linear bioretention cells will run along the north and eastern edges of the site. The passage of stormwater into the facility will depend on the site's future grading/development schema, but, once in the facility, stormwater will be conveyed down a gradual slope towards the northeastern corner of the site. As stormwater travels through the tiered bioretention cells, it will receive treatment before being collected in an underlying perforated pipe or, pending the condition of the existing subgrade, potentially encouraged to infiltrate. Discharge of treated stormwater from the facility will depend on the City's evolving plans to disconnect this sub-watershed from the City's WWTP.

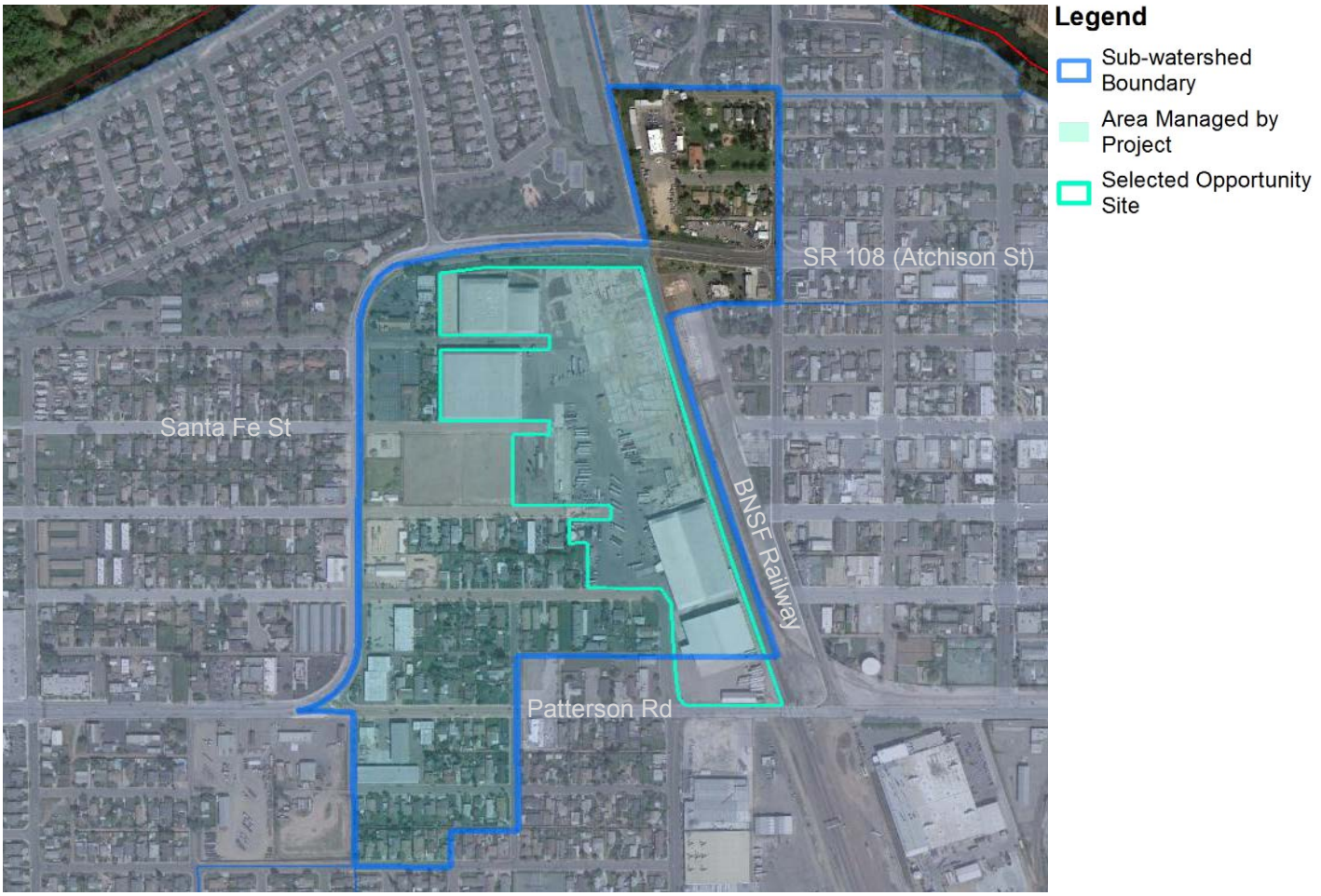

Figure 5–5 Cannery Sub-watershed Project Site

Operations and Maintenance: The swale should be inspected post-construction and semi-annually to ensure that it is draining properly. Typical problems that may need to be addressed include excess accumulation of debris and litter, erosion of slopes, damage to vegetation, channelization of flow into and within the swale, and the accumulation of sediment.

Additional Considerations: The fate of stormwater captured by this facility is undefined. A potential destination is the property north of the existing First Street Basin, although further development of this idea should start with an investigation of the implications of crossing the BSNF railway and the planned vehicular underpass at Santa Fe Street. An additional possibility would be to route treated stormwater north of SR108 to a new detention basin (as proposed in the 2008 SDSMP) and, most likely, a new river outfall.

An additional unresolved issue is that this project concept does not propose to capture or treat stormwater from north of SR108, where the presence/routing of existing drainage infrastructure is unclear. Accordingly, if the City goes forward with the planned disconnection of the Cannery Sub-watershed from the WWTP, an additional project would be required to capture and treat runoff from this area.

Ultimately, the fact that this facility is located on a sizable brownfield property makes it largely abstract. For example, depending upon the site's future development plans and soil conditions, the footprint of linear bioretention could morph into a central multi-use park or an underground infiltration gallery.

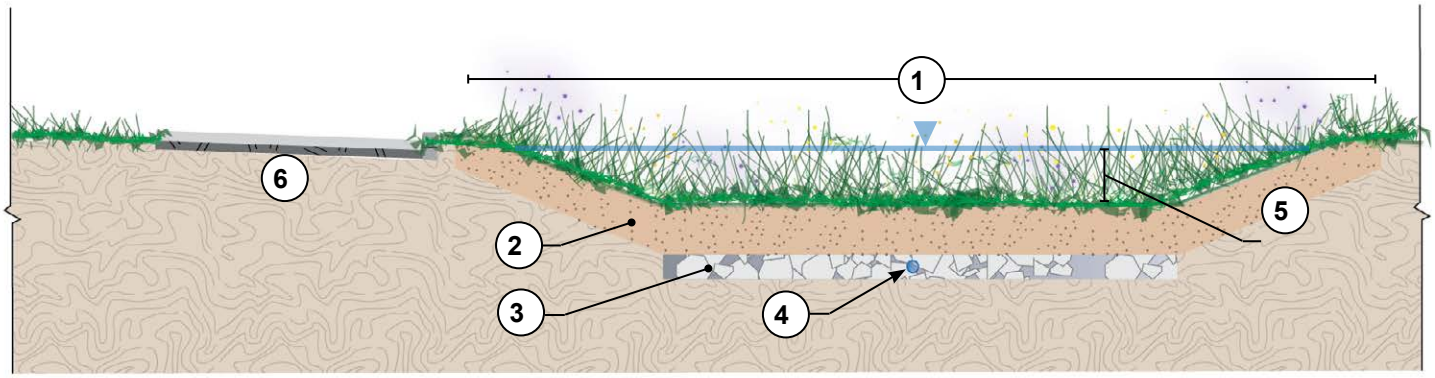

Figure 5–6 Proposed Section A-A'

1. One of two long, tiered, bioretention swales with average widths of 30ft and 3:1 side slopes to yield a total ponding footprint of 68,750sf; basins are lined with 2in shredded hardwood mulch and filled with a variety of native plants species that can tolerate both dry soils and periodic inundation.
2. 18in amended soil layer to enhance treatment and allow ponded surface water to drain from swale with a minimum 4in/hr infiltration rate.
3. Subsurface drainage layer composed of 3in of No. 9 drainage rock underlain with 9in of Class 1 Type A drain rock to further enhance treatment and provide an additional barrier to the existing sub-grade.
4. 4in perforated underdrain pipe runs length of both bioretention swales to collect and convey treated stormwater to an off-site detention basin.
5. Maximum 9in ponding depth with corresponding infiltration time of 2.5hrs; below the ponding depth, the basins are planted with hardier plants that can withstand periodic standing or flowing water.
6. Optional pedestrian/bicycle path that would link pedestrian movement from Patterson Road to Callander Avenue and enhance the walkability of Riverbank's downtown corridor.

1. Linear, tiered, bioretention swales that gradually convey collected stormwater to the northeastern corner of the site where flow from underdrains and an overflow structure can be discharged off-site.
2. The character of the vegetated buffer can vary along the length of the project - long linear sections that are not useable and have a bioretention plant palate can be interrupted by pocket parks that act as grassy play areas during dry weather and floodable detention space during wet weather.
3. First possible discharge strategy; piped conveyance to the vacant parcel north of the existing 1st Street Basin, as proposed by the TAC at the December 2014 meeting.
4. Second possible discharge strategy; piped conveyance to a new dual-use detention basin to be located directly east of Dunbar Lane, as proposed by the 2008 SDSMP.
5. Optional pedestrian / bicycle path that could link pedestrian movement from Patterson Road to Callander Avenue and enhance the walkability of Riverbank's downtown corridor.
6. Conceptual project within 7th Street Sub-watershed (First Street Basin Treatment Improvements).

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PROJECT CONCEPT: CANNERY SITE VEGETATED BUFFER

LOW IMPACT DEVELOPMENT ALTERNATIVE COMPLIANCE STUDY
THE CITY OF RIVERBANK, CA

NORTH

SCALE: VARIES
DATE: 1/29/2015

Figure 5–7 Cannery Sub-watershed Plan View of Project Concept

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Figure 5–8 Existing Conditions at Project Location Facing South (Left) and East (Right)

Figure 5–9 Project Precedent - Linear Bioretention in Mixed-use Development (Ladera Ranch, CA)

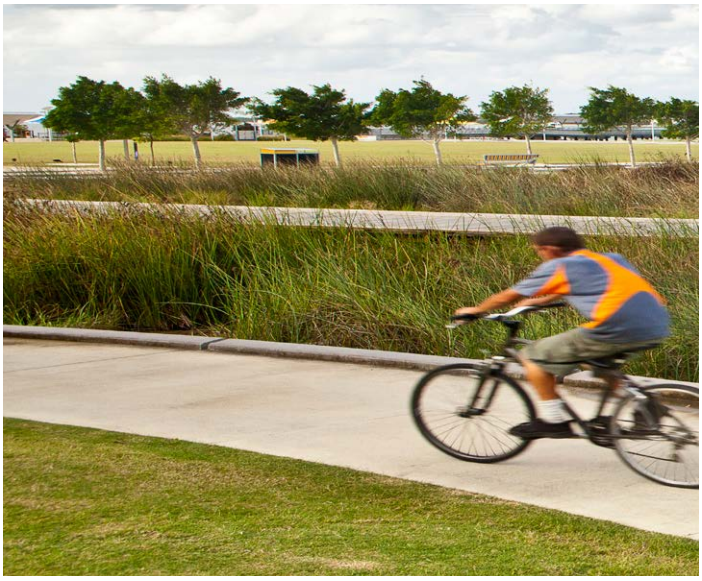


Figure 5–10 Project Precedent - Linear Bioretention Accompanied with Pedestrian/Bike Pathway (Southport Broadwater Parklands, Australia)

4th Street Sub-watershed

Total Sub-Watershed Area: 28.8 acres

Project Site: Hutcheson Park

Project Footprint: 0.4 acres

Project Drainage Management Area: 28.8 acres

Water Quality Volume: 0.87 acre-feet

Construction Cost Estimate: $1.1 million

Objective: Project seeks to capture, retain/infiltrate, and provide treatment of stormwater from the entire 4th Street Sub-watershed, while enhancing the existing landscape and functionality of Hutcheson Park.

Project Description: Stormwater is collected through existing sub-surface drainage infrastructure before being diverted and pumped into the northwest corner of Hutcheson Park. Stormwater will then be conveyed through two linear bioretention swales that will run at a gradual slope along the western and southern edges of the park. To avoid encroaching on the existing recreational space, the southern swale will replace the existing 18' diagonal parking strip along Riverside Drive. Within the swales, stormwater will receive treatment and, depending on the condition of underlying soils, will be encouraged to infiltrate. Only during large storm events will stormwater overtop the swales via reinforced outlets and flow into the interior of the park, where it will temporarily pond-up, drain through amended planting soil, collect in perforated underdrain pipes, and ultimately be conveyed to the existing 4th Street outfall.

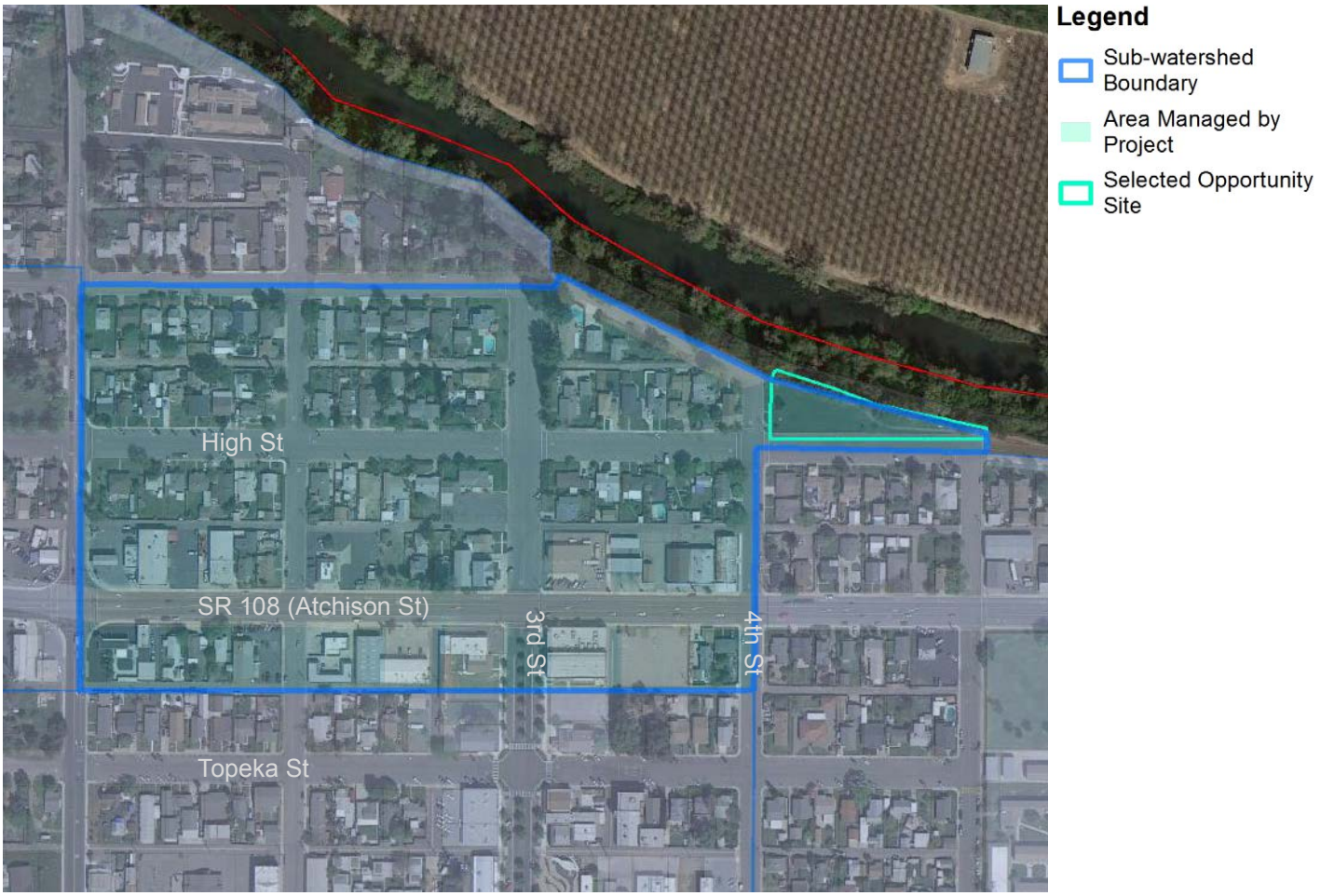


Figure 5–11 4th Street Sub-watershed Project Site

Figure 5–12 Existing Conditions at Project Location Facing Northeast (Left) and East (Right)

Figure 5–13 Project Precedent - Linear Vegetated Swale Encircling a Park

Figure 5–14 Project Precedent - Vegetated Swale with Concrete Inlet to Capture Drainage from Adjacent Roads

Operations and Maintenance: The swale should be inspected post-construction and semi-annually to ensure that it is draining properly. Typical problems that may need to be addressed are excess accumulation of debris and litter, erosion of slopes, damage to vegetation, channelization of flow into and within the swale, and the accumulation of sediment. The underdrains and sub-surface hydraulic connection also need to be flushed out on a biannual basis. Finally, the pump will require periodic inspection and maintenance, as specified by the manufacturer.

Additional Considerations: The City of Riverbank already has several parks that double as retention basins. This project concept enhances this idea by providing additional treatment beyond sedimentation. Further investigation of underlying soils and existing utilities within the park would need to be completed before this conceptual design is carried forward. Another consideration is the potential for public opposition to the removal of adjacent parking spaces. If such is the case, a potential solution would be to replace these spaces with parallel parking on the opposing side of High Street.

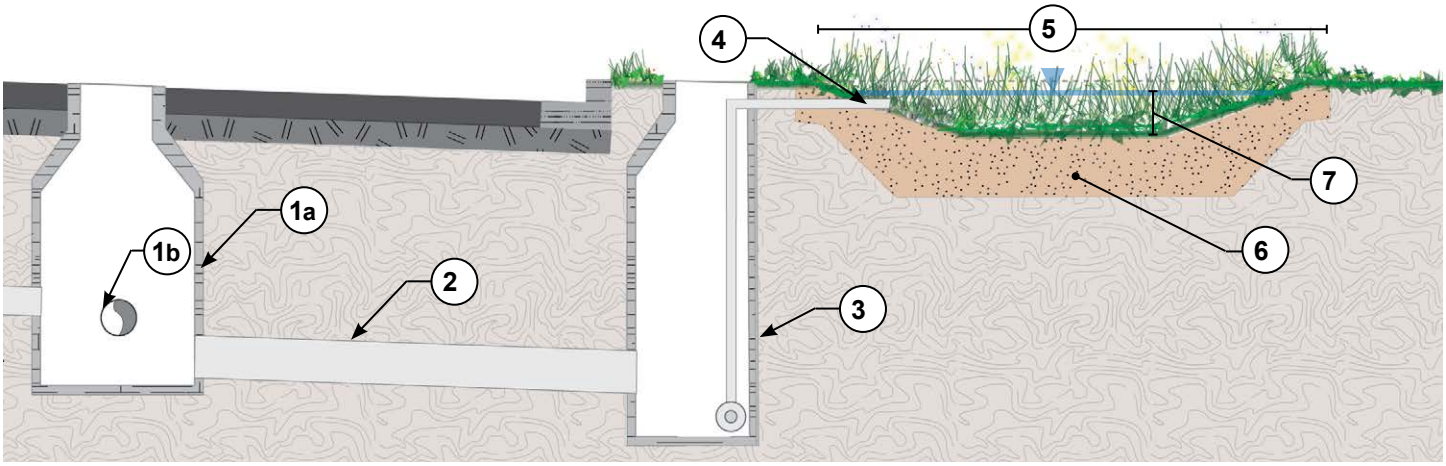


Figure 5–15 Proposed Section A-A'

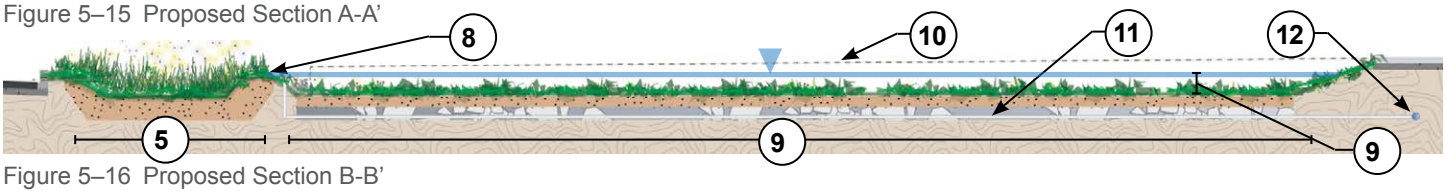
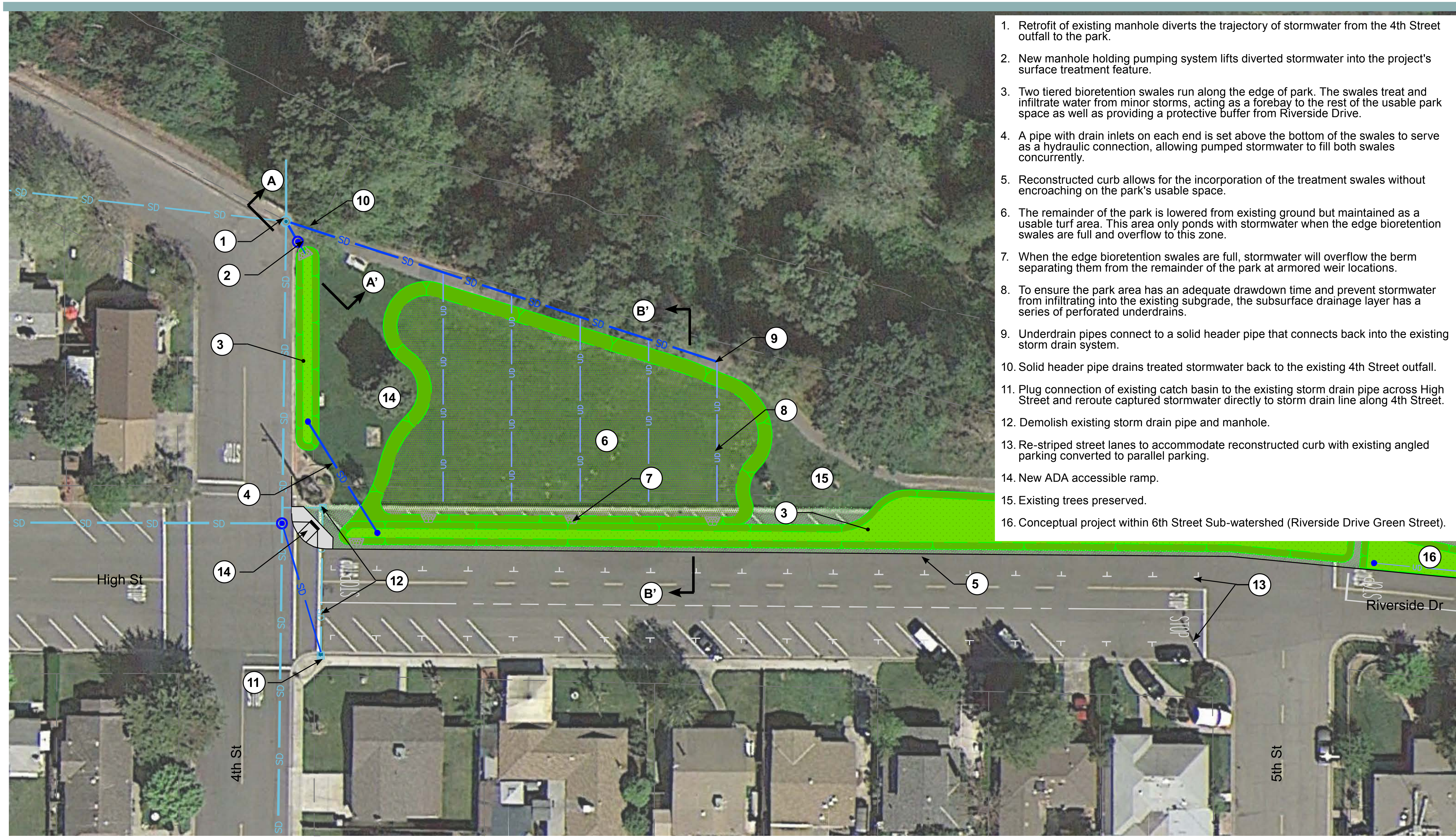


Figure 5–16 Proposed Section B-B'

1. Retrofit of existing manhole to redirect stormwater from the existing storm drain line to a low-flow bypass pipe that will route stormwater to the park (1a); During large storm events water will exit out the existing outfall pipe to the 4th Street Outfall (1b).
2. 12in low-flow bypass pipe to route stormwater from outfall toward the park.
3. New manhole holding pumping system to lift stormwater into the park's surface treatment feature.
4. Outlet to the surface treatment feature armoured with stones to diffuse energy and protect against erosion.
5. Two long, linear, bioretention swales with widths of 10ft and 3:1 side slopes to yield a total ponding footprint of 5,875sf; basins lined with 2in shredded hardwood mulch; swales act as a forebay to keep minor stormwater from entering the usable park space as well as provide a protective safety buffer to the street.
6. 18in amended soil layer to enhance treatment and allow ponded surface water to drain from swale into existing subgrade with a minimum 4in/hr infiltration rate.
7. Maximum 6in ponding depth within linear swales with corresponding infiltration time of 1.7hrs.
8. Berm / Armoured weir locations will allow stormwater from large events to safely overflow from bioretention swales into the remainder of the park.
9. Remainder of the park lowered from existing ground level (#10) but maintained as a usable turf area; with maximum 1ft ponding depth during large storm events.
11. Subsurface drainage layer composed of 3in of No. 9 drainage rock underlain with 9in of Class 1 Type A drain rock and a series of 4in perforated underdrain pipes to ensure stormwater ponded within park area drains in under 3.2hrs.
12. Underdrain pipes connect to a solid 8in header pipe that connects back into the existing storm drain system and drains water to the 4th Street outfall.



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300 California Street
San Francisco CA 94104

PROJECT CONCEPT: HUTCHESON PARK BIORETENTION

LOW IMPACT DEVELOPMENT ALTERNATIVE COMPLIANCE STUDY
THE CITY OF RIVERBANK, CA

NORTH

SCALE: 1" = 40'
DATE: 1/29/2015

Figure 5–17 4th Street Sub-watershed Plan View of Project Concept

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6th Street Sub-watershed

Total Sub-Watershed Area: 47 acres

Project Site: Cardozo School

Project Footprint: 0.5 acres

Project Drainage Management Area: 36.2 acres

Water Quality Volume: 1.01 acre-feet

Construction Cost Estimate: $1.3 million

Objective: Project seeks to capture, detain, treat, and infiltrate stormwater from the southern portion of the 6th Street Sub-watershed, without affecting the recreational space available at Cardozo School.

Project Description: The project is located beneath existing open space at Cardozo School. Stormwater is routed into the project through an existing catch basin on SR108. The catch basin is deepened to direct water into a sub-surface infiltration chamber composed of modular blocks or tubes that are easy to construct and maintain. Stormwater is retained within the tank before passing through the its pervious bottom, where it receives further treatment by filtrating through an amended soil layer, and eventually into the site's existing sub-surface soils. During large storm events, when the chamber has reached its capacity, stormwater will be redirected away from the school via an existing pipe leading to the existing 6th Street outfall.

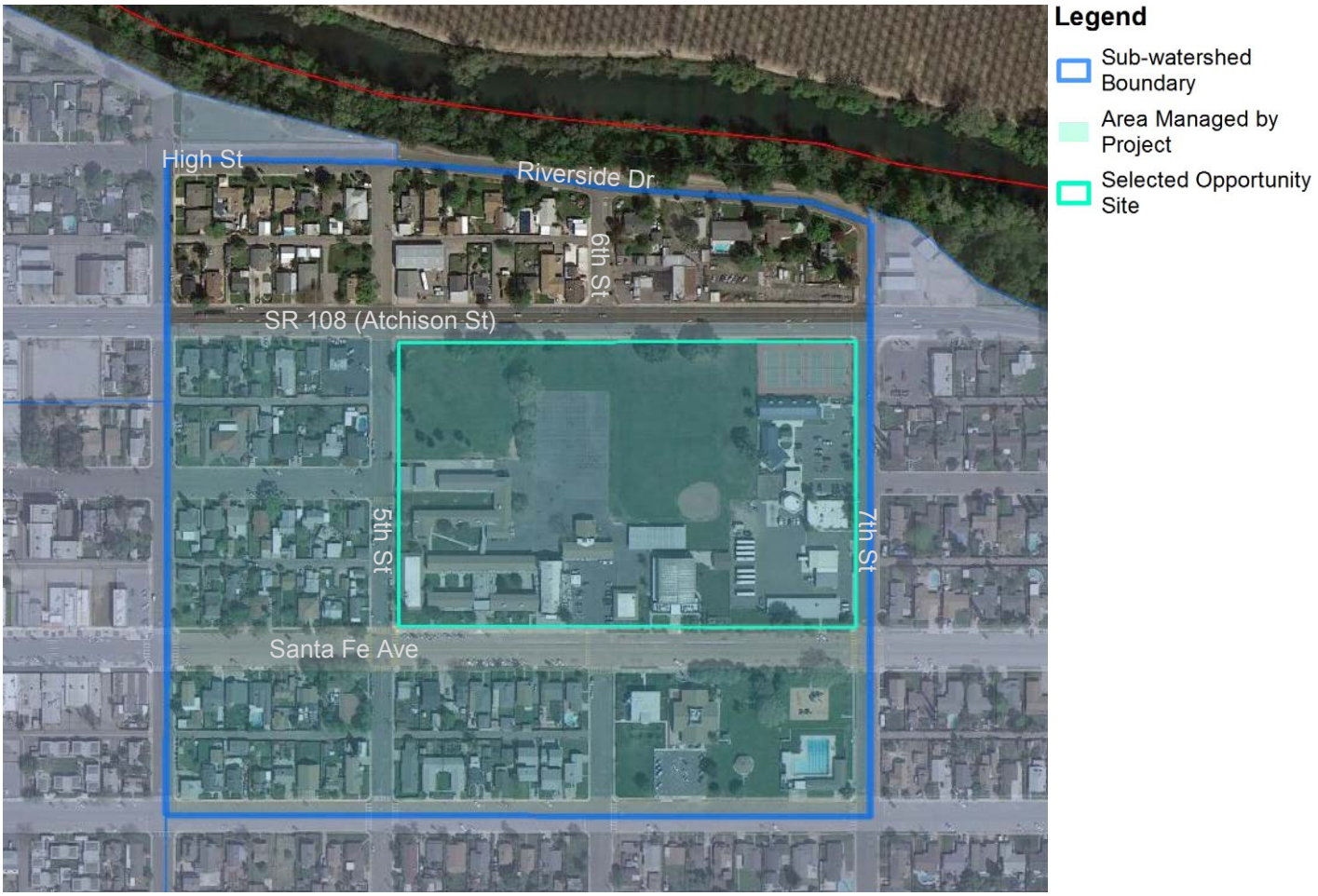

Figure 5–18 6th Street Sub-watershed Project Site

Operations and Maintenance: The catch basin / diversion structures should be inspected post-construction and semi-annually for sediment build-up or structural damage. Maintenance within the chamber would typically include clearing debris or accumulated sediment. The protective geotextile membrane would likely need to be periodically inspected/replaced, as specified by the manufacturer. Ground above the chamber should be mowed and maintained in accordance with the rest of the open/recreational space at the school.

Additional Considerations: For any project located at a school or other civic space, it is important to include the associated governing body throughout the entire process - from early planning through construction - to ensure the facility does not interfere with future programmatic plans/opportunities for the space. As the focus of this project is infiltration, to ensure feasibility, a detailed characterization of underlying soils would need to be completed in the early planning stages. Finally, the depth to the base of the system and backfill/protection material will vary with the type of storage unit selected. Thus, the nuances of the site should be carefully considered when selecting the appropriate type of storage unit.

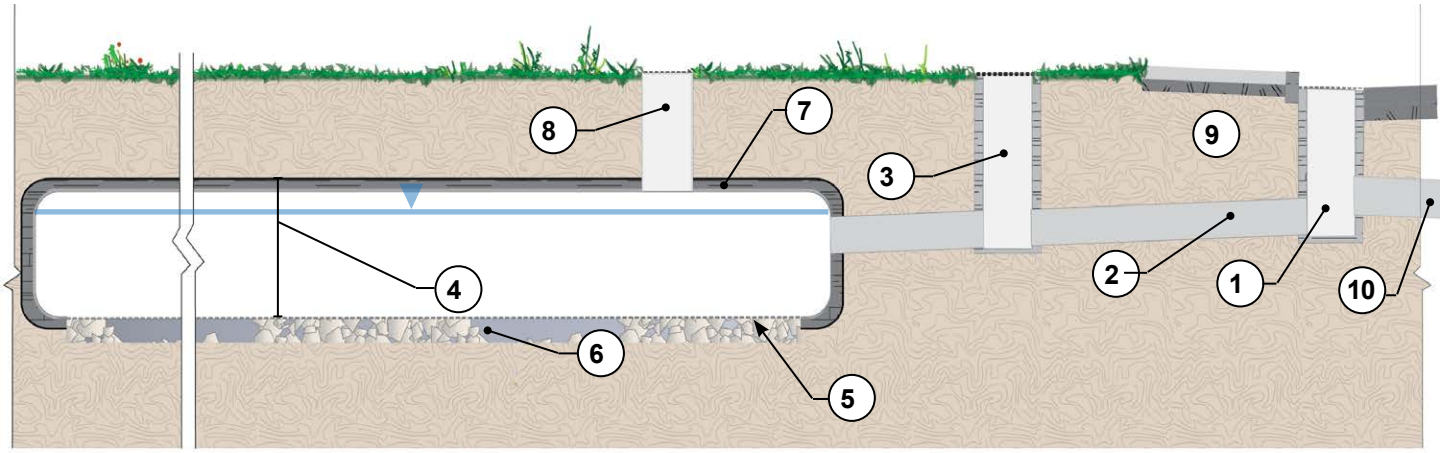

Figure 5–19 Proposed Section A-A'

1. Retrofit of existing catch basin to redirect stormwater from the existing storm drain line to a bypass pipe that would route stormwater to the infiltration chamber.
2. New 12in bypass pipe with 2 degree slope to gravity drain stormwater into the infiltration chamber.
3. New manhole for ease of maintenance of the new sub-surface drainage infrastructure.
4. 20,000sf x 1.5ft underground infiltration chamber (subsurface treatment feature) receives and stores up to 34,700cf of diverted stormwater, allowing it to gradually infiltrate and recharge groundwater.
5. Pervious bottom of infiltration chamber.
6. Subsurface drainage layer composed of 6in of No. 9 drainage rock to prevent migration of existing subgrade into the infiltration chamber and enhance treatment.
7. Geotextile membrane to prevent 3ft of overlying subgrade from migrating down and clogging the infiltration chamber.
8. Vertical perforated inspection well with removable cap to monitor infiltration chamber for proper function.
9. Existing pedestrian sidewalk along Atchinson Street that is separated from the school by a chain-link fence.
10. During consecutive and/or large storm events, stormwater would overflow through existing 1ft stormdrain pipe that runs north beneath 6th Street to the existing 6th Street outfall.

1. Retrofit of existing catch basin diverts the trajectory of stormwater from the 6th Street outfall toward the infiltration chamber.
2. New manhole to allow for maintenance of infiltration chamber and its associated infrastructure.
3. 34,700cf subsurface chamber with pervious bottom to allow for infiltration into the existing subgrade and provide stormwater treatment and groundwater recharge. A geotextile membrane prevents the migration of surrounding subgrade into the chamber.
4. Existing pedestrian sidewalk along Atchinson Street that is separated from the school by a chain-link fence.

AECOM
300 California Street
San Francisco CA 94104

PROJECT CONCEPT: CARDOZO SCHOOL INFILTRATION GALLERY

LOW IMPACT DEVELOPMENT ALTERNATIVE COMPLIANCE STUDY
THE CITY OF RIVERBANK, CA

NORTH

SCALE: 1" = 40'
DATE: 1/29/2015

Figure 5–20 6th Street Sub-watershed Plan View of Project Concept

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Figure 5–21 Existing Conditions at Project Location Facing Southeast (Left) and South (Right)

Figure 5–22 Project Precedent - Underground Infiltration Modules with Gravel Overlay

Figure 5–23 Project Precedent - Underground Infiltration Gallery with Access Ports (Las Vegas, NV)

6th Street Sub-watershed

Total Sub-Watershed Area: 47 acres

Project Site: Riverside Drive

Project Footprint: 0.2 acres

Project Drainage Management Area: 10.6 acres

Water Quality Volume: 0.34 acre-feet

Construction Cost Estimate: $1.1 million

Objective: Project seeks to capture, retain, and provide treatment of stormwater from the northern half of the 6th Street Sub-watershed, while enhancing the safety and aesthetic experience for pedestrians that use the existing 'Riverside' pathway.

Project Description: Excess width of Riverside Drive would be replaced with a linear bioretention swale that will run from 7th Street to 5th Street, where it will link up to the project concept proposed at Hutcheson Park. To direct stormwater collected in existing stormwater infrastructure into the facility, a new manhole with accompanying pump is proposed at the intersection of 5th Street and Riverside Drive. Other gravity-based solutions and more complex pumping scenarios were investigated and tested, but the project team ultimately determined that the proposed pump, although not ideal, is the most appropriate solution. All remaining overland flow will enter the swale via a series of reinforced curb cuts. Stormwater receives treatment by percolating through grassy vegetation and amended planting soil before collecting in an underdrain that discharges to the existing 6th Street outfall.

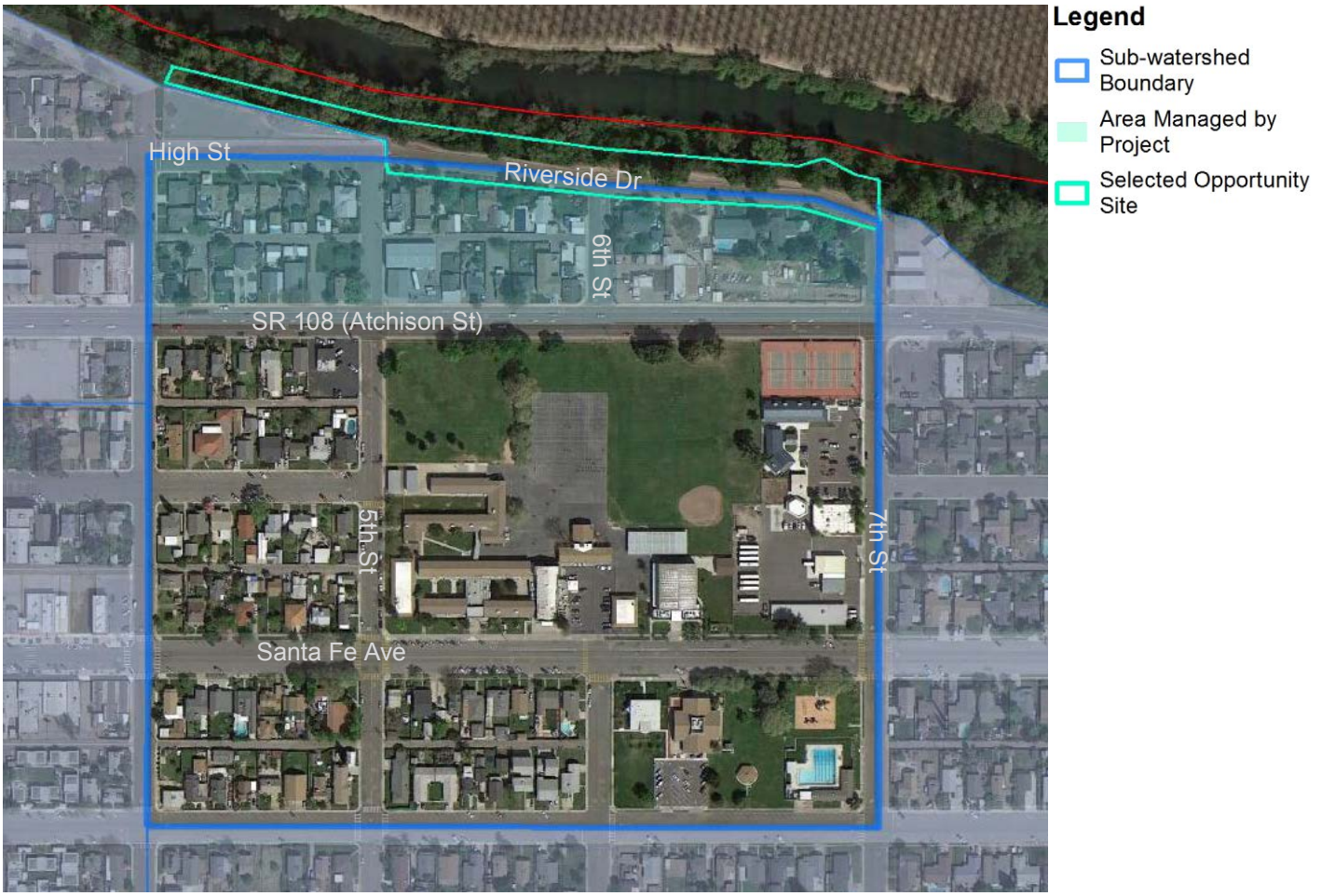


Figure 5–24 6th Street Sub-watershed Project Site

Figure 5–25 Existing Conditions at Project Location Facing East (left) and West (Right)

Figure 5–26 Project Precedent - Vegetated Swale with Concrete Inlet to Capture Drainage from Adjacent Road (High Point Seattle, WA)

Figure 5–27 Project Precedent - Long Linear Vegetated Swale (Southport Broadwater Parklands, Australia)

Operations and Maintenance: The swale should be inspected post-construction and semi-annually to confirm that it is draining properly. Typical problems that may need to be managed include excess accumulation of debris and litter, erosion of slopes, damage to vegetation, channelization of flow into and within the swale, and the accumulation of sediment. The underdrains and sub-surface hydraulic connection will need to be flushed out on a biannual basis. The pump will require periodic inspection and maintenance, as specified by the manufacturer.

Additional Considerations: The cost and maintenance associated with a pump is the largest barrier to this project concept. Generally speaking, green streets SCMs work best in concert with other green streets; a standalone green street project is not ideal. Another potential challenge for this project concept is the decreased width of Riverside Drive which, despite the swale doubling as a buffer to the pathway, has the potential to decrease pedestrian safety.

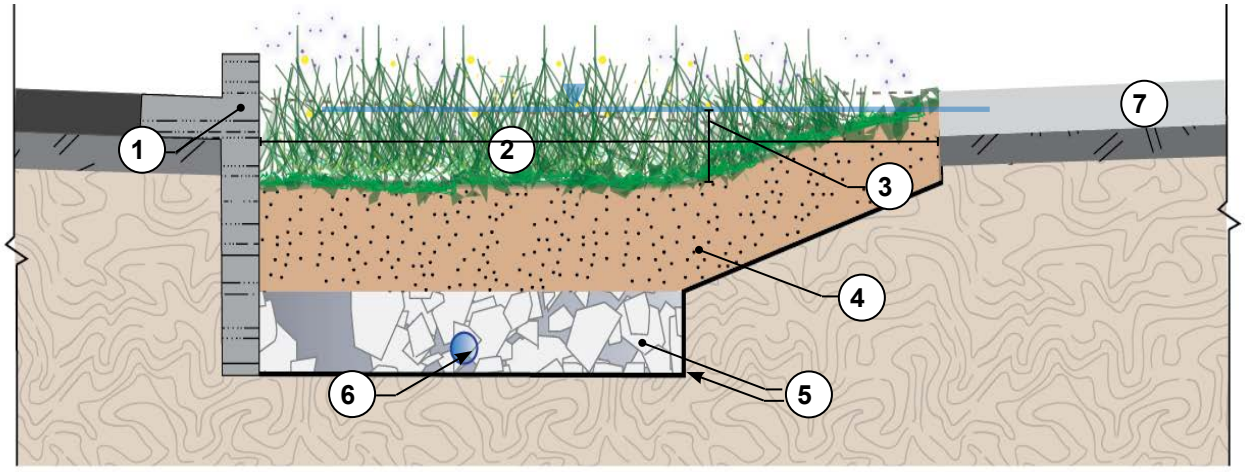
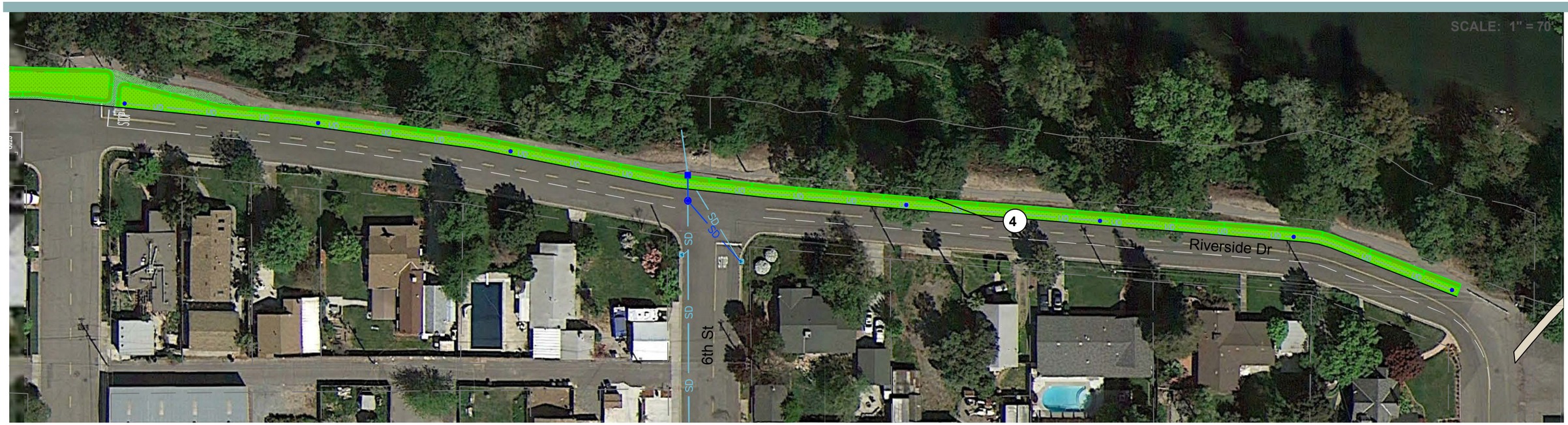
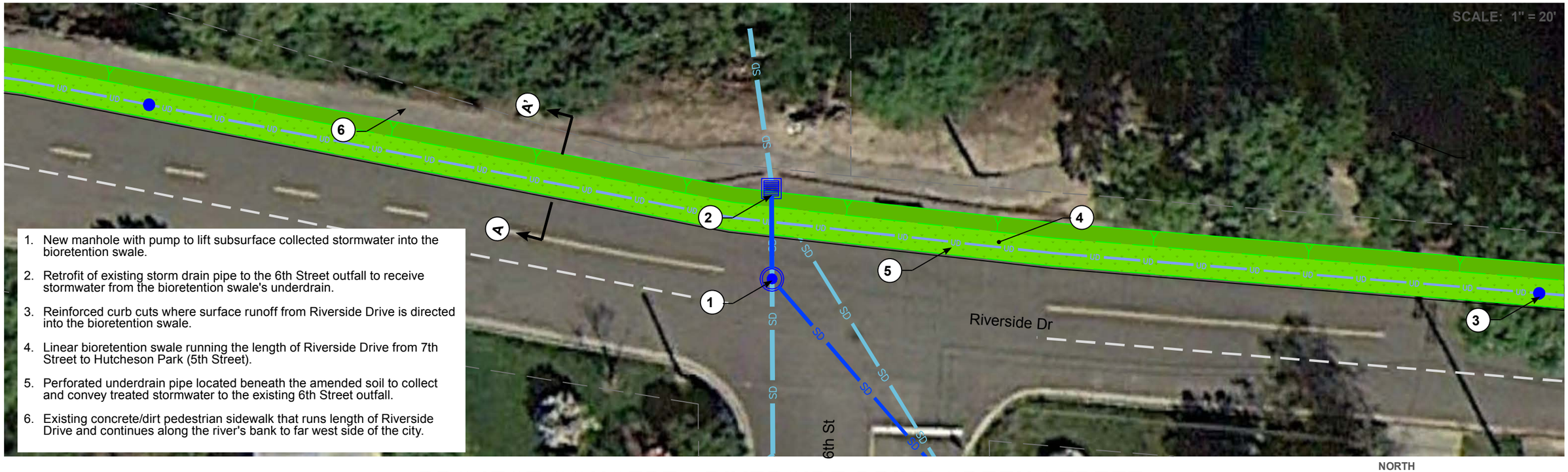


Figure 5–28 Proposed Section A-A'

1. 990ft new concrete retaining wall and curb to run the length of the project; every 140ft curb cuts allow surface runoff from Riverside Drive to enter the new surface treatment feature.
2. One long, linear, bioretention swale with 8.5 width and 3:1 side slopes up to 8,685sf ponding footprint; swale is lined with 2" shredded hardwood mulch and filled with a variety of native plants species that can tolerate both dry soils and periodic inundation.
3. Maximum ponding depth 1ft above bottom of swale with corresponding surface water infiltration time of 3.7hrs; beyond 1ft of ponding, the retaining wall forces stormwater to spill over existing sidewalk into Stanislaus River (i.e. not onto Riverside Drive).
4. 12in amended soil layer on top of existing subgrade to enhance treatment and allow ponded surface water to drain from the swale with a minimum 4in/hr infiltration rate.
5. Subsurface drainage layer composed of 3in of No. 9 drainage rock underlain with 6in of Class 1 Type A drain rock; impermeable liner prevents stormwater from infiltrating into the river's vulnerable bank.
6. 990 ft 4in perforated underdrain pipe runs length of bioretention swale to collect and convey treated stormwater to the existing 6th Street Outfall.
7. Existing concrete/dirt pedestrian sidewalk that runs length of Riverside Drive and continues along River's bank to far west side of the city.





1. New manhole with pump to lift subsurface collected stormwater into the bioretention swale.
2. Retrofit of existing storm drain pipe to the 6th Street outfall to receive stormwater from the bioretention swale's underdrain.
3. Reinforced curb cuts where surface runoff from Riverside Drive is directed into the bioretention swale.
4. Linear bioretention swale running the length of Riverside Drive from 7th Street to Hutcheson Park (5th Street).
5. Perforated underdrain pipe located beneath the amended soil to collect and convey treated stormwater to the existing 6th Street outfall.
6. Existing concrete/dirt pedestrian sidewalk that runs length of Riverside Drive and continues along the river's bank to far west side of the city.

AECOM
300 California Street
San Francisco CA 94104

PROJECT CONCEPT: RIVERSIDE DRIVE GREEN STREET

LOW IMPACT DEVELOPMENT ALTERNATIVE COMPLIANCE STUDY
THE CITY OF RIVERBANK, CA

NORTH

SCALE: VARIES
DATE: 1/29/2015

Figure 5–29 6th Street Sub-watershed Plan View of Project Concept

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7th Street Sub-watershed

Total Sub-Watershed Area: 258 acres

Project Site: First Street Basin

Project Footprint: 1.4 acres

Project Drainage Management Area: 194 acres

Water Quality Volume: 6.17 acre-feet

Construction Cost Estimate: $2.2 million

Objective: Project seeks to enhance the functionality of the existing First Street Basin through the creation of a deepened forebay and amended soil/planting scheme, with the possibility of opening up the southern portion of the basin to double as a public park.

Project Description: Stormwater is routed into the retention basin using existing infrastructure and is accessible from the existing pump. Stormwater will enter the detention basin, be directed north into a deepened vegetated forebay, temporarily pond, and then infiltrate into the existing subgrade. This process will not only increase the lifetime of the basin and enhance treatment, but will also promote groundwater recharge. Only during large storm events will water overtop the forebay and spill into the rest of the basin, where it will then infiltrate through amended planting soil. Stormwater will be allowed to pond to several feet above existing grade before entering into overflow structures that drain to the basin's existing pump station. From the pump station, stormwater is discharged to the existing 7th Street outfall.

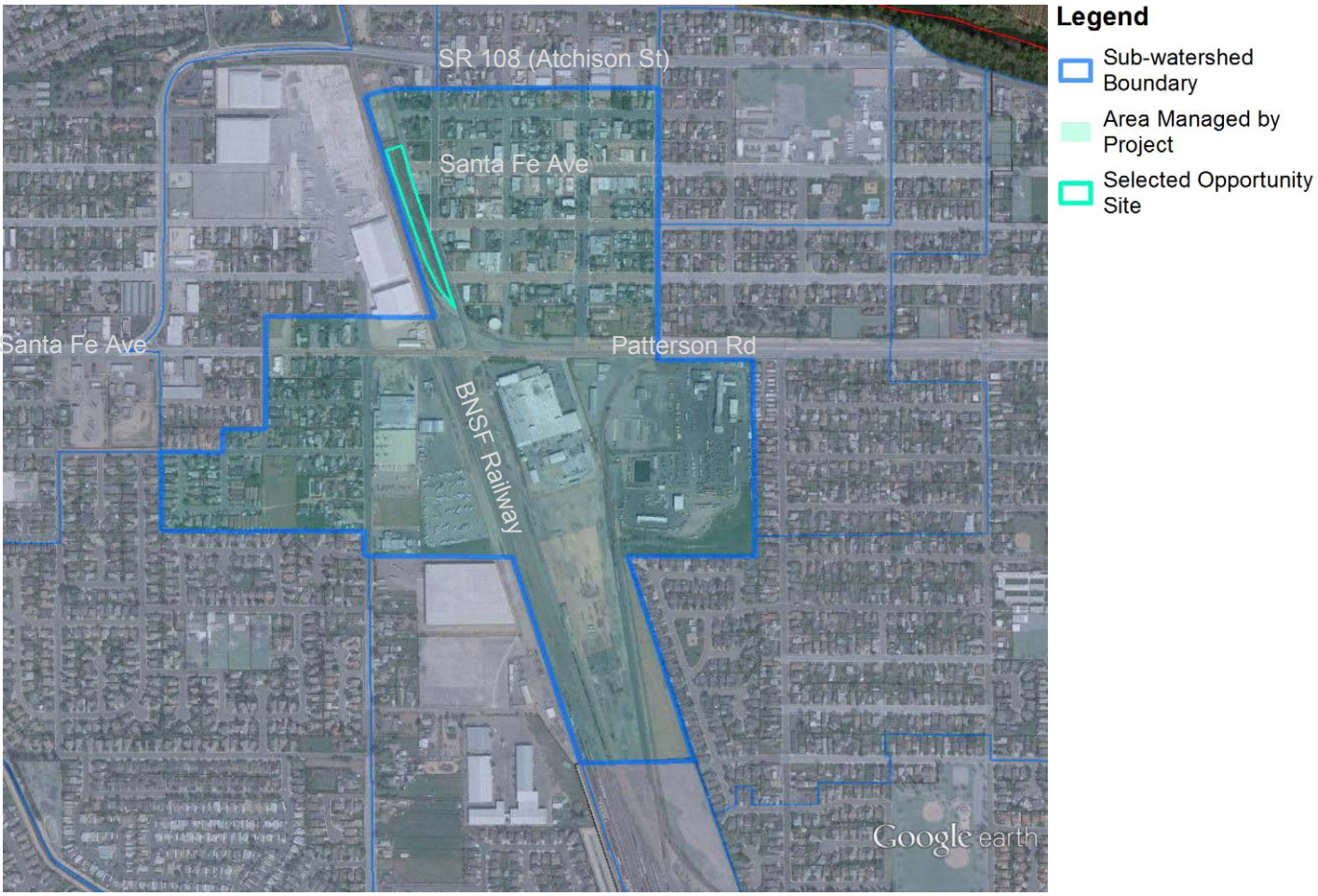


Figure 5–30 7th Street Sub-watershed Project Site

Operations and Maintenance: The forebay should be inspected post-construction and semi-annually to ensure that it is draining properly. Typical management needs include excess accumulation of debris and litter, erosion of slopes, damage to vegetation, channelization of flow into and within the forebay, and the accumulation of sediment. The vegetated portion of the basin will need to be periodically mowed (depending on plant selection palate) and should be inspected annually to ensure the overflow drains are kept clear and free of debris. The underdrains and sub-surface hydraulic connection will need to be flushed out on a biannual basis. The existing pump will require periodic inspection and maintenance would depend on the type of device installed.

Additional Considerations: In the past, the First Street Basin pump has been manually turned on and off. In accordance with the improvements proposed in the 2008 SDSMP and by the TAC, the project team encourages synchronization/activation of the pump with the proposed overflow drains. Depending on the quality of underlying soils, dry wells may need to be added beneath the forebay to meet desired infiltration levels. The project team also suggests taking down the existing perimeter fence so that, similar to Castleberg Park, the southern end of the basin could double as a public recreational area.

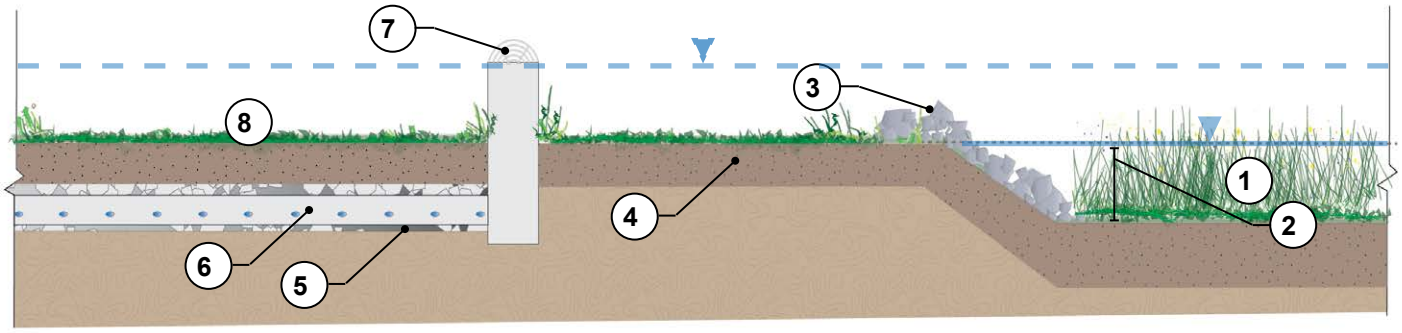
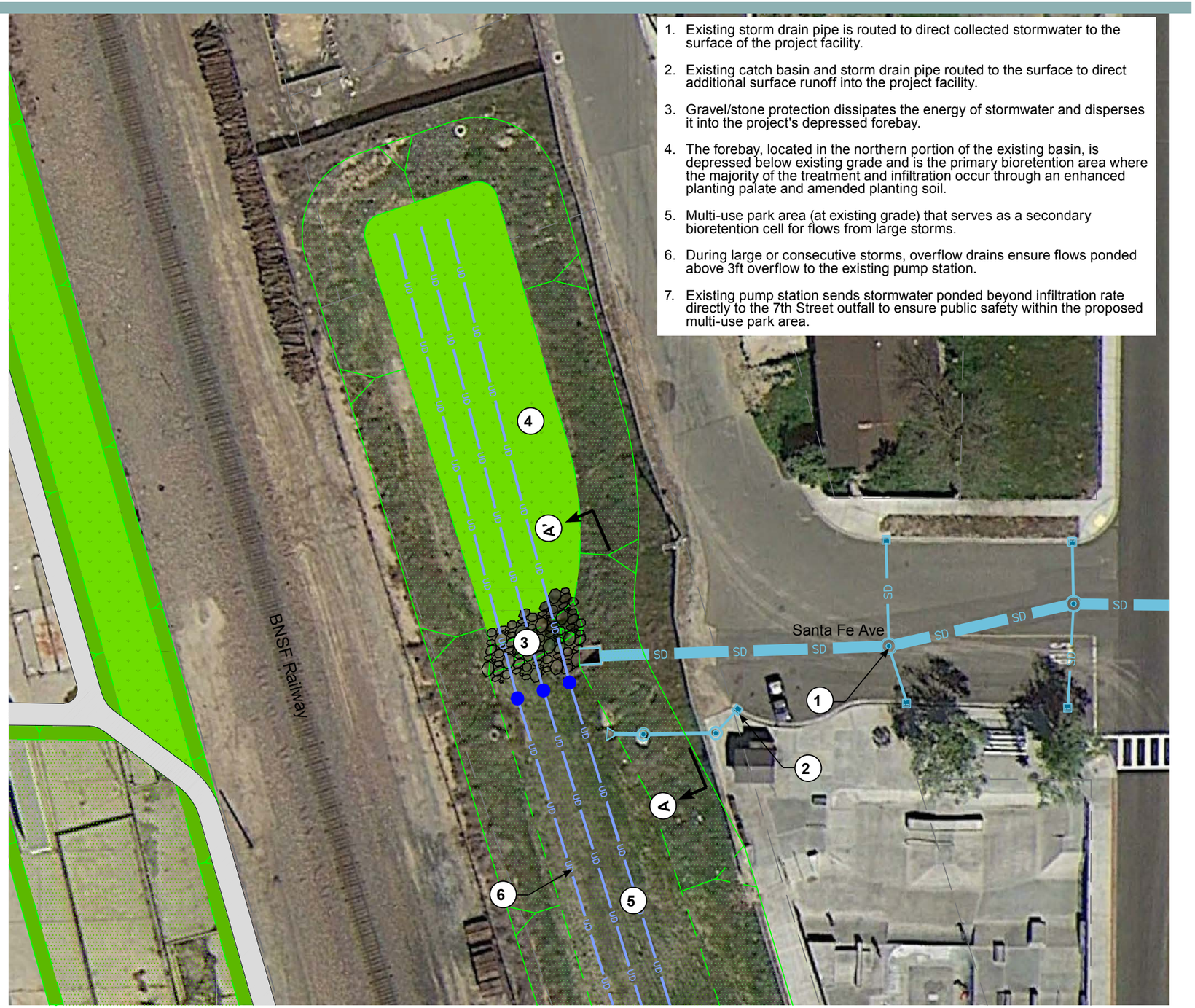


Figure 5–31 Proposed Section A-A'

1. Vegetated forebay is depressed 2ft below existing grade with 3:1 side slopes up to 11,300sf ponding footprint; lined with 2in shredded hardwood mulch and filled with a variety of native plants species that can tolerate both dry soils and periodic inundation.
2. Maximum ponding depth 5.2ft above bottom of forebay with corresponding surface water infiltration time of 19hrs; below ponding depth the basin will be planted with hardy plants that can withstand periodic standing and/or flowing water.
3. Structural barrier to forebay where existing storm drain infrastructure enters basin; stormwater feeds into forebay for treatment and infiltration; only during large storm events will water overtop the barrier to flow into multi-use park area (#8).
4. 18in amended soil layer on top of existing subgrade to enhance treatment and allow ponded surface water to drain from the basin with a minimum 4in/hr infiltration rate.
5. Subsurface drainage layer composed of 3in of No. 9 drainage rock underlain with 1ft of Class 1 Type A drain rock.
6. One of three 800ft perforated 10in underdrain pipes that runs north to south beneath bottom of multi-use park area (#8) to collect and send treated water out to the existing 7th Street outfall.
7. One of three overflow drain structures; during/after large storms, stormwater ponded above 3.2ft bypasses treatment and is sent directly to 7th Street Outfall (via existing pump and storm drain pipes).
8. Multi-use park area with base at existing grade and 3:1 slopes up to 50,650sf ponding footprint; during large storm events, stormwater that overflows from the forebay, will enter park and receive treatment (up to 3.2ft ponding) before being carried to the existing pump station via perforated underdrain pipes.



1. Existing storm drain pipe is routed to direct collected stormwater to the surface of the project facility.
2. Existing catch basin and storm drain pipe routed to the surface to direct additional surface runoff into the project facility.
3. Gravel/stone protection dissipates the energy of stormwater and disperses it into the project's depressed forebay.
4. The forebay, located in the northern portion of the existing basin, is depressed below existing grade and is the primary bioretention area where the majority of the treatment and infiltration occur through an enhanced planting palate and amended planting soil.
5. Multi-use park area (at existing grade) that serves as a secondary bioretention cell for flows from large storms.
6. During large or consecutive storms, overflow drains ensure flows ponded above 3ft overflow to the existing pump station.
7. Existing pump station sends stormwater ponded beyond infiltration rate directly to the 7th Street outfall to ensure public safety within the proposed multi-use park area.

AECOM
300 California Street
San Francisco CA 94104

PROJECT CONCEPT: 1ST STREET BASIN TREATMENT IMPROVEMENTS

LOW IMPACT DEVELOPMENT ALTERNATIVE COMPLIANCE STUDY
THE CITY OF RIVERBANK, CA

NORTH

SCALE: VARIES
DATE: 1/29/2015

Figure 5–32 7th Street Sub-watershed Plan View of Project Concept

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Figure 5–33 Existing Conditions at Project Location Facing Northwest

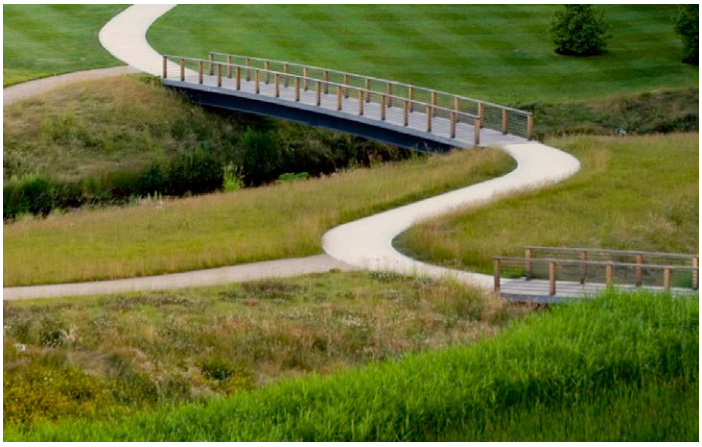

Figure 5–34 Project Precedent - Bioretention Basin that Doubles as a Park with Pedestrian Pathway (Royal Bank of Scotland, United Kingdom)

Figure 5–35 Project Precedent - Bioretention Basin with Overflow Structure (Seattle Seahawks Stadium, WA)

8th Street Sub-watershed

Total Sub-Watershed Area: 342 acres

Project Site: Existing Open Space Bench

Project Footprint: 0.8 acres

Project Drainage Management Area: 60.5 acres

Water Quality Volume: 2.12 acre-feet

Construction Cost Estimate: $4.3 million

Objective: Project seeks to detain and provide treatment of water - through an engineered marsh along the River's edge - from the likely to be redeveloped northern portion of the 8th Street Sub-watershed.

Project Description: Stormwater is routed into an engineered marsh through an armoured extension of the existing outfall. At the outfall, water would initially be directed into a rocky forebay in order to dissipate the energy gathered as water travels from the top of the bank down to the River, and to provide time for trash and sediment to settle out. From the forebay, water would spread north and south, travelling through the extent of the marsh, receiving primary treatment in the form of sedimentation, filtration, and other biological processes. Slightly depressed regions within the marsh allow water to temporarily pond before slowly draining to the River via level spreaders. Only during large storms would stormwater be directly discharged to the River via two armoured overflow outlet structures.

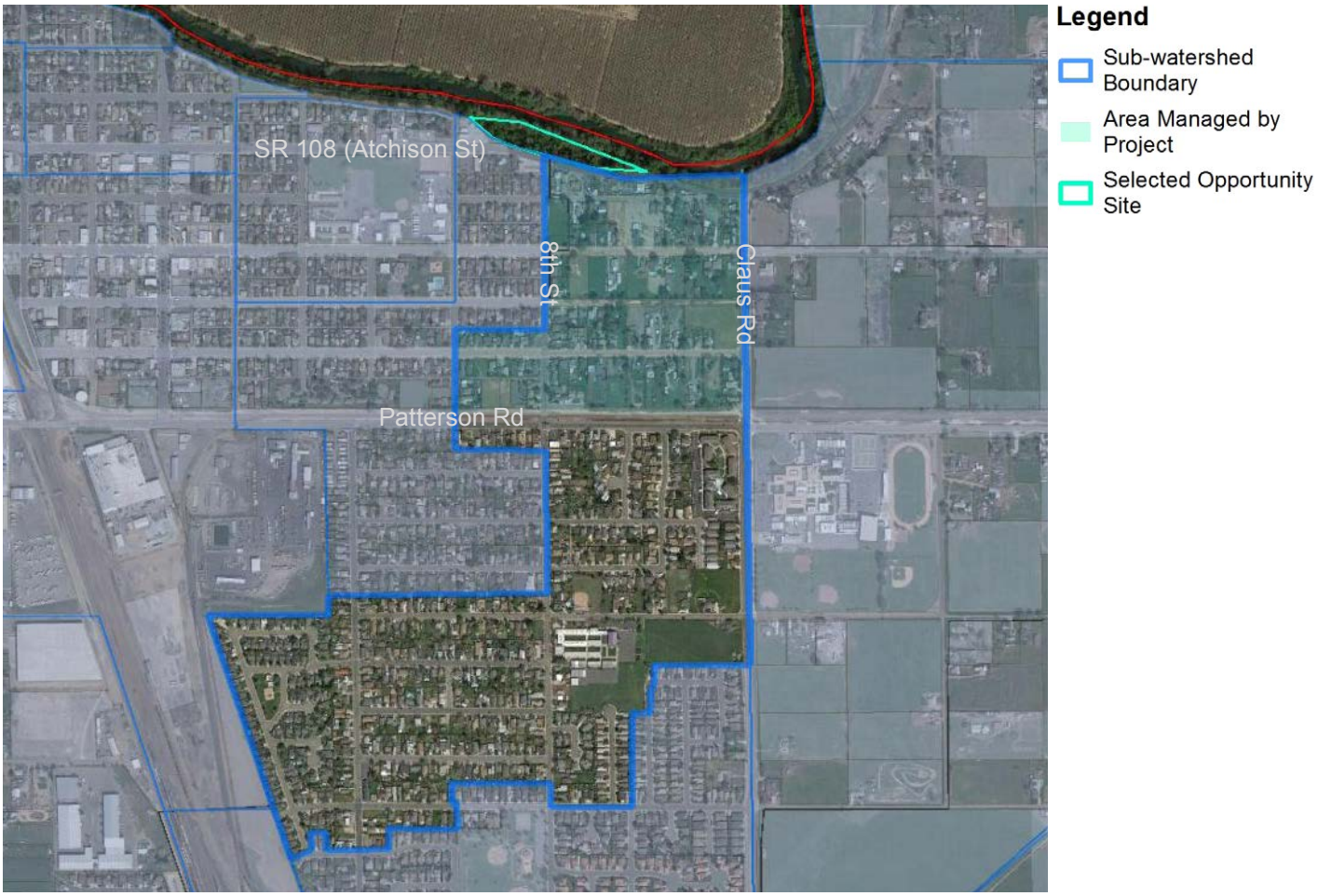

Figure 5–36 8th Street Sub-watershed (direct to outfall) Project Site

Figure 5–37 Existing Conditions at Project Location

Figure 5–38 Project Precedent - Marsh with Pedestrian Boardwalk (Victoria Park, London)

Figure 5–39 Project Precedent - Bioretention Basin that works around and incorporates pre-existing trees (Ladera Ranch, CA)

Operations and Maintenance: The forebay should be inspected post-construction and quarterly for the first three years to ensure that it is properly dissipating and dispersing flow. Typical management needs address debris and litter accumulation, erosion, damage to vegetation, channelization of flow, accumulation of sediment, and bank stabilization. The vegetated portion of the marsh can be inspected on an annual basis for similar problems, with attention to maintaining planting zones, ensuring upland to low marsh regions have optimal density, height and mix of native species. Specifically, the emergent (upland) marsh zone should maintain at least an 85% cover. After the first three years, the marsh, if properly designed and maintained should become fairly self-regulating. Additional maintenance may include: inspection on a biannual basis / after large storms, harvesting vegetation annually to increase pollutant removal, and removing sediment from the forebay, typically every 3-7 years.

Additional Considerations: Although the site is not considered a wetland nor does it lie within the River's base floodplain (Figure 5–42), due to the facilities location along the river's edge, NRCS, USFWS, the California Department of Fish and Wildlife (CNDDB), the U.S. Army Corps of Engineers, and state of CA regulatory personnel should be contacted to determine what permits or clearances may be needed.[1]

1. In particular, members of the TAC voiced concerns over the endangered riparian brush rabbit. According to the USFWS, only two populations of this species exist, neither of which are in the City of Riverbank (http://www.fws.gov/sacramento/es/Recovery-Planning/Riparian-Brush-Rabbits/es_recovery_rip-brush-rabbit-recovery.htm); In addition, there is no USFWS critical habitat listed for Riverbank, other than the channel itself. However, other riparian species of concern include the endangered Swainson's hawk and the threatened western yellow-billed cuckoo. As mentioned the project intends to protect existing vegetation and proposes to work with biologists to ultimately enhance the habitat for the aforementioned species by planting new riparian species such as the valley elderberry longhorn.

This could significantly impact construction time and the final cost of this conceptual project.

That said, the intention of the wetland is not to disturb, but to enhance existing riparian vegetation and habitats, as possible. To this point the project could potentially be classified as habitat enhancement for existing or newly listed species (e.g. the western billed cuckoo), and/or be considered as mitigation for the loss of habitat elsewhere.

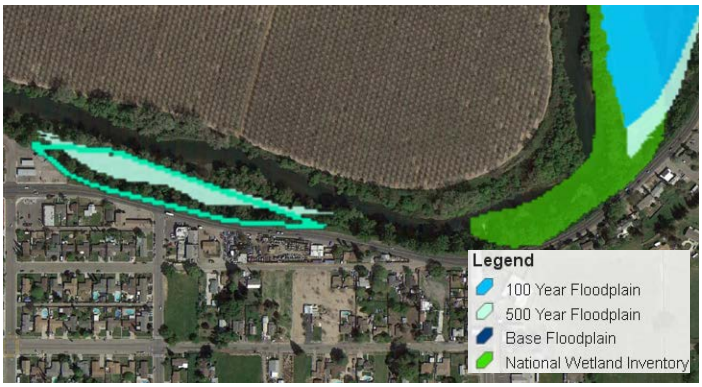

Figure 5–42 Facility resides within the base- 500-year floodplain and may require additional regulatory oversight

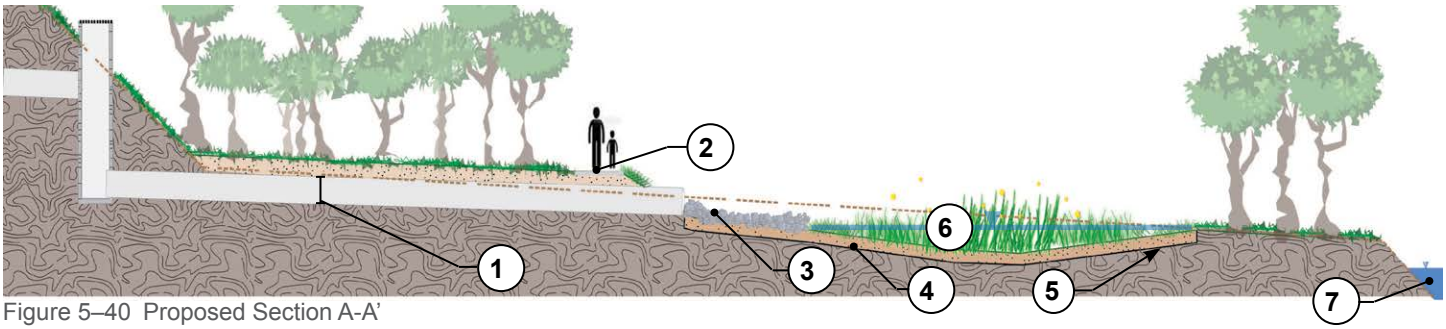

Figure 5–40 Proposed Section A-A'

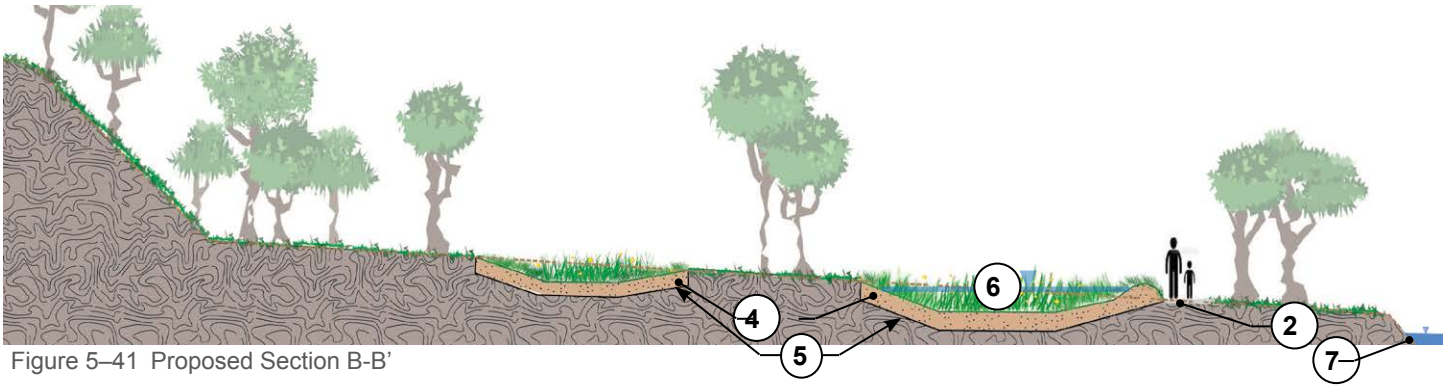

Figure 5–41 Proposed Section B-B'

1. Armoured extension of the existing 1ft 8th Street Outfall pipe directs stormwater into the treatment marsh; the width of the marsh will vary with existing vegetation with a total footprint of 35,000sf.
2. Decomposed granite pedestrian path to wind throughout the marsh and link up with existing path along Riverside Drive.
3. 2,000sf central rocky forebay to dissipate energy of stormwater and from there spread the flow to other lower lying bioretention areas of the marsh.
4. 18in amended soil layer on top of existing subgrade to enhance treatment and allow ponded surface water to drain from the marsh with a minimum 4in/hr infiltration rate.
5. Compacted clay liner beneath amended planting soil layer to prevent stormwater from further infiltration that could potentially destabilize the river's bank; treated water is directed out to the River through level spreaders; only during large storms will water be directly discharged to the River via two armoured overflow structures.
6. One of several wet ponds within the marsh where stormwater can temporarily pond up to 2ft and drain to the River within 48 hours of the storm event.
7. The Stanislaus River, the ultimate destination of treated stormwater from this and the other conceptual projects presented in this chapter.

1. Existing outfall, repaired and extended into new forebay.
2. Rocky forebay to dissipate the energy stormwater gathers as it falls down the river's bank and to provide time for trash and sediment to settle out before stormwater disperses into the marsh.
3. Constructed marsh that enhances and works with existing vegetation to increase the retention time, and subsequent treatment, of stormwater before it reaches the river.
4. Throughout marsh, slightly depressed pockets allow for temporary ponding; pockets are underlain with amended soil and compacted clay liner to prevent stormwater from infiltrating into the potentially unstable bank.
5. Level spreaders located throughout the edge of the marsh slowly discharge ponded stormwater to the River, thereby minimizing erosion and maintaining the stability of the bank.
6. Two armoured overflow structures allow for direct discharge of stormwater to the River during large storms.
7. Protected existing and preserved large-growth trees and riparian brush; new vegetation chosen to complement and enhance the bench's existing habitat.
8. 'Riverwalk' pedestrian pathway replaces the existing derelict dirt pathway and winds throughout marsh to connect with the existing pathway along Riverside Drive; path creates another access point (beyond Jacob Meyers park) to allow residents to enjoy the beauty of the river.

SR 108 (Atchison St)
7th St
8th St
Topeka St
SD

AECOM
300 California Street
San Francisco CA 94104

PROJECT CONCEPT: OPEN SPACE TREATMENT MARSH

LOW IMPACT DEVELOPMENT ALTERNATIVE COMPLIANCE STUDY
THE CITY OF RIVERBANK, CA

NORTH

SCALE: 1" = 80'
DATE: 1/29/2015

Figure 5–43 8th Street Sub-watershed Plan View of Project Concept

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5.3 Project Concepts Summary

	Project	Sub-watershed	Drainage Management Area (DMA)	DMA / Total Sub-watershed Area Ratio	Project Footprint	Project Footprint / DMA Ratio	Conceptual Construction Cost Estimate	Construction Cost / DMA	Construction Cost / Project Footprint	Treatment Technology	Maximum Volume Treated per 24-hour Storm Event
	**Cannery Site Vegetated Buffer**	Cannery	70.3 acres	85%	1.6 acres	2.3%	$3.3 million	$46,700 / acre	$47 / sf	Bioretention w/ Underdrain - Brownfield	124,900 cf
	**Hutcheson Park Bioretention**	4th Street	28.8 acres	100%	0.4 acres	1.4%	$1.1 million	$38,900 / acre	$64 / sf	Bioretention w/ Infiltration & Underdrain - Parcel	38,000 cf
	**Cardozo School Infiltration Gallery**	6th Street	36.2 acres	77%	0.5 acres	1.4%	$1.3 million	$35,300 / acre	$59 / sf	Infiltration Chamber - Parcel	44,000 cf
	**Riverside Drive Green Street**	6th Street	10.6 acres	23%	0.2 acres	1.9%	$1.1 million	$102,700 / acre	$125 / sf	Bioretention w/ Underdrain - Street	14,700 cf
	**1st Street Basin Treatment Improvement**	7th Street	194 acres	69%	1.4 acres	0.7%	$2.2 million	$11,600 / acre	$37 / sf	Bioretention w/ Infiltration & Underdrain - Parcel	269,000 cf
	**Open Space Treatment Marsh**	8th Street	60.5 acres	18%	0.8 acres	1.3%	$4.0 million	$66,900 / acre	$116 / sf	Treatment Marsh / Wetland - Open Space	92,200 cf
	TOTAL / AVERAGE		**400.3 acres**	**51%**	**4.9 acres**	**1.2%**	**$13.1 million**	**$50,343 / acre**	**$61 / sf**		**576,100 cf**

Table 5–2 Project Summary Table

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6.0

IN-LIEU FEE STRUCTURE

Castleberg Park, Riverbank
AECOM, 2013

CONTENTS

6.1 Overview

The City of Riverbank faces more stringent stormwater runoff regulations from state and federal agencies, to take effect in 2018. In the interim, the City has an opportunity to get ahead of the requirement, and thus prevent new regulations from inhibiting continued development and reinvestment potential. Part of this response is to invest in district-level stormwater management infrastructure in the City's downtown redevelopment area.

The incorporation of onsite LID in new development on greenfield sites is becoming more accepted and commonplace. Unfortunately, there are fewer examples of onsite LID for infill development. An Alternative Compliance (AC), centralized, LID approach can provide the incentive and flexibility the development community needs to pursue reinvestment in the City of Riverbank's historic downtown core. That is, LID projects incorporated into development plans can require between 4-11% of the total project site area. Alternatively, AC projects enable more complete development of a site by shifting the stormwater footprint to district-wide solutions.

Using this centralized/district approach, development yields for participating projects would increase.

This study provided the City of Riverbank an opportunity to explore the most efficient and cost-effective strategies to address both stormwater water quality and capacity requirements. The City can consider the trade-offs between updating their stormwater plan with the adopted standard of practice (i.e. site-by-site approach to stormwater quantity and quality) and a more centralized approach.

The six conceptual level centralized LID projects presented in Chapter 5 (henceforth referred to as Alternative Compliance 'AC projects') were located and designed in order to accommodate infill development and achieve evolving regulatory water quality requirements for each of their 'benefit' areas (i.e. DMA) (Figure 6–1 and Table 6–1).

However, if AC Projects are to be successful, their strategic location and design must be accompanied by effective financing strategies. This chapter identifies various means the City of Riverbank could pursue to finance the conceptual projects.

Sub-watershed	Project Site	Benefit Area (acres)	Total Construction Cost ($)	Cost per Volume (gal) Treated ($)
Cannery	Cannery	70.3	$ 3.3 million	$ 3.84
4th Street	Hutcheson Park	28.8	$1.1 million	$ 3.94
6th Street	Cardozo School	36.2	$ 1.3 million	$ 3.89
6th Street	Riverside Drive	10.6	$ 1.1 million	$ 9.89
7th Street	First Street Basin	194	$ 2.2 million	$ 1.12
8th Street	Open Space Marsh	60.5	$ 4.0 million	$ 5.87
Total		**402 acres**	**$13.1 million**	

Table 6–1 Project Cost Summary Table

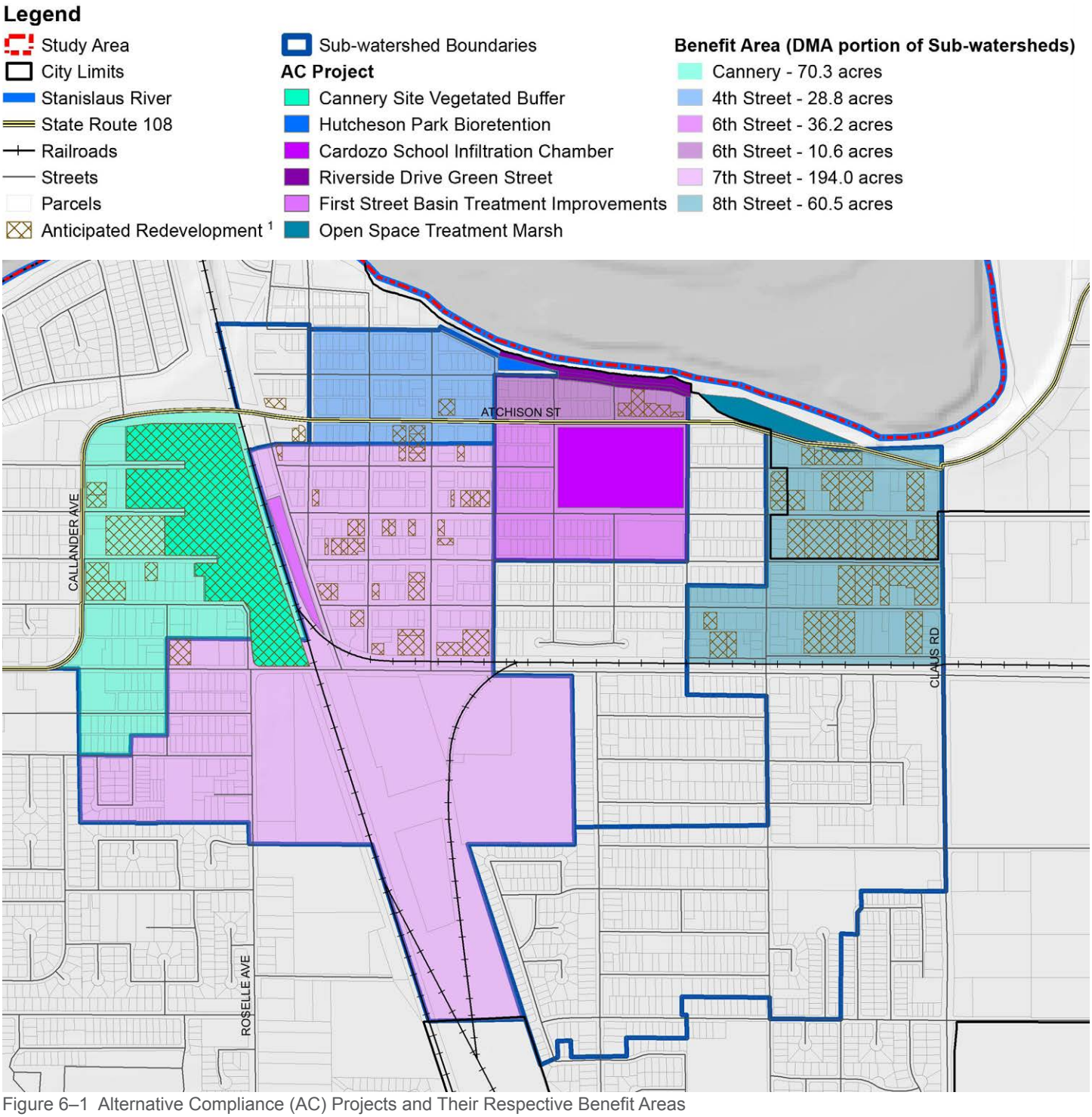

Figure 6–1 Alternative Compliance (AC) Projects and Their Respective Benefit Areas

1. Based on the 2009 update to the City of Riverbank's 2005-2025 General Plan.

Financing Options

The project team provided a preliminary summary of options for funding these AC projects for discussion with the TAC (Appendix A.10). The summary covered existing development impact fees, the collection and use of fees/parcel taxes from identified benefit areas, external grant funding, and a combination thereof.

The storm drainage portion of the City's adopted impact fees represents approximately 23% of the total impact fees (Figure 6–3 and Table 6–2). While this is a 10% increase over the City's previous (2006) fee structure (Figure 6–2), it still does not fully account for the costs (construction costs and opportunity costs associated with undeveloped land) needed to meet water quality requirements.

In Riverbank, the proportion that storm drainage represents of the total adopted impact fees is higher for non-residential development (Table 6–2). This is partially due to the higher impervious area (e.g. parking area) required for commercial and industrial uses above those typically designed for residential uses. Thus, revising the drainage master plan to include centralized LID/stormwater management projects could be a strategy for addressing the current and future regulatory environment and reducing overall costs, and could potentially provide a particular benefit for non-residential development areas.

Impact Fee Regulatory Requirements

Adoption of development impact fees are governed under Assembly Bill 1600 (AB 1600), which sets specific guidelines on how fees can be set and administered. Under AB 1600, Riverbank must establish a clear nexus between a development project's impact on stormwater flow and the proposed fee to manage the stormwater. Within this framework, the project team used feedback from the TAC (as summarized in A.9 March 6th meeting minutes) to consider two potential approaches:

1. Adopt a development impact fee at the citywide level, recognizing that water quality benefits realized in one sub-watershed provide larger citywide benefits.

2. Adopt a development impact fee at the district level, assigning the costs only to each benefit area and the potential infill development within the benefit area.

This chapter presents these two approaches, along with other funding tools, to discuss how the construction of the conceptual projects could be financed.

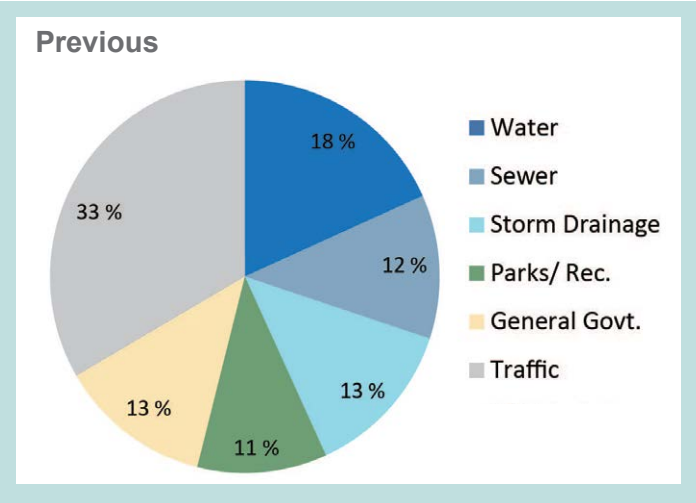

Figure 6–2 Previous Citywide Development Impact Fees

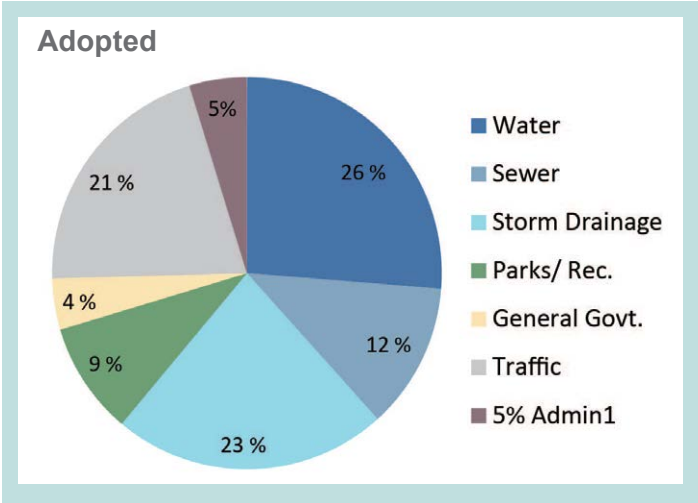

Figure 6–3 Adopted Citywide Development Impact Fees

Land Use	No. Units	Percent of Total Stormwater Generation	Total Storm Drainage Impact Fee	Fee per Unit
Residential	DU[1]			
Clustered Rural	250	3 %	$ 1,907,937	$ 7,632
Lower Density	4,410	48 %	$30,526,986	$ 6,922
Medium Density	4,470	20 %	$ 12,488,313	$ 2,794
Higher Density	1,430	7 %	$ 4,509,668	$ 3,154
Mixed Use	170	1 %	$346,898	$ 2,041
Non-residential	KSF[1]			
Community Commercial	816	5 %	$ 3,468,976	$ 4,251
Mixed Use	411	3 %	$ 1,734,488	$ 4,220
Industrial Business Park	1,835	12 %	$ 7,631,747	$ 4,159
Industrial	255	2 %	$ 1,040,693	$4,081

Table 6–2 Adopted Citywide Development Impact Fee per Land Use for Storm Drainage Improvements

1. DU = Dwelling Unit; KSF = thousand square feet

6.2 Funding Components

Project Cost

Preliminary order-of-magnitude construction cost estimates were developed for each project concept based on anticipated project elements and estimated quantities (Table 6–1). Itemized project cost estimates can be found in Appendix A.8. Land acquisition or easement costs were not included in the estimate. The land acquisition[1] or lease[2] cost could be considerable and take significant time to acquire, especially for Federal and State properties, but would depend on the property owner and their willingness to accommodate an easement to improve water quality. Operations and maintenance (O&M) costs, which are required for the lifetime of any SCMs, were also not included in the project cost estimates.

Operations and Maintenance

While the AC projects included in this Study are designed, where feasible, to reduce the costs required for ongoing maintenance, there will still be the need to maintain them over time. Maintenance costs are not calculated in the estimate and are in addition to the construction cost estimates provided. Furthermore, development fees are not intended to pay for the ongoing maintenance of infrastructure. Rather, the City uses assessment districts to provide operations and maintenance (or "O&M") funding by including an incremental charge (sometimes called a millage) as a part of each property tax bill. Assessments can be developed based on the property value, the improved property value, or some other metric. In this case, it may make sense to develop an assessment for properties within each benefit district that is based on the amount of runoff generated by each property. Another option is to allocate a marginal increase in to the right of way maintenance through the City's General Fund.

1. The Cannery Site AC Project is the only conceptual AC Project located on private land. In this case, the cost of acquiring the 1.6 acres is estimated to be around $320,000, or $4.59 a square foot.
2. The Open Space Marsh AC Project is located on Federal Land. If the City was able to demonstrate a strong case for the public good – then a Recreation and Public Purpose Lease might be offered (under the Recreation and Public Purpose Act). If the improvements / mitigation were made within a specified time period, then a patent for the land might be issued.

Citywide Development Impact Fee

Development impact fees are adopted by local governments to require development to pay for its fair share of the city's infrastructure needs. The fees can either pay for the establishment of new infrastructure and city facilities that directly service the development or to pay for development's projected share of the citywide facility need as identified in a capital plan.

California Government Code Sections 66000-66025 summarize legal requirements in California for a local government to levy a development impact fee. Local agencies are required to establish a nexus between the need for identified improvements and projects for which a fee is collected, and a reasonable relationship between the amount of the fee and the demand for the improvement generated by projects.

Within the guidance provided in State law, individual jurisdictions take different approaches. Some jurisdictions establish citywide fees, while others identify "districts" where different fees would apply, based on the cost of infrastructure needed to serve development in each district. Yet other jurisdictions take a "hybrid" approach where some types of fees apply citywide and other fees are applied on a district-by-district basis.

Riverbank Impact Fee

Riverbank's currently adopted impact fees apply on a citywide basis and are based on a nexus study that outlines the costs of public improvements (water, sewer, storm drainage, parks & recreation, general gov't and traffic) and how these costs are distributed by land use type and scale/size of development (Table 6–3 and Figure 6–3).

The City's impact fees were recently updated to be consistent with the 2009 update to the 2005-2025 General Plan. There is extensive guidance in the General Plan regarding the location, size, and design of public improvements that need to be factored into the updated fees. This, along with the updated development forecasts and estimates of infrastructure needs were used to derive the City's impact fees. A full breakdown of the forecasts and infrastructure needs are summarized in Table 6–3.

Land Use	Water	Sewer	Storm Drainage	Parks & Rec.	General Gov't	Traffic	5% Admin[1]
Residential	per DU	per DU	per DU	per DU	per DU	per DU	per DU
Clustered)	$ 13,486	$ 5,023	$ 7,632	$ 3,442	$ 1,246	$3,551	$1,719
Lower Density	$ 7,024	$ 3,063	$ 6,922	$ 3,912	$ 1,416	$ 2,983	$ 1,266
Medium Density	$ 6,743	$ 2,558	$ 2,794	$ 3,353	$ 1,213	$ 2,628	$ 964
Higher Density	$ 4,889	$ 3,141	$ 3,154	$ 2,794	$ 1,011	$ 2,237	$ 861
Mixed-Use	$ 4,889	$ 951	$2,041	$ 2,439	$ 883	$ 3,551	$ 738
Non-Residential[2]	per KSF	per KSF	per KSF	per KSF	per KSF	per KSF	per KSF
Commercial	$ 2,066	$ 1,651	$ 4,251	NA	$ 368	$ 5,568	$ 695
Mixed-Use	$ 2,078	$ 1,661	$ 4,220	NA	$367	$ 5,793	$ 706
Industrial	$ 2,058	$ 1,402	$ 4,159	NA	$ 270	$ 5,759	$ 682
Office	$ 2,027	$ 1,289	$ 4,081	NA	$ 506	$ 3,511	$ 571
Total	$ 45,260	$ 20,739	$ 39,254	$ 15,940	$ 7,280	$35,581	$ 8,203

Table 6–3 Adopted Citywide Development Impact Fee Summary Table

1 The City's 2006 System Development Fee includes a 5% administrative fee to cover staff time analyzing, planning, tracking, and managing the City's fee program
2 Regional commercial uses have a traffic impact fee of $5,768 per 1,000 square feet (KSF).

The recently adopted impact fee program is more detailed by land use compared to the City's previous impact fees. The new fees have several different residential categories and the analysis is designed to reflect costs associated with different densities. The same is true on the non-residential side, where the nexus study includes additional non-residential categories to promote more accurate and representative costs for different land uses.

Impact fees for stormwater, water, and wastewater facilities are based on infrastructure master plans developed in 2008. The master plans on which the existing fees are based do not take into account evolving regulatory requirements that will increase projects' responsibility for water quality. In addition to the need for impact fees to cover the cost of drainage facilities necessary to manage the rate of runoff following certain storm events, future projects in Stanislaus County will also be required to address construction-related and long-term stormwater quality.

District Impact Fee

District impact fees follow the same regulatory processes as citywide impact fees, but are confined to a smaller area typically to pay for infrastructure that will only provide benefit to the specific area. One example is lighting and landscape investments in one specific district. The fee still requires a clear nexus between the fee and the impact generated from new development, and will need to meet all the administrative requirements established under AB 1600.

Local fees/parcel taxes

Through a local election process, cities or districts can self-assess themselves to pay for initial infrastructure investments and ongoing operations and maintenance. There are a number of special assessment mechanism which can be utilized, including establishing a community benefits district, a lighting and landscaping district, or a parcel tax. All of these have different voting thresholds and processes for approval, and none are easily passed. For example, parcel taxes requires 2/3 voter approval.

Alternatively, the local water and sewer utility can establish a stormwater management fee which is adopted by the Board. These are typically set based on the amount of impervious area of a given private parcel. Stormwater management fees are charged to all uses, including school facilities.

External Grant Funding

During this Study and the previous Stanislaus County LID Manual prepared for Stanislaus County communities, there has been explicit consideration of the various co-benefits associated with LID projects – urban heat island reductions, aesthetic benefits, management of stormwater volume, erosion control, groundwater recharge, among others. Maximizing co-benefits in the location and design of AC projects can be considered as a part of the funding strategy as well.

Grant funding can contribute to existing development's proportional share of the stormwater benefit realized from the AC projects. To be clear, development fees cannot be used to pay for existing deficiencies, but only its incremental share of the costs. Thus, identifying and secure outside grant funds will be essential to any successful LID finance effort (Table 6–4).

For example, funding for 'green' road improvements comes from various sources. The CalTrans State Transportation Improvement Program (STIP) is a funding stream ($1.2 billion) that is a mix of local, State and Federal taxes and fees, and funds "new construction that adds capacity to the transportation network;" funds are also available for 'green' improvements such as 'green streets' programs. 'Green Streets' programs have been initiated in Ventura County (the pilot), and several others (including San Mateo County) are now underway.

CalTrans' 'Local Assistance Program' (LAP) is another funding stream ($1 billion, State and Federal) which is directed to the local level – and allows for city-level improvements. Finally, the "Active Transportation Program" (ATP) ($129.5 million) provides funds at the local level for "safe routes to school, pedestrian, bike, and trail" projects – and is prioritized for disadvantaged communities across California.

The State Water Board has in previous years administered a grant program for Concept Proposals, intended to fund projects that "reduce and prevent storm water contamination of rivers, lakes, and streams." Eligible project types include LID projects on public or private lands that are designed to infiltrate, filter, store, evaporate, or retain runoff in close proximity to the source of water. The U.S. Fish and Wildlife Service has a Cooperative Endangered Species Conservation Fund program that can be used for acquisition of property for endangered species protection, but past successful applications have included co-benefits, such as recreation, and water quality enhancements. These are a just a few examples of grants that could support AC Projects –

Project	Total Project Cost	Nexus Grant Opportunity	Potential Award
Cannery Site Vegetated Buffer	$ 3,285,000	Urban and Community Forestry Greenhouse Gas Reduction Fund (GGRF)	$ 750,000
Hutcheson Park Bioretention	$ 1,119,000	Water Quality, Supply, and Infrastructure Improvement Act of 2014	$ 750,000
Cardozo School Infiltration Gallery	$ 1,051,400	Drought Response Outreach Program for Schools (DROPS)	$ 750,000
Riverside Drive Green Street	$ 1,086,000	Urban Water Small Grants	$ 60,000
First Street Basin Treatment Improvements	$ 2,248,000	Water Quality, Supply, and Infrastructure Improvement Act of 2014	$ 1,500,000
Open Space Treatment Marsh	$ 4,409,000	Cooperative Endangered Species Conservation Fund (Section 6 Grants)	$ 1,500,000
Total	**$ 13,063,000**		**$ 5,310,000**

Table 6–4 Summary of External Funding Sources Potentially Available to Study's Conceptual AC Projects

Note: Grants listed in this table are not inclusive of one another; e.g. it would be unlikey for the City to receive $2,250,000 from the Water Quality, Supply and Infrastructure Improvement Act all in one award period. Overall, to apply, secure and manage these grants would likely require the full time effort of a City, or contracted, staff member.

particularly those projects that emphasize co-benefits. A complete list of external funding sources identified by the project team is summarized in Table 6–5.

City of Riverbank staff may identify future funding opportunities from outside sources that could be used to fund some or all of an AC Project that meets the funding source's criteria. The City has in recent years been quite successful in securing grants to finance local benefits while also meeting the granting entity's objectives [or requirements] (e.g., securing a State Water Board Stormwater Grant—funded through Prop 84—to complete the Stanislaus County LID Manual and this Study).

Proactive efforts to secure these outside resources for LID project development will ensure a competitive advantage for the AC projects presented in this Study, and are thus included in the recommended funding strategies.

Additional Considerations

The City can potentially reduce the existing drainage impact fee if LID projects are demonstrated to have a benefit in reduced demand on the drainage system (through a reduction in stormwater runoff following a storm event). While the LID projects are designed specifically to improve water quality, they provide many other co-benefits, including detaining and retaining stormwater. On-site detention and retention of stormwater in an AC Project could reduce the level and size of drainage improvements elsewhere. In particular, the projects designed at the Cannery site, the First Street Basin and Cardozo School would provide stormwater capacity benefits to address flooding and peak flow abatement.

Other potential co-benefits include new/improved public spaces, carbon sequestration, reduced heat island effect, overall city aesthetics, groundwater recharge, and habitat enhancement/ restoration. In other words, the City can be opportunistic in its overall infrastructure investments to include stormwater management elements in additional to traditional infrastructure components.

A park project could be designed to include an LID component that would provide areawide stormwater capacity and water quality benefit, but may be mostly funded by park impact fees. A trails improvement project along the Stanislaus River should consider LID projects, such as the open space treatment marsh designed along the 'Open Space Treatment Marsh,' passive landscaping along public rights-of-way could be converted to LID projects, using a combination of funding sources. Open space buffers can be provided along high-volume, high-speed roadways that provide LID treatment benefits, as well as noise attenuation benefits, and could be funded from a combination of sources. A project that requires mitigation for natural resources of some sort could potentially be designed to involve restoration of the subject habitat, along with LID and potentially stormwater capacity benefits, reducing the total cost involved for each obligation (habitat, water quality, drainage capacity).

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	Grant Title	Total Funding	Max per Grantee	Matching	RFP Deadline	Award Criteria Description	Donor / Awarding Body	Example Projects
State	**State Transportation Improvement Fund (STIF)**	$ 1.2 Billion [2014]	Depends according to a county-weighting formula; smallest (Alpine County), to largest (Los Angeles County)	N/A	Rolling	Demonstrate improvements to sustainability and safety.	**Cal Trans**	Ventura, CA Green Streets
	Environmental Enhancement and Mitigation (EEM) Program	$ 7 Million Annually	$500,000 per project, up to $1 Million if including land acquisition	Not required	7/13/2015	Contribute to mitigation of the environmental effects of transportation facilities; offer mitigation through urban forestry, resource lands, or other projects beyond the scope of the lead agency.	**California Natural Resources Agency**	Los Angeles, CA ($712,000) Hollywood Beautification Team Tree Planting & Community Greening Project; Tulare, CA ($458,260) SR 99-Cartmill Ave. Interchange Landscaping Project
	Drought Response Outreach Program for Schools (DROPS)	$25.5 Million	$50,000 up to $2.5 Million based on school district size	10-20%, of total project cost, based on school district size	2014/2015 grant cycled closed	Provide drought mitigation measures on school properties (including Indian land).	**State Water Resources Control Board (SWRCB)**	None listed on program website at this time
	Underground Storage Tank Cleanup Fund (USTCF)	$255 Million [2010/11], funding is based on a per gallon fee on petroleum stored in USTs	$ 1.5 Million, less the claimants deductible	Not required	Rolling	Have storage tanks (water and petroleum or other chemicals) that require repair or reconstruction. Provides reimbursement for expenses associated with the cleanup of leaking USTs.	**SWRCB**	Gonzales, CA ($460,000 Grant with $55,000 matching funds)
	Clean Water Act State Revolving Fund (CWSRF) *(loan program providing low cost financing)*	$4.5 Billion Annually	Can finance projects from <$1 Million to >$100 Million	No (loans average 1.7% interest up to 20 year)	Rolling	Demonstrate improvements involving water quality, protecting aquatic wildlife, protecting and restoring drinking water sources, and/or preserving our nation's waters for recreational use.	**Environmental Protection Agency (EPA) and SWRCB**	Hermosa Beach, CA Infiltration Trench; El Cerrito, CA Green Streets Rain Gardens; Redondo Beach, CA Alta Vista Park Diversion & Reuse Project
	Water Quality, Supply, and Infrastructure Improvement Act of 2014	$ 7.545 Billion	$ 50 Million	Grant guidelines still under development	Grant guidelines still under development	Improve water quality, supply, and/or infrastructure.	**State of California (grant process implemented by State agencies: SWRCB, various State conservancies, California Department of Fish and Wildlife, Department of Water Resources, etc.)**	None yet
	Urban and Community Forestry Greenhouse Gas Reduction Fund (GGRF) - 'Woods in the Neighborhood' Grants	$15.7 Million total for all GGRF grants (14/15); future funding undetermined at this time	$ 0.2 - $ 1.5 Million	Yes (75/25); 25 can be funds or in-kind	2014/2015 grant cycled closed	Expand and better the management of urban forests through the purchase a vacant urban parcel or parcels and improving them with vegetation.	**State of California Department of Forestry & Fire Protection (CalFire)**	Grants to be awarded by June 2015
	Urban and Community Forestry GGRF - 'Green Innovations Project' Grants	$15.7 Million [14/15]	$ 0.2 - $ 1.5 Million	Yes (75/25); 25 can be funds or in-kind	2014/2015 grant cycled closed	Be unique and forward-thinking urban GI projects that demonstrate greenhouse gas reduction, with strong focused on environmental justice communities.	**CalFire**	Grants to be awarded by June 2015
Federal	**Cooperative Endangered Species Conservation Fund (Section 6 Grants)**	$ 45.4Million [FY14]	Range of grant awards has been between $1,000 and $24 Million	Yes (at least 25 percent of the total project cost)	2014/2015 grant cycled closed	Provide general environmental mitigation measures and water improvements in areas with known endangered species.	**US Fish and Wildlife Service (USFWS)**	Santa Clara County, CA: Santa Clara Valley HCP/NCCP ($2,000,000); San Bernardino County, CA: Metcalf Meadow ($1,197,000)
	Clean Water Act Nonpoint Source Grant (Section 319 Grants)	$ 165 Million Annually	$750,000 for implementation and $175,000 for planning/ assessment projects	Yes (at least 25 percent of the total project cost)	The solicitation process runs from August (of the previous year) through May of the following year when the Grant funding is actually received from EPA	Be nonpoint source related project that requires technical assistance, financial assistance, education, training, technology transfer, demonstration projects, and/or monitoring to assess the project's success; Ineligible projects are in areas that are under or affiliated with a NPDES Permit, or address an issue in a land use included in a MS4s Permit.	**Environmental Protection Agency (EPA) with SWRCB**	Los Angeles, CA River Street Biofiltration Project; The Popoia Street and Rain Garden Retrofit (HI); Marsh Creek BMP Preserve, Sandy Springs Georgia.
	Urban Water Small Grants	$5.3 Million [since 2012]	$40,000 - $60,000	NA	None at this time	Contribute to improved water quality and community revitalization.	**Environmental Protection Agency (EPA)**	Portland, Oregon design, planning and performance of water quality sampling and data collection activities; Bozeman, Montana integrated stream monitoring program
	Water Infrastructure and Resiliency Finance Center Funding Environmental Finance Center (EFC) Grant Program	$48 Million [2016-2021]; $8 Million for GY2016	Exact amounts for specific awards will depend on the availability of funds and the number of awards made	None required	2014/2015 grant cycled closed	Sustainable public-purpose water and other environmental infrastructure systems that identify and support drinking water and wastewater utility water conservation, energy efficiency, management, and capital planning. Available to public and private non-profit universities, and non-profit organizations subject to 2 CRF Part 200.	**Environmental Protection Agency (EPA)**	None yet (pending)
Public-Private Partnership (P3)	**Qualified Public Infrastructure Bonds (QPIBs)** *Still requires approval from Congress*	NA	Tax exempt municipal bonds, amount variable depending on private sector contribution	NA	NA	Airport, port, mass transit, solid waste, sewer, water and surface transportation projects, but only if they are governmentally-owned.	**Federal Government in Consortium with Private Parties**	Prince Georges County, MD
	Transportation Investment Center	$ 7.5 Billion	13 Awards 2014	N/A	N/A	High-Impact Projects deemed worthy of acceleration.	**Department of Transportation (DOT)**	Presidio Parkway, California (Under Construction), $852 Million
	Tax-Exempt Private Activity Bond (PAB)	NA	Amount variable depending on private sector contribution	NA	NA	Infrastructure projects with a public benefit.	**Issued by local or state government on behalf of private businesses**	Presidio Parkway, California (Under Construction), $852 Million
	Tax Incentive Programs	NA	Amount variable depending on private sector contribution	NA	NA	Environmental and Infrastructure Projects and Programs.	**United States Department of Energy (DOE)**	Euguene, OR Biofuel Station w/ green roof, bioswales and rain gardens ($ 250K tax credits)

Table 6–5 Summary of External Funding Sources available to LID Projects

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6.3 Funding Options

The following two recommended methods can be considered as 'blended' approaches to the funding of AC projects – methods that are supported through a combination of city/district wide development fee, a city/district wide fee/tax and external (grant or similar) funding. Note that both options require contributions from existing development, either through securing grants or through local taxes/fees.

Option 1: Apply the development fee at the citywide level

The AC projects identified as a part of this planning effort provide a regional benefit in improving water quality in the Stanislaus River with a focus on pollutants and mitigating the erosive conditions along the River corridor.

On this basis, the first method would have the City adopt the nexus fee at a citywide level where the benefit of the proposed improvements is realized to all property owners. Under this scenario, the water quality and stormwater benefits realized from the designed infrastructure investments would contribute broadly to the citywide water quality improvement mandate. All new development in Riverbank (Figure 6–5) would pay its proportional share of the cost with the remainder paid by citywide sources. In this case, the proportional share of the costs is the estimated amount of stormwater flowing off-site in proportion to the existing citywide stormwater flow.

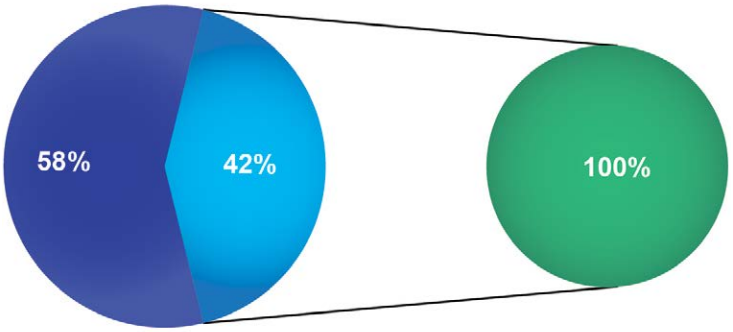
Preliminarily, the proportion ascribed to new development is approximately $7.5 million. The fee is then set on each land use's projected contribution to stormwater runoff. Those parcels contributing more runoff, pay more. See Table 6–6 and Figure 6–4 for an example citywide fee program. The remaining cost is then assigned to existing development, which can pay a share of its costs from State and Federal Grants, and through a local fee or assessment. Without grants, the estimated cost to existing development would be $21,100 per annual acre foot of runoff.

Land Use	EXISTING DEVELOPMENT			PROJECTED DEVELOPMENT					
	Net Area	Units	Runoff[1]	Net Area[2]	Units[2]	Runoff[1]	Share of Runoff	Cost Per Unit	Total Cost
Residential	acres	DU	acre-feet	acres	DU	acre -feet		DU	
Clustered Rural	-	-		123	250	11	3 %	$ 910	$ 227,496
Lower Density	1,016	5,080	203	882	4410	176	48 %	$ 822	$ 3,625,147
Medium Density	11	105	2	448	4470	72	20 %	$ 330	$ 1,473,075
Higher Density	21	277	5	110	1430	26	7 %	$ 379	$ 542,539
Mixed-Use	-	-	-	9	170	2	1 %	$ 283	$ 48,089
Non-Residential	acres	KSF	acre-feet	acres	KSF	acre-feet		KSF	
Commercial	59	639	15	75	816	20	5 %	$ 0.49	$ 400,739
Mixed Use	-	-	-	38	411	10	3 %	$ 0.49	$ 203,041
Industrial	160	1748	42	168	1835	44	12 %	$ 0.49	$ 897,655
Office	7	79	2	23	255	6	2 %	$ 0.48	$ 122, 893
TOTAL	**1,274**		**269**	**1,876**		**367**			**$ 7,540,675**

Table 6–6 New Development's Fair Share Calculation for Funding Option 1 - Citywide level

1. Based on the 2008 City of Riverbank Storm Drain System Master Plan (Nolte Beyond Engineering) projected runoff from a 100-yr 24-hour storm, distribution of which is proportional to runoff from 2-yr 24-hr water quality event; however, future studies should consider assigning values based directly off of the 2-yr 24-hr, water quality, storm.
2. Based on the 2009 update to the City of Riverbank's 2005-2025 General Plan.

Citywide Development Fee



Total Cost of All AC Projects	**$ 13,063,000**
Development Fee	$ 7,540,675
Citywide (Existing Development) Fee	$ 5,522,325
Available Federal & State Grants	$ 5,310,000
Total Local Match	$ 0

Figure 6–4 Citywide distribution of AC Projects Total Cost

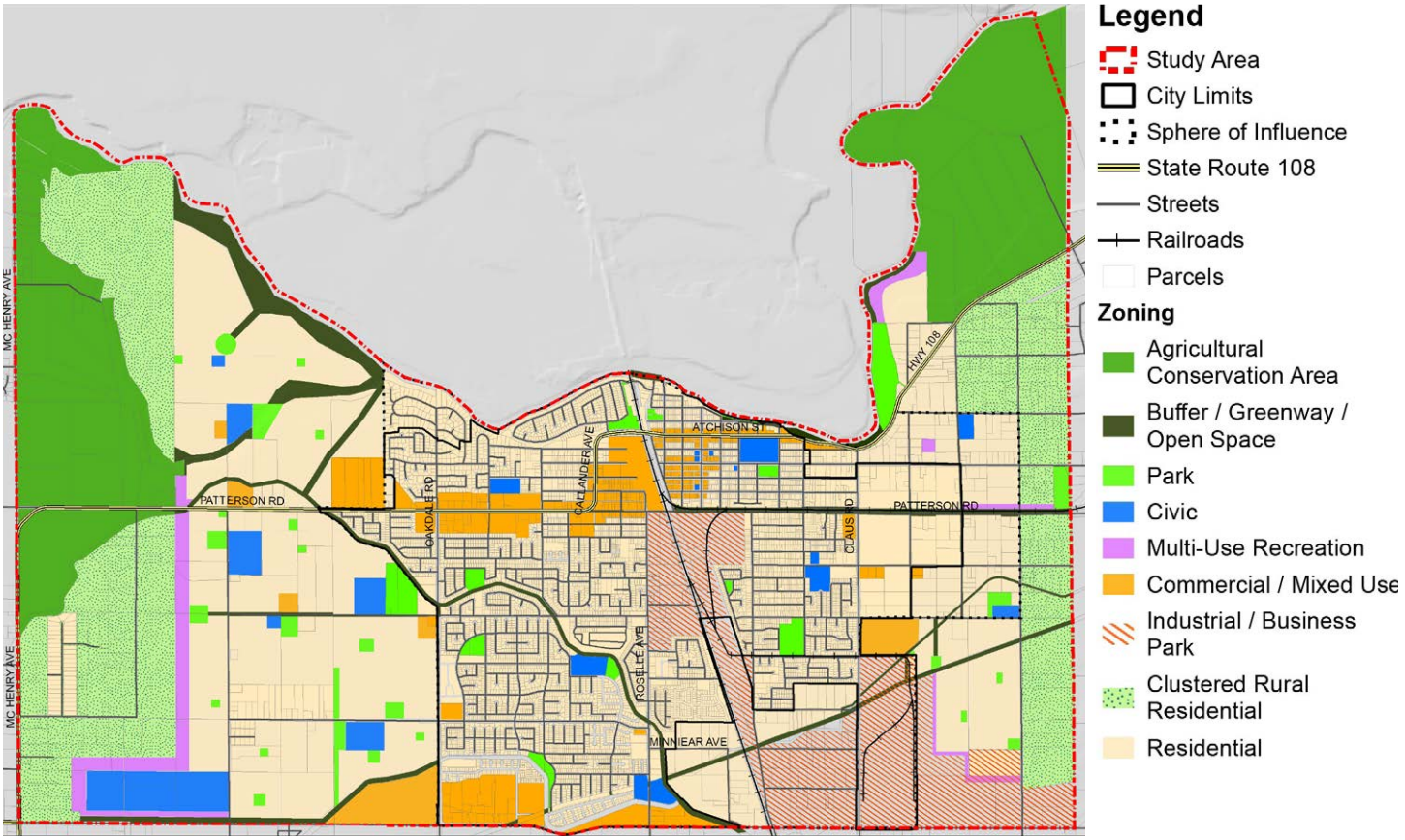


Figure 6–5 Projected Development for City of Riverbank through 2025

1. Based on 2009 update to the City of Riverbank's 2005-2025 General Plan

Option 2: Apply the development fee at the district level.

The second option isolates the costs to the immediate benefit area where new development in the benefit area pays its fair share of the stormwater managed from the LID projects (Table 6–7). In this scenario, development is charged based on its proportional off site flow versus the total flow generated from existing development. In other words, development would pay for their proportional benefit with the remaining paid by the benefit area (Figures 6-6 through 6-17). Where no development is anticipated, the benefit area would be required to pay for all infrastructure invested, less grants secured by the City (Figures 6-10 & 6-11).

Paying for Existing Development's Share

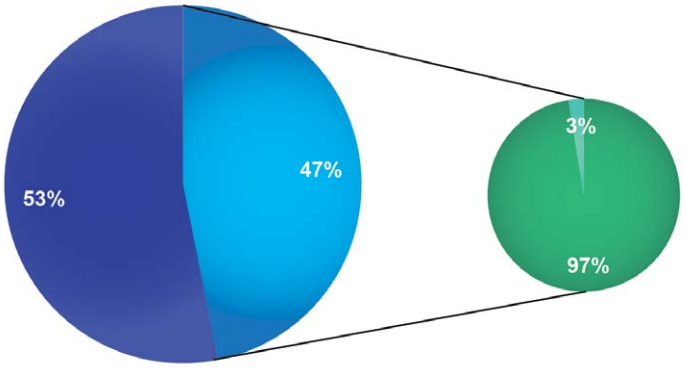
Under both of these two scenarios, existing property can meet their share through available outside grants and local fees/parcel taxes. These grants/fees/parcel taxes do not need to be perfectly timed with development fees, but they are required over the life of the program as originally estimated in the engineering report. In either case, the fundamental rule is that new development cannot pay for existing deficiencies and would only pay for its proportional share of the impact.

Land Use	EXISTING DEVELOPMENT			PROJECTED DEVELOPMENT					
	Net Area	Units	Existing Runoff[1]	Net Area[2]	Units[2]	Projected Runoff[1]	Share of Runoff	Cost per Unit	Total Cost
	acres	DU / KSF	acre-feet	acres	DU / KSF	acre-feet			
CANNERY SITE VEGETATED BUFFER									
Residential	5.3	47	1.14	42.7	539	9.82	59 %	$ 2,786	$ 1,032,454
Non-residential	51.9	567	13.5	26.1	284	6.78	41 %	$ 3	$ 713,150
HUTCHESON PARK BIORETENTION									
Residential	13.3	67	2.66	1.8	24	0.44	50 %	$ 5,885	$ 98,363
Non-residential	5.8	63	1.50	1.7	18	0.44	50 %	$ 5	$ 97,626
CARDOZO SCHOOL INFILTRATION GALLERY									
Residential	11.0	63	2.24	0	0	-	- %	$ -	$ -
Non-residential	0.1	1	0.02	0	0	-	- %	$ -	$ -
RIVERSIDE DRIVE GREEN STREET									
Residential	5.4	28	1.08	2.0	26	0.48	40 %	$ 10,574	$ 191,463
Non-residential	1.7	19	0.45	2.7	30	0.71	60 %	$ 9	$ 284,624
FIRST STREET BASIN TREATMENT IMPROVEMENT									
Residential	7.9	92	1.8	17.0	221	4.1	51 %	$ 2,036	$ 313,370
Non-residential	74.6	815	19.4	15.2	165	3.9	49 %	$ 2	$ 303,037
OPEN SPACE TREATMENT MARSH									
Residential	21.1	117	4.3	9.5	95	1.5	100 %	$ 16,969	$ 975,164
Non-residential	2.0	22	0.5	0	0	-	- %	$ 15	$ -

Table 6–7 New Development's Fair Share Calculation for Funding Option 2 - District level

1. Based on the 2008 City of Riverbank Storm Drain System Master Plan (Nolte Beyond Engineering) projected runoff from a 100-yr 24-hour storm, distribution of which is proportional to runoff from 2-yr 24-hr water quality event; however, future studies should consider assigning values based directly off of the 2-yr 24-hr, water quality, storm.
2. Based on the 2009 update to the City of Riverbank's 2005-2025 General Plan.

Cannery Site Vegetated Buffer



Total Cost of AC Project	**$ 3,285,000**
Development Fee	$ 1,745,604
Citywide (Existing Development) Fee	$ 1,539,896
Available Federal & State Grants	$ 1,500,000
Total Local Match	$ 39,396

Figure 6–6 Distribution of Total Cost of Cannery Site Bioretention Buffer Project

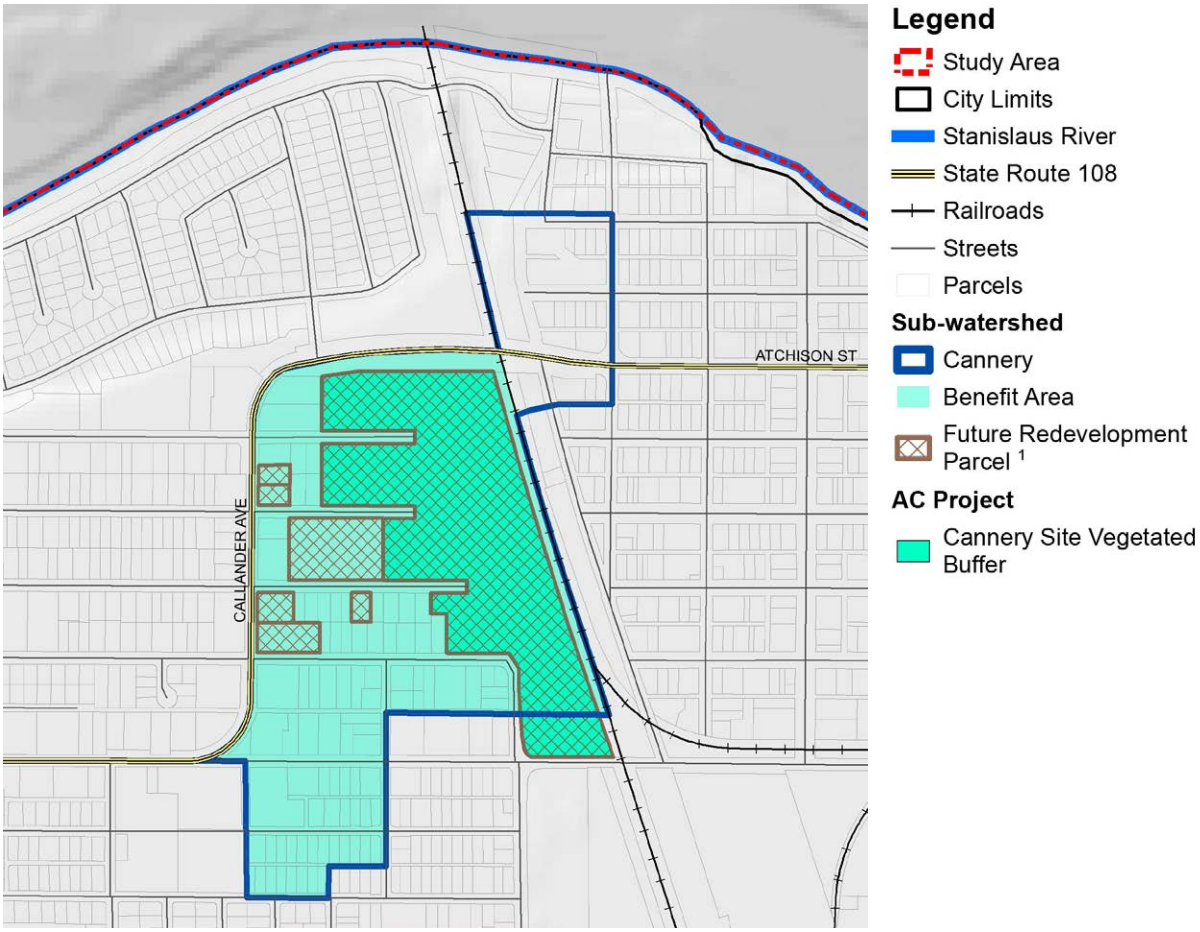
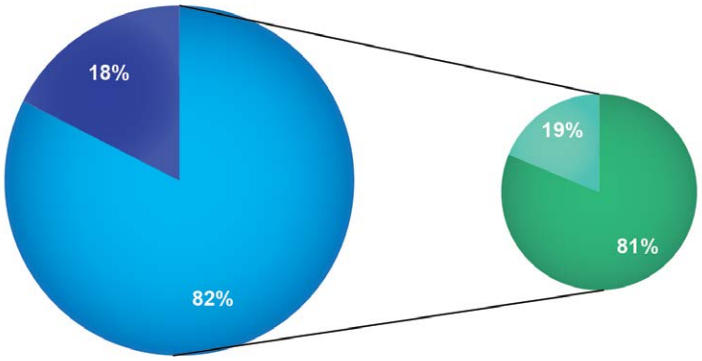


Figure 6–7 Projected Development for Cannery Site Bioretention Buffer Benefit Area

1. Based on the 2009 update to the City of Riverbank's 2005-2025 General Plan

Hutcheson Park Bioretention



Total Cost of AC Project	$ 1,119,000
Development Fee	$ 195,990
Citywide (Existing Development) Fee	$ 923,010
Available Federal & State Grants	$ 750,000
Total Local Match	$ 173,010

Figure 6–8 Distribution of Total Cost of Hutcheson Park Bioretention Project

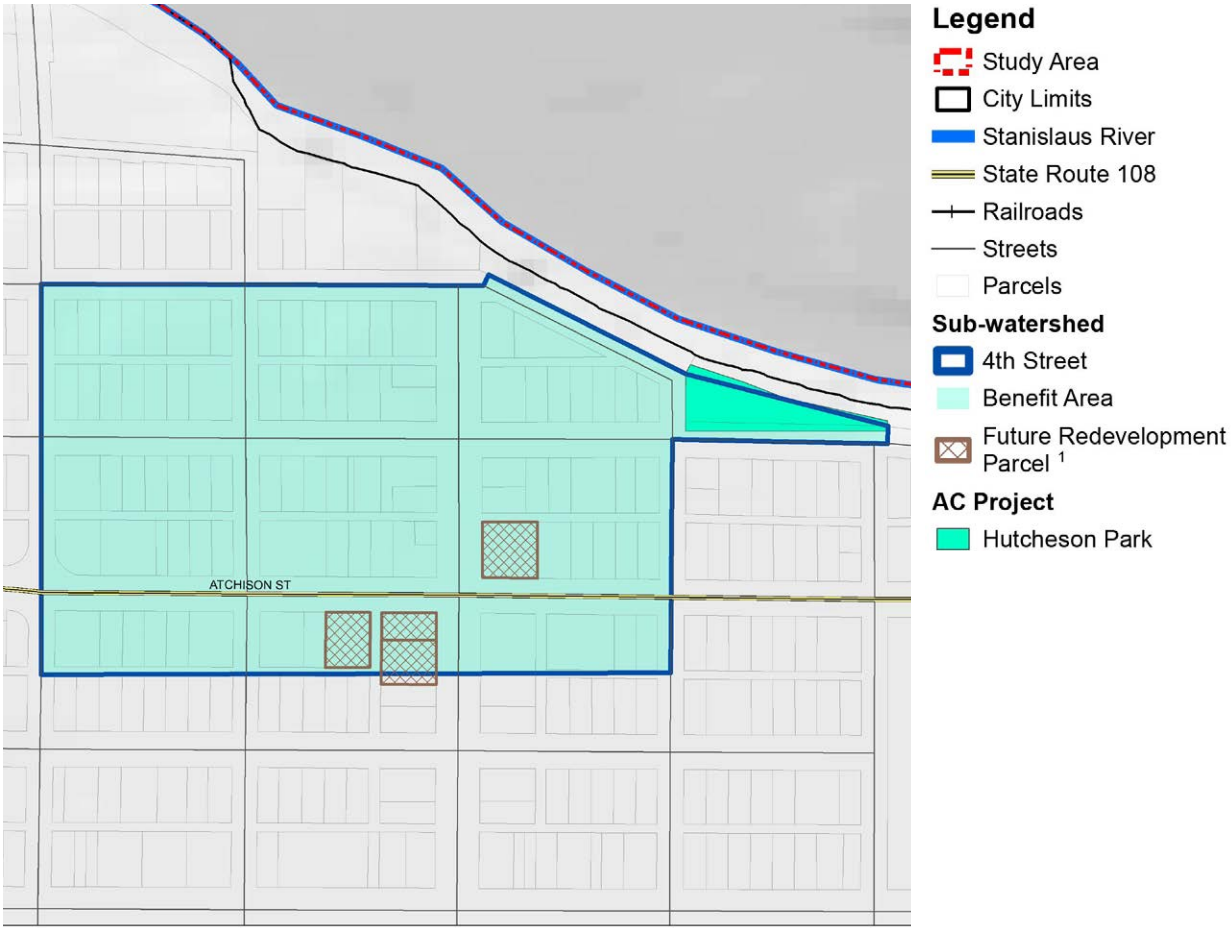
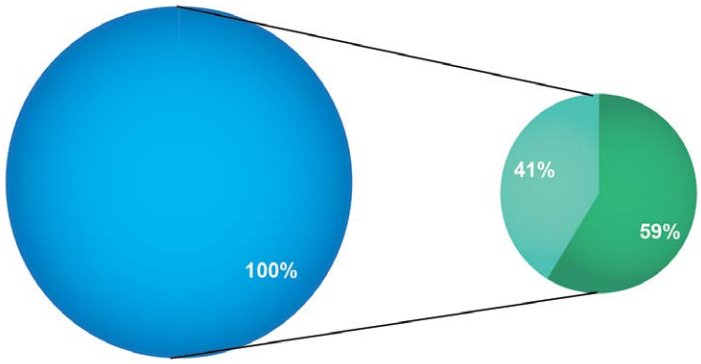


Figure 6–9 Projected Development for Hutcheson Park Bioretention Benefit Area

1. Based on the 2009 update to the City of Riverbank's 2005-2025 General Plan

Cardozo School Infiltration Gallery



Total Cost of AC Project	$ 1,276,000
Development Fee	$ 0
Citywide (Existing Development) Fee	$ 1,276,000
Available Federal & State Grants	$ 750,000
Total Local Match	$ 526,000

Figure 6–10 Distribution of Total Cost of Cardozo School Infiltration Gallery Project

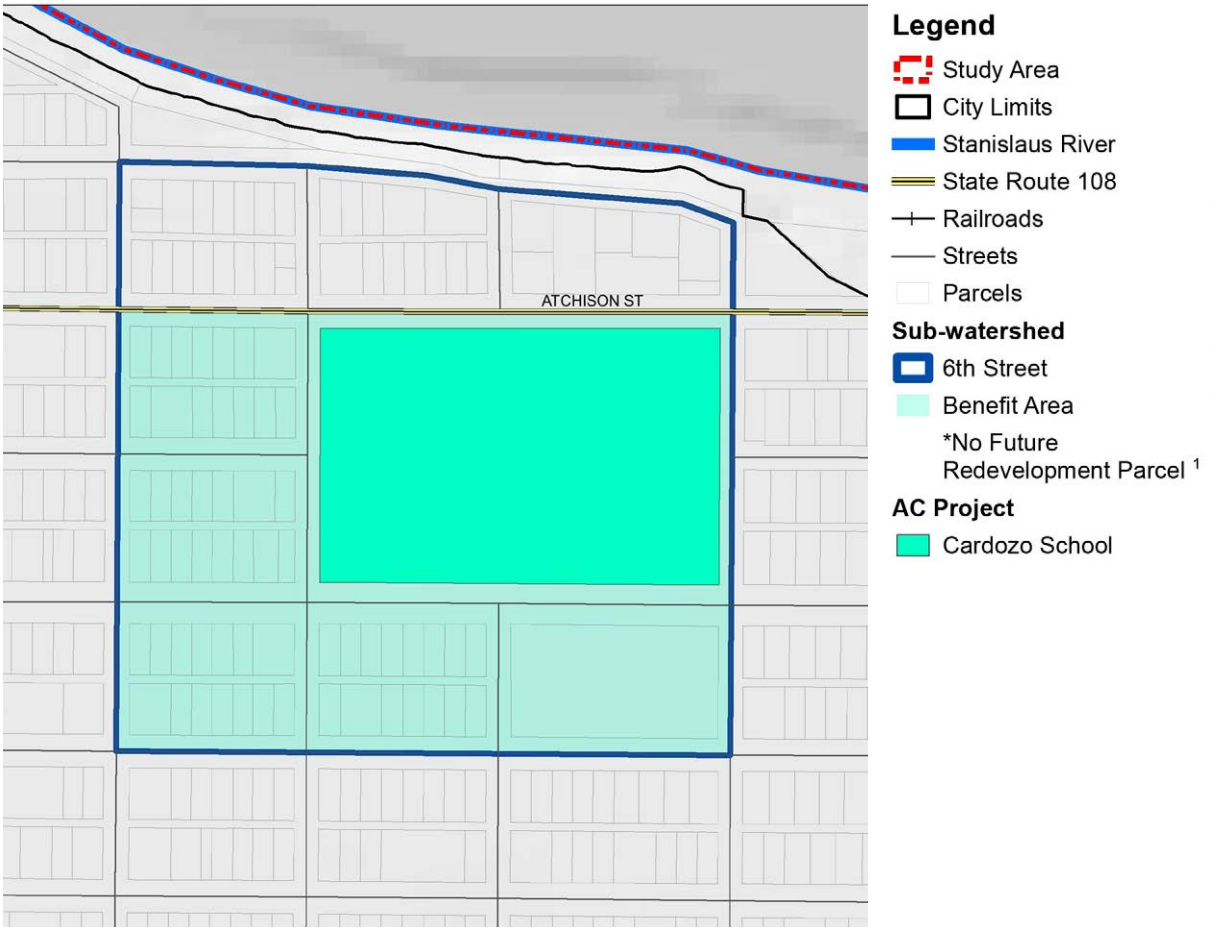
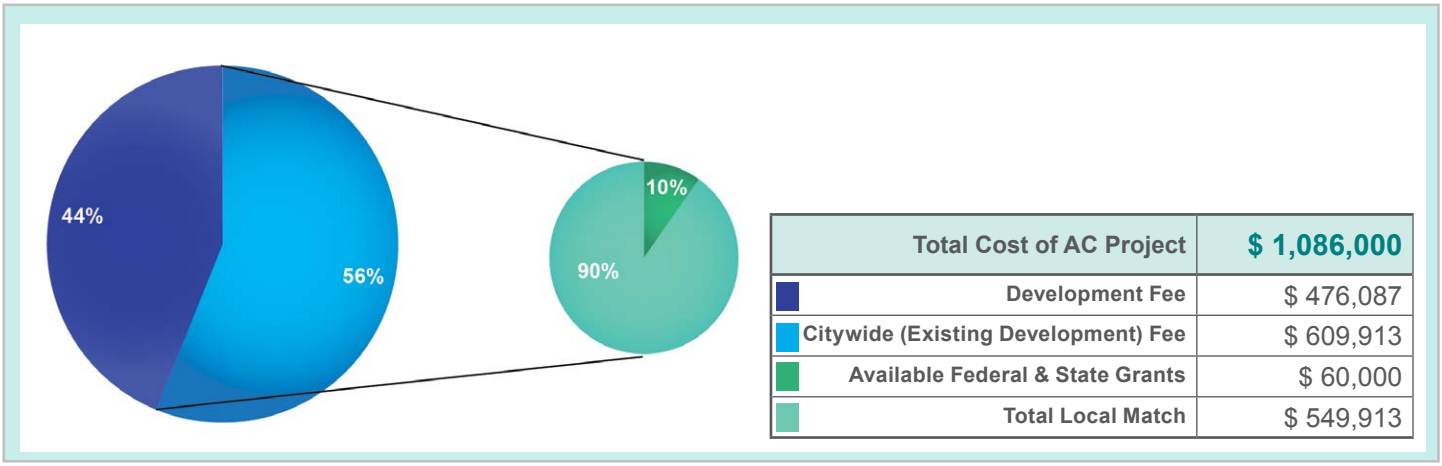


Figure 6–11 Projected Development for Cardozo School Infiltration Gallery Buffer Benefit Area

1. Based on the 2009 update to the City of Riverbank's 2005-2025 General Plan

Riverside Drive Green Street



Total Cost of AC Project	$ 1,086,000
Development Fee	$ 476,087
Citywide (Existing Development) Fee	$ 609,913
Available Federal & State Grants	$ 60,000
Total Local Match	$ 549,913

Figure 6–12 Distribution of Total Cost of Riverside Drive Green Street Project

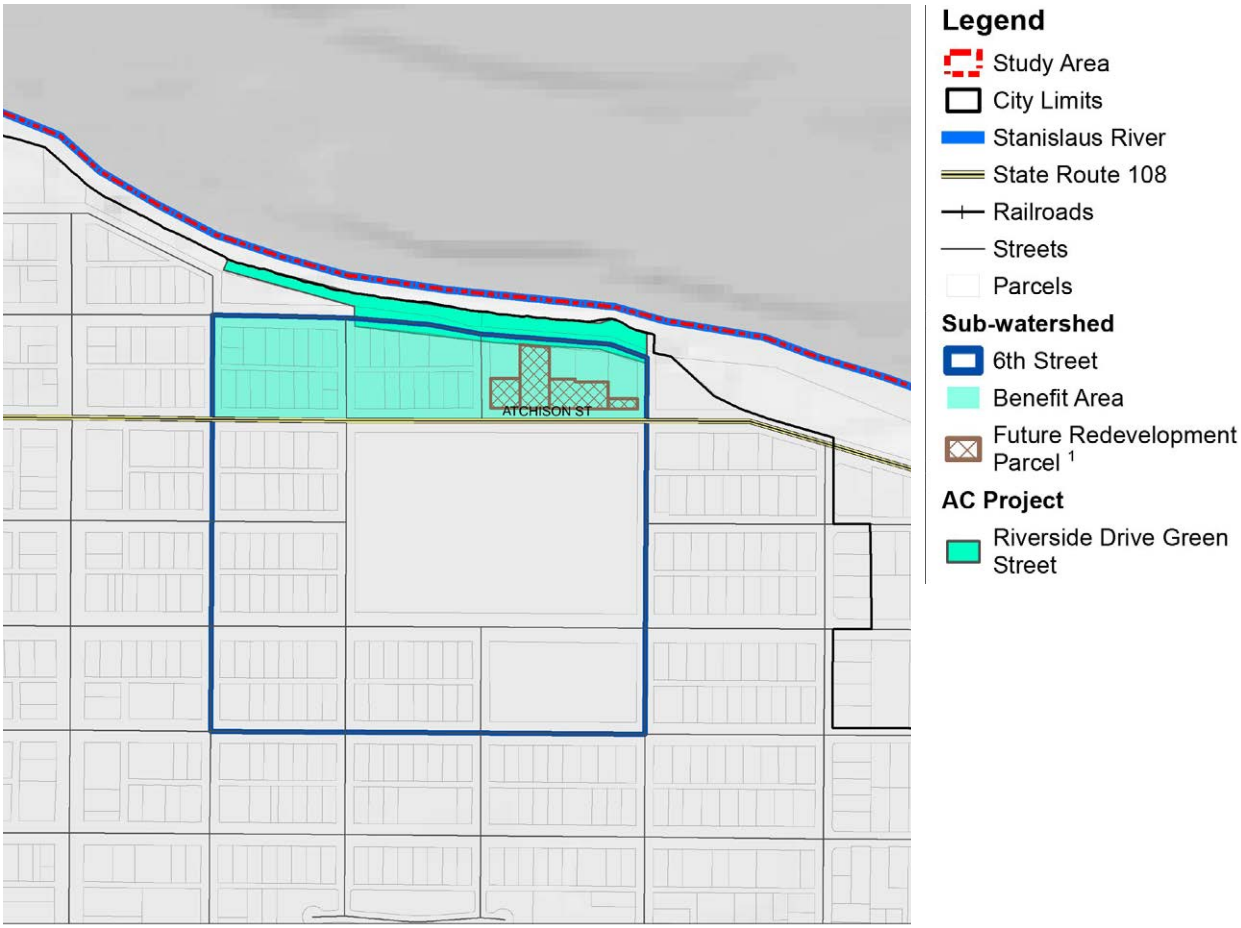
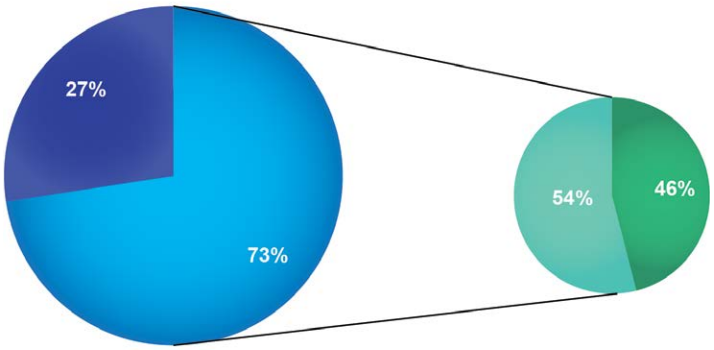


Figure 6–13 Projected Development for Riverside Drive Green Street Benefit Area

1. Based on the 2009 update to the City of Riverbank's 2005-2025 General Plan

First Street Basin Treatment Improvements



Total Cost of AC Project	$ 2,248,000
Development Fee	$ 616,407
Citywide (Existing Development) Fee	$ 1,613,593
Available Federal & State Grants	$ 750,000
Total Local Match	$ 881,593

Figure 6–14 Distribution of Total Cost of First Street Basin Treatment Improvements Project

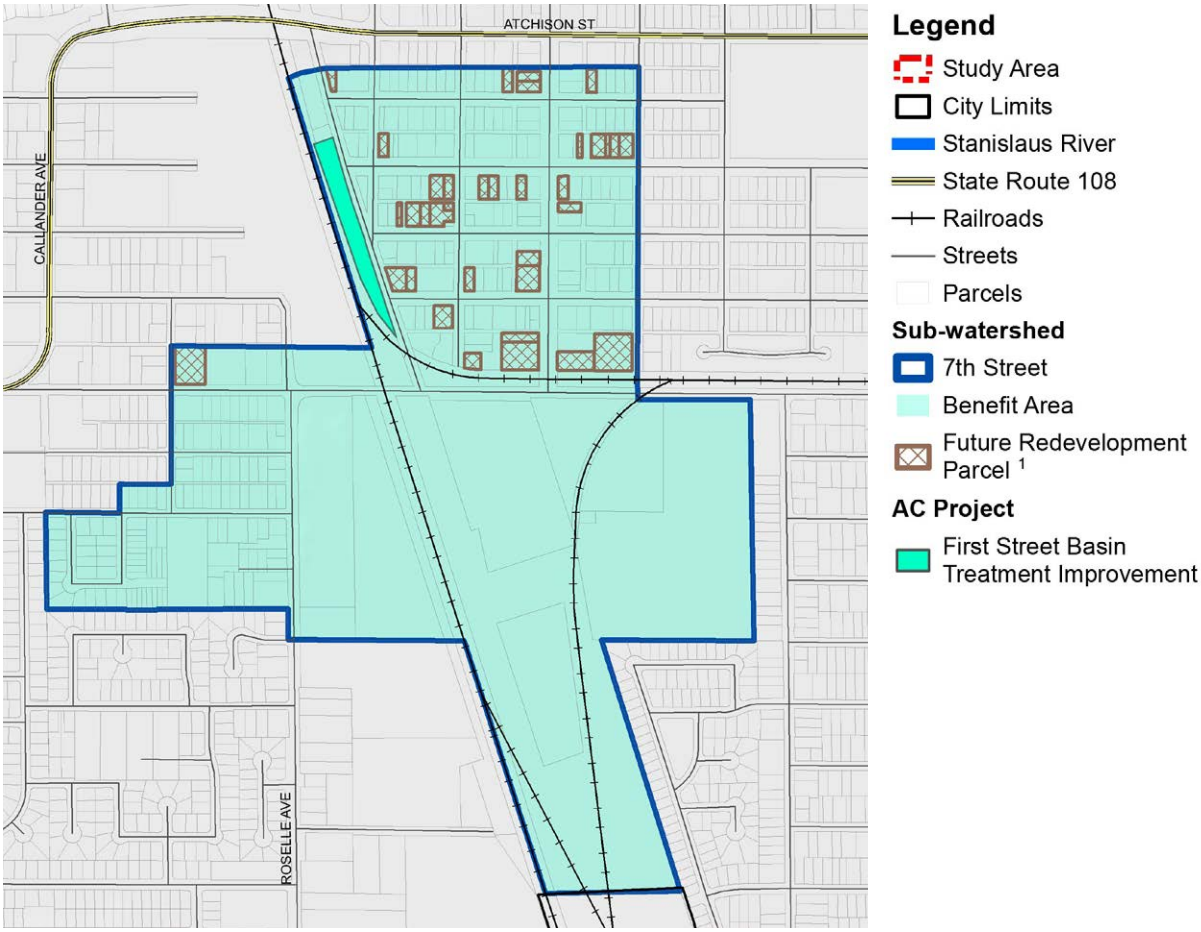
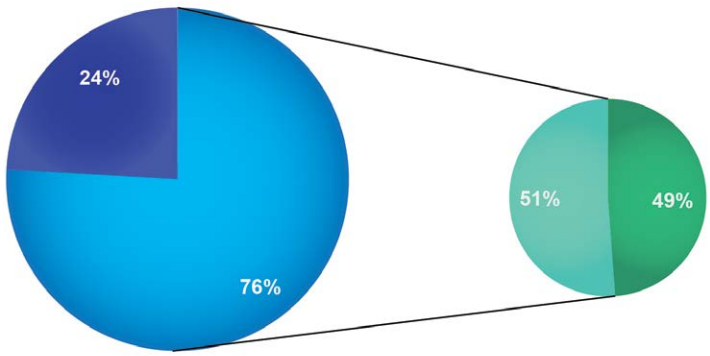


Figure 6–15 Projected Development for First Street Basin Treatment Improvements Benefit Area

1. Based on the 2009 update to the City of Riverbank's 2005-2025 General Plan

Open Space Treatment Marsh



Total Cost of AC Project	$ 4,049,000
Development Fee	$ 975,164
Citywide (Existing Development) Fee	$ 3,073,836
Available Federal & State Grants	$ 1,500,000
Total Local Match	$ 1,573,836

Figure 6–16 Distribution of Total Cost of Open Space Treatment Marsh Project

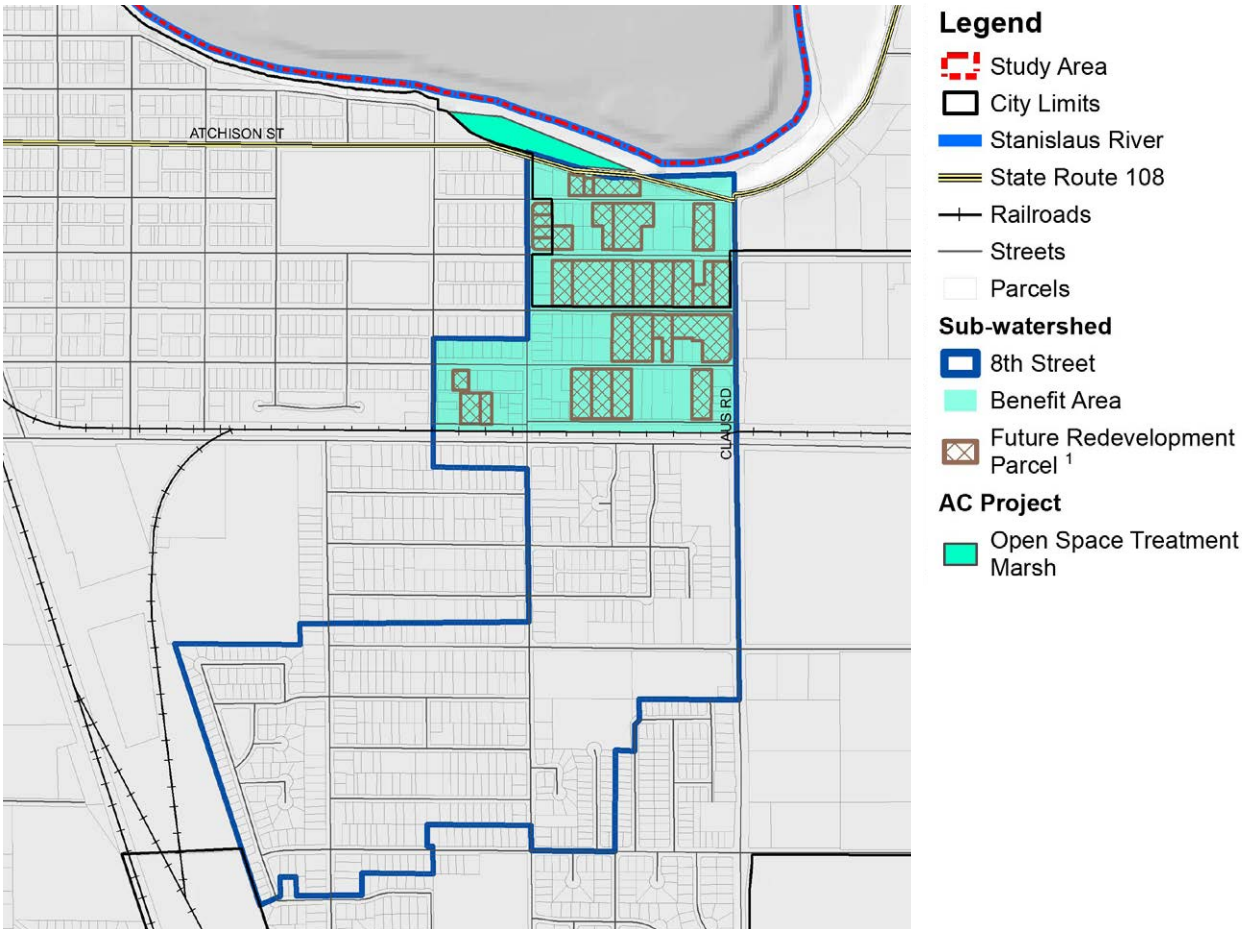


Figure 6–17 Projected Development for Open Space Treatment Marsh Benefit Area

1. Based on the 2009 update to the City of Riverbank's 2005-2025 General Plan

6.4 Recommended Funding Strategy

Small Phase II MS4s such as Riverbank are struggling to meet increasingly more stringent stormwater regulations with a limited operations budget. The requirement to monitor, track and report any activity that may contribute to the degradation of the Stanislaus River (i.e. TMDLs) by 2018 is anticipated to be particularly challenging.

Regional AC projects can enhance water quality, provide multiple co-benefits, and ease the burden or disparate monitoring efforts at one centralized location. Furthermore, for cities like Riverbank that are trying to preserve their character and revitalize already developed areas, regional projects can provide the development community the flexibility to more fully develop each infill site. Development fees are one method to provide off-site funding for district wide solutions.

However, if this flexibility is accompanied with expensive impact fees, then infill development will not be financially feasible and will contribute nothing to needed infrastructure. In other words, if the price of admission is too high, there will be no ticket sales and therefore no revenue.

Broad water quality benefits to the Stanislaus River provide the required nexus for distributing these costs to new development throughout the City's Planning Area. However, the full distribution of these costs to Citywide development may not be advisable. All drainage management areas within the City of Riverbank will eventually need to build or modify existing flood management infrastructure for water quality treatment improvements.

Recommended Financing Strategy

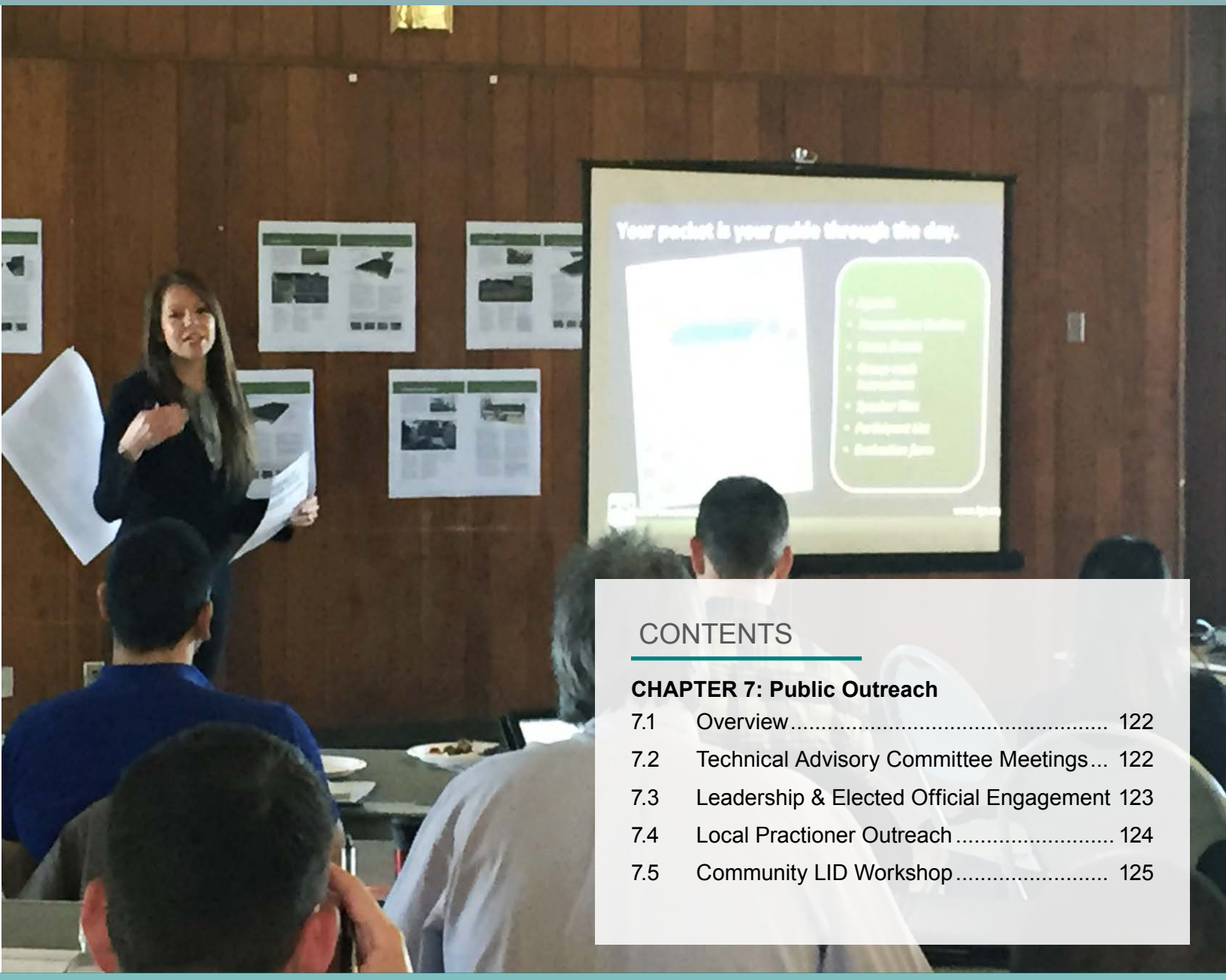
With this in mind, a 'blended' approach for funding of water quality AC projects would be most feasible. Specifically, the Project Team recommends funding Option 1, i.e. the citywide fee combined with aggressive pursuit of grants to pay for existing development's share. Funding of water quality improvements for infill development in smaller central valley cities must be supported by outside funding. Depending on the level of outside grant funding that could be secured, the remainder of the project's construction cost is met through a combination of City/district wide development impact fees and parcel taxes.

Update to the Drainage Master Plan

However, over and above this funding strategy, the project team recommends that the City consider an update to their SDSMP. The 2008 master plan does not consider the 2013 update to the MS4 General Permit, and thus will eventually need to be updated to consider water quality. Contrary to the 2008 plan, the update could consider an integrated drainage/parks/open space master plan that optimizes co-benefits among these different services and reduces the total cost of the provision of each of these facilities/services.

7.0

PUBLIC OUTREACH



CONTENTS

7.1 Overview

Public outreach and community engagement are critical to the success and applicability of any planning process. Community acceptance of a proposed plan is more likely when the community is engaged early and often in the development process. Public outreach and community engagement are particularly necessary when seeking to achieve multiple community objectives or priorities. Holistic strategies that provide multiple community benefits are a priority of the SWRCB's stormwater initiative, and the most recent NPDES MS4 permit regulations require the use of LID approaches. This Study provides specific examples of how this can be accomplished.

A key component of this Study was education and outreach to local developers, builders, engineers, elected officials, and others who are engaged in stormwater management, land use planning, and community design. The project team sought out local experts to help identify constraints to LID in various development contexts of the San Joaquin Valley and provide input on potential LID techniques that could achieve multiple benefits for the community (e.g., water quality improvements including flow attenuation, groundwater recharge, open space, beautification). The intent of this Study is to provide regional guidance specific to the City of Riverbank and Stanislaus County for use by both public agencies and private developers, but to be broad enough to serve as a template for other regions including the Lower Stanislaus region.

LGC worked with the City of Riverbank and the Modesto Engineers Club (MEC) to refine the Public Outreach Strategy for this Study, which included four components:

- Technical Advisory Committee (TAC) Meetings
- Leadership & Elected Official Engagement
- Local Practitioner Outreach
- Community LID Workshop

Each of these components is described in more detail in the following sections. At minimum, the Study was to include two presentations to local elected officials and other community leaders, and a half- or full-day workshop for local government, planners, designers, engineers, developers, and environmental organizations to learn about strategies for removing barriers and integrating LID into sustainable community planning, design, and construction. The focus of the Public Outreach Strategy was to integrate LID into community-wide planning efforts and take a neighborhood, multi-site, or regional approach to LID implementation.

7.2 Technical Advisory Committee Meetings

The project team worked with the City of Riverbank, and MEC to identify and recruit appropriate TAC members. The final TAC was comprised of ten (10) members and two (2) alternates, representing interested public agencies (such as the State Water Resources Control Board and the Central Valley Regional Water Quality Control Board), municipal Public Works staff, and community stakeholders (such as business owners, developers, landowners, and community leaders).

LGC was responsible for convening the TAC and coordinating all TAC meetings. This included identifying and contacting TAC members; securing meeting locations; developing meeting agendas and materials; facilitating meeting discussion and flow; and capturing and summarizing group discussions. LGC ensured that the consultant team received necessary guidance and direction from the TAC. Over the course of the two-year project, LGC held a kick-off meeting, six (6) TAC meetings (five (5) in person, one (1) via conference call), and facilitated between-meeting correspondence and project-item feedback. TAC meeting agendas, meeting attendees, and meeting minutes can be found in Appendix A.9.

7.3 Leadership & Elected Official Engagement

The Study's Public Outreach Strategy included educational and informative presentations to local elected officials and community leadership. LGC fulfilled this objective through the use of two formats: (1) a dinner forum for local leadership, and (2) a presentation to the Riverbank City Council. Both formats served as an introduction to LID and the Study, while also demonstrating how LID can help cities implement other community priorities such as urban greening, beautification, complete streets, and economic development.

Dinner Forum

LGC leveraged funding from other projects (Building Healthy Communities, Complete Streets, and Removing Barriers to LID in Local Codes and Ordinances) to co-host a LID/complete & green streets dinner forum for local elected officials and other community leaders in the region (Figure 7–1). The forum — held on February 19, 2015 in Modesto — included presentations from LID and Complete Streets experts and included a facilitated discussion between presenters and attendees. This Study and upcoming LID Community Workshop were highlighted at the event. Twenty-five individuals attended, representing elected officials and senior-level staff from five different municipalities, as well as private-sector employers. The event agenda, list of attendees, and presentations are included in Appendix A.11.

Riverbank City Council

LGC worked with the City of Riverbank to schedule a presentation to the Riverbank City Council at their March 10th, 2015 council meeting. LGC provided the City Council with an overview of the Study, its importance, and potential benefit to the City of Riverbank. Mayor Richard O'Brien and the four other council members were engaged in the presentation, complementary of the work, and expressed interest in reviewing the Final Study Report. The presentation and list of attendees are included in Appendix A.11.

Please join us for a special invitation-only forum for local leaders in the San Joaquin Valley, to learn about Complete Streets and Low Impact Development design, and meeting new funding requirements. During this **complimentary** dinner, speakers will highlight examples and strategies for transforming community streets into safe, efficient, and green spaces that benefit the local economy

For your convenience, there are two opportunities to attend:

Wednesday, February 18, 2015
5:30pm - 8pm
The Downtown Club
2120 Kern Street, Fresno 93721

Speaking in Fresno:
Paul Zykofsky, Associate Director, Local Government Commission
Eric Zickler, Associate Principal, AECOM

Thursday, February 19, 2015
6:00pm-9:00pm
Greens Market
953 Tenth Street, Modesto, CA 9535

Speaking in Modesto:
Paul Zykofsky, Associate Director, Local Government Commission
Kevin Perry, Pricipal, Urban Rain/Design

Space is limited! Click here to RSVP and reserve your space

Paul Zykofsky
Local Government Commission

Eric Zickler
AECOM

Kevin Perry
Urban Rain/Design

Complete Streets are roads that provide safe, easy access and mobility for walkers, cyclists, drivers, and public transit. Low Impact Development strategies direct rainwater into the ground to reduce contaminated runoff and increase local water supplies. Not only are these straightforward solutions for greening up streets and attracting new investment, but they are also now required under state law

Come join the discussion about Complete Streets and low impact development, new funding opportunities, and what communities in your region are doing to implement these strategies.

We hope to see you there!

Kate Meis, Executive Director
Local Government Commission

This event is organized by the Local Government Commission and the California Stormwater Quality Association (CASQA). Dinner is complementary and made possible through the sponsorship of the Osprey Foundation and the State Water Resources Control Board.

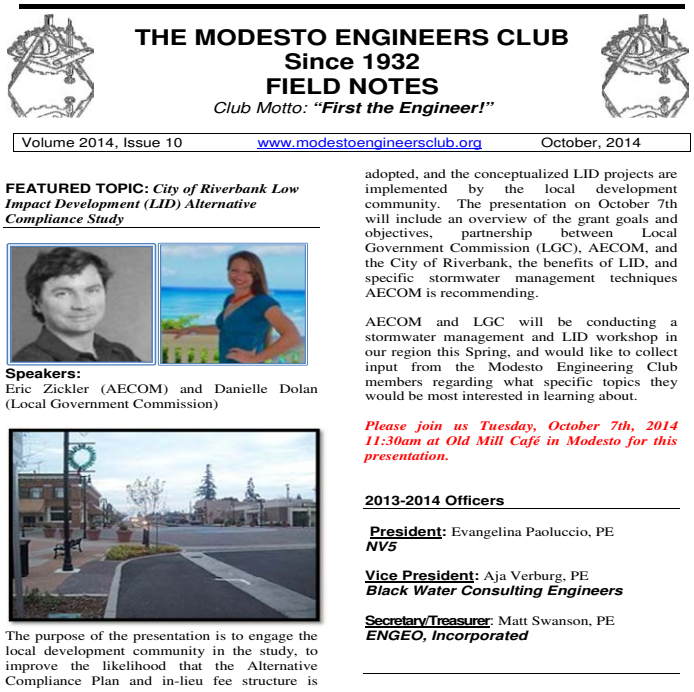
Figure 7–1 Dinner Forum Invitation

7.4 Local Practitioner Outreach

Modesto Engineers Club

MEC was engaged early and often in the Study's public outreach efforts. MEC recommended participants for the TAC, used their listserv as an outreach channel for the Study, provided input on the community LID workshop topics and speakers (Section 7.5), and hosted the project team as the guest speaker at their October 2014 monthly club meeting.

LGC coordinated with MEC leadership to provide an outreach and engagement presentation at their October 2014 club meeting (Figure 7–2). Both LGC and AECOM staff presented at the MEC meeting. The purpose of the meeting was two-fold: (1) to inform the local development community about the Study, and (2) to generate interest in and solicit ideas for the community LID workshop to be held in April 2015. LGC and AECOM's joint presentation emphasized the overall project purpose, goals and concepts, and was designed to generate interest in the Study, as well as receive feedback. LGC also administered a survey for MEC members to provide input on topics and content for the community LID workshop, and solicited volunteers from the club to further assist with workshop development. The meeting presentation and list of attendees are included in Appendix A.11.



THE MODESTO ENGINEERS CLUB
Since 1932
FIELD NOTES
*Club Motto: "**First the Engineer!**"*

Volume 2014, Issue 10 www.modestoengineersclub.org October, 2014

FEATURED TOPIC: ***City of Riverbank Low Impact Development (LID) Alternative Compliance Study***

Speakers:
Eric Zickler (AECOM) and Danielle Dolan (Local Government Commission)

The purpose of the presentation is to engage the local development community in the study, to improve the likelihood that the Alternative Compliance Plan and in-lieu fee structure is adopted, and the conceptualized LID projects are implemented by the local development community. The presentation on October 7th will include an overview of the grant goals and objectives, partnership between Local Government Commission (LGC), AECOM, and the City of Riverbank, the benefits of LID, and specific stormwater management techniques AECOM is recommending.

AECOM and LGC will be conducting a stormwater management and LID workshop in our region this Spring, and would like to collect input from the Modesto Engineering Club members regarding what specific topics they would be most interested in learning about.

Please join us Tuesday, October 7th, 2014 11:30am at Old Mill Café in Modesto for this presentation.

2013-2014 Officers

President: Evangelina Paoluccio, PE
NV5

Vice President: Aja Verburg, PE
Black Water Consulting Engineers

Secretary/Treasurer: Matt Swanson, PE
ENGEO, Incorporated

Figure 7–2 Excerpt from MEC Field Notes (Vol 2014, Issue 10)

Greater Valley Building Industry Association

Similar to MEC, the Greater Valley Building Industry Association (GV BIA) was asked to recommend participants for the TAC, were utilized as an outreach channel via their listserv, and were requested to provide input on the community LID workshop topics and speakers. The GV BIA was particularly helpful in promoting the community LID workshop to their members.

San Joaquin Valley Stormwater Quality Partnership

Like MEC and GV BIA, the San Joaquin Valley Stormwater Quality Partnership (SJVSQP) was contacted early in the Study's development to identify potential TAC members. Later in the Study, LGC reached out to the SJVSQP to seek input on potential case study projects to highlight at the community LID workshop, as well as for potential workshop presenters. The SJVSQP also served as an important promotional outlet for the community LID workshop.

7.5 Community LID Workshop

The Study's Public Outreach Strategy included organizing and facilitating an interactive workshop for the greater Stanislaus County region planning and development community. LGC worked with City of Riverbank staff, the consultant team, TAC, MEC, GV BIA, and SJVSQP to develop a full-day workshop for the community to learn about stormwater management and how to achieve multiple co-benefits through alternative strategies.

General Interest Survey

In order to gauge overall interest in a potential community LID workshop and solicit feedback on specific workshop content, LGC conducted a survey of the target audience. The survey included eight questions designed to identify information gaps and areas of particular need, while also recruiting partners to assist with development of the community LID workshop and to promote the event. Twenty-two individuals participated in the survey, either online (SurveyMonkey) or in paper format. Survey results identified "Economic and Environmental Benefits of LID" as the topic of greatest interest to the local community, with "LID Philosophy & Principles," "LID BMPs," and "LID in Urban Redevelopment" all tied for second place (Figure 7–3). A copy of the General Interest Survey is included in Appendix A.11

The theme of the workshop was focused around the area of greatest interest (Economic & Environmental Benefits), while incorporating the other three aforementioned topics throughout. Twelve individuals from nine different municipalities or firms volunteered to assist either with workshop content development or sponsorship . This participation further enhanced community buy-in for the workshop, as well as for the overall Study.

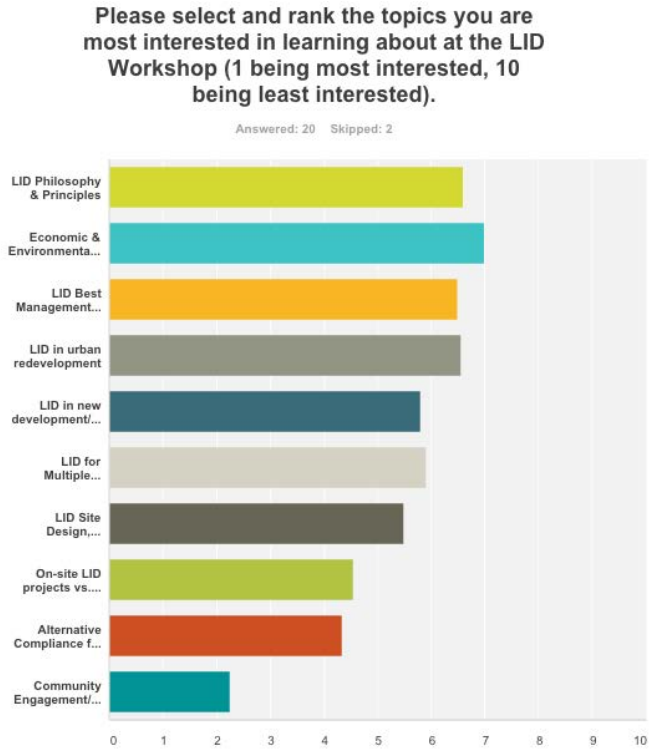


Figure 7–3 Example Output from General Interest Survey

Workshop Purpose & Goals

The purpose of the community LID workshop was to provide local government, planners, designers, engineers, developers, and environmental organizations with strategies for removing barriers and integrating LID into sustainable community planning, design, and construction. LGC had three primary goals, or desired outcomes, for workshop participants: (1) gain a better understanding of LID benefits, principles, philosophy, barriers, and BMPs; (2) discuss challenges and solutions specific to the lower Stanislaus regional community; and (3) identify preferred strategies and next steps for implementing LID in the lower Stanislaus region. Based on observations during the workshop, and an analysis of feedback received, the project team is confident that these goals were met (see Feedback section).

Recruitment and Attendance

The workshop promotional flier and announcements were sent out via the following local, regional, and statewide networks:

- Modesto Engineers Club (MEC)
- Greater Valley Building Industry Association (GV BIA)
- San Joaquin Valley Stormwater Partnership (SJVSWP)
- California Stormwater Quality Association (CASQA)
- American Association of Landscape Architects (ASOA), Northern California Chapter
- American Institute of Architects (AIA), San Joaquin Chapter & Central Valley Chapter
- Urban Land Institute (ULI), Sacramento District Council
- American Society of Civil Engineers (ASCE), Central Valley Branch
- American Planning Association (APA), California Chapter, Central Section

LGC also sent targeted invitations to their vast network of local elected officials, senior-level municipal staff, regional planning authorities, and local agencies, in eight counties across the region.

In all, 46 individuals registered for and attended the event, from 24 unique entities (Figure 7–4). Five municipalities were represented, with a total of 14 municipal employees. Table 7–1 below outlines workshop representation by type of organization. The workshop invitation and complete list of attendees are included in Appendix A.11.

Figure 7–4 Workshop Participants

Entity Type	No. of Entities Represented	No. of Attendees	Specific Entities Represented
Cities	3	10	Modesto, Newman, Turlock
Counties	2	6	Stanislaus, Merced
State Agencies	1	1	State Water Resources Control Board
Non-profit Organizations	2	6	Local Government Commission, CivicSpark
Consulting / Engineering Firms	12	16	AECOM; LotusWater; Provost & Pritchard; Giuliani & Kull, Inc.; RRM Design Group; O'Dell Engineering; Hawkins & Associates Engineering, Inc.; DBF Engineering, Inc.; ENGEO; VVH Consulting Engineers; CBEC Eco Engineers, Inc.; Benchmark Engineering, Inc.
Other Private / for-Profit Corporations	4	7	Revel Environmental Manufacturing; Belgard, Commercial Hardscapes; Filtrexx International; Petrulakis Law & Advocacy, APC
TOTALS	**24**	**46**	-

Table 7–1 Workshop Participation by Entity Type

Workshop Content

LGC worked with MEC and TAC members to create a publicity flier for the event, and promote the event through local and regional networks. LGC developed the workshop program, solicited guest speakers, identified local case study projects to highlight, and facilitated the event. The workshop—held on April 30, 2015 at the City of Riverbank Community Center—featured a presentation by AECOM and LGC on the Study, which emphasized integrating LID into community-wide planning efforts and taking a regional, centralized, approach to LID implementation.

LGC's Water Program Manager, Danielle Dolan, served as workshop facilitator (provided the welcome and opening remarks, ice breaker, introductory presentation, speaker introductions, transitions, and exercises). The first guest presenter was Melanie Carr, a regional stormwater expert, from CBEC EcoEngineers. Carr provided an introduction to LID principles, philosophy, and best practices. Next, Bill Hereth from the State Water Resources Control Board MS4 Program provided an overview of permitting regulations, followed by an open question and answer session. Local case study presentations followed. David Felix from the City of Modesto and Bill Strand

Figure 7–5 Workshop Participants Identify Favorite LID (SCM) Technologies (Green dots)

Primary Challenges	Potential Solutions
1. **Lack of education** – about the MS4 permit requirements, about LID implementation – to developers, engineers, stormwater managers, other municipal departments/ agencies, and the general public. 2. **Getting development/developers on board** - buy-in to neighborhood-scale LID and AC (potential in-lieu fees), cost effectiveness and benefits of LID. 3. **Misaligned ordinances** – municipal codes and ordinances that hinder in-fill development, LID, and AC. 4. **Space and cost constraints** – LID impinging on lot size and lot count for projects, driving overall project costs up. 5. **Unknowns about SGMA** – how groundwater sustainability plans will address and/or impact stormwater.	1. **Vegetated swales & flow-through planters** – preferred/ most promising LID treatment design because of cost effectiveness and space efficiency. 2. **Additional education & outreach** – about the MS4 permit requirements, about LID implementation – to developers, engineers, stormwater managers, other municipal departments/ agencies, and the general public. 3. **Agency flexibility** – more holistic regulatory evaluation; beyond a standard checklist to see the bigger picture; multiple benefits approach. 4. **Pilot Project Implementation** – to demonstrate feasibility and success.

Table 7–2 Primary Challenges and Potential Solutions Identified by Workshop Participants

from RRM Design Group presented the City of Modesto's Garrison Park LID project. Koosun Kim, from the City of Newman, then presented two different projects: the City of Manteca Woodward Park Parking Lot LID retrofit and the City of Newman's LID Planning Project. The local case study examples were followed by a robust discussion time. In the afternoon, Merril Putnam and Alexander Quinn of AECOM and Eric Zickler of LotusWater presented the Riverbank LID Alternative Compliance Study.

The day was punctuated by multiple interactive problem-solving sessions (Figure 7–6) to identify specific challenges of implementing LID in the lower Stanislaus region of the San Joaquin Valley, as well as potential solutions for overcoming those challenges (Table 7–2). By the close of the workshop, participants identified five primary challenges, four potential solutions, and three critical next steps to help shape the future of Alternative Compliance in the San Joaquin Valley.

Critical Next Steps

1. Encourage the State Board and Central Valley Regional Board to clarify regulatory requirement language for MS4 permittees, and Municipalities to do so for developers.

2. Municipalities should apply for grants and external funding for LID project implementation.

3. The City of Riverbank (and other municipalities in the region) should adopt the AC strategy.

The promotional flier, workshop agenda, presentations, and materials are included in Appendix A.11.

Workshop Evaluation & Feedback

LGC distributed an evaluation form at the close of the workshop, and asked all attendees to complete the form anonymously, prior to leaving. The evaluation form included five sections, designed to assess various aspects of the workshop. Eighteen of our 46 attendees completed the evaluation form. A copy of the workshop evaluation form, as well as a complete tabulation of all responses, is included in Appendix A.11. Results were as follows.

Section one evaluated progress toward the workshop's three goals. Using a four-point Likert scale (strongly agree—agree—disagree—strongly disagree), participants were asked to identify if, "As a result of attending this workshop I was able to…

- "Gain a better understanding of LID Benefits, Principles, and Philosophy."
- "Identify challenges and solutions specific to my community."
- "Identify preferred strategies and next steps for broader implementation of LID in the Stanislaus region."

Figure 7–6 Interactive Problem-Solving Session

Responses to this question were highly favorable, with only one individual "disagreeing" with the second and third statements.

Section two evaluated achievement of the workshop's two desired outcomes. Using the same scale as in section one, participants were asked whether they:

- "Feel better equipped to implement LID strategies into my future development projects."
- "Are committed to help with the next steps identified for achieving broader implementation of LID in the Stanislaus region."

Responses to this question were favorable, but not as strongly so as section one; ratings trended more toward "agree" than "strongly agree," with three respondents "disagreeing."

Section three evaluated each individual workshop session, on a five-point Likert scale (excellent—very good—good—fair—poor). The first session of the day, the "LID 101 Panel," was by far the favorite. Thirteen of eighteen respondents ranked it "excellent" or "very good." The second most popular was session 6, the small group exercise. Least popular were sessions four and seven – the Riverbank Alternative Compliance Study and the final summary session. However, feedback for all sessions was generally positive. We did not receive a single "poor" rating, and at most three "fair" ratings on any session.

Sections four and five were open-ended response, allowing participants an opportunity to pose additional questions that were not answered during the workshop (section four), and to provide any additional comments or feedback (section five). Remaining questions were predominantly regarding maintenance. The most noteworthy open-ended comments/ general feedback were:

- "More clarification of the regulations, less on what we think about the regulations as a group."
- "The use of local examples (not ideas or theories) was very much appreciated."

Additionally, the workshop facilitator received the following unsolicited comments, directly from participants via email:

- "Andrew and I found the LID seminar to be very informative and useful, especially as the LID requirements are developed and implemented by the local agencies." – Rick, Modesto
- "Great workshop today, with wonderful turnout & informative discussions. Thank you for everything you did." – Barbara, Modesto

While there is always room for improvement, the project team is satisfied with the results. We successfully achieved the workshop's primary goals and desired outcomes, and reviews were generally favorable.

The key "lesson learned" from this project's various education and outreach efforts is that more still needs to be done. There remains a significant need for general LID education, as well as very specific technical assistance on MS4 requirements, throughout the San Joaquin Valley, and within the Lower Stanislaus region. Some local leaders are willing to test new approaches, but the vast majority—whether out of apprehension, insufficient capacity, or lack of support—are slow to adopt basic LID strategies widely accepted in other areas. A substantial infusion of resources and support are needed to provide the requisite outreach and engagement if larger-scale LID and alternative compliance for in-fill development are to succeed in the Lower Stanislaus River region and greater San Joaquin Valley.

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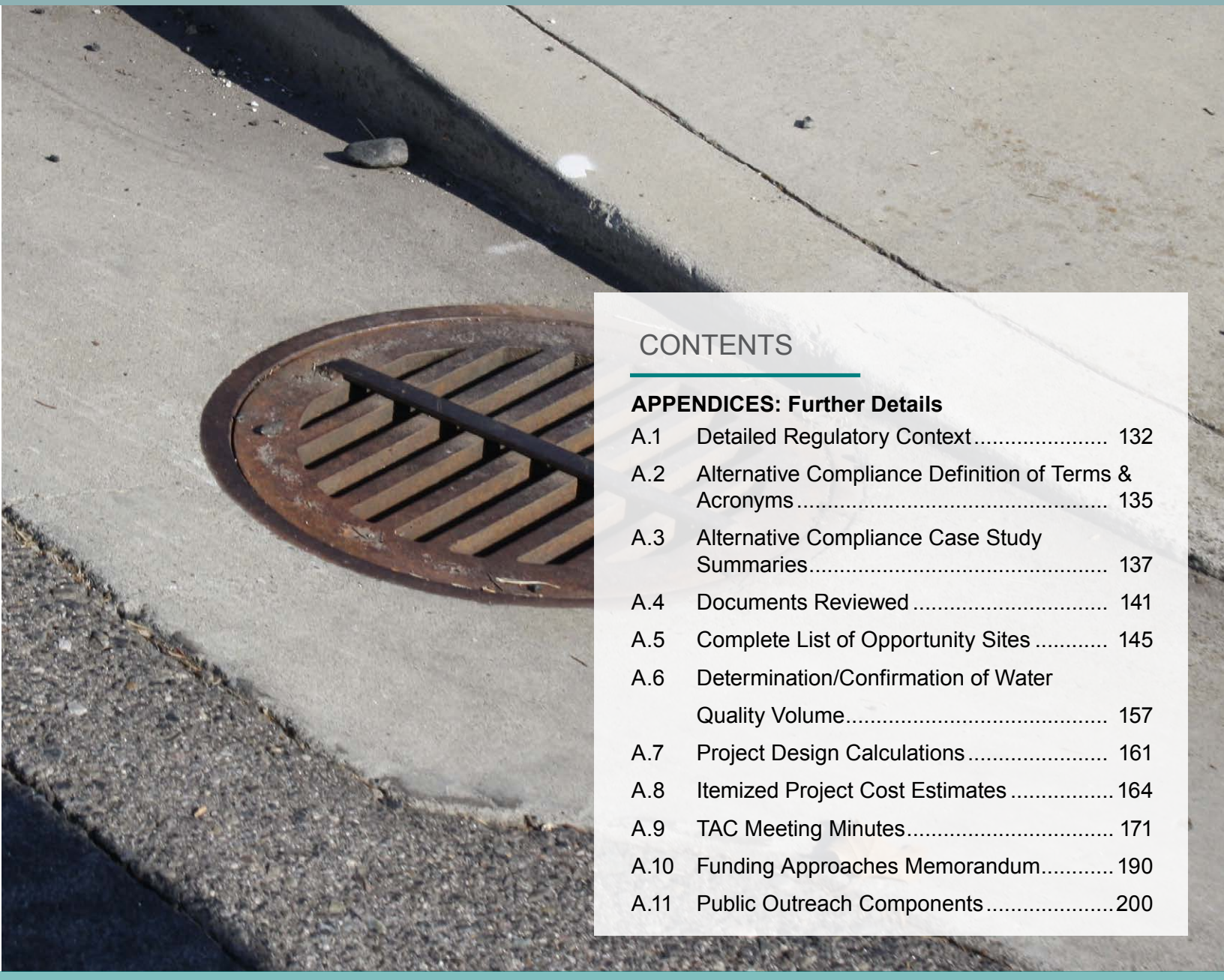
APPENDICES

FURTHER DETAILS



CONTENTS

A.1 Detailed Regulatory Context

Permit History

This Study is part of the larger Stormwater Grant Program that aims to reduce and prevent stormwater contamination of rivers, lakes and streams (begun with Prop 40 and expanded upon with Prop 84). Stormwater regulation dates back to 1972 when the EPA introduced the NPDES permit program with the primary goal to control water pollution and reduce the degradation of the nation's surface waters by regulating point source discharges of wastewater and stormwater. Applicable discharges of stormwater include those from MS4s, construction activities, and industrial activities.

For MS4s, the NPDES permit was developed in two phases. Phase I was issued in 1990 and required medium and large cities (serving between 100,000 to 250,000 people) to file for permits. Phase II, introduced in 1999, extended the permit requirement to smaller urbanized areas (≤ 100,000 people) (40 CFR Part 122 et seq., Phase II, Porter-Cologne Water Quality Control Act 13376).

Along with the majority of states, California is authorized to administer their own stormwater permitting program, which is administered through the SWRCB and its nine RWQCBs. In April of 2003, the SWRCB issued Order No. 2003-0005-DWQ, which provides coverage to all small MS4s state-wide (NPDES Phase II) under one general permit.

At the time of its issuance, the General Permit required Permittees to develop Storm Water Management Plans (SWMPs) with time frames for implementing the following six minimum control measures (MCMs):

1. Public education and outreach
2. Public participation
3. Illicit discharge detection and elimination
4. Construction site runoff control
5. Post-construction runoff
6. Pollution prevention/good housekeeping

Phase II, Small MS4, General Permit

In February 2013, the General Permit was revised (Order No. 2013-0001-DWQ) to increase its effectiveness, particularly its ability to improve the water quality of stormwater discharges. Listed below are a summary of these changes:

- Implementation of Low Impact Development Principles
- ASBS
- TMDL Implementation Requirements
- Specific Management Measures
- Elimination of SWMP in exchange for more flexible Guidance Document
- Water Quality Monitoring for ASBS and TMDL
- Designation Criteria & Waiver Certification
- Program Effectiveness Assessments
- Program Management Personnel
- SMARTS

Although the requirement to submit a formal SWMP was eliminated in 2013, all regulated small MS4s must still electronically file an Annual Report to document and summarize implementation of their stormwater program during the previous year, evaluate program results, and describe future changes towards continual improvement. The Permittee must file this report and a permit boundary map via the SWRCB's SMARTS website and submit the appropriate permit fee. Under Water Code 13377, RWQCBs have the authority to evaluate Permittees' compliance through Annual Report review or audits.

City of Riverbank Permit

The City of Riverbank is one of 13 regulated MS4s in Stanislaus County, which is overseen by the Central Valley RWQCB. In the past, the City of Riverbank has filed its Annual Report as a co-Permittee along with the neighboring cities of Ceres, Oakdale, and Patterson. Given municipalities in close proximity often face similar challenges, joint permits that require partnership and can achieve broader watershed goals are encouraged by the SWRCB.

One of the primary challenges for the City of Riverbank and their neighbors is protecting the quality of the lower Stanislaus River. The Stanislaus River continues to be listed as an impaired water body (California 303(d) list, 2010) and, per Attachment G of the 2013 General Permit, the City of Riverbank was assigned a TMDL for Diazinon and Chlorpyrifos as well as organic enrichment and low dissolved oxygen (DO) affecting the Stanislaus River. Riverbank will need to determine what are the sources that contribute to these TMDLs. If new construction/development is contributing to the TMDLs, then via the Annual Report the City will have to provide[1]:

(i) A description of BMPs implemented, including types, number, and locations

(ii) An assessment of the effectiveness of implemented BMPs in progressing towards attainment of wasteload allocations within the TMDLs' specified time frames

(iii) All monitoring data, including a statistical analysis of the data to assess progress towards attainment of wasteload allocations within the TMDLs' specified time frames

(iv) Based on results of the effectiveness assessment and monitoring, a description of the additional BMPs that will be implemented to attain

Alternative Compliance & The General Permit

A regional- watershed-based approach to stormwater dates back to the State's 1995 Strategic Plan that outlined a Watershed Management Initiative (WMI) that divided California into nine distinct zones. Regional is a relative term and encouraging consideration of upstream and downstream activities can be useful at any scale. Alternative Designs to on-site LID are permitted per E.12.e.ii.(g) of the 2013 General Permit if they have:

1. Equal or greater amount of runoff infiltrated or evapotranspired
2. Equal or lower pollutant concentrations in runoff that is discharged after biotreatment
3. Equal or greater protection against shock loadings and spills
4. Equal or greater accessibility and ease of inspection and maintenance.

Centralized LID mechanisms also have can have benefits beyond managing the volume and quality of runoff such as creation of a public amenity (e.g. dual-use park), and creating connectivity through safe pedestrian corridors (e.g. green street). Identifying these ancillary perks can help make multi-benefit facilities a viable substitute to on-site control, particularly for ensuring they are properly monitored and maintained in the long-term.

With respect to O&M, a recent amendment to Proposition 218 added stormwater drainage as one of now four items (water, sewer, refuse) that is exempt from otherwise requisite two-third public approval vote; the caveat is that the fee must be used to increase water supply. As the amendment is in its early stages of implementation, it will remain to be tested what is considered an increase in supply (e.g. groundwater recharge).

Future Changes to Regulations / Permit

Trash

Unlike DO impairments of the Stanislaus River, trash is a visible form of pollution that MS4s often seek to reduce through institutional controls such as street sweeping and educational programs. However, amendments for trash in the California Ocean Plan and the Enclosed Bays, Estuaries, and Inland Surface Waters (Trash Amendments) have been in development to further reduce Municipalities impact on surface waters. Permittees will have the option of complying via one of two tracks; Track 1) install a network of full capture systems, or Track 2) install both physical and institutional controls and, through monitoring, demonstrate they achieve the same effectiveness of Track 1. The amendment proposes to take a land-use

1. Small Phase II MS4 Permit E.15 TMDL Compliance Requirements, Section 15.d

based compliance approach focused on Permittees in high trash generating areas (high density residential, industrial, commercial, etc....). However, full compliance will still be expected within ten years of the first implementing permit. Adoption of the amendment is anticipated by summer of 2015.

Central Valley Region-wide MS4 Permit

The City of Riverbank is not alone in their struggle to meet ever-more stringent regulations. Monitoring, tracking and reporting on water quality could be eased in the near future by the passage of a region-wide permit for the Central Valley. The intention of the regional agreement is to cover both Phase I and II MS4 Permittees under one general permit. However, Phase II MS4's will not be required to enroll in the Central Valley Region-wide MS4 General Permit. They may choose to stay covered under the State Board Phase II Small MS4 Permit.

Nonetheless, the hope is that by managing stormwater management from the perspective of watershed basins, the Region-wide Permit will increase the efficiency of how Phase I and II permits are issued, managed, and monitored, thereby maximizing improvements to water quality and groundwater recharge through more creative, regionally focused, approaches. A regional approach may also ease the undue burden faced by some municipalities who are subject to TMDLs that are the result of upstream activities originating far outside their jurisdiction (e.g., pesticides, resource extraction, etc.). A preliminary draft of the Regional Permit is anticipated to be released in early summer with corresponding workshops.

A.2 Alternative Compliance Definition of Terms & Acronyms

The following vernacular is common in discussions of alternative compliance for stormwater runoff mitigation, presented in alphabetical order.

Alternative Compliance

Off-site SCMs deemed equivalent and acceptable for replacing infeasible on-site SCMs needed to mitigate development-related stormwater impacts. Typically, permittees (developers) fund and construct off-site mitigation SCMs or pay equivalent in-lieu fees towards publically driven SCMs. NOTE: It is often beneficial for municipalities to establish numerous paths to compliance in order to facilitate desired local economic development.

In-Kind vs Out-of-Kind Mitigation

Compensatory mitigations that involve resource trading with similar structural and functional types to the impacted resource (in-kind/typically on-site) and those mitigations that would involve resources of different structural and functional type and be located off-site (out-of-kind).[1]

In-Lieu Fee Mitigation

A scaled payment from a permit applicant to the responsible government entity into a specific program that will conduct wetland, stream, or other aquatic resource restoration, creation, enhancement, or preservation activities. In-lieu fee programs are generally administered by government agencies or non-profit organizations as approved by the associated regulatory agencies.[2]

Mitigation Banks

A wetland, stream, or other water resource area that has been restored, established, enhanced, or preserved and is set aside to compensate for future development impacts to other water resources. A mitigation bank's value is determined by quantifying the aquatic resource functions restored, established, enhanced, and/or preserved in terms of "credits," which may then be obtained by permit applicants to meet their compensatory mitigation requirements. In-lieu fees and mitigation banks are considered "third-party" compensation if the bank or in-lieu fee sponsor assumes responsibility from the permittee for the implementation and success of the compensatory mitigation.[3]

Low Impact Development (LID)

An innovative land planning, engineering, and landscape design approach to managing urban stormwater runoff in a more natural / decentralized way. The idea is to manage stormwater quality and detention on-site and recharge local groundwater instead of collecting / piping runoff within sewer networks to WWTPs.

Mitigation Ratio / Trading Ratio

A determined factor built into trading equivalencies to protect against shifts in spatial and temporal differences between locations. Well established ratios help reduce uncertainties regarding mitigation equivalencies between the impacted site and the mitigation activity. The methodology may vary by agency, but in general, it serves as a decision-making framework for addressing typical alternative compliance concerns such as quantitative and qualitative assessment of on-site impact and off-site mitigation, uncertainty of SCM value, and mismatched timing of on-site and off-site construction.[4]

National Pollutant Discharge Elimination System (NPDES)

Authorized by the Clean Water Act, the permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.[5]

Permittee

Typically, especially in California, the permittee is the municipality that retains responsibility for the implementation and success of the mitigation project, holding applicants liable for the performance of systems established by developers, etc. In some areas, the project owner is the permittee, although this is rare.[6]

Post-construction Stormwater Management Requirements for Development Projects (PCRs)

Seeks to limit surface runoff volumes and reduce water runoff pollutant loadings associated with new development, as consistent with local and regional watershed plans.[7]

Stormwater Control Measures (SCMs)

Structural (physical) and non-structural (design) LID features used alone or in conjunction with other SCMs to manage runoff and water quality. They are integrated into a development project's design and seek to replicate pre-development runoff patterns.[8]

Water Quality Trading (WQT)

An innovative approach to achieving water quality goals more efficiently, understanding that different sources within the same watershed may face very different costs to controlling the same contaminant. More costly operations may purchase credits from lower cost mitigations to help offset their cumulative water quality costs.[9]

Watershed Management Zone (WMZ)

Typically established at the municipal or regional level based on common key watershed processes (e.g., infiltration, groundwater recharge) and receiving water type (e.g., creek, marine nearshore waters). Municipalities sometimes establish specific criteria or mitigation processes based on specific watershed characteristics.[10]

1. http://water.epa.gov/lawsregs/guidance/wetlands/upload/2008_03_28_wetlands_Mit_rule_QA.pdf
2. U.S. Environmental Protection Agency. 2008. Compensatory Mitigation for Losses of Aquatic Resources; Final Rule. EPA-HQ-OW-2006-0020, Washington, D.C. [Section 404 of the Clean Water Act]
3. U.S. Environmental Protection Agency. 2008. Compensatory Mitigation for Losses of Aquatic Resources; Final Rule. EPA-HQ-OW-2006-0020, Washington, D.C. [Section 404 of the Clean Water Act]
4. Pristel, Violetta. An Alternative Compliance Framework for Stormwater Management in the Central Coast Region. California State University Monterey Bay, Fall 2013, page 26.
5. http://cfpub.epa.gov/npdes/
6. U.S. Environmental Protection Agency. 2008. Compensatory Mitigation for Losses of Aquatic Resources; Final Rule. EPA-HQ-OW-2006-0020, Washington, D.C. [Section 404 of the Clean Water Act]
7. http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=92
8. Pristel, Violetta. An Alternative Compliance Framework for Stormwater Management in the Central Coast Region. California State University Monterey Bay, Fall 2013, page 14.
9. http://water.epa.gov/type/watersheds/trading.cfm
10. Central Coast Regional Water Quality Control Board. 2012. Post-construction stormwater management requirements for development projects in the Central Coast Region. Resolution No. R3-2012-0025, Attachment 1. [Internet] [cited 2012 October1]. Available from: http://www.waterboards.ca.gov/rwqcb3/water_issues/programs/stormwater/docs/lid/hydromod_lid_docs/PCRs_final.pdf

A.3 Alternative Compliance Case Study Summaries

CASE STUDY: Ventura County, CA

The Ventura County Municipal Separate Storm Sewer System Permit[1] was adopted in July 2010, which directs requirements for separated storm sewer discharge during wet weather and includes Integrated Water Quality/Flow Reduction/Resources Management Criteria for new development/ redevelopment. Section III-2 specifies procedures for alternative compliance due to technical infeasibility. As with most municipalities, the stated impetus for alternative compliance is to encourage infill development in areas with space constraints or other challenges to complying with standard LID requirements. Project applicants must demonstrate the infeasibility, which typically results from high ground water, geotechnical or brownfield/contamination issues, density or urban development, or limited parcel size.

In Ventura County, it falls to the project applicant to propose the alternative compliance option, referring to the Ventura County Technical Guidance Manual. Regardless of the SCMs pursued off-site, the project must still ensure that less than 30% of the site is impervious. The project must retain and treat as much stormwater runoff on site as possible, with the balance being accommodated with off-site mitigation or in-lieu fees. Off-site mitigations must accommodate an equivalent volume of runoff and achieve the same standard of pollutant load reduction as required on-site. As with on-site systems, off-site SCMs may utilize infiltration, reuse, evapotranspiration, and/ or biofiltration to treat the runoff.

Notable Characteristics

- Projects with technical infeasibility that have impervious area in excess of 30% of the site must mitigate or make in-lieu payments at an increased ratio of 1:1.5 the stormwater volume not accommodated on site.
- All off-site mitigations must be located in the development's same sub-watershed (a list of options to be provided by the Permittee)
- Acceptable SCM project types include green streets, parking lot retrofits, other site specific LID BMPs, and regional BMPs.
- Project applicants may also propose other off-site mitigation projects to the Permittee for review.
- Off-site projects should be built as soon as possible and no later than 4 years from the occupancy of the initial project which seeded the funds
- The Permittee must provide descriptions of all public off-site mitigation projects in its annual report, including in-lieu fees received and the water retention and quality levels achieved, showing that equivalent watershed benefits have been secured.

CASE STUDY: State of West Virginia

The State of West Virginia maintains a comprehensive set of stormwater mitigation tools, including an alternative compliance program. These tools include innovative off-site mitigation options (reforestation and two approaches to stream restoration) and a runoff reduction spreadsheet, which also provides BMP sizing criteria[2]. Runoff volumes are used as the local trading currency and deed restrictions are applied to lands that host off-site mitigations in order to ensure that the intended stormwater mitigation continues in perpetuity.

In January 2013, the West Virginia Department of Environmental Protection released its Guidance for Developing an Off-Site Stormwater Compliance program, targeting MS4 applications that wish to develop off-site mitigations or pay into the in-lieu program to meet the General Permit.

NOTE: The State of Virginia manages a similar set of alternative compliance approaches and tools.

Notable Characteristics

- Permittees must present an explanation of why and how much stormwater cannot be accommodated on-site.
- Off-site mitigation or in-lieu fees (or a combination of both) must be provided at a ratio of 1:1.5 for up to 0.6 inches of the original obligation. Anything in excess that cannot be accommodated on-site must use an alternative compliance ratio of 1:2.
- Runoff reduction credit is given for tree planting based on canopy/interception.

- Reforestation must reduce the equivalent volume of runoff in excess of existing site conditions (planted at a minimum 100 trees/ acre).
- Monitoring studies (which measured the proportion of rainfall removed through processes such as interception, transpiration, and infiltration) were used to estimate a 30% runoff reduction benefit provided by trees.

- The provisional methodology for stream restoration credits is based on sediment and nutrient load reductions. Although assigning volume reduction credit is challenging, the State offers two methods for assigning runoff reduction via stream restoration: [1] equivalent BMP approach, and [2] site assessment approach.[3]
  - The site assessment approach uses a more sophisticated, four step process:

    1. Estimate stream sediment erosion rates
    2. Convert stream bank erosion to nutrient loading
    3. Estimate reduction efficiency attributed to stream restoration
    4. Equate pollutant reduction with equivalent runoff reduction (bioretention benchmark)

Depending on certain criteria, stream restoration may be considered an "in-kind" mitigation

- Stream restoration requires a site-specific assessment of bank conditions and stable reference stream data

CASE STUDY: Prince George's County, MD

Prince George's County operates a unique alternative compliance program for non-profit organizations. The overall goals (NOT in rank order) are to [1] connect people to water bodies, [2] engage people in restoration, [3] revitalize communities, and [4] improve water quality. Under the alternative compliance program, qualified property may consider one or all of the following options:

- Option 1: Provide Easements (50% reduction in impervious area fee)
  - Property owner gives the County a temporary right of entry to install BMPs.
  - The property owner must maintain and operate the BMPs in order to sustain the credit.
  - BMPs are subject to inspection by the Department of Environmental Resources.
- Option 2: Outreach and Education (25% reduction in impervious area fee)
  - Property owner agrees to participate in the County's outreach/education campaign, which encourages other property owners to participate in the County's Rain Check Rebate Program focused on restoration.
  - Owners also create an environmental green team or ministry, which conduct activities such as:

    Tree planting
    Trash pick-up
    Lot stewardship and cleanliness
    On-site recycling and better waste management
    Planting rain gardens
- Option 3: Green Care and Good Housekeeping (25% reduction in impervious area fee)
  - Property owner commits to using lawn management companies certified in the proper use/application of fertilizers in vegetated areas and lawns.
  - Owner also agrees to good housekeeping practices for ensuring clean lots.[4]

In order to secure the various awards/credits, qualified non-profit property owners must:

1. File an application with the County.
2. Schedule and receive a consultation visit from the County to confirm which option(s) will be implemented.
3. Write and submit an alternative compliance plan to the County Department of Environmental Resources who will determine the credits received.

Notable Characteristics

- Currently only provides reductions or exemptions from the Impervious Fee portion of the Clean Water Act (save a standard administrative fee) for 501-C non-profit organizations and tax exempt

religious organizations

- Tiered system allows for 25–100% reduction in Impervious fees

CASE STUDY: City of Los Angeles, CA

Los Angeles County (84 cities) and San Diego areas have been working to increase water supply reliability in Southern California and focus on multi-benefit water conservation projects with numeric outcomes. In 2011, the City of Los Angeles adopted a new ordinance (Los Angeles, No. 181899) to expand urban stormwater mitigation regulations to include LID requirements for all projects requiring building permits. Los Angeles was also one of the first cities to officially adopt the required LID legislation (May 2013) required to comply with the County MS4 NPDES permit (adopted in December 2012).

In its MS4 Permit, Los Angeles County outlined alternative compliance approaches that require the County and its associated cities to establish Enhanced Watershed Management Programs (EWMP), a Green Streets policy, an LID ordinance, action-based and numeric compliance standards (land planning and development), implementation strategies, and coordinated integrated monitoring programs (CIMP).[5] The MS4 Permit also requires that TACs oversee collaborative and transparent watershed-based planning processes that provide opportunities for meaningful stakeholder input. Permitees in unincorporated areas are encouraged to collaborate with each other. As of June, 2013, the County had received notice from over 70 permitees that were forming 18 watershed groups to pursue the aforementioned alternative compliance path.[6]

Cities can identify multi-benefit regional projects, with an overall focus on developing options and agreements between private permittees, regional water quality and flood boards, and water / wastewater districts. Cities that committed by June 2013 (via a memorandum of understanding [MOU]) to develop a WMP (alone or in groups) received a 12-month extension on meeting the MS4 Permit deadlines, 18 months if they included LID and Green Streets elements. EWMP require multi-city partnerships, at least one structural BMP project, and allow for water reuse alternatives to standard infiltration measures. Computer modeling is required in both options to prove pollutant reduction goals are met.[7]

In the City of Los Angeles, development or redevelopment projects occurring on less than 1-acre parcels have the option to pursue alternative compliance methods for LID as outlined in the Development Management Best Practices Handbook. In addition to outlining the standards and requirements, the Handbook also includes technical feasibility / implementation parameters and alternative compliance options. Users are required to follow the path outlined in the graphic[8]. As with all of the case studies presented, applicants must demonstrate technical infeasibility of on-site LID; in Los Angeles, this must include a site-specific geotechnical investigation report and/or hydrologic analysis conducted by a State of California certified professional (civil engineer, geotechnical engineer, or geologist).[9]

Notable Characteristics (City of Los Angeles)

- As of 2014, permits require development and redevelopment projects to manage the design capture volume on-site using LID BMPs.
- Any runoff volume NOT managed on-site using LID BMPs must be mitigated off-site by one of the following options (via MS4 permits):
  - Mitigate the exact volume difference at an off-site location
  - Pay an in-lieu fee equivalent to the cost of LID systems to manage runoff on-site
  - Credit trading systems
  - Watershed planning elements/instruments
- Focus on credit trading system and economic and development data for alternative compliance projects[10].
- The Regional Board has been criticized and accused of breaking State law for recent decisions to allow alternative compliance demonstrations in regards to toxicity for General Industrial, General Construction, MS4, and CalTrans Storm Water Permits. Advocates claim that the agency is failing to require sufficient proof from Permittees that alternative compliance mechanisms are sufficiently managing Water Quality-Based Effluent Limits, TMDL, and Waste Load Allocations[11].

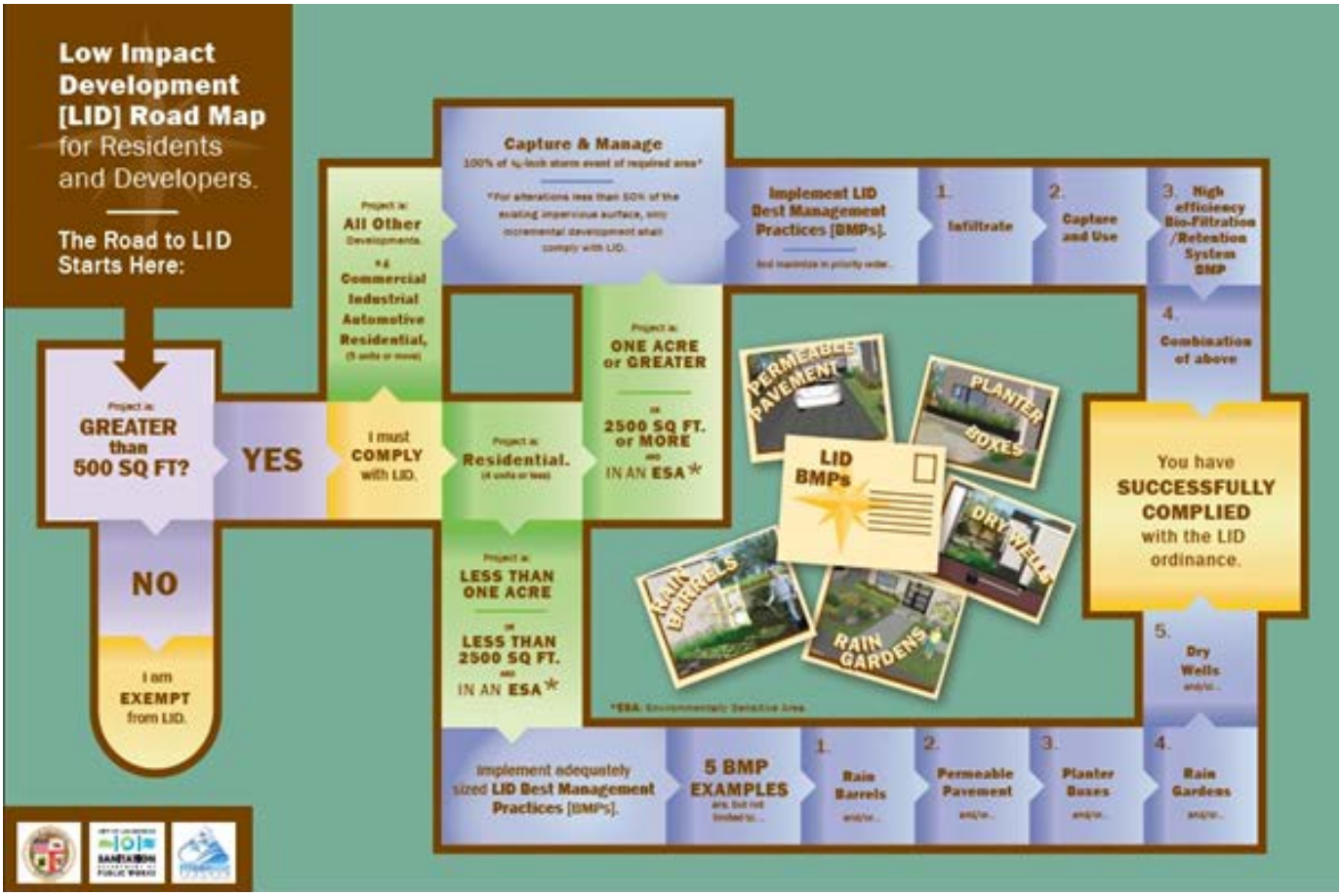


Figure A.3–1 Los Angeles Guide for Permittees

1. http://www.vcstormwater.org/documents/reference/2010_NPDES_permit/Ventura_County_MS4_Permit_Order_No.%20R4-2010-0108%20final%20pending%20verification.pdf
2. West Virginia Department of Environmental Protection Web site. http://www.dep.wv.gov/WWE/Programs/stormwater/MS4/permits/Pages/ToolsandGuidance.aspx
3. Pristel, Violetta. An Alternative Compliance Framework for Stormwater Management in the Central Coast Region. California State University Monterey Bay, Fall 2013, page 30.
4. http://www.princegeorgescountymd.gov/sites/StormwaterManagement/CleanWaterActFees/Alternative%20Compliance/Pages/default.aspx
5. http://www.southbaycities.org/sites/default/files/board_directors/meeting/Torrance%20AND%20RWQCB%20MS4%20Permit%20PPTs.pdf
6. http://file.lacounty.gov/bc/q3_2013/cms1_199205.pdf
7. http://www.gatewayirwmp.org/files/documents/gateway%20Presentation%20of%20the%20new%20MS4%20permit.pdf
8. http://www.lastormwater.org/blog/2012/02/how-low-impact-development-applies-to-you/
9. http://www.lastormwater.org/wp-content/files_mf/lidhandbook.pdf, page 25
10. http://www.ocbc.org/wp-content/uploads/Grey_Orange-County-Business-Council-Presentation-1_14_2014.pptx
11. https://lawaterkeeper.org/wp-content/uploads/2012/05/LAW_HTB-MDR-Toxics-TMDL-comment-letter.pdf

A.4 Documents Reviewed

Data	Format	Description
Boundaries	GIS	City Boundary, Sphere of Influence, General Plan
Parcels	GIS	Lot lines, size, age, owner
Zoning	GIS	Land use designations within the City and regionally
Neighborhoods	GIS	Neighborhood designations within the City
Transportation Infrastructure	GIS	Rail, street, and highway alignments
Topography	GIS	Regional contour data from USGS
Soils	GIS	Regional soils data (type, infiltration capacity, limiting layers, groundwater depth, etc)[1]
Surface Water	GIS	Location of rivers, lakes, creeks, and canals
Floodplains	GIS	Levees and flood zones from the Federal Emergency Management Agency (FEMA)
Storm Drainage Infrastructure	CAD	Pipes, inlets, structures, lift stations, and outfalls from the Storm Drain System Master Plan[2]

Table A.4–1 Summary of Data Compiled

1. National Resources Conservation Service Web Soil Survey. 2013 (March). http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm
2. Nolte Beyond Engineering. 2008 (June). City of Riverbank Storm Drain System Master Plan.

Date	Document	Source
Environmental Reports		
01.1997	Crossroads Community Specific Plan - Final Environmental Impact Report	EMC Planning Group
05.2005	Preliminary Geotechnical Investigation, Proposed Subdivision (APN #62-20-023 & 62-20-05)	Construction Testing & Engineering Inc
05/2006	Riverbank Army Ammunition Plant, Riverbank, CA	US Department of Army
10.2006	Proposed 2006 CWA Section 303(d) List of Water Quality Limited Segments Being Addressed by USEPA Approved TMDLs	State Water Resources Control Board
10.2006	Proposed 2006 CWA Section 303(d) List of Water Quality Limited Segments	Central Valley Regional Board
11.2006	Environmental Condition of Property Phase I Report Riverbank Army Ammunition Plant	C2HMHill
06.2007	Phase I Environmental Site Assessment Report, Sun Garden-Gangi Property	LFR, Inc.
06.2007	Source Sufficiency Report for City of Riverbank: General Plan Update	Dunn Environmental, Inc.
10.2010	Final EIR for the 2005-2025 General Plan Update	EDAW/AECOM
02.2011	Draft Environmental Impact Report: Downtown Specific Plan	AECOM
03.2013	Stanislaus County Regional Greenhouse Gas Inventory - Explanation of Results	ICF
05.2013	Phase I Environmental Site Assessment California Fruit and Tomato Kitchens	Keinfelder, Inc.
05.2014	Environmental Site Assessment for Real Property	ATC Associates, Inc.
Regulations		
2003	Stormwater Phase II Final Rule	US EPA
2003	Water Quality Order No. 2003-0005-DWQ; NPDES General Permit No. CAS000004	SWRCB
2004	Storm Water Management Program for Stanislaus County: Report of Waste Discharge	SWRCB
2007	Department of Public Works Stanislaus County: Standards and Specifications	Stanislaus Co. Public Works
2011	4th Edition of the Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins	Central Valley Regional Water Quality Board

Table A.4–2 Summary of Key Documents Reviewed

Date	Document	Source
2013	NPDES General Permit No. CAS000004 (Phase II Small MS4 General Permit, Order No. 2013-0001-DWQ)	SWRCB
2013	Fact Sheet for NPDES General Permit and Waste Discharge Requirements for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems (Order)	SWRCB
2014	Revision to 2002 Memorandum: Establishing TMDL WLAs for Storm Water Sources and NDPES Permit Requirements Based on those WLAs	EPA
Land-Use / Development Plans		
07.1994	Department of Public Works Standard Specifications	City of Riverbank
03.2003	Storm Water Management Program: Ceres, Oakdale, Patterson, Riverbank - Report of Waste Discharge	Tulloch Engineering
04.2005	Integrated Regional Groundwater Management Plan For Modesto Sub basin	Bookman-Edmonston
09.2005	Bruinville Area Master Public Facilities Plan	TCB / AECOM
07.2006	Eastern Riverbank Drainage Study	Giuliani and Kull, Inc.
11.2007	City of Riverbank Water Supply Study and Water Master Plan	Nolte Beyond Engineering
06.2008	City of Riverbank Storm Drain System Master Plan	Nolte Beyond Engineering
10.2008	Riverbank Army Ammunition Plant, Base Reuse Plan	Design, Community & Environment
04.2009	City of Riverbank: General Plan	City of Riverbank
10.2010	Downtown Riverbank Specific Plan	AECOM
10.2011	Downtown Specific Plan: City of Riverbank, CA	City Design Collective
01.2013	Model Standards & Specifications for Low Impact Development Practices	AECOM
06.2013	Municipal Service Review & Sphere of Influence Update	Stanislaus Local Agency Formation Commission
07.2013	Technical Report First Street Basin	Bill Kull, PE
11.2013	Riverbank Army Ammunition Plant Specific Plan	The Planning Center

Table A.4-2 Summary of Key Documents Reviewed Continued

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A.5 Complete List of Opportunity Sites

Legend	
Blue	Within Priority Area
	Potential Flooding [1]
	Proposed Infrastructure [1]
	Top 10% - Size
	Green / Open Space
	Public Ownership Zoning
	City of Riverbank Ownership
	A or A/x Soil Group
	Vacant* Parcel [2]
	Bottom 10% - Value per Sq. Ft.
	> 5' to Hardpan

Opportunity Site No.	Sub-watershed	Area (acres)	Zoning	Source	Soil Group	Owner	APNs	Land Use	Assessed Value	$ / sq. foot	Depth to Hardpan
1	4th Street	0.2	Commercial	2010 Downtown Specific Plan	A	Private	132-010-013	Mini-Marts	$266,604	$35.14	> 5'
2	4th Street	0.3	Commercial	2010 Downtown Specific Plan	A	Private	132-010-012	Shopping Centers (Large & Small)	$405,000	$32.50	> 5'
3	4th Street	0.3	Commercial	2010 Downtown Specific Plan	A	City of Riverbank	132-010-014	Churches / Welfare	$153,029	$12.41	> 5'
4	4th Street	0.6	Commercial	2010 Downtown Specific Plan	D	City of Riverbank	132-009-001	City Non-Assess.			1.5 - 3'
5	4th Street	0.4	Commercial	2010 Downtown Specific Plan	D	City of Riverbank	132-009-002	City Non-Assess.			1.5 - 3'
6	4th Street	0.4	Commercial	2010 Downtown Specific Plan	D	Private	132-004-045	Auto Sales - Auto Service Centers	$201,500	$12.93	1.5 - 3'
7	4th Street	2.6	Null	2005-2025 General Plan	A/D	State of CA	Highway 108	Highway 108			1.5 - 3'
8	4th Street	1.3	Buffer / Greenway / Open Space	2005-2025 General Plan	A	Private*	132-002-006 / 132-004-051	Single Family Residence / Vacant Misc.	$188,674	$3.25	1.5 - 3'
9	4th Street	0.9	Buffer / Greenway / Open Space	Google Earth (04/2013)	A	City of Riverbank	132-005-001	City - Non-assess.			1.5 - 3'
10	6th Street	0.2	Commercial	2010 Downtown Specific Plan	D	Private	132-009-060	Stores & Shops (All Sizes)	$161,473	$16.91	1.5 - 3'
11	6th Street	0.1	Commercial	2010 Downtown Specific Plan	D	Private	132-009-050	Stores & Shops (All Sizes)	$61,215	$20.22	1.5 - 3'
12	6th Street	0.1	Commercial	2010 Downtown Specific Plan	D	Private	132-009-055	Vacant C-2	$14,344	$4.43	1.5 - 3'
13	6th Street	0.1	Commercial	2010 Downtown Specific Plan	D	City of Riverbank	132-009-054	City Non-Assess.			1.5 - 3'
14	6th Street	0.2	Commercial	2010 Downtown Specific Plan	D	Private	132-009-059	Office Buildings Large & Small	$169,389	$18.20	1.5 - 3'
15	6th Street	0.1	Commercial	2010 Downtown Specific Plan	D	Private	132-011-013	Stores & Shops (All Sizes)	$206,944	$33.02	1.5 - 3'
16	6th Street	0.1	Commercial	2010 Downtown Specific Plan	D	Private	132-011-012	Vacant C-2	$45,500	$7.04	1.5 - 3'
17	6th Street	0.1	Commercial	2010 Downtown Specific Plan	D	Private	132-011-017	Stores & Shops (All Sizes)	$57,965	$9.18	1.5 - 3'
18	6th Street	0.2	Commercial	2010 Downtown Specific Plan	D	City of Riverbank	132-011-018	City Non-Assess.			1.5 - 3'
19	6th Street	0.2	Commercial	2010 Downtown Specific Plan	A	Private	132-006-003	Auto Repair Shops	$168,077	$16.69	> 5'
20	6th Street	0.5	Commercial	2010 Downtown Specific Plan	A	Private	132-006-011	Mixed Commercial	$235,500	$11.12	> 5'
21	6th Street	0.4	Commercial	2010 Downtown Specific Plan	A	Private	132-006-013	Undeveloped C-2	$179,800	$9.43	> 5'
22	6th Street	0.1	Commercial	2010 Downtown Specific Plan	A	Private	132-006-014	Auto Service Centers	$44,118	$12.61	> 5'
23	6th Street	0.1	Residential	2010 Downtown Specific Plan	A	Private	132-010-016	Single Family w/Higher Use Potential	$15,082	$2.40	> 5'
24	6th Street	0.2	Commercial	2010 Downtown Specific Plan	D	Private	132-010-063	HAS 4 to 9 Income Units	$105,476	$14.40	1.5 - 3'
25	6th Street	0.2	Commercial	2010 Downtown Specific Plan	D	City of Riverbank	132-009-023	City Non-Assess.			1.5 - 3'
26	6th Street	0.2	Civic	2010 Downtown Specific Plan	D	City of Riverbank	132-010-043	City Non-Assess.			1.5 - 3'
27	6th Street	0.2	Civic	2010 Downtown Specific Plan	D	City of Riverbank	132-010-045	City Non-Assess.			1.5 - 3'
28	6th Street	0.1	Civic	2010 Downtown Specific Plan	D	City of Riverbank	132-010-044	City Non-Assess.			1.5 - 3'
29	6th Street	13.6	Civic	Google Earth (04/2013)	C/A	City of Riverbank	132-008-001	Public School			1.5 - 3'
30	6th Street	0.1	Commercial	2010 Downtown Specific Plan	D	City of Riverbank	132-012-023	City Non-Assess.			1.5 - 3'
31	6th Street	0.2	Commercial	2010 Downtown Specific Plan	D	City of Riverbank	132-012-024	City Non-Assess.			1.5 - 3'
32	6th Street	2.6	Null	2005-2025 General Plan	D/A	State of CA	Highway 108	Highway 108			1.5 - 3'
33	6th Street	2.7	Buffer / Greenway / Open Space	2005-2025 General Plan	A	Private*	132-005-032 / 132-006-016	Vacant Misc.	$15,351	$0.13	> 5'
34	6th Street	5.3	Null	Google Earth (04/2013)	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
35	6th Street	2.4	Null	Google Earth (04/2013)	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
36	6th Street	1.7	Null	Google Earth (04/2013)	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
37	6th Street	2.4	Buffer / Greenway / Open Space	2005-2025 General Plan	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
38	7th Street - A	2.4	Residential	Google Earth (04/2013)	D	Private	132-036-003	Sinlge Family w/Extra Land	$188,500	$1.78	1.5 - 3'
39	7th Street - A	0.5	Residential	2010 Downtown Specific Plan	D	Private	132-017-021	Single Family w/Higher Use Potential	$45,319	$2.29	1.5 - 3'
40	7th Street - A	0.4	Residential	2010 Downtown Specific Plan	D	Private	132-017-020	HAS 4 to 9 Income Units	$682,820	$35.04	1.5 - 3'
41	7th Street - A	0.2	Residential	2010 Downtown Specific Plan	D	Private	132-017-023	Single Family w/Higher Use Potential	$54,072	$5.59	1.5 - 3'
42	7th Street - A	0.7	Residential	2010 Downtown Specific Plan	D	Private	132-017-022	Under-Over Improved	$29,367	$0.99	1.5 - 3'
43	7th Street - A	0.2	Residential	2010 Downtown Specific Plan	D	Private	132-017-027	Vacant R-1	$26,322	$3.46	1.5 - 3'
44	7th Street - A	0.5	Commercial	2010 Downtown Specific Plan	D	Private	132-011-065	Misc. Mixed Commercial	$301,802	$13.49	1.5 - 3'
45	7th Street - A	0.2	Commercial	2010 Downtown Specific Plan	D	Private	132-011-064	Single Family Residence	$47,433	$5.04	1.5 - 3'
46	7th Street - A	0.5	Commercial	2010 Downtown Specific Plan	D	n/a	132-011-067	n/a			1.5 - 3'
47	7th Street - A	0.8	Commercial	2010 Downtown Specific Plan	D	Private	132-022-017	Vacant C-1	$130,500	$3.97	1.5 - 3'
48	7th Street - A	0.3	Commercial	2010 Downtown Specific Plan	C	City of Riverbank	132-017-005	City Non-Assess.			1.5 - 3'
49	7th Street - A	0.4	Civic	2010 Downtown Specific Plan	D	Private	132-011-047	Misc. Mixed Commercial	$197,620	$11.87	1.5 - 3'
50	7th Street - A	0.9	Residential	2010 Downtown Specific Plan	D	Private	132-017-019	Residential w/Pot. Higher Use	$50,366	$1.28	1.5 - 3'
51	7th Street - A	0.1	Commercial	Google Earth (04/2013)	D	Private	132-011-051	Transitional Comm H&B Use w/Res	$118,000	$19.19	1.5 - 3'
52	7th Street - A	0.1	Commercial	Google Earth (04/2013)	C	Private	132-011-052	Vacant M-1, M-2 or C-M	$22,099	$3.54	1.5 - 3'
53	7th Street - A	0.3	Commercial	2010 Downtown Specific Plan	A	Private	132-011-055	Misc. Mixed Commercial w/Res	$78,784	$6.82	1.5 - 3'
54	7th Street - A	1.0	Null	Google Earth (04/2013)	A	Private	132-034-017	Vacant M-1, M-2 or C-M	$73,658	$1.63	> 5'

October 7th, 2014

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Legend	
Blue	Within Priority Area
	Potential Flooding [1]
	Proposed Infrastructure [1]
	Top 10% - Size
	Green / Open Space
	Public Ownership Zoning
	City of Riverbank Ownership
	A or A/x Soil Group
	Vacant* Parcel [2]
	Bottom 10% - Value per Sq. Ft.
	> 5' to Hardpan

Opportunity Site No.	Sub-watershed	Area (acres)	Zoning	Source	Soil Group	Owner	APNs	Land Use	Assessed Value	$ / sq. foot	Depth to Hardpan
55	7th Street - A	2.0	Null	Matthew Gerken 140911 email	A	City of Riverbank	132-034-019	City Non-Assess.			1.5 - 3'
56	7th Street - A	0.1	Commercial	2010 Downtown Specific Plan	D	Private	132-010-056	Warehouses	$202,819	$31.52	1.5 - 3'
57	7th Street - A	5.6	Industrial	Google Earth (04/2013)	D	BN & SF Railroad	132-039-005	Railroad Non-assess			1.5 - 3'
58	7th Street - A	0.4	Commercial	2010 Downtown Specific Plan	D	Private	132-051-007	Stores & Shops (All Sizes)	$147,496	$7.60	1.5 - 3'
59	7th Street - A	1.5	Industrial	2005-2025 General Plan	A	Private*	132-039-020	Light Industrial / Manf.	$2,576,500	$40.11	1.5 - 3'
60	7th Street - A	3.1	Industrial	2005-2025 General Plan	A	Private*	132-039-020	Light Industrial / Manf.	$2,576,500	$18.94	1.5 - 3'
61	7th Street - A	1.6	Buffer / Greenway / Open Space	2005-2025 General Plan	D	n/a	n/a	n/a			1.5 - 3'
62	7th Street - A	1.5	Null	Google Earth (04/2013)	A/D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
63	7th Street - A	1.0	Null	Google Earth (04/2013)	A/D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
64	7th Street - A	1.6	Null	Google Earth (04/2013)	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
65	7th Street - A	4.5	Buffer / Greenway / Open Space	2005-2025 General Plan	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
66	7th Street - A	3.5	Null	Google Earth (04/2013)	D	n/a	n/a	n/a			1.5 - 3'
67	7th Street - B	0.3	Commercial	Google Earth (04/2013)	A	Private	132-007-006	Mixed Commercial	$192,610	$14.39	> 5'
68	7th Street - B	0.7		Google Earth (04/2013)	A/D	Private	132-006-008	Gas Stations - Any Size	$337,520	$11.23	> 5'
69	7th Street - B	1.2	Residential	Google Earth (04/2013)	D	Private	132-015-023	Undeveloped R-3	$175,000	$3.43	1.5 - 3'
70	7th Street - B	0.7	Null	2005-2025 General Plan	A	State of CA	Highway 108	Highway 108			> 5'
71	7th Street - B	1.5	Null	Google Earth (04/2013)	A	City of Riverbank	Urban Arterial	Urban Arterial			> 5'
72	7th Street - B	2.9	Null	Google Earth (04/2013)	D/A	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
73	7th Street - B	2.0	Null	Google Earth (04/2013)	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
74	7th Street - B	2.2	Buffer / Greenway / Open Space	2005-2025 General Plan	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
75	8th Street - A	0.8	Null	Google Earth (04/2013)	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
76	8th Street - A	0.6	Null	Google Earth (04/2013)	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
77	8th Street - A	12.2	Existing Stormwater Detention Basin	Site Visit (underutilized)	D	City of Riverbank	075-018-006	City Non-Assess.			1.5 - 3'
78	8th Street - A	1.8	Null	2008 Stormdrain System Master Plan	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
79	8th Street - A	2.8	Null	Google Earth (04/2013)	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
80	8th Street - B	3.2	Buffer / Greenway / Open Space	2005-2025 General Plan	A	Federal	132-050-001	USA Non-Assess.			> 5'
81	8th Street - B	4.5	Residential	Google Earth (04/2013)	D	Private	132-045-002	Developed w/Res	$324,596	$1.66	1.5 - 3'
82	8th Street - B	3.8	Civic	2005-2025 General Plan	D	City of Riverbank	132-065-056	Public School			1.5 - 3'
83	8th Street - B	0.9	Residential	Google Earth (04/2013)	A	Private	132-049-032	Single Family w/Extra Land	$157,500	$4.02	> 5'
84	8th Street - B	0.7	Residential	Google Earth (04/2013)	A	Private	132-049-016	Undeveloped R-1	$12,804	$0.43	> 5'
85	8th Street - B	0.6	Residential	Google Earth (04/2013)	D	Private	132-015-025	Undeveloped R-3	$61,467	$2.41	1.5 - 3'
86	8th Street - B	0.3	Residential	Google Earth (04/2013)	D	Private	132-015-026	Undeveloped R-3	$42,909	$2.87	1.5 - 3'
87	8th Street - B	2.0	Residential	Google Earth (04/2013)	D	Private	132-048-016	Undeveloped w/Pot. Subdivision	$126,572	$1.49	1.5 - 3'
88	8th Street - B	0.2	Residential	Google Earth (04/2013)	A	Private	132-049-041	Undeveloped R-1	$30,136	$3.19	> 5'
89	8th Street - B	0.2	Residential	Google Earth (04/2013)	A	Private	132-049-043	Undeveloped R-1	$30,136	$3.15	> 5'
90	8th Street - B	0.2	Residential	Google Earth (04/2013)	A	Private	132-049-042	Undeveloped R-1	$30,136	$3.15	> 5'
91	8th Street - B	0.2	Residential	Google Earth (04/2013)	A	Private	132-049-044	Undeveloped R-1	$36,000	$3.81	> 5'
92	8th Street - B	1.7	Null	Google Earth (04/2013)	D	City of Riverbank	Urban Arterial	Urban Arterial			> 5'
93	8th Street - B	1.0	Null	Google Earth (04/2013)	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
94	8th Street - B	1.6	Null	Google Earth (04/2013)	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
95	8th Street - B	1.8	Null	Google Earth (04/2013)	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
96	8th Street - B	2.0	Null	2008 Stormdrain System Master Plan	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
97	8th Street - B	2.1	Null	Google Earth (04/2013)	A	City of Riverbank	Urban Arterial	Urban Arterial			> 5'
98	8th Street - B	1.8	Buffer / Greenway / Open Space	2005-2025 General Plan	C/D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
99	8th Street - B	4.5	Buffer / Greenway / Open Space	2005-2025 General Plan	C/D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
100	Bruinville	4.6	Residential	Google Earth (04/2013)	C	Private	062-022-001	Undeveloped w/Pot. Subdivision	$200,908	$1.01	1.5 - 3'
101	Bruinville	9.4	Residential	Google Earth (04/2013)	C	Private	062-022-003	Pot. Subdivision w/Res	$261,000	$0.64	1.5 - 3'
102	Bruinville	0.7	Commercial	2005 East Side Master Plan	D	Private	062-022-005	Developed w/Res	$120,187	$4.06	1.5 - 3'
103	Bruinville	1.4	Commercial	2005 East Side Master Plan	D	Private	062-022-006	Developed w/Res	$233,721	$3.92	1.5 - 3'
104	Bruinville	0.9	Greenfield Development Area	Google Earth (04/2013)	A	Private	062-019-014	Developed w/Res	$331,497	$8.08	3 - 5'
105	Bruinville	5.4	Civic	2005-2025 General Plan	C	Private	062-017-001	Undeveloped Res w/CLCA	$16,356	$0.07	1.5 - 3'
106	Bruinville	35.3	Civic	2005-2025 General Plan	D	City of Riverbank	062-021-001	School			1.5 - 3'
107	Bruinville	9.2	Residential	2005-2025 General Plan	D	Private	062-021-008	Developed w/Res	$168,221	$0.42	1.5 - 3'
108	Bruinville	9.6	Park	2005-2025 General Plan	A/C	City of Riverbank	062-018-011	n/a			> 5'

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Legend	
Blue	Within Priority Area
	Potential Flooding [1]
	Proposed Infrastructure [1]
	Top 10% - Size
	Green / Open Space
	Public Ownership Zoning
	City of Riverbank Ownership
	A or A/x Soil Group
	Vacant* Parcel [2]
	Bottom 10% - Value per Sq. Ft.
	> 5' to Hardpan

Opportunity Site No.	Sub-watershed	Area (acres)	Zoning	Source	Soil Group	Owner	APNs	Land Use	Assessed Value	$ / sq. foot	Depth to Hardpan
109	Bruinville	0.4	Park	2005-2025 General Plan	A/C	City of Riverbank	062-018-012	Developed w/Res	$125,372	$7.81	> 5'
110	Bruinville	12.1	Residential	2005 East Side Master Plan	D/A	Private	062-020-001	Pot. Subdivision w/Res	$932,000	$1.77	1.5 - 3'
111	Bruinville	2.3	Residential	2005-2025 General Plan	A	Private	062-020-005	Undeveloped w/Pot. Subdivision	$63,286	$0.62	3 - 5'
112	Bruinville	4.7	Greenfield Development Area	2008 Stormdrain System Master Plan	C	Private	062-022-011	Developed w/CLCA & Res	$109,786	$0.54	1.5 - 3'
113	Bruinville	4.5	Residential	Google Earth (04/2013)	D	Private	062-022-020	Developed w/Res	$235,282	$1.20	1.5 - 3'
114	Bruinville	1.4	Commercial	2005 East Side Master Plan	D	Private	062-022-023	Residential w/Pot. Higher Use	$164,117	$2.70	1.5 - 3'
115	Bruinville	4.5	Residential	Google Earth (04/2013)	C	Private	062-022-022	Developed w/Res	$208,500	$1.07	1.5 - 3'
116	Bruinville	1.4	Commercial	2005 East Side Master Plan	D	Private	062-022-025	Developed w/Res	$207,950	$3.37	1.5 - 3'
117	Bruinville	1.4	Commercial	2005 East Side Master Plan	D	Private	062-022-024	Developed w/Res	$197,237	$3.28	1.5 - 3'
118	Bruinville	4.8	Residential	Google Earth (04/2013)	C	Private	062-022-019	Developed w/Res	$169,500	$0.80	1.5 - 3'
119	Bruinville	4.9	Greenfield Development Area	2008 Stormdrain System Master Plan	C	Private	062-022-018	Developed w/Res	$137,204	$0.65	1.5 - 3'
120	Bruinville	4.9	Greenfield Development Area	2008 Stormdrain System Master Plan	A	Private	062-019-041	Irrigated Open Land w/Res	$240,500	$1.13	> 5'
121	Bruinville	4.4	Greenfield Development Area	Google Earth (04/2013)	A	Private	062-019-040	Developed w/Res	$225,418	$1.19	3 - 5'
122	Bruinville	4.5	Greenfield Development Area	Google Earth (04/2013)	A	Private	062-019-042	Developed w/Res	$139,700	$0.72	> 5'
123	Bruinville	2.5	Greenfield Development Area	Google Earth (04/2013)	A	Private	062-019-037	Developed w/Res	$274,500	$2.55	3 - 5'
124	Bruinville	4.3	Greenfield Development Area	2008 Stormdrain System Master Plan	A	Private	062-019-039	Developed w/Res	$442,967	$2.35	3 - 5'
125	Bruinville	5.5	Greenfield Development Area	Google Earth (04/2013)	A	Private	062-017-010	Developed w/Res	$240,377	$1.01	> 5'
126	Bruinville	13.6	Residential	Google Earth (04/2013)	C/D	Private	062-020-010	Undeveloped w/Pot. Subdivision	$172,292	$0.29	1.5 - 3'
127	Bruinville	6.0	Residential	2005-2025 General Plan	A	Private	062-020-019	Undeveloped w/Pot. Subdivision	$112,508	$0.43	3 - 5'
128	Bruinville	3.2	Buffer / Greenway / Open Space	2005-2025 General Plan	A	Amry Corps of Eng.	062-019-001	USA Non-Assess.			> 5'
129	Bruinville	3.1	Greenfield Development Area	Google Earth (04/2013)	A	Private	062-019-003	Developed w/Res	$247,000	$1.84	> 5'
130	Bruinville	32.9	Greenfield Development Area	2005-2025 General Plan	D	Private*	062-031-003	Irrigated Open Land	$409,617	$0.29	1.5 - 3'
131	Bruinville	4.2	Multi-Use Recreation	2005-2025 General Plan	C	Private*	062-018-018 / 062-018-006	Irrigated Open Land w/Res	$684,126	$3.75	> 5'
132	Bruinville	2.6	Multi-Use Recreation	2005-2025 General Plan	A	Private	062-019-024	Developed w/Res	$424,000	$3.71	3 - 5'
133	Bruinville	2.4	Residential	2005-2025 General Plan	D	Private*	062-021-003 / 062-021-006	Developed w/Res	$530,000	$4.97	1.5 - 3'
134	Bruinville	2.1	Residential	2005-2025 General Plan	D	Private	062-021-003	Developed w/Res	$265,500	$2.90	1.5 - 3'
135	Bruinville	2.3	Multi-Use Recreation	2005-2025 General Plan	C	Private*	062-018-007 / 062-018-010	Developed w/CLCA & Res	$337,276	$3.40	1.5 - 3'
136	Bruinville	3.7	Multi-Use Recreation	2005-2025 General Plan	C/D	Private*	020-008 / 062-020-018 / 062-02(	Single Family w/Extra Land	$757,461	$4.72	1.5 - 3'
137	Bruinville	2.9	Park	2005-2025 General Plan	A	Federal	062-008-009	USA Non-Assess.			> 5'
138	Bruinville	5.0	Null	Google Earth (04/2013)	A	City of Riverbank	Urban Arterial	Urban Arterial			> 5'
139	Bruinville	21.0	Buffer / Greenway / Open Space	2005-2025 General Plan	C/D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
140	Bruinville	2.9	Null	Google Earth (04/2013)	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
141	Bruinville	2.1	Null	Google Earth (04/2013)	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
142	Bruinville	1.3	Null	Google Earth (04/2013)	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
143	Bruinville	2.7	Null	Google Earth (04/2013)	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
144	Bruinville	1.9	Null	Google Earth (04/2013)	A/D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
146	Candlewood	0.7	Residential	Google Earth (04/2013)	A	Private	074-018-056	Undeveloped R-1	$7,564	$0.26	3 - 5'
147	Candlewood	4.7	Residential	2005-2025 General Plan	A	Private	074-004-055	Vacant Misc.	$8,863	$0.04	> 5'
148	Candlewood	0.7	Residential	Google Earth (04/2013)	A	Private	074-004-007	Undeveloped R-1	$44,985	$1.53	> 5'
149	Candlewood	6.7	Civic	2005-2025 General Plan	C	City of Riverbank	075-008-001	Elementary School			1.5 - 3'
150	Candlewood	5.8	Commercial	Google Earth (04/2013)	A	Private	075-011-033	Undeveloped C-2	$1,868,610	$7.35	> 5'
151	Candlewood	3.4	Buffer / Greenway / Open Space	2005-2025 General Plan	A	State of CA	Highway 108	Highway 108			3 - 5'
152	Cannery	3.1	Commercial	2010 Downtown Specific Plan	A	Private	132-023-020	Food Processing - Wet&Dry	$221,236	$1.62	3 - 5'
153	Cannery	0.3	Commercial	2010 Downtown Specific Plan	A	Private	132-023-024	HAS 4 to 9 Income Units	$250,608	$19.54	> 5'
154	Cannery	0.3	Commercial	2010 Downtown Specific Plan	A	Private	132-023-001	Misc Mixed Industrial w/Res	$139,776	$9.26	3 - 5'
155	Cannery	0.7	Commercial	2010 Downtown Specific Plan	A	Private	132-023-002	Misc Mixed Industrial w/Res	$45,621	$1.51	3 - 5'
156	Cannery	0.1	Commercial	2010 Downtown Specific Plan	A	Private	132-010-003	Stores & Shops (All Sizes)	$134,800	$23.15	> 5'
157	Cannery	0.1	Commercial	2010 Downtown Specific Plan	A	Private	132-010-002	Stores & Shops (All Sizes)	$251,662	$48.15	> 5'
158	Cannery	0.6	Commercial	2010 Downtown Specific Plan	A	Private	132-023-013	Multi-use Warehouse	$162,810	$6.46	3 - 5'
159	Cannery	1.0	Commercial	2010 Downtown Specific Plan	A	Private	132-023-014	Misc Mixed Industrial w/Res	$103,426	$2.37	3 - 5'
160	Cannery	28.0	Commercial	2010 Downtown Specific Plan	A	Private	132-034-012	Food Processing - Wet&Dry	$4,406,420	$3.61	> 5'
161	Cannery	5.3	Null	2005-2025 General Plan	A	State of CA	Highway 108	Highway 108			> 5'
162	Cannery	1.2	Buffer / Greenway / Open Space	2005-2025 General Plan	D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'
163	Cannery	1.1	Null	Google Earth (04/2013)	A	City of Riverbank	Urban Arterial	Urban Arterial			3 - 5'

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Legend	
Blue	Within Priority Area
	Potential Flooding [1]
	Proposed Infrastructure [1]
	Top 10% - Size
	Green / Open Space
	Public Ownership Zoning
	City of Riverbank Ownership
	A or A/x Soil Group
	Vacant* Parcel [2]
	Bottom 10% - Value per Sq. Ft.
	> 5' to Hardpan

Opportunity Site No.	Sub-watershed	Area (acres)	Zoning	Source	Soil Group	Owner	APNs	Land Use	Assessed Value	$ / sq. foot	Depth to Hardpan
164	Cannery	1.4	Null	Google Earth (04/2013)	A	City of Riverbank	Urban Arterial	Urban Arterial			3 - 5'
165	Cannery	1.7	Null	Google Earth (04/2013)	A	City of Riverbank	Urban Arterial	Urban Arterial			3 - 5'
166	Harless Park	6.6	Industrial	Google Earth (04/2013)	D	Private	132-038-032	Vacant M-1, M-2 or C-M	$398,000	$1.38	1.5 - 3'
167	Offsite Central	2.5	Industrial	2008 Stormdrain System Master Plan	D	Private	075-020-007	Heavy Industrial	$237,259	$2.19	1.5 - 3'
168	Offsite Central	5.5	Industrial	2008 Stormdrain System Master Plan	D	Private	075-020-008	Warehouses	$511,136	$2.14	1.5 - 3'
169	Offsite Central	3.8	Greenfield Development Area	Google Earth (04/2013)	D	Private	075-022-021	Developed w/Res	$101,415	$0.61	1.5 - 3'
170	Offsite Central	12.1	Industrial	Google Earth (04/2013)	D	Private	075-024-001	Irrigated Open Land w/CLCA & Res	$112,020	$0.21	1.5 - 3'
171	Offsite Central	8.7	Industrial	Google Earth (04/2013)	D	Private	075-024-011	Residential / Undeveloped	$107,151	$0.28	1.5 - 3'
172	Offsite Central	17.3	Greenfield Development Area	Google Earth (04/2013)	D	Private	075-025-012	Pot. Subdivision w/Res	$1,029,000	$1.37	1.5 - 3'
173	Offsite Central	4.5	Null	Google Earth (04/2013)	D	n/a	n/a	n/a			1.5 - 3'
174	Offsite Central	5.3	Null	Google Earth (04/2013)	D	n/a	n/a	n/a			1.5 - 3'
175	Offsite East	13.9	Very Low Density Rural Development	Google Earth (04/2013)	D	Private	062-024-032	Irrigated Open Land	$142,817	$0.24	1.5 - 3'
176	Offsite East	1.7	Park	2005-2025 General Plan	D	Private*	062-031-003	Irrigated Open Land	$409,617	$5.48	1.5 - 3'
177	Offsite East	0.4	Park	2005-2025 General Plan	D	Private*	062-031-003	Irrigated Open Land	$409,617	$26.76	1.5 - 3'
178	Offsite East	1.0	Park	2005-2025 General Plan	D	Private*	062-031-003	Irrigated Open Land	$409,617	$9.73	1.5 - 3'
179	Offsite East	7.6	Multi-Use Recreation	2005-2025 General Plan	D	Private*	062-031-003	Irrigated Open Land	$409,617	$1.24	1.5 - 3'
180	Offsite East	2.0	Park	2005-2025 General Plan	D	Private*	062-030-014	Irrigated Open Land	$338,287	$3.97	1.5 - 3'
181	Offsite East	1.0	Park	2005-2025 General Plan	D	Private*	062-030-014	Irrigated Open Land	$338,287	$8.04	1.5 - 3'
182	Offsite East	4.8	Multi-Use Recreation	2005-2025 General Plan	D	Private*	062-031-004 / 062-030-012	Irrigated Open Land	$319,715	$1.53	1.5 - 3'
183	Offsite East	9.9	Civic / Park	2005-2025 General Plan	D	City of Riverbank	062-024-033	City Non-Assess.	$80,613	$0.19	1.5 - 3'
184	Offsite East	2.4	Buffer / Greenway / Open Space	2005-2025 General Plan	D	Private*	062-031-003	Irrigated OpenLand w/CLCA & Res	$409,617	$3.99	1.5 - 3'
185	Offsite West	0.4	Park	2005-2025 General Plan	A	Private	074-006-021	Irrigated Open Land w/Res	$38,143	$2.33	3 - 5'
186	Offsite West	8.7	Park	2005-2025 General Plan	A/D	Private	074-006-022	Irrigated Open Land	$280,000	$0.74	1.5 - 3'
187	Offsite West	11.0	Park	2005-2025 General Plan	A	City of Riverbank	074-006-014	City Non-Assess.	$125,159	$0.26	1.5 - 3'
188	Offsite West	4.4	Park	2005-2025 General Plan	D/A	Private*	074-011-009	Undeveloped w/CLCA & Res	$1,512,360	$7.89	1.5 - 3'
189	Offsite West	2.7	Park	2005-2025 General Plan	D/A	Private*	074-011-009	Undeveloped w/CLCA & Res	$1,512,360	$13.03	1.5 - 3'
190	Offsite West	4.2	Park	2005-2025 General Plan	A	Private*	074-011-009	Undeveloped w/CLCA & Res	$1,512,360	$8.30	3 - 5'
191	Offsite West	2.4	Civic	2005-2025 General Plan	A	Private*	074-011-010	Mixed GI w/CLCA	$1,208,600	$11.78	3 - 5'
192	Offsite West	5.1	Park	2005-2025 General Plan	A	Private*	074-011-005	Orchard	$548,366	$2.49	> 5'
193	Offsite West	16.6	Civic	2005-2025 General Plan	D/A	Private*	074-006-016	Irrigated Open Land w/Res	$626,204	$0.86	1.5 - 3'
194	Offsite West	1.5	Park	2005-2025 General Plan	A	Private*	074-006-017	Orchard	$271,678	$4.17	> 5'
195	Offsite West	1.0	Park	2005-2025 General Plan	A	Private*	074-006-003	Orchard	$159,249	$3.84	> 5'
196	Offsite West	20.9	Civic	2005-2025 General Plan	A	Private	074-006-018	Orchard w/CLCA & Res	$530,562	$0.58	> 5'
197	Offsite West	0.7	Park	2005-2025 General Plan	A	Private*	074-007-013	Orchard	$270,051	$8.43	> 5'
198	Offsite West	20.3	Multi-Use Recreation	2005-2025 General Plan	A	Private*	007-013 / 074-007-014 / 074-007	Orchard / Mixed GI w/Res	$574,187	$0.65	> 5'
199	Offsite West	2.4	Park	2005-2025 General Plan	A	Private*	074-007-015	Mixed GI	$183,034	$1.76	> 5'
200	Offsite West	5.1	Park	2005-2025 General Plan	A	Private*	074-007-013	Orchard	$270,051	$1.22	> 5'
201	Offsite West	20.4	Multi-Use Recreation	2005-2025 General Plan	A	Private*	074-010-013	Mixed GI w/Res	$638,282	$0.72	> 5'
202	Offsite West	1.0	Park	2005-2025 General Plan	A/C	Private*	074-010-013	Mixed GI w/Res	$638,282	$14.14	> 5'
203	Offsite West	2.5	Park	2005-2025 General Plan	A	Private*	074-010-013	Mixed GI w/Res	$638,282	$5.81	> 5'
204	Offsite West	59.8	Civic	2005-2025 General Plan	A/D	Private*	015-010 / 074-015-008 / 074-015	Mixed GI	$1,238,370	$0.48	> 5'
205	Offsite West	28.0	Multi-Use Recreation	2005-2025 General Plan	A/D	Private*	015-010 / 074-015-008 / 074-015	Mixed GI	$1,238,370	$1.02	> 5'
206	Offsite West	9.1	Buffer / Greenway / Open Space	2005-2025 General Plan	A/D	Private*	074-015-007 / 074-015-010	Mixed GI	$902,278	$2.28	> 5'
207	Offsite West	2.1	Park	2005-2025 General Plan	A	Private*	074-014-010	Orchard w/Res	$900,864	$10.01	> 5'
208	Offsite West	1.0	Park	2005-2025 General Plan	A	Private*	074-014-013	Developed w/CLCA & Res	$346,508	$7.68	> 5'
209	Offsite West	7.2	Buffer / Greenway / Open Space	2005-2025 General Plan	A/D	Private*	074-014-010	Orchard w/Res	$900,864	$2.87	> 5'
210	Offsite West	15.6	Civic	2005-2025 General Plan	A	Private*	074-014-006	Dairy w/CLCA & Res	$1,379,980	$2.02	3 - 5'
211	Offsite West	2.2	Park	2005-2025 General Plan	A	Private*	074-014-006	Dairy w/CLCA & Res	$1,379,980	$14.63	3 - 5'
212	Offsite West	1.0	Park	2005-2025 General Plan	A	Private*	074-014-006	Dairy w/CLCA & Res	$1,379,980	$30.58	> 5'
213	Offsite West	8.4	Park	2005-2025 General Plan	A/C	Private*	074-014-006	Dairy w/CLCA & Res	$1,379,980	$3.77	> 5'
214	Offsite West	21.0	Civic	2005-2025 General Plan	A	Private*	074-015-015	Mixed GI	$256,976	$0.28	> 5'
215	Offsite West	11.8	Multi-Use Recreation	2005-2025 General Plan	A/D	Private*	074-015-015	Mixed GI	$256,976	$0.50	> 5'
216	Offsite West	3.2	Buffer / Greenway / Open Space	2005-2025 General Plan	D	Private*	074-015-015	Mixed GI	$256,976	$1.82	> 5'
217	Offsite West	9.9	Multi-Use Recreation	2005-2025 General Plan	A	Private*	074-016-021 / 074-016-022	Orchard w/Res	$160,206	$0.37	> 5'

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Legend	
Blue	Within Priority Area
	Potential Flooding [1]
	Proposed Infrastructure [1]
	Top 10% - Size
	Green / Open Space
	Public Ownership Zoning
	City of Riverbank Ownership
	A or A/x Soil Group
	Vacant* Parcel [2]
	Bottom 10% - Value per Sq. Ft.
	> 5' to Hardpan

Opportunity Site No.	Sub-watershed	Area (acres)	Zoning	Source	Soil Group	Owner	APNs	Land Use	Assessed Value	$ / sq. foot	Depth to Hardpan
218	Offsite West	5.4	Buffer / Greenway / Open Space	2005-2025 General Plan	A	n/a	n/a	n/a			> 5'
219	Offsite West	1.1	Buffer / Greenway / Open Space	2005-2025 General Plan	A	Private*	074-007-015 / 074-010-013	Mixed GI	$821,316	$17.44	> 5'
220	RIC	1.2	Buffer / Greenway / Open Space	2005-2025 General Plan	D	Federal	062-031-006	USA Non-Assess.			1.5 - 3'
221	River Central	1.4	Null	Google Earth (04/2013)	A	n/a	n/a	n/a			> 5'
222	River Central	0.8	Residential	Google Earth (04/2013)	A	City of Riverbank	075-048-003	City Non-assess			> 5'
223	River Central	4.1	Buffer / Greenway / Open Space	2005-2025 General Plan	A	n/a	n/a	n/a			> 5'
224	River Central	1.0	Buffer / Greenway / Open Space	2005-2025 General Plan	A	Private*	035-008 / 132-002-004 / 132-002	Residential / Floodplain	$1,223,370	$28.80	> 5'
225	River Cove	2.5	Residential	2008 Stormdrain System Master Plan	A	n/a	n/a	n/a			> 5'
226	River Cove	0.8	Residential	Google Earth (04/2013)	A	City of Riverbank	075-052-045	Vacant Misc.			> 5'
227	River Cove	1.1	Residential	Google Earth (04/2013)	A	Private	075-005-025	Undeveloped w/Pot. Subdivision	$45,000	$0.96	3 - 5'
228	River Cove	0.8	Residential	Google Earth (04/2013)	A	Private	075-054-001	Single Family w/Extra Land	$219,406	$5.97	> 5'
229	River Cove	2.0	Residential	Google Earth (04/2013)	A	City of Riverbank	075-054-002	City Non-Assess.			> 5'
230	River Cove	2.1	Residential	Google Earth (04/2013)	A	Private	075-056-031	Vacant Misc.			> 5'
231	River Cove	1.0	Residential	Google Earth (04/2013)	A	Private	075-005-013	Undeveloped R-1	$45,000	$1.05	3 - 5'
232	River Cove	1.5	Residential	Google Earth (04/2013)	A	City of Riverbank	075-047-069	City Non-Assess.			> 5'
233	River Cove	7.9	Commercial	Google Earth (04/2013)	A/C/D	Private	075-008-029	Recreational Prop.	$10,276,000	$29.80	> 5'
234	River Cove	7.7	Commercial	Google Earth (04/2013)	A	Private	075-011-034	Undeveloped w/ Pot. Higher Use	$50,631	$0.15	1.5 - 3'
235	River Cove	1.3	Residential	Google Earth (04/2013)	A	City of Riverbank	075-050-079	Residential Common Area			> 5'
236	River Cove	2.6	Residential	Google Earth (04/2013)	D	Private	075-028-009	Churches / Welfare	$666,516	$5.92	1.5 - 3'
237	River Cove	1.7	Commercial	Google Earth (04/2013)	A	n/a	075-008-025	n/a			1.5 - 3'
238	River Cove	1.9	Buffer / Greenway / Open Space	2005-2025 General Plan	D	State of CA	Highway 108	Highway 108			3 - 5'
239	River Cove	1.7	Null	Google Earth (04/2013)	A	City of Riverbank	Urban Arterial	Urban Arterial			3 - 5'
240	River Cove	2.5	Null	Google Earth (04/2013)	A	City of Riverbank	Urban Arterial	Urban Arterial			3 - 5'
241	River Cove	2.0	Null	Google Earth (04/2013)	A/D	City of Riverbank	Urban Arterial	Urban Arterial			3 - 5'
242	River Cove	3.4	Buffer / Greenway / Open Space	2005-2025 General Plan	A	State of CA	Highway 108	Highway 108			3 - 5'
243	River East	14.4	Multi-Use Recreation	2005-2025 General Plan	A	n/a	062-001-010	n/a			> 5'
244	River East	6.4	Buffer / Greenway / Open Space	2005-2025 General Plan	A	n/a	062-001-010	n/a			> 5'
245	River East	26.2	Park	2005-2025 General Plan	A	Federal	062-008-009	USA Non-Assess.			> 5'
246	River West	9.8	Commercial	Matthew Gerken 140604 email	A	Private	074-003-003	Orchard w/Res	$255,842	$0.60	3 - 5'
247	River West	4.8	Commercial	Matthew Gerken 140604 email	A	Private	074-003-005	Developed w/Res	$237,817	$1.15	> 5'
248	River West	5.0	Commercial	Matthew Gerken 140604 email	A	Private	074-003-004	Developed w/Res	$199,419	$0.92	3 - 5'
249	River West	9.6	Commercial	Matthew Gerken 140604 email	A	Private	074-003-007	Orchard w/Res	$288,505	$0.69	> 5'
250	River West	9.4	Commercial	Matthew Gerken 140604 email	A	Private	074-003-006	Mixed Commercial w/Res	$525,844	$1.28	> 5'
251	River West	5.7	Agricultural Conservation Area	2005-2025 General Plan	A	Private	074-002-007	Misc Rural	$168,676	$0.68	> 5'
252	River West	29.8	Agricultural Conservation Area	2005-2025 General Plan	A	Private	074-002-006	Irrigated Open Land w/CLCA	$142,869	$0.11	> 5'
253	River West	2.1	Agricultural Conservation Area	2005-2025 General Plan	A	Private	074-002-017	Undeveloped Res w/CLCA	$31,200	$0.34	> 5'
254	River West	12.1	Civic	2005-2025 General Plan	C	Private*	074-003-013	Mixed w/CLCA & Res	$370,114	$0.70	> 5'
255	River West	5.4	Multi-Use Recreation	2005-2025 General Plan	A	Private*	074-003-016	Orchard w/Res	$393,700	$1.67	> 5'
256	River West	10.0	Buffer / Greenway / Open Space	2005-2025 General Plan	A/C	Private*	1 / 074-003-016 / 074-003-020 /0	Orchard w/CLCA & Res	$1,352,170	$3.09	> 5'
257	River West	4.9	Park	2005-2025 General Plan	A	n/a	074-003-001	n/a			> 5'
258	River West	1.1	Park	2005-2025 General Plan	C	n/a	074-003-001	n/a			> 5'
259	River West	2.1	Civic	2005-2025 General Plan	A	n/a	074-003-001	n/a			> 5'
260	River West	1.0	Park	2005-2025 General Plan	A	n/a	074-003-001	n/a			> 5'
261	River West	10.4	Park	2005-2025 General Plan	A/B	n/a	074-003-001	n/a			> 5'
262	River West	1.2	Park	2005-2025 General Plan	A	n/a	074-003-001	n/a			> 5'
263	River West	94.6	Buffer / Greenway / Open Space	2005-2025 General Plan	A	n/a	074-003-001	n/a			> 5'
264	River West	30.9	Very Low Density Rural Development	2005-2025 General Plan	A	Private*	074-002-001	Orchard w/CLCA & Res	$4,215,030	$3.13	> 5'
265	River West	25.6	Greenfield Development Area	Google Earth (04/2013)	A	n/a	074-003-001	n/a			> 5'
266	Silva Park	2.4	Residential	Google Earth (04/2013)	A	Private	075-030-001	Pot. Subdivision w/Res	$178,124	$1.72	1.5 - 3'
267	Silva Park	1.2	Residential	Google Earth (04/2013)	D	Private	132-062-001	Single Family Residence	$249,900	$4.83	1.5 - 3'
268	Silva Park	1.2	Residential	Google Earth (04/2013)	D	Private	132-062-003	Single Family Residence	$148,630	$2.87	1.5 - 3'
269	Silva Park	1.2	Residential	Google Earth (04/2013)	D	Private	132-062-002	Pot. Subdivision w/Res	$160,052	$3.12	1.5 - 3'
270	Silva Park	1.2	Residential	Google Earth (04/2013)	D	Private	132-062-004	Pot. Subdivision w/Res	$305,364	$6.03	1.5 - 3'
271	Silva Park	0.9	Null	Google Earth (04/2013)	A/D	City of Riverbank	Urban Arterial	Urban Arterial			1.5 - 3'

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Legend	
Blue	Within Priority Area
	Potential Flooding [1]
	Proposed Infrastructure [1]
	Top 10% - Size
	Green / Open Space
	Public Ownership Zoning
	City of Riverbank Ownership
	A or A/x Soil Group
	Vacant* Parcel [2]
	Bottom 10% - Value per Sq. Ft.
	> 5' to Hardpan

Opportunity Site No.	Sub-watershed	Area (acres)	Zoning	Source	Soil Group	Owner	APNs	Land Use	Assessed Value	$ / sq. foot	Depth to Hardpan
272	Silva Park	5.7	Null	2005-2025 General Plan	D	City of Riverbank	Urban Arterial	Urban Arterial			3 - 5'
273	Sorensen Park	5.0	Civic	2005-2025 General Plan	D	MID	075-075-052	Irrigation / Non-assesable			1.5 - 3'
274	6th Street	0.1	Commercial	2010 Downtown Specific Plan	D	Private	132-012-001	Banks & Savings & Loans	$142,970	$22.49	1.5 - 3'
275	6th Street	0.1	Commercial	2010 Downtown Specific Plan		Private	132-010-062	Vacant C-1	$48,000		1.5 - 3'

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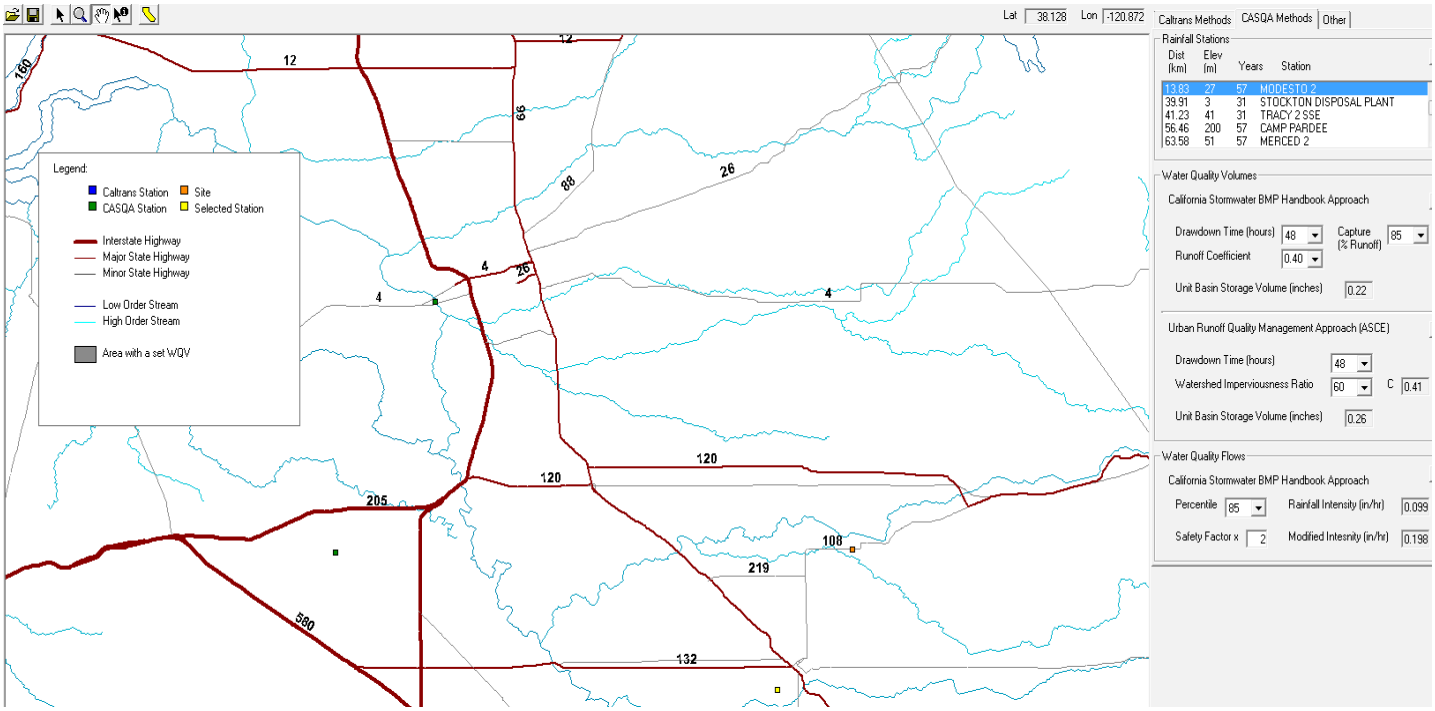
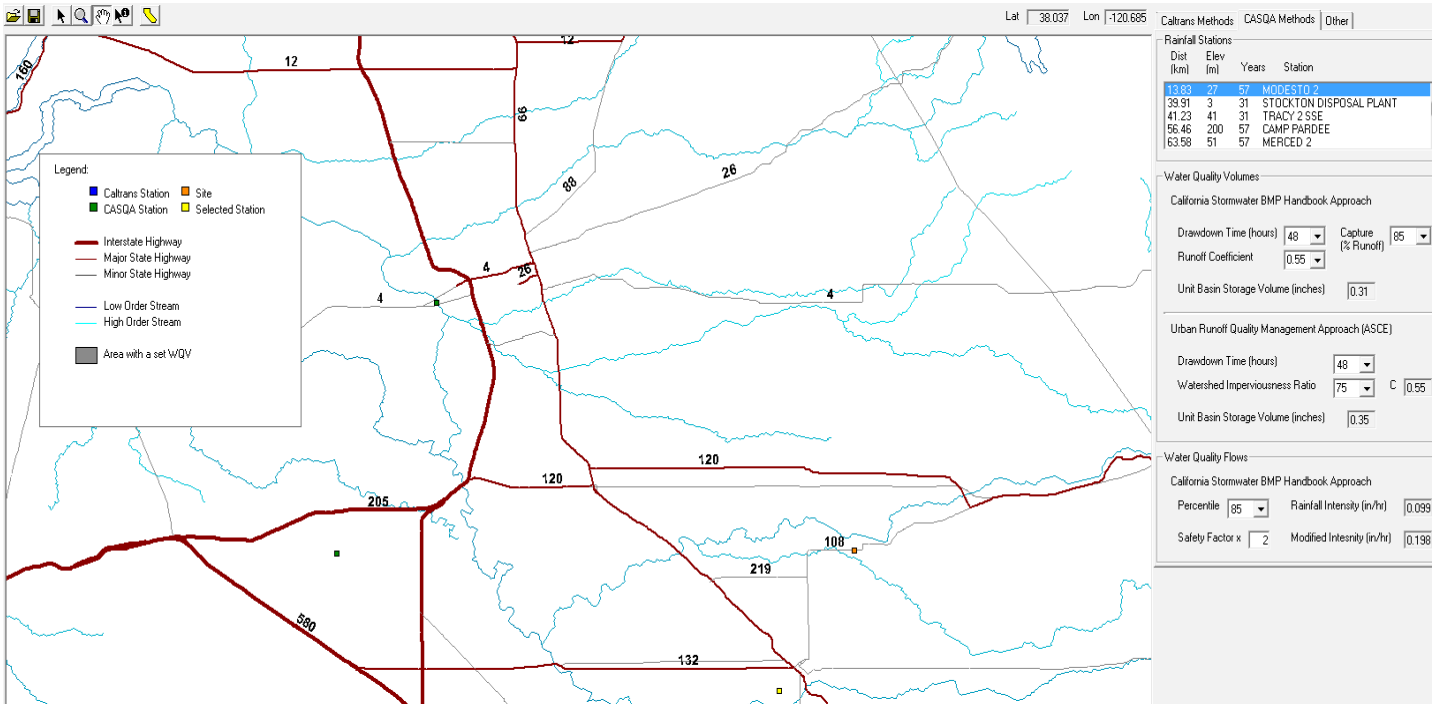
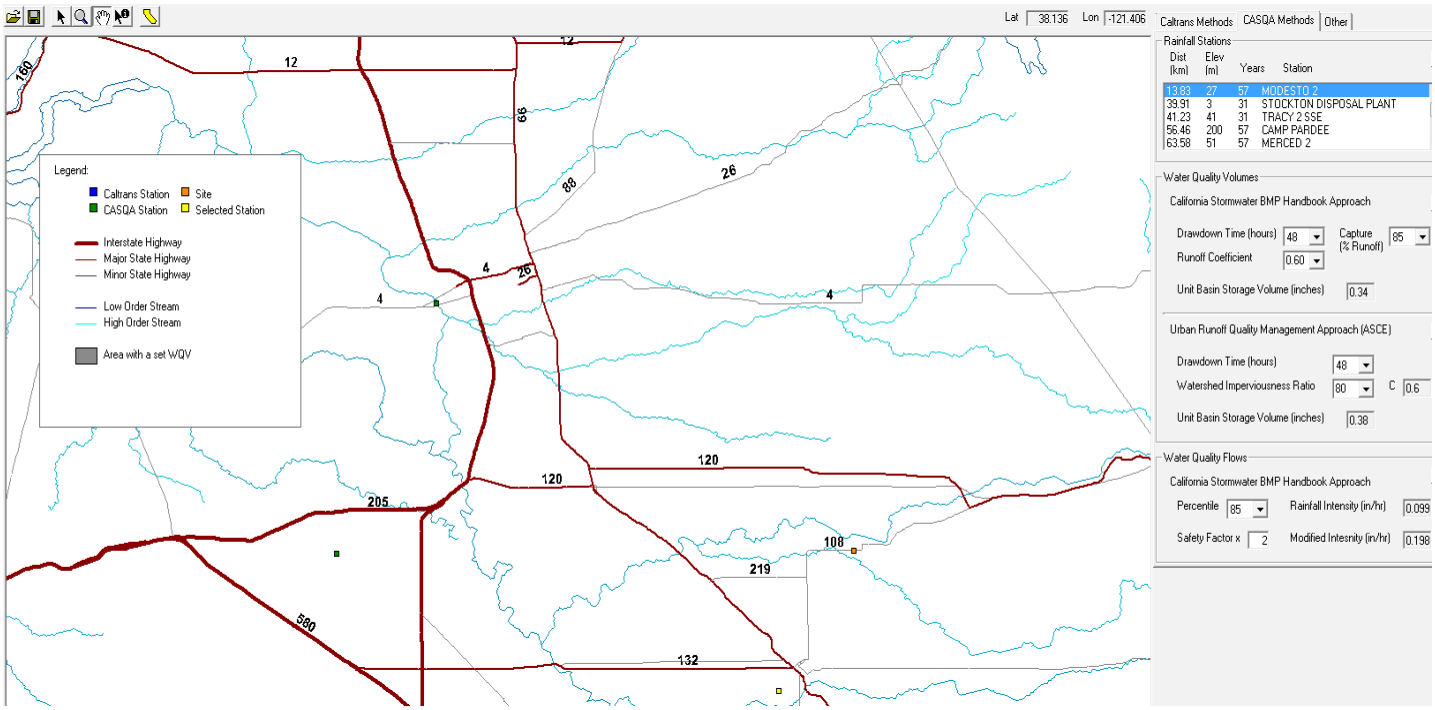
A.6 Determination/Confirmation of Water Quality Volume

CASQA Basin Sizer Input / Output



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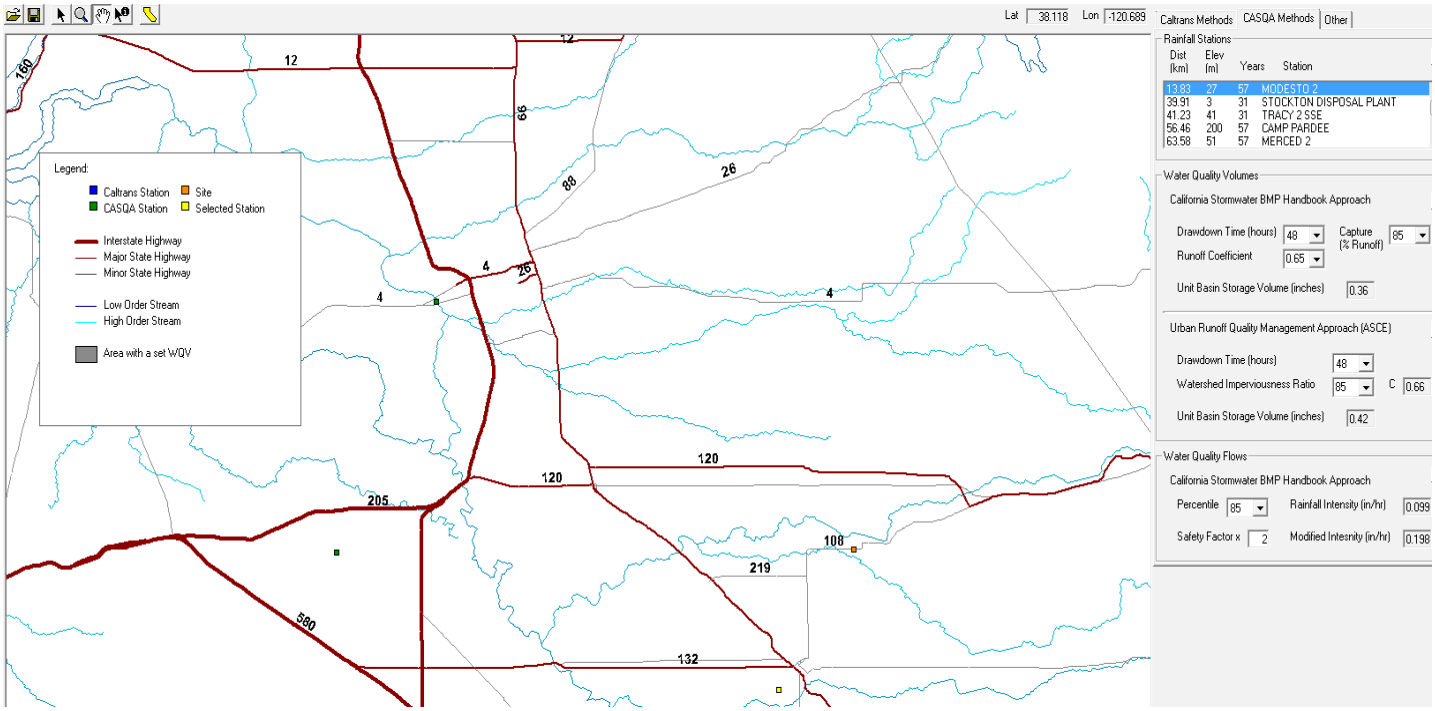
Caltrans Methods CASQA Methods Other
Rainfall Stations
Dist (km) Elev (m) Years Station
13.83 27 57 MODESTO 2
39.91 3 31 STOCKTON DISPOSAL PLANT
41.23 41 31 TRACY 2 SSE
56.46 200 57 CAMP PARDEE
63.58 51 57 MERCED 2
Water Quality Volumes
California Stormwater BMP Handbook Approach
Drawdown Time (hours) 48
Capture (% Runoff) 85
Runoff Coefficient 0.60
Unit Basin Storage Volume (inches) 0.34
Urban Runoff Quality Management Approach (ASCE)
Drawdown Time (hours) 48
Watershed Imperviousness Ratio 80
C 0.6
Unit Basin Storage Volume (inches) 0.38
Water Quality Flows
California Stormwater BMP Handbook Approach
Percentile 85
Rainfall Intensity (in/hr) 0.099
Safety Factor x 2
Modified Intensity (in/hr) 0.198
Legend:
Caltrans Station
Site
CASQA Station
Selected Station
Interstate Highway
Major State Highway
Minor State Highway
Low Order Stream
High Order Stream
Area with a set WQV
160
12
66
88
26
4
25
120
205
108
219
580
132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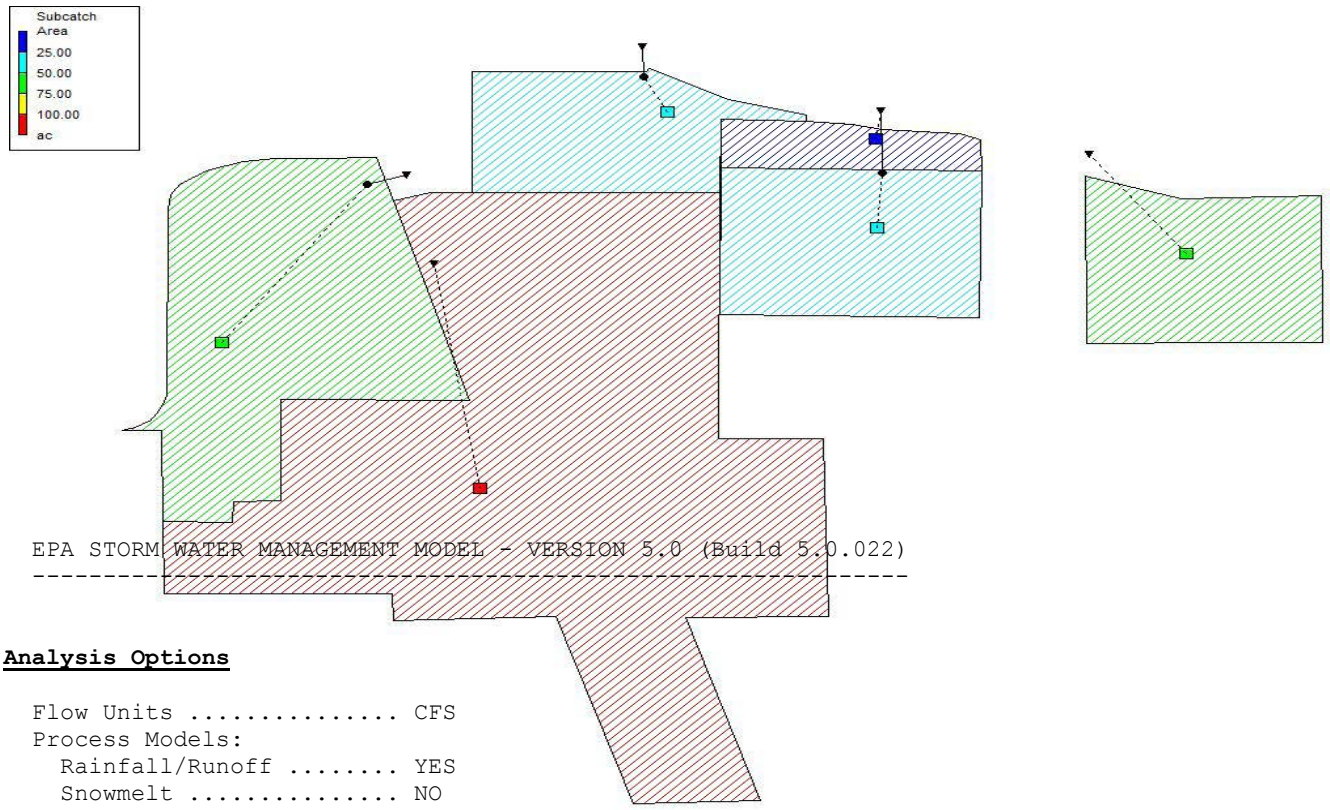
Caltrans Methods CASQA Methods Other
Rainfall Stations
Dist (km) Elev (m) Years Station
13.83 27 57 MODESTO 2
39.91 3 31 STOCKTON DISPOSAL PLANT
41.23 41 31 TRACY 2 SSE
56.46 200 57 CAMP PARDEE
63.58 51 57 MERCED 2
Water Quality Volumes
California Stormwater BMP Handbook Approach
Drawdown Time (hours) 48
Capture (% Runoff) 85
Runoff Coefficient 0.65
Unit Basin Storage Volume (inches) 0.36
Urban Runoff Quality Management Approach (ASCE)
Drawdown Time (hours) 48
Watershed Imperviousness Ratio 85
C 0.66
Unit Basin Storage Volume (inches) 0.42
Water Quality Flows
California Stormwater BMP Handbook Approach
Percentile 85
Rainfall Intensity (in/hr) 0.099
Safety Factor x 2
Modified Intensity (in/hr) 0.198
Legend:
Caltrans Station
Site
CASQA Station
Selected Station
Interstate Highway
Major State Highway
Minor State Highway
Low Order Stream
High Order Stream
Area with a set WQV
160
12
66
88
26
4
25
120
205
108
219
580
132

SWMM Input / Output




```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------
```

Analysis Options

```
  Flow Units ............... CFS
  Process Models:
    Rainfall/Runoff ........ YES
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Infiltration Method ...... HORTON
  Flow Routing Method ...... DYNWAVE
  Starting Date ............ JUN-30-2014 00:00:00
  Ending Date .............. JUL-01-2014 00:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:05:00
  Wet Time Step ............ 00:05:00
  Dry Time Step ............ 00:05:00
  Routing Time Step ........ 5.00 sec
```

LID Control Summary

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated
Cannery	Cannery_Veg_Buffer	1	55000.00	0.00	1.80	100.00
4th_St	Hutcheson_Park_Bioret	1	15860.00	0.00	1.26	100.00
6th_St_School	Cardozo_Infil_Gallery	1	20000.00	0.00	1.27	100.00
6th_St_Road	Riverside_Dr_Green_St	1	5703.00	0.00	1.23	100.00
7th_St_Basin	1st_St_Basin_Imp	1	48180.00	0.00	0.57	100.00
8th_St	Treatment_Marsh	1	35000.00	0.00	0.39	100.00

Water Balance in Stormwater Facilities During 2-year 24-hour storm (1.2" Rainfall Depth)

Project	Facility Bottom Footprint (sf)	Total Inflow to Facility (cf)	Infiltration through Soil During Storm Event (cf)	Detention Volume in Facility Following Storm Event (cf)	Volume of Runoff Treated (Infiltration + Detention) (cf)	Overflow from Facility (cf)	Total Cost	Cost / Acre Managed	Cost / Sq. Ft
Hutcheson Park Bioretention	15,850	90,068	13,261	24,752	38,014	52,054	$ 1,119,000	$ 38,854	$ 71
Riverside Drive Green Street	20,000	33,310	4,824	9,857	14,680	18,630	$ 1,086,000	$ 102,665	$ 54
Cardozo School Infiltration Gallery	5,703	89,650	9,267	34,617	43,883	45,767	$ 1,276,000	$ 35,297	$ 224
1st Street Basin Treatment Improvements	48,180	633,607	41,154	227,811	268,965	364,642	$ 2,248,000	$ 11,586	$ 47
Open Space Treatment Marsh	35,000	189,204	11,725	80,500	92,225	96,979	$ 4,049,000	$ 66,926	$ 116
Cannery Site Vegetated Buffer	55,000	244,017	43,588	81,308	124,896	119,121	$ 3,584,911	$ 50,996	$ 65

SWMM OUTPUT

A.7 Project Design Calculations

Cost Summary Tables

City of Riverbank LID Alternative Compliance Study - Conceptual Project Data

Cannery Site Vegetated Buffer

Drainage Management Area	
Sub-watershed	**Cannery**
Total Sub-watershed Area	82.8 ac
Drainage Management Area	70.3 ac
Impervious Cover	85%
Unit Basin Storage	0.42 inch
Water Quality Volume (WQV)	**107,103 cf**
Stormwater Facility	
Vegetated Treatment Buffer	
Surface Storage	
Bottom Footprint	55,000 sf
Ponding Footprint	68,750 sf
Max Ponding Depth	9 in
Surface Storage Volume	46,300 cf
Amended Soil Layer (Stormwater Filter)	
Soil Depth	18 in
Hydraulic Conductivity	4 in/hr
Soil Porosity	0.35
Time to Infiltrate Surface Water	2.5 hr
Drainage Layer	
No. 9 Drain Rock	3 in
Class 1 Type A Drain Rock	9 in
Drain Rock Void Ratio	0.75
Subsurface Storage Volume	35,008 cf
24-hour Storm Event (SWMM Model)	
Infiltration During Storm Event	43,588 cf
Estimated Treatment Volume	**124,896 cf**

Hutcheson Park Bioretention

Drainage Management Area	
Sub-watershed	**4th Street**
Total Sub-watershed Area	28.8 ac
Drainage Management Area	28.8 ac
Impervious Cover	75%
Unit Basin Storage	0.35 inch
Water Quality Volume (WQV)	**36,590 cf**
Stormwater Facilities	
Bioretention Edge	
Surface Storage	
Bottom Footprint	4,700 sf
Ponding Footprint	5,875 sf
Max Ponding Depth	6 in
Surface Storage Volume	2,600 cf
Amended Soil Layer (Stormwater Filter)	
Soil Depth	18 in
Hydraulic Conductivity	4 in/hr
Soil Porosity	0.35
Time to Infiltrate Surface Water	1.7 hr
Multi-use Park Overflow Area	
Surface Storage	
Bottom Footprint	11,150 sf
Ponding Footprint	12,800 sf
Max Ponding Depth	12 in.
Surface Storage Volume	12,000 cf
Amended Soil Layer (Stormwater Filter)	
Soil Depth	12 in
Hydraulic Conductivity	4 in/hr
Soil Porosity	0.35
Time to Infiltrate Surface Water	3.2 hr
Drainage Layer	
No. 9 Drain Rock	3 in
Class 1 Type A Drain Rock	9 in
Drain Rock Void Ratio	0.75
Subsurface Storage Volume	10,152 cf
24-hour Storm Event (SWMM Model)	
Infiltration During Storm Event	13,261 cf
Estimated Treatment Volume	**38,014 cf**

Cardozo School Infiltration Gallery

Drainage Management Area	
Sub-watershed	**6th Street**
Total Sub-watershed Area	46.8 ac
Drainage Management Area	36.2 ac
Impervious Cover	60%
Unit Basin Storage	0.26 inch
Water Quality Volume (WQV)	**34,118 cf**
Stormwater Facility	
Subsurface Infiltration Gallery	
Sub-surface Storage Gallery	
Storage Footprint	20,000 sf
Storage Depth	18 in
Drainage Layer	
Class 1 Type A Drain Rock	6 in
Drain Rock Void Ratio	0.75
Subsurface Storage Volume	34,617 cf
24-hour Storm Event (SWMM Model)	
Infiltration During Storm Event	9,267 cf
Estimated Treatment Volume	**43,883 cf**
Subgrade Infiltration Rate	0.25 in/hr
Time to Infiltrate Stored Water	82 hr

Riverside Drive Green Street

Drainage Management Area	
Sub-watershed	**6th Street**
Total Sub-watershed Area	46.8 ac
Drainage Management Area	10.6 ac
Impervious Cover	75%
Unit Basin Storage	0.35 inch
Water Quality Volume (WQV)	**13,439 cf**
Stormwater Facility	
Vegetated Swale	
Surface Storage	
Bottom Footprint	5,703 sf
Ponding Footprint	8,685 sf
Max Ponding Depth	12 in
Surface Storage Volume	7,100 cf
Amended Soil Layer (Stormwater Filter)	
Soil Depth	12 in
Hydraulic Conductivity	4 in/hr
Soil Porosity	0.35
Time to Infiltrate Surface Water	3.7 hr
Drainage Layer	
No. 9 Drain Rock	3 in
Class 1 Type A Drain Rock	6 in
Drain Rock Void Ratio	0.75
Subsurface Storage Volume	2,757 cf
24-hour Storm Event (SWMM Model)	
Infiltration During Storm Event	4,824 cf
Estimated Treatment Volume	**14,680 cf**

1st Street Basin Treatment Improvements

Drainage Management Area	
Sub-watershed	**7th Street**
Total Sub-watershed Area	279.6 ac
Drainage Management Area	194.0 ac
Impervious Cover	80%
Unit Basin Storage	0.38 inch
Water Quality Volume (WQV)	**267,645 cf**
Stormwater Facilities	
Forebay Area	
Surface Storage	
Bottom Footprint	7,780 sf
Ponding Footprint	11,300 sf
Max Ponding Depth	5.20 ft
Surface Storage Volume	49,324 cf
Amended Soil Layer (Stormwater Filter)	
Soil Depth	18 in
Hydraulic Conductivity	4 in/hr
Soil Porosity	0.35
Time to Infiltrate Surface Water	19.0 hr
Multi-use Park Overflow Area	
Surface Storage	
Bottom Footprint	40,400 sf
Ponding Footprint	50,650 sf
Max Ponding Depth	3.20 ft
Surface Storage Volume	145,371 cf
Amended Soil Layer (Stormwater Filter)	
Soil Depth	12 in
Hydraulic Conductivity	4 in/hr
Soil Porosity	0.35
Time to Infiltrate Surface Water	10.8 hr
Drainage Layer	
No. 9 Drain Rock	3 in
Class 1 Type A Drain Rock	12 in
Drain Rock Void Ratio	0.75
Subsurface Storage Volume	33,116 cf
24-hour Storm Event (SWMM Model)	
Infiltration During Storm Event	41,154 cf
Estimated Treatment Volume	**268,965 cf**

Open Space Treatment Marsh

Drainage Management Area	
Sub-watershed	**8th Street**
Total Sub-watershed Area	342.1 ac
Drainage Management Area	60.5 ac
Impervious Cover	75%
Unit Basin Storage	0.35 inch
Water Quality Volume (WQV)	**76,865 cf**
Stormwater Facility	
Treatment Marsh/Wetland	
Surface Storage	
Facility Footprint	35,000 sf
Average Ponding Depth	2 ft
Surface Storage Volume	61,250 cf
Amended Soil Layer (Stormwater Filter)	
Soil Depth	18 in
Hydraulic Conductivity	4 in/hr
Soil Porosity	0.35
Time to Infiltrate Surface Water	5.3 hr
Subsurface Storage Volume	19,250 cf
24-hour Storm Event (SWMM Model)	
Infiltration During Storm Event	11,725 cf
Estimated Treatment Volume	**92,225 cf**
Drain Time	48 hrs
Orifice Area	0.10 sf
Approx. Orifice Diameter for Drain Time	4.3 in
Max Flow Rate thru Orifice	0.71 cfs

Design Terminology

Bioretention / Vegetated Swale – a shallow, landscaped area that receives and treats stormwater through processes of sedimentation and filtration.

Biological Uptake – vegetative and microbial uptake of nutrients.

Detention – the process of holding or retaining runoff and slowly discharging it from the site to reduce peak flows and downstream flooding.

Drawdown time – the time it takes for the storage area of the SCM to drain the water quality volume.

Evapotranspiration – the process of water evaporation from soil and plants into the atmosphere.

Filtration – a both physical and biological process whereby pollutants and particles can be separated out of a fluid (stormwater).

Hydromodification – the process by which changes in land cover alters a site's runoff and transport characteristics.

Impervious Area – a hard surface area that prevents or retards the entry of water into the soil, thus causing water to run off of the surface in greater quantities and at an increased flow rate (e.g., sidewalk, road, parking lot, roof).

Infiltration – the process by which water on the ground surface enters the soil; **groundwater recharge** is when infiltration continues to the depth of native soils.

Low Impact Development - an innovative land planning, engineering, and landscape design approach to managing urban stormwater runoff in a more natural / decentralized way. The idea is to manage stormwater quality and detention on-site and recharge local groundwater instead of collecting / piping runoff within sewer networks to WWTPs.

Pervious area – areas of uncompacted soil or other material that allow water to pass through it and infiltrate.

Retention – the process of holding or retaining runoff close to the source for infiltration, evapotranspiration, or reuse.

Sedimentation – the process by which particles in suspension settle of a fluid (stormwater).

Soil Adsorption – the physical attachment of a particle, usually nutrients and heavy metals, to the soil.

Water quality volume (WQv) – the runoff volume to be managed by the SCM such that it meets performance requirements specified by the 2013 General Permit.

Water quality flow rate (WQf) – the required flow rate to be managed by the SCM such that the treatment requirements are met.

A.8 Itemized Project Cost Estimates

Cannery Project

Description	Quantity					Total
Site Preparation						
Site Clearing						
Assume cost is a component of the overall site development.						
Site Demolition and Relocations						
Assume cost is a component of the overall site development.						
Site Earthwork						
Excavation and disposal of soil	8,135	CY	$	25.00	$	203,369
Rough and fine grading	68,750	SF	$	0.40	$	27,500
Site Protection and Erosion Control						
Assume cost is a component of the overall site development.						
Subtotal					**$**	**230,869**
Site Improvements						
Roadways & Pedestrian Paving						
Assume cost is a component of the overall site development.						
Site Development						
Bioretention system						
Bioretention plants	55,000	SF	$	10.00	$	550,000
Shredded hardwood mulch	340	CY	$	80.00	$	27,200
Amended planting soil	3,056	CY	$	150.00	$	458,400
No. 9 drain rock (3" depth)	510	CY	$	95.00	$	48,450
Class 1 Type A drain rock (6-9" depth)	1,528	CY	$	120.00	$	183,360
4" perforated underdrain pipe	2,625	LF	$	35.00	$	91,875
Landscaping						
Landscape, turf	13,750	SF	$	10.00	$	137,500
Subtotal					**$**	**1,496,785**
Site Mechanical Utilities						
Water Supply						
New irrigation system, allowance	68,750	SF	$	5.00	$	343,750
Storm Sewer						
8" SD pipe	400	LF	$	90.00	$	36,000
12" SD pipe	1,200	LF	$	120.00	$	144,000
24" SD pipe	150	LF	$	180.00	$	27,000
Catch basin	5	EA	$	3,000.00	$	15,000
Manhole	6	EA	$	5,000.00	$	30,000
Overflow drain	8	EA	$	2,500.00	$	20,000
Subtotal					**$**	**615,750**
Direct Construction Cost					**$**	**2,343,000**
Design Contingency				15%	$	351,000
Traffic Management				0%	$	-
Subtotal					**$**	**2,694,000**
General Conditions				5%	$	135,000
Insurance & Bond				1.5%	$	42,000
Office Overhead & Profit				4%	$	115,000
Subtotal					**$**	**2,986,000**
Construction Contingency				10%	$	299,000
Total Construction Cost					**$**	**3,285,000**

Notes:

1. All quantities are rough approximations estimated from aerial image.
2. Unit costs used are from preliminary cost estimates prepared for similar projects.
3. It was assumed that existing curb would remain except were curb cuts where needed for raingardens.
4. Extent of required utility relocation and traffic signage is unknown. Lump sum amounts provided as place holders.
5. This estimate is for rough budgetary planning purposes only.

Hutcheson Park Project

Description	Quantity				Total
Site Preparation					
Site Clearing					
Sawcut curb and sidewalk	486	LF	$	12.00	$ 5,832
Remove and dispose of curb & gutter	470	LF	$	4.00	$ 1,880
Remove and dispose of pavement	7,956	SF	$	3.50	$ 27,846
Site Demolition and Relocations					
Remove storm drain line	80	LF	$	15.00	$ 1,200
Remove catch basin / drainage inlet	1	EA	$	750.00	$ 750
Utility protection & relocation allowance	1	LS	$	10,000.00	$ 10,000
Demolition allowance	1	LS	$	10,000.00	$ 10,000
Site Earthwork					
Excavation and disposal of soil	1,318	CY	$	25.00	$ 32,943
Excavation and reuse of soil	784	CY	$	15.00	$ 11,760
Rough and fine grading	24,650	SF	$	0.40	$ 9,860
Site Protection and Erosion Control					
Construction perimeter fence	650	LF	$	8.00	$ 5,200
Tree protection barrier	200	LF	$	3.00	$ 600
Silt fence	650	LF	$	3.50	$ 2,275
Allowance to protect drain inlets, sidewalk, e	1	LS	$	5,000.00	$ 5,000
Subtotal					**$ 125,146**
Site Improvements					
Roadways & Pedestrian Paving					
6" curb & gutter (standard)	486	LF	$	45.00	$ 21,870
Concrete curb ramp	1	EA	$	2,500.00	$ 2,500
Signage & striping, allowance	1	LS	$	10,000.00	$ 10,000
Site Development					
Bioretention systems					
Bioretention plants	4,700	SF	$	15.00	$ 70,500
Gravel mulch	30	CY	$	160.00	$ 4,800
Amended planting soil	262	CY	$	150.00	$ 39,300
Landscape, turf	1,175	SF	$	10.00	$ 11,750
Park system					
Landscape, turf	14,080	SF	$	10.00	$ 140,800
Amended planting soil	522	CY	$	150.00	$ 78,300
No. 9 drain rock (3" depth)	104	CY	$	95.00	$ 9,880
Class 1 Type A drain rock (6-9" depth)	310	CY	$	120.00	$ 37,200
4" perforated underdrain pipe	400	LF	$	35.00	$ 14,000
Cleanout	5	EA	$	500.00	$ 2,500
Landscaping					
Landscape, replacement	4,695	SF	$	5.00	$ 23,475
Subtotal					**$ 466,875**
Site Mechanical Utilities					
Water Supply					
New irrigation system, allowance	19,955	SF	$	5.00	$ 99,775
Points of connection	2	EA	$	2,500.00	$ 5,000
Reconfiguration of existing system, allowanc	4,695	SF	$	2.50	$ 11,738
Storm Sewer					
8" SD pipe	200	LF	$	90.00	$ 18,000
12" SD pipe	120	LF	$	120.00	$ 14,400
Manhole	1	EA	$	5,000.00	$ 5,000
Curb inlet	3	EA	$	1,500.00	$ 4,500
Overflow drain	2	EA	$	2,500.00	$ 5,000
Connection to existing system	2	EA	$	2,250.00	$ 4,500

Hutcheson Park Project continued

	Allowance for repairs to existing CBs	1	EA	$	1,000.00	$ 1,000
	Pump / Lift station	1	EA	$	25,000.00	$ 25,000
Subtotal						**$ 193,913**
Direct Construction Cost						**$ 786,000**
	Design Contingency				15%	$ 118,000
	Traffic Management				1.5%	$ 14,000
Subtotal						**$ 918,000**
	General Conditions				5%	$ 46,000
	Insurance & Bond				1.5%	$ 14,000
	Office Overhead & Profit				4%	$ 39,000
Subtotal						**$ 1,017,000**
	Construction Contingency				10%	$ 102,000
Total Construction Cost						**$ 1,119,000**

Cardozo School Project

Description	Quantity				Total
Site Preparation					
Site Clearing					
Sawcut curb and sidewalk	20	LF	$	12.00	$ 240
Remove and dispose of curb & gutter	5	LF	$	4.00	$ 20
Remove and dispose of pavement	10	SF	$	3.50	$ 35
Site Demolition and Relocations					
Remove catch basin / drainage inlet	2	EA	$	750.00	$ 1,500
Utility protection & relocation allowance	1	LS	$	5,000.00	$ 5,000
Demolition allowance	1	LS	$	5,000.00	$ 5,000
Site Earthwork					
Excavation and disposal of soil	1,481	CY	$	25.00	$ 37,037
Excavation and reuse of soil	2,222	CY	$	15.00	$ 33,333
Rough and fine grading	20,000	SF	$	0.40	$ 8,000
Site Protection and Erosion Control					
Construction perimeter fence	600	LF	$	8.00	$ 4,800
Tree protection barrier	250	LF	$	3.00	$ 750
Silt fence	400	LF	$	3.50	$ 1,400
Allowance to protect drain inlets, sidewalk, e	1	LS	$	5,000.00	$ 5,000
Subtotal					**$ 102,115**
Site Improvements					
Roadways & Pedestrian Paving					
none					
Site Development					
Infiltration Gallery system					
Underground stormwater chamber	30,000	CF	$	15.00	$ 450,000
Maintenance/access risers	5	EA	$	2,500.00	$ 12,500
Class 1 Type A drain rock (6" depth)	370	CY	$	120.00	$ 44,444
Geotextile membrane (above chamber)	20,000	SF	$	5.00	$ 100,000
Landscaping					
Landscape, replacement	22,900	SF	$	5.00	$ 114,500
Subtotal					**$ 721,444**
Site Mechanical Utilities					
Water Supply					
Reconfiguration of existing system, allowanc	22,900	SF	$	2.50	$ 57,250

Cardozo School Project continued

Storm Sewer						
12" SD pipe	25	LF	$	120.00	$	3,000
Catch basin	2	EA	$	3,000.00	$	6,000
Connection to existing system	1	EA	$	2,250.00	$	2,250
Subtotal					**$**	**68,500**
Direct Construction Cost					**$**	**892,000**
Design Contingency				15%	$	134,000
Traffic Management				2.0%	$	21,000
Subtotal					**$**	**1,047,000**
General Conditions				5%	$	52,000
Insurance & Bond				1.5%	$	16,000
Office Overhead & Profit				4%	$	45,000
Subtotal					**$**	**1,160,000**
Construction Contingency				10%	$	116,000
Total Construction Cost					**$**	**1,276,000**

Riverside Drive Project

Description	Quantity					Total
Site Preparation						
Site Clearing						
Sawcut curb and sidewalk	990	LF	$	12.00	$	11,880
Remove and dispose of curb & gutter	990	LF	$	4.00	$	3,960
Remove and dispose of pavement	8,415	SF	$	3.50	$	29,453
Site Demolition and Relocations						
Remove storm drain line	95	LF	$	15.00	$	1,425
Utility protection & relocation allowance	1	LS	$	5,000.00	$	5,000
Demolition allowance	1	LS	$	10,000.00	$	10,000
Site Earthwork						
Excavation and disposal of soil	634	CY	$	25.00	$	15,849
Rough and fine grading	10,865	SF	$	0.40	$	4,346
Site Protection and Erosion Control						
Construction perimeter fence	2,000	LF	$	8.00	$	16,000
Tree protection barrier	300	LF	$	3.00	$	900
Silt fence	1,000	LF	$	3.50	$	3,500
Allowance to protect drain inlets, sidewalk, et	1	LS	$	5,000.00	$	5,000
Subtotal					**$**	**107,313**
Site Improvements						
Roadways & Pedestrian Paving						
AC pavement, grind and 2" overlay	9,900	SF	$	2.00	$	19,800
AC pavement, vehicular	1,980	SF	$	10.00	$	19,800
Signage & striping, allowance	1	LS	$	5,000.00	$	5,000
Site Development						
Bioretention system						
Bioretention plants	8,685	SF	$	15.00	$	130,275
Shredded hardwood mulch	36	CY	$	80.00	$	2,880
Amended planting soil	212	CY	$	150.00	$	31,800
No. 9 drain rock (3" depth)	53	CY	$	95.00	$	5,035
Class 1 Type A drain rock (6-9" depth)	106	CY	$	120.00	$	12,720
4" perforated underdrain pipe	980	LF	$	35.00	$	34,300
Impermeable liner	6,230	SF	$	15.00	$	93,450
Concrete deepened curb around system	990	LF	$	150.00	$	148,500
Stone check dam	158	SF	$	80.00	$	12,640
Landscaping						
Landscape, turf	2,180	SF	$	10.00	$	21,800
Subtotal					**$**	**538,000**

Riverside Drive Project continued

Site Mechanical Utilities						
Water Supply						
	New irrigation system, allowance	8,685	SF	$ 5.00	$	43,425
	Points of connection	1	EA	$ 2,500.00	$	2,500
Storm Sewer						
	8" SD pipe	75	LF	$ 90.00	$	6,750
	12" SD pipe	20	LF	$ 120.00	$	2,400
	Manhole	2	EA	$ 5,000.00	$	10,000
	Curb inlet	7	EA	$ 1,500.00	$	10,500
	Overflow drain	7	EA	$ 2,500.00	$	17,500
	Connection to existing system	2	EA	$ 2,250.00	$	4,500
	Pump / Lift station	1	EA	$ 20,000.00	$	20,000
Subtotal					**$**	**117,575**
Direct Construction Cost					**$**	**763,000**
	Design Contingency			15%	$	114,000
	Traffic Management			1.5%	$	13,000
Subtotal					**$**	**890,000**
	General Conditions			5%	$	45,000
	Insurance & Bond			1.5%	$	14,000
	Office Overhead & Profit			4%	$	38,000
Subtotal					**$**	**987,000**
	Construction Contingency			10%	$	99,000
Total Construction Cost					**$**	**1,086,000**

First Street Basin Project

Description	Quantity			Total
Site Preparation				
Site Clearing				
none				
Site Demolition and Relocations				
Utility protection & relocation allowance	1	LS	$ 50,000.00	$ 50,000
Demolition allowance	1	LS	$ 10,000.00	$ 10,000
Site Earthwork				
Excavation and disposal of soil	2,808	CY	$ 25.00	$ 70,207
Excavation and reuse of soil	1,929	CY	$ 15.00	$ 28,928
Rough and fine grading	48,180	SF	$ 0.40	$ 19,272
Site Protection and Erosion Control				
none				
Subtotal				**$ 178,407**
Site Improvements				
Roadways & Pedestrian Paving				
none				
Site Development				
Bioretention plants	7,780	SF	$ 15.00	$ 116,700
Gravel mulch	49	CY	$ 160.00	$ 7,840
Landscape, turf	40,400	SF	$ 10.00	$ 404,000
Amended planting soil	1,929	CY	$ 150.00	$ 289,278
No. 9 drain rock (3" depth)	447	CY	$ 95.00	$ 42,465
Class 1 Type A drain rock (12" depth)	1,785	CY	$ 100.00	$ 178,500
10" perforated underdrain pipe	2,400	LF	$ 42.00	$ 100,800
Dry well	6	EA	$ 10,000.00	$ 60,000
Armored outfall structure	1	EA	$ 25,000.00	$ 25,000
Gravel/stone protection	31	CY	$ 200.00	$ 6,296

First Street Basin Project continued

Landscaping						
above						
Subtotal					**$**	**1,230,879**
Site Mechanical Utilities						
Water Supply						
Reconfiguration of existing system, allowanc	48,180	SF	$	2.50	$	120,450
Storm Sewer						
24" SD pipe	60	LF	$	180.00	$	10,800
Manhole	3	EA	$	5,000.00	$	15,000
Overflow drain	3	EA	$	2,500.00	$	7,500
Connection to existing system	1	EA	$	2,250.00	$	2,250
Allowance for upgrades to existing lift station	1	EA	$	15,000.00	$	15,000
Subtotal					**$**	**171,000**
Direct Construction Cost					**$**	**1,580,000**
Design Contingency				15%	$	237,000
Traffic Management				1.5%	$	27,000
Subtotal					**$**	**1,844,000**
General Conditions				5%	$	92,000
Insurance & Bond				1.5%	$	29,000
Office Overhead & Profit				4%	$	79,000
Subtotal					**$**	**2,044,000**
Construction Contingency				10%	$	204,000
Total Construction Cost					**$**	**2,248,000**

Open Space Treatment Marsh

Description	Quantity					Total
Site Preparation						
Site Clearing						
Clear and grub	49,800	SF	$	0.15	$	7,470
Tree removal	8	EA	$	600.00	$	4,800
Site Demolition and Relocations						
Remove storm drain line	50	LF	$	15.00	$	750
Demolition allowance	1	LS	$	50,000.00	$	50,000
Site Earthwork						
Excavation and disposal of soil	2,269	CY	$	25.00	$	56,713
Excavation and reuse of soil	1,944	CY	$	15.00	$	29,167
Rough and fine grading	49,800	SF	$	0.40	$	19,920
Site Protection and Erosion Control						
Construction perimeter fence	600	LF	$	8.00	$	4,800
Tree protection barrier	2,000	LF	$	3.00	$	6,000
Silt fence	1,000	LF	$	3.50	$	3,500
Subtotal					**$**	**183,120**
Site Improvements						
Roadways & Pedestrian Paving						
Decomposed granite pathway	10,000	SF	$	5.00	$	50,000
Site Development						
Forebay						
Armored outfall structure	1	EA	$	25,000.00	$	25,000
Gravel/stone protection	2,000	SF	$	200.00	$	400,000

Treatment Marsh						
Engineered marsh/wetland	35,000	SF	$	50.00	$	1,750,000
Compacted clay liner	35,000	SF	$	10.00	$	350,000
Stone check dam	400	SF	$	80.00	$	32,000
Orifice outlet structure	2	EA	$	5,000.00	$	10,000
Landscaping						
48" box trees, replacement	8	EA	$	2,000.00	$	16,000
Landscape, replacement	2,800	SF	$	2.50	$	7,000
Subtotal					**$**	**2,640,000**
Site Mechanical Utilities						
Water Supply						
none						
Storm Sewer						
36" SD pipe	85	LF	$	200.00	$	17,000
Manhole	1	EA	$	5,000.00	$	5,000
Subtotal					**$**	**22,000**
Direct Construction Cost					**$**	**2,845,000**
Design Contingency				15%	$	427,000
Traffic Management				1.5%	$	49,000
Subtotal					**$**	**3,321,000**
General Conditions				5%	$	166,000
Insurance & Bond				1.5%	$	52,000
Office Overhead & Profit				4%	$	142,000
Subtotal					**$**	**3,681,000**
Construction Contingency				10%	$	368,000
Total Construction Cost					**$**	**4,049,000**

A.9 TAC Meeting Minutes

November 14th, 2013
1:00 PM – 2:30 PM – Technical Advisory Committee Meeting #1
City of Riverbank, CA

Attendees

Brandon Davison – State Water Resources Control Board
Elizabeth Lee – Central Valley Regional Water Quality Control Board
Peter Lolonis – City of Riverbank, Public Works Inspector
Cary Pope – Developer/ Citizen
Kathleen Cleek – City of Riverbank
Mathew Gerken – AECOM
Eric Zickler – AECOM
John Anderson – City of Riverbank
Laura Podolsky – Local Government Committee

Similar Studies/Examples

- El Dorado and Placer County looking at region-wide LID Plan
- Phase II valley-wide permit being considered. Riverbank project could inform the alternative compliance section.
- Other early innovators looking at community-wide approach to LID – City of Ventura Green Streets Master Plan; Los Angeles RWQCB – permits with Los Angeles and Ventura with alternative off-site compliance strategies; West Virginia State guidance document for alternative compliance

Discussion of Preliminary List of Goals/Objectives

1. Provide regulatory flexibility for difficult sites and/or sites at which the City wishes to promote infill or redevelopment.

2. Allow for the collection of fees to partially/fully fund stormwater and watershed projects.

3. Seek cost-effective strategies to achieve equivalent or superior runoff reduction compared to what would be accomplished on the site in question.

4. Fulfill other local program goals and objectives.
    - Incorporate City Council's Strategic Priorities as part of this project's goals/objectives
    - Promoting economic development effort; link Cannery and downtown to promote vibrancy
    - Promote bicycle/pedestrian access and mobility

General Discussion

- All cities have to comply with the new stormwater permit. There are milestones for compliance. Riverbank is part of San Joaquin partnership, which is made up of staff from local governments addressing stormwater permit from throughout the Valley. Stanislaus County estimated it would be about $800,000 to comply with new MS4 permit; County sent out RFP to hire a consultant. Smaller agencies do not have this type of funding to hire a consultant. This study could feed into the County's permit compliance plan
- Riverbank currently has four river discharge points now; existing master plan anticipates two new outfalls; though new discharge points might not be allowed in the future
- This study will help with compliance in downtown infill areas; Nolte master plan did not take into account current and future regulatory changes

- Every infill application has to take care of on-site stormwater management needs and ongoing funding program. Using current LID guidelines working with development community to incorporate into site design. For downtown area, there are fewer applicants, less vacant land, and funding for development projects is more difficult
- Limited space in downtown for LID features; maybe consider living buildings approach for stormwater; there could be approaches where the building is designed to use all stormwater runoff on-site.
- Currently not directing stormwater to the planted medians in downtown but it is possible will see medians in the future designed to collect and infiltrate stormwater.
- For downtown, finding points near the end of the line to serve the downtown area would be cheaper than disparate LID systems on various private properties.
- Make sure stormwater in-lieu fee program is something that works with the development community. Development community would be interested in alternative compliance strategies. Want to know what the rules are and options are; do not like changes partially through a project.
- Are there City roadway related projects that could infuse LID approaches? Patterson Road planning project underway now; considering storm drainage; considering drainage swale along Patterson. Could a LID project associated with Patterson road be an areawide LID project?
- Will more cities be forming stormwater maintenance districts? City currently has 2 of these districts: Sterling Ridge and behind the commercial center that are existing stormwater maintenance districts.
- Two sets of issues and contexts in regards to LID implementation: existing infrastructure and new development that can implement LID more easily
- City samples MID canals twice per year; required by franchise agreement with MID.
- Best practice for addressing pollutants is infiltration. Have some drain inlet filters in downtown. It's a patch-type solution.
- Ammo Plant is not included in this study. Focus will be downtown.

Important Points for Later in the Project

- Challenge with timing of collection and use of in-lieu funds and construction of drainage projects.
- The City will do sampling and testing to comply with the permit, so can share the outcome of these data with the LID Plan Team.
- Consider Caltrans drainage into Riverbank system; consider **Caltrans EEM funding for improvements. Consider other State funding sources, as well, including State Water Resources Control Board project program.
- Study will identify co-benefit projects that will add amenities in areas where the City wants to encourage investment and infill development; will use this study, in part, to identify and design amenities in targeted compact development areas to help leverage private investment in these same locations.

Follow-Up Items

- Kathleen Cleek to share electronic version of spreadsheet she created on new MS4 permit requirements
- Peter has outreach ideas; lists of questions to ask before/after to determine whether there has been progress in understanding permit requirements. Peter will have water quality sampling for Riverbank to share with the Team
- City staff to provide Eric Zickler with electronic information showing the entire drainage system; Make sure have latest and most up to date; review for areas where accuracy is questionable; identify areas where the Caltrans facility and local facilities interact.
- Current Patterson Road project to consider storm drainage (i.e., swale along roadway). Should identify any opportunities for areawide drainage and water quality benefits.
- John Anderson to share City Council's Strategic Priorities
- Solicit input from local engineering firms. Their input may help to sell the program. Local civil engineers have dealt with LID in the Bay Area, where these have been in place for longer. Invite Bill Kull to next meeting.

July 14th, 2014
10:00am – 12:30pm - Technical Advisory Committee
Meeting #2
Remote, via teleconference

Attendees:
John Anderson – Contract Planner, City of Riverbank
Kathleen Cleek – City of Riverbank
Barbara DeLaMare – DF Engineering, Inc.;
Dave Hoberg – DF Engineering, Inc.
Bill Kull – Contract Engineer, City of Riverbank
Peter Lolonis – City of Riverbank
Laura Podolsky – Local Government Commission
Cary Pope – Local Developer/Riverbank Resident
Michael Riddell – Deputy Development Services Director, City of Riverbank
Bryce Wilson – AECOM
Eric Zickler – AECOM

Presentation by AECOM
link to download:
www.dropbox.com/s/ugnl08ke5qsnzpf/AECOM_PPT_TAC_July14_FINAL.pdf

Group Discussion

- Kull – Maintenance of green streets is a challenge. How do we address this? For the case studies mentioned, are there stormwater maintenance districts to finance maintenance or is it covered by general fund?
- *Not sure how maintenance is being paid for in case study presented from Paso Robles.*
- Pope – How do we acquire privately-owned sites for stormwater management? Have a couple development projects in progress. Planning to manage stormwater on site. I don't want to manage stormwater on site and pay an in-lieu fee. Identify public lands that could potentially used for LID, stay away from new acquisition.
- *Developers would not have to manage stormwater onsite and pay an in-lieu fee.*
- Anderson – How do we address long term operation and maintenance? What if these projects fail?
- Kull – Systems will have limited amounts of life. We are focusing LID onsite and also looking to do regional LID features in the future.
- Pope – Ammo Plant has a huge storm drain that is dry – 27" stormline going down Central Ave connecting to a percolation field. Could we utilize this?
- Wilson – Utilizing the 27" stormline would be incredibly cost effective
- Anderson – many streets in downtown are extremely wide (100'+). Can we do something here? But downtown soils are not good (all hard plan).
- *We may not be able to infiltrate water but will be able to treat it before it goes to the river. Therefore, regional LID projects might serve flood management needs.*
- Riddell – What size of storm event are projects being designed for?
- *Depends. These facilities are meant to address water quality in the river.*
- Pope – Where does groundwater recharge come into play?
- *It comes into play if that is a priority of the city.*
- Riddell – State Water Board will be taking a hard look at groundwater recharge.
- Wilson – Is parking an issue here?
- *Focus LID projects in public right-of-way in residential areas where parking is not as big as an issue as in commercial area.*

- Eric – Floodplain is a pretty big opportunity site.
- Kull – But what about permitting issues with utilizing floodplain?
- Zickler – Will be challenging but depends on the proposed changes to land use there. Dealing with the multiple agencies will be factored into costs.
- Kull – Is the trend going towards pervious pavements? City is not excited about this from a maintenance standpoint.
- *This is not the most promising solution in our opinion. There is a lot of uncertainty on how pervious pavement will function over time.*
- Pope – Solutions will depend on context. Downtown is already developed and sites could be constrained. Open (greenfield) sites will be easy.
- Wilson – Any other priorities we should be thinking about as a component of a project?
- Kull – Projects that incorporate stormwater management and recreation has worked well here.
- Anderson – Recreation use will drive design of LID feature/project.
- Kull – Cannery site is a priority site. Have a significant trail system in town. Would like to emphasize that. City owns 11 acres of property at Kentucky and Eleanor and a portion of this could be used for stormwater.
- Anderson – The cannery also owns a storm drain to the east so expand the boundary of that event.
- Anderson – The Nolte plan is proposing 7 new outfall sites so what are we proposing in this project? If we have soils that can percolate, then I would rather see this than new outfall sites. *Agreed. Should stay away from new outfalls. AECOM will not be proposing outfalls as part of this project. It is outside our scope of work.*
- Pope – What are the state and federal mandates regarding timing for these communities?
- *The County is doing an overall implementation plan covering all cities within Stanislaus County. AECOM has connected with the County to figure out how to share information.*
- Pope – Incorporating LID into development has been a challenge.
- Hoberg – When does the new NPDES permit come into effect? When will new development have to utilize LID? How will county requirements impact the city and this project? I like the idea of having several options for developers to choose from to meet permit requirements.
- Cleek – Considering having one set of LID standards county-wide to make it more straight forward for developers.
- Hoberg – Will city staff go out and inspect all LID projects?
- Kull – City is creating maintenance contracts with all LID features.
- Pope – What do guys like me (the pioneers) do with LID implementation?
- *How regulations are being implemented seems in limbo. Zickler invited Pope to email him about how to address this in the memo.*

Next Steps

- AECOM will be preparing a memo for watershed characterization and prioritization and will include analysis in appendix. This will be circulated to TAC members. Next TAC meeting will be in approximately three months where the draft memo will be discussed and TAC can ask questions and provide feedback. LGC will try to schedule the next TAC meeting on the same day as the Modesto Engineer Club meeting so that AECOM can provide a brief presentation on the Riverbank project and for LGC to receive feedback on a Spring workshop on LID that will highlight the Riverbank project as well as other issues/priorities identified by the Engineer Club, Riverbank, and TAC members.

October 7th, 2014
2:00 – 3:30 – Technical Advisory Committee
Meeting #3
City of Riverbank, CA

Attendees
Brandon Davidson – State Water Board, Division of Financial Assistance (DFA)
Peter – City of Riverbank, Engineer
Daren – City of Riverbank, Engineer
Kathleen – City of Riverbank, Administrator
John Anderson – consultant to City of Riverbank, Land Use Planner
Bill Kull – consultant to City of Riverbank, Engineer
Cary Pope – 28 yr. Riverbank Resident, Developer
Dave Hoberg – Engineer, consultant with D.F Engineering
Barbara DeLaMore – Engineer, consultant with D.F. Engineering
Jen (?) – called in from Central Valley Water Board
Paul Zykofsky – Local Government Commission
Danielle Dolan – Local Government Commission

Report back from MEC

1. Brandon clarifies what will be done with results of study
   - Reports will be uploaded to State Water Resources website, with map of Riverbank
   - Will summarize results in Excel and distribute to Water Boards; particularly the new water quality division that will be starting up
   - Water Board is 5 members and they will also personally receive report, "approve," and distribute as they see fit; Approval does not imply policy however; Policy would come more from the Water Boards legislative arm which the DFA does not deal with
   - There is an opportunity for us to present directly to Board
2. Paul brings up that Regional implies a large-scale to many people so perhaps it is important to emphasize that this Study uses regional term in reference to neighborhood level

Group Discussion - Opportunities

Cannery
- John asked if appropriate to consider linking Cannery to 1st St. Basin since it is so close?
- *If no permit for new outfall, this could be a possibility*
- John concerned/confused with delineation of sub-watershed going above Callender Road
- *We will revisit*
- Peter asked if any of our projects might utilize capture and reuse
- *Discussion of how this is difficult in practice, particularly in climates with seasonal rainfall but clarification was provided that it would be used within first few months and for needs like toilet flushing and irrigation*

4th Street
- John likes this idea and wants to know how deep outfall pipe is
- *6-8' not 30', very feasible to do project here*

6th Street
- *No initial comments*

7th Street A
- John says 'green' parcel (what we believed to be Riverbank ROW) is actually owned by Railroad and will be very difficult to utilize
- John okay with idea of extending 1st St. Basin northward

7th Street B
- Emphasis placed on difficulty of locating project in this watershed and prior discussion of the gas station as a no-go parcel
- Bill Kull offers up idea of small filters and CDS
- Peter mentions that the outfall is deep (15-20') and that the gas station is up for sale

8th Street A
- *No initial comments*

8th Street B

- John says several issues with siting project on floodplain; Army Corps easements, Riparian Corridor, he thinks permitting would be horrendous – he dealt with a similar situation in Ripon and the permitting around Riparian brush rabbits was very time consuming
- *We mention this could be factored in as soft costs*
- *Ask environmental studio for feedback ?*

Bruinville

- *No initial comments*

General Discussion

- Brandon asks if drywells were at all considered in LID plans?
  - *Emphasis that we are not at that stage of design yet, still very conceptual and about deciding locations*
- Cory noticed that we had Ammo plant parcel in our initial opportunity pool but then did not select and wanted to know whether that was because of ownership
  - *Yes would be ideal location but knowledge of City's long-term struggle to try and buy this parcel* – John A confirms will still be long-time down the road
- John A wants us to bring forward Cannery sites and then there is also the short and long-term interest in cleaning up the discharge points; they have to provide bad news to the council about money that needs to be set aside to meet existing (and new trash) regulations
- John A and other City officials not as worried about Bruinville where they will likely site a few basin along existing line that runs from RAAP up to river (line coincides with western edge of proposed northern basin)
- Kathleen though idea of Cardazo School was interesting (John thinks it's a fantastic idea) and wonders if we considered the high school as it is adjacent to existing RAAP line as well
- Dave Hoberg worked on project in Modesto that is similar to an AC situation; a neighborhood was constantly flooding so a park was retrofit with a centralized infiltration facility – Dave to provide information (including costs) for the project
- Peter and Daren comment that 7B is further difficult because they don't have access to that mainline for purposes of inspection, cleaning and maintenance
- General concern that soon they will have to meet 5mm trash limit on top of BMPs
- Danielle asked for feedback on Spring workshop; what should be topics and who should attend
  - John A says other jurisdictions should come as they all are/will be dealing with the same issues (Oakdale, Merced, San Joaquin…)
  - Comment on Oakdale and Modesto Irrigation District and their tailwater discharges and that they are not coordinating with one another so at the least City should coordinate with them
  - Cory encourages to invite Development community as they are the ones that will be bearing brunt of these decisions (brings up that they are in RB, not SF, and that funding will kill these projects)
- John A says 'only thing interested in' is from financing perspective… how will they handle long-term O&M expenses, how will they deal with the costs associated with the projects in general
  - Does not want have to go through Prop 218 and pass vote to leverage funds; thought of asking public for additional stormwater fee very difficult considering they had hard time even getting money for stoplights
  - New development they can handle but redevelopment another situation
  - Bottom line is that local government wants an easy way to collect fees and it won't be through 218 route because that is hard
- Brandon confirmed that state requires 20 yrs. O&M and asks this to be considered when deciding what type of LID approaches; for example, plants are cheap to replace but maintaining and underground infiltration gallery could pose problems
- Brandon thinks Parks are excellent places for public outreach and likes idea of dual-use solutions
- Danielle mentioned new line item in Prop 218 reform that may allow Municipalities to impose stormwater fee without having to pass vote

October 7th, 2014
11:30 – 1:00pm – Modesto Engineers Club
Old Mill Restaurant, Modesto, CA

Question / Comments Received

1. David Leamon – Deputy Director, Stanislaus County Department of Public Works – (previously worked in private sector as well as City of Modesto)
   - Concerned that our study does not align with the 2003 permit that places focus on source-control and LID
   - Views AC approach as a return to hydro-mod, flood control, giant basin approach characteristic of the early 80s
   - Does not understand why State Water Board would fund such a study to return to "business as usual" when he and others were finally getting their heads around LID; he feels as if AC is a get out of jail free card for LID and the State Water Board is running experiments on them and that they are not sure what they want either
   - Concerned that we are moving forward without checking in with them as they are not proactive and may have changed their minds
     - Danielle Dolan responded that we are regularly involved with State Board and that AC is not necessarily in opposition to LID, many of the centralized facilities we are considering would incorporate LID-type techniques (wetlands, bioretention, swales, etc.) – size may be larger but strategy would be similar

2. Gentleman from center table
   - Wanted to know percentage of City draining to River and percentage draining to irrigation canals and whether Crossroads area has a basin.
     - Bryce responds about a 50/50 split and Yes, they do
   - Wanted to know how serious the peak flow problems are for the Cannery
     - Bryce responds that 100% of flows go to WWTP and City looking to disconnect

3. David Learnon
   - City of Modesto was already doing "AC" 15-years ago with central dual-use basins
   - He cannot keep up with State Water Boards decisions and is very frustrated
   - He brings up that you can always do LID, feasible anywhere, the problem in small towns/cities is that no one wants to pay for it.

4. John Anderson
   - Notes that Riverbank is unique in that they have 7 outfalls to River with significant portion from direct discharge; with new Trash amendment that is to come out, they will be in big trouble
   - Wants to know how the output from this study will go back to the State; how will it be used?

5. TAC member
   - Do we see AC as option more for smaller areas or does it have potential to be used for Phase I permittees as well?

December 8th, 2014
11:00 – 12:30 – Technical Advisory Committee
City of Riverbank, CA

Attendees

Peter Lolonis – City of Riverbank, Public Works Inspector
Daren Martin – City of Riverbank, Public Works Supervisor
John Anderson – City of Riverbank, Planning Director
Bill Kull –City of Riverbank, City Engineer
Cary Pope – 28 yr. Riverbank Resident, Developer
Barbara DeLaMore – Engineer, consultant with D.F. Engineering
Dave Hoberg (on phone) – Engineer, consultant with D.F Engineering
Matthew Gerken –AECOM (on phone)
Merril Putnam – AECOM
Bryce Wilson –AECOM
Danielle Dolan – Local Government Commission

Introduction (Danielle)

1. Five months until closure, remaining items:
    - finalize project designs and corresponding in-lieu fee structures
    - education and outreach
2. Tuesday, February 10th – first presentation to City Council

Project Concepts – Open Discussion (Bryce)

Bruinville

1. Group okay with not carrying this sub-watershed through the project development phase as it is not part of the redevelopment/infill/opportunity area and thus is unlikely to be a successful or primary area for stormwater treatment through alternative compliance.

Cannery

1. John concerned that sub-watershed as we have delineated it actually represents three separate drainage areas, particularly confused as to why we included portion north of SR108
    - Open discussion brought consensus that the area we delineated likely all does link back to sewer, but it is clear that mechanics of it are not fully understood
2. John points out that property north of First Street Basin is also owned by the Cannery and wondering about existing, or possibility of future, connections between the two
    - Daren is not familiar about existing infrastructure within the Cannery; although he knows lines that runs down Stanislaus Street, through Cannery, does run across the tracks
    - Preswik and left of Atchinson, viaduct, Daren believes a cluster of storm manholes
    - Discussion surrounding whether 24”storm pipe that runs along eastern edge of Cannery parcel, as shown in 2008 Storm Drain System Master Plan, actually exists
    - Ultimately, drainage in and around Cannery site is not clearly understood but consensus among the group is that there is likely no existing stormwater infrastructure from the site that crosses Atchison St (SR108) to the north *(note: this is contradictory to the information shown within the 2008 SDSMP)*
3. John points out that development at Cannery site will eventually need barrier to SR108 and BNSF for noise reasons so he can envision the project, as shown, as feasible
    - Goes on to say that likes the idea that as Cannery develops they will have to develop project(s) that can manage all of their stormwater which would essentially do away with in-lieu fee structure for Cannery drainage area, unless the portion of sub-watershed, as delineated, that is north of SR108 would also be managed on the Cannery site
    - Building stormwater project(s) into parcel as an amenity has the additional benefit of conserving space in upstream areas
4. The residential areas to the southwest of the Cannery currently use drywells to manage stormwater. These drywells have failed in the past and periodically need to be rehabilitated so the preference would be to

eventually convert to a "positive system" – this could be achieved by piping stormwater from these areas to stormwater management facilities within the Cannery.

5. John A asked about seeing a cross-section for Cannery
    - Bryce responds designed at no more than one foot ponding; two feet max, but won't be deep
6. John A wondering where discharge ultimately goes
    - Discussion of using Cannery-owned parcel north of First Street Basin for larger flows, ultimately routing to 7th street outfall in order to avoid the time/money associated with permitting and constructing another outfall; however, group is not clear about feasibility of installing a storm drain pipe beneath the railroad tracks
    - If the First Street Basin is pumped out too soon (i.e. before there is adequate capacity in the downstream system) then stormwater backs up at "Thunderbolt" (Patterson Road) (comment from Daren)

Fourth Street / Hutcheson Park

1. TAC generally favorable of proposed project concept.
2. Preference is to avoid mechanical/pumping elements (cost, operation, maintenance) - Bill asks if we can design the project in reverse, i.e. fill park detention area by connecting the underdrains to the storm drain main and allowing them to surcharge and fill up the facilities in the park
    - Bryce responds that something like this could be considered, however would be difficult to achieve considering how deep the existing storm drain pipe is
3. Bill confirms that we are taking parking out and comments that because Riverside Drive is a really wide street we could just re-stripe it and have parallel parking on both sides; group discussion reaches consensus that removing parking would be fine and that the biggest gripe would probably be from people living across from park who would not want visitors parking in front of their homes
4. Bill said not to be afraid of sub-drain system 6-8' deep, he says that is pretty common in the Central Valley
    - Bryce confirms we want to try to avoid pumps but hard with retrofit projects with existing infrastructure

Sixth Street / Infiltration Gallery & Green Street

1. The biggest hurdle for the underground infiltration at Cardozo school will getting the school on board with the project and ensuring that the location of the infiltration gallery does not conflict with any potential future development/programmatic plans that the school may have
    - Consensus from group with no further comments
2. Group likes idea of linear street project and does not see any problems with it; Bill Kull says this concept would work with another project Cary is working on

Seventh Street / 1st Street Basin Improvements

1. Group on board with project; one of the most cost-effective options and could have ancillary benefits of improving area that is considered by some as an eyesore
2. Group in favor of the creation of the forebay, which would make maintenance easier and increase lifespan of the whole facility, and additional drywells to promote infiltration
3. The basin currently percolates some stormwater, and Daren guesses that the existing soils are amenable to infiltration, however there is no info on how much infiltration occurs.
4. Daren currently has to manually operate the pump, turning it on when it is apparent there is capacity in the downstream piping network (the pump station does not have capability for automatically turning on or off); with Basin revitalization, idea would be to ensure that the Water Quality Volume filters through the surface soil before being pumped out (or infiltrates down), but that the pump can quickly evacuate higher flows if the basin fills up
5. Group on board with taking down fence and making basin into park – Peter mentioned possibility of creating a bridge from Santa Fe Street toward tracks with a little path looping around Basin
    - Biggest hurdle for basin beautification and park improvements will be determining how they are funded

Eighth Street / Open Space Marsh

1. John agrees that the area north of railroad is most likely to develop, though he does think there are some areas south of the railroad with potential
2. John understands why we are proposing wetland but will have a hard time getting on board with the project until we can guarantee that we can get all the necessary permits; he has had direct communication with all the agencies that would be involved and knows that it would cost a lot of time and money to bring this project to fruition

- Discussion around framing the project as a habitat restoration effort, in addition to stormwater management, to try and make the permitting process more achievable (approvals, costs, and timeframe)

3. Daren mentions trail that already goes down to river and John mentions the encampments
4. Group discussion turns from obstacles to opportunities with emphasis on all of the ancillary benefits it could provide, e.g. public amenity, habitat restoration, ideal location for treatment facility
5. Peter notes that design would need to account for the river experiencing very high flows and flooding the project location

Final run through of all Projects

1. Bill Kull says none seem like fatal flaws although some are definitely more challenging than others (leaves for other meeting)
2. Final group commentary, led by John:
    - Cannery: main issue is we are looking at three different sub-drainage areas and there is confusion as to how they drain; constructing detention in parcels north of First Street Basin is a good idea
    - Hutcheson; Good project, self-explanatory; If the project can be non-mechanical (i.e. no pump) that would be best as would save City time, energy and money
    - Cardozo School; good project, similar to what Modesto has done, but will obviously need to negotiate with school district about how they can occupy space; will need joint powers agreement over the area for operations and maintenance; On plus side, the school may have existing storm drainage issues that the project could resolve to achieve dual-benefit; wants to bring a map and illustration with some dimensions to the school to start initial conversation; Dave clarifies that similar Modesto project was so expensive because it was dealing with heavy flooding as well as disconnecting areas from sewer system
    - Riverside Drive, easy concept, will just be a matter of money/funding mechanism
    - First Street Basin – 'our best bet'; everyone on board to open it up as a park as well
    - Marsh; good idea but would require a lot of direct communication with a lot of agencies which would be extremely difficult and could easily take ten years to permit; unless get clearances from environmental resource agencies involved in this effort, we will have to look at other solutions; asked to go back to drainage area slide to confirm that pipe handles both areas, with underdeveloped areas both N and S of Patterson road; W of 8th Street along Claus and along California is where John says most of development opportunities exist; if we need to create alternative B and treat water prior to the outfall, the question is how to get water up to the surface; … all in all, group decides to include this project, positioned as 'gold-standard,' high-value habitat area/restoration project, and see what resource agencies say, knowing that there are other 'low-hanging fruit' projects elsewhere in the City

In-lieu Fee Structure (Matthew)

1. Looking for philosophical preliminary input from group; Possibility for multi-benefit projects; some set of projects may not need in-lieu fee, others will.., does this approach seem okay to group?
    - John thinks this is the way it might have to be
2. Discussion for alternative funding sources from State and Federal grants, especially for 'multi-benefit' projects that can have additional habitat and recreational benefits
3. 8th street, majority of site already urbanized so only some underdeveloped sites would be contributing to fee, anticipated development is what would govern what kind of funding structure we would develop
4. Confirmation that there is currently no general fund, i.e. City-wide impact fees, money for these projects although at some point these will need to come together, John agrees that at this point, however, the two need to be kept separate
5. Matthew assumes that we do not want to have assessment fee on existing developed properties
    - John agrees that we could never sell this to public/Mayor; the focus must be on new development projects, however it is important that redevelopment is not considered responsible for the city's past woes (in terms of funding projects)
    - projects that are partly related to new and existing development will only have fee on part that requires new development + grant
6. John brings up new state-wide water bond – any money there?
    - Matthew confirms that a certain part of fund for urban water needs, although timing of the money may not coincide with this project we will definitely consider it
7. Discussion on cost per / unit (?)

- we need some sort of filter for projects to position them as more competitive - cost/benefit to filter out one or more of these projects
- group reaches consensus that cost/acre is the most meaningful/useful metric
- John says to give opinion he would need to see numbers; $100,000 or more an acre is a big deal

- Barbara said while cost could be first filter, agency involvement would be another

8. John brings up 8th Street again and says while we can position wetland as alternative A, that we will need an alternative B; recognition that the maintenance associated with a piping/retrofit-heavy project could have a higher long-term cost than time/fees associated with permitting a wetland

LID– Survey results and Workshop discussion (Danielle)

1. Danielle scraps from agenda in interest of time; will share the results with the group off-line
2. Wants to know if anyone from TAC interested in helping with public workshop; will be all-day, hosted in Riverbank on LID principles and BMPS; first step will be to find venue and select date
   - Barbara said she can help but to send details about what it entails
   - John said City will obviously help but he thinks it is most important that local engineering and development community and contractors are there to participate in the discussion; Peter says even manufacturers of certain filtration devices should be incorporated; Private sector will need to help in a bigger way

Closing Items (Danielle)

1. Bryce will send out slides and meeting notes to larger group including Matthew and Dave on phone
2. Danielle will send out information on Prop 1 and long-term funding options
3. February 10th is next meeting– City Council presentation
4. LID Workshop TBA – slotted for March or April

December 8th, 2014
1:30 – 3:30 – Project Sites Visit
City of Riverbank, CA

Attendees

Daren Martin– City of Riverbank, Engineer
Merril Putnam – AECOM
Bryce Wilson –AECOM
Danielle Dolan – Local Government Commission

1. First Street Basin
   - lifting manholes confirmed that water enters basin at its northern end and exits at southern end, adjacent to pump, through small outlet
   - Daren has to manually turn on pump but is not too familiar with Basin beyond basic mechanics as it was designed prior to his time
   - "Thunderbolt" area connects into same line that leaves basin so Daren has to be careful when he turns on the pump that he does not cause overflows within the system
   - Daren mentions that he believes the soils beneath the Basin are sandy and that at Silva Park they get great percolation, after the last storm there was no standing water there
   - Daren reiterates that the basin, and adjacent parcel, are eyesores currently and that taking down fence to open up the area as a park would be great

2. Hutcheson Park (spelling correction)
   - What we thought was manhole is actually sewer; storm manhole is actually located in sidewalk adjacent to park
   - Manhole within the park (near northwestern corner) is water
   - Outfall pipe appears to be about 10-12' deep
   - Large concrete pad in southwest corner of park appears to just be base for former picnic table

3. Seventh Street outfall
    - 'Manhole' is 24" pipe at corner of 7th and SR108 (Atchinson); Daren and Peter mentioned at meeting that City is planning to address this situation regardless of AC project
    - Daren thinks that the next storm drain connection after Atchinson may be at Topeka but there is definitely one at Santa Fe Ave (two blocks down)
    - Erosion observed on first site visit has increased significantly and is threatening integrity of bank and Riverside Drive (Daren called in his boss to come look at as we were leaving, they will have to stabilize in some form until a more long-term solution is found)

4. Sixth Street
    - Fence hugs sidewalk west of sixth street
    - Erosion at bank seems to be similar to that seen on first site visit; Daren said that stakes and sand bags he put in several years ago are no longer doing their job and they are planning to remove
    - Manhole directly in middle of Riverside Drive is sewer, not storm
    - Storm manhole is large structure adjacent to bank, lid of which was too big/heavy to remove
    - Looking into catch bains along 6th street, outfall does not appear to be very deep (4-5' at corner of Riverside Drive and 6th Street, 3' at Cardozo School)
    - The five storm drains along 6th up to Cardozo school appear to all tie into pipe along western edge of 6th Street
    - The manhole cover behind catch basin at Cardozo school (just south of the fence) must be a drywell because there is no connection to the back of the catch basin
    - Daren points out that increased erosion at 7th St. outfall shows how soft the bank is and that maybe our Riverside Dr. project may not work after all; however, if we do not infiltrate any water at all it could work..

5. Bench
    - Path down to water starts ~ 20' east of used car lot
    - There are two large flat areas, one with two, distinct, levels
    - The edge separating the bench from the existing river level is very gradual
    - At time of visit there were a couple of tents occupying one of the benches

March 10th, 2015
1:30 – 3:00 PM – Technical Advisory Committee
City of Riverbank, CA

Attendees
Danielle Dolan – Local Government Commission
Peter Lolonis – City of Riverbank, Public Works Inspector
Eric Zickler – AECOM
Matthew Gerken –AECOM (on phone)
Kathleen Cleek – City of Riverbank
Barbara DeLaMore – Engineer, consultant with D.F. Engineering
Dave Hoberg (on phone) – Engineer, consultant with D.F Engineering
Michael Riddell – City of Riverbank
Bill Kull –City of Riverbank, City Engineer
Merril Putnam – AECOM

IN-LIEU FEE OVERVIEW – Matthew Gerken

- How to fund
  1. Project by project
  2. Fee by area of benefit
     e.g. Cannery = 12-31% increase
  3. City-wide fee
     e.g. 3-7% increase
     Does not consider capacity, or 'metering,' benefits
  4. Regional funding based on commonality of Stanislaus River water quality
  5. In-lieu fee credits
  6. Other funding sources linked to Water Quality and/or co-benefits
     e.g. Habitat Restoration grant from Dept. of Fish & Wildlife

- Important considerations
  - Projects' co-benefits
    - Habitat restoration, public space, traffic calming, air quality, etc.
    - SWRCB - Some elements the State considers as multiple benefits of LID projects include: urban greening, reduce flooding, reduce runoff, reduce energy consumption, reduce CO2, augment local water supply, increase conservation, increase awareness, improve stream habitat.
  - City undergoing comprehensive update of 2005 development fees (drainage, traffic, sewer, etc.)
    - Fees by dwelling unit and square footage of non-residential
    - Current drainage fee only about capacity, does not consider current regulatory environment (i.e. water quality), nor does 2008 SDSMP
    - Update will be more fine-grained – treat different land uses in accord with their impact
      - Looking at drainage portion increase from 12-17% of total impact fee to 13-34% (there is a lot of infrastructure required to build out the City to the extent detailed by the General Plan)
      - There is an opportunity to lower the drainage fee if it can be blended with other parts of the fee (e.g. traffic, parks, etc.)
    - Impact fees dictated by State Law in CA (AB1600) – ideas in this memo might be illegal at end of day

IN-LIEU FEE DISCUSSION – Matthew Gerken

- Q. - Barbara – what were external funding sources from lunch?
  - Prop 1 / Calfire / Add't Prop 84 grants
  - Riverbank well-suited to receive another grant based on this and previous LID study
  - Revision to Prop 218 requirements – just added stormwater drainage fee to one of the four fees that is except from 2/3 public approval vote IF stormwater is used to increase water supply; will remain to be tested if groundwater recharge can be considered as increasing supply
- Q. – Bill Kull – What went into cost?
  - No land acquisition or O&M

  - Projects that are not located on city land include Cannery, Cardozo School, and the Marsh; however, in case of the School, the City would not have to buy land, just work with the school to ensure if did not interfere with their existing/future program
- Q. - Matthew – What is TAC's initial reaction, what is the most attractive option?
  - Most attractive is funding from other sources
  - Funding through Caltrans Environmental Enhancement and Mitigation Program is competitive and most of it goes south. There have been attempts to attract funding related to SR 99 enhancement projects, which has been challenging
  - Environment enhancement and mitigation grants hard to get in Riverbank; typically awarded to highway improvement projects down south (LA) (e.g. Stanislaus County (StanCOG) is trying to enhance 99 and Caltrans not willing to help out in any way)
  - SWRCB: The word in my unit is that CalTrans is going to have our program take over some of their SW compliance projects. It's still in negotiations, but there might be some funds available in the next two years—possibly of the in-lieu variety.
- Kathleen – City currently on year 2 of new Phase II permit
  - All stormwater compliance comes out of the city's operations budget – there are hardly funds to maintain existing infrastructure let along meet all the new requirements
  - Maintenance of these projects would need to be financed by CFDs
- Q. – Eric – What is most onerous part about complying with existing permit?
  - Monitor everything that goes on (e.g. pools, construction, etc.)
  - Report on that monitoring
  - Track maintenance
  - Track chemical applications
  - Install filtration systems (new trash amendment)
  - Started as 5 acre 'construction' trigger, then 1 acre, now looking at 2,500 square feet (i.e. front yards)
  - No funding for any of the above
- Eric – Reiterates that the project is a study – it is okay to send message to CVRWQB that the new requirements are infeasible without outside funding – they need to be aware of the local reality
- Matthew – Reiterates developed fee structures are impact fee orientated work (i.e. we are only looking at development properties + outside grants)
- Q. - Matthew – What does TAC prefer, citywide approach (similar to insurance program in that any one project is not unduly affected) or benefit district approach?
  - Michael says John is in favor of the latter
  - CFDs for maintenance
  - There is the need to treat infill differently than greenfield areas
  - SWRCB: I would lean toward the latter as well. The district approach can likely leverage more stakeholders with common goals, and funding!
- Q. - Matthew – What does TAC think about considering quality and capacity together moving forward?
  - General consensus that there is no other choice although the City's existing plans do not account for this
  - Recognize the potential to offset future basins and pipes with LID projects
  - There is support for helping to reduce entitlement risk by doing some of the quantity/quality related LID design that can be incorporated into projects rather than considering this on a project-by-project basis.
- Bill - new development areas now have to incorporate LID into plans but still build dry lines to future infrastructure; LID is being accepted by developers
- Dave - it has been a challenge to educate clients over last 15 years because it is hard for them to see how LID can enhance their site; his clients arguments are based on verbage not hard #s; however, they have accepted the reality of the cost and he thinks they are coming around; Modesto is a different situation; LID push since 2000 so developers have accepted that you have to put in some kind of filter; however, not yet up to level of upfront planning for a grassy swale; developers resist predesign before project approved; Outside planning area, heck of a lot easier to fund/do centralized projects; true of Ceres, Turlock, parts of Modesto
- SWRCB - We have a new LID sizing tool that can make WQ benefits easier to see/quantify. Find it here: http://www.owp.csus.edu/research/software-tools.php
- Q. – Matthew - What does TAC think of integrated parks approach?

- Michael Riddell: there is no parks master plan; Sue Fitzpatrick (Parks Director) wants to ensure that the right design is used if drainage basins are also recreation areas
- Parks currently don't have master plan and one is currently being done / he thinks she is against integrating park/stormwater, possibly for maintenance reasons
- SWRCB - Obviously, some require more than others.
- Ceres approach – all of their parks are retaining basins; when there is no stormwater event, the public uses the whole park; Worked well for them but eventually need a way to convey the water out – typically pump into irrigation system (canal)

- Kathleen - would be nice to recycle water for landscaping and replace cost or irrigation (multi-benefit); especially given drought
  - Stormwater flows to OID or MID. Perhaps also the City could consider ways to store and use recycled water
  - Prop 1 will have recycling / purple pipe grants.
  - Back in the day, the City had talked about storing water for this at the First Street Basin, complemented by drought resistant landscaping
- All drainage closures have filters in downtown area revitalization– twice a year they are cleaned out
  - Filters are an easy retrofit but then an O&M issue
  - City currently does not have manpower to do this so contracts the maintenance work out; $1,800-$2,400 per service for total of $4,000-5,000/yr.
  - Kathleen: the City has two lighting and landscaping districts that fund stormwater – have two basins funded through this mechanism, but ongoing funding for this service is missing for much of the City. The design approach has been lacking – stormwater basins have been a locked up hole in some locations – i.e. no dual use – especially lost land when not raining (would be great to build a track around one of them)
- Q. - Dave - Wants to know answer to *'is there a particular cost threshold that will 'kill' a project' (?);* a hard question to answer but a really good one; Michael adds that there would be a myriad of answers depending on who you ask

LGC WORKSHOP - Danielle Dolan
April 30th – Riverbank Community Center - Registration link is up and people have already signed up
Solid Agenda – with input from Barbara, MEC and Eric

- Outstanding items:
  - Find local practitioners with experience doing LID in the area to present local case studies; ideally one person on design side and one on maintenance side; goal to identify from Workshop attendees what works, what doesn't work, and come up with a plan for region
    - Peter - underground park in Modesto; Dave said funded by separation of stormwater and sewer, then for flooding… but morphed into LID; there was a lot of material pulled out of the park which they had trouble getting rid of; Dave believes Will Wong was project manager but he will confirm
    - Dave – been doing individual projects with filters but nothing regional
    - Peter - City of Mantica tried on in a parking lot – had issues with discharge point into swale; will try to find information
    - Kathleen – will let Stormwater management partnership group know about the workshop on the website
    - Peter – Empire project?; will follow up with Paul or David Leeman
    - Dave - little project on school district campus with filters
    - Bill – Stanislaus County Claribel road-widening project all LID; has seen plans but they have only started construction; Bill has only seen plans but they have started construction; Bill will follow-up
    - Eric - multi-family home project near Riverbank High School that collects water which then drains through rock structure with some infiltration; Dave says small but creative
    - Peter - new soccer field complex with 6-8 fields (half synthetic) in Modesto is all LID; $10 million (all people from the Dept. that did that are gone)
    - Peter - Kaiser hospital – porous asphalt and retention; have to vacuum asphalt twice a year, particularly after harvests (dust); also breakdown of asphalt and loading issues

- Expert speaker
  - Peter - John Teravskis at WGR in Lodi – already involved with some of these cities anyway – built coalition of all MS4s Phase IIs on Permit Basics

- Barbara - Kevin Perry from meeting downtown; Kevin is expensive though and most of his examples are from Seattle and Portland

PROJECT CONCEPT REVIEW – Eric Zickler

- Overview of material presented at Fourth TAC meeting with addition of new section views and flow animations.

FOLLOW-UP

- Danielle will type up what a presenter would be expected to do and send along to TAC so they can follow-up on potential case studies/speakers
- Michael will put Danielle in contact with who does filters for Riverbank - make a little tradeshow of it – possibly get sponsors
- Eric – will create rough cost estimate of land acquisition for memo
- Eric – will prioritize projects - create a project kill graph
- Bill - Fatal flaw for Marsh is that it is in floodplain, he will give us more local data of different flood levels

May 27th, 2015
1:00 – 2:30 – Technical Advisory Committee
City of Riverbank, CA

Attendees
Danielle Dolan – Local Government Commission
Eric Zickler – Lotus Water
Alexander Quinn – AECOM
Matthew Gerken – AECOM (on phone)
Merril Putnam – AECOM
Dave Hoberg – Engineer, consultant with D.F. Engineering
Barbara DeLaMore - Engineer, consultant with D.F. Engineering
Peter Lolonis – City of Riverbank, Public Works Inspector
Daren Martin – City of Riverbank, Public Works Supervisor

OVERVIEW OF STUDY REPORT – Eric Zickler
- Briefly talked through contents of Memo
- Regulatory context might be dated in a couple months – new permit compliance coming July 1st

IN-LIEU FEE STRUCTURE w/ discussion - Alexander Quinn
- Based on AB1600 – cannot just assign all costs of LID to future development because undermines law; need to show a clear nexus between fee and development costs
- Did not only include in-lieu fees; other funding components /availability
    - Project fees
    - District fees/ taxes
    - City funds (*establish stormwater utility)
    - State & federal, grants and loans
- In-lieu fees do not typically include O&M or grant writing, - can include land acquisition and permitting but that we did not consider that in our cost estimates
- Two forms of nexus analysis – citywide or sub-watershed/ district level
- Grants section most hypothetical of the entire analysis
    - Take a lot of leadership, in kind support, to apply and carry forth
    - Can sometimes find contractor to write but cannot always guarantee them the project on the back end
    - State seems to be more generous with grants to help municipalities that are struggling to comply e.g. Lake Lake Berryessa – mobile home park intended for recreational use is now occupied 12 months a year and subsequently has had series of water quality violations regarding discharge to the lake, to help ease the burden of this huge bill the state has been favorable to giving them breaks in the form of awarding grants to address the problem
- Take away, far more onerous to do at district level, even with Cannery district; on other hand, implications at citywide level are not bad, provided you can secure grants
    - City-Wide is 5x less exp. Than district-wide
    - Best to do as in-lieu fee; provide option for developers to choose on-site or off-site (onerous!)
    - To make it work; need 1 BIG project to come forward; if do distinct-wide; localized
- Cardozo School interesting example because if City has to comply with WQ in existing neighborhood with no projected redevelopment, it is very onerous
- None of solutions are particularly great – in some scenarios not feasible at all – not even for whole picture, just capital, O&M not even considered
    - Dave – that is why this was a study
- City of San Francisco currently looking at stormwater fee to raise funds for O&M of stormwater projects but school districts get hit with huge fee for all their paved playgrounds & parking lots that had no water bill all of the sudden have huge fee

Questions –
- Q. Daren – whether projects manage flooding? what to do about that?

    - Master plan is responsible for this; basins and storm drains are the city's assets so their job to manage both flood and quality
- Quinn – what is the tipping point for which you consider in-lieu fee?
- Eric – biggest criticism with in-lieu fee is that fees never relate back to a tangible benefit – really challenging in infill because don't want to take money from people who have been living there for 50 years

Take-Aways & Next Steps -

- Eric - As engineer – what next? Would link to storm drain master plan and combine water quality and flooding in one - relate the outcome of this study to what may come July 1st
- Dave says difficult question to answer – learned something through the study – in-lieu fees are a difficult concept; it was good to consider, incentivize the development to work in redevelopment areas by giving them this option; unfortunately, the option does not seem as feasible as he had previously thought – where do you go from here? He is not sure he can answer – he wanted the other outcome. Small communities like RB, in Stan Cty there are several, could have really benefited from this type of program – this will not be attractive for developer – he will still be thinking about how to deal with Phase II MS4 on individual project
- Barbara – telling that the developers on the TAC are not at the meeting – early on we thought it may turn out like this
- Eric – analysis we did in terms of sub-watershed delineation, site definition, etc. is valuable for City; benefit to state on other hand is to understand implications of the permit at this level – trying to do the right thing by promoting infill but it's a struggle
- Project team would like to figure out how to promote beyond putting this up on a website – our tax dollars paid for this study – provide information to the greater State
- Riverbank will have a new planner from City of Livingston to replace John Anderson
- Dave – said clear that this (water quality and increasingly tough regulations) is not going away, getting a little more difficult with each phase of permit and July 1st is looming – how will we accommodate this reality – may prevent some developers from doing these projects – not clear to him – he thought could be more black and white with in-lieu fee – dollar sign feasibility bottom line –
- If we aren't treating every drop – as long as we are dealing with amount required – how city of Modesto is approaching and what this was doing too – can you get forgiveness in an old area, reduction? Something? And then be allowed to press on with best foot forward –
- Create in-lieu fee program – make commitment that alternative source of funds would come through to supplement
- Developer could use the data from this Study to go for variance – forgiveness in this location – community has this level of resources, I will achieve this level of density – can you give me a break on these requirements
- Dave - where would Cary go to seek this forgiveness? – he would have to go to the board, who actually paid for this Study
- Danielle – State and Regional board continue to say "work with us, don't wait until we regulate," but the requirements and how to implement them is still unclear; Water Boards need to provide more direction
- Peter – City has been trying to slowly integrate the requirements over the past 2-3 years – Little over year ago started with stormwater maintenance agreements
- Eric – would be interesting to come up with formula that related size of sub-watershed with redevelopment potential to equate whether possible to do in-lieu fee
- Dave – did we see a pattern when we did six sites? It would be interesting if we could look at different community to see if any parallels
- Eric – agrees, especially if could find a nearby community in Stanislaus County that is dealing with same permit
- Quinn – one thing the project team did not have much analysis on is cost on onsite vs. offsite – projects he worked, came up with idea of typical runoff based on zoning type, cost vs. benefit relationship – informs developers as well as State Board
- Eric – was not within our scope to come up with onsite unit cost because varies per site and a lot of creative ways to do LID onsite
- Quinn – could also add to Study analysis of what prevailing land price is, if put this fee on top of this property, you are essentially making it negative – curtailing any infill development – would be a strong message to present to the Board

STUDY EVALUATION - Danielle Dolan

1st goal – Develop Technical Advisory Committee to help establish specific project goals and objectives; and provide overall guidance and direction to project.

- goal met; 50% engagement of members throughout process
  Q. Danielle – what could we do differently next time to keep everyone engaged throughout the process?
  A. Eric – we had turnover in Project Team that created some large gaps between meetings, which likely contributed to inconsistent turnout

2nd goal – Ensure inter-and intra agency coordination of stormwater management activities with land use policy and avoid policy conflicts.

- Danielle - did not do good job of coordination with regional board – they perhaps did not want to say anything that can be turned against them
- Eric - our scope was dynamic and could have done a better job of having regular communication with Board to create scope that was something they could actually use
- Dave – want to be able to connect in personal way with Board and clarify concerns through a personal connection; a guy from Board once came to MEC club and did presentation and it was great – he got sense of what kind of reaction he would get if he were to call the Board with a question in the future
- Eric – someone from County would have been useful to have on TAC
- Peter – said City of Santa Rosa (SR) had TAC with 20-30 people on it – different departments from within city – refer to City of SR LID technical guidance manual for complete list
- Dave – in the end, difficult to get people to step up and volunteer their time

3rd & 4th goals – Characterize Watershed & Define LID Projects

- Danielle – consultant team did a great job and TAC feedback was critical to our success
- Dave - impressed with details of study – a lot of groundwork went into it which makes the Report very valid in his eyes – extensive research of local area
- Barbara – agrees, consultant team did a good job of characterization well before even got into site selection and project design
- Danielle - Consultant team & TAC spent time ground-truthing available data and its accuracy

5th goal – In lieu fee structure

- Most challenging aspect for Project Team
- Peter – always comes down to the money
- Danielle – did we include useful and correct information?
- Dave – we met goal but we do have a conclusion to it – not as practical as we were all hoping, at this time anyway

6th goal – Educate general public about stormwater management and the multi-benefit solutions that can be achieved in Riverbank by organizing one (1) community workshop.

- Danielle - passes out summary of LID workshop evaluations – not raving but okay
- Group - ratings may be reflection of delivery of bad news but attendance in itself was success
- Barbara – often folks don't even know where to go to get the information they need; just getting them in the same room and opening up conversation was beneficial.
- We did not have any developers there – Possibly do a half-day next time, or couple hours for different audiences, if want more developers to come
- Dave - disappointed with guy from State board – wanted more – he did not seem prepared and he is a reflection of what our tax dollars are going toward
- We're trying to comply; the water boards are not prepared to tell us what we need to know; "what's required, what do we need to do?"

7th goal - Educate policymakers (i.e., Planning Commission and City Council) about stormwater management solutions that provide multiple benefits to the community by providing two (2) educational presentations.

- Brief overview of how LGC accomplished this. No discussion

8th goal - Develop final plan.

- Reiterated what a great job the team did on the final report, what a great resource it will be.

A.10 Funding Approaches Memorandum

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Memorandum

To: Lower Stanislaus Low Impact Development Plan Technical Advisory Committee
From: Matthew Gerken
Date: March 6, 2015
Subject: Lower Stanislaus Low Impact Development Plan: Funding Approaches

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With the changing regulatory landscape and as part of this study of alternatives to on-site source control, it is not only important to consider the location and design of centralized Low Impact Development (LID) projects, but also effective financing strategies. While stormwater facilities have historically been funded mostly on an individual project basis, since these types of projects could provide water quality benefits in the Stanislaus River, promote groundwater recharge, and achieve other broader community benefits, alternative funding approaches could be appropriate. Centralized LID projects could be funded in a number of ways:

- By individual development projects;
- Through collection and use of in-lieu fees from an identified benefit area;
- Through external grant funding (especially for projects designed to have multiple benefits);
- Through the City's capital improvements program; and
- Potentially through other means or a combination of mechanisms.

This Memo provides a preliminary summary of options for funding centralized LID projects for discussion by the Technical Advisory Committee (TAC) and project team. We will develop a more detailed approach to funding based on input and feedback from the TAC.

LID Projects and Locations

LID projects have been located and designed in order to accommodate infill development and maximize co-benefits, with a focus on water quality, while achieving evolving regulatory requirements. These projects have different designs, appropriate to their individual locations. Projects include:

- Cannery Site Vegetated Buffer
- Hutcheson Park Bioretention
- Cardozo School Infiltration Gallery
- Riverside Drive Green Street
- 1st St Basin Treatment Improvements
- Open Space Treatment Marsh ("Riverside Bench")

Exhibit 1 shows the location of these projects and their direct benefit areas (also known as drainage management areas).

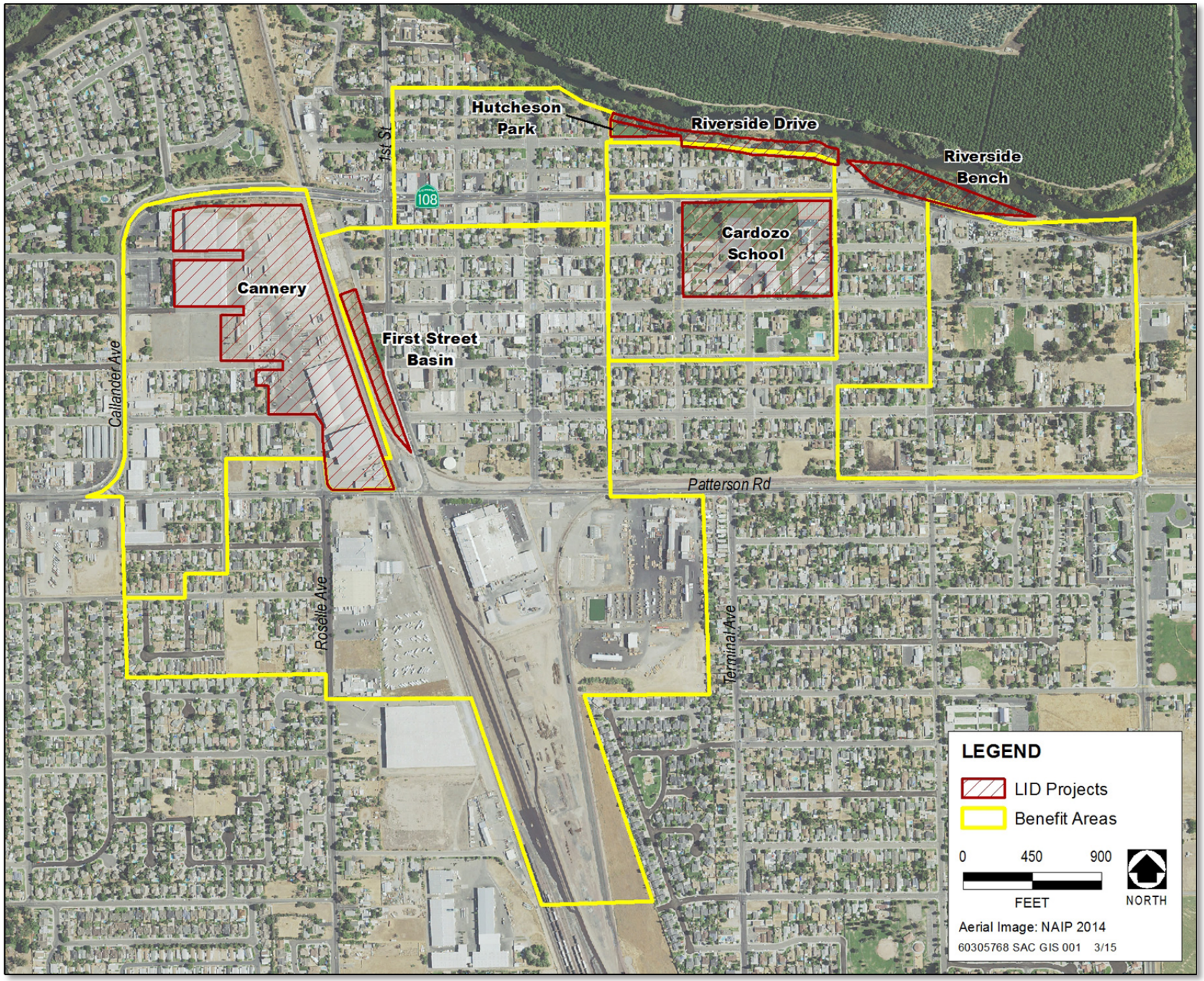

Exhibit 1 **LID Projects and Locations**

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LID Project Conceptual Cost Estimates

Planning-level cost estimates have been developed for each of the above centralized LID demonstration projects, as identified below in Table 1. As shown, the total cost estimate is approximately $13M.

Table 1
LID Project Conceptual Cost Estimates

Project	Conceptual Construction Cost Estimate
Cannery Site Vegetated Buffer	$ 3,285,000
Hutcheson Park Bioretention	$ 1,119,000
Cardozo School Infiltration Gallery	$ 1,276,000
Riverside Drive Green Street	$ 1,086,000
1st St Basin Treatment Improvements	$ 2,248,000
Open Space Treatment Marsh	$ 4,049,000
Total	$ 13,063,000

Development Impact Fee Update

The City is currently in the process of a comprehensive update to its development impact fees, including the storm drainage fee, to be consistent with the updated 2005-2025 General Plan. There is extensive guidance in the General Plan regarding the location, size, and design of public improvements that need to be factored into the updated fees. This, along with the updated development forecasts and updated estimates of infrastructure needs were used to derive new DRAFT fees.

Compared to existing fees, proposed fees are more detailed with respect to land use. Instead of just single- and multi-family categories, as with the existing program, the proposed fees have several different residential categories and the analysis is designed to reflect costs associated with different densities. The same is true on the non-residential side, where the Study includes additional non-residential categories to promote more accurate and representative costs for different land uses.

Distribution of Costs

California Government Code Sections 66000-66025 summarize legal requirements in California for a local government to levy a development impact fee. Local agencies are required to establish a nexus between the need for identified improvements and projects for which a fee is collected, and a reasonable relationship between the amount of the fee and the demand for the improvement generated by projects. Within the guidance provided in State law, different jurisdictions take different approaches.

Some jurisdictions establish citywide fees. Some jurisdictions identify “districts” where different fees would apply, based on the cost of infrastructure needed to serve development in each district. Some jurisdictions take a “hybrid” approach where some types of fees apply citywide and other fees are applied on a district-by-district basis. Riverbank’s current impact fees apply on a citywide basis.

EXAMPLE ASSIGNMENT OF COSTS, CITYWIDE

The LID projects identified as a part of this planning effort provide a regional benefit in improving water quality in the Stanislaus River, with a focus on pollutants of concern and mitigating the erosive conditions along the River corridor. On this basis, some type of regional funding approach could potentially be supported.

City fees are currently derived at the citywide level. If the construction of centralized LID projects is funded at the citywide level, this could increase total impact fees by between 3% and 7% per dwelling unit or per square foot of non-residential building space (Table 2).

However, the City could also reduce the existing drainage impact fee if LID projects are demonstrated to have a benefit in reduced demand on the drainage system (through a reduction in stormwater runoff following a storm event). While the LID projects are designed specifically to improve water quality, they provide many other co-benefits, including detaining and retaining stormwater. On-site detention and retention of stormwater in these areawide serving LID projects could reduce the level and size of drainage improvements elsewhere. In particular, the projects designed at the Cannery site, the First Street Basin and Cardozo School would provide stormwater capacity benefits to address flooding and peak flow abatement. Other potential co-benefits include new/improved public spaces, overall city aesthetics, groundwater recharge and, habitat enhancement/ restoration,

The increase in total impact fees if LID projects were funded on a citywide basis does not assume any such benefit of "upstream" projects that would reduce stormwater discharge. The actual level of peak flow reduction and benefit to the drainage system would require a more detailed analysis that is not included in this study.

Table 2
Example LID Costs, Assigned Citywide

Land Use	LID Project Costs	Per DU/KSF LID Costs	Total DRAFT Impact Fees	Increase Attributable to LID Projects
Residential				
Clustered Rural (RR)	$391,534.06	$ 1,566	$ 36,099	4%
Lower Density (LDR)	$6,264,545	$ 1,421	$ 26,586	5%
Medium Density (MDR)	$2,562,768	$ 573	$ 20,253	3%
Higher Density (HDR)	$925,444	$ 647	$ 18,087	4%
Mixed Use (Residential) (MU)	$71,188	$ 419	$ 15,492	3%
Non-Residential				
Community Commercial (CC)	$711,880	$ 872	$ 14,600	6%
Mixed Use (Commercial) (MU)	$355,940	$ 866	$ 14,820	6%
Industrial/Business Park (I/BP)	$1,566,136	$ 853	$ 14,330	6%
Office (MU)	$213,564	$ 838	$ 11,980	7%
Total	**$13,063,000**			

The location of land uses classifications outlined in Table 2 are depicted on Exhibit 2.

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Example Assignment of Costs by Direct Benefit District

If one were to assign costs of the centralized LID projects to the direct area of benefit (in terms of water quality treatment), this would address evolving regulatory requirements related to water quality for all projects within the prescribed benefit area, without the need to design and construct stormwater quality treatment on-site. This would allow subject projects to develop sites more completely and not place the burden of on-site stormwater control onto developers who are pursuing infill projects and potentially trying to achieve higher densities. LID projects incorporated into development plans can require between 4-11% of the total project site area. Using this centralized/areawide approach, development yields for participating projects could increase.

The assignment of costs by direct benefit district ignores the citywide and regional water quality benefits associated with the Stanislaus River and connected groundwater supplies.

The former Cannery site is used as an example for illustrative purposes. If the centralized LID project designed for this benefit area has its costs assigned to the direct drainage benefit area (assuming no regional or citywide water quality benefit), this would increase impact fees by between 12% and 31%, depending on the specific land use. For the other LID projects and their respective direct benefit areas, the cost increases would be different.

The conceptual cost estimates and allocations outlined in Table 4 assume a 50% reduction in the City's stormwater impact fee (not the LID project costs) in association with stormwater volume and flow control benefits that could be provided through the LID project designed for this site.

Table 4
Example LID Costs, Assigned by District

Land Use	LID Project Conceptual Costs	Per DU/KSF LID Costs	Total DRAFT Impact Fees	Increase Attributable to LID Projects
Residential				
Medium Density (MDR)	$208,798	$3,940	$ 20,253	13%
Mixed Use (Residential) (MU)	$1,398,436	$2,877	$ 15,492	12%
Non-Residential				
Community Commercial (CC)	$622,468	$5,995	$ 14,600	27%
Industrial/Business Park (I/BP) (Industrial Reuse)	$896,464	$5,865	$ 14,330	26%
Office (MU)	$158,835	$5,755	$ 11,980	31%
Total	**$3,285,000**			

Existing System Development Fees

The City has an existing development impact fee structure called "System Development Fees" that are based on a 2006 study that outlines the costs of public improvements and how these costs are distributed by land use type and scale/size of development. For example, there is a fee for storm drainage improvements, which in the 2006 study was $2,970 per unit for single-family development, $2,121 per unit for multi-family development, $1.44 per square foot of retail building space, $1.33 per square foot for office and other commercial building space, and $0.88 per square foot for industrial development.

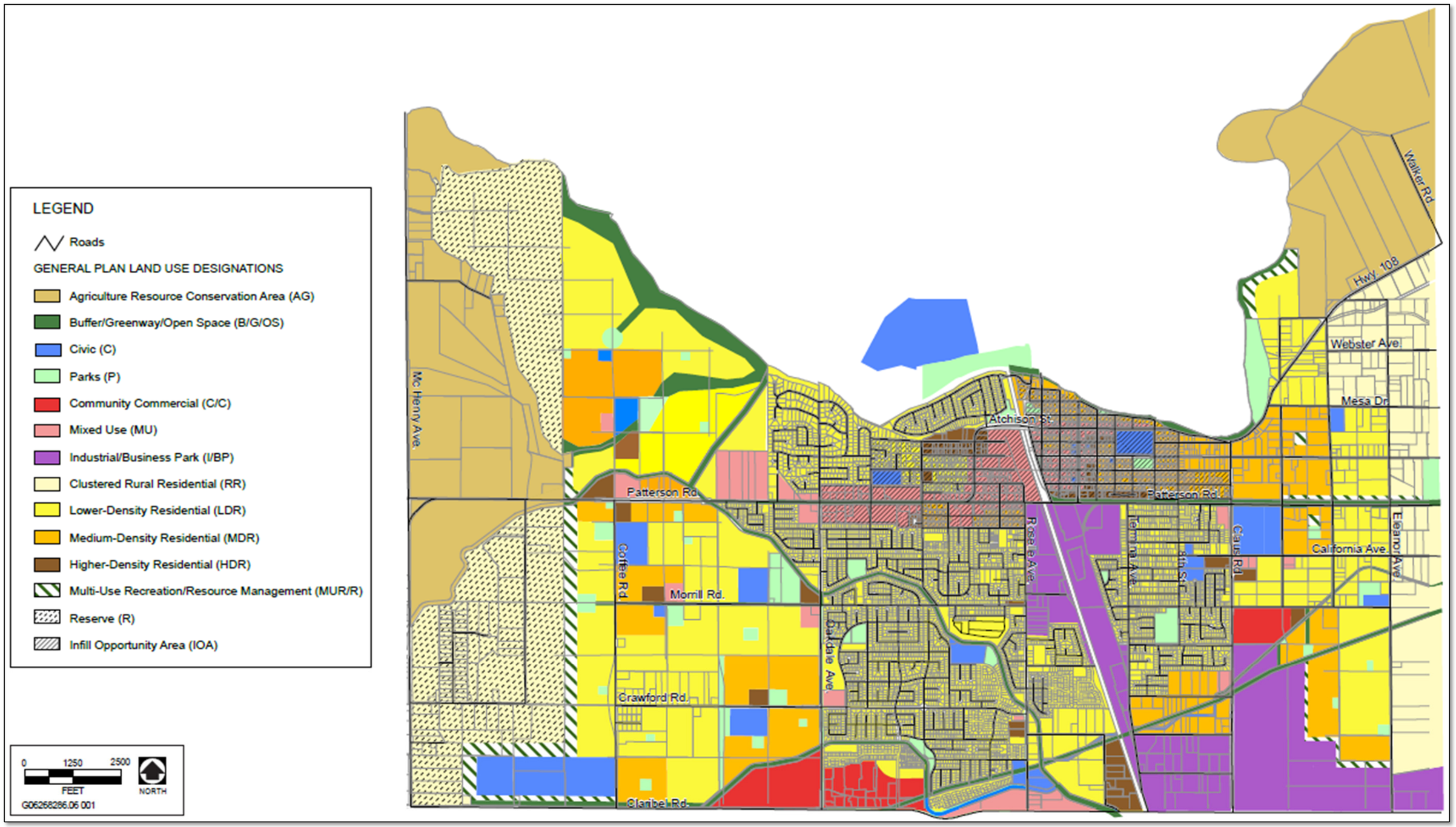

Exhibit 2 **City of Riverbank General Plan Land Use Classifications**

Table 3
City of Riverbank General Plan Land Use Classifications

Agricultural Resource Conservation Area (AG)	This designation provides for ongoing agricultural operations and land uses compatible with ongoing agricultural operations.
Buffer/Greenway/Open Space (B/G/OS)	This designation provides the opportunity to preserve important open spaces containing natural resources, such as sensitive biological habitat. This category also includes areas where buffering is necessary between different land uses. Bicycle and pedestrian pathways are also accommodated by this Land Use Designation.
Civic (C)	This category includes civic and cultural land uses of various types. Examples include schools, places of worship, public facilities and infrastructure, community halls, and similar cultural and civic land uses.
Parks (P)	This category includes active and passive parkland of all types.
Community Commercial (CC)	Areas with this designation are anticipated to be developed for retail, employment, and/or commercial services.
Mixed Use (MU)	This designation would accommodate neighborhood-scale retail uses, offices, personal and commercial services, and similar land uses. The Mixed Use designation also explicitly allows for higher-density residential development in a vertical or horizontal mixed-use setting. This could include residential development above (on upper stories of a building) or adjacent to commercial operations on the same property.
Industrial/Business Park (I/BP)	This designation includes manufacturing uses, as well as a mixture of light manufacturing and office spaces.
Clustered Rural Residential (RR)	This category provides an opportunity to preserve usable open space, including ongoing agricultural operations, or to protect natural resource areas. Residential development in this area must be clustered to preserve large and unbroken pieces of property for agriculture or open space, including both cultivation and grazing activities.
Lower-Density Residential (LDR)	This designation includes single-family homes, one to each lot, developed at a net density of up to eight dwelling units per acre.
Medium-Density Residential (MDR)	This category includes small-lot, single-family detached homes, attached single-family homes, and other residences developed at a net density of between eight and 16 dwelling units per acre.
Higher-Density Residential (HDR)	This category allows for all types of attached single-family and multi-family housing, including condominiums, apartment buildings, townhouses, and other similar residential structures developed at a net density of 16 or more dwelling units per acre.
Multi-Use Recreation/Resource Management (MUR/R)	This designation would provide opportunities for stormwater management, renewable energy production, and community recreation amenities. This area would accommodate stormwater detention facilities, groundwater recharge areas, wind generators, solar collectors, wind breaks, as well as trails, benches, and other passive recreational areas.
Reserve (R)	The Reserve category is intended for land that the City has not yet planned for a specific urban, agricultural, or resource land use. This designation does not necessarily imply urban development, but rather could be areas to preserve in natural open space or for agricultural use, for example.
Infill Opportunity Area (IOA)	The Infill Opportunity Area is an already developed portion of the Riverbank Planning Area. However, many properties within this area are vacant or otherwise underutilized. This General Plan designates an Infill Opportunity Area where the City will focus reinvestment, redevelopment, and revitalization efforts during this General Plan time horizon.

The existing fee structure does not take into account evolving regulatory requirements that will increase projects' responsibility for water quality since the storm water master plan on which fees are based did not factor in the existing regulatory environment.

DRAFT IMPACT FEE UPDATE AND LID PROJECTS

The DRAFT updated drainage impact fees are based on the City's most recently updated stormwater master plan, which does not factor in the current regulatory framework related to water quality treatment. In addition to impact fees for drainage facilities needed to manage the rate of runoff following certain storm events, future projects in Stanislaus County would also be required to address construction-related and long-term stormwater quality.

With this project, the City has the opportunity to explore the most efficient and cost-effective strategies to address both stormwater capacity and water quality requirements. With the "centralized" or areawide approaches developed as a part of this Plan, the City can consider the tradeoffs between the adopted standard of practice which includes a site-by-site approach to stormwater quantity and quality, and the more centralized approach as developed as part of this study. As documented in other deliverables associated with this Plan, there are several land use, aesthetic, and ongoing maintenance cost advantages to areawide approaches for stormwater management that could be embodied in an updated stormwater master plan.

The storm drainage portion of the City's DRAFT impact fees represents between 13% and 34% of the total impact fees, which include water, sewer, storm drainage, parks and recreation, general government, and transportation. The City's existing adopted fees show storm drainage's share at between 12% and 17%. However, neither fee structure fully accounts for costs (construction costs and opportunity costs associated with undeveloped land) needed to meet water quality requirements.

In general, the proportion that storm drainage represents of the total DRAFT impact fees is higher for non-residential development. So, while revising the drainage master plan to include centralized LID/stormwater management projects could be a strategy for addressing the current and future regulatory environment and reducing overall costs, this could potentially provide a particular benefit for non-residential development areas.

OTHER FUNDING OPTIONS

The funding approach depends, in part, on the type of LID project. During this planning effort and the previous LID Design Manual[1] prepared for Stanislaus County communities, there has been explicit consideration of the various co-benefits associated with LID projects – urban heat island reductions, aesthetic benefits, management of stormwater rates and erosion control, groundwater recharge, and others.

Grant Funding
Maximizing co-benefits in the location and design of LID projects can also be considered as a part of the funding strategy. City staff may identify future funding opportunities from outside sources that could be used to fund some or all of a local LID project that meets the funding source's criteria. City staff has been very successful in the recent past at being proactive regarding grant opportunities that help to provide local benefits (while also achieving the granting entities' funding objectives).

[1] Please see: http://www.riverbank.org/depts/developmentservices/pages/low_impact_development_design_manual.pdf for more information.

For example, Caltrans has a grant program called "Environmental Enhancement and Mitigation Program," which is focused on implementing environmental enhancement projects that provide environmental benefits or mitigation related to State Highway improvement projects. Funded projects must be in addition to the mitigation requirements identified in environmental documents for the subject highway projects. The State Water Resources Control Boards has in previous years had a grant program for "Concept Proposals," which is intended to fund projects that "reduce and prevent storm water contamination of rivers, lakes, and streams. Eligible project types include LID projects that on public or private lands that are designed to infiltrate, filter, store, evaporate, or retain runoff in close proximity to the source of water. The U.S. Fish and Wildlife Service has a "Cooperative Endangered Species Conservation Fund" program that can be used for acquisition of property for endangered species protection, but past successful applications have included co-benefits, such as recreation, and perhaps water quality enhancements.[2] These are a just a few examples of several that could be appropriate to support LID projects – particularly those that emphasize co-benefits.

Proactive efforts to bring outside resources for LID project development or matching funds could provide local infill projects with a competitive advantage.

Joint-Use Design and Funding
If the City integrated "green street" concepts into a road widening or improvement project, the LID portion of this project could be funded by the same combination of funding that is used for the roadway improvement project (or supplemented with a separate set of funding for the added cost of incorporating LID). A park project could be designed to include a LID component that would provide areawide stormwater capacity and water quality benefit, but may be mostly funded by park impact fees. A trails improvement project along the Stanislaus River should consider LID projects, such as the open space treatment marsh designed along the "Riverside Bench." Passive landscaping along public rights-of-way could be converted to LID projects, using a combination of funding sources. Open space buffers can be provided along high-volume, high-speed roadways that provide LID treatment benefits, as well as noise attenuation benefits, and could have a combination of funding. A project that requires mitigation for natural resources of some sort could potentially be designed to involve restoration of the subject habitat, along with LID and potentially stormwater capacity benefits, reducing the total cost involved for each obligation (habitat, water quality, drainage capacity).

Fees and Fee Credits

In addition to collecting in-lieu fees to support construction of LID projects, project sites that are located at the fringe of the City's Planning Area, that would be expected to have lower-density development, may be able to accommodate LID projects that provide areawide benefits. Such projects could be positioned to receive fee credits from this program in exchange for the dedication of land to on-site LID projects (that could also have stormwater capacity benefits).

Key Questions and Potential Points of Discussion

- Should key stakeholders actively consider a regional funding mechanism that can be used to fund or match local funding for LID projects that provide regional water quality benefits?
- Would you favor a citywide approach for funding LID projects, consistent with the balance of City impact fees?

[2] For some examples, please see: https://www.fws.gov/endangered/esa-library/pdf/04Awards.pdf

- Should the City investigate LID project designs that can also optimize stormwater capacity benefits, so that the existing drainage fee can be reduced or eliminated for certain projects or areas in favor of the LID project fee? (It is challenging to find locations for LID projects that can provide capacity benefits *and* water quality benefits, but there would be additional opportunity for this in future drainage master planning efforts that examine areas outside the existing City limits).
- Would you favor a benefit district approach to assigning LID costs, or are you concerned that this ignores the regional and citywide water quality benefits?
- Should the City investigate a "hybrid" approach for funding LID projects that has regional, citywide, and benefit district components?
- Is there an opportunity both to provide an in-lieu fee structure and also credits for projects that are not near existing or planned neighborhood centers (that are located at the fringes of the City's Planning Area)? (This concept would likely apply more to future efforts, and less to this planning effort, since we are now focused on LID within the existing developed City).
- Should the City examine the storm drainage master plan to integrate the existing and anticipated future regulatory framework and take advantage of cost savings available through the "centralized/areawide" strategies forwarded in this planning effort?
- Should City staff work with other stakeholders and interested organizations to proactively pursue grant funding that could be used to support LID projects (while also providing other community, environmental, etc. benefits)?
- Should the City explore an integrated parks / open space / drainage master plan to help optimize co-benefits and reduce total cost of the provision of each of these facilities/services?
- Other questions and points of discussion?
- Is there a particular cost threshold that will "kill" a project (fee price point)?
- What does the TAC think would be the most effective approach: a new citywide fee just for LID/ stormwater, or an increase to the existing citywide impact fee, or specific development-area fees for specific projects/ sub-basins?

TAC Members

Riverbank LID Technical Advisory Committee		
Name	Title	Affiliation
Kathleen Cleek	Sr. Management Analyst	City of Riverbank
Michael Riddell	Deputy Development Services Director – Operations	City of Riverbank
Peter Lolonis	Construction Inspector	City of Riverbank
John Anderson	Contract Planner	City of Riverbank
Elizabeth Lee	Sr. Water Resources Control Engineer, Unit Chief	Central Valley Regional WQCB
Genevieve (Gen) Sparks	Environmental Scientist	Central Valley Regional WQCB
Cary Pope		Developer
Bill Kull	City Engineer	City of Riverbank / Giuliani & Kull
Dave Hoberg	Civil Engineer	DF Engineering, Inc.
Barbara DeLaMare		DF Engineering, Inc.
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Alexander Quinn	Senior Economist	AECOM
OTHER CONTACTS		
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Aja Verburg	Club VP	Modesto Engineers Club

Modesto Engineers Club Meeting Announcement

THE MODESTO ENGINEERS CLUB
Since 1932
FIELD NOTES

*Club Motto: "**First the Engineer!**"*

Volume 2014, Issue 10 www.modestoengineersclub.org October, 2014

FEATURED TOPIC: ***City of Riverbank Low Impact Development (LID) Alternative Compliance Study***

Speakers:
Eric Zickler (AECOM) and Danielle Dolan (Local Government Commission)

The purpose of the presentation is to engage the local development community in the study, to improve the likelihood that the Alternative Compliance Plan and in-lieu fee structure is adopted, and the conceptualized LID projects are implemented by the local development community. The presentation on October 7th will include an overview of the grant goals and objectives, partnership between Local Government Commission (LGC), AECOM, and the City of Riverbank, the benefits of LID, and specific stormwater management techniques AECOM is recommending.

AECOM and LGC will be conducting a stormwater management and LID workshop in our region this Spring, and would like to collect input from the Modesto Engineering Club members regarding what specific topics they would be most interested in learning about.

Please join us Tuesday, October 7th, 2014 11:30am at Old Mill Café in Modesto for this presentation.

2013-2014 Officers

President: Evangelina Paoluccio, PE
NV5

Vice President: Aja Verburg, PE
Black Water Consulting Engineers

Secretary/Treasurer: Matt Swanson, PE
ENGEO, Incorporated

Local Government Commission

Complete and Green Streets in the San Joaquin Valley

Thursday, February 19, 2015
6:00 pm – 9:00 pm
Greens Market
953 Tenth Street Street, Modesto

6:00 **Networking Reception**

6:30 **Welcome & Introductions**

6:45 **Supporting Complete and Green Streets in Our Communities**

Paul Zykofsky, Local Government Commission
Economic benefits of Complete Streets

Kevin Robert Perry, Urban Rain/Design
Tools and Benefits of Green Streets and Low Impact Development

7:30 **Group Discussion**

8:30 **Wrap-Up**

8:45 **Adjourn**

This event is made possible with support from the Osprey Foundation and the State Water Resources Control Board.

Complete and Green Streets in the San Joaquin Valley Dinner Forum

Modesto, CA * February 19, 2015

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General Interest Survey

Local Government Commission LID Workshop

The Local Government Commission and AECOM will be hosting a Low Impact Development (LID) Workshop for the greater Stanislaus County region Engineering and Design community this Spring (February or March) 2015. This workshop is part of our State Water Board Stormwater Program grant, "Lower Stanisalus LID Plan."

We hope that the Modesto Engineers Club will partner with us in making this workshop both successful and beneficial to your community. Please answer this brief survey so we can get a better sense of your interests.

1. Please select and rank the topics you are most interested in learning about at the LID Workshop (1 being most interested, 10 being least interested).

	LID Philosophy & Principles
	Economic & Environmental Benefits of LID
	LID Best Management Practices
	LID in urban redevelopment
	LID in new development/ suburban expansion
	LID for Multiple benefits (water quality, water supply, wastewater treatment, environmental services)
	LID Site Design, Planning & Management
	On-site LID projects vs. Regional LID projects
	Alternative Compliance for MS4 Permitting
	Community Engagement/ Public Participation in LID

Local Government Commission LID Workshop

2. Which of the following specific LID Techniques are you interested in learning more about?

	Very Interested	Somewhat Interested	Not Very Interested	Not At All Interested
Permeable Pavement/ Semi-pervious Surfaces	◯	◯	◯	◯
Rain Gardens & Stormwater Swales	◯	◯	◯	◯
Green Highways & Green Streets	◯	◯	◯	◯
Retention/Detention & Percolation Basins	◯	◯	◯	◯
Mixed-use recharge Zones	◯	◯	◯	◯
Underground Settling Basins	◯	◯	◯	◯
Rainwater Capture; On-site and/or Off-site Re-use	◯	◯	◯	◯
Harnessing Stormwater for Alternative Supply	◯	◯	◯	◯
LID planning & design tools	◯	◯	◯	◯

3. Are you interested in partnering with the Local Government Commission to plan and/or host this workshop?

◯ Yes

◯ Maybe

◯ No

4. In what way(s) are you interested in helping with this workshop?

☐ Sponsoring (MEC or my specific company/ organization) will help promote the workshop, and will add our logo to all promotional materials

☐ Selecting Topics

☐ Planning Agenda

☐ Recruiting Speakers

☐ Identifying Tools & Resources

Other (please specify)

Page 2

Local Government Commission LID Workshop

5. How likely is it that you will attend the LID Workshop?

- ◯ Very Likely
- ◯ Somewhat Likely
- ◯ Somewhat Unikely
- ◯ Very Unlikely

6. What would make you more likely to attend the LID workshop?

7. What other organizations and/or individuals do you recommend we reach out to in organizing this LID workshop?

8. Optional: Please provide your contact information below if you would like to be more involved in organizing the LID workshop.

Name	
Company/ Organization	
Email Address	
Phone Number	

Lower Stanislaus LID Plan **12-419-550**

Presentation to the Riverbank City Council
Tuesday, March 10, 2015

The City of Riverbank is a general law city, governed by a City Council/City Manager form of government. The City Council is comprised of five members, selected through an at-large municipal election to serve a four-year term, including the Mayor. Elections are conducted on staggered even years with (2) Councilmembers elected during one election year and (2) Councilmembers, plus the Mayor elected at the next even election year, so transition of a continuing measure is maintained from one Council to the next.

The City Council also serves as the Local Redevelopment Authority and the Public Financing Authority. These boards meet on an "as needed" basis.

Regular City Council meetings are scheduled on the 2nd and 4th Tuesday of each month at 6:00 p.m. The Council meetings are held in the City Council Chamber located at 6707 Third Street, Suite B, in downtown Riverbank, unless otherwise noticed. If you have any questions regarding the City Council, please contact the City Clerk's Office at (209) 863-7198; cityclerk@riverbank.org or the Administration office at (209) 863-7122.

Members of the Riverbank City Council; all in attendance:

Mayor Richard D. O'Brien
Message Phone: (209) 863-7198
Email: robrien@riverbank.org
Term Expires: 11/2016

Vice Mayor Cal Campbell
Message Phone: (209) 863-7198
Email: ccampbell@riverbank.org
Term Expires: 11/2018

Councilmember Darlene Barber-Martinez
Message Phone: (209) 863-7198
Email: dbmartinez@riverbank.org
Term Expires: 11/2016

Councilmember Leanne Jones Cruz
Message Phone: (209) 863-7198
Email: ljonescruz@riverbank.org

Councilmember Jeanine Tucker
Message Phone: (209) 863-7198
Email: jtucker@riverbank.org
Term Expires: 11/2016

Also in attendance:
Unidentified members of the City of Riverbank Staff
Unidentified community members
(no sign-in sheet provided)

Riverbank Low Impact Development Alternative Compliance Study

Presentation to Riverbank City Council

Danielle Dolan, Local Government Commission

Tuesday, March 10, 2015

Local Government Commission

We are a nonprofit organization that *fosters innovation* in local environmental sustainability, economic prosperity, and social equity.

www.lgc.org

The LGC helps transform communities through *inspiration*, *practical assistance* and a *network* of visionary local elected and community leaders.

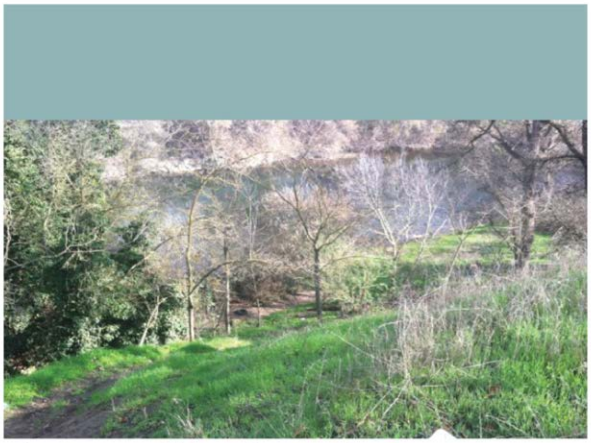
How we do it:

- ✓ Workshops and Trainings
- ✓ Participatory Planning and Design Work
- ✓ Policy Development Assistance
- ✓ Tours of Model Projects
- ✓ Networking Events
- ✓ Conferences

Local Government Commission www.lgc.org

The Riverbank LID Alternative Compliance Study strives to…

- ➢ *Protect and improve water quality in the Stanislaus River,*
- ➢ *Promote groundwater recharge,*
- ➢ *Achieve broader community goals and benefits.*



Local Government Commission

LID is a development approach that **mimics natural processes** on a site to **manage stormwater** close to its source.

Figure 4–1 Examples of potential strategies and technologies

Slow, Sink, Spread, to:

- *Reduce pollutant loads*
- *Utilize stormwater as a resource*
- *Provide multiple community benefits*

Local Government Commission

LID can achieve other community priorities.

Like what?

- ✓ Enhancing Public Safety
  - ✓ Complete Streets
  - ✓ Traffic Calming
  - ✓ Quality of Life
  - ✓ Community Health
- ✓ Improving Infrastructure
- ✓ Retaining and Attracting Businesses
  - ✓ Urban Greening
  - ✓ Beautification

Local Government Commission

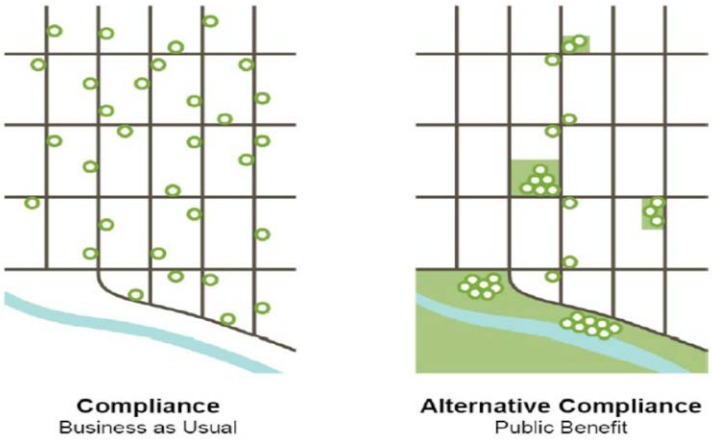
The Riverbank Alternative Compliance Study will help overcome some of the challenges with LID.

	On-Site Treatment (Conventional LID)	Centralized Treatment (Alternative Compliance Approach)
Benefits	• Source-control • Clear ownership	• Flexibility • Ease of monitoring • Potential community benefit (e.g. multifunctional open space)
Challenges	• Uses valuable space within properties • Difficult in highly developed areas • Piecemeal approach • Problematic maintenance	• Difficult in highly developed areas • Additional burden placed on City to locate, design, and maintain systems

Table 1–1 Approaches to Stormwater Treatment

Local Government Commission www.lgc.org

The Riverbank Alternative Compliance Study will help achieve multiple community benefits.



Compliance
Business as Usual

Alternative Compliance
Public Benefit

Figure 2–2 Compliance vs. Alternative Compliance - Alternative Compliance can lead to clustered LID projects that provide greater community-wide benefits; e.g., several rain gardens grouped together can form an aesthetic and functioning wetland surrounded by a recreation trail.

- *Options for the City & Developers*
- *Align with General Plan Goals*
- *Comply with State permits*
- *Designs and costs for LID features*
- *Long-term financial planning for in-lieu fee structures*

www.lgc.org


Questions or Comments?
Riverbank Low Impact Development Alternative Compliance Study
Danielle Dolan, Local Government Commission
ddolan@lgc.org
916-448-1198 x311

LID Workshop Flier

WHAT:

AN INTERACTIVE WORKSHOP FOR THE GREATER STANISLAUS COUNTY REGION PLANNINGAND DEVELOPMENT COMMUNITY.

WORKSHOP DESCRIPTION:

We will discuss strategies for removing barriers and integrating LID into sustainable community planning, design and construction. An emphasis will be placed on integrating LID into community-wide planning efforts and taking a neighborhood, community-wide, or regional approach to LID implementation.

WHO SHOULD ATTEND:

- City Staff
- County Staff
- Planners
- Engineers
- Developers
- Designers
- Environmental organizations
- Stormwater managers

AGENDA

Session:	Topic:	Invited Speakers:
Introductions	Purpose of the workshop, introductory ice breaker.	LGC & AECOM
1 LID 101 Panel	• Philosophy, principles, benifits of low impact development (LID): including national context & importance. • Brief presentation on Urban Forestry/ LID. • State Water Board presentation on Phase II Small MS4 Gerneral Permit and approach to Alternative Compliance.	Melanie Carr, CBEC Eco Engineers Jennifer Alvarez, CivicSpark Bill Hereth, State Water Board
2 Local Panel	• Regional case-study examples, with an emphasis on struggles & overcoming barriers.	Local Practitioners: 1 David Felix, City of Modesto & Bill Strand, RRM 2 Koosun Kim, City of Newman
3 Group Discussion	• Analyze the presentations, focusing on specific barrriers and challenges. • Develop a set of questions, issues, concerns, to be addressed later.	All, facilitated by LGC & AECOM team
LUNCH Optional Site Visit	Networking; lunch provided. Optional “walking lunch” to proposed project location(s).	NA
4 Feasibility Study Presentation	• Lower Stanislaus River LID Alternative Compliance Study.	Eric Zickler, & Mathew Gerken AECOM
5 Small-Group Exercise	• Problem-solving to identify specific solutions to challenges identified in session 3.	All Attendees; Facilitated by LGC & AECOM Team
6 BREAK Clustering Activity	Identify preferred technology/treatments for LID via Design Manual Posters.	All Attendees
7 Report Out	• Whole group report back on small-group discussion & synthesize small-group output.	All Attendees
8 LID in the SJV	• Identify preferred approaches and next steps for implementing low impact development in the San Joaquin Valley.	All, facilitated by LGC & AECOM team
CLOSE	Exit Evaluation.	All Attendees

Please forward this invitation to any of your following staff:

- Public Works, Operations, Maintenance, Budgets, etc.
- Planners
- Civil and/or Environmental Engineers
- Community Developers
- Designers/Landscape Designers/Architects
- Environmental Specialists
- Stormwater Managers
- Architects

As a member of the Greater Stanislaus County Region planning and development Community, we would like to invite you to an interactive and informative workshop on low impact development strategies for stormwater management.

We will address common challenges to integrating LID into sustainable community planning, design and construction, and highlight local projects that successfully overcame those challenges. An emphasis will be placed on LID as part of community-wide planning efforts and taking a neighborhood, multi-site approach to LID implementation.

When:
Thursday, April 30, 2015
8:30am-4:30pm

Where:
Riverbank Community Center
3600 Santa Fe Street
Riverbank, CA 95367

Cost: $35 Through April 23
Lunch Included!

Workshop Description

We will discuss strategies for removing barriers and integrating LID into sustainable community planning, design and construction. An emphasis will be placed on integrating LID into community-wide planning efforts and taking a neighborhood, community-wide, or regional approach to LID implementation CLICK HERE for more information, including the workshop agenda.

Who Should Attend

- City Staff
- County Staff
- Planners
- Engineers
- Developers
- Designers
- Environmental organizations
- Stormwater managers

Agenda

We hope to see you there!

Lunch is being sponsored in part by Revel Environmental Manufacturing (REM)

LID Workshop Evaluation Results

Making LID Work for US
Economic & Environmental Benefits of LID for New & In-Fill Development
April 30, 2015 - Riverbank, CA
Evaluation Results

1. As a result of attending this workshop I was able to…

Answer Options	Strongly agree	Agree	Disagree	Strongly disagree	Response Count
Gain a better understanding of LID Benefits, Principles, and Philosophy	10	8	0	0	18
Identify challenges and solutions specific to my community	8	9	1	0	18
Identify preferred strategies and next steps for broader implementation of LID in the Stanislaus region	7	10	1	0	18
				Answered question	18
				skipped question	0

2. Please respond to the following statements:

Answer Options	Strongly agree	Agree	Disagree	Strongly disagree	Response Count
I feel better equipped to implement LID strategies into my future development projects	3	12	3	0	18
I am committed to help with the next steps identified for achieving broader implementation of LID in the Stanislaus region	9	6	3	0	18
				Answered question	18
				skipped question	0

3. Please rate the value of the following sessions:

Answer Options	Excellent	Very Good	Good	Fair	Poor	Response Count
Sessions 1: LID 101 Panel	8	4	3	3	0	18
Session 2: Local Panel	4	4	8	2	0	18
Session 3: Group Discussion	6	4	8	0	0	18
Session 4: Feasibility Study	3	4	8	2	0	17
Session 5: Small-Group Exercise	6	5	7	0	0	18
Session 6: Report out	5	3	9	1	0	18
Session 7: LID in SJV	4	3	7	3	0	17
				answered question		18
				skipped question		2

4. What questions do you still have about LID?

- Applicability for flat land areas like Turlock and for areas that use retention basins.
- Costs associated with maintenance
- I need to be more familiar about what the requirements are exactly/ for example when LID would potentially kill a project
- Program for on-going maintenance

5. In the space provided below, please share any additional feedback on the workshop:

- More clarification of the regulations, less on what we think about the regulations as a group.
- Board representative was a bit ambiguous
- Thank You
- The use of local examples (not ideas or theories) was very much appreciated

Project Performance Measures Table Summary

Local Government Commission
State Water Board Grant Agreement No. 12-419-550
Project Performance Measures Table / PAEP

I. Project Summary

A. Funding Program: Proposition 84 Stormwater Grant Program Planning Grant

B. Project Description:
The Lower Stanislaus River Regional Low Impact Development Plan will identify "regional" LID projects as part of a comprehensive LID program. These projects will provide stormwater management for multiple sites in priority reinvestment areas. The size, location, and design of the projects will be keyed to anticipated development in these priority areas. The Plan will include design and cost estimates of regional LID to support an in-lieu fee program for design, construction, and maintenance of regional LID solutions. The projects would handle stormwater management needs, but also improve water quality, promote groundwater recharge, and achieve broader community goals

C. Problem Statement:
The site-by-site approach embodied in low impact development (LID) can sometimes work against other planning principles, such as compact and infill development. In addition, a dispersed LID system can be difficult to manage, monitor, and maintain over time, and can lead to LID features failing. This grant will fund research that is needed to address the physical and fiscal constraints of on-site LID, which are disproportionately experienced by projects in infill, brownfield, and redevelopment contexts. In these areas, land is at a premium, compared to the urban fringe. Some LID solutions can be either land consumptive and/or too expensive to be incorporated in the financing of infill projects. This situation exists in communities across the state. Therefore, this Plan will serve as a demonstration project for communities throughout the San Joaquin and beyond. Infill and redevelopment areas are of particular importance given recent state legislation that encourages more compact and coordinated growth (i.e., SB 375, AB 32, formation of Strategic Growth Council, etc.). This Plan will allow local governments to comply with both stormwater management goals and sustainable growth goals.

To address these challenges, the Plan will be identifying in-lieu solutions that manage the rate of runoff equal to on-site solutions. Projects identified in the Plan will manage runoff from multiple sites in a targeted reinvestment area, thus helping to address the maintenance and operation costs associated with a highly dispersed LID system. The LID solutions will also provide a more coordinated LID network that will help lower the ongoing costs of maintenance and operation.

Riverbank is also dependent on groundwater and, therefore, this is an important co-benefit of this Plan. The Plan will explore regional LID projects that can enhance water quality, manage runoff, but also provide groundwater recharge co-benefits.

The Plan leverages other studies and planning efforts, including the City's General Plan and EIR. The City’s Downtown Specific Plan includes policies that address drainage/water quality and would be implemented by this Plan. Riverbank has recently updated its Storm Water Master Plan, which provides data and analysis useful to this Plan. Riverbank is also developing LID standards and specifications to be used in new developments. The data and analysis from this related work will support this Plan. The Plan would build on the efforts completed by a team of

Local Government Commission
State Water Board Grant Agreement No. 12-419-550
Project Performance Measures Table / PAEP

U.C. Davis ecologists to help the communities integrate wildlife connectivity into local planning efforts, with a focus on the Stanislaus River corridor. The Plan would build on previous restoration plans developed for Central Valley Rivers, including the lower Stanislaus River.

This project presents the challenge of creating performance-based relationships between regional LID projects and distributed on-site source controls. The challenge results primarily from the difficulty in matching centralized project costs and performance to units of development potential, such as square footage of impervious surface or the ratio of land cover types in new development. However, to overcome this challenge, the team proposes to apply engineering methodology, LID design experience, knowledge of the current regulatory environment, knowledge of local economic and development conditions, and land use policy to provide a holistic analysis that accounts for the social, economic, and environmental tradeoffs of these different approaches to stormwater management. The result is an equitable relationship between two different stormwater management strategies, their development factors, and the opportunity cost related to each.

D. & E. Project Activities and Tasks and Associated Categories

Task	Activity	Category
1	Develop Technical Advisory Committee to help establish specific project goals and objectives; and provide overall guidance and direction to project.	Planning, Research, Monitoring and Assessment
2	Ensure inter-and intra agency coordination of stormwater management activities with land use policy and avoid policy conflicts.	Planning, Research, Monitoring and Assessment
3	Characterize Watershed	Planning, Research, Monitoring and Assessment
4	Define LID Projects	Planning, Research, Monitoring and Assessment
5	Develop In-Lieu Fee Structure	Planning, Research, Monitoring and Assessment
6	Educate general public about stormwater management and the multi-benefit solutions that can be achieved in Riverbank by organizing one (1) community workshop.	Education, Outreach, and Capacity-Building
7	Educate policymakers (i.e., Planning Commission and City Council) about stormwater management solutions that provide multiple benefits to the community by providing two (2) educational presentations.	Education, Outreach, and Capacity-Building
8	Develop final plan.	Planning, Research, Monitoring and Assessment

Local Government Commission
State Water Board Grant Agreement No. 12-419-550
Project Performance Measures Table / PAEP

Project Goals	Desired Outcomes	Output Indicators	Outcome Indicators	Measurement Tools and Methods	Targets
Develop Technical Advisory Committee to help establish specific project goals and objectives; and provide overall guidance and direction to project.	The project reflects the multiple goals and objectives of the various agencies and interests represented by the TAC. TAC members are engaged throughout the planning effort. TAC members support final plan.	Roster of TAC reflects diverse agency and stakeholder representation. Meeting notes from TAC meetings represent input from majority of TAC members.	Draft goals and objectives for project are updated to reflect input from TAC. Sustained and consistent participation from TAC.	Sign-in sheet from all 6 TAC meetings. Meetings notes from all 6 TAC meetings documenting input and comments.	100% attendance of all TAC members for all 6 meetings. 100% of TAC members support and endorse final plan.
Ensure inter-and intra agency coordination of stormwater management activities with land use policy and avoid policy conflicts.	Provide document summarizing relevant planning and environmental information as well as relevant data. Increase in coordination within city departments on stormwater management and land use planning activities. Increase in coordination and communication between city and regional water board.	Memo summarizing relevant planning and environmental documentation as well as relevant physical, spatial and water quality data with Project boundaries.	Increased awareness of city staff from multiple departments regarding stormwater management activities and how it relates to land use policy and planning. New connections are made between city staff and regional water board staff.	Sign-in sheets/rosters of TAC meetings that include both city representations from multiple departments and representation from regional water board. Memo is distributed to all city representatives and regional water board	City staff from three different departments are engaged and attend TAC meetings. At minimum 1 staff from regional water board is engaged and attend TAC meetings. All city and regional water board staff serving on TAC review and provide comments

				representatives for review and comment.	on memo.
Characterize Watershed	Boundaries of sub-watersheds within the study area are identified and delineated. Existing conditions and needs assessment per-sub-watersheds are completed. Areas in sub-watershed are prioritized based on need based on reinvestment potential, development pressure, and/or drainage and water quality issues.	Create watershed boundary map. Create Watershed Study Area Opportunities and Constraints Map Draft memo outlining existing conditions, needs and results of the prioritization process.	Increased awareness of city staff and TAC members regarding boundaries of sub-watersheds in project area; opportunities, constraints and needs of sub-watersheds within project area.	Meetings notes from TAC meetings documenting input and comments on maps and memos presented. Memo is distributed to all city representatives and regional water board representatives for review and comment.	Watershed boundary map is approved by city staff. Watershed Study Area Opportunities and Constraints Map is approved by city staff. Final memo outlining existing conditions, needs, and results of prioritization process.
Define LID Projects	List of LID BMPs is developed that maximizes opportunities to mimic the natural hydrologic conditions with the relevant areas of the sub-watershed.	Performance criteria established for LID projects that is linked with identified needs in the sub-watershed. Identify specific LID projects and locations in project area. Develop	Increased understanding of city staff and TAC regarding how various LID projects perform in various locations of the city and sub-watershed. Increased awareness of city staff regarding how and	Meetings notes from TAC meetings documenting input and comments on performance criteria, list of LID projects, and cost estimates.	City staff approve map locating various LID project interventions, cost associated with those interventions, and conceptual designs of LID interventions.

Local Government Commission
State Water Board Grant Agreement No. 12-419-550
Project Performance Measures Table / PAEP

		conceptual level designs of LID projects that demonstrate performance and have associated cost estimates.	where different LID project interventions can be located in their community. Increased awareness of city staff regarding how much various LID project interventions cost.		
Develop In-Lieu Fee Structure	Increase alternative compliance opportunities for developments that may incur usually high relative fees or have other unique conditions.	Identify specific thresholds for in-lieu development fees and determine appropriate units for assessing fees. Draft in-lieu fee plan summarizing the findings and providing recommendations for the Project development and associated fee structure.	Increased understanding of city staff and TAC regarding how an in-lieu fee program for community/regional LID projects can work in Riverbank.	Meetings notes from TAC meetings documenting input and comments on thresholds for in-lieu development fees; and input and comments on draft in-lieu fee plan.	Final in-lieu fee structure approved by city staff.
Educate general public about stormwater management and the multi-benefit	Reduce stromwater pollution by sharing basic stormwater quality information at events.	Develop presentations and activities for community workshop.	Increased awareness of water quality and stormwater issues in the City and sub-watershed; LID	Sign-in sheets. Residents will fill out post-workshop evaluation form.	50 residents engaged. 100% of those engaged will agree

solutions that can be achieved in Riverbank by organizing one (1) community workshop.	Increase awareness of general public regarding stormwater management and how innovative solutions that provide multiple community co-benefits. Generate public awareness of and support for adoption of plan once completed.		solutions in general; and community/regional LID solutions that can be applied in Riverbank that provide multiple benefits to the community. Increased support of LID and pursuing a community/regional approach to LID.		they have increased their knowledge related to stormwater management and the multi-benefit solutions that can be achieved in Riverbank. The final in-lieu fee program and community-wide plan for LID is adopted by City Council and supported by the public.
Educate policymakers (i.e., Planning Commission and City Council) about stormwater management solutions that provide multiple benefits to the community by providing two (2) educational presentations.	Increase awareness of and support for LID principles and LID solutions that can be applied at neighborhood/community level. Answer any questions about LID and this project so as to minimize concerns and build support for the project.	Develop presentation for policymakers. Present at minimum of one time to both the Planning Commission and City Council.	Increased awareness of water quality and stormwater issues in the City and sub-watershed; LID solutions in general; and community/regional LID solutions that can be applied in Riverbank that provide multiple benefits to the community.	Each group will be asked to evaluate the information they have received, either in writing or via verbal comments that will be recorded and summarized.	Two policy maker groups will be engaged. 100% of Commissioners and Council Members who hear the presentations will agree that they have increased their knowledge related to water quality and stormwater issues in the City and sub-

Local Government Commission
State Water Board Grant Agreement No. 12-419-550
Project Performance Measures Table / PAEP

			Increased support of LID and pursuing a community/regional approach to LID.		watershed; LID solutions in general; and community/regional LID solutions that can be applied in Riverbank that provide multiple benefits to the community. The final in-lieu fee program and community-wide plan for LID is adopted by City Council and supported by Planning Commission.
Develop final plan.	Provide a final plan that summarizes all data, research, maps, LID projects, and in-lieu fee structure.	Prepare draft plan that is circulated to TAC, state water board, and city staff for comment input. Draft plan is presented to city council for comment and questions.	Increase in support from TAC, state water board, city staff, and city council for final plan.	List of comments on draft plan from TAC, state water board, city staff, and city council. Final plan is approved by city council.	The final in-lieu fee program and community-wide plan for LID is adopted by City Council and supported by the public.

Local Government Commission
State Water Board Grant Agreement No. 12-419-550
Project Performance Measures Table / PAEP

		Input from city council, TAC, state water board, and city staff are incorporated and final plan is drafted.			

Final TAC Project Evaluation Form

Low Impact Development (LID) Alternative Compliance Study
Technical Advisory Committee
Project Evaluation Survey

At the TAC kick-off meeting in November of 2013, the TAC identified eight (8) project goals. Please evaluate how well we achieved these goals throughout the course of the project. We ask that you answer these questions honestly and completely, as we will use this information to pursue and improve future projects in this region.

Please Use the following Scale:

1	2	3	4
Very Effective/ Strongly Agree	Somewhat Effective/ Somewhat Agree	Somewhat Ineffective/ Somewhat Disagree	Very Ineffective/ Strongly Disagree

1. Develop Technical Advisory Committee to help establish specific project goals and objectives; and provide overall guidance and direction to project.

Desired Outcomes	**1**	**2**	**3**	**4**
The project reflected the multiple goals and objectives of the various agencies and interests represented by the TAC.				
TAC members were engaged throughout the planning effort.				
TAC members support the final plan.				

What could have been done differently, or improved upon?

---

2. Ensure inter-and intra agency coordination of stormwater management activities with land use policy and avoid policy conflicts.

Desired Outcomes	**1**	**2**	**3**	**4**
Provided a document summarizing relevant planning and environmental information as well as relevant data.				
Increased coordination within city departments on stormwater management and land use planning activities.				
Increased coordination and communication between city and regional water board.				

What could have been done differently, or improved upon?

---

3. Characterize Watershed.

Desired Outcomes	**1**	**2**	**3**	**4**
Boundaries of sub watersheds within the study area were identified and delineated.				
Existing conditions and needs assessment per sub-watersheds were completed.				
Areas in sub-watersheds were prioritized based on need, reinvestment potential, development pressure, and/or drainage and water quality issues.				

What could have been done differently, or improved upon?

---

4. **Define LID Projects.**

Desired Outcomes	**1**	**2**	**3**	**4**
List of LID BMPs was developed that maximizes opportunities to mimic the natural hydrologic conditions with the relevant areas of the sub-watershed.				

What could have been done differently, or improved upon?

---

5. **Develop In-Lieu Fee Structure.**

Desired Outcomes	**1**	**2**	**3**	**4**
Increased alternative compliance opportunities for developments that may incur unusually high relative fees or have other unique conditions.				

What could have been done differently, or improved upon?

---

6. **Develop Educate general public about stormwater management and the multi-benefit solutions that can be achieved in Riverbank by organizing one (1) community workshop.**

Desired Outcomes	**1**	**2**	**3**	**4**
Reduced stormwater pollution by sharing basic stormwater quality information at events.				
Increased awareness of the general public regarding stormwater management & innovative solutions that provide multiple benefits.				
Generated public awareness of and support for adoption of the plan once completed.				

What could have been done differently, or improved upon?

---

7. **Educate policymakers (i.e., Planning Commission and City Council) about stormwater management solutions that provide multiple benefits to the community by providing two (2) educational presentations.**

Desired Outcomes	**1**	**2**	**3**	**4**
Increased awareness of and support for LID principles and LID solutions that can be applied at the neighborhood/ community level.				
Answered any questions about LID and this project so as to minimize concerns and build support for the project.				

What could have been done differently, or improved upon?

---

8. **Develop final plan.**

Desired Outcomes	**1**	**2**	**3**	**4**
Provided a final plan that summarized all data, research, maps, LID projects, and an in-lieu fee structure.				

What could have been done differently, or improved upon?

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