CITY OF HOLLISTER

Storm Drain Master Plan

APRIL 2011

PREPARED BY

WALLACE GROUP®

CITY OF HOLLISTER

STORM DRAIN MASTER PLAN

APRIL 2011

City Council

Mayor Pauline Valdivia

Vice Mayor Ray Friend

Councilman Robert Scattini

Councilman Doug Emerson

Councilman Victor Gomez

Approved By:

_____

David Rubcic, P.E. 57601
Senior Civil Engineer

Prepared By:

_____

Kari Wagner, P.E. 66026
Senior Civil Engineer

_____

Valerie Huff, P.E. 72426
Civil Engineer

WALLACE GROUP®

TABLE OF CONTENTS

CHAPTER 1 INTRODUCTION 1-1
Purpose 1-1
Related Reports and Studies 1-1
Environmental Review 1-3
Authorization and Scope of Work 1-3
Acknowledgements 1-5

CHAPTER 2 STUDY AREA CHARACTERISTICS 2-1
Regional Watershed 2-1
Topography 2-1
Climate 2-2
Soils 2-2
Land Use 2-3

CHAPTER 3 STORM DRAIN SYSTEM OVERVIEW 3-1
Storm Drain Mapping 3-1
Existing Storm Drain System 3-2
Drainage Problem Areas 3-4
General Capital Improvement Recommendations 3-5

CHAPTER 4 STORM WATER MANAGEMENT AND LONG-TERM WATERSHED PROTECTION 4-1
Background 4-1
Existing City of Hollister Water Quality Elements 4-4
Summary and Recommendations 4-12

CHAPTER 5 STORM DRAIN DESIGN STANDARDS 5-1
Introduction 5-1
Hydrology 5-1
Hydraulics 5-9
Conclusions and Recommendations 5-10

CHAPTER 6 STORM DRAIN SYSTEM ANALYSIS 6-1
Introduction 6-1
Storm Drain System Analysis Criteria 6-1
Storm Drain Model Development 6-2
Storm Drain Model Test Run 6-6
Storm Drain Model Results – Existing Conditions 6-7
Drainage Problem Area Analysis 6-9
Storm Drain Model Results – Future Conditions 6-10
Sump Conditions 6-12
Floodplain Review 6-14

CHAPTER 7 INDUSTRIAL WASTEWATER TREATMENT PLANT ANALYSIS 7-1
Existing Facilities 7-1
Storm Drain Collection System Alternatives 7-2
Industrial Wastewater Treatment Plant 7-5
Recommendations 7-8

CHAPTER 8 CAPITAL IMPROVEMENT PROGRAM 8-1
Basis of Capital Improvement Program Costs 8-1
Timing of Recommended Improvements 8-2
Capital Improvement Project Summary 8-2
Operations and Maintenance Projects 8-3
1st Priority Project No. 1: San Felipe Ditch Upgrade 8-10
1st Priority Project No. 2: Monterey & Hawkins Upgrade 8-11
1st Priority Project No. 3: 4th & Line Upgrade 8-12
1st Priority Project No. 4: San Benito & 6th Upgrade 8-13
1st Priority Project No. 5: San Benito & 1st Upgrade 8-14
1st Priority Project No. 6: San Benito & Haydon Upgrade 8-15
1st Priority Project No. 7: Bella Vista & Sunnyslope 8-16
2nd Priority Project No. 1: Rustic Basin 8-17
2nd Priority Project No. 2: Suiter Street 8-18
2nd Priority Project No. 3: Powell Street 8-19
2nd Priority Project No. 4: South to IWWTP 8-20
2nd Priority Project No. 5: San Felipe 8-21
2nd Priority Project No. 6: South Street 8-22
2nd Priority Project No. 7: Memorial Drive 8-23
2nd Priority Project No. 8: Line Street 8-24
2nd Priority Project No. 9: Third & East 8-25
2nd Priority Project No. 10: Clearview Drive 8-26
2nd Priority Project No. 11: Sunnyslope Road 8-27
2nd Priority Project No. 12: Hawkins Street 8-28
2nd Priority Project No. 13: Central Avenue 8-29
2nd Priority Project No. 14: Hillcrest Road 8-30
2nd Priority Project No. 15: Felice Drive 8-31
2nd Priority Project No. 16: Citation Way 8-32
2nd Priority Project No. 17: Knight Lane 8-33
2nd Priority Project No. 18: Clearview Drive at Hillcrest 8-34
2nd Priority Project No. 19: Nash Road 8-35
3rd Priority Project No. 1: Meridian Street 8-36
3rd Priority Project No. 2: Westside Boulevard 8-37
3rd Priority Project No. 3: Apollo Way 8-38
3rd Priority Project No. 4: Nash Road 8-39
3rd Priority Project No. 5: Airway Pond 8-40
3rd Priority Project No. 6: “A” Street 8-41
3rd Priority Project No. 7: Miller Road 8-42

APPENDIX A STORMWATER MANAGEMENT CODE REVIEW AND CHECKLISTS

APPENDIX B STORM MODEL REFERENCE INFORMATION

APPENDIX C EXHIBITS

LIST OF TABLES

Table 2-1 Study Area Hydrologic Soil Groups 2-3
Table 2-2 Study Area Existing Land Use 2-4
Table 2-3 Study Area General Plan Land Use 2-5
Table 3-1 Existing Storm Drain Pipeline Inventory 3-2
Table 3-2 Storm Drain Basin Inventory 3-3
Table 3-3 Drainage Problem Areas 3-4
Table 4-1 Summary of Outfall Sampling Data 4-10
Table 5-1 City of Hollister Design Storm Return Interval 5-2
Table 5-2 Storm Drain master Plan Design Storm Return Interval 5-2
Table 5-3 Rational Method C Values 5-3
Table 5-4 Curve Number (CN) Values for AMC II 5-6
Table 5-5 Fractional Rainfall for 24-Hour Design Storm, 5-Minute Pattern 5-7
Table 5-6 24-Hour Design Storm Participation Depth 5-9
Table 6-1 Outfall Conditions for 100-year Storm 6-4
Table 6-2 Drainage Basin Summary 6-5
Table 6-3 Model Test Run Summary, 10-year Storm 6-7
Table 6-4 Summary of Locations with Sump Conditions 6-12
Table 7-1 85% Storm Event Diversion Capacity 7-5
Table 8-1 Unit Cost for Construction of Storm Drain Improvements 8-1
Table 8-2 City of Hollister Storm Drain CIP Ranking Matrix 8-4
Table 8-3 City of Hollister 1st Priority Capital Improvement Program 8-5
Table 8-4 City of Hollister 2nd Priority Capital Improvement Program 8-6
Table 8-5 City of Hollister 3rd Priority Capital Improvement Program 8-8
Table 8-6 City of Hollister Operations and Maintenance Projects 8-9

LIST OF FIGURES

Figure 2-1 Study Boundary 2-6
Figure 2-2 NRCS Soils Data Hydrologic Group 2-7
Figure 2-3 Existing Study Area Land Use 2-8
Figure 2-4 Study Area General Plan Land Use 2-9
Figure 3-1 Storm Drain Overview 3-7
Figure 3-2 Storm Drain Problem Areas 3-8
Figure 5-1 Design Storm Rainfall Pattern 5-7
Figure 6-1 Storm Drain Model Overview 6-16
Figure 6-2 Floodplains and Existing Land Use 6-17
Figure 6-3 Floodplains and General Plan Land Use 6-18
Figure 6-4 Existing Inverse Sloped Storm Drain Pipes 6-19
Figure 7-1 Outfall Locations 6-10
Figure 7-2 Industrial Wastewater Treatment Plant 6-11
Figure 7-3 Outfall C11-1OF Diversion 6-12
Figure 7-4 Outfall D12-1OF Diversion 6-13
Figure 7-5 Outfall E13-2OF Diversion 6-14
Figure 7-6 Outfall E12-1OF Diversion 6-15

CHAPTER 1

INTRODUCTION

This report presents the Storm Drain Master Plan (SDMP) for the City of Hollister (City). The City is located in San Benito County (County) 40 miles east of Monterey, and is intersected by State Highways 156 and 25. The City has an existing population of 37,054. The City is governed by a City Council made up of a Mayor, Vice Mayor, and three council members. The City is currently responsible for the maintenance and operation of the storm drain system serving the City of Hollister.

PURPOSE

The City of Hollister owns and operates a storm drain system comprised of multiple networks of inlets and pipes that flow to either the San Benito River, Santa Ana Creek, or a terminal basin within the City's system. The City also owns and operates an industrial wastewater treatment plant that collects storm water during wet weather.

Preparation of the SDMP will assist the City in prioritizing both existing and future storm drain system needs through repair, rehabilitation, replacement, and new facility installation.

RELATED REPORTS AND STUDIES

Multiple documents were reviewed and referenced for the development of this Master Plan, including the City's previous Storm Drain Master Plan, developed in 2001, and other related reports and studies. This section provides a brief overview of relevant referenced reports.

City of Hollister Storm Drain Master Plan 2001

The previous Storm Drain Master Plan was prepared for the City in March 2002. The Master Plan focused on a hydraulic analysis of the City's storm drain network. The study area encompassed the entire City and tributary drainage areas. This Master Plan was reviewed to identify storm water analysis criteria and consider improvements previously recommended for the City's storm water system.

The 2002 Master Plan utilized the existing City of Hollister design standards. The majority of pipes were analyzed for 15-year storm conditions. Water surface elevations (WSE) for all creek or river outfalls were also based on 15-year storm conditions. The analysis determined that approximately 9.7 miles of existing storm drain piping was deficient for future conditions (2010). Improvement recommendations focused on pipe upgrades as storm water retention and/or detention was "found to be not appropriate because of physical setting and the lack of available open land". Any improvement projects for the storm water system subsequent to the 2001 Master Plan are assumed to be reflected in the City's AutoCAD storm water basemap.

Storm Water Master Plan for the Hollister Municipal Airport

The Storm Water Master Plan for the City Airport was completed January 2010, and adopted by the City Council March 2010. The Master Plan analyzed drainage on the Airport property only. This Master Plan was reviewed to determine if the existing and future storm water infrastructure for the Airport could affect the City's storm drainage system.

The Airport Storm Water Master Plan utilized the existing City of Hollister design standards. The onsite storm drain pipe network was analyzed for the 15-year storm. According to the report there are upgrades required to the onsite storm water system to convey existing flow, and additional upgrades required to convey flow under proposed conditions. The report indicated that future peak flows would increase with future development but did not propose mitigation. The report did identify potential locations for storm water detention basins. The report identified that appropriate onsite storm water BMPs include bio-filter swales, permeable paving, and infiltration basins.

Based on the Airport Master Plan, the airport property in general drains north and northwest. It is noted that the storm water analysis assumed no offsite drainage contribution from the land area to the south of the Airport, including the Airway storm water basin near Flynn Road. There is an existing drainage channel on the west side of San Felipe Road (Highway 156) that conveys storm water north. According to the Airport Master Plan report this channel captures runoff from a portion of the Airport. Although the channel is north of the City of Hollister limits, portions of the City may drain to this channel as well, and if the channel was adversely affected by Airport storm water then flooding could occur upstream in the City. Evaluation of the capacity of this open channel is beyond the scope of this Master Plan analysis. A detailed drainage study should be conducted concurrent with engineering design of any Airport infrastructure upgrades, to verify capacity of this channel with respect to future Airport drainage conditions.

Pajaro River Watershed Study

The Pajaro River Watershed Study is a four phase analysis and planning document for the Pajaro River Watershed completed under the authority of the Pajaro River Watershed Flood Prevention Authority. Phases 1, 2, and 3 of the study are complete. The Pajaro River Watershed is a large regional watershed covering approximately 1,300 square miles within the Counties of Monterey, San Benito, Santa Clara, and Santa Cruz. The Pajaro River Watershed encompasses the City of Hollister.

Phase 1 of the Pajaro River Watershed Study established hydrology models to describe watershed conditions and flood impacts. The hydrology model was calibrated to multiple rain and river gauges in the watershed. This study provides valuable background information for the hydrologic analysis of the City of Hollister. This study will be used as a reference for various hydrologic parameters, including rainfall distribution, design storm rainfall depth, soil moisture conditions, and coefficients describing runoff potential in relation to land surface conditions.

City of Hollister Westside Infrastructure Master Plan

The Westside Infrastructure Master Plan was completed for the City of Hollister in 1994. This Master Plan analyzed land use, sanitary sewer, storm sewer, industrial sewer and storm drain, and water distribution for the planning area known as the Westside Area. The Westside Area encompasses approximately 150 acres bounded on the north by Highway 156, on the south by South Street, on the east by Line Street, and on the west by City Corporation Yard and Industrial Wastewater Treatment Plant.

The Westside Infrastructure Master Plan includes an analysis of both the storm drain and industrial storm drain system in the planning area, and recommendations for upgrades to these systems based on build-out conditions. The analysis of these systems will be compared results from the analysis conducted under this Storm Drain Master Plan. Background information on the storm drain and industrial storm drain systems contained in the Westside Master Plan will be incorporated into this Master Plan.

ENVIRONMENTAL REVIEW

In accordance with Title 14, California Code of Regulations, Chapter 3, Article 18 (Statutory Exemptions), this SDMP is considered a planning study and therefore adoption of this document is exempt from the requirements to prepare Environmental Impact Reports (EIR) or Negative Declarations (ND). However, on a project-specific basis, the California Environmental Quality Act (CEQA) must be satisfied for any major capital improvement project described in this report that will be implemented by the City in the future, through the preparation of an appropriate EIR or ND.

AUTHORIZATION AND SCOPE OF WORK

On February 1, 2010, the City authorized Wallace Group to prepare a comprehensive Storm Drain Master Plan. The Storm Drain Master Plan was prepared in accordance with Wallace Group's proposal, dated November 9, 2009. The Scope of Work is as follows.

Survey: Wallace Group, in conjunction with San Benito Engineering & Surveying, Inc., will identify the trunk storm water system that will need to be modeled (24-inches and larger), survey the rim elevations of each storm water manhole, dip the manhole to obtain the invert elevation of the flow line, will survey the locations of all of the sidewalk inlets that connect to the main trunk system, survey the existing detention basins (inlet and outlet structures, and bottom and top elevation of the basin), and all outlet structures to the local rivers or creeks. Wallace Group will also obtain detailed survey (inlet dimension, street cross slope) at locations of known flooding. Wallace Group will take pictures of the storm drain facilities, which would then be included in the GIS database.

Geographic Information System (GIS): Wallace Group will design and create an ESRI ArcGIS 9.3 personal geodatabase for the City. We will complete the mapping and attributing of the storm drainage system for the entire City. We will develop the storm drainage geodatabase to allow for integration with the storm drainage modeling software. This will allow the City to efficiently transfer storm drainage collection system

changes between the GIS and the storm drainage modeling software. We will also attach the scanned drawings from Task 2.1 to the appropriate pipe segments for the City's use in the future. We will generate updated maps for the study area that delineates storm drainage pipes, storm drainage structures, tributary areas, etc. for existing and future systems. We will also prepare atlas maps of the collection system similar to the City's existing atlas maps. These atlas maps are useful for documenting daily activities, identifying problem locations, and noting changes to the database.

Long Term Watershed Protection: We will analyze and evaluate water quality, pollutant loading, and storm water management considerations, based on the following items:

Local Hydromodification Control Criteria and Applicability Thresholds. We will research existing data sources and summarize local water quality and LID design considerations identified as needed by the joint effort defined methodology or as appropriate to satisfy other hydromodification control criteria required by the Regional Board.

Processes, Procedures, and Forms to Facilitate Annual Reporting. We will research existing processes, procedures and forms and interview up to 5 key employees who provide data necessary to complete SWMP annual reports.

Pollutant Loading Characterization Data. We will research existing testing locations, testing methods and quality assurance plans for their ability to analyze pollutant loading characterization. We will review mapping of the City and determine if additional testing locations are warranted.

Public Outreach. Facilitate outreach with the public, development, planning and engineering communities of pending changes to better ensure that adopted regulations are a good fit for the community and watershed.

Design Standards Review: We will review the City's existing design standards and specifications for storm water system facilities, and make recommendations for updates or improvements. We will also make recommendations for design standards for new development based on land use type, and using the Rational Method for runoff calculations. Rational Method criteria will include "C" values, time of concentration determination, and IDF (intensity, duration, and frequency) curves for various design storms. Design standards for retention and detention basins will be developed including percolation rates where applicable. This task will also evaluate opportunities to promote (or mandate) LID and identify any barriers or conflicts to its implementation.

Storm Drain Modeling: We will evaluate selected conveyance system components based on a review of information collected in Task 2.0, a study of the general plan, interviews with City staff, and field inspections of specific improvements. It is anticipated that evaluation of those conveyance systems warranting capacity review will include: areas of known deficiencies, storm drains with watersheds subject to notable future development, and storm drains 24-inches in diameter and larger.

Review of Floodplains: We will prepare a map that overlays the FEMA mapped floodplains (100-year and 500-year) over the City land use maps. Based on this, we will identify concerns for existing and proposed development and recommend appropriate policies for floodplain management. We will comment on the potential for the planned General Plan development to impact the floodplain elevations. We will evaluate flooding elevations and impact on the storm drain system when the river is at flood stage.

Industrial Wastewater Treatment Plant Analysis: We will evaluate opportunities to convey additional storm water to the industrial wastewater treatment plant, in lieu of going to the outfalls. We will evaluate the industrial wastewater treatment plant for capacity to handle various storms, treatment options and phasing options. We will provide capital improvement recommendations for the industrial wastewater treatment plant to be incorporated into the Capital Improvement Program.

Storm Drain Master Plan: We will utilize the information determined in the previous tasks and prepare a SDMP. The master plan will provide a summary of the existing facilities, stormwater flows, identified system capacity deficiencies for existing and future conditions, recommended capital improvement projects (CIP), and conformance with existing and potential future NPDES regulations. The CIPs will be grouped into three categories; 1st Priority, those projects that are required for existing problem areas as identified by the City, 2nd Priority, those projects required to upgrade deficiencies identified through the modeling effort, and 3rd Priority, those upgrades that are required due to future development (duration depending on future development). We will determine cost estimates for each of the CIPs and O&M activities, which will include construction and soft costs.

ACKNOWLEDGEMENTS

Wallace Group thanks and gratefully acknowledges the following City of Hollister and San Benito County staff for their efforts, involvement, input and assistance in preparing the SDMP:

City of Hollister

David Rubcic, P.E., P.L.S., Senior Civil Engineer
Rudi Golnik, P.E., Engineering Manager/City Engineer
Danny Hillstock, Utility Engineer
Henry Gonzales, Utility Supervisor
Ray Rojas, Street Supervisor
Dennis Rose, Wastewater Treatment Plant Supervisor
Mary Paxton, Planning Manager

San Benito County

Steve Wittry, P.E., Public Works Administrator
Rene Anchieta, GIS Analyst

The SDMP was completed with the efforts of many team members. They include:

Wallace Group

Kari Wagner, P.E., Senior Civil Engineer
Craig Campbell, P.E., Principal Engineer
Valerie Huff, P.E., Civil Engineer
Rob Lepore, GISP, GIS Specialist
Rob Miller, P.E., Principal Engineer
Ed Reading, P.L.S., Senior Land Surveyor

San Benito Engineering and Surveying, Inc.

Ken Weatherly, P.L.S.

CHAPTER 2

STUDY AREA CHARACTERISTICS

This Chapter presents an overview of the characteristics of the City of Hollister and surrounding area that are pertinent to storm drain master planning. The City of Hollister is the County Seat and the largest city in San Benito County. Agriculture is the predominant economic activity in the County. The majority of urban growth in the County over the past 20 years has been concentrated in the City.

REGIONAL WATERSHED

The City of Hollister is part of a large watershed that extends from Tres Pinos Creek south of the City to the northern border of San Benito County, as defined by the Natural Resources Conservation Service (NRCS) in cooperation with the California Interagency Watershed Mapping Committee. The City drains to the San Benito River and the Santa Anta Creek, which both flow north to the Pajaro River. In general, the watershed slopes north and northwest.

Study Boundary

The Storm Drain Master Plan boundary (study boundary) has been defined based on the City's existing storm water infrastructure, existing topography, and the City of Hollister General Plan boundary. All parcels that slope toward the City, or currently drain to the City's storm water system, and are contained within the General Plan boundary have been included in the study boundary. In the case that only a portion of a parcel currently slopes toward the City, the entire parcel has been included in the study boundary. Any developed areas outside of the existing City limits that are served by an existing drainage system that does not drain to the City's storm drain system will not be considered in this Master Plan for hydrologic or hydraulic analysis.

A storm water master plan was recently completed for the Hollister Municipal Airport property, and as such the Airport is not included in this study. The City storm drain system contributes to the Enterprise Road drainage pond, however the pond and downstream storm drain system is under the jurisdiction of the County. The Enterprise pond is tributary to San Benito River, and has a large drainage area that extends south and east of the City. Tributary storm water flow from this area will be based on the *Enterprise Storm Basin Technical Report* completed for the County in 1996. The study boundary is illustrated in Figure 2-1. The study area totals 8,007 acres. The Enterprise Pond drainage area outside of the study boundary totals 2,191 acres.

TOPOGRAPHY

The City of Hollister is characterized by relatively flat land, generally sloping north and northwest. Elevations range from approximately 500 feet in the southeast part of the City near Fairview Road and Airline Highway to approximately 200 feet in the northern portion of the City near the Hollister Municipal Airport. The terrain is hilly near the San

Benito River, west of the Southern Pacific railroad line northwest of the City, and in the undeveloped and agricultural land east of the City.

CLIMATE

The City of Hollister has a mild climate, with an average daytime high temperature ranging from 81°F during the summer months to 60°F during the winter months. Mean monthly temperatures range from 68°F to 49°F. The City's yearly rainfall ranges from a high of 26 inches to a low of under 7 inches, with the majority of rain occurring from October through March. January is on average the rainiest month, with an average monthly rainfall of 2.8 inches. Snowfall is rare, and is considered a negligible form of precipitation. Climate data was obtained from the Western Regional Climate Center for the weather station Hollister 2, with records from 1948 through 2009.

SOILS

Soils within the study area have been classified based on three soil associations by the NRCS. These three soil associates are the Sorrento-Yolo Mocho, the Rincon-Antioch-Cropley, and the Clear Lake-Pacheco-Willows. The Sorrento-Yolo Mocho association consists of nearly level to sloping soils that are deep and well drained. These soils underlie the central and western portions of the study area. The Rincon-Antioch-Cropley association consists of nearly level to strongly sloping soils that are well drained but may be prone to erosion. These soils underlie the southeastern portion of the study area. The Clear Lake-Pacheco-Williams association consists of nearly level and gently sloping soils with moderate to poor drainage. These soils underlie the northern portion of the study area.

Hydrologic Soil Group

The NRCS evaluates and assigns each soil a hydrologic soil group (HSG). Hydrologic group is a group of soils having similar storm water runoff potential under similar storm and ground cover conditions. Soil properties that influence runoff potential are those that influence infiltration rate, including depth to groundwater table, saturated hydraulic conductivity, and depth to a layer with slow water transmission rate. These factors are taken into account by the NRCS in estimating hydrologic soil groups. Soils are classified with an HSG designation of A, B, C, or D, or the dual classes A/D, B/D, C/D. An HSG designation of "A" represents a soil with lower runoff potential, while an HSG designation of "D" represents a soil with higher runoff potential. The HSG classifications for the soils within the study area are listed in Table 2-1 and illustrated in Figure 2-2.

Table 2-1. Study Area Hydrologic Soil Groups

Hydrologic Soil Group (HSG)	Acres within Study Area	Percent of Study Area
A	155	2%
B	3,515	43%
C	892	11%
D	3,586	44%
Not Classified	23	0.3%
Total	8,172	100%

The majority of soils within the study area are classified as HSG B and D. The soils classified as HSG A are near to and underlie the San Benito River. For this Master Plan, the soils that have not been classified for HSG by the NRCS will be assigned appropriate hydrologic factors based on nearby soils and topography.

LAND USE

This section presents the existing and future land use within the study area. The purpose of establishing existing and future land use is to form a basis for evaluating storm water runoff due to land surface conditions. Both existing and future land use for the study area have been compiled in GIS format through data provided by San Benito County. Future land use is based on either the City of Hollister General Plan or the San Benito County General Plan, dependent on location.

Existing Land Use

The City of Hollister is comprised of primarily residential development, with commercial development in and around the downtown area, and a heavy concentration of industrial development near the airport. In some cases, parcels within the County supplied GIS data were not assigned land use codes. Where possible, existing land use was discerned based on parcel location in conjunction with aerial imagery and building type information available through ESRI and Google Earth. Existing land uses within the study area are summarized in Table 2-2 and illustrated in Figure 2-3. It is noted that existing land use was evaluated in GIS on a per parcel basis; therefore the category of Roads is included in the table which represents the land area between the parcels.

Table 2-2. Study Area Existing Land Use

Land Use Category	Area (acres)	Percent of Study Area
Agriculture	3,157	39%
Commercial	345	4.3%
Industrial	339	4.2%
Low Density Residential	1,494	19%
Medium/High Density Residential	196	2.5%
Open Space	49	0.6%
Public	102	1.3%
Residential Estate	581	7.3%
Roads/Streets	1,007	12.6%
School	154	1.9%
Unknown	54	0.7%
Vacant	530	6.6%
Total	**8,007**	**100%**

Future Land Use

For the purpose of this Master Plan analysis, future conditions for the study area will be full build-out based on the 2005 City of Hollister General Plan. Timing for full-build out is unknown, as the City's General Plan currently projects through year 2023 (not full build-out). It is noted that the City's Growth Management Program provides priority for medium to high density residential and mixed-use development projects within the Redevelopment Project Area. For this reason, in the near future the majority of development is anticipated to occur within the City's Redevelopment Area, which focuses growth in and near downtown Hollister.

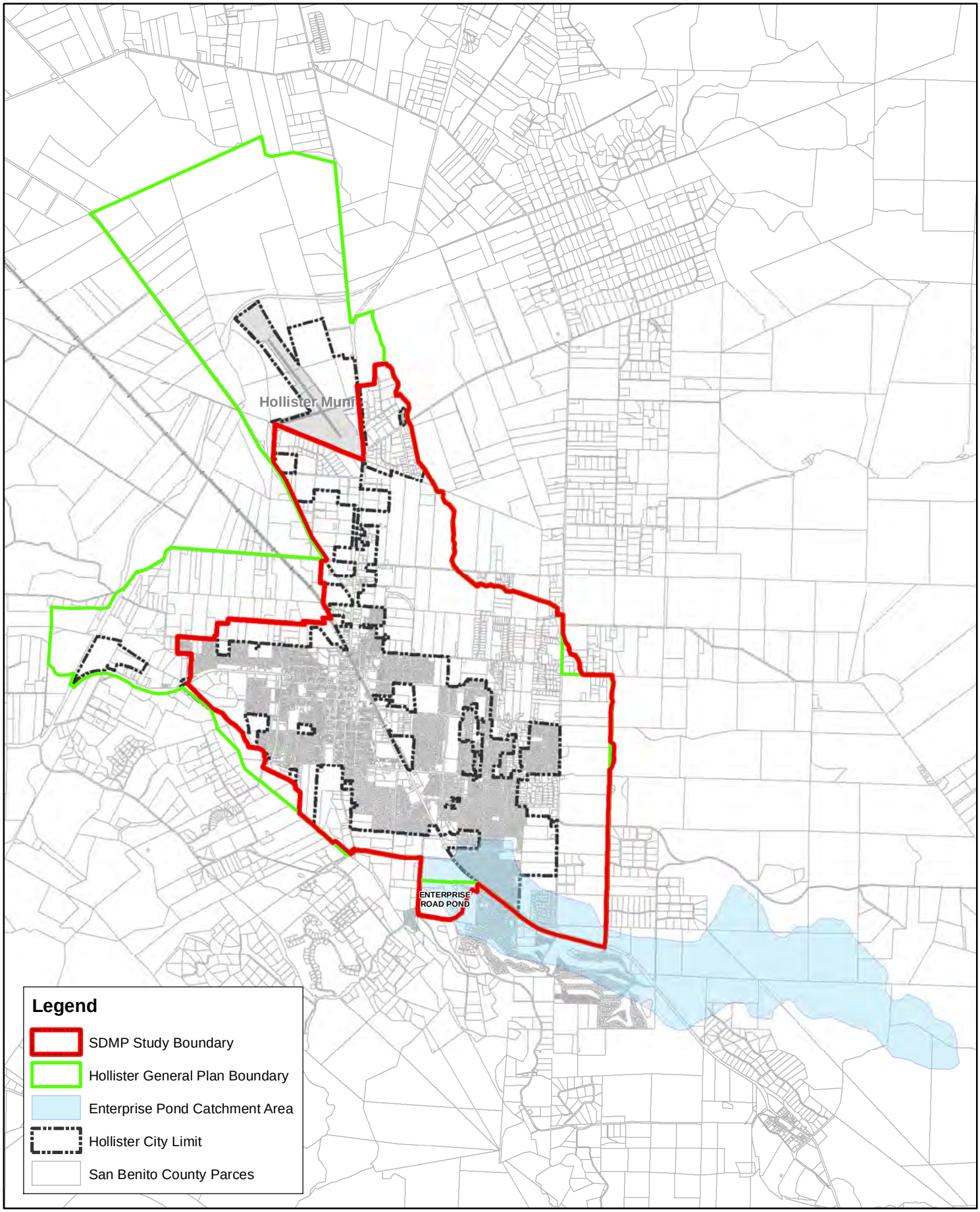
Future land uses within the study area are summarized in Table 2-3 and illustrated in Figure 2-4. For the purpose of evaluating land coverage conditions for this Master Plan only, the County's General Plan Land Use categories were equated to categories within the City's General Plan.

Table 2-3. Study Area General Plan Land Use

City of Hollister General Plan		
Land Use Category	**Area (acres)**	**Percent of Study Area**
Downtown Commercial and Mixed Use	97	1.2%
General Commercial	152	1.9%
High Density Residential	304	3.8%
Home Office	18	0.2%
Industrial	1,174	15%
Low Density Residential	2,820	35%
Medium Density Residential	542	6.8%
Mixed Use	179	2.2%
North Gateway Commercial	339	4.2%
Parks and Open Space	298	3.7%
Residential Estate	1,434	18%
School and Public	415	5.2%
West Gateway	93	1.2%
San Benito County General Plan		
Land Use Category	**Area (acres)**	**Percent of Study Area**
Low Density Residential	27	0.3%
Medium Density Residential	101	1.3%
Residential Estate	14	0.2%
Study Area Totals		
Total	**8,007**	**100.0%**

Land Use Summary

Existing and future land use has been evaluated in a GIS format based on data provided by San Benito County. The purpose of evaluating land use is to assign runoff parameters based on land coverage conditions. Future land use conditions for this Master Plan will be based on full build-out of the study area. Timing of build-out is unknown.



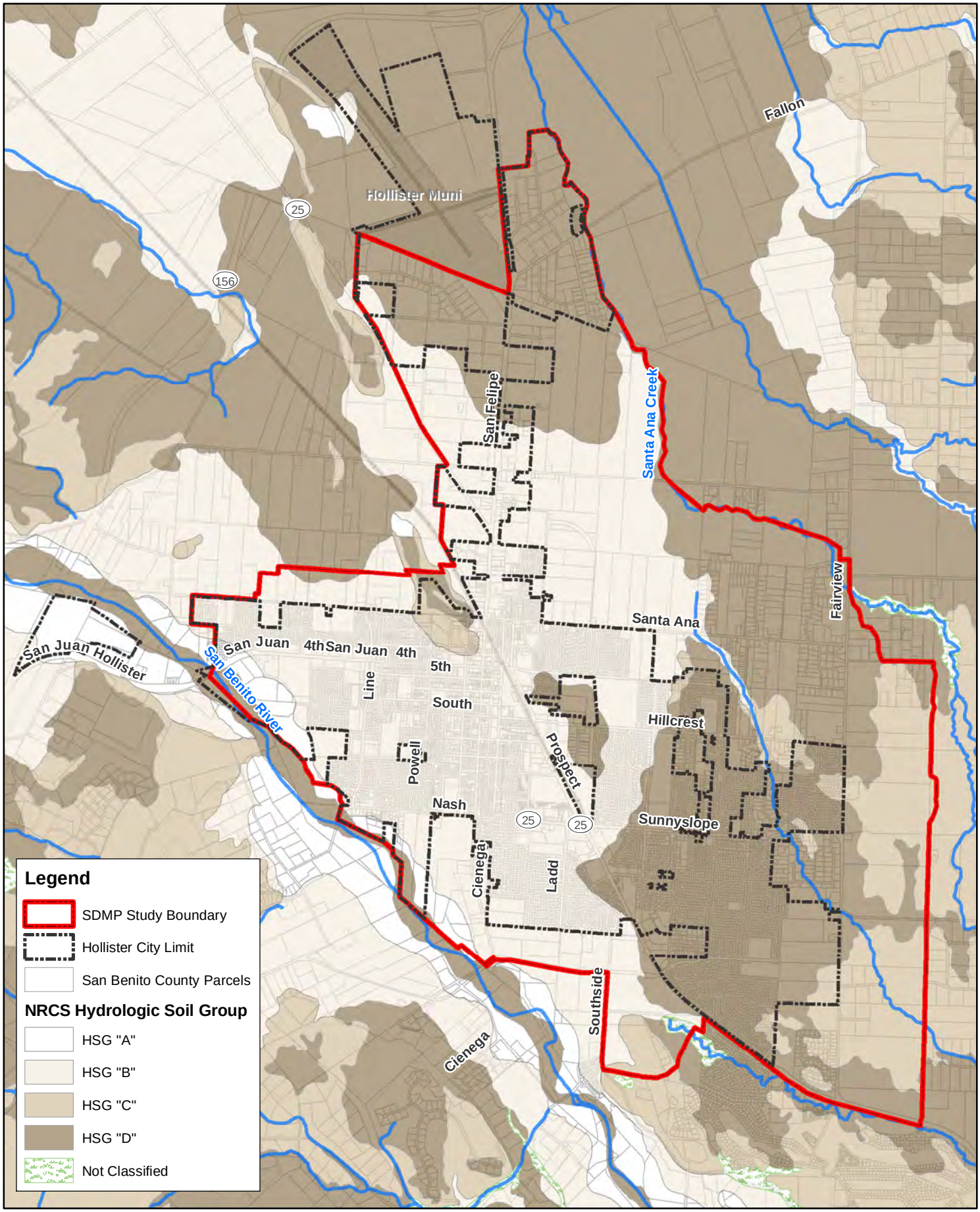
WALLACE GROUP
CIVIL ENGINEERING
CONSTRUCTION MANAGEMENT
LANDSCAPE ARCHITECTURE
MECHANICAL ENGINEERING
PLANNING
PUBLIC WORKS ADMINISTRATION
SURVEYING/GIS SOLUTIONS
WATER RESOURCES
WALLACE SWANSON INTERNATIONAL
612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011 F 805 544-4294
www.wallacegroup.us

SCALE: NTS

CITY OF HOLLISTER
2011 SDMP

FIGURE 2-1: STUDY BOUNDARY

NOTES:
BASEMAP PROVIDE BY SAN BENITO COUNTY.
WALLACE GROUP DID NOT PERFORM BOUNDARY SURVEY SERVICES FOR THIS MAP. NOT A LEGAL DOCUMENT.
MAP PRODUCED APRIL 2011.



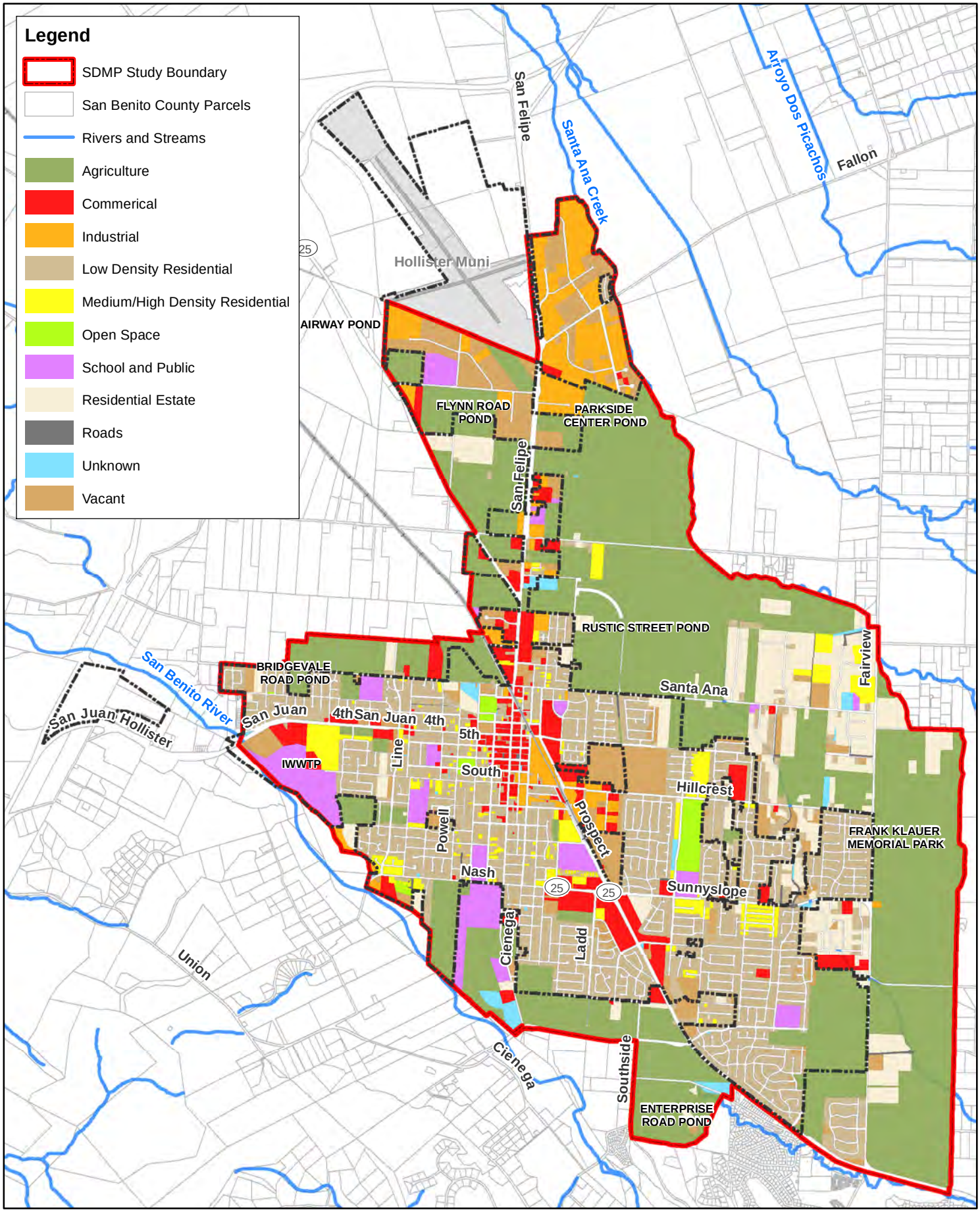
WALLACE GROUP
CIVIL ENGINEERING
CONSTRUCTION MANAGEMENT
LANDSCAPE ARCHITECTURE
MECHANICAL ENGINEERING
PLANNING
PUBLIC WORKS ADMINISTRATION
SURVEYING/GIS SOLUTIONS
WATER RESOURCES
WALLACE SWANSON INTERNATIONAL
612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011 F 805 544-4294
www.wallacegroup.us

SCALE: NTS

CITY OF HOLLISTER
2011 SDMP

FIGURE 2-2: NRCS SOILS DATA
HYDROLOGIC GROUP

NOTES:
BASEMAP PROVIDE BY SAN BENITO COUNTY.
WALLACE GROUP DID NOT PERFORM BOUNDARY SURVEY SERVICES FOR THIS MAP. NOT A LEGAL DOCUMENT.
MAP PRODUCED APRIL 2011.



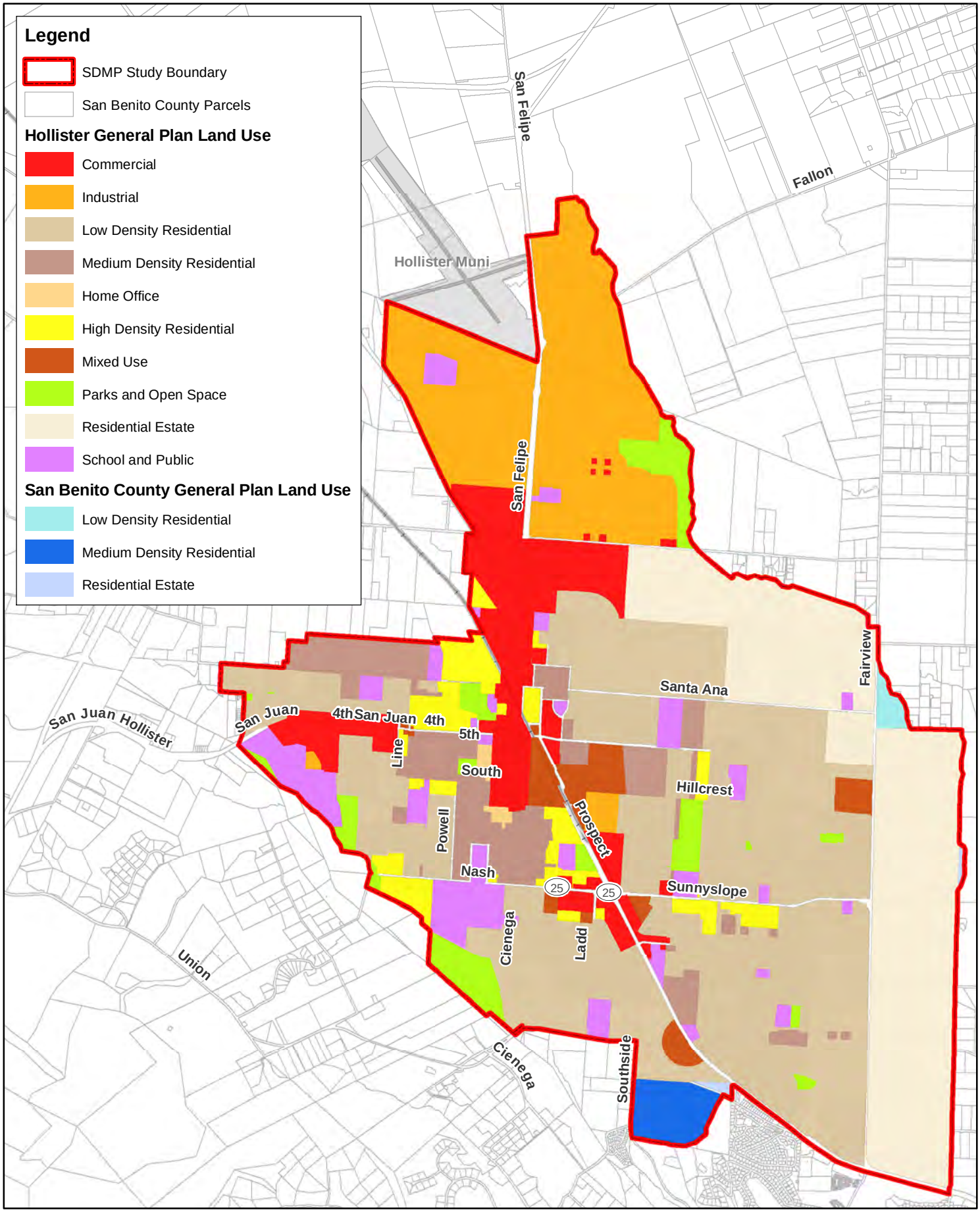
WALLACE GROUP
CIVIL ENGINEERING
CONSTRUCTION MANAGEMENT
LANDSCAPE ARCHITECTURE
MECHANICAL ENGINEERING
PLANNING
PUBLIC WORKS ADMINISTRATION
SURVEYING/GIS SOLUTIONS
WATER RESOURCES
WALLACE SWANSON INTERNATIONAL
612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011 F 805 544-4294
www.wallacegroup.us

SCALE: NTS

CITY OF HOLLISTER
2011 SDMP

FIGURE 2-3: EXISTING STUDY AREA LAND USE

NOTES:
BASEMAP PROVIDE BY SAN BENITO COUNTY.
WALLACE GROUP DID NOT PERFORM BOUNDARY SURVEY SERVICES FOR THIS MAP. NOT A LEGAL DOCUMENT.
MAP PRODUCED APRIL 2011.



CIVIL ENGINEERING
CONSTRUCTION MANAGEMENT
LANDSCAPE ARCHITECTURE
MECHANICAL ENGINEERING
PLANNING
PUBLIC WORKS ADMINISTRATION
SURVEYING/GIS SOLUTIONS
WATER RESOURCES
WALLACE SWANSON INTERNATIONAL

WALLACE GROUP

612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011 F 805 544-4294
www.wallacegroup.us

SCALE: NTS

CITY OF HOLLISTER
2011 SDMP

FIGURE 2-4: STUDY AREA
GENERAL PLAN LAND USE

NOTES:
BASEMAP PROVIDE BY SAN BENITO COUNTY.
WALLACE GROUP DID NOT PERFORM BOUNDARY SURVEY SERVICES FOR THIS MAP. NOT A LEGAL DOCUMENT.
MAP PRODUCED APRIL 2011.

CHAPTER 3

STORM DRAIN SYSTEM OVERVIEW

This Chapter provides an overview of the existing storm drain system for the City of Hollister. The City owns and operates multiple storm drain networks that provide storm water collection for the City and tributary outlying areas. All figures are located at the end of this Chapter.

STORM DRAIN MAPPING

The City's existing storm drain system was catalogued through a digital mapping effort that included field survey and review of existing record plans and system maps provided by the City.

Field Survey

A field survey of the City's storm drain system was conducted in a joint effort by Wallace Group and San Benito Engineering and Surveying. Over 1,000 storm drain features have been surveyed and documented in support of this master plan. A copy of the Survey Report will be included with the final report document.

Horizontal measurements were based on the North American Datum (NAD) of 1983 California State Plane Zone 4 Feet Coordinate System. Vertical measurements were based on North American Vertical Datum (NAVD) of 1988.

GIS Database

A comprehensive Geographic Information System (GIS) was developed in support of this master planning project. The storm drain GIS was compiled using the following data:

- Survey-grade coordinates, rim and invert elevations for the storm drain manholes on the main storm drain system;
- The City's existing AutoCAD storm drain basemap
- Storm drain record plans; and
- San Benito County parcel data and aerial photo base map.

Attributes of the storm drain system have been compiled in the GIS geodatabase, including manhole rim and invert, and pipe material, length, and diameter. Within the GIS geodatabase, scanned record drawings and field survey photos have been linked to individual storm drain features. The GIS will be provided to the City for future mapping, inventory, and maintenance use.

EXISTING STORM DRAIN SYSTEM

The City's storm drainage system is comprised of multiple networks of inlets, pipes, and basins that flow to the San Benito River, the Santa Ana Creek, or to terminal (retention) basins. Over 59 miles of piping flows to one of the 20 river outfalls or to one of the 5 terminal basins in the City's system. The City's system does not include any stormwater pumping stations. The City's stormwater system is illustrated on Figure 3-1.

Storm Drain Piping

The City's storm drain pipe network is made up of approximately 1,420 pipes ranging in length from under 10-feet long to over 1,000-feet long. Diameters range from 6-inch to 84-inch, with the majority of pipes 18-inch diameter. A summary of the City's existing storm drain piping is included in Table 3-1.

Table 3-1. Existing Storm Drain Pipeline Inventory

Diameter (inches)	Total Length		Percent of System
	Feet	Miles	
6	95	0.02	0.03%
8	645	0.12	0.2%
12	4,243	0.80	1.4%
15	13,618	2.58	4.3%
18	95,673	18.12	30.5%
21	2,726	0.52	0.9%
24	53,926	10.21	17.2%
27	6,340	1.20	2.0%
30	32,407	6.14	10.3%
36	22,569	4.27	7.2%
40	2,322	0.44	0.7%
42	12,132	2.30	3.9%
45	4,134	0.78	1.3%
48	20,702	3.92	6.6%
54	6,986	1.32	2.2%
60	9,920	1.88	3.2%
66	8,378	1.59	2.7%
72	3,666	0.69	1.2%
84	11,285	2.14	3.6%
Unknown	1,926	0.36	0.6%
Total	**313,691**	**59.4**	100%

All storm drain pipes with unknown diameter are likely 18-inches or less. These pipes are not included in the storm drain model and therefore were not surveyed, and record drawings were not available to determine diameter.

Storm Drain Channels

Open channels in the City's storm drain system have not been surveyed or analyzed as a part of this master plan. Where possible, approximate locations of open channels have been mapped based on the City's AutoCAD basemap and visual location using the County's aerial photo basemap.

Storm Drain Manholes

The City's storm drain system includes approximately 1,235 manholes with depths ranging from 3 feet to over 27 feet. From an initial review of the surveyed manholes the majority of the manholes are concrete with some manholes of brick construction. At the time of this report the number of each type of manhole construction is not available.

Storm Drain Inlets

Approximately 1,845 inlets have been catalogued and mapped through the field survey and GIS effort. The majority of inlets were mapped based on record plan information and the County's aerial photo basemap, as the inlets have not been analyzed as a part of this Master Plan.

Bubbler Inlets

The City system includes multiple locations with bubbler inlets. These inlets discharge flow conveyed from another inlet typically discharge a short distance away. This type of inlet was installed in place of cross gutters or where a storm drain pipe was not available for connection.

Storm Drain Basins

The City's storm drain system includes both detention and retention (terminal) drainage basins. Basin inlet and outlet structures were surveyed and mapped, and record plan data was referenced for basin characteristics such as storage volume and depth. Table 3-2 includes basic data for the basins analyzed within this Master Plan.

Table 3-2. Storm Drain Basin Inventory

Stormwater Basin	Type	Design Storm	Total Depth (feet)	Total Volume (ac-ft)
Airway	Terminal	100-year	15	NA
Citation Business Park	Detention	10-year	18	NA
Enterprise Road	Detention	100-year	5.2	29.84
Rustic Street	Terminal	NA	12	45.70
Frank Klauer Memorial	Detention	NA	10	NA
Bridgevale	Detention	100-year	5.3	0.12
Flynn Road	Terminal	NA	4	NA

Some record information was not available for all the modeled basins. It is recommended that the City conduct a study to determine if record information can be

obtained, or, a field investigation as necessary to evaluate physical parameters such as depth and volume.

Storm Drain Outfalls

The City's storm drain system has 20 river outfalls, 8 to the San Benito River and 12 to the Santa Ana Creek. The outfalls are of various construction types, with the majority a projecting concrete pipe. Some of the outfalls have grates, headwalls and/or wingwalls. The outfall recently installed for the Highway 25 bypass drainage system, located on McCloskey Road at Santa Ana Creek, has a flap gate.

DRAINAGE PROBLEM AREAS

The City's operations department provided a list of known problem areas throughout the storm drain system. These locations have flooding during even minor storm events due to pavement and gutter damage, very flat slopes, and potentially inlet capacity issues. A detailed analysis of these locations is included in Chapter 6 of this Master Plan. The problem areas are summarized in Table 3-3 and illustrated on Figure 3-2.

Table 3-3. Drainage Problem Areas

ID	Location	Description of Problem
P1	San Benito &Vine	Bubbler system overwhelmed on east side of T-intersection. Flows to north @ 0.3%. Root uplift along gutter. Unknown if gutter has sufficient capacity.
P2	San Benito & Palm	Bubbler system overwhelmed on east side of T-intersection. Flows to north @ 0.3%. Root uplift along gutter. Unknown if gutter has sufficient capacity.
P3	San Benito & Olive	Bubbler system overwhelmed on east side of T-intersection. Flows to north @ 0.3%. Root uplift along gutter. Unknown if gutter has sufficient capacity.
P4	San Benito & Park	Bubbler system overwhelmed on east side of T-intersection. Flows to north @ 0.3%. Root uplift along gutter. Unknown if gutter has sufficient capacity.
P5	San Benito & 6th	Flooding runs north-south on east side of San Benito. Very flat area with x-gutter. No obvious blockage.
P6	Monterey & Hawkins	NW & SW corners are flooded. Bubblers carry flow across the corners but are overwhelmed. East corners have curb inlets and 18" SD runs to west in Hawkins. Roots of tree on south side of Hawkins have raised gutter to block flow to west.
P7	West & 5th	NE & SE corners flood in small storms, entire intersection floods in large. No bubblers or cross gutters. Flow may go west or south but unclear.
P8	West & 4th	SE corner floods
P9-10	4th Street between Mapleton & Line	The north side of 4th floods at Mapleton and continues flooding to west to Line St. Very flat gutter (0.2%). Tree roots and bulging driveway block flow to west in gutter.
P11	Locust near W. 2nd	Gutter flooded @ "DIP" sign on west side of Locust. Transition from curb and gutter to no gutter is an obstacle to flow. It appears that the dirt swale has been paved over.

ID	Location	Description of Problem
P12	College & 5th	Bubblers at all 4 corners are overwhelmed by collection of flow from fairly large drainage area. All bubblers cut the corners in an attempt to make it possible for pedestrians to cross, but is not successful. Flooding at mortuary.
P13	Hwy 25 @ Meridian	Vertical dry well does not have capacity for flows to this area. Once full, the area floods to the highway
P14	Sunnyslope @ Vet Clinic	Westward flow along north side of Sunnyslope leaves the roadside and enters a dirt parking area at the vet clinic and flows towards some homes. No roadside ditch exists. Natural slope is to northwest.
P15	Memorial Dr north of Sunnyslope	Right lane is an inverted crown. Gutter has limited capacity and overtops into inverted crown which flows north to a grate opening in the middle of the travel lane. Spread flooding at grate in middle of traffic.
P16	Rail Road ditch flowing to San Benito	2,000 feet of RR ditch on west side of tracks intercepts drainage and directs to the gutter in San Benito between 1st & Santa Ana. Numerous culverts along the way can get clogged. The final reach is a bubbler that terminates in a grate that gets clogged from the underside.
P17	Open ditch on east side of San Felipe at car dealer	East side of street has an open ditch that creates a safety hazard. Accidents have occurred in the past.
P18	Flynn Rd & San Felipe	Flooding on north side of Flynn Road near the Flynn Road Pond may be caused by the absence or burial of storm drain inlets to the west at AeroStar Way.

A detailed evaluation of these problem areas is included in Chapter 6 of this report.

GENERAL CAPITAL IMPROVEMENT RECOMMENDATIONS

Based on the information provided above, the following are recommendations for capital improvement projects.

Storm Drain Manhole and Inlet Database

It is recommended that the City invests in the development of a comprehensive storm drain manhole and inlet inventory database. This project would include conducting an inspection of all city manholes and inlets to catalog their construction material and physical condition, at a minimum. This information would be inputted to the GIS database and ultimately result in the ability to provide recommendations to replace or line manholes that are in poor/substandard conditions, or replace inlets due to performance issues related to inlet type.

Maintenance Program Database

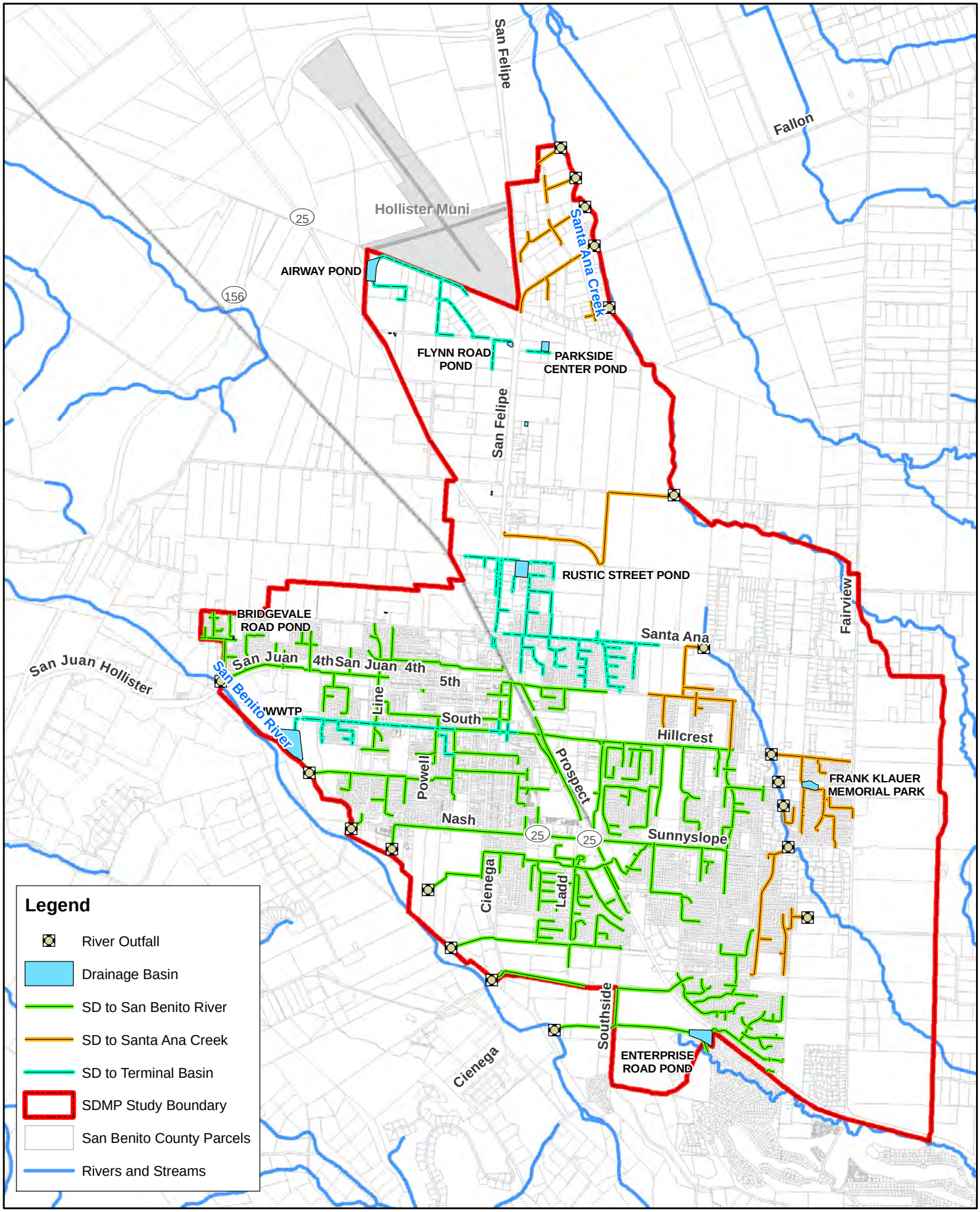
It is recommended the City invest in the development of a maintenance program database that would link the City's efforts in stormwater management to the GIS database. This comprehensive maintenance database could be used to track

maintenance activities in relation to storm events, and help to identify areas where additional maintenance may be able to prevent drainage issues when rain is predicted.

Storm Drain Basin Evaluation and Database

It is recommended that the City conduct an internal review to determine if additional record information is available for the existing storm drain basins. In the case that record information is not available, it is recommended to conduct a field investigation to evaluate physical parameters of the basins, including depth, outlet or overflow configuration, and volume. It is recommended to incorporate this information within the GIS database.

In addition, it is recommended that the City maintain records of the storm drain basin maintenance and performance. During the rainy season, performance measures such as basin depth following a storm event and time required for stormwater to infiltrate could be visually monitored and recorded in the GIS.



CIVIL ENGINEERING
CONSTRUCTION MANAGEMENT
LANDSCAPE ARCHITECTURE
MECHANICAL ENGINEERING
PLANNING
PUBLIC WORKS ADMINISTRATION
SURVEYING/GIS SOLUTIONS
WATER RESOURCES
WALLACE SWANSON INTERNATIONAL

WALLACE GROUP

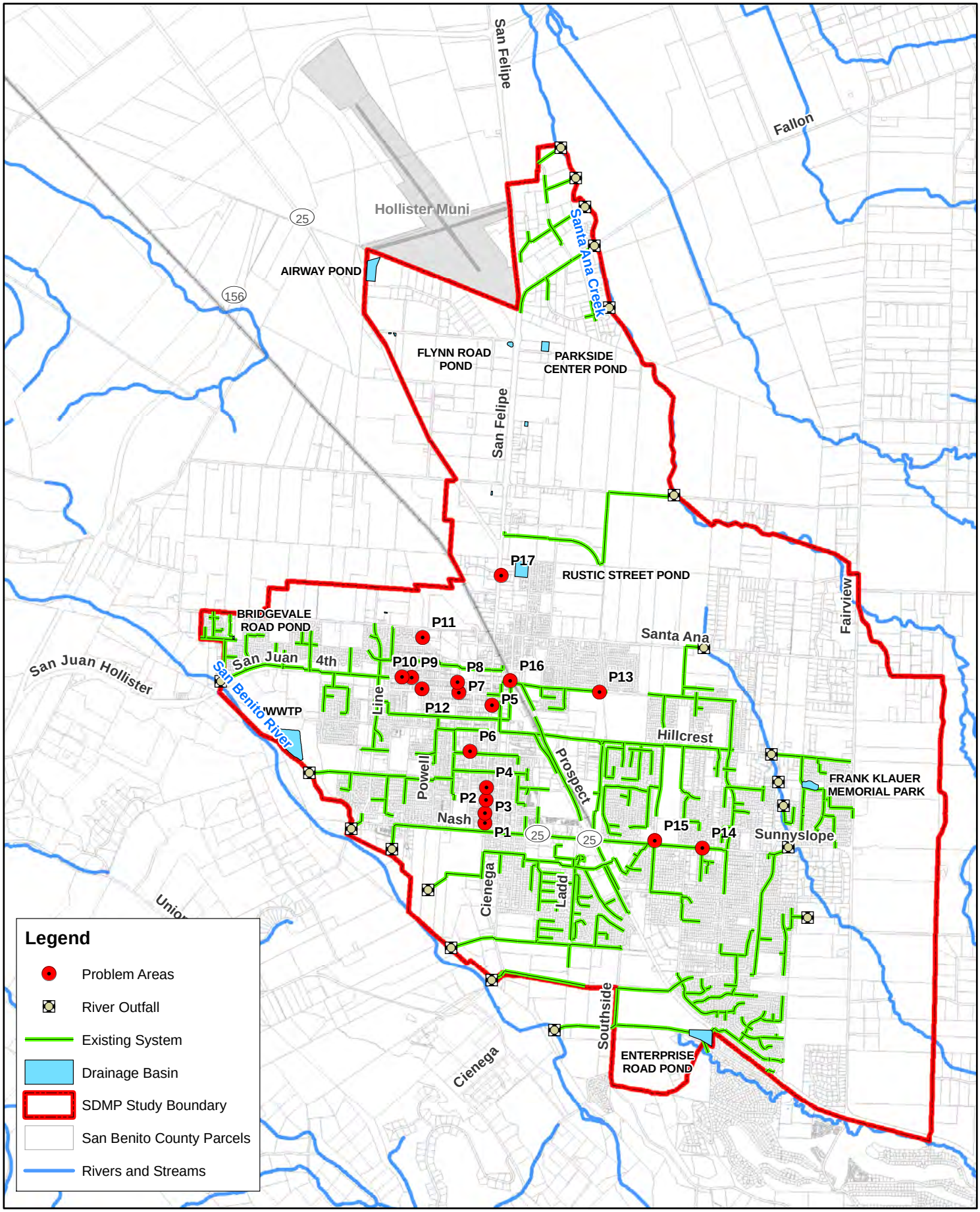
612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011 F 805 544-4294
www.wallacegroup.us

SCALE: NTS

CITY OF HOLLISTER
2011 SDMP

FIGURE 3-1: STORM DRAIN OVERVIEW

NOTES:
BASEMAP PROVIDE BY SAN BENITO COUNTY.
WALLACE GROUP DID NOT PERFORM BOUNDARY SURVEY SERVICES FOR THIS MAP. NOT A LEGAL DOCUMENT.
MAP PRODUCED APRIL 2011.



WALLACE GROUP
CIVIL ENGINEERING
CONSTRUCTION MANAGEMENT
LANDSCAPE ARCHITECTURE
MECHANICAL ENGINEERING
PLANNING
PUBLIC WORKS ADMINISTRATION
SURVEYING/GIS SOLUTIONS
WATER RESOURCES
WALLACE SWANSON INTERNATIONAL
612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011 F 805 544-4294
www.wallacegroup.us

SCALE: NTS

CITY OF HOLLISTER
2011 SDMP

FIGURE 3-2: STORM DRAIN PROBLEM AREAS

NOTES:
BASEMAP PROVIDE BY SAN BENITO COUNTY.
WALLACE GROUP DID NOT PERFORM BOUNDARY SURVEY SERVICES FOR THIS MAP. NOT A LEGAL DOCUMENT.
MAP PRODUCED APRIL 2011.

CHAPTER 4

STORM WATER MANAGEMENT AND LONG-TERM WATERSHED PROTECTION

This Chapter presents the analysis of the effectiveness of the City's Storm Water Management Program (SWMP) to:

- Maximize infiltration of clean storm water and minimize runoff volumes and rates;
- Protect riparian areas, wetlands and other buffer zones;
- Minimize pollutant loading; and
- Provide long term watershed protection

In accordance with goals as set forth by the Central Coast Regional Water Quality Control Board.

Our review focused on the City's design standards and policies, historic water quality sampling and testing results and trends, and processes, procedures and forms to collect and determine the effectiveness of the City's SWMP. In addition to the above, through our review we strived to answer the following questions:

1. Are the stormwater quality and quantity requirements appropriate, easily understood and implementable?
2. How will new hydromodification/LID requirements affect development patterns in the City?
3. Are the Best Management Practices (BMPs) and corresponding Measurable Goals identified in the City's SWMP effective?
4. Can SWMP BMPs be streamlined or otherwise implemented more efficiently while yielding the same or better results?

BACKGROUND

In 1972, the Federal Water Pollution Control Act, which established the National Pollutant Discharge Elimination System (NPDES) program, was adopted. The NPDES program regulates the discharge of wastes from point sources to surface waters. The Federal Water Pollution Control Act was amended in 1977 and became known as the Clean Water Act (CWA). In 1987 the CWA was again amended to add Section 402, which established a framework for regulating discharges from Municipal Separate Storm Sewer Systems (MS4) as a special category of point source under the NPDES Program.

An "MS4" is defined by the SWRCB as a conveyance or system of conveyances[1]:

1. Designed or used for collecting or conveying clean stormwater;
2. Which is not a combined sewer; and

[1] A collection and conveyance system includes storm drain inlets and roads with catch basins, curbs, gutters, ditches and/or man-made channels.

3. Which is not part of a Publicly Owned Treatment Works (POTW) as defined by Title 40 of the Code of Federal Regulations (CFR) Section 122.2.

In 1990, the United States Environmental Protection Agency (EPA) promulgated regulations for permitting MS4s serving a population of 100,000 people or more. These regulations, known as the Phase I regulations, require operators of medium and large MS4s to obtain stormwater permits.

The EPA adopted the NPDES Phase II Stormwater regulations, which expanded the NPDES program to cover smaller MS4s, in 1999. The State of California adopted the U.S. Environmental Protection Agency (USEPA) NPDES Phase II Final Rule and the State Water Resources Control Board (SWRCB) Water Quality Order No. 2003-00005-DWQ, NPDES General Permit No. CAS000004, "Waste Discharge Requirements for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s) General Permit (referred to as the "MS4 General Permit") on April 30, 2003.

Storm Water Management Plan Requirements

Section D of the MS4 General Permit defines Stormwater Management Program requirements necessary to protect water quality and to reduce the discharge of pollutants from the City to the Maximum Extent Practicable (MEP). It states that the City's SWMP must include BMPs, measurable goals, and timetables for implementation in the following six program areas (minimum control measures):

1. <u>Public Education and Outreach</u>

   The Permittee must implement a public education program to distribute educational materials to the community or conduct equivalent outreach activities about the impacts of stormwater discharges on water bodies and the steps that the public can take to reduce pollutants in stormwater runoff.

2. <u>Public Participation</u>

   The Permittee must comply with all State and local public notice requirements when implementing a public involvement/participation program.

3. <u>Illicit Discharge Detection and Elimination</u>

   The Permittee must
   - Develop and enforce a program to detect and eliminate illicit discharges;
   - Develop a storm drain system map, including the location of all outfalls and the names and locations of all waters of the U.S. that receive discharges from those outfalls;
   - Prohibit, through ordinance or other regulatory mechanisms, non-storm water discharges into the MS4 and implement appropriate enforcement procedures and actions;
   - Develop and implement a plan to detect and address non-stormwater discharges, including illegal dumping, to the system that are not authorized by a separate NPDES permit;
   - Inform public employees, businesses, and the general public of the hazards that are generally associated with illegal discharges and improper disposal of waste; and
   - Address non-stormwater discharges or flows when they are identified as significant contributors of pollutants to the MS4.

4. Construction Site Stormwater Runoff Control

   The Permittee must develop a program consistent with the SWRCB's General Construction Activities Stormwater Permit to control the discharge of pollutants from construction sites greater than or equal to one acre in size within its permitted jurisdiction. The program must include inspections of construction sites and enforcement actions against violators.

5. Post Construction Stormwater Management

   The Permittee must require long-term post-construction BMPs that protect water quality and control runoff flow, to be incorporated into development and significant redevelopment projects. Post-construction programs are most efficient when they stress (i) low impact design; (ii) source controls; and (iii) treatment controls.

6. Pollution Prevention/Good Housekeeping for Municipal Operations

   The Permittee must examine its own activities and develop a program to prevent the discharge of pollutants from these activities. At a minimum, the program must educate staff on pollution prevention, and minimize pollutant sources.

BMPs and measureable goals incorporated into the SWMP must be chosen that will result in the reduction of pollutant discharge to the MEP. Per the Fact Sheet for the MS4 General Permit:

- MEP is a technology-based standard set by Congress in the CWA (Section 402(p)(3)(B)(iii) to establish the level of pollutant reductions the discharger must achieve.
- MEP is generally a result of emphasizing pollution prevention and source control BMPs as the first lines of defense in combination with structural and treatment methods where appropriate serving as additional lines of defense.
- The MEP Approach is an ever-evolving, flexible, and advancing concept, which considers technical and economic feasibility. As knowledge about controlling urban runoff continues to evolve, so does that which constitutes MEP.
- Communities that have greater water quality impacts must put forth a greater level of effort.
- The RWQCB Executive Officer or, if requested, the RWQCB through a public hearing, is responsible for evaluating the SWMP for compliance with the MEP standard.

Low Impact Development

Low Impact Development (LID) is a site design strategy that is currently mandated by the General Permit conditions applied to municipalities under the jurisdiction of the Central Coast Regional Water Quality Control Board. LID has been used extensively on the East coast and more recently in the western states. The goal of LID is to preserve a site's predevelopment hydrology through the use of distributed lot-level controls such as infiltration, filtering, storage, evaporation and detention. An LID approach reduces stormwater runoff, pollution and erosion typically associated with new development and redevelopment projects.

Hydromodification

Hydromodification as defined by the Central Coast Regional Water Quality Control Board is the alteration to the patterns and processes of runoff and sediment from a

watershed into its receiving waters as a result of land use changes and that generally produce changes to the physical, chemical, and/or biological conditions of those receiving waters.

Generally hydromodification impacts are minimized by:

I. Maximizing infiltration of clean stormwater

II. Minimizing runoff volumes and rates

III. Preserving the integrity of site soils

LID as a site design strategy has been successful at achieving all three hydromodification goals for small storms. It is extremely successful in areas where small and frequent rainstorms are the norm.

EXISTING CITY OF HOLLISTER WATER QUALITY ELEMENTS

The City enrolled in the MS4 General Permit in February 2, 2006 and has made significant efforts to comply with the terms and intent of the MS4 General Permit. The City uses a combination of General Plan policies, regulations and standard plans, as well as processes and procedures to implement their program.

The following items were reviewed as part of our analysis:

- Title 12 Streets, Sidewalks and Public Places
- Title 13 Public Services
- Title 15 Buildings and Construction
- Title 16 Subdivisions
- Title 17 Zoning
- Design Standards
- General Plan
- Storm Water Management Plan and annual report

The full evaluation of these codes is included in tabular form in Appendix A. The evaluation form utilized was developed to meet the requirements of the RWQCB Joint Effort measurable goal for “Enforceable Mechanisms.”

Are the stormwater quality and quantity requirements appropriate, easily understood and implementable?

The City has several ordinances that address stormwater quality and quantity requirements:

- Treatment Controls: 17.16.140C Stormwater Quality requires all practicable measure to reduce pollution. Where practices, guidelines, or requirements have been adopted by any federal, State of California, regional authority, or the City of Hollister, these shall be complied with.
- Design Guidance: 15.24.131 and 15.24.132 require minimum standards for appropriate interim and final BMP selection to be in accordance with the BMP Manual or as approved by City Engineer, and be included in an Interim and Final BMP Control Plan.
- Hydromodification: 17.16.140 requires all land use activities to be designed to detain stormwater runoff on the property to pre-development levels. Where

unable to meet this standard, fees are collected for city-wide stormwater pollution control and management.

- Low Impact Development: 15.24.130 requires that LID principles shall be considered and incorporated as part of site planning and design as appropriately feasible.

A discussion of each stormwater requirement is provided below.

Treatment Controls

Treatment systems have the potential to easily be evaluated for compliance if the City defines the minimum numerical standard (and a clearly defined exception process to be used for projects that cannot meet the numerical treatment standards).

Attachment 4 of the MS4 General Permit is the standard of care currently being applied in the Central Coast Region. Attachment 4 stipulates that the post-construction program include design standards for the following types of discretionary development and redevelopment projects:

- Single-Family Hillside Residences
- 100,000 Square Foot Commercial Developments
- Automotive Repair Shops
- Retail Gasoline Outlets
- Restaurants
- Home Subdivisions with 10 or more housing units
- Parking lots 5,000 square feet or more or with 25 or more parking spaces and potentially exposed to stormwater runoff

The City will be required to meet specific design standards described in Attachment 4 even though the General Permit does not define the City of Hollister as an Attachment 4 community because of a December 17, 2008 e-mail from Water Board Staff which indicated that the Executive Officer has designated all Phase II MS4s, regardless of their exclusion per Attachment 2 (and thus Attachment 4) of the General Permit, be subject to Attachment 4 requirements. Appendix A includes an evaluation of City Codes and Ordinances for adherence to the Attachment 4 requirements.

Attachment 4 of the General Permit requires the City to include numerous design criteria as part of their post-construction program. In regards to treatment, Attachment 4 requires the Permittees to require that post-construction treatment control BMPs incorporate, at a minimum, either a volumetric or flow based treatment control design standard, or both, to mitigate (infiltrate, filter or treat) stormwater runoff. To identify a potential design standard, we reviewed the rainfall stations near Hollister in the Basin Sizer application developed by the Office of Water Programs at Sacramento State with a Caltrans grant. Basin Sizer defines water quality flow rates and water quality volume depths necessary to meet Attachment 4's numerical standards. Results for the City of Hollister are as follows, based on two stations with more than 30 years of data:

VOLUMETRIC TREATMENT CONTROL BMP (85TH PERCENTILE 24-HR STORM): 0.52-INCH

FLOW BASED TREATMENT CONTROL BMP (85TH PERCENTILE RAINFALL INTENSITY X 2): 0.199 IN/HR

Providing the specific design standard, in lieu of the options of determining the design standard, will simplify both designers and reviewers understanding of the requirement.

Basin Sizer can be downloaded from the internet at:

http://stormwater.water-programs.com/BasinSizer/Basinsizer.htm.

Design Guidance

The City has adopted California Storm Water Quality Association (CASQA) Manuals to assist the development community in adhering to new development requirements. The benefit of selecting such a well-known and highly regarded publication is the majority of the design community is already aware of the publication and it is endorsed by Regional Board staff. The downside of selecting the CASQA Manuals as the City's standards are that the manuals are not entirely in the public domain, and they are either not definitive or too restrictive in many aspects of LID design to be used as a stand-alone tool. For instance, the design and sizing guidelines for a vegetated swale include a minimum hydraulic resident time of 10 minutes, a length in excess of 100-feet and a longitudinal slope less than 2.5%. Elsewhere in their selection criteria and additional design guidelines section text, CASQA indicates that studies of hydraulic resident time as little as 5 minutes have shown acceptable results, that slopes between 2 and 6 percent can be used but may require check dams, and that longitudinal slopes less than two percent can be used, if sufficient to provide adequate conveyance.

Having flexibility in design is beneficial, especially to allow LID to be implemented on unique and specific sites, and to give credit for providing LID to the maximum extent practicable. However, having specificity in design lends credibility to the Regional Board, the development community, and other concerned parties that the standards are being applied uniformly. To balance the need for both flexibility and specificity, it is recommended that the City develop and publish review protocols. These protocols should be developed to:

- Qualify how the benefit of using treatment trains can off-set the deficiency of a single BMP;
- Define an exception process to document tradeoffs that may be considered;
- Identify how the City will ensure that long term protection of the watershed is not dismissed.

Another issue with using stormwater focused design guidelines is that the opportunity to integrate stormwater design with other City requirements could be missed. Ideally, a fact sheet or other means would be used to integrate stormwater quality and quality regulations with:

- Irrigation and landscape requirements specified in California Assembly Bill 1881 "Model Water Efficient Landscape Ordinance (MWELO)", as implemented in Section 17.16.080 Landscaping Design and Standards;
- The City's Drainage Design Standards;
- The City's Grading Ordinance;
- And other City Codes and Standards as appropriate.

By integrating these requirements into a single document, conflicts can be avoided up front and opportunities to synergize designs to meet multiple requirements are increased.

Hydromodification

The City, through Section 17.16.140, requires all land use activities to be designed to detain stormwater runoff on the property. The code does not specify how the applicant will demonstrate compliance (event based or continuous simulation modeling) and to within what tolerance. It is noted that this code is in conflict with the City's drainage pond policy included in the Engineering Design Standards which states that drainage ponds are meant to be an interim solution for stormwater management.

The code wisely provides an option to the applicant to pay a fee for a project unable to meet the standard. However, the criteria for the fee (gallons of runoff, directly connected impervious area, etc) and the process to request a waiver is not evident. By defining and publicizing the waiver process and fee structure, the risk of it being challenged by the Board, a lawsuit and/or by the applicant is reduced, the process is transparent and the City can demonstrate that the funds collected are being applied (and quantified) to address regional hydromodification issues.

Low Impact Development

The City has developed and approved an LID ordinance which mandates LID on all projects. A common complaint among the development community in other communities that require the use of LID on projects is that the typical LID ordinance lacks an upper threshold. This can lead to ambiguity in determining when the applicant has provided enough LID to meet the ordinance, and lead to concern that a project is being targeted for strict compliance while another project is not.

Other agencies that require the use of LID on projects have found the environmental community frustrated that their LID ordinance lacks a lower threshold. As a generalization, the environmental community is concerned that the development review process doesn't require enough LID.

To minimize this conflict, the LID ordinance, or guidelines on the application of the ordinance, could recommend an upper and lower threshold for LID. This threshold could be defined by a design storm (retain the 85th percentile storm) or by defining an area that is allowed to drain from the site without going through an LID facility (maximum effective area of 10%).

Miscellaneous

Section 17.16.140C specifies a specific Construction General Permit (99-08). To keep the code from having to be modified with each subsequent adoption of a new water quality control board order, it is recommended that the code be revised to refer to the "Current" or "Construction General Permit applicable at the time of construction" in lieu of a specific order number.

How will new hydromodification/LID requirements affect development patterns in the City?

LID is easiest to implement in locations that have well drained sandy-loam soils, rain distributed uniformly throughout the year, and groundwater at depths in excess of 10-feet.

A large portion of Hollister is situated on clay soils and the region generally sees its entire annual rain yield take place within a five-month window with moderate to intense rainfall intensities. High ground water is generally restricted to the north-west corner of the City.

LID is most appropriate to implement on sites with sandy soils, such as those located along Cienega Road and Santa Ana Creek. Implementing LID features in clay soils require additional care. Underdrains can be used to minimize risk that standing water will become a vector issue. Reducing the tributary area to each LID and using LID features in a series is also helpful.

Implementing LID in clay soils is burdensome with increased installation costs when compared with implementing LID in other areas. Also, higher density locations often lack adequate area to incorporate LID features capable of mitigating all but the smallest of storm flows. For these reasons, the City could consider looking towards a regional solution for hydromodification management for higher density infill locations in the City. One such solution is the utilization of the City's existing industrial wastewater treatment plant for stormwater treatment and retention, which is discussed in detail in Chapter 7 of this report. This type of regional facility may be able to offset the impacts of upstream development, allowing higher density infill to occur without the use of onsite LID. Another solution is the redesign of existing City streets to include LID features such as pervious pavements and biorentention.

Are Best Management Practices (BMPs) and corresponding Measurable Goals identified in the City's SWMP effective?

The City's Stormwater Management Program includes six program areas (minimum control measures). Each program area has a list of BMPs, with measurable goals and timetables for implementation. A full review of the City's existing BMPs is included in Appendix A.

The City has incorporated measurable goals that are consistent with the California Stormwater Quality Association (CASQA) program documented in the *Municipal Stormwater Program Effectiveness Assessment Guidance* manual. The minimum outcomes for most BMPs are consistent with "level 1 outcomes" (documenting activities). Where adequate base line data currently exists, levels 2 (raising awareness) and 3 (changing behaviors) were used. Level 3 outcomes (changing behaviors) are incorporated into program elements by developing interim milestones that will allow the collection of necessary baseline data to support higher level outcome expectations.

Level 4 outcomes (reducing loads from sources) may require inspections and observations of pollutant sources to demonstrate a reduction. Program funding limitations and BMP implementation priorities require that the City not divert resources from implementing on the ground projects/process improvements to calculate the information necessary to achieve and document level 4 desired outcomes. However, some BMPs could achieve level 4 outcomes without significant increases in cost. For example, quantifying the volume of trash collected during creek clean up days. Other agencies have developed a volunteer program for ongoing waterway cleanup and have provided a method for reporting the volume of trash collected by volunteers.

The highest outcome, outcome 5 (Improving Runoff Quality) anticipated is associated with the discharge, testing and inspection BMP (ID-2). Achieving outcome 5 for this BMP would require that the City analyze results and trends and tailor their SWMP to address constituents of concern identified.

Can SWMP BMPs be streamlined or otherwise implemented more efficiently while yielding the same or better results?

BMPs were evaluated to identify and focus efforts on BMPs that would provide the most value for the City's funding. Two BMPs in particular are considered costly, yet effective.

These BMPs were scrutinized to identify potential cost savings without compromising long term water quality goals. Both of these BMPs fall under the Illicit Discharge Detection and Elimination Minimum Control Measure.

Federal regulations define an illicit discharge as "...any discharge to an MS4 that is not composed entirely of stormwater..." with some exceptions. These exceptions include discharges from NPDES-permitted industrial sources and discharges from fire-fighting activities. Illicit discharges are considered "illicit" because MS4s are not designed to accept, process, or discharge such non-stormwater wastes.

Common sources of illicit discharges include wastewater, septic tank effluent, car wash and laundry wastewaters, oils and other roadway accident spills, and improper disposal of auto and household toxics.

Many municipalities rely on visual observations to identify illicit discharges. Some communities promote a volunteer program to encourage locals to walk their neighborhood and report illicit discharges.

The specific requirements of the Federal regulations include the following:

- A storm sewer drain map, showing the location of all outfalls and the names and location of all waters of the United States that receive discharges from those outfalls;
- Through an ordinance, or other regulatory mechanism, a prohibition (to the extent allowable under State, Tribal, or local law) on non-stormwater discharges into the MS4, and appropriate enforcement procedures and actions;
- A plan to detect and address non-stormwater discharges, including illegal dumping, into the MS4; and
- The education of public employees, businesses, and the general public about the hazards associated with illegal discharges and improper disposal of waste.

Appropriate best management practices (BMPs) and measurable goals for this minimum control measure per the EPA fact sheet 2.5 "Illicit Discharge Detection and Elimination Minimum Control Measure" include creating a storm drain map, conducting field surveys, adopting an ordinance which prohibits illicit discharges and engaging the community.

<u>ID-2 Discharge Testing and Inspections</u>

The City has implemented an aggressive sampling and monitoring program (SWMP ID-2) which requires that runoff from each of the storm drain outlets be evaluated annually during the first flush event. The City also provides visual inspections twice annually of these same outfalls. Baseline water quality testing was conducted in December 2006 at all storm drain outfalls. Continued water quality testing was conducted at all outfalls during the first storm of the wet season in 2007, 2008 and 2009. The City has provided sampling data from years 2006 through 2009 for review.

Analysis of pollutant loading characteristics will support the City's water quality improvement efforts in several ways. First, a review of testing locations, methods and quality assurance plans can be tailored to improve the value of testing results while reducing costs. Second, an evaluation of collected data can be used to identify and prioritize projects as well as target outreach and educational efforts at appropriate stakeholder groups.

It is noted that wet weather outfall monitoring may identify characteristics of land uses, but not necessarily indentify the impacts to receiving waters unless monitoring is expanded to subsequent storms beyond first flush. A review of wet weather sampling in

other regions found that the concentrations associated with the first flush did not vary significantly from the concentrations found in subsequent rain events, and while first flush samples are good at identifying total suspended solids and some metals, they rarely were able to identify phosphates and nitrates.

A summary of the City's outfall sampling data is presented in Table 4-1. For comparison, the tables includes status of the San Benito River with respect to each analyte, as listed in the Central Coast Ambient Monitoring Program (CCAMP) database. A more detailed table including outfall locations and threshold levels is included in Appendix A.

Table 4-1. Summary of Outfall Sampling Data

Analyte	Percentage of Samples Exceeded	CCAMP Status (San Benito River at Y Road)
Cadmium	0%	---
Chromium	0%	---
Coliform, E. coli	89%	Very Impacted
Coliform, Total	100%	Slightly Impacted
Copper	25%	---
Iron	19%	---
Lead	0%	---
Mercury	0%	---
Nickel	0%	---
Nitrate as NO3	0%	Slightly Impacted (Nitrate as N)
Oil & Grease	3%	---
pH (Laboratory)	25%	Slightly Impacted
Specific Conductance (E.C)	8%	Slightly Impacted
Total Diss. Solids	0%	Slightly Impacted
Total Organic Carbon	0%	---
Total Susp. Solids	28%	Very Impacted
Zinc	28%	---

Based on the trends of the outfall sampling data, the City's stormwater management program would benefit from targeting sources of fecal coliform and heavy metals (copper, iron, and zinc exceeding). A brief description of each is included below.

- Heavy Metals. Typical sources of heavy metals include vehicle service facilities, gas stations, metal fabrication shops, auto wrecking yards, parking lots, and streets and highways. Potential BMPs to reduce pollutant loading include: fact sheets provided to and regular inspections of businesses that are potential contributors; parking lot and street sweeping; provide curbside collection of used motor oil; and if deemed necessary, pre-treatment in hotspot areas.
- Fecal Coliform. Typical sources of fecal coliform include pet waste, wild animal waste, sewage spills and leaks, and illicit connections between a wastewater and storm drain collection system. Potential BMPs to reduce pollutant loading include: public service announcements, newsletters, and fact sheets; providing pet waste removal facilities in City parks and open spaces; expand the

wastewater pretreatment program to include testing for illicit connections to the storm drain system; and inspection and cleaning (if required) of storm drains adjacent to wastewater spills.

It is noted that the Central Coast RWQCB has developed a SWMP requirement to address the recently adopted USEPA TMDL for fecal coliform in the Pajaro River and tributary water bodies. The City is required to incorporate a Wasteload Allocation Attainment Program into their SWMP, targeting fecal indicator bacteria (FIB) in urban runoff. The program must address:

1. Development of an implementation and assessment strategy;
2. Source identification and prioritization;
3. Best management practice identification, prioritization, implementation, analysis, and effectiveness assessment;
4. Monitoring program development and implementation;
5. Reporting; including evaluation whether current best management practices are progressing towards achieving the wasteload allocations by thirteen years after the TMDLs are approved by the Office of Administrative Law;
6. Coordination with stakeholders; and
7. Other pertinent factors.

This program is required for inclusion in the SWMP within a) one year of approval of the TMDLs (eg July 12, 2011), or b) when the Phase II Municipal Storm Water Permit is renewed, whichever occurs first.

It is noted that the CCAMP database includes additional analytes that are not currently tested under the City's outfall program. These analytes include ammonia, boron, chloride, chlorophyll, dissolved oxygen, phosphate, phosphorus, sodium, and turbidity. It is recommended that the City update their testing program to include those analytes that are identified in the City's SWMP as pollutants of concern, and are described in the CCAMP database as impacting the quality of the San Benito River.

Another source for information on potential sources of stormwater pollutants in the City are the Annual Reports required for an Industrial Stormwater Permit. It is recommended that the City review the Industrial Annual Reports for businesses with the City, to collect information regarding potential pollutant loading and hotspots.

It is also recommended that the City collect and review additional data at each outfall at the time of discharge testing, including general descriptions of the outfall and discharge observed. To facilitate uniformity of inspections, it is recommended the City adopt a standard inspection form to be completed in the field for each outfall. An example form as prepared by the Center for Watershed Protection is included in Appendix A.

<u>ID-5 Video Surveillance Program</u>

The Center for Watershed Protection (2004) researched the most cost-effective and efficient techniques that can be employed to identify and correct inappropriate discharges. Data from Montgomery County, Maryland, was analyzed and it was determined that staff identify and correct about six inappropriate discharges per year as a result of regular screening. By contrast, over 185 inappropriate discharges are corrected each year in Montgomery County as a direct result of citizen complaints and calls to a storm water compliant hotline. Public education and labeling of outfalls and

other storm drain infrastructure is an important element of establishing a successful citizen hotline. Outreach to public employees, businesses, property owners, the general public, and elected officials regarding ways to detect and eliminate illicit discharges is an integral part of this minimum measure.

The City uses a video surveillance program (SWMP ID-5) to detect illicit discharges. This program is evaluated based on the number and percent of storm drain lines that have been recorded on an annual basis. A significant cost is associated with videoing the entire storm drain system. The number of illicit discharges identified through this program since its inception and the estimated cost of the program is unknown at the time of completing this report.

The first recommendation is to eliminate this BMP altogether and focus on a community outreach program. However, if the City is committed to the video surveillance program, a significant portion of the MS4 can be removed from annual monitoring. A review of the City's MS4 identified large regions that drained to terminal basins. It is recommended that in lieu of conducting video surveillance monitoring upstream of each terminal basin, that the City inspect the terminal basins more frequently and develop a formal basin inspection protocol which provides criteria to determine if video surveillance monitoring is necessary upstream of each terminal basin along with other, possibly more appropriate methods to identify the sources of the illicit discharge. Identification methods include dye testing of building, smoke testing of building at the time of sale, or simply walking up the storm drain network and recording observations found. Outfall inspections conducted during dry weather conditions can also be an effective means of identifying illicit connections. The City may realize a cost savings by integrating the illicit discharge connection program with the City's FOG program or other wastewater related inspection activities.

SUMMARY AND RECOMMENDATIONS

Based on the information provided above, the following are recommendations for the City's existing storm water management program.

- Integrate storm water quality regulations into a single fact sheet, including elements from the City's Storm Drain Design Standards, Grading Ordinance, and other relevant City Codes.
- Provide a design standard for water quality, including both flow based and volumetric control.
- Update the LID ordinance to include an upper and lower threshold for LID implementation.
- Develop and Publish an LID review protocol, including a waiver process and associated fee structure.
- Modify the ID-2 Discharge Testing and Inspection to include:
    - Testing for the pollutants of concern listed in the City's SWMP
    - A standard field inspection form to be completed for each outfall
    - Additional dry weather visual monitoring to help identify illicit connections
- Modify the ID-5 Video Surveillance Program to not include the storm drain networks that are tributary to a terminal (retention) basin, or, eliminate this program altogether and alternatively fund a community outreach program.
- Develop a program and timeline to update the City Codes and Ordinances as needed, based on the review documents included in Appendix A.

CHAPTER 5

STORM DRAIN DESIGN STANDARDS

This Chapter presents a review of the City's existing storm drain design standards which are relevant to hydrologic and hydraulic analysis for this SDMP. The City's standards were compared to the standards of San Benito County and other public agencies, in order to develop criteria to be used for analysis of the City's storm drain system.

INTRODUCTION

The City of Hollister's design standards were published in May 1992. The storm drain design standards provide detailed information on Rational Method hydrology, pipe hydraulics, drainage ponds, and other drainage structures. The design standards were reviewed to develop and recommend criteria for the analysis of the City's storm drain system. The City's existing standards were compared to the following agency's standards.

- San Benito County. In general, the City's design standards are in accordance with the County design standards. However, the County standards include additional requirements above and beyond the current City standards.
- Santa Clara County. The Santa Clara County Drainage Manual was recently updated in 2007, and incorporates much of the criteria utilized for the Pajaro River Watershed Study which includes the City of Hollister.
- Caltrans. The Caltrans design standards are widely accepted throughout California.

The following sections discuss the storm drain design standards relevant to the hydrologic and hydraulic analysis for this Master Plan.

HYDROLOGY

This section reviews the City's current standards for Rational Method Hydrology, and provides a basis for Unit Hydrograph hydrology which is not currently contained in the City standards.

Flood Protection Levels

The City of Hollister storm drain standards require the design storm return interval to be evaluated based on the size of the drainage area and inclusion of detention basins or open channel improvements. Table 5-1 summarizes the City's return interval requirements.

Table 5-1. City of Hollister Design Storm Return Interval

Design Area or Item	Design Return Interval
Under 50 acres	10-year
Between 50 acres and 10 square miles	15-year
Greater than 10 square miles	100-year
Detention Basin and all open channel improvements	100-year

The evaluation of return interval must also be balanced with the City's requirement to contain the 100-year storm within the right-of-way with a maximum flood depth of 0.70 feet. In some cases, this requirement may lead to the underground system designed to carry a greater return interval than dictated by the Table 5-1 criteria. It is also noted that the Hollister City limits encompass less than 10 square miles, and therefore according to the City's standards the 100-year return interval would not apply unless a detention basin or open channel was included in the analysis, or the right-of-way requirement controlled design.

In general, it is recommended that the City expand their standards for return interval to include criteria for minimum clear lane widths for major roads, and include more stringent requirements for sump conditions. For the purpose of this Master Plan analysis, the storm intervals listed in Table 5-2 will be utilized to evaluate hydraulic capacity of the storm drain piping.

Table 5-2. Storm Drain Master Plan Design Storm Return Interval

Design Area or Item	Design Return Interval
Under 50 acres	10-year
Between 50 acres and 10 square miles	25-year

Rational Method Hydrology

The City's standards allow for the Rational Method to be utilized for any watershed up to 10 square miles (approximately 6,400 acres). In general, it is recommended that use of the Rational Method is limited to watersheds less than 200 acres in size. For the purpose of this Master Plan, the Rational Method will not be utilized to analyze the storm drain network, but will be used as a comparison to peak flows estimated by the hydrograph method. Rational Method hydrology requires determination of a Runoff Coefficient (C), Rainfall Intensity (I), and Time of Concentration (Tc).

<u>Runoff Coefficient, C</u>
The City's existing storm drain standards provide a table of C values corresponding to different land uses. These C values appear low when compared to C values typically used in practice. Recommended C values for the land use types included in the City's General Plan were calculated based on the following formula:

$$C = 0.85 \times (\%\ \text{Impervious}) + Cp \times (1 - \%\ \text{Impervious}) \quad (1)$$

Where 0.85 = the C value for impervious or paved surfaces, and
Cp = the C value for pervious surfaces

The Caltrans standard for C values for undeveloped areas was referenced to evaluate the Cp values applicable for pervious areas in the City's drainage area. Typical percent impervious for the City General Plan land uses was estimated based on allowable development density and existing development in the City. Representative C values were calculated for each NRCS hydrologic soil group (HSG). The hydrologic group represents a group of soils with similar runoff potential in relation to soil permeability, infiltration, and other soil properties. Soils are classified with an HSG designation of A, B, C, or D. An HSG designation of "A" represents a soil with lower runoff potential, where an HSG designation of "D" represents a soil with higher runoff potential.

Table 5-3 summarizes the Rational Method C values calculated for the City of Hollister's General Plan land use, and compares these calculated values to the City's existing design standards.

Table 5-3. Rational Method C Values

Land Use		Estimated Percent Impervious	Recommended C Value by Soil Type				Existing City Standard
			A	B	C	D	
RR	Residential Estate	10%	0.28	0.34	0.40	0.44	10%
LDR	Low Density Residential	30%	0.41	0.45	0.50	0.53	30%
MDR	Medium Density Residential	50%	0.54	0.57	0.60	0.62	50%
HDR	High Density Residential	70%	0.66	0.68	0.70	0.71	70%
HO	Home Office	50%	0.54	0.57	0.60	0.62	50%
MU	Mixed-Use Commercial and Residential	75%	0.69	0.71	0.73	0.74	75%
D-MU	Downtown Commercial and Mixed-Use	80%	0.72	0.74	0.75	0.76	80%
WG	West Gateway Commercial and Mixed-Use	75%	0.69	0.71	0.73	0.74	75%
NG	North Gateway Commercial	80%	0.72	0.74	0.75	0.76	80%
GC	General Commercial	80%	0.72	0.74	0.75	0.76	80%
I/AS	Industrial/Airport Support	85%	0.76	0.76	0.78	0.78	85%
OS	Open Space	5%	0.25	0.31	0.38	0.41	5%
AG	Agriculture	5%	0.37	0.39	0.41	0.46	5%

It is recommended that the City include a tabular form of Rational Method C values that are dependent on HSG within their design standards, similar to those values in Table 5-3. In addition, it is recommended that the City allow for flexibility in the calculation of C values for different land uses in order to promote onsite storm water management, LID, and optimized storm drain design. For example, a developer may choose to incorporate more open space within a commercial or industrial development, which could result in a

lower C value and the potential for less runoff, and therefore a smaller onsite drainage system and less impact to the City's storm drain system.

Time of Concentration, Tc

The City's existing design standards include the use of the Kirpich equation to calculate Tc. The Kirpich equation is as follows.

$$Tc = 60 * (11.9L^3 / H)^{0.385} \quad (2)$$

Where: Tc = time of concentration, minutes
L = overland flow length, miles
H = Elevation difference between point of concentration and top of watershed, feet

This formula was developed in the 1940's through data obtained from rural watersheds in Tennessee that had well-defined channels, slopes from 3% to 10%, and areas of 1 to 112 acres. The Kirpich equation was originally intended for use in smaller agricultural watersheds with drainage areas less than 200 acres. However, this formula is used in practice for urban watersheds for both channelized and overland flow, and typically provides good results. It is recommended that the City continue to include the use of the Kirpich equation in their standards, but limit use of the equation to watersheds less than 200 acres. Time of concentration of watersheds greater than 200 acres could be calculated using different equations for the sheet flow and concentrated flow components.

Rainfall Intensity, I

The City's design standards include equations to calculate rainfall intensity for the 10, 15, and 100-yr return interval. These equations were utilized to generate rainfall intensity-duration curves and compared to the San Benito County standards and the Santa Clara County standards. The City's intensity equations resulted in calculated intensity significantly higher than San Benito County and slightly higher than Santa Clara County. However, the City's average annual rainfall exceeds the annual rainfall contained in the San Benito County standards; therefore, it is reasonable that the City's standards for intensity would exceed the County's.

The National Oceanic and Atmospheric Administration (NOAA) is currently undergoing a project to update precipitation data for California as a part of the Atlas 14 project. Anticipated publish date for the California portion of NOAA Atlas 14 is March 2011. It is recommended the City review their rainfall intensity equation as compared to the updated NOAA records when Atlas 14 for California is published.

Hydrograph Method Hydrology

The City's standards recommend drainage analysis to be based on the hydrograph method for drainage areas greater than 10 square miles (approximately 6,400 acres) or for networks including detention basins and/or open channel improvements. It is recommended that the City require analysis by the hydrograph method for all drainage areas greater than 200 acres. The County standards recommend the use of hydrograph analysis for any watershed larger than 100 acres.

Readily available computer programs can automate computations for a hydrograph based analysis. In addition, potential future requirements related to hydromodification may ultimately result in computer based hydrologic analysis for both large and small catchment areas. It is recommended the City include a list of acceptable computer programs within their design standards.

It is recommended that the City include the use of the NRCS method in their design standards for rainfall abstraction and hydrograph generation. This method is widely accepted throughout California and the U.S., has documentation readily available through the NRCS, and is incorporated into most of the computer programs designed for hydrograph based hydrology. The NRCS method requires the determination of Curve Number (CN) for runoff depth and calculation of lag time or time of concentration for unit hydrograph development. An effective rainfall hyetograph is then used in conjunction with the unit hydrograph to generate a flood hydrograph for a specific storm.

Curve Number, CN

The City's existing storm drain standards do not include values for the NRCS Curve Number. CN values were evaluated using the same premise as the evaluation of Rational Method C values. CN values for the land use types included in the City's General Plan were calculated based on the following formula:

$$CN = 98 \times (\%\ \text{Impervious}) + CNp \times (1 - \%\ \text{Impervious}) \qquad (3)$$

Where 98 = the CN value for impervious or paved surfaces, and
CNp = the CN value for pervious surfaces

Multiple sources were reviewed to determine CNp values representative for the City of Hollister, including TR-55 *Urban Hydrology for Small Watersheds* (NRCS), and the Santa Clara County Drainage Manual. CN values were calculated for each of the hydrologic soil groups. These CN values assume an antecedent moisture condition (AMC) II. Recommended CN values are summarized in Table 5-4.

Table 5-4. Curve Number (CN) Values for AMC II

Land Use			Runoff Curve Number by Soil Type			
		Estimated Percent Impervious	A	B	C	D
RR	Residential Estate	10%	53	64	76	82
LDR	Low Density Residential	30%	77	81	83	85
MDR	Medium Density Residential	50%	83	86	87	89
HDR	High Density Residential	70%	89	91	91	93
HO	Home Office	50%	83	86	87	89
MU	Mixed-Use Commercial and Residential	75%	91	92	93	94
D-MU	Downtown Commercial and Mixed-Use	80%	92	93	94	94
WG	West Gateway Commercial and Mixed-Use	75%	91	92	93	94
NG	North Gateway Commercial	80%	92	93	94	94
GC	General Commercial	80%	92	93	94	94
I/AS	Industrial/Airport Support	85%	94	94	95	95
OS	Open Space	5%	70	74	77	81
AG	Agriculture, row crops	5%	69	76	83	86

The CN values in Table 5-4 will be used to analyze the City's storm drain system for the purpose of this Master Plan. It is recommended that the City include a tabular form of CN values within their design standards that are dependent on HSG, similar to those values in Table 5-4. In addition, it is recommended that the City allow for flexibility in the calculation of CN values for different land uses in order to promote onsite storm water management, LID, and optimized storm drain design. For example, a developer may choose to incorporate more open space within a commercial or industrial development, which could result in a lower CN value and the potential for less runoff, and therefore a smaller onsite drainage system and less impact to the City's storm drain system.

Rainfall Hyetograph

A rainfall hyetograph is a precipitation pattern that illustrates the depth of rainfall over time for a geographic region. For the purpose of hydrograph based analysis, typical storm duration is 24-hours. Rainfall hyetographs are generally developed based on recorded rainfall data. The Santa Clara County Drainage Design Manual includes a rainfall hyetograph based upon the three-day December 1955 rainfall event, which is considered to be the storm of record for northern California. It is recommended that the City adopt this rainfall pattern for use in hydrograph analysis. The Santa Clara County rainfall pattern is a function of Mean Area Precipitation (MAP). For Hollister, MAP is equal to 15-inches, in accordance with precipitation data collected by the National Oceanic and Atmospheric Administration (NOAA) and published by PRISM Climate Group in coordination with the NRCS. The 15-inch MAP rainfall pattern is included in Table 5-5 and illustrated in Figure 5-1. It is noted that the rainfall hyetograph is a 5 minute pattern, meaning that each of the rainfall fractions in Table 5-5 represent repeated 5-minute increments between the listed time values.

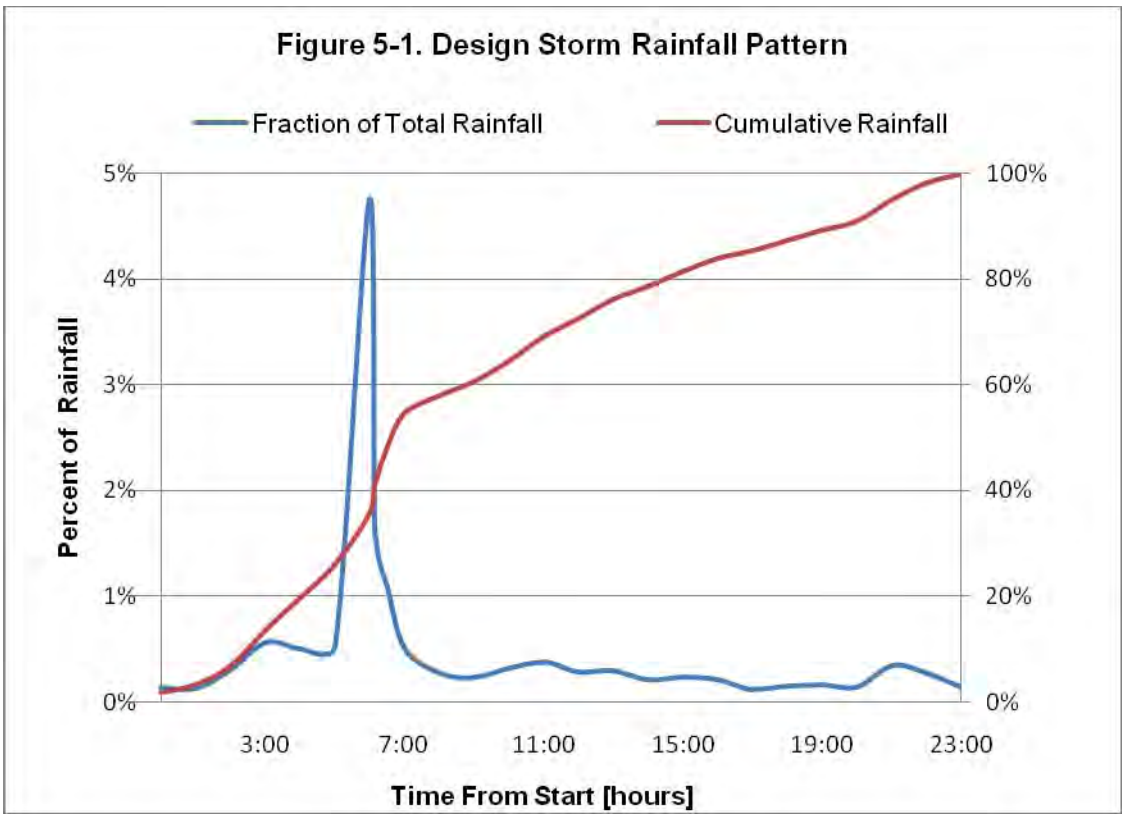


Table 5-5. Fractional Rainfall for 24-Hour Design Storm, 5-Minute Pattern

Time Starting	Fraction of Total Rainfall[1]	Cumulative Percent of Total Rainfall
0:00	0.1412%	1.69%
1:00	0.1294%	3.25%
2:00	0.3080%	6.94%
3:00	0.5667%	13.74%
4:00	0.5051%	19.80%
5:00	0.5272%	26.13%
6:00	4.7600%	35.65%
6:10	1.5540%	41.87%
6:30	1.0850%	48.38%
7:00	0.5177%	54.59%
8:00	0.2763%	57.91%
9:00	0.2302%	60.67%
10:00	0.3223%	64.54%
11:00	0.3799%	69.09%
12:00	0.2878%	72.55%

Time Starting	Fraction of Total Rainfall[1]	Cumulative Percent of Total Rainfall
13:00	0.2993%	76.14%
14:00	0.2118%	78.68%
15:00	0.2353%	81.50%
16:00	0.2118%	84.05%
17:00	0.1177%	85.46%
18:00	0.1530%	87.29%
19:00	0.1647%	89.27%
20:00	0.1412%	90.97%
21:00	0.3412%	95.06%
22:00	0.2706%	98.31%
23:00	0.1412%	100.00%

1. Each rainfall fraction is repeated in 5 minute increments between the times listed in the table.

Rainfall Depth

Rainfall depth for a 24-hour storm is not currently contained within the City's design standards. The County standards include a chart of rainfall depth that is applicable only for areas with MAP of 10-inches (Hollister has an MAP of 15-inches). The Santa Clara County standards include an equation to calculate 24-hour storm depth based on the Santa Clara Valley Water District's Return Period-Duration-Specific Regional Equation. The equation is as follows.

$$X_{T,D} = A_{T,D} + (B_{T,D} * MAP) \quad (4)$$

Where $X_{T,D}$ = precipitation depth for a specific return period and storm duration, inches
T = return period, years
D = storm duration, hours
$A_{T,D}$ and $B_{T,D}$ = dimensionless coefficients
MAP = mean annual precipitation, inches

A summary of 24-hour storm depth based on equation 3 is listed in Table 5-6. The calculated values are compared to 24-hour storm depth as documented in NOAA Atlas 2, Volume 11, Precipitation Frequency Atlas of the Western United States. Depths for the 2 and 100-year storm were taken from NOAA's on-line look-up function (http://www.nws.noaa.gov/ohd/hdsc/noaaatlas2.htm). Depths for the remaining storms were read from the NOAA Atlas 2 maps. At the time of final completion of this report, NOAA published updated precipitation data for California as a part of the Atlas 14 project. The NOAA Atlas 14 storm depths are included in Table 5-6 for reference. These storm depths are based on the Hollister 2 rain gauge located near the city's IWWTP. The Atlas 14 data can be accessed at the following website: http://hdsc.nws.noaa.gov/hdsc/pfds/

Table 5-6. 24-Hour Design Storm Precipitation Depth

Return Period	$A_{T,D}$	$B_{T,D}$	24-hour Precipitation Depth (inches)		
			Santa Clara County, $X_{T,D}$	NOAA Atlas 2	NOAA Atlas 14
2-year	0.3141	0.0963	1.76	1.79	1.74
5-year	0.4745	0.1360	2.52	2.5	2.36
10-year	0.5670	0.162	3.01	2.75	2.87
25-year	0.6750	0.1954	3.61	3.25	3.58
50-year	0.7471	0.2196	4.04	3.75	4.14
100-year	0.8140	0.2433	4.46	4.18	4.71

The Santa Clara County method for rainfall depth results in values close to but greater than those reported by NOAA Atlas 14 for storms up to the 25-year event, and underestimates 24-hour precipitation depth for the 50-yr and 100-yr storm when compared to NOAA. Due to the fact that the Santa Clara method was utilized for the calibrated Pajaro River Watershed Study, it is recommended to utilize the 24-hour rainfall depth values as calculated by the Santa Clara County method for the 10-year and 25-year storm analysis.

HYDRAULICS

The City's existing storm drain design standards require the use of the Manning equation for hydraulic capacity calculations. This method is widely used and suitable for this purpose. Values for Manning's roughness coefficient (n) as listed in the standards are reasonable. In addition, requirements for calculation of minor losses are in agreement with standard engineering practice.

Surcharging

The City's standards require that pipes are sized to carry the design storm without surcharging. It is common that an agency allows surcharging in a pipe so long as the required freeboard is met. It is recommended that the City allow for surcharging in design, for systems with drainage areas greater than 50 acres, with a minimum freeboard of 1-foot below street or ground level. For the purpose of this master plan analysis, existing surcharged pipes will not be considered deficient so long as they meet a minimum of 1-foot freeboard.

Inlet Specifications

The City has a number of locations where drainage inlets for developed areas are adjacent to agricultural or undeveloped land. City maintenance staff has indicated that inlets in these conditions are typically not protected from silt and sediment entering the storm drain system and potentially blocking or burying the inlet. It is recommended that the City incorporate a requirement for long-term sediment protection for inlets, either in the design standards or standard drawings, or both.

CONCLUSIONS AND RECOMMENDATIONS

Based on the information provided above, the following are recommendations for the City's Storm Drain Design Standards.

Flood Protection Levels

The following are recommended changes to the City's current standard for flood protection levels.

- Street surface conveyance: spread limited to edge of traveled way (ETW) for 10-year storm
- Street total conveyance: contain 100-year flood in right-of-way
- Sump condition: spread limited to ETW for 25-year storm

Hydrology

The following are recommended changes to the City's current standards for hydrology.

- Rational Method allowed for watersheds up to 200 acres with no basins
    - Modify C values to include HSG
- Hydrograph procedure required for watersheds over 200 acres, or any watershed that includes a basin
    - Allow use of NRCS methodology
    - Develop and include a list of acceptable computer programs

Hydraulics

The following are recommended changes to the City's current standards for hydraulics.

- For watersheds up to 50 acres, pipe capacity designed for 10-year storm with no surcharge
- For watersheds over 50 acres, pipe capacity designed for 25-year storm with maximum hydraulic grade line 1-foot below surface
- Specify protection from silt and sediment for storm drain inlets to be located adjacent to agriculture, open space, or otherwise undeveloped land

CHAPTER 6

STORM DRAIN SYSTEM ANALYSIS

This Chapter presents the analysis of the storm drain system for the City of Hollister. Refer to Chapter 7 for a detailed analysis of the City's Industrial Wastewater Treatment Plant. Refer to Chapter 8 for the proposed capital improvements based on the analysis presented in this Chapter. All Figures are located at the end of this Chapter.

INTRODUCTION

The City of Hollister storm drain system consists of multiple networks of inlets, pipes, and basins which convey storm water flow to either the San Benito River, the Santa Ana Creek, or to one of the terminal basins within the City's system. A computer based model was created using MWHSoft InfoSWMM Version 9.1 to analyze both hydrology and hydraulics of the City's storm drain pipes and basins.

STORM DRAIN SYSTEM ANALYSIS CRITERIA

The following hydrologic and hydraulic criteria were applied in the analysis of the City's storm drain system. Refer to Chapter 5 for detailed discussion on the development of these criteria.

Hydrology

- Return Interval: The 10-year storm was used to analyze pipe capacity for total tributary area less than 50 acres, and the 25-year storm was used to analyze pipe capacity for tributary areas greater than 50 acres.
- Rainfall Pattern: The 24-hour hyetograph based on the 1955 storm of record.
- Rainfall Depth: A 24-hour rainfall depth of 3.01 inches for the 10-yr storm, and 3.61 inches for the 25-year storm.
- Runoff Model: Environmental Protection Agency (EPA) SWMM Method.
- Time of Concentration: Time of concentration is not explicitly calculated in the model methodology used.
- Runoff Coefficient: Percent impervious based on land use.
- Infiltration Model: Horton's method. Soil infiltration parameters were assigned based on soil data available through the NRCS, and comparison of peak flows calculated by both the SWMM methodology and the Rational Method.

Hydraulics

- Hydraulic Capacity: Manning equation
- Manning's n: Manning's n was assigned based on the City's existing storm drain design standards.
    - RCP 15-inch to 21-inch = 0.015
    - RCP 24-inches and larger = 0.013
- Pipe Routing Calculation: Dynamic wave

STORM DRAIN MODEL DEVELOPMENT

The following sections provide background information on the parameters used to analyze hydrology and hydraulics of the City's storm drain system.

Topography

The City provided an AutoCAD based topographic map of the City and surrounding areas with 2-foot contour intervals. This topographic data was supplemented with the field survey data collected for this Master Plan to compile a digital elevation model (DEM). The DEM was the basis for identifying drainage flow paths and land slope.

Storm Drain Model Extents

The storm drain model includes all pipes 24-inches in diameter and larger, known deficiency areas, and those smaller pipes that may be subject to future development. All the manholes associated with these pipes are also included in the model. Per direction from the City, inlets will not be included in the model. The pipes and drainage basins included in the storm drain model are illustrated in Figure 6-1.

Storm Drain Network Assumptions

This section describes specific assumptions made to develop the model of the storm drain network.

<u>Manholes and Diversion Structures</u>
There are some locations in the system where spatial information was not obtained through the manhole field survey because manholes had been paved over, were constructed on private property and not accessible, or otherwise could not be found. In these locations, record drawings and the City's existing storm drain basemap were utilized to fill in missing information. In some cases, record drawings were not available, or did not include elevation or invert data. Where there was no invert elevation available, it was assumed that pipes followed a constant grade between two known manhole inverts.

The following specific locations include assumptions that are recommended to be verified when additional system information is available:

- San Benito Street to Outfall E14-1OF. The storm drain manholes located west of San Benito Street and upstream of Outfall E14-1OF could not be located. Inverts for these manholes were calculated based on a straight grade between the manhole in San Benito Street and the downstream outfall, with a resultant slope of 0.5%. Hydraulic capacity through this segment is important because these pipes convey all the stormwater from this outfall drainage area. If one of these pipes has a lower slope than modeled, than backwater conditions could cause upstream flooding.
- Hillcrest Road at Clearview Drive. The storm drain network at this intersection appears to be connected between two outfall drainage areas. Based on survey and record drawing data, the storm drain in Hillcrest Road was constructed to divert flow to the west. The pipe heading north in Clearview was modeled with

an invert height of 2-inches above the pipe in Hillcrest. If the pipe in Clearview has been abandoned downstream from the manhole, then more flow would be conveyed to the pipe in Hillcrest than has been modeled.

- West Street just south of Hawkins Street. The manhole at this location has a manually operated slide gate that directs flow either west or south through the storm drain network. Based on direction from the City, this manhole was modeled as conveying all flow to the south, to the outfall on Apricot Lane just south of the IWWTP. It is noted that during the dry season this gate is operated to direct flow from food processing plants to the IWWTP.

Pipe Material

Data regarding the pipe material of the City's existing storm drain system is limited. The majority of record drawings available specified concrete pipe for storm drain construction, with a few newer projects calling out PVC. In addition, concrete pipe was observed in nearly all of the manholes surveyed as a part of this master plan. For this reason, and per direction provided by the City, all modeled pipe was assumed to be of concrete construction. Manning's n values were assigned for concrete pipe material in accordance with the City's design standards. Corrugated metal pipe (CMP) has a reduced capacity compared to concrete pipe due to the higher friction loss associated with this type of material. *Therefore, if there are segments of CMP in the City's storm drain network, the hydraulic capacity of these pipes have been overestimated in the model, and flooding conditions may exist that were not found through this modeling effort.*

Catchment Areas

Catchment areas were delineated based on topography, locations of storm drain piping and inlets, and pipe carrying capacity. Approximately 1,043 catchments were delineated that are tributary to the City's existing storm drain system. The catchment areas are illustrated in Exhibit 4 located in Appendix C.

Flow Allocation

As directed by the City, storm drain inlets were not included in the computer model. Therefore, an assumption of 100% inlet efficiency is inherent in the flow distribution. Within individual catchment areas, storm drain flow was typically assigned to the most upstream modeled storm drain manhole, with a few exceptions. This combination of assumed inlet efficiency and flow allocation results in a conservative hydraulic analysis.

Outfall Boundary Conditions

Outfall conditions were established for each outfall, dependent on the anticipated tailwater elevation in the receiving water body. Three tailwater conditions were modeled, as follows.

- Free Outfall. This condition represents an absence of tailwater, with no downstream limiting condition to outfall flow.
- Full Submergence. This condition represents a tailwater elevation at the crown of the outfall.

- River Flood Stage. This condition represents peak water surface elevations anticipated during a 100-year storm event for the San Benito River and Santa Ana creek. This condition is described in more detail in the following paragraph.

River Flood Stage Water Surface Elevations

The Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) for Hollister was reviewed for flood elevations the San Benito River and Santa Ana Creek. The FIS includes only 100-year storm flows and water surface elevations for both Santa Ana Creek and the San Benito River. Therefore, the 100-year surface elevations were used in the storm drain model to represent worst case tailwater conditions for all storm events.

The Base Flood Elevation (BFE) represents the 100-year flood elevation as established by FEMA. Every outfall in the City of Hollister system is anticipated to be submerged in the 100-year event. Outfall conditions for the 100-year event are listed in Table 6-1.

Table 6-1. Outfall Conditions for 100-year Storm

Survey Point	Outfall ID	Outlet Invert	100-year BFE	100-year Submergence (ft)
859	C11-1OF	245.55	258.37	12.82
1302	D12-1OF	259.45	270.47	11.02
1089	E13-2OF	273.06	284.77	11.71
760	E14-1OF	278.46	285.57	7.11
687	F15-1OF	280.69	295.57	14.88
678	F15-2OF	292.72	300.87	8.15
600	G16-1OF	298.09	305.07	6.98
1255	G2-2OF	205.74	218.15	12.41
1257	G2-3OF	209.42	220.34	10.92
1239	G4-1OF	215.80	229.34	13.54
1264	G5-1OF	222.30	234.84	12.54
1181	H8-1OF	245.92	261.09	15.17
NF	H10-1OF	273.91	290.37	16.46
NF	I12-1OF	331.50	347.57	16.07
823	I13-1OF	347.57	356.82	9.25
676	I13-2OF	364.18	371.47	7.29
1162	I14-1OF	397.31	400.17	2.86

NF = Not Found
NA = Not Available

Drainage Basins

The City's system includes multiple retention and detention basins. Basins were incorporated in the model as required to accurately represent outflow for detention basins and tailwater conditions for pipes tributary to retention basins. This section discusses the basin tributary areas and any specific conditions defined in the model.

Percolation was not accounted for in the model, representing worst case operating conditions for the basins. Table 6-2 provides a summary of the drainage basins. The basins are illustrated in Figure 6-1.

Table 6-2. Drainage Basin Summary

Stormwater Basin	Type	Design Storm	Total Depth (feet)	Maximum Water Depth (feet)	Approx. Volume[1] (ac-ft)
Airway	Terminal	100-year	15	13	28.2
Citation Business Park	Detention	10-year	18	16	1.2
Enterprise Road	Detention	100-year	NA	5.2	29.8
Rustic Street	Terminal	NA	12	12	45.7
Frank Klauer Memorial	Detention	NA	10	8.5	NA
Bridgevale	Detention	100-year	5.3	3.3	0.12
Flynn Road	Terminal	NA	4	4	NA

NA = Not Available
1. Approximate Volume from record drawings or estimation based on topography data provided by the City.

Airway Pond
This terminal basin collects flow from commercial and agricultural land between Flynn Road and the Airport. Record documents for this basin indicate a design percolation rate of 1.25 inches per hour. Based on the NRCS designation of site soils as HSG D, this percolation rate appears to be high.

Citation Business Park Pond
This detention basin collects flow from a small commercial development on Citation Way just west of San Felipe Road. It is noted that record documents for this basin include an extremely high design percolation rate of 49.5 inches per hour. Based on the NRCS designation of site soils as HSG D, this percolation rate appears to be high.

Enterprise Road Pond
This detention basin collects flow from a large area south and east of the City, including the Ridgemark development. Within the model, storm water flow to the Enterprise Road Pond was based on the *Enterprise Storm Basin Technical Report* prepared for the County in 1996. Based on this Technical Report, peak flow to the Enterprise Road pond is 403 cfs and 470 cfs for the 10-year and 25-year storm, respectively.

Rustic Street Pond
This terminal basin collects flow from residential, commercial, and agricultural land between Meridian Street and Pacific Way, east of San Felipe Road. It is noted that this basin was constructed with gravel filled dry-wells to increase percolation. Design percolation rates were not indicated on the record documents available.

Frank Klauer Memorial Pond
This detention basin collects flow from residential development between Hillcrest Road and Sunnyslope Road, east of Santa Ana Creek. Design percolation rates were not provided.

Flynn Road Pond
This terminal basin collects flow from the commercial development on Flynn Road just east of Highway 25. Design percolation rates were not indicated on the record documents available.

Bridgevale Road Pond (North of Central)
This relatively small detention basin collects flow from the recently constructed Bridgevale development. Design percolation rates were not provided.

Industrial Wastewater Treatment Plant (IWWTP)
This terminal basin has a dual use of collecting industrial waste during the dry season and storm water during the wet season. The IWWTP pond collects flow from 238 acres of land, including residential and commercial development. A detailed analysis of this basin is included in Chapter 7 of this Master Plan.

Future Conditions

This section describes the parameters assigned to the storm drain model for future conditions.

Land Use
Future land use conditions were based on full build-out of the City's General Plan, as discussed in detail in Chapter 2.

Topography
Land slopes and flow paths for future conditions were evaluated based on existing topography. It was assumed that future development would not significantly alter existing ground slope, and that pre-development drainage flow paths would be maintained at property lines.

Catchment Areas
Catchment areas were delineated for undeveloped areas outside of City limits that are currently or have the potential to be tributary to the City's system. The catchment areas for undeveloped areas are large compared to the areas developed within the City. This may result in an underestimation of peak flow for the fully developed condition. However, with the anticipated upcoming regulations regarding hydromodification, the peak flows calculated through this analysis are likely conservative as they do not account for any onsite detention or infiltration. *As development is anticipated, storm drain capacity for proposed post-development peak flow should be verified on a case by case basis.*

STORM DRAIN MODEL TEST RUN

Select drainage areas within the City were modeled in InfoSWMM to verify that the proposed hydrologic parameters provide sound results. Seven subcatchments were delineated that are representative of the City's system, and the model was run on these subcatchments for hydrologic results only. Peak flows generated by the InfoSWMM model were compared to peak flows calculated by the Rational Method for the 10-year

storm, in accordance with the parameters contained in Chapter 5. Results of the model test run are summarized in Table 6-3.

Table 6-3. Model Test Run Summary, 10-year Storm

Land Use Type	LDR	LDR	LDR	COM	COM	IND	IND
SWMM Catchment ID	1398	422	358	1910	148	1240	1906
Acres	4.538	4.731	9.855	3.52	5.618	11.49	4.099
Percent Impervious	45%	32%	43%	82%	81%	75%	85%
Slope	0.29%	0.88%	2.03%	0.53%	1.69%	0.48%	0.34%
HSG	B	B	D	B	D	D	B
Equivalent Rational C Value	0.53	0.46	0.59	0.74	0.76	0.73	0.76
Gutter Flow length (ft)	597	837	894	518	498	1385	487
Tc (min)	20.1	18.6	16.6	17.2	14.5	26.0	18.2
10-yr Intensity (in/hr)	1.29	1.34	1.42	1.39	1.52	1.13	1.35
Rational Method Peak Runoff (cfs)	3.12	2.94	8.23	3.65	6.52	9.58	4.24
SWMM Peak Runoff (cfs)	2.789	2.75	7.66	3.65	6.72	9.05	3.86
Percent Difference	-10.6%	-6.6%	-7.0%	0.0%	2.9%	-5.5%	-9.0%

The InfoSWMM results for peak flow closely approximate the peak flows calculated by the Rational Method for the various land use types and topography represented by the model test run. The InfoSWMM hydrograph method peak flows are generally less than the Rational Method, which is reasonable based on the simplified and typically conservative Rational Method calculation. Additional details of the model test run are included in Appendix B.

STORM DRAIN MODEL RESULTS – EXISTING CONDITIONS

This section discusses results of the storm drain model runs representing existing land use conditions. The model results discussed in this section are based on a tailwater elevation equal to the crown of the storm drain outfall (full submergence).

Deficient System Capacity

Based on results of the stormwater model, approximately 8% of the modeled storm drain network does not have capacity to convey 10-year storm peak flow, and approximately 14% of the modeled storm drain network does not have capacity to convey 25-year storm peak flow. Locations with flooding during the 10-year and 25-year storm event are illustrated on Exhibits 2 and 3, located in Appendix C. Significant areas of concern include the following.

Powell Street and South Street

This intersection is a sump condition that collects surface flow from a relatively large drainage area. The model indicates flooding from the IWWTP drainage line at this intersection during the 10-year storm event, and flooding from this same line and the storm drain that flows north on Powell Street during the 25-year storm event. Because of the sump condition, significant ponding could occur at this intersection, blocking traffic on both Powell Street and South Street, and potentially damaging nearby homes if drainage water reached depths in excess of 1-foot.

It is recommended that additional storage is built in to the storm drain system at this location to provide capacity for the 25-year storm event. The storm drain piping downstream from this location is already large (84-inches) and the length of the pipe upgrade required (over 8,000 feet) is also significant. Storage could be incorporated through either an above ground or below ground retention/detention system at the existing City Park at the intersection of Powell Street and 7th Street. Above ground storage is more cost effective and easier to maintain, however it may limit the use of the park during the rainy season. However, the above ground storage would serve as an "overflow" and would only hold standing water during extreme storm events. If above ground storage is pursued, it is recommended to limit ponding depth to a maximum of 3-feet and utilize gentle side slopes (6:1 max) to maximize the dual use of the system. Below ground storage is a viable option if the City is dedicated to regular inspections and maintenance. Below ground storage is more costly but provides the benefit of maintaining full existing use of the park. A below ground storage system could be designed to provide both retention and detention, and could also incorporate stormwater quality elements if designed to capture flow from lesser storms. Such a system could fit within the footprint of the ball fields at the City Park.

Rustic Basin

This terminal basin has a total depth of 12-feet. However, manholes upstream in the system would flood prior to this basin reaching its maximum capacity. The inlets on the north side of Gateway Drive west of San Felipe Road would flood with a water depth of approximately 7.8 feet in the basin, and manhole F9-3 on the west side of San Felipe adjacent to the car dealerships would flood with a water depth of approximately 9.5 feet in the basin. The storm model indicates flooding at both of these locations for the 10-year and 25-year storm event.

Citation Park Pond

This terminal basin has a total depth of 14.8 feet, to the invert of the overland escape structure. However, manhole F6-1 in Citation Way would flood with a water depth of 14 feet in the basin. The storm model indicates flooding on Citation way for both the 10-year and 25-year storm event.

San Felipe and Fallon Road

The model indicates flooding at the southwest corner of this intersection for both the 10-year and 25-year storm, where an existing inlet collects drainage from San Felipe Road and conveys flow to the storm drain network. Of particular concern is the potential for flooding to impact traffic on San Felipe Road.

Line Street north of Central Avenue

An existing 12-inch storm drain with very flat slopes ranging from 0.01% to 0.02% does not have capacity for the 10-year or 25-year event and would cause flooding in Line Street. Of particular concern is the sump condition at the intersection of Line and 2nd Street, which could lead to significant ponding. In addition, overflow from this sump area would flow to the regional sump at Westside Boulevard and San Juan Road.

Hillcrest Road north of Veterans Memorial Park

The model indicates flooding on Hillcrest Road and along the east side of Veterans Memorial Park for both the 10-year and 25-year storm event. Flooding on Hillcrest at this location could result in significant ponding due to the very flat street slopes west of Memorial Drive.

Backwards Sloped Storm Drain Pipes

There are multiple locations in the City's storm drain network where pipes are sloped adverse to the direction of flow, based on the survey and record drawing information compiled in the storm drain model. Where the system has extremely flat slopes or short pipes, the elevation drop could be within the level of accuracy of the field survey. (The GPS equipment utilized typically has an accuracy of +/- 0.1 foot). There are approximately 18 pipes in the system with a negative elevation drop greater than 0.1 foot. This could be due to improper construction, settlement, or earthquake damage. These pipes are illustrated in Figure 6-4.

In all cases, the negative elevation drop is less than the pipe diameter, meaning that stormwater could still flow by gravity once the depth of water exceeds the negative drop in elevation. However, the negative slope can cause sediment and debris to build up in pipes and manholes, further limiting hydraulic capacity. It is recommended to inspect and maintain these pipes on a regular basis, and prior to predicted storm events.

DRAINAGE PROBLEM AREA ANALYSIS

The City's operations and maintenance department provided a list of known problem areas throughout the storm drain system. These locations have flooding during even minor storm events due to pavement and gutter damage, very flat slopes, lack of a storm drain system, and potentially inlet capacity issues. A preliminary technical memorandum was prepared that outlines the approach for analyzing these areas as well as potential solutions to consider. This memorandum is included in Appendix B for reference.

Problem areas were analyzed based on topographic mapping provided by the City, supplemented by field survey as necessary. In general, street cross sections, curb returns, and drain inlets at the problem area locations were surveyed as a part of this Master Plan. Peak flows to the problem areas were calculated in the storm drain model

based on 10-year storm conditions (all problem area catchments are less than 50 acres). Street, gutter, and bubbler pipe capacity was calculated using the hydraulics program FlowMaster by Bentley Systems Inc.

A summary of the problem area analysis is included in Table 6-5, located at the end of this Chapter. The problem areas, subcatchments, and proposed solutions are illustrated in Exhibit 5 located in Appendix C. Recommendations as a result of the analysis are included in the Capital Improvement Program outlined in Chapter 8 of this report.

STORM DRAIN MODEL RESULTS – FUTURE CONDITIONS

This section discusses results of the storm drain model runs representing future land use conditions. Similar to the analysis of existing conditions, the model results discussed in this section are based on a tailwater elevation equal to the crown of the storm drain outfall (full submergence). Also, *future conditions were modeled with all storm drain pipe upgrades required for existing deficiencies. This means that areas of flooding identified for future conditions are in addition to those identified for existing conditions.*

Deficient System Capacity

Based on results of the stormwater model with all existing deficiencies addressed, approximately 6% of the modeled storm drain network does not have capacity to convey future 10-year storm peak flow, and approximately 10% of the modeled storm drain network does not have capacity to convey future 25-year storm peak flow. Significant areas of concern include the following.

<u>Airway Pond</u>
According to record information this pond was designed for the 100-year storm event. However the model indicates flooding from this pond for the 25-year storm under fully developed conditions. The model is conservative in that it does not account for infiltration, however based on the design percolation rate of 1.25 inches/hour the pond would still overtop during the 25-year event. Future development in this tributary area includes industrial development along Airway Drive and south of Flynn Road. Dependent on actual infiltration anticipated in the pond, future development may need to mitigate flow rate and volume, or the pond capacity may need to be increased to accommodate increased stormwater contribution.

<u>Meridian at Highway 25</u>
The model indicates flooding in Meridian Street between Highway 25 and Chappell Road, for the 10-year and 25-year storm event. This location is adjacent to the proposed Lowe's development south of Meridian Street. Design drawings for the site development indicate onsite storage for mitigation of stormwater peak flow. Therefore, peak flow from this development was modeled based on the maximum outflow from the proposed site storage basin. There is potential for additional residential development (General Plan MDR) on the east side of Highway 25 that would contribute flow to this storm drain as well. The site soils for the parcels designated MDR are mainly HSG B, and therefore may be a good opportunity to include LID features to reduce stormwater impacts.

"A" Street at Suiter Street

The model indicates flooding at the intersection of "A" Street and Suiter Street, for the 10-year and 25-year storm event. The manhole at Suiter Street is lower in elevation than both the upstream and downstream manholes. Potential future development in this tributary area includes general residential infill and a high density residential project east of Sherwood Drive (General Plan HDR). Although the site soils for the HDR development are HSG B, it can be difficult to incorporate enough LID within a high density development to fully mitigate increased stormwater flow. However, this could be a suitable location for the City to accept in-lieu fees for not meeting onsite hydromodification criteria because the storm drain system flows to the IWWTP for retention and infiltration.

Fallon Road

The model indicates flooding along Fallon Road for the 10-year and 25-year storm event. The storm drain in Fallon Road has the potential to collect stormwater at San Felipe Road from a large tributary area to the south. Some of this stormwater may be conveyed under San Felipe Road through culverts before reaching Fallon Road. However, as industrial and commercial development occurs along San Felipe and Fallon Road peak flows will increase if they are not mitigated onsite. In addition to upgrading the storm drain on Fallon Road, the City may also consider development of another regional retention facility similar to the Rustic Basin to collect and infiltrate stormwater. The soils along Santa Ana Creek are likely suitable for such a facility.

Westside Boulevard

The model indicates flooding during 10-year and 25-year storm conditions in Westside Boulevard at Steinbeck Drive. Although the tributary area is less than 50 acres, it is recommended that this portion of the system is designed for the 25-year storm due to the sump conditions at the intersection of Westside Boulevard and South Street. Potential development in the tributary area includes residential construction along Westside Boulevard between South Street and Apricot Lane. The soils in this area are HSG B, and may be suitable for LID site features. This storm drain currently crosses under the IWWTP storm drain in South Street. As a part of the upgrade process, the storm drain could be raised and redirected to the South Street line to flow to the IWWTP for retention and infiltration.

Apollo Way

The model indicates flooding in Apollo Way for the 10-year and 25-year storm event. Upstream of manhole G4-5 the tributary area is less than 50 acres and is therefore required to be sized for the 10-year event only. Future development in this tributary area includes industrial development along Apollo Way and Bert Drive. The soils in this region are HSG D, and are likely not suitable for LID site design.

Nash Road

Under future conditions the increased flow depth in the storm drain in Nash Road causes modeled flooding upstream in Squire Court and Rancho Drive, for both the 10-year and 25-year storm event. Squire Court is a sump condition with flooding indicated under existing conditions. Future development in this tributary area includes high density residential along Airline Highway and Sunnyslope Road (General Plan HDR). The majority of the soils in this development area are HSG B and are likely suitable for LID site design. However, it can be difficult to incorporate enough LID within a high density

development to fully mitigate increased stormwater flow. Additional development may include high density residential infill along Valley View Road between Sunset Drive and Sunnyslope Road. The soils in this development area are predominantly HSG D. This could be a suitable location for the City to accept in-lieu fees for not meeting onsite hydromodification criteria if the storm drain system in Nash Road is diverted to the IWWTP for retention and infiltration.

Miller Road

The model indicates flooding in Miller Road between Central Avenue and Buena Vista Road for both the 10-year and 25-year storm event. There is potential for a considerable amount of future residential development north of Buena Vista Road to connect to the existing storm drain system in Miller Road. The majority of the soils in the development area are HSG B, and are likely suitable for LID site design. In addition, the relatively large undeveloped land area is conducive for a localized storm drain master plan to identify potential for regional retention and infiltration facilities to accommodate hydromodification criteria.

SUMP CONDITIONS

Through the process of topography review and subcatchment delineation, numerous locations with sump conditions were found throughout the City's storm drain network. Some of these locations will experience only minor shallow flooding before stormwater can surface flow; while a few of these locations do not have a means of overland escape and could experience severe flooding if the storm drain system was backed up or the inlets were clogged. Table 6-4 summarizes the locations with sump conditions. This list may not be all-inclusive.

Table 6-4. Summary of Locations with Sump Conditions

Location	Cross Street	Overland Escape	Approximate Flood Depth for Overland Escape (inches)
Powell Street	South Street & 7th Street	No	100+
Westside Boulevard	San Juan Road	No	54+
Sunnyslope Road	west of Fairview	No	48+
Osborne Circle	---	No	48+
Poppy Lane Circle	---	No	36+
Ranchito Court Cul-de-sac	---	No	36+
Willow Drive	Central Avenue & Buena Vista Road	No	36+
Verde Circle Cul-de-sac	---	No	36+
Sherwood Drive Cul-de-sac	---	No	24+
Brittany Circle	---	No	24+
Mica Court Cul-de-sac	---	No	24+
Westside Boulevard	South Street	No	24+
Ranchito Drive	Central Avenue	No	24+

Location	Cross Street	Overland Escape	Approximate Flood Depth for Overland Escape (inches)
Westside Boulevard	C Street	No	20+
Sunnyslope Road	East of Hwy 25	No	18+
Miller Road	San Juan Road	No	18+
Carmen Court & Monica Court	C Street	No	12+
Matulich Court Cul-de-sac	---	No	12+
Gonzales Drive	south of Central Avenue	No	12+
Teresita Court Cul-de-sac	---	No	12+
Acacia Court Cul-de-sac	---	No	12+
Shelton Drive	Fallon Road	Yes	14
McCarthy Street	Recht Street	Yes	12
Nash Road	Homestead Avenue	Yes	12
Lana Lane	Fallon Road	Yes	12
Kathryn Drive	South Street	Yes	12
Kimberly Court	Robert Drive	Yes	12
Miller Road	Central Avenue & Buena Vista Road	Yes	12
Gonzales Drive	Central Avenue & Buena Vista Road	Yes	12
Recht Street	Meridian Street	Yes	10
Santa Ana Road	Gray Alley	Yes	10
Squire Court	Knight Lane	Yes	10
Line Street	2nd Street	Yes	10
Central Avenue	Rossi Court	Yes	8
Felice Drive	Cosco Court	Yes	8
South side of Meridian Street	Vintage Way	Yes	6
South side of Meridian Street	La Baig Drive	Yes	6
Meridian Street	Memorial Drive	Yes	6
Beverly Drive	Frank Klauer Pond	Yes	6
South side of Meridian Street	McCray	Yes	6
Apollo Way	---	Yes	6
San Lorenzo Drive	Central Avenue	Yes	6

It is critical to maintain the storm drain inlets at these sump locations to ensure that flooding does not occur due to clogged or otherwise substandard inlet conditions. Highest priority locations are those with no viable overland escape path, that are more highly susceptible to flooding in the event of inlet failure.

FLOODPLAIN REVIEW

Federal Emergency Management Authority (FEMA) flood hazard data was analyzed with respect to existing and potential future land use within the study area. FEMA flood hazard zones are defined as follows:

- Zone A: Areas subject to inundation by the 1-percent-annual-chance (100-year) flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
- Zone AE: Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Base Flood Elevations (BFEs) are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
- Zone AO: Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.
- Zone X Shaded: Moderate flood hazard areas, subject to inundation by the 0.2-percent-annual-chance (500-year) flood event. Mandatory flood insurance purchase requirements and floodplain management standards *do not* apply.
- Zone X Un-shaded: Low risk flood hazard areas, above the elevation of the 0.2-percent-annual-chance (500-year) flood event. Mandatory flood insurance purchase requirements and floodplain management standards *do not* apply.

In general, the floodplain along the San Benito River closely follows the riverbed, while the floodplain along the Santa Ana Creek extends a considerable distance through the northeast portion of the study area.

Hollister Municipal Code

The Hollister Municipal Code Chapter 15.20 “Flood Damage Prevention Regulations” specifies standards of construction within flood hazard areas, and outlines the duties and responsibilities of the City’s floodplain administrator. Code Section 17.14.040 “Flood Hazard Overlay Zone” specifies that residential development within the floodplain is designed to avoid 100-year flood zones, and that industrial development within the floodplain shall comply with the City’s floodplain ordinance. The FEMA National Flood Insurance Program (NFIP) requires that the City’s floodplain management regulations meet or exceed the minimum requirements as includes in Chapter 44 of the Code of Federal Regulations (44 CFR).

Existing Land Use

Figure 6-2 illustrates potential flood hazard extents with respect to existing land use conditions. The majority of land area within the San Benito River flood zone is currently either used for agriculture or is vacant land. A few developed parcels adjacent to the River are susceptible to 100-year flooding, including the California Aggregate and Mining facility and the City’s Industrial Waste Water Treatment Plant. The Santa Ana Creek

flood zone extends over approximately 140 acres of commercial and industrial development southeast of the Airport, and in addition covers approximately 550 acres of agricultural land on the west side of Santa Ana Creek.

The 500-year flood zone covers isolated low-lying areas of the City, including the southern portion of the downtown core. Areas potentially affected by the 500-year flood are mostly residential and commercial uses.

General Plan Land Use

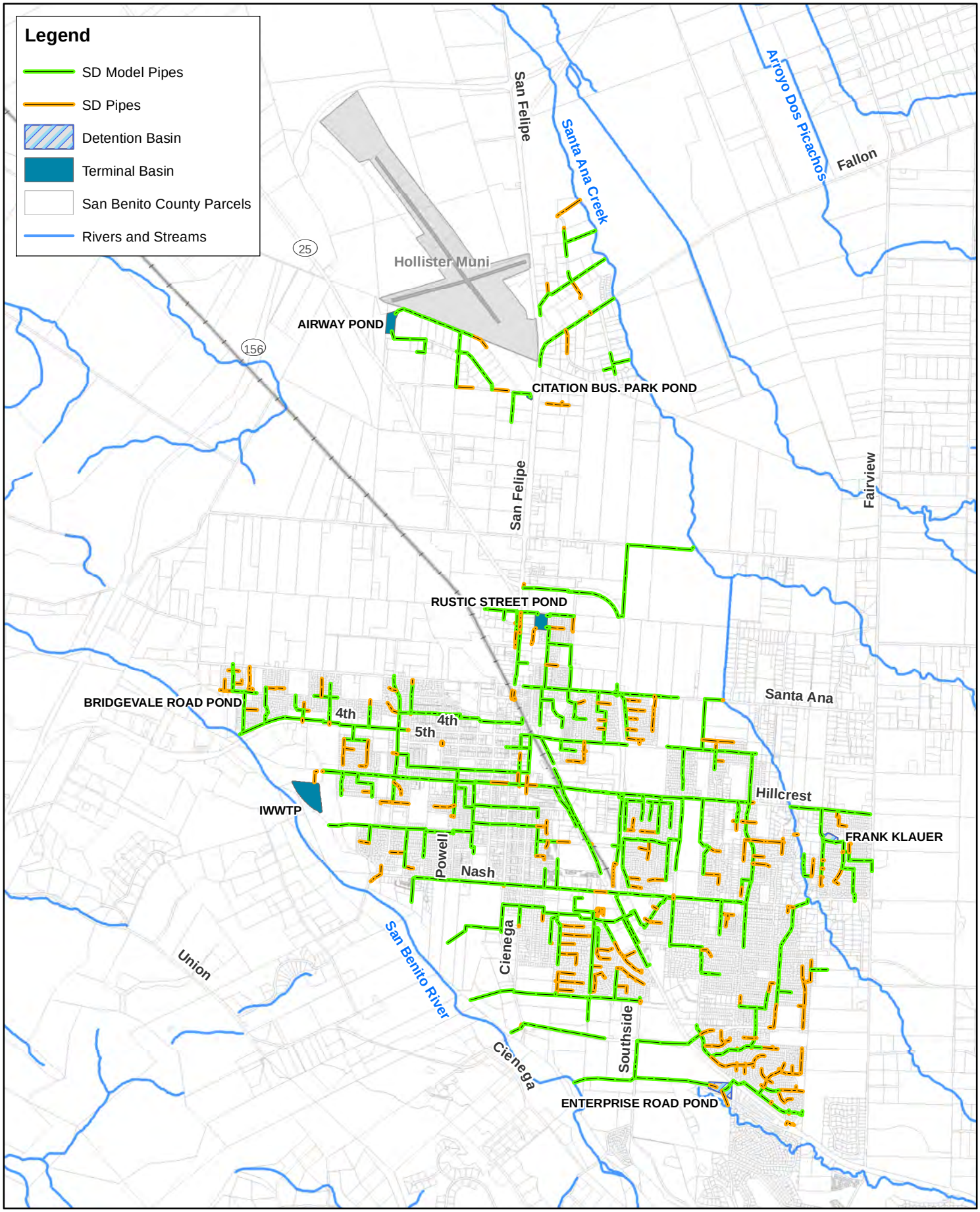
Figure 6-3 illustrates potential flood hazard extents with respect to the City's General Plan land use designations. The majority of land area within the San Benito River flood zone is designated parks and open space, which is an appropriate use of this floodplain area. Designated land use within the Santa Ana Creek floodplain includes existing commercial development, as well as additional commercial and residential use. If future development negatively impacts floodplain elevations then the extent of potential flooding could increase or worsen through the existing floodplain. The appropriate application of the City's floodplain ordinance and diligent review by the City for compliance with floodplain regulations will help to ensure that future development does not exacerbate flood conditions.

Flood Affect on Storm Drain Network

The storm drain network was modeled for both 10-yr and 25-yr storm events based on BFE tailwater elevations in the San Benito River and Santa Ana Creek. In general, the BFE are below the upstream storm drain system invert and ground elevations, and do not directly cause flooding from upstream storm drain manholes. However, the backwater effect from the tailwater conditions does limit hydraulic conveyance and exacerbates flooding conditions in the system. In addition, the BFE is above ground surface in the commercial area west of the Airport, flooding the storm drain system as well. Locations with significant flooding due to 100-year river flows are as follows.

<u>Powell Street between South Street and 7th Street</u>
This block of Powell Street is a sump condition that collects surface flow from a relatively large drainage area. According to the model, the storm drain network would have increased flooding at this location with the San Benito River at BFE stage. Because this area does not have an overland escape path, significant ponding could occur and flooding could extend a considerable distance from this intersection.

<u>Highway 25 at San Felipe Road</u>
With the Santa Ana Creek at BFE conditions, the backwater effect from the creek could cause flooding at the recently installed Highway 25 bypass drainage system, at the intersection of Highway 25 and San Felipe Road. Of particular concern is the potential impact to traffic if the flooding extended into the traffic way. It is noted that this drainage system has a flap gate at the outlet which would prevent creek water from entering the storm drain. However, with the flapgate closed the upstream storm drain system could fill will stormwater and cause flooding as well.



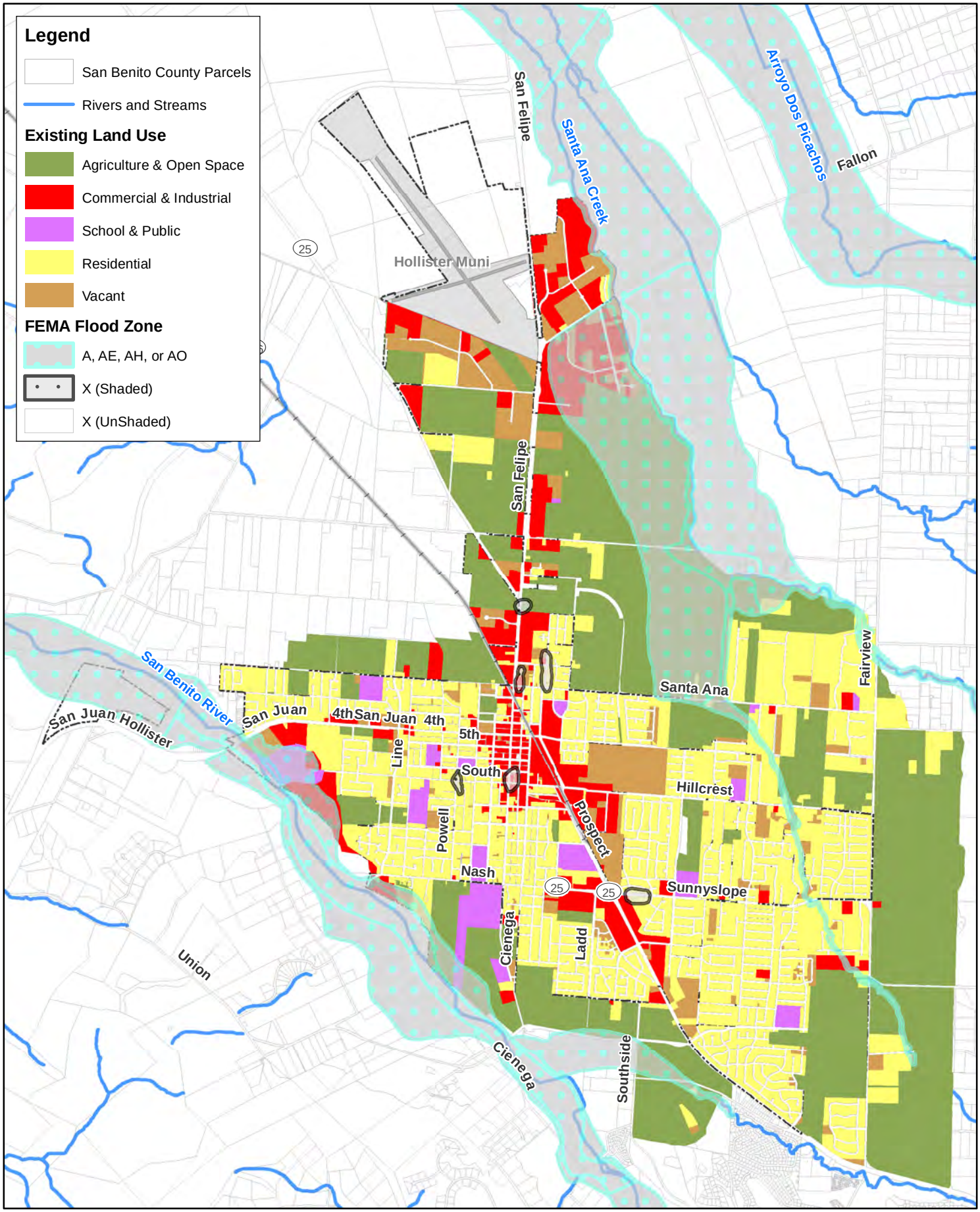
WALLACE GROUP
CIVIL ENGINEERING
CONSTRUCTION MANAGEMENT
LANDSCAPE ARCHITECTURE
MECHANICAL ENGINEERING
PLANNING
PUBLIC WORKS ADMINISTRATION
SURVEYING/GIS SOLUTIONS
WATER RESOURCES
WALLACE SWANSON INTERNATIONAL
612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011 F 805 544-4294
www.wallacegroup.us

SCALE: NTS

CITY OF HOLLISTER
2011 SDMP

FIGURE 6-1: STORM DRAIN MODEL OVERVIEW

NOTES:
BASEMAP PROVIDE BY SAN BENITO COUNTY.
WALLACE GROUP DID NOT PERFORM BOUNDARY SURVEY SERVICES FOR THIS MAP. NOT A LEGAL DOCUMENT.
MAP PRODUCED FEBRUARY 2011.



CIVIL ENGINEERING
CONSTRUCTION MANAGEMENT
LANDSCAPE ARCHITECTURE
MECHANICAL ENGINEERING
PLANNING
PUBLIC WORKS ADMINISTRATION
SURVEYING/GIS SOLUTIONS
WATER RESOURCES
WALLACE SWANSON INTERNATIONAL

WALLACE GROUP

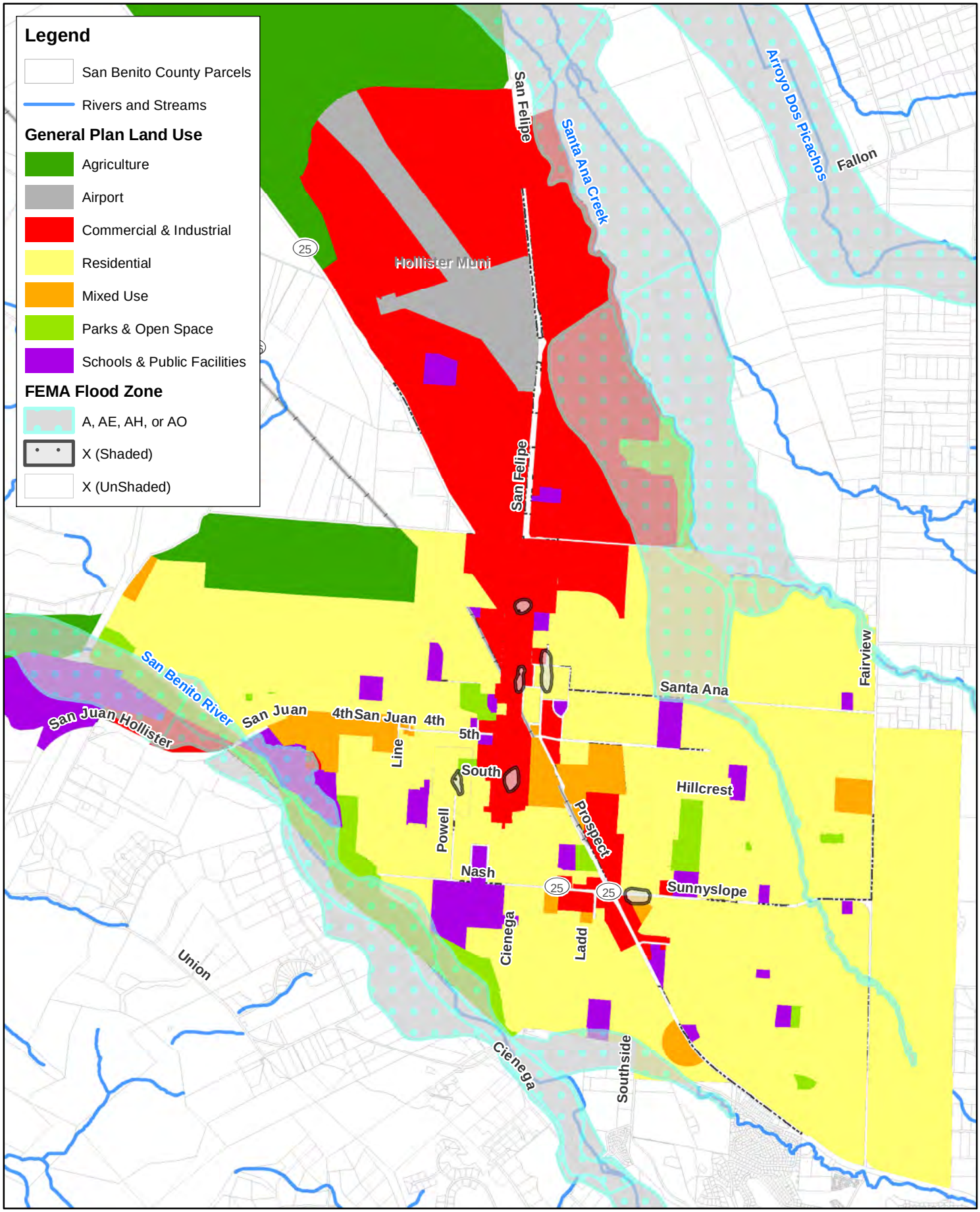
612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011 F 805 544-4294
www.wallacegroup.us

SCALE: NTS

CITY OF HOLLISTER
2011 SDMP

FIGURE 6-2: FLOODPLAINS AND EXISTING LAND USE

NOTES:
BASEMAP PROVIDE BY SAN BENITO COUNTY.
WALLACE GROUP DID NOT PERFORM BOUNDARY SURVEY SERVICES FOR THIS MAP. NOT A LEGAL DOCUMENT.
MAP PRODUCED FEBRUARY 2011.



CIVIL ENGINEERING
CONSTRUCTION MANAGEMENT
LANDSCAPE ARCHITECTURE
MECHANICAL ENGINEERING
PLANNING
PUBLIC WORKS ADMINISTRATION
SURVEYING/GIS SOLUTIONS
WATER RESOURCES
WALLACE SWANSON INTERNATIONAL

WALLACE GROUP

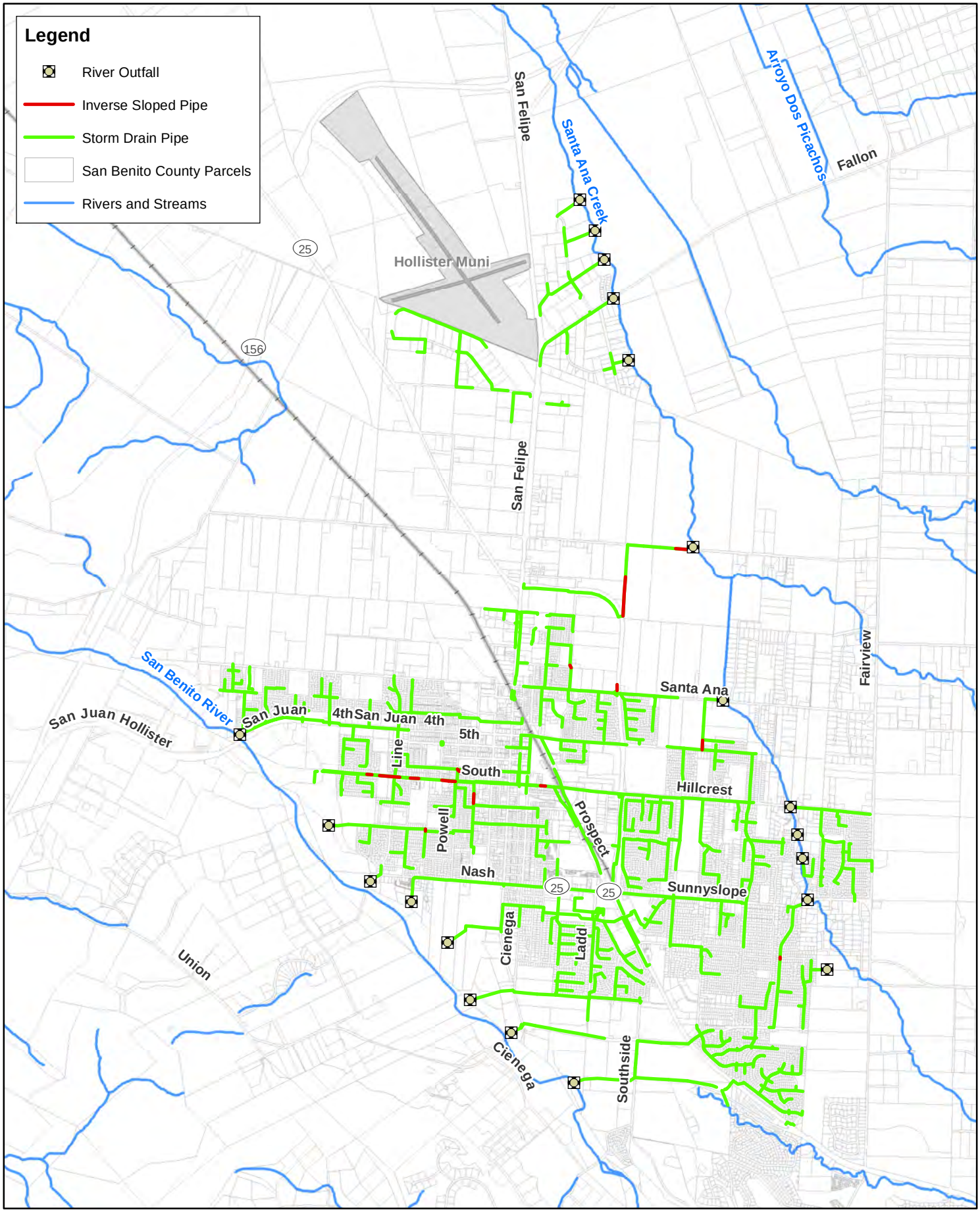
612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011 F 805 544-4294
www.wallacegroup.us

SCALE: NTS

CITY OF HOLLISTER
2011 SDMP

FIGURE 6-3: FLOODPLAINS AND GENERAL PLAN LAND USE

NOTES:
BASEMAP PROVIDE BY SAN BENITO COUNTY.
WALLACE GROUP DID NOT PERFORM BOUNDARY SURVEY SERVICES FOR THIS MAP. NOT A LEGAL DOCUMENT.
MAP PRODUCED FEBRUARY 2011.



CIVIL ENGINEERING
CONSTRUCTION MANAGEMENT
LANDSCAPE ARCHITECTURE
MECHANICAL ENGINEERING
PLANNING
PUBLIC WORKS ADMINISTRATION
SURVEYING/GIS SOLUTIONS
WATER RESOURCES
WALLACE SWANSON INTERNATIONAL

WALLACE GROUP

612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011 F 805 544-4294
www.wallacegroup.us

SCALE: NTS

CITY OF HOLLISTER
2011 SDMP

FIGURE 6-4:EXISTING INVERSE SLOPED STORM DRAIN PIPES

NOTES:
BASEMAP PROVIDE BY SAN BENITO COUNTY. WALLACE GROUP DID NOT PERFORM BOUNDARY SURVEY SERVICES FOR THIS MAP. NOT A LEGAL DOCUMENT. MAP PRODUCED APRIL 2011.

CHAPTER 7

INDUSTRIAL WASTEWATER TREATMENT PLANT ANALYSIS

The City owns and operates a Regional Wastewater Treatment Plant (RWWTP) and an Industrial Wastewater Treatment Plant (IWWTP). The RWWTP receives all of the domestic wastewater from the City. Over the past 10 years, industrial companies who discharge to the IWWTP have slowly been leaving the City and currently there is only one industrial discharger to the IWWTP. The IWWTP receives wastewater during the summer and fall from this one remaining industrial user. During the winter, the facility is a detention pond for storm water for a small area of the City. With the growing emphasis on storm water quality and the reduction of need for industrial wastewater treatment, the City would like to analyze opportunities to maximize the IWWTP's ability to treat additional storm water and possibly incorporate some environmental habitat into the project. The following chapter discusses the existing facility, the opportunities for additional storm water to enter the facility, and the various options for treatment and disposal of storm water. All figures for Chapter 7 are located at the end of this chapter.

EXISTING FACILITIES

There are two components to the analysis of the IWWTP to be used for storm water detention. The first is the storm drain collection system and its ability to convey water to the IWWTP. The second is the treatment plant itself and its available capacity. Both are described in further detail below.

Storm Drain Collection System

The City has 20 outfalls that lie either on the San Benito River or on the Santa Ana Creek. The City also has five terminal basins, including the IWWTP and one detention basin. Figure 7-1 depicts the locations of the outfalls and their corresponding tributary areas. Currently, the tributary area that terminates at the IWWTP is 202 acres. In addition, through some operational changes to a slide gate at MH F12-9 within the storm drain collection system, a small portion of the tributary area from Outfall D12-1OF (36 acres) can also flow to the IWWTP. Therefore, a total of 238 acres of land is currently tributary to the IWWTP.

Industrial Waste Water Treatment Plant

The IWWTP has a total of six ponds, which occupy a total of approximately 65 acres. The IWWTP does not have an active headworks or influent metering station. Pond 1 is the primary treatment pond. It has a capacity of approximately 62 mg. It is an aerated lagoon with approximately 15, 100 hp surface aerators and 8, 50 hp surface aerators. Pond 1 overflows to Pond 2, which acts primarily as a settling pond. Pond 2 has a capacity of approximately 32 mg. Both Ponds 1 and 2 have a clay liner that restricts the ponds from percolating. From Pond 2, effluent can be discharged via two, 25 hp manually operated pumps to Ponds 3, 4, 5 or 6. These four ponds are percolation ponds with a total capacity of approximately 131 mg with an additional 2 foot of freeboard. Figure 7-2 provides the layout of the IWWTP ponds.

STORM DRAIN COLLECTION SYSTEM ALTERNATIVES

At this time, as noted previously, the IWWTP has the ability to receive storm flows from the 238 acres tributary to it without any capital improvement projects required. The most critical storm to catch is the first flush because typically this storm runoff will carry the highest levels of contaminants and solids. To analyze the capacity of the storm drain infrastructure, an 85 percentile storm was modeled (meaning - 85% of all storms will be less than the projected flow). Based on the storm drain model, the 85 percentile storm will bring 0.60 mg of storm water to the IWWTP. If the slide gate diverts water to the IWWTP, an additional 0.26 mg of storm water can flow to the IWWTP. This is substantially less than the overall capacity of the IWWTP. At this rate, the storm drain system has substantial capacity to meet these storm flows.

The intention of the City is to maximize the storage and percolation capacity of the IWWTP to enhance water quality treatment and therefore, additional tributary areas were evaluated to determine the cost/benefit of diverting storm water to the IWWTP. After completing a preliminary evaluation of the outfalls, it was determined that Outfalls C11-10F, D12-10F, E13-20F, and E14-10F have potential for diversion facilities. Descriptions for each outfall are provided as follows:

Outfall C11-10F

OF C11-10F is located at the southwest corner of Bridge Road, just north of the San Benito Bridge (See Figure 7-1). The outfall is 84-inches in diameter and discharges to the San Benito River. OF C11-10F has the largest tributary area in the City totaling approximately 1,161 acres. During an 85% storm, OF C11-10F will see up to 7.13 mg in 24 hours. This is estimated to have a peak flow of almost 25,000 gpm, with an average flow rate of almost 5,000 gpm. Peak flow has a hydraulic peaking factor of approximately five times the average flow.

The City, in 2001 constructed a diversion pump station on Bridge Road that collected wastewater prior to the inverted siphon and diverted wastewater from the RWWTP to the IWWTP. This diversion pump station was in operation periodically during the construction of the new RWWTP. This pump station is no longer being used for wastewater purposes. This diversion pump station has been considered to be used for storm water diversion and potentially the recycled water program.

The pump station consists of two-50 hp pumps with the ability to install one more 50 hp pump. Each pump is rated for raw wastewater at approximately 2,250 gpm at 75 feet of head. There are two, 12-inch PVC force mains from the pump station to just upstream of Pond 1 on the IWWTP site for a total distance of approximately 3,700 feet.

To utilize this facility for storm water diversion, some modifications to the storm drain facility are required. The following are the improvements needed to divert storm water to the pump station:

1. Install a new storm drain manhole or diversion structure along the 84-inch storm drain adjacent to the existing wet well for the pump station (See Figure 7-3). The invert of this manhole will be approximately 246.1 ft.
2. Install a 15-inch storm drain pipe from this new manhole to the wet well (approximately 15 feet). The 15-inch storm drain will limit the capacity of the flow going to the wet well to match the capacity of the two pumps. The storm drain pipe will penetrate the side of the wet well approximately 2.5 feet from the

bottom. The pump controls do not turn the pump on until 5.5 feet. It is anticipated that there will be 3-feet of surcharge in the new manhole.

3. Install an orifice plate in the new manhole in the downstream 84-inch storm drain to allow the manhole to surcharge and water to rise in the wet well. This orifice plate will require structural design.
4. Install a butterfly valve on the 15-inch storm drain. Butterfly valve to be normally open unless facility is being used for wastewater diversion.
5. Optional – Install the third pump in the pump station for additional pumping capacity.

Operation: During a rain event, storm water would flow through the 84-inch storm drain to the new manhole. The orifice plate on the 84-inch downstream pipe will divert the flow to the wet well. The wet well will fill to 5.5 feet. At this time, the pumps would turn on and storm water would be pumped to the IWWTP. If flow continues to rise faster than the pumps can deliver, the water would then flow over the orifice and continue to flow downstream to the outfall on the San Benito River. It is anticipated that water would surcharge in the new manhole and the storm drain manhole on Bridge Road @ Azul Court. It is not anticipated to surcharge in any additional storm drain manholes located further upstream.

The amount of water that can be diverted to the IWWTP would be equivalent to the capacity of the pumping facility, or approximately 4,000 gpm, with two pumps. If the third pump is installed, the City could divert up to approximately 5,500 gpm. Therefore, the pumping station would be capable of handling the average flow, but not the peak flows. During rain events, peak flows would continue to flow out the outfall.

If the facility is to be used for wastewater diversions, the 15-inch butterfly valve would be closed so that wastewater does not flow into the storm drain collection system.

In addition, this facility could have the potential to collect a substantial amount of silt and debris. The new manhole and the existing diversion structure should be checked continuously to protect the pumps from large debris. Prior to completing this project, the pumps should also be verified that they are capable of handling some debris, rags, sticks, etc. New pumps may be required to meet the needs of storm water or an upstream system to catch the debris may be required prior to the water reaching the pumps.

Cost: The construction cost of this capital improvement project is estimated at $100,000. This does not include the cost of new pumps or a manhole to collect debris is determined this is required.

Additional Items to Note: It should be noted that this facility could still be used for recycled water in the future. Typically, recycled water is used primarily in the non-rainy season. Therefore, with modifications to the facility, the wet well can accept storm water during the winter and recycled water during the non-rainy season. In addition, during emergency periods, the facility can still be used for wastewater flow diversion. Proper cleaning of the wet well would be required prior to converting the facility from one use to another.

Outfall D12-10F

OF D12-10F is in open space located at the end of Apricot Lane, south of the IWWTP (See Figure 7-1). The outfall is 60-inches in diameter and discharges to the San Benito River. OF D12-10F has a tributary area of approximately 239 acres. As noted previously, the upper reaches of the tributary area can be diverted to the IWWTP tributary area or can be diverted to OF D12-10F. Above the slide gate is an additional 36 acres, which was discussed previously. For purposes of this evaluation, it is assumed that the storm water from this upper region is diverted directly to the IWWTP.

Storm water can be diverted from OF D12-10F to the IWWTP by installing a new manhole at the end of Apricot Lane and diverting water to Pond 2 at the IWWTP (See Figure 7-4). The upstream manhole from OF D12-10F has an invert elevation of 265.6 ft. It is located approximately 240 feet from the southeast corner of Pond 2. The water surface elevation for Pond 2 is approximately 263.1 ft. With a slope of 0.5%, the storm drain would have a fall of 1.2 feet, which results in an elevation of 264.3 or 1.2 feet above the water surface elevation of Pond 2.

Since the water surface elevation of Pond 1 is higher than Pond 2 and located further away, water would not be capable of being diverted to Pond 1 without the need for a pump.

During an 85% storm, approximately 1.49 mg of storm water can be diverted to the IWWTP in a 24-hour rain event from OF D12-10F.

Cost: The construction cost for diverting storm water from OF D12-10F to the IWWTP is estimated at $245,000.

Outfall E13-20F

OF E13-20F is located off of Nash Road, just west of Quail Run (See Figure 7-1). OF E13-20F is 48-inches in diameter and discharges to the San Benito River. It has a tributary area of approximately 451 acres. During an 85% storm event, this outfall has the potential to divert approximately 1.51 mg of storm water to the IWWTP.

The best opportunity to re-direct storm water from OF E13-20F to the IWWTP is at Homestead Avenue (See Figure 7-5). The invert elevation of the manhole (MH E13-6) on Nash Road at Homestead Avenue is 282.2 ft. Homestead Avenue is tributary to OF D12-10F, which is described above to also be diverted to the IWWTP. The last manhole on Homestead Avenue (MH E12-37), at C Street, has an invert of 279.0 ft. The two manholes are approximately 675 feet apart. A new 24-inch storm drain with a fall of just under 0.5% can be constructed to connect the two systems together.

Cost: The construction cost for the capital improvement project is included in the cost to construct Second Priority Project #19 (See Chapter 8).

Outfall E14-10F

OF E14-10F is located west of San Benito Road. The outfall is 66-inches in diameter and discharges to the San Benito River. OF E14-10F has a tributary area of approximately 227 acres (See Figure 7-1). In an 85% storm event, approximately 2.06 mg of storm water can be diverted to the IWWTP.

The best opportunity to re-direct storm water from OF E14-10F to the IWWTP is at San Benito Street (MH F13-11) and Bundeson Drive (MH F13-6) (See Figure 7-6). The

invert elevation of the manhole on San Benito Street at Bundeson Drive is 290.0. Located 650 feet to the north is the tributary area for OF E13-20F, which is described above as being diverted to the IWWTP via OF D12-10F. The manhole at the intersection of San Benito Street and Nash Road has an invert elevation of 288.8 ft. The 2 manholes are approximately 640 feet apart. A new 24-inch storm drain with a minimal slope of 0.0019% can be constructed to connect the two systems together.

Cost: The construction cost for the capital improvement project is estimated at $251,000.

Summary of Flow

Based on the analysis above, Table 7-1 provides a summary of the flow diversions to the IWWTP during an 85 percentile storm event.

Table 7-1. 85% Storm Event Diversion Capacity

Outfall	Capacity Diverted to IWWTP (mg)	Notes
IWWTP	0.86	Includes flows upstream of slide gate
C11-10F	5.7	Includes 80% of total flow to outfall
D12-10F	1.49	
E13-20F	1.51	
E14-10F	2.06	
Total	**11.62**	

The City has the potential to divert approximately 11.62 mg of storm water during an 85% storm event, which is equivalent to capture a first flush storm. Additional information regarding the capacity of the IWWTP and operations of the facility are included in the following section of this chapter.

INDUSTRIAL WASTEWATER TREATMENT PLANT

The IWWTP is currently being used for wastewater treatment for one industrial user located in the City. This facility discharges to the IWWTP during the summer and fall during the canning season. During the winter and spring, the City receives some storm water from the IWWTP tributary area, which is approximately 238 acres. This section will evaluate the overall capacity of the IWWTP, steps to utilize the facility for storm water treatment and disposal, storm water quality, and recycled water and wetland habitat opportunities.

IWWTP Capacity

As noted previously, the IWWTP is situated on approximately 65 acres with 94 mg of treatment pond storage capacity and 131 mg of percolation pond disposal capacity

(excluding actual percolation). The percolation ponds encompass approximately 30 acres of the site. Actual percolation data is unknown for each of the percolation ponds at this time. *Percolation tests should be conducted on each percolation pond to confirm actual percolation rates and potential for mounding.*

Based on 2008 data received from the City, the average daily percolation and/or evaporation was approximately 630,000 gallons for Ponds 3, 4, 5 and 6 or roughly 1 in/day. The daily disposal rates ranged from an average of 300,000 gpd during the winter to over 900,000 gpd during the summer (actual percolation rates and potential for mounding study should be conducted on the percolation ponds to determine actual percolation rates). For the purposes of this analysis, 300,000 gpd percolation rate will be used to estimate capacity of the facility. Therefore, over a 5 month period or the length of the rainy season, it is estimated that the IWWTP could percolate a minimum of 45 mg of storm water over the four percolation basins. It is anticipated that additional percolation would occur.

As noted above, with upgrades to the system, an 85% storm could divert approximately 11.62 mg of storm water to the IWWTP. Based on 300,000 gpd percolation rate, it would take up to 40 days for all of the storm water to percolate. This does not include the additional water that would fall directly onto each percolation pond during a storm event. Operationally, it is recommended that the City hold the water in Ponds 1 and 2 for aeration purposes, similar to a WWTP operation and move water to each percolation pond at a rate that allows water to percolate within 3 days for mosquito abatement.

Wastewater Treatment vs. Storm Water Treatment

Currently, the IWWTP is being used for wastewater treatment for one industrial user, which operates only during the summer and fall. For purposes of maintaining permitting for the IWWTP for wastewater use while this industrial user is still in operation, it is recommended to **not** comingle Ponds 1 and 2 for wastewater and storm water treatment. If the facility was to overflow due to a heavy rain event and the City would need to direct discharge to the river, there would be no opportunity for wastewater effluent to be included in this discharge. Therefore, the following are recommended changes to be completed at the IWWTP to separate the storm water and the wastewater treatment process.

- Convert Pond 1 into Pond 1A and 1B. The current IWWTP is oversized for the existing industrial user and additional industrial users are not anticipated to return in the future. Therefore, reducing the plant capacity for wastewater treatment is feasible in the near term. Pond 1A would be for treatment of industrial wastewater only. Pond 1B would be for settling of the industrial wastewater before discharge to the percolation ponds for disposal. This conversion would require an interior berm, barrier, or floating curtain to be installed internally in Pond 1. The required sizes for Ponds 1A and 1B would need to be determined based on anticipated wastewater flow to the pond during the peak season. A preliminary engineering report should be completed for the IWWTP to determine the flow anticipated from the industrial user during peak conditions and the required treatment pond sizing to the meet the effluent water quality requirements.
- Convert Pond 2 into a storm water detention pond. This pond would allow for settling of material picked up in the storm water such as sand and grit. Depending on oxygen demand requirements, some aeration may be required.

- Additional piping to allow Pond 1B to flow to the percolation ponds will most likely be required.
- Additional piping to divert flow from the pumping facility from OF C11-10F to Pond 2B will be required.

Once there are no industrial wastewater sources to the IWWTP, both Ponds 1 and 2 can be utilized for storm water treatment, detention, and disposal.

Based on the recommendations noted above, in the interim, the City would have approximately 32 mg of storage in Pond 2. This is equivalent to approximately three, 85% storms. Water would continue to percolate daily at a minimum rate of 300,000 gpd for a minimum of 45 mg during a 5 month period.

Wetland Opportunities

The IWWTP has a fairly high visual profile as it is visible from San Juan Road as you enter the City from the west. In addition, the City is planning to incorporate walking trails around the San Benito River and adjacent to the IWWTP. Therefore, the City is looking at methods to improve the visual aesthetics of the IWWTP and creating a more natural habitat for wildlife, while maintaining the functionality of a treatment plant.

The City has an opportunity to incorporate a wetland environment along the San Benito River and the San Juan Road edge of the IWWTP property. The wetland would be a meandering wetland along the edge that would incorporate plants that are able to be sustainable without water year-round. During the winter months, the wetlands would be filled with water. During the summer, the wetland area would be dry, but the plant life would still thrive. The wetland area would screen the IWWTP, while providing a habitat for treatment and disposal.

It is not recommended to convert the IWWTP to a wetland habitat until after the facility is no longer needed for wastewater treatment. Currently, maintaining the existing configuration provides the City with more flexibility with wastewater and storm water treatment options in the interim. Once the wastewater treatment process is no longer necessary, the facility can be converted to incorporate a meandering wetland along the edge of the facility. A preliminary design and evaluation should be completed prior to moving forward with this design. The preliminary evaluation should include soils analysis, percolation rate, topographic survey, plant species recommendations, storm water capacity analysis, and preliminary layout of the facilities.

Recycled Water Opportunities

The City is moving forward with incorporating recycled water into their water portfolio to offset potable water to various large water users throughout the City. The City will utilize the pumping station on Bridge Road, near OF C11-10F as a means to distribute Title 22 2.2 tertiary water to these various facilities. See the City's recycled water reports for more information regarding specific plans for recycled water.

The storm water retained at the IWWTP could be used in addition to the recycled water to offset potable water use. Currently there are no regulations that restrict an agency from blending recycled water and storm water that is not treated. In addition, no regulations are proposed in the future. It is recommended that the City prepare a plan for operating and maintaining the system, anticipated water quality for the end user and submit this report to the California Department of Public Health and the Regional Water

Quality Control Board for concurrence. The City may need to install a filtration and disinfection system at the IWWTP for the storm water.

There are two benefits to blending storm water with recycled water. First, the storm water will increase the available water to end users. Second, the TDS levels in storm water are substantially lower than in the recycled water. Therefore, by blending the recycled water and storm water, the overall TDS levels are reduced, providing the end user with better quality water for crop and turf irrigation.

Operational Considerations

To operate this facility, recycled water from the RWWTP would be delivered, via a pump station at the RWWTP to the pump station on the east side of the San Benito River. Storm water would also be pumped to this facility from the IWWTP. To reduce fecal coliforms and grain size particles that don't settle out, it may be required to pump the storm water from the IWWTP through filtration and disinfection facility prior to be blended with the recycled water. In the wet well at the pumping facility, the recycled water and storm water would be blended before it is pumped into the recycled water distribution system.

The City would need to calculate the ratio of recycled water to storm water based on the Total Dissolved Solids (TDS) levels in the recycled water and the desired delivery levels of TDS to the end users. This would estimate the amount of storm water needed to be diverted to the blending station.

To complete this project, minor piping upgrades will be required. In addition, a filtration and disinfection treatment facility may be required. A detailed preliminary engineering study should be completed on this project to determine the full cost of this project.

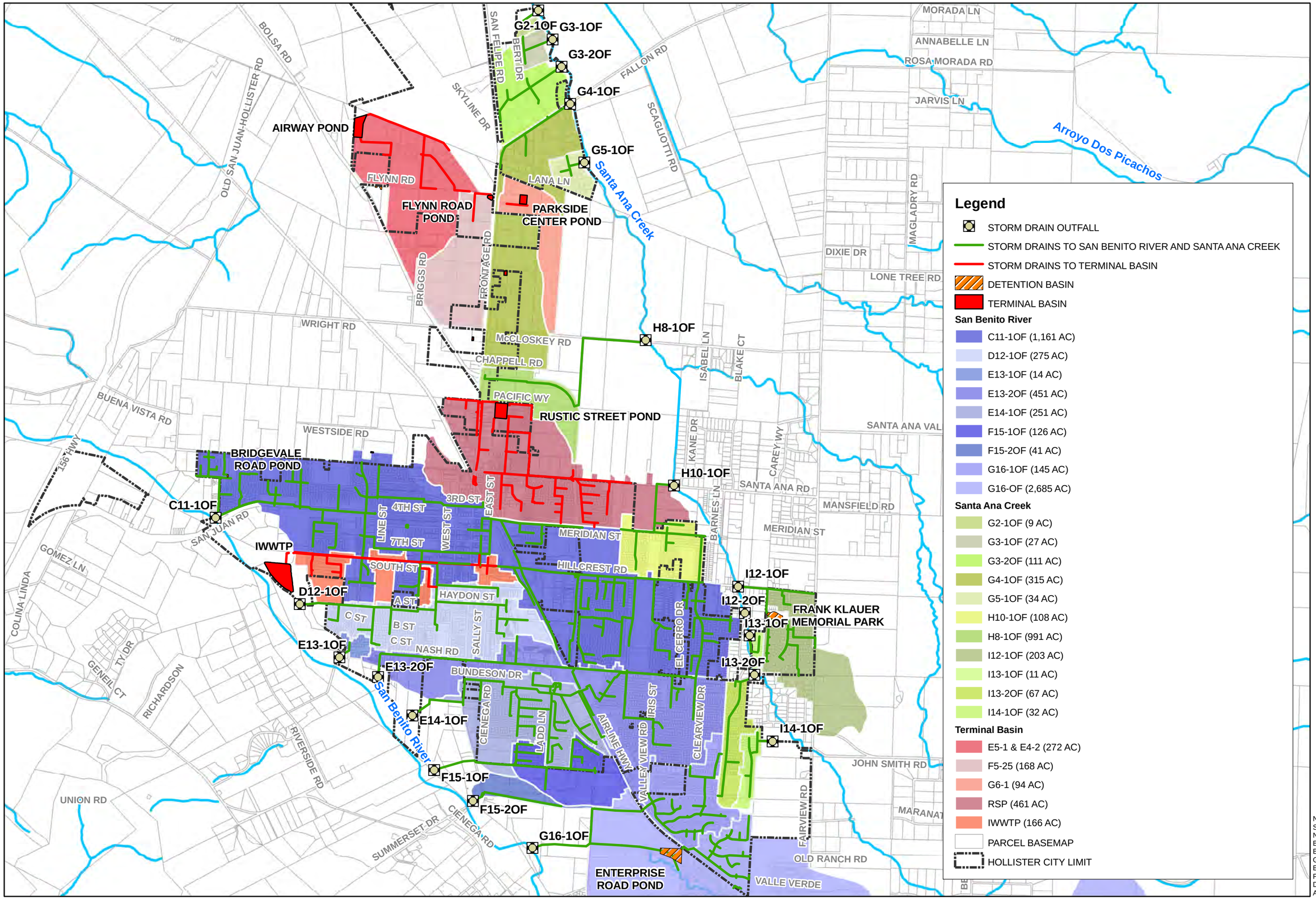
RECOMMENDATIONS

The City has an opportunity to incorporate storm water treatment at a centralized facility reducing the overall quantity of water going to outfalls and minimizing impacts to the San Benito River, and potentially creating a wetland habitat that will be more aesthetically pleasing while providing a more natural habitat along the San Benito corridor. Based on the analysis provided in this Chapter, the following recommendations, in order of priority are listed below:

- **IWWTP Pond Upgrades:** Conduct a preliminary engineering study to determine the optimum size for Pond 1 treatment based on wastewater capacity and water quality needs. Install an interior berm, barrier, or floating curtain in Pond 1 to create both treatment and settling zones within the Pond. Re-arrange aerators for proper aeration in all ponds. Install piping at the IWWTP to allow wastewater and storm water from Ponds 1B and 2 to be delivered to the percolation ponds. Estimated Cost: $150,000.
- **Bridge Road Diversion (OF C11-10F):** Construct diversion infrastructure at OF C11-10F (See Figure 7-3). Estimated Cost: $100,000. This does not include cost for an additional pump or upgrades required to collect silt and debris prior to entering the diversion structure to protect the pumps.

- **Apricot Lane Diversion (OF D12-10F):** Construct diversion from OF D12-10F to Pond #2 at the IWWTP (See Figure 7-4). Estimated Cost: $245,000.
- **Homestead Road Diversion (OF E13-20F):** Construct diversion from OF E13-20F to OF D12-10F (See Figure 7-5). This project is included in Second Priority Project #19 discussed in Chapter 6. This project provides storm system relief upstream of the diversion within OF E13-20F tributary area. See Chapter 8 for project costs.
- **San Benito Street Diversion (OF E14-10F):** Construct diversion from OF E14-10F tributary to OF E13-20F tributary (See Figure 7-6). Estimated Cost: $251,000.
- **Recycled Water Blending Facility Upgrades:** Complete a preliminary engineering report to identify the constraints and requirements to construct necessary facilities to divert storm water to the pumping station on San Juan Road and blend with recycled water. The report should evaluate the options for filtration and disinfection of the storm water to meet the recycled water requirements and the quantity of water needed for blending. Estimated Cost: $50,000 for a preliminary engineering report.
- **Wetland Preliminary Engineer Report:** Conduct a preliminary engineering report for a wetland facility. Estimated Cost: $65,000

It should be noted that the improvements recommended above may be eligible for grant funding through the California Department of Water Resources Implementation Grants for projects incorporated in an Integrated Regional Water Management Plan. The Pajaro River Watershed Integrated Regional Water Management Plan lists the City of Hollister IWWTP as a project for storm water capture and management.



CITY OF HOLLISTER

2011 SDMP

FIGURE 7-1: OUTFALL LOCATIONS

SCALE: NTS

NOTES:
SOILS DATA PROVIDED BY NRCS SSURGO DATABASE. BASEMAP PROVIDED BY SAN BENITO COUNTY. WALLACE GROUP DID NOT PERFORM BOUNDARY SURVEY SERVICES FOR THIS MAP. NOT A LEGAL DOCUMENT. MAP PRODUCED APRIL 2011.

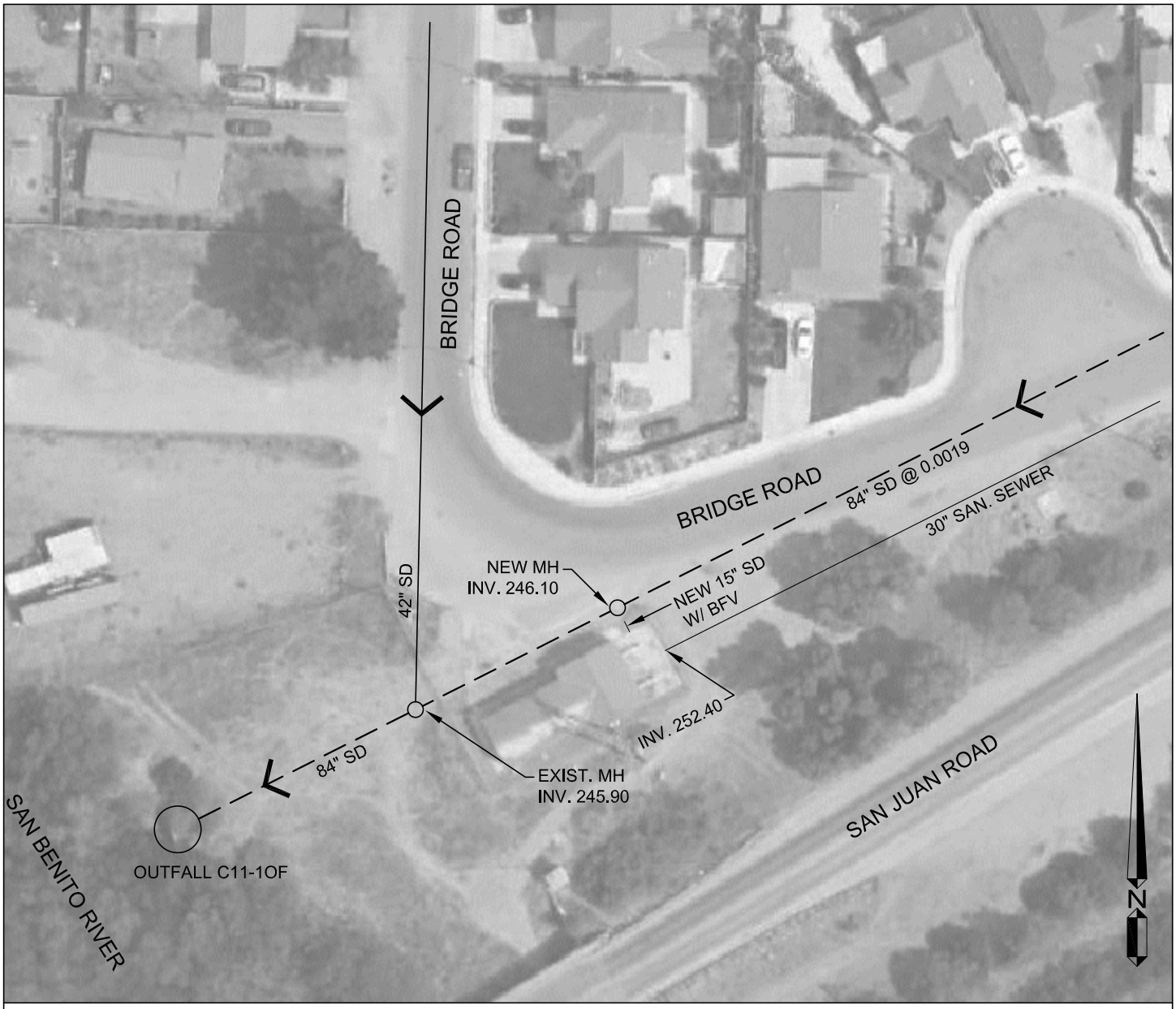
WALLACE GROUP
CIVIL ENGINEERING
CONSTRUCTION MANAGEMENT
LANDSCAPE ARCHITECTURE
MECHANICAL ENGINEERING
PLANNING
PUBLIC WORKS ADMINISTRATION
SURVEYING/GIS SOLUTIONS
WATER RESOURCES
WALLACE SWANSON INTERNATIONAL
612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011 F 805 544-4294
www.wallacegroup.us

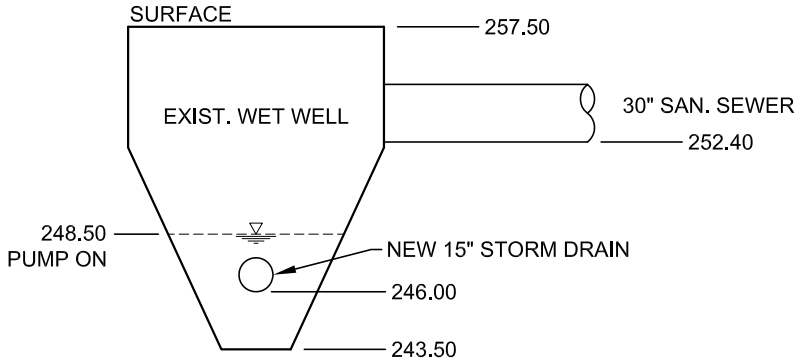
SCALE: NTS

CITY OF HOLLISTER
2011 SDMP

FIGURE 7-2:
INDUSTRIAL WASTEWATER
TREATMENT PLANT

NOTES:
BASEMAP PROVIDE BY
SAN BENITO COUNTY.
WALLACE GROUP DID
NOT PERFORM BOUNDARY
SURVEY SERVICES FOR THIS
MAP. NOT A LEGAL DOCUMENT.
MAP PRODUCED APRIL 2011.

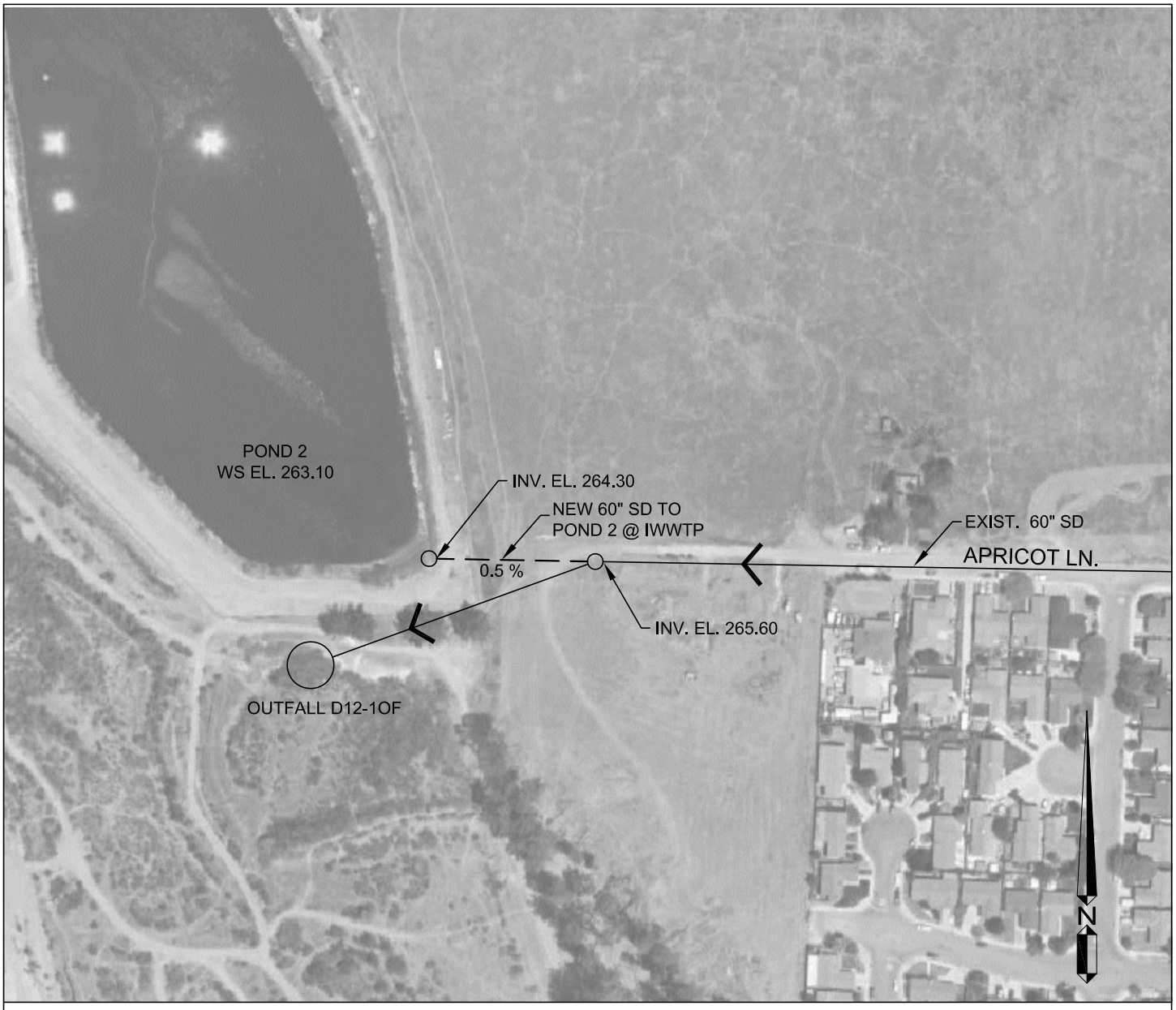




612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011
F 805 544-4294
www.wallacegroup.us
WALLACE GROUP®

CITY OF HOLLISTER
2011 SDMP

FIGURE 7-3: OUTFALL
C11-1OF DIVERSION



612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011
F 805 544-4294
www.wallacegroup.us
WALLACE GROUP®

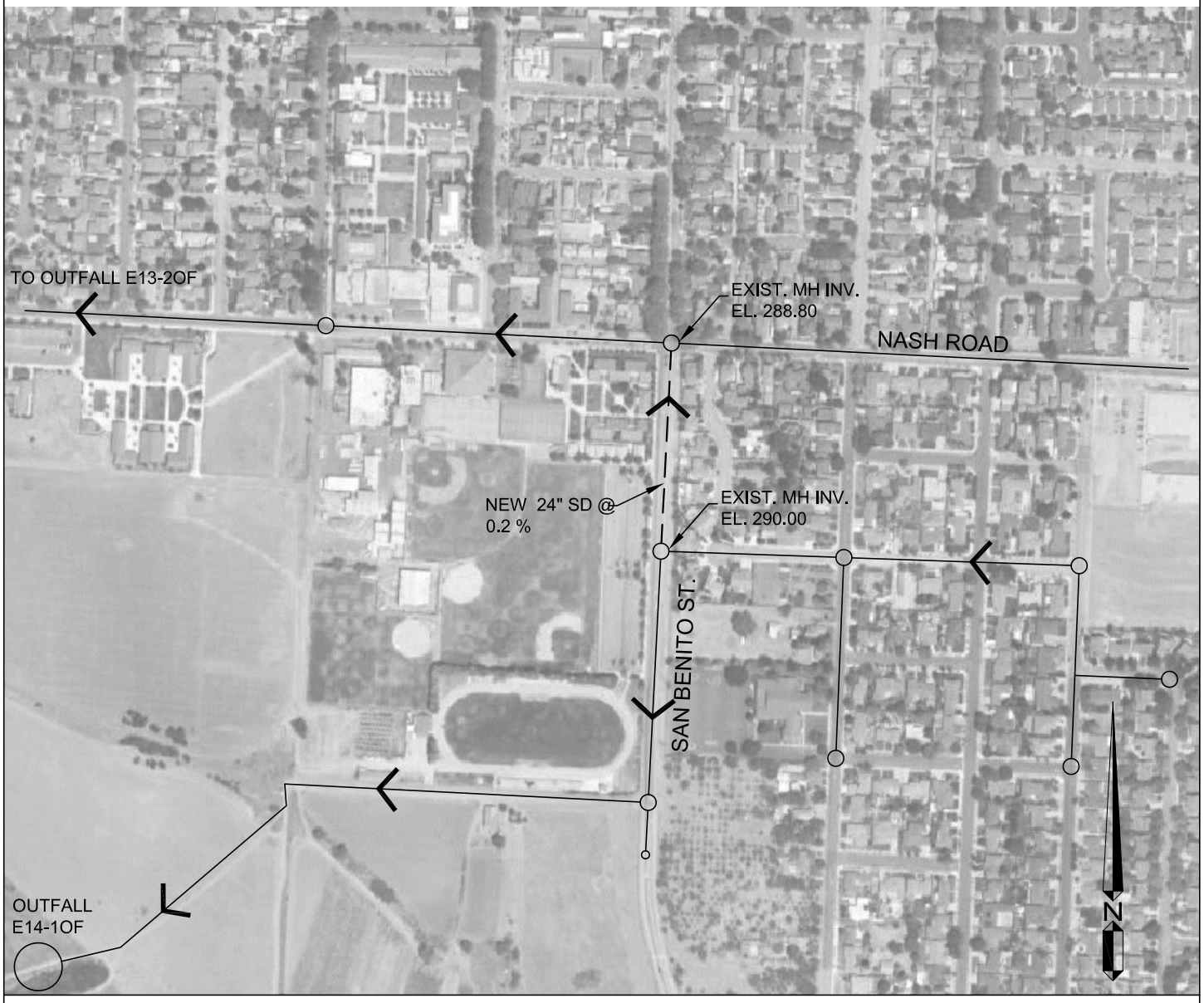
CITY OF HOLLISTER
2011 SDMP

FIGURE 7-4: OUTFALL
D12-1OF DIVERSION

WALLACE GROUP®
612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011
F 805 544-4294
www.wallacegroup.us

CITY OF HOLLISTER
2011 SDMP

FIGURE 7-5: OUTFALL
E13-2OF DIVERSION



612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011
F 805 544-4294
www.wallacegroup.us
WALLACE GROUP®

CITY OF HOLLISTER
2011 SDMP

FIGURE 7-6: OUTFALL
E14-1OF DIVERSION

CHAPTER 8

CAPITAL IMPROVEMENT PROGRAM

This Chapter presents the proposed Capital Improvement Program (CIP), with a brief description of the proposed projects and a preliminary cost estimate for each proposed improvement for the City. Also included in the CIP recommendations are general timelines and scheduling for the needed improvements, and general guidelines for cost allocations relative to existing and future developments.

BASIS OF CAPITAL IMPROVEMENT PROGRAM COSTS

The capital improvement program (CIP) costs were developed based on engineering judgment, confirmed bid prices for similar work in the Central Coast area, consultation with vendors and contractors, established budgetary unit prices for the work, and other reliable sources. Hard construction costs are typically escalated by a factor of 1.4, to allow budget for "soft costs" that include preliminary engineering, engineering, administration, construction management and inspection costs. Some projects may have factors other than 1.4 depending on project type. All CIP costs are expressed in Year 2011 dollars, using McGraw-Hill ENR Construction Cost Index of **9027** (April 2011), and will need to be escalated to the year or years scheduled for the work. The unit cost for new storm drain piping reflects the cost of **reinforced concrete pipe**, and includes the proposed pipelines, manholes, inlets, lateral connections, traffic control, etc., and all other aspects of storm drain system construction.

Unit Costs

The unit costs for various components of the CIP projects are listed in Table 8-1.

Table 8-1. Unit Cost for Construction of Storm Drain Improvements

Pipe Diameter (inches)	Traffic Control	Unit Cost by Pipe Type ($/LF)	
		HDPE	RCP
18	Moderate	$205	$235
18	Heavy	$280	$310
21	Moderate	$215	$260
24	Moderate	$230	$280
30	Moderate	$250	$360
36	Moderate	$270	$390
42	Heavy	$335	$540
48	Moderate	$320	$560
48	Heavy	$360	$600
54	Moderate	---	$660
60	Moderate	---	$725
66	Moderate	---	$770

Projects with heavy traffic control requirements were identified using the listing of highways, major thoroughfares, major collectors, and collectors as defined in Appendix D of the City's 1992 Design Standards.

TIMING OF RECOMMENDED IMPROVEMENTS

Projects are triggered by existing deficiencies or future deficiencies due to potential future development. The projects that address existing drainage problem areas, as identified by the City, are considered 1st Priority Projects, to be completed within the next 1 to 5 years. Projects that address existing deficiencies for the 10-yr and 25-yr storm event are considered 2nd Priority Projects, to be completed within the next 5 to 10 years. 1st and 2nd Priority projects have been ranked in order of importance, which is discussed in greater detail below.

Timing for the projects triggered by future development is unknown at this time. These projects are recommended to be completed as development occurs.

Recommended projects have not been evaluated for potential environmental impacts as a part of this study. Projects will be subject to the requirements of CEQA prior to approval and funding.

CIP Ranking

The 1st and 2nd Priority capital improvement projects were ranked to determine priority of construction based on existing deficiencies. The 1st Priority projects were ranked based on severity of the drainage issue, as identified by the City. The 2nd Priority projects were ranked based on four categories: flooding frequency, public safety, flooding severity, and cost. Each category was provided a weighted importance factor. The importance factor is multiplied by the score the project received and then summed together to determine its final score. The 2nd Priority project ranking is listed in Table 8-2.

*Although the projects are ranked as described above, it should be noted that **all** projects identified as 1st and 2nd Priority are a result of deficiencies in the existing collection system due to existing needs and are therefore all important to be constructed within the next 10 years. It is also recommended that the City review these projects periodically to determine if any substantial changes have occurred that may re-prioritize a project to a higher ranking.*

CAPITAL IMPROVEMENT PROJECT SUMMARY

Table 8-3 provides a summary of the 1st Priority projects. Table 8-4 provides a summary of the 2nd Priority projects, in order of ranking from Table 8-2. Although the 2nd Priority projects are triggered by existing conditions, some of these projects must also be upgraded to provide capacity for storm water flow from future land use conditions. In these cases, the CIP recommendation is the upgrade required for future flows.

Table 8-5 provides a summary of the 3rd Priority (future) recommended projects. These future projects have not been ranked.

The project summary tables also provide an estimate of the construction and "soft" costs for each project. Actual project costs will vary depending upon economic conditions at the time of construction. As noted previously, these costs are based on Year 2011 dollars (McGraw-Hill ENR Construction Cost Index of **9027**) and need to be escalated to the year or years scheduled for the work.

Following the summary tables, project description sheets are provided for each project. The project description sheets provide the following information:

- Project name
- Project trigger
- Project benefit
- Project need
- Project cost
- Project schedule
- Project description
- Project map

These description sheets can be used by City Staff in the planning for each project, and for inclusion in fiscal year budget requests.

Exhibit 6 located in Appendix C provides an overview of the 1st, 2nd, and 3rd Priority Projects throughout the City.

OPERATIONS AND MAINTENANCE PROJECTS

In addition to the projects required to provide storm drain system capacity for flood protection, there are recommended projects or programs that are related to the day-to-day operations and maintenance (O&M) of the storm drain system. These projects are described in more detail in Chapter 3 of this report. The projects required to upgrade the City's IWWTP to provide for additional storm water retention and infiltration are also considered O&M projects, as they are not required for flood control purposes. These projects are described in more detail in Chapter 7. Table 8-6 provides a summary of the proposed O&M projects.

Storm Drain Basin Evaluation and Database

The 2nd and 3rd Priority CIP includes studies and analysis for multiple existing storm water ponds in the City's storm drain system. The estimated cost of these studies includes infiltration testing by a geotechnical engineer to determine in-situ infiltration rates in each basin. The most cost effective method for the City to obtain infiltration information for their storm water basins is to monitor basin levels during the wet season. It is recommended that the City install a level gauge in each retention basin and record daily water levels during wet weather events. This data can then be used to estimate anticipated infiltration rates throughout varying conditions during the year.

Table 8-2. City of Hollister Storm Drain CIP Ranking Matrix

Weighting Factor	3	3	3	1			
	Flooding Frequency	Public Safety	Flooding Severity	Cost	Impacted By Future Development		
Project Name	Most Frequent - 5 Less Frequent - 1	Most Critical - 5 Less Critical - 1	Widespread Flooding - 5 Localized Flooding - 1	<$100,000 - 5 $100,001 to $1,000,000 - 3 >$1,000,000 - 1	Yes/No	Score	Ranking
						= Sum of Importance Factor x Points	
Rustic Basin	5	4	4	5	Yes	44	1
Suiter Street	3	5	5	3	No	42	2
Powell Street	3	5	5	1	Yes	40	3
South Street to IWWTP	2	5	5	1	Yes	37	4
San Felipe at Fallon Road	4	5	3	1	Yes	37	5
South Street	3	4	4	3	No	36	6
Memorial Drive	3	5	3	1	No	34	7
Line Street	3	3	4	3	No	33	8
Third and East	3	4	2	3	No	30	9
Clearview Drive	3	3	3	3	No	30	10
Sunnyslope Road	2	4	3	1	No	28	11
Hawkins Street	2	3	4	1	No	28	12
Central Avenue	2	2	4	3	No	27	13
Hillcrest Road	3	3	2	3	No	27	14
Felice Drive	3	3	2	3	No	27	15
Citation Way	3	2	1	5	Yes	23	16
Knight Lane	2	2	2	3	No	21	17
Clearview Drive at Hillcrest Road	2	2	2	1	No	19	18
Nash Road	1	2	2	1	Yes	16	19

Table 8-3. City of Hollister 1st Priority Capital Improvement Program

Project #	Title	Description	Inlet Quantity	Length (Ft)	Old Diameter (in)	New Diameter (in)	Street	Location	Upstream Manhole Number	Downstream Manhole Number	Upgrade to Meet Future Needs*	Traffic Control	Construction Cost ($)		Subtotal ($)	Total Project Cost ($)**
1	**San Felipe Ditch Upgrade**	Replace the open ditch with new pipe and drop inlets	5	600	---	21	San Felipe	South of Gateway Drive to the north side of Hollister Honda (extension of Pacific Way)	---	F9-3	No	Heavy	$227,752	LS	$227,752	**$318,853**
2	**Monterey & Hawkins Upgrade**	Construct new curb inlets and laterals to existing pipe	2	110	---	15	Hawkins	At the Monterey Street intersection	---	F12-5	No	Moderate	$69,841	LS	$69,841	**$97,777**
3	**4th & Line Upgrade**	Construct new SD pipe and curb inlets	8	1,125	---	24	West	4th Street to 7th Street	---	F11-20	No	Moderate	$305	LF	$343,125	$480,375
			8	1,125	---	24	Powell	4th Street to 7th Street	---	F11-19	No	Moderate	$305	LF	$343,125	$480,375
			8	1,125	---	24	College	4th Street to 7th Street	---	E11-21	No	Moderate	$305	LF	$343,125	$480,375
			2	670	---	18	4th	Mapleton Avenue to Line Street	---	E11-6i	No	Heavy	$330	LF	$221,100	$309,540
		Total Pipe Length		4,045											**Total**	**$1,750,665**
4	**San Benito & 6th Upgrade**	Construct concrete cross gutter, new SD pipe, and curb inlets	4	425	---	18	San Benito	6th Street to 7th Street	---	F11-25	No	Heavy	$147,025	LS	$147,025	**$205,835**
5	**San Benito & 1st Upgrade**	Upgrade pipe, and construct new pipe to abandon bubbler	---	500	12	18	San Benito	1st Street to Santa Ana Road	---	F10-10i	No	Heavy	$150,700	LS	$150,700	**$210,980**
6	**San Benito & Haydon Upgrade**	Construct new SD pipe and curb inlets	8	1,600	---	24	San Benito	Vine Street to Haydon Street	---	F12-17	No	Moderate	$305	LF	$488,000	**$683,200**
7	**Bella Vista & Sunnyslope**	Construct asphalt berm, grassed swale, and new drop inlet to existing SD pipe	1	---	---	---	Sunnyslope	North side of Sunnyslope, across from Bella Vista Drive	---	H13-27	No	Moderate	$30,532	LS	$30,532	**$42,745**
															TOTAL 1st PRIORITY PROJECT COSTS	**$3,310,055**

*** If noted "Yes", then the proposed project has existing deficiencies. In addition, upgrades are necessary for future development. The proposed pipe diameter noted in this Table is to meet the capacity needs of future development.**

****Project cost reflects reinforced concrete pipe (RCP) construction. Total includes construction cost plus preliminary engineering, design engineering, administration construction management and inspection costs. Construction costs were developed based on engineering judgment, confirmed bid prices for similar work in the Central Coast area, consultation with vendors and contractors, established budgetary unit prices for the work, and other reliable sources.**

Table 8-4. City of Hollister 2nd Priority Capital Improvement Program

Project #	Title	Description	Quantity	Length (Ft)	Old Diameter (in)	New Diameter (in)	Street	Location	Upstream Manhole Number	Downstream Manhole Number	Upgrade to Meet Future Needs*	Traffic Control	Construction Cost ($)		Subtotal ($)	Total Project Cost ($)**
1	**Rustic Basin**	Study	1	--	--	--	Rustic Street	Pacific Way	--	--	Yes	--	$15,000	LS	$20,000	**$24,000**
2	**Suiter Street**	Pipe Upgrade	--	880	24	36	Suiter Street	Cullum Street to Powell Street	F12-7	F11-43	No	Moderate	$390	LF	$343,200	$480,480
			--	200	24	36	Powell Street	Suiter Street to South Street	F11-43	F11-28	No	Moderate	$390	LF	$78,000	$109,200
		Total Pipe Length		1,080											**Total**	**$589,680**
3	**Powell Street**	New Detention/Retention	1	--	--	--	Powell Street	7th Street	--	F11-19	Yes	Moderate	$876,072	LS	$876,072	**$1,226,501**
4	**South to IWWTP**	Pipe Upgrade	--	4,200	30	54	South Street	Powell Street to IWWTP	F11-48	D11-10	Yes	Moderate	$660	LF	$2,772,000	**$3,880,800**
5	**San Felipe**	Pipe Upgrade	--	2,750	18,30,36	60	Fallon Road	San Felipe Road to Santa Ana Creek	F5-4	G4-1OF	Yes	Moderate	$725	LF	$1,993,750	**$2,791,250**
6	**South Street**	Pipe Upgrade	--	2,160	18	24	South Street	Sally Street to Powell Street	F11-37	F11-48	No	Moderate	$280	LF	$604,800	**$846,720**
7	**Memorial Drive**	Pipe Upgrade	--	1,340	12 & 15	18	Valley View and Mesa Drive	Mesa Drive to Sunset Drive	H14-19	H14-13	No	Moderate	$235	LF	$314,900	$440,860
			--	980	15	21	Sunset Drive	Valley View to Memorial Drive	H14-13	H14-8	No	Moderate	$260	LF	$254,800	$356,720
			--	1,230	24	30	Memorial Drive	Sunset Drive to Caputo Court	H14-8	H13-38	No	Moderate	$360	LF	$442,800	$619,920
		Total Pipe Length		3,550											**Total**	**$1,417,500**
8	**Line Street**	Pipe Upgrade	--	1,010	12	30	Line Street	Second Street	E10-4I	E10-18	No	Moderate	$360	LF	$363,600	**$509,040**
9	**Third & East**	New Diversion	--	980	--	18	East Street	Furlong Alley to Santa Ana Road	F10-21	F10-8	No	Heavy	$310	LF	$303,800	**$425,320**
10	**Clearview Drive**	Pipe Upgrade	--	750	18	24	Clearview Drive	Sunset Drive to Diablo Drive	H14-12	H13-51	No	Moderate	$280	LF	$210,000	$294,000
			--	610	18	30	Clearview Drive	Diablo Drive to Sunnyslope Road	H13-51	H13-37	No	Moderate	$360	LF	$219,600	$307,440
		Total Pipe Length		1,360											**Total**	**$601,440**

Table 8-4. City of Hollister 2nd Priority Capital Improvement Program

Project #	Title	Description	Quantity	Length (Ft)	Old Diameter (in)	New Diameter (in)	Street	Location	Upstream Manhole Number	Downstream Manhole Number	Upgrade to Meet Future Needs*	Traffic Control	Construction Cost ($)		Subtotal ($)	Total Project Cost ($)**
11	**Sunnyslope Road**	Pipe Upgrade	--	2,920	36	48	Sunnyslope Road	Rancho Drive to Versailles Drive	H13-18	G13-17	No	Heavy	$600	LF	$1,752,000	**$2,452,800**
12	**Hawkins Street**	Pipe Upgrade	--	2,600	18	24	Hawkins Street	Prune Street to Suiter Street	F12-13	F12-9	No	Moderate	$280	LF	$728,000	**$1,019,200**
13	**Central Avenue**	Pipe Upgrade	--	1,610	18	24	Central Avenue	Locust Street to Line Street	F10-17	E10-18	No	Moderate	$280	LF	$450,800	$631,120
			--	380	24	36	Central Avenue	Line Street to Westside Blvd	E10-18	E10-20	No	Moderate	$390	LF	$148,200	$207,480
		Total Pipe Length		1,990											**Total**	**$838,600**
14	**Hillcrest Road**	Pipe Upgrade	--	660	24	42	Hillcrest Road	Memorial Drive	H12-6	H12-4	No	Heavy	$540	LF	$356,400	**$498,960**
15	**Felice Drive**	Pipe Upgrade	--	820	18	24	Felice Drive	Central Avenue to 4th Street	E10-26I	E10-30	No	Moderate	$280	LF	$229,600	**$321,440**
16	**Citation Way**	Study	1	--	--	--	Flynn Road	Citation Way	--	--	Yes	--	$15,000	LS	$15,000	**$18,000**
17	**Knight Lane**	New Diversion	--	700	--	18	Knight Lane	Squire Court to Prune Street	F13-2	F12-37	No	Moderate	$235	LF	$164,500	**$230,300**
18	**Clearview Drive at Hillcrest**	Pipe Upgrade	--	2,000	24 & 30	36	Clearview Drive	El Camino de Vida to Hillcrest Road	H12-47	H12-13	No	Moderate	$390	LF	$780,000	**$1,092,000**
19	**Nash Road**	Pipe Upgrade	--	1,160	45	54	Nash Road	Suiter Street to Homestead Avenue	F13-4	E13-6	No	Moderate	$660	LF	$765,600	$1,071,840
		New Diversion	--	700	--	18	Homestead Ave	Nash Road to "C" Street	E13-6	E12-37	No	Moderate	$235	LF	$164,500	$230,300
		Total Pipe Length		1,860											**Total**	**$1,302,140**
															TOTAL 2nd PRIORITY PROJECT COSTS	**$20,085,691**

*** If noted "Yes", then the proposed project has existing deficiencies. In addition, upgrades are necessary for future development. The proposed pipe diameter noted in this Table is to meet the capacity needs of future development.**

****Project cost reflects reinforced concrete pipe (RCP) construction. Total includes construction cost plus preliminary engineering, design engineering, administration construction management and inspection costs. Construction costs were developed based on engineering judgment, confirmed bid prices for similar work in the Central Coast area, consultation with vendors and contractors, established budgetary unit prices for the work, and other reliable sources.**

Table 8-5. City of Hollister 3rd Priority Capital Improvement Program

Project #	Title	Description	Quantity	Length (Ft)	Old Diameter (in)	New Diameter (in)	Street	Location	Upstream Manhole Number	Downstream Manhole Number	Traffic Control	Construction Cost ($)		Subtotal ($)	Total Project Cost ($)**
1	**Meridian Street**	Pipe Upgrade	--	2,050	24 & 36	48	Meridian Street	Hwy 25 to Chappell Road	G11-22	G11-13	Heavy	$600	LF	$1,230,000	**$1,722,000**
2	**Westside Blvd**	Pipe Upgrade	--	630	18	24	Westside Blvd	Steinbeck Drive to South Street	E12-6	E11-40	Moderate	$280	LF	$176,400	**$246,960**
3	**Apollo Way**	Pipe Upgrade	--	1,225	36	48	Apollo Way	Bert Drive to Santa Ana River	G4-4	G2-3OF	Moderate	$560	LF	$686,000	**$960,400**
4	**Nash Road**	Pipe Upgrade	--	460	42 & 45	54	Tres Pinos Road	Rancho Drive to Cushman Street	G13-17	F13-10	Moderate	$660	LF	$303,600	$425,040
			--	2,200	45	54	Nash Road	Cushman Street to Suiter Street	F13-10	F13-4	Moderate	$660	LF	$1,452,000	$2,032,800
		Total Pipe Length		2,660										**Total**	**$2,457,840**
5	**Airway Pond**	Study	--	--	--	--	Aerostar Way	south of the Airport	--	--	--	$15,000	LS	$20,000	**$24,000**
6	**"A" Street**	Pipe Upgrade	--	580	48	60	"A" Street	West Street to Powell Street	F12-26	E12-24	Moderate	$725	LF	$420,500	**$588,700**
7	**Miller Road**	Pipe Upgrade	--	430	18	30	Miller Road	Amador Circle to Central Avenue	D10-2	D10-9	Moderate	$360	LF	$154,800	**$216,720**
														TOTAL 3rd PRIORITY PROJECT COSTS	**$6,216,620**

****Project cost reflects reinforced concrete pipe (RCP) construction. Total includes construction cost plus preliminary engineering, design engineering, administration construction management and inspection costs. Construction costs were developed based on engineering judgment, confirmed bid prices for similar work in the Central Coast area, consultation with vendors and contractors, established budgetary unit prices for the work, and other reliable sources.**

Table 8-6. City of Hollister Operations and Maintenance Projects

Project #	Title	Description	Project Cost**
1	**Manhole and Inlet Database**	Comprehensive inventory of storm manholes and inlets to catalogue condition and needed maintenance and/or rehabilitation.	$5,000 (yearly)
2	**Maintenance Database**	Develop a maintenance database to track ongoing O&M efforts within the GIS database.	$5,000 (yearly)
3	**Storm Drain Basin Database**	Conduct a review to locate and file record information for the City's existing detention and retention basins. Monitor basins during wet weather events to track infiltration rates.	$10,000
4	**GIS Maintenance & Mapping**	Update GIS database and maps on a semi-annual basis.	$5,000 (yearly)
5	**IWWTP Pond Upgrades**	Install barriers in Ponds 1 and 2 and re-arrange aerators. Install new piping to deliver stormwater to percolation ponds.	$150,000
6	**Bridge Road Diversion**	Construct diversion infrastructure at the Bridge Road Outfall (C11-1OF) to convey stormwater to the IWWTP.	$100,000
7	**Apricot Lane Diversion**	Construct a diversion from the Apricot Lane outfall (D12-1OF) to the IWWTP.	$245,000
8	**Homestead Road Diversion**	Construct a diversion from the Nash Road outfall (E13-1OF) to the Apricot Lane tributary area. Project cost is included in 2nd Priority Capital Improvement Project No. 19.	See Table 8-4
9	**San Benito Street Diversion**	Construct a diversion from the San Benito Street outfall (E14-1OF) to the Nash Road tributary area.	$251,000
10	**Recycled Water Blending Engineering Report**	Complete a preliminary engineering report to evaluate constraints and requirements to blend stormwater with recycled water for distribution and reuse.	$50,000
11	**Wetland Preliminary Engineering Report**	Complete a preliminary engineering report for the construction of a wetland facility at the IWWTP.	$65,000
		TOTAL OPERATIONS AND MAINTENANCE PROJECT COSTS	**$886,000**

****For new construction projects, total includes construction cost plus preliminary engineering, design engineering, administration construction management and inspection costs. Construction costs were developed based on engineering judgment, confirmed bid prices for similar work in the Central Coast area, consultation with vendors and contractors, established budgetary unit prices for the work, and other reliable sources.**

1st Priority Project No. 1: San Felipe Ditch Upgrade

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

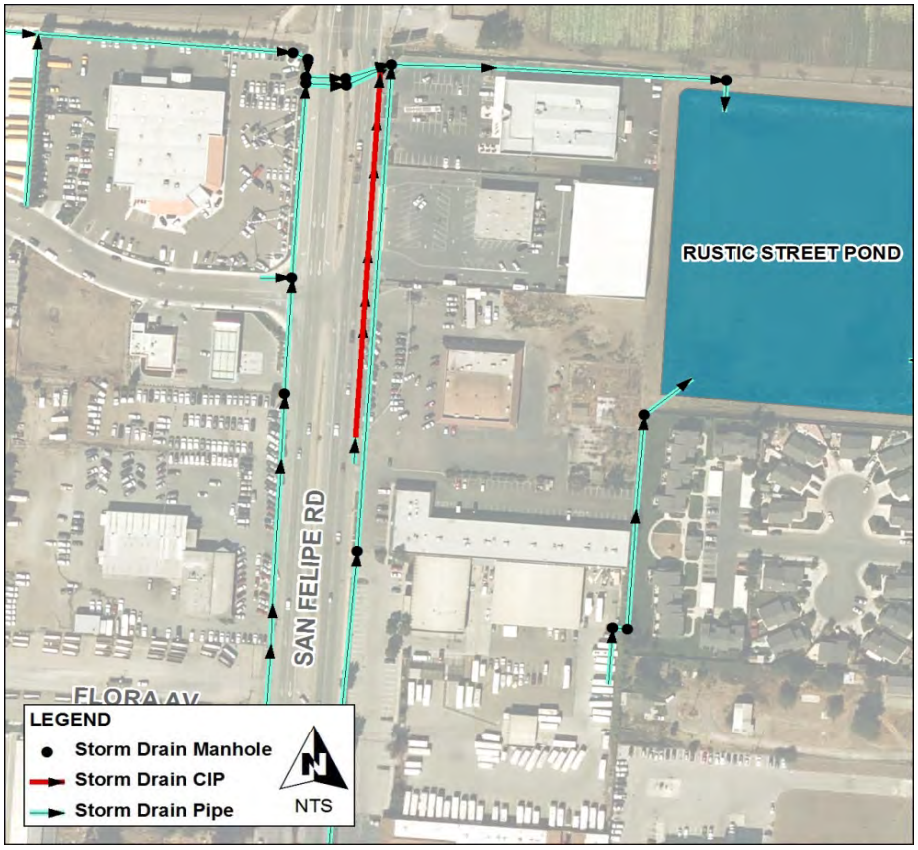
Existing Development	100%
New Development	0%

Project Components

- [ ] Upgrade Gravity Pipeline
- [x] New Gravity Pipeline
- [x] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 3 weeks



Project Need

- [x] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [ ] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$227,752
Planning, Engineering, CM, Legal/Admin (40%)	$91,101
Total Project Cost	**$318,853**

Project Description

This project would replace an existing open ditch on the east side of San Felipe Road with approximately 600 linear feet of new 21-inch storm drain pipe. Traffic accidents have occurred due to vehicles driving into the open ditch. The new pipe would be installed in the existing ditch. A vegetated swale with drop inlets would be constructed over the pipe, to promote water quality while allowing for storm water to be conveyed safely off of San Felipe Road.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

1st Priority Project No. 2: Monterey & Hawkins Upgrade

City of Hollister Capital Improvement Project Information Sheet

2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

Existing Development	100%
New Development	0%

Project Components

- [ ] Upgrade Gravity Pipeline
- [x] New Gravity Pipeline
- [x] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [x] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 2 weeks

Project Need

- [x] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [ ] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$69,841
Planning, Engineering, CM, Legal/Admin (40%)	$27,936
Total Project Cost	**$97,777**

Project Description

This project will construct two new curb inlets and storm drain laterals to connect to the existing storm drain system in Hawkins Street. Currently, the northwest and southwest corners of the intersection are flooded during minor storm events. In addition, tree roots have caused localized damage to the curb and gutter at this intersection.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

1st Priority Project No. 3: 4th & Line Upgrade

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

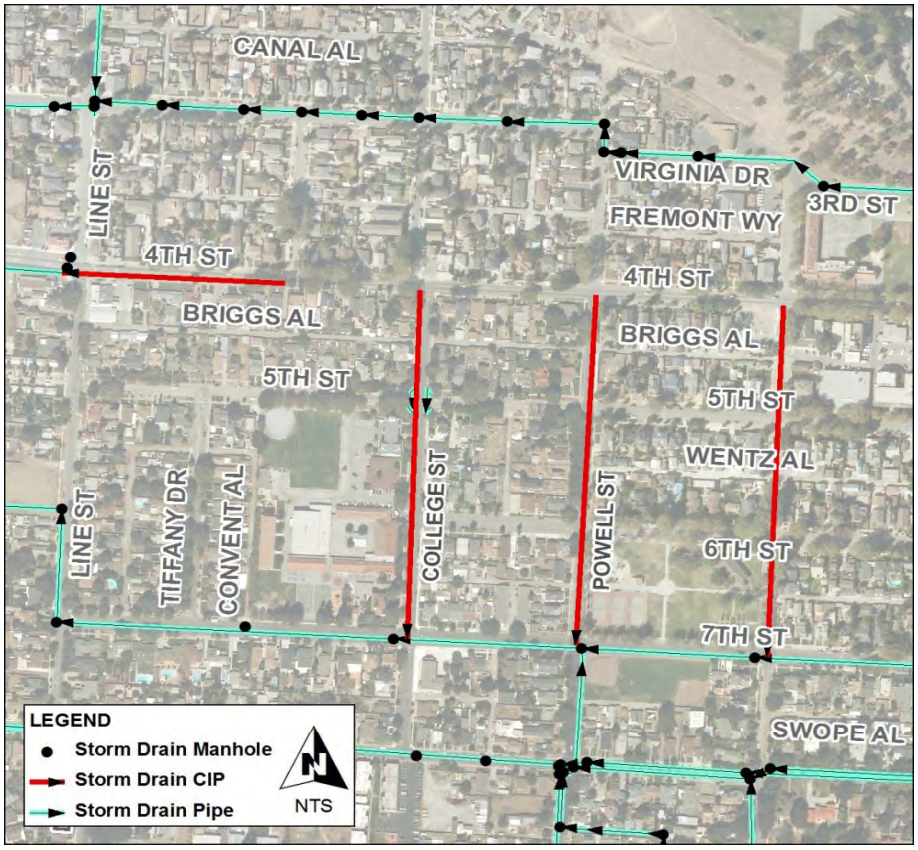
Existing Development	100%
New Development	0%

Project Components

- [ ] Upgrade Gravity Pipeline
- [x] New Gravity Pipeline
- [x] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [x] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 10 weeks



Project Need

- [x] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [ ] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$1,250,475
Planning, Engineering, CM, Legal/Admin (40%)	$500,190
Total Project Cost	**$1,750,665**

Project Description

This project will construct approximately 1,125 linear feet of new 24-inch storm drain pipe on West Street, Powell Street, and College Street, and approximately 670 linear feet of new 18-inch storm drain pipe on 4th Street. This project will alleviate surface flooding in multiple areas, including: 4th Street between Mapleton and Line Streets, West and 4th Street, West and 5th Street, and College and 5th Street. This project will maximize conveyance of stormwater away from 4th Street while minimizing construction in 4th Street.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

1st Priority Project No. 4: San Benito & 6th Upgrade

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

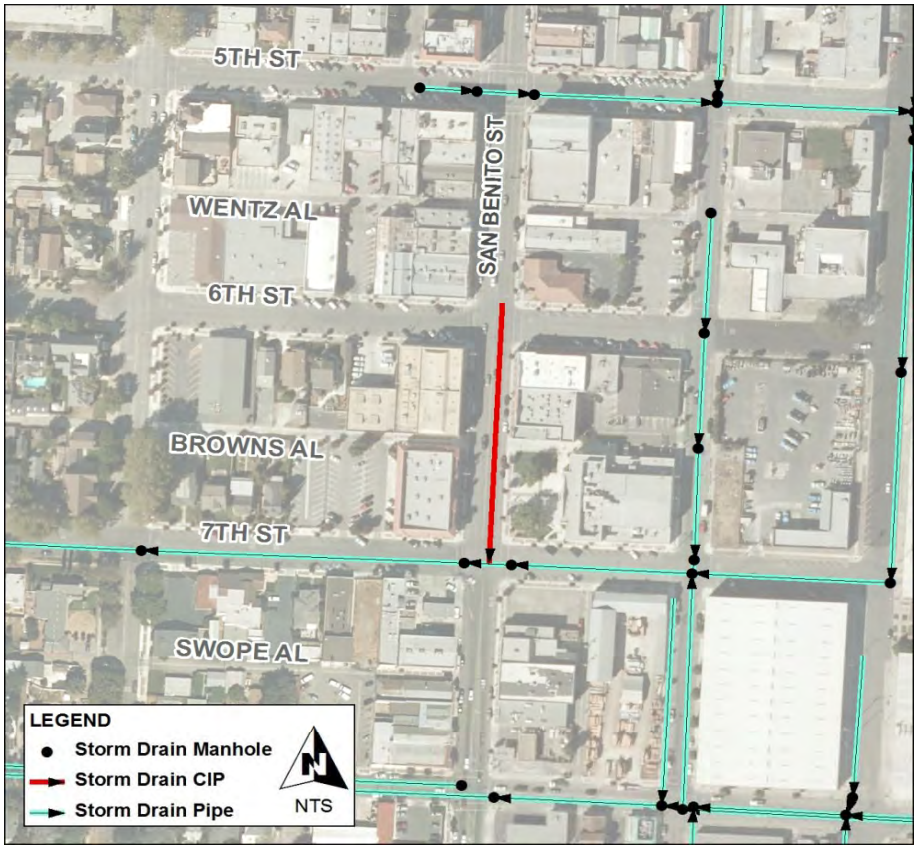
Existing Development	100%
New Development	0%

Project Components

- [ ] Upgrade Gravity Pipeline
- [x] New Gravity Pipeline
- [x] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [x] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 3 weeks



Project Need

- [x] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [ ] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$147,025
Planning, Engineering, CM, Legal/Admin (40%)	$58,810
Total Project Cost	**$205,835**

Project Description

This project will construct approximately 425 linear feet of new 18-inch storm drain pipe in San Bentito Street to alleviate surface flooding at the San Benito and 6th Street intersection. Currently, the east side of San Benito Street floods through this interesection during smaller storm events. In addition, a new cross gutter will be constructed through the intersection to convey stormwater safely across 6th Street.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

1st Priority Project No. 5: San Benito & 1st Upgrade

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

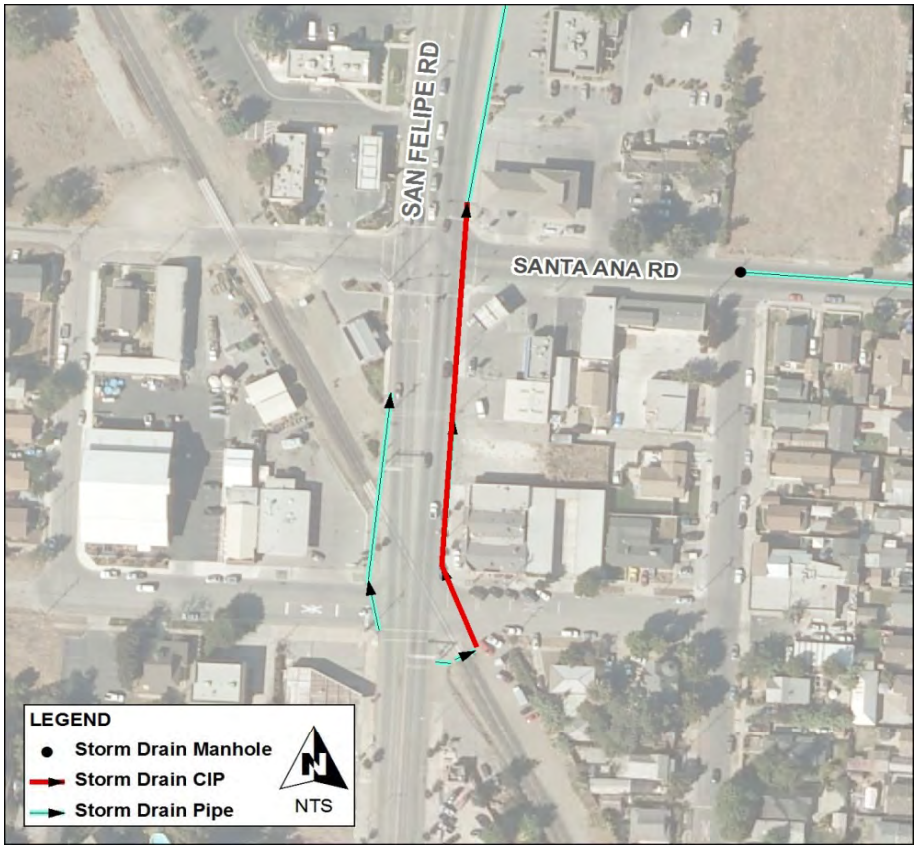
Existing Development	100%
New Development	0%

Project Components

- [x] Upgrade Gravity Pipeline
- [x] New Gravity Pipeline
- [x] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 4 weeks



Project Need

- [x] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [ ] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$150,700
Planning, Engineering, CM, Legal/Admin (40%)	$60,280
Total Project Cost	**$210,980**

Project Description

This project will replace approximately 260 linear feet of 12-inch storm drain with 18-inch pipe, and construct approximately 240 linear feet of new 18-inch pipe to connect to the existing storm drain system in San Felipe Road. The existing pipe at 1st street collects stormwater from the railroad right-of-way and conveys it to a bubbler inlet in San Felipe Road. The bubbler inlet becomes clogged during even minor storm events, causing surface flooding in San Felipe Road.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

1st Priority Project No. 6: San Benito & Haydon Upgrade

City of Hollister Capital Improvement Project Information Sheet

2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

Existing Development	100%
New Development	0%

Project Components

- [ ] Upgrade Gravity Pipeline
- [x] New Gravity Pipeline
- [x] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [x] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 5 weeks

Project Need

- [x] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [ ] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$488,000
Planning, Engineering, CM, Legal/Admin (40%)	$195,200
Total Project Cost	**$683,200**

Project Description

This project will construct approximately 1,600 linear feet of new 24-inch storm drain pipe to alleviate flooding on San Benito Street between Vine Street and Haydon Street. Currently, gutter damage and very flat street slopes lead to flooding on the east side of San Benito Street during minor storm events.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

1st Priority Project No. 7: Bella Vista & Sunnyslope

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

Existing Development	100%
New Development	0%

Project Components

- [ ] Upgrade Gravity Pipeline
- [x] New Gravity Pipeline
- [x] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 2 weeks

Project Need

- [x] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [ ] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$30,532
Planning, Engineering, CM, Legal/Admin (40%)	$12,213
Total Project Cost	**$42,745**

Project Description

This project will construct a new storm drain inlet and lateral to connect to the existing storm drain pipe in Sunnyslope Road. Currently, stormwater from Sunnyslope Road flows onto the property on the north side of the Bella Visa and Sunnyslope intersection, causing surface flooding during even minor storm events. The stormwater will be directed to a new drop inlet with a new asphalt berm and vegetated swale.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

2nd Priority Project No. 1: Rustic Basin

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

Existing Development	90%
New Development	10%

Project Components

- [ ] Upgrade Gravity Pipeline
- [ ] New Gravity Pipeline
- [ ] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [x] Detention or Retention Facility
- [x] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Not applicable

Project Need

- [ ] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [x] Capacity for 100-yr storm

Project Cost Breakdown

Project Cost[1]	$20,000
Planning, Legal/Admin (20%)	$4,000
Total Project Cost	**$24,000**

Project Description

The goal of this project is to analyze in-situ infiltration rates for the existing Rustic Street stormwater basin, to determine if the basin has sufficient capacity to provide flood protection for it's tributary area. Multiple manholes and inlets upstream of the basin are lower in elevation than the top of the basin and therefore limit the available water depth for stormwater retention. Dependent on results of the infiltration testing, the basin capacity may need to be increased to provide flood protection. The estimated cost for this project includes a feasibility study of alternatives to increase basin capacity.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

2nd Priority Project No. 2: Suiter Street

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

Existing Development	95%
New Development	5%

Project Components

- [x] Upgrade Gravity Pipeline
- [ ] New Gravity Pipeline
- [ ] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 4 weeks

Project Need

- [ ] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [x] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$421,200
Planning, Engineering, CM, Legal/Admin (40%)	$168,480
Total Project Cost	**$589,680**

Project Description

This project will upgrade approximately 1,080 linear feet of existing 24-inch pipe to 36-inch pipe to provide flood protection for the 25-yr storm event. This project has a high priority because surface flooding in this location would flow to the regional sump at the South Street and Powell Street intersection. In addition, this upgrade provides capacity for the storm drain in Hawkins Street to be routed to the Suiter Street pipeline via the existing slide gate at the West Street and Hawkins Street intersection. This change in operations increases stormwater flow to the IWWTP for retention and infiltration.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

2nd Priority Project No. 3: Powell Street

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

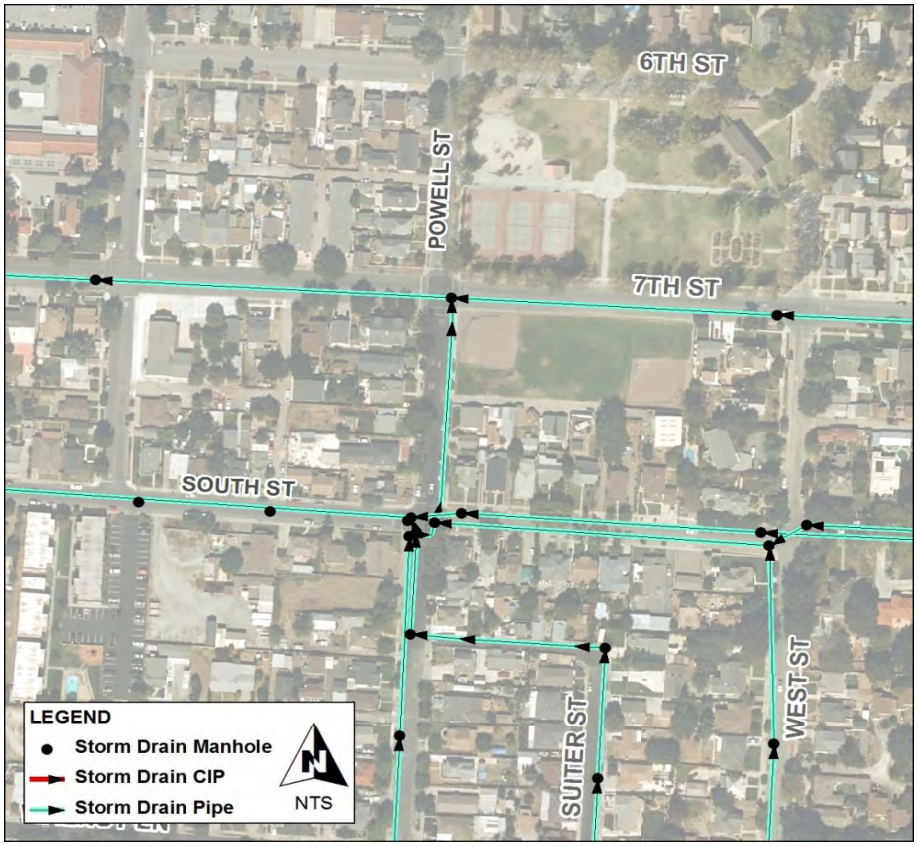
Existing Development	100%
New Development	0%

Project Components

- [ ] Upgrade Gravity Pipeline
- [ ] New Gravity Pipeline
- [ ] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [x] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 12 weeks



Project Need

- [ ] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [x] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$876,072
Planning, Engineering, CM, Legal/Admin (40%)	$350,429
Total Project Cost	**$1,226,501**

Project Description

This project will construct a new underground stormwater retention/detention facility at the City ballpark on Powell and 7th Street. The construction of new storage will provide flood protection for the 25-yr storm event and eliminate the need to upgrade approximately 8,100 linear feet of downstream storm drain pipe. Underground storage is more costly and difficult to maintain, but will allow the City to preserve existing use of the ball park facility. In addition, this project has the potential to be designed to improve stormwater quality, if the underground facility is used to treat stormwater from lesser storm events. This project benefits existing development only, as additional storage would be required for increased stormwater flow from future development.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

2nd Priority Project No. 4: South to IWWTP

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

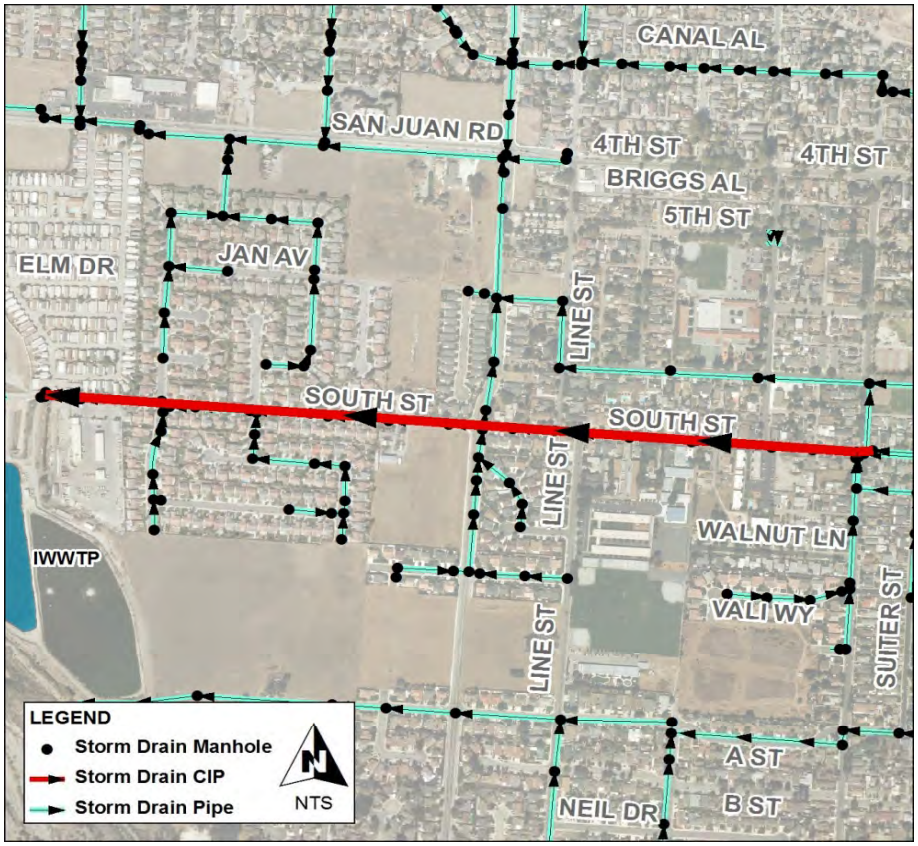
Existing Development	80%
New Development	20%

Project Components

- [x] Upgrade Gravity Pipeline
- [ ] New Gravity Pipeline
- [ ] New Curb Inlet(s)
- [x] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 10 weeks



Project Need

- [ ] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [x] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$2,772,000
Planning, Engineering, CM, Legal/Admin (40%)	$1,108,800
Total Project Cost	**$3,880,800**

Project Description

This project will upgrade approximately 4,200 linear feet of 30-inch storm drain pipe in South Street to 54-inch pipe to provide capacity for the 25-year storm event. The new pipeline will extend from Powell Street to the IWWTP. This project is a high priority because under existing conditions the storm drain system is anticipated to flood to the regional sump at South Street and Powell Street. The new pipeline also provides capacity for existing storm drain inlets to be tied into the IWWTP pipeline on South Street to increase stormwater flow to the IWWTP facility for retention and infiltration. In addition, this project will construct an overflow from the upgraded pipe to the existing abandoned 18-inch storm drain in South Street to provide redundancy for flood protection at the regional sump.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

2nd Priority Project No. 5: San Felipe

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

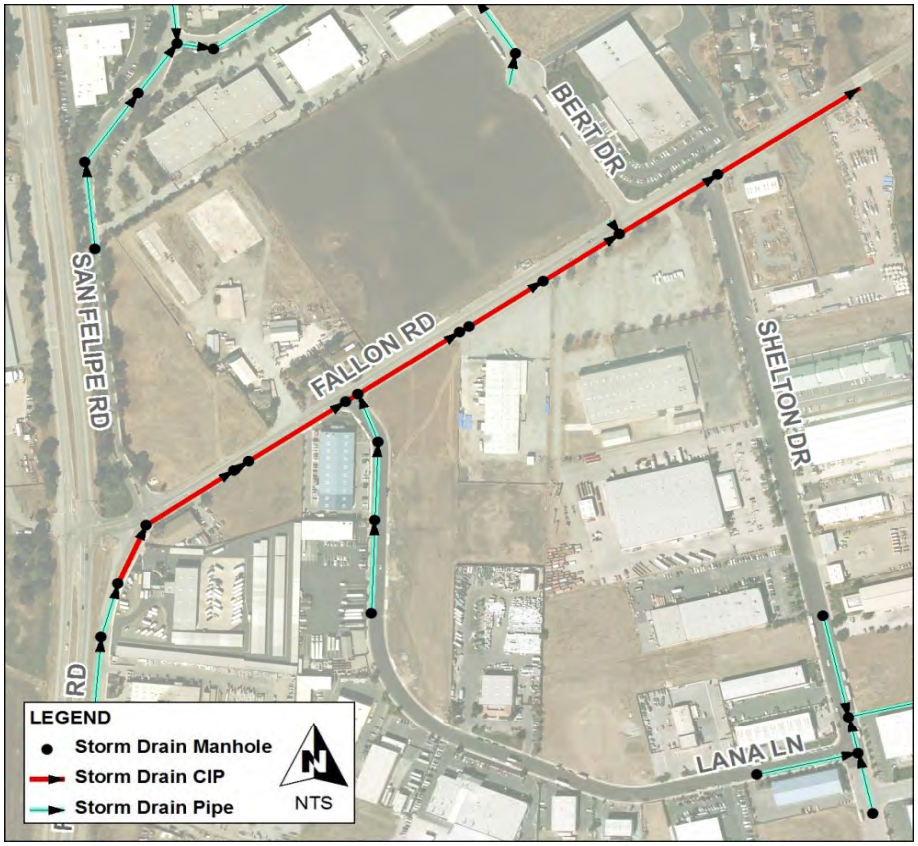
Existing Development	65%
New Development	35%

Project Components

- [x] Upgrade Gravity Pipeline
- [ ] New Gravity Pipeline
- [ ] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 7 weeks



Project Need

- [ ] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [x] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$1,993,750
Planning, Engineering, CM, Legal/Admin (40%)	$797,500
Total Project Cost	**$2,791,250**

Project Description

This project will upgrade approximately 2,750 linear feet of existing storm drain pipe ranging in size from 18-inch to 36-inch to 60-inch pipe. This storm drain system collects stormwater flow from San Felipe Road, in addition to industrial and commercial facilities along San Felipe Road and Fallon Road. Under existing conditions, stormwater has the potential to flood San Felipe Road.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

2nd Priority Project No. 6: South Street

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

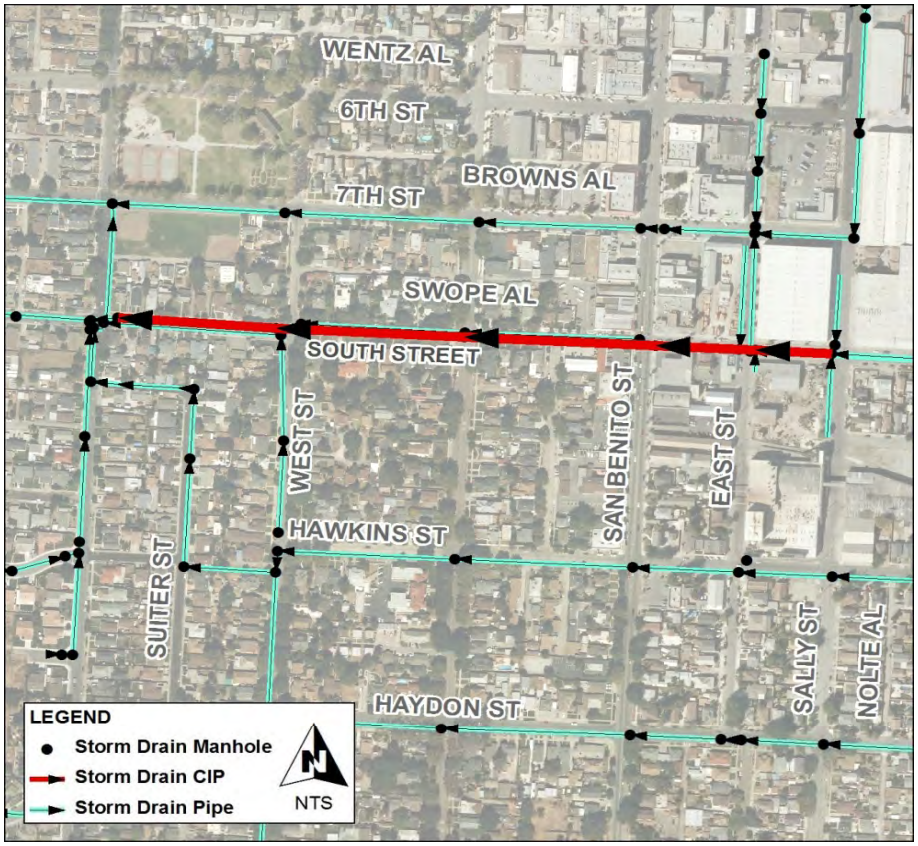
Existing Development	98%
New Development	2%

Project Components

- [x] Upgrade Gravity Pipeline
- [x] New Gravity Pipeline
- [x] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 6 weeks



Project Need

- [ ] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [x] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$604,800
Planning, Engineering, CM, Legal/Admin (40%)	$241,920
Total Project Cost	**$846,720**

Project Description

This project will upgrade approximately 2,160 linear feet of 18-inch pipe to 24-inch pipe to provide capacity for the 25-year storm event. This project will also construct a new diversion between the existing parallel 15-inch storm drain in South Street that is currently routed to 7th Street and the upgraded pipeline, to increase flow to the IWWTP for retention and infiltration. In addition, existing storm drain inlets at the intersection of South Street with both Monterey Street and San Benito Street will be tied over to the upgraded storm drain, to increase flow to the IWWTP and eliminate the need to upgrade the existing parallel 15-inch pipe.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

2nd Priority Project No. 7: Memorial Drive

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [x] San Benito County

Project Benefit

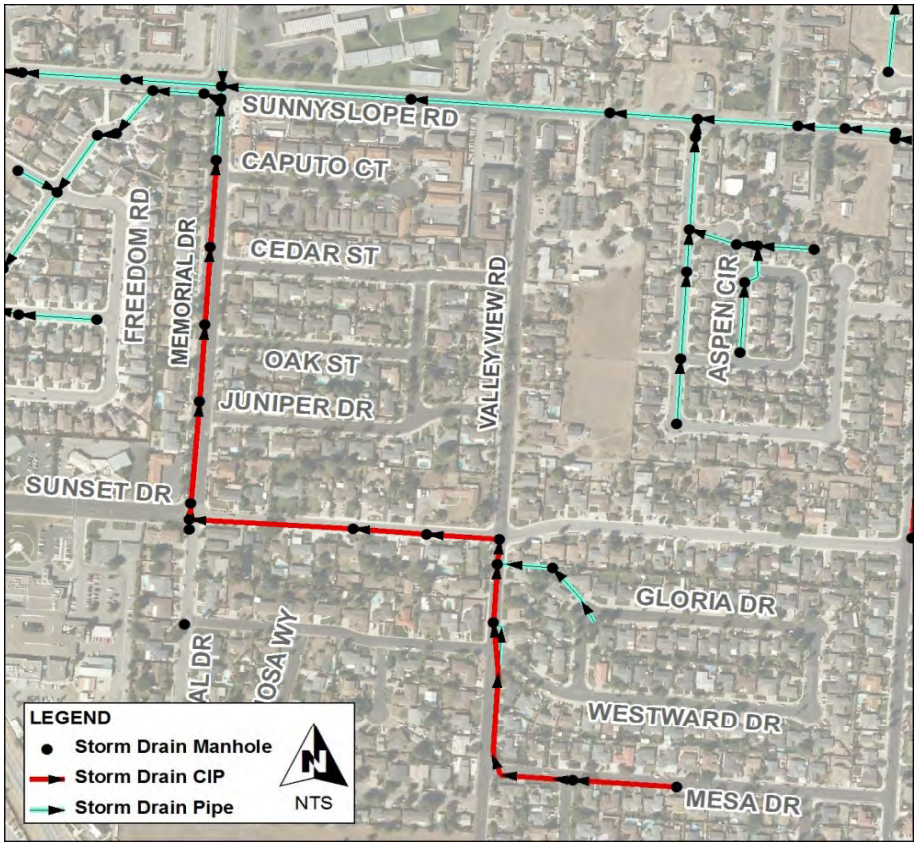
Existing Development	100%
New Development	0%

Project Components

- [x] Upgrade Gravity Pipeline
- [ ] New Gravity Pipeline
- [ ] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 8 weeks



Project Need

- [ ] Existing surface flooding
- [x] Capacity for 10-yr storm
- [x] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$1,012,500
Planning, Engineering, CM, Legal/Admin (40%)	$405,000
Total Project Cost	**$1,417,500**

Project Description

This project will upgrade approximately 3,550 linear feet of storm drain ranging in size from 12-inches to 24-inches, to storm drain ranging from 18-inches to 30-inches. This upgrade will provide capacity for the 10-year storm on Valley View Road and Mesa Drive, and capacity for the 25-year storm on Sunset Drive and Memorial Drive. Approximately 5 parcels in the tributary area are currently under the jurisdiction of the County.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

2nd Priority Project No. 8: Line Street

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

Existing Development	95%
New Development	5%

Project Components

- [x] Upgrade Gravity Pipeline
- [ ] New Gravity Pipeline
- [ ] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 4 weeks

Project Need

- [ ] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [x] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$363,600
Planning, Engineering, CM, Legal/Admin (40%)	$145,440
Total Project Cost	**$509,040**

Project Description

This project will upgrade approximately 1,010 linear feet of 12-inch storm drain to 30-inch pipe to provide capacity for the 25-year storm, in Line Street between Buena Vista Road and Central Avenue. The upgrade was designed for the 25-year storm because the intersection of Line Street and 2nd Street is a local sump. It is anticipated that new development on the north side of Buena Vista Road will connect to the existing storm drain in Westside Road, and not the storm drain in Line Street.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

2nd Priority Project No. 9: Third & East

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

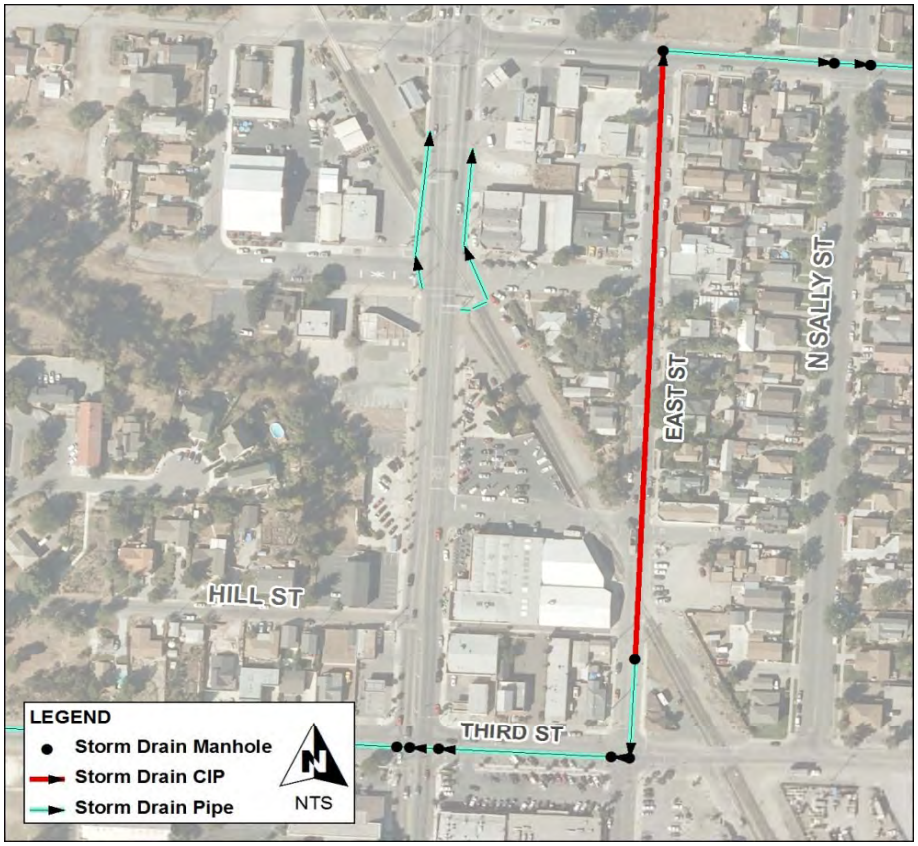
Existing Development	100%
New Development	0%

Project Components

- [ ] Upgrade Gravity Pipeline
- [x] New Gravity Pipeline
- [x] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 4 weeks



Project Need

- [ ] Existing surface flooding
- [x] Capacity for 10-yr storm
- [ ] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$303,800
Planning, Engineering, CM, Legal/Admin (40%)	$121,520
Total Project Cost	**$425,320**

Project Description

This project will construct a new 18-inch diversion to provide capacity for the 10-year storm and eliminate the need to upgrade the existing 18-inch storm drain in 3rd Street. Approximately 980 linear feet of storm drain will be constructed in East Street to connect to the existing storm drain in Santa Ana Road and divert stormwater under high flow conditions. This project will divert stormwater flow to the Rustic Basin for retention and infiltration. The proposed pipeline will cross the railroad just north of Furlong Alley.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

2nd Priority Project No. 10: Clearview Drive

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

Existing Development	100%
New Development	0%

Project Components

- [x] Upgrade Gravity Pipeline
- [ ] New Gravity Pipeline
- [ ] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 5 weeks

Project Need

- [ ] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [x] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$429,600
Planning, Engineering, CM, Legal/Admin (40%)	$171,840
Total Project Cost	**$601,440**

Project Description

This project will upgrade approximately 1,360 linear feet of existing 18-inch storm drain to 24-inch and 30-inch pipe. The pipe will be constructed in Clearview Drive from Sunset Drive to Sunnyslope Road. This project will provide capacity for the 25-yr storm event.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

2nd Priority Project No. 11: Sunnyslope Road

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

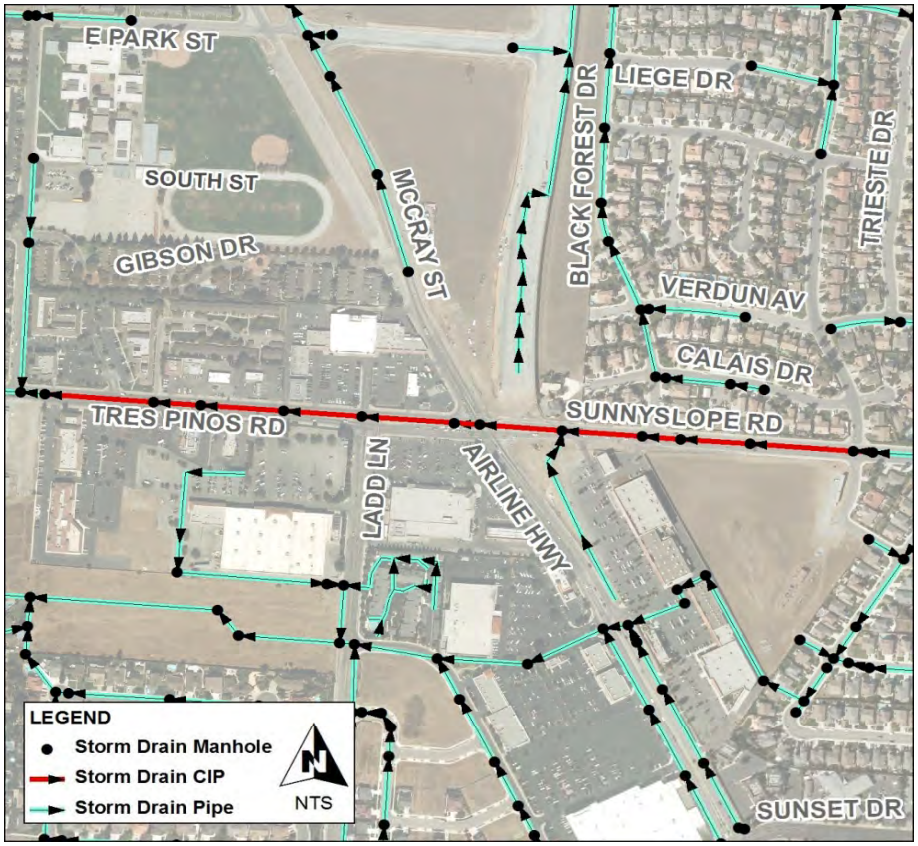
Existing Development	95%
New Development	5%

Project Components

- [x] Upgrade Gravity Pipeline
- [ ] New Gravity Pipeline
- [ ] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 8 weeks



Project Need

- [ ] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [x] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$1,752,000
Planning, Engineering, CM, Legal/Admin (40%)	$700,800
Total Project Cost	**$2,452,800**

Project Description

This project will upgrade approximately 2,920 linear feet of 36-inch storm drain to 48-inch pipe, on Sunnyslope Road and Tres Pinos Road. The storm drain upgrade will provide capacity for the 25-year storm. Sunnyslope Road is a sump condition on the east side of Highway 25. Under existing conditions it is anticipated that stormwater will pond in the sump area due to inadequate pipe capacity. This project requires construction across Highway 25.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

2nd Priority Project No. 12: Hawkins Street

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

Existing Development	100%
New Development	0%

Project Components

- [x] Upgrade Gravity Pipeline
- [ ] New Gravity Pipeline
- [ ] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 5 weeks

Project Need

- [ ] Existing surface flooding
- [x] Capacity for 10-yr storm
- [ ] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$728,000
Planning, Engineering, CM, Legal/Admin (40%)	$291,200
Total Project Cost	**$1,019,200**

Project Description

This project will upgrade approximately 2,600 linear feet of 18-inch storm drain to 24-inch pipe. The upgrade will provide capacity for the 10-year storm. It is recommended that the storm drain in Hawkins Street is routed to the Suiter Street storm drain via the existing slide gate at the West Street and Hawkins Street intersection. This change in operations increases stormwater flow to the IWWTP for retention and infiltration.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

2nd Priority Project No. 13: Central Avenue

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

Existing Development	100%
New Development	0%

Project Components

- [x] Upgrade Gravity Pipeline
- [ ] New Gravity Pipeline
- [x] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 5 weeks

Project Need

- [ ] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [x] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$599,000
Planning, Engineering, CM, Legal/Admin (40%)	$239,600
Total Project Cost	**$838,600**

Project Description

This project will upgrade approximately 1,990 linear feet of 18-inch and 24-inch storm drain to 24-inch and 36-inch pipe. Upgrade will provide capacity for the 25-year storm event. The upgraded pipeline will extend on Central Avenue from Locust Avenue to Westside Boulevard. As a part of this project it is recommended to analyze the need for additional inlets at the Locust Avenue and Central Avenue intersection, and include the construction of additional inlets as needed.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

2nd Priority Project No. 14: Hillcrest Road

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [x] San Benito County

Project Benefit

Existing Development	90%
New Development	10%

Project Components

- [x] Upgrade Gravity Pipeline
- [ ] New Gravity Pipeline
- [ ] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 4 weeks

Project Need

- [ ] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [x] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$356,400
Planning, Engineering, CM, Legal/Admin (40%)	$142,560
Total Project Cost	**$498,960**

Project Description

This project will upgrade approximately 660 linear feet of 24-inch storm drain to 42-inch pipe to provide capacity for the 25-yr storm. This storm drain collects flow from a relatively large tributary area south of Hillcrest Road, including approximately 50 acres currently under the jurisdiction of the County.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

2nd Priority Project No. 15: Felice Drive

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

Existing Development	90%
New Development	10%

Project Components

- [x] Upgrade Gravity Pipeline
- [ ] New Gravity Pipeline
- [ ] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 4 weeks

Project Need

- [ ] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [x] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$229,600
Planning, Engineering, CM, Legal/Admin (40%)	$91,840
Total Project Cost	**$321,440**

Project Description

This project will upgrade approximately 820 linear feet of 18-inch storm drain with 24-inch pipe, on Felice Drive from Central Avenue to San Juan Road. Felice Drive is a sump condition, and this upgrade will provide capacity for the 25-year storm to minimize potential for ponding on Felice Drive.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

2nd Priority Project No. 16: Citation Way

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

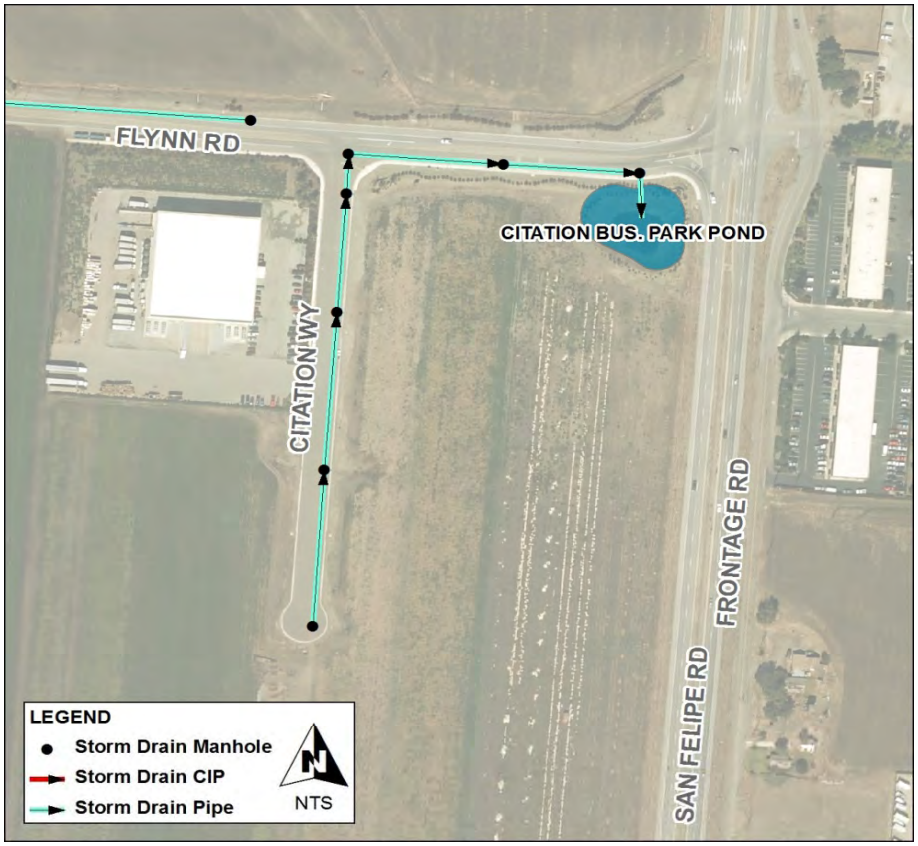
Existing Development	16%
New Development	84%

Project Components

- [ ] Upgrade Gravity Pipeline
- [ ] New Gravity Pipeline
- [ ] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [x] Detention or Retention Facility
- [x] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Not applicable



Project Need

- [ ] Existing surface flooding
- [x] Capacity for 10-yr storm
- [ ] Capacity for 25-yr storm

Project Cost Breakdown

Project Cost[1]	$15,000
Planning, Legal/Admin (20%)	$3,000
Total Project Cost	**$18,000**

Project Description

The goal of this project is to analyze in-situ infiltration rates for the existing Citation Park stormwater basin, to determine if the basin has sufficient capacity to provide flood protection for it's tributary area. According to record drawings, multiple manholes and inlets in Citation Way are lower in elevation than the top of the basin and therefore stormwater could flood Citation Way prior to the pond overflowing to San Felipe Road as designed. Dependent on results of the infiltration testing, the basin capacity may need to be increased to provide flood protection. The estimated cost for this project includes a feasibility study of alternatives to increase basin capacity.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

2nd Priority Project No. 17: Knight Lane

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

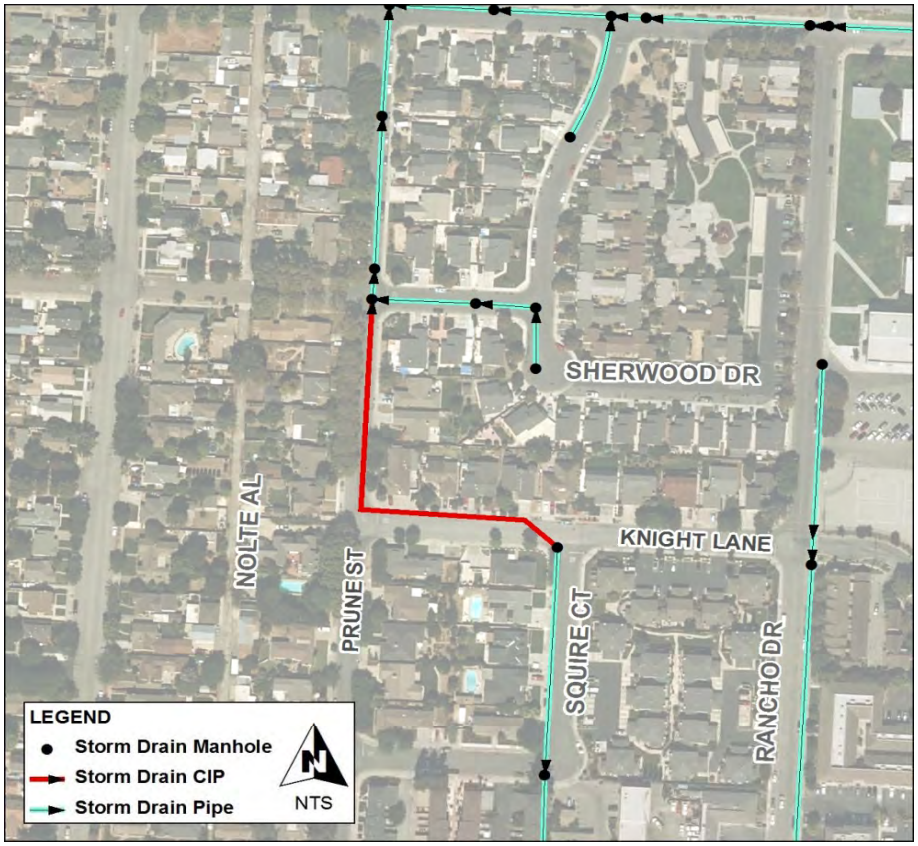
Existing Development	100%
New Development	0%

Project Components

- [ ] Upgrade Gravity Pipeline
- [x] New Gravity Pipeline
- [ ] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 4 weeks



Project Need

- [ ] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [x] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$164,500
Planning, Engineering, CM, Legal/Admin (40%)	$65,800
Total Project Cost	**$230,300**

Project Description

This project will construct approximately 700 linear feet of new 18-inch storm drain pipe, to divert stormwater from the existing storm drain in Squire Court to the existing storm drain in Prune Street under high flow conditions. Squire Court is a sump condition that is anticipated to flood under existing conditions during the 25-year event. This diversion will provide capacity for the 25-year storm and provide redundancy for flood protection in the sump condition.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

2nd Priority Project No. 18: Clearview Drive at Hillcrest

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [x] San Benito County

Project Benefit

Existing Development	95%
New Development	5%

Project Components

- [x] Upgrade Gravity Pipeline
- [ ] New Gravity Pipeline
- [ ] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 5 weeks

Project Need

- [ ] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [x] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$780,000
Planning, Engineering, CM, Legal/Admin (40%)	$312,000
Total Project Cost	**$1,092,000**

Project Description

This project will upgrade approximately 2,000 linear feet of 24-inch and 30-inch storm drain to 36-inch pipe, on Clearview Drive from El Camino de Vida to Hillcrest Road. The upgrade will provide capacity for the 25-year storm. Approximately 15 acres of the storm drain tributary is currently in the jurisdiction of the County.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

2nd Priority Project No. 19: Nash Road

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- [x] Existing Condition
- [ ] Future Condition

Jurisdiction

- [x] City of Hollister
- [ ] San Benito County

Project Benefit

Existing Development	85%
New Development	15%

Project Components

- [x] Upgrade Gravity Pipeline
- [x] New Gravity Pipeline
- [ ] New Curb Inlet(s)
- [ ] Pipeline Rehabilitation/Repair
- [ ] Detention or Retention Facility
- [ ] Inspection and/or Analysis
- [ ] Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 6 weeks

Project Need

- [ ] Existing surface flooding
- [ ] Capacity for 10-yr storm
- [x] Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$930,100
Planning, Engineering, CM, Legal/Admin (40%)	$372,040
Total Project Cost	**$1,302,140**

Project Description

This project will upgrade approximately 1,160 linear feet of 45-inch storm drain to 54-inch pipe, in Nash Road from Suiter Street to Homestead Avenue. In addition, 700 linear feet of new 24-inch pipe will be constructed to divert low flows north on Homestead Avenue. This diversion increases flow to the IWWTP for retention and infiltration, and also eliminates the need to upgrade the storm drain on Nash Road downstream from the diversion. This upgrade will provide capacity for the 25-year storm, and also provides capacity for an upstream diversion on San Benito Street to further increase flow to the IWWTP. A portion of the storm drain tributary area on the south side of Nash Road is currently in the jurisdiction of the County.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

3rd Priority Project No. 1: Meridian Street

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- ☐ Existing Condition
- ☑ Future Condition

Jurisdiction

- ☑ City of Hollister
- ☐ San Benito County

Project Benefit

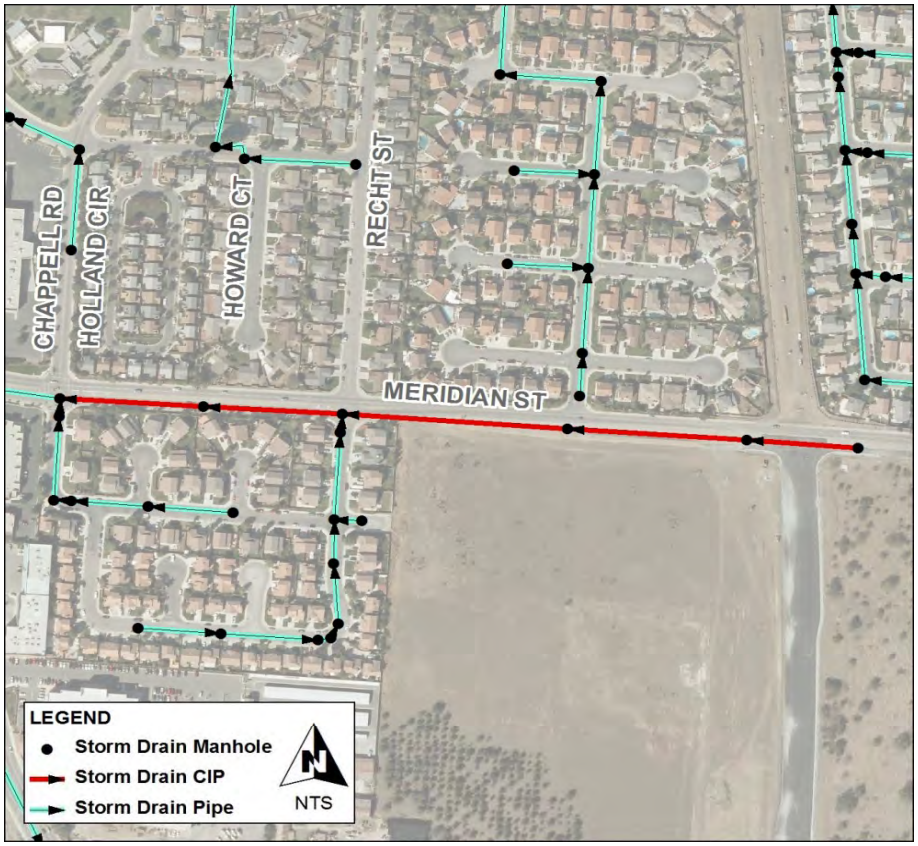
Existing Development	0%
New Development	100%

Project Components

- ☑ Upgrade Gravity Pipeline
- ☐ New Gravity Pipeline
- ☐ New Curb Inlet(s)
- ☐ Pipeline Rehabilitation/Repair
- ☐ Detention or Retention Facility
- ☐ Inspection and/or Analysis
- ☐ Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 7 weeks



Project Need

- ☐ Existing surface flooding
- ☐ Capacity for 10-yr storm
- ☑ Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$1,230,000
Planning, Engineering, CM, Legal/Admin (40%)	$492,000
Total Project Cost	**$1,722,000**

Project Description

This project will upgrade approximately 2,050 linear feet of 24-inch and 36-inch storm drain to 48-inch pipe in Meridian Street from east of Highway 25 to Chappell Road. The upgrade will provide 25-yr storm capacity for future commercial and residential development south of Meridian Street.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

3rd Priority Project No. 2: Westside Boulevard

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- ☐ Existing Condition
- ☑ Future Condition

Jurisdiction

- ☑ City of Hollister
- ☐ San Benito County

Project Benefit

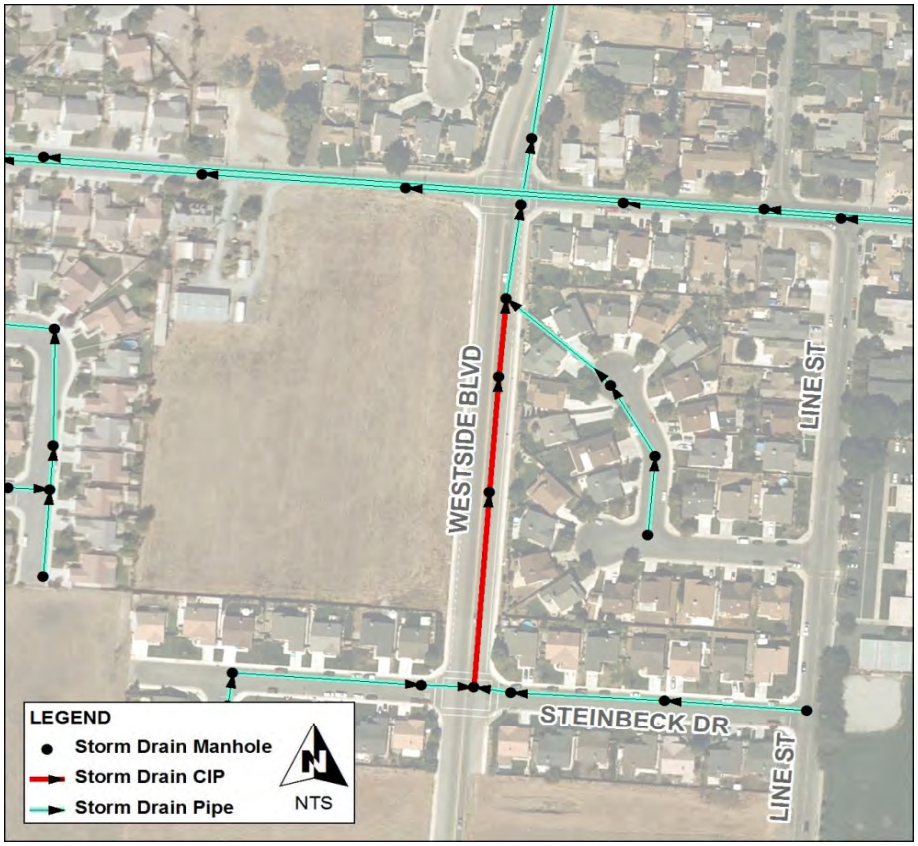
Existing Development	0%
New Development	100%

Project Components

- ☑ Upgrade Gravity Pipeline
- ☐ New Gravity Pipeline
- ☐ New Curb Inlet(s)
- ☐ Pipeline Rehabilitation/Repair
- ☐ Detention or Retention Facility
- ☐ Inspection and/or Analysis
- ☐ Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 4 weeks



Project Need

- ☐ Existing surface flooding
- ☐ Capacity for 10-yr storm
- ☑ Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$176,400
Planning, Engineering, CM, Legal/Admin (40%)	$70,560
Total Project Cost	**$246,960**

Project Description

This project will upgrade approximately 630 linear feet of existing 18-inch storm drain to 24-inch pipe, on Westside Boulevard between Steinbeck Drive and South Street. This upgrade will provide capacity for the 25-year storm, for future residential development along Westside Boulevard between South Street and Apricot Lane. This upgrade was designed for the 25-year storm due to the sump condition at the intersection of Westside Boulevard and South Street. This project also has the potential to divert stormwater from Westside Boulevard to the IWWTP for retention and infiltration.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

3rd Priority Project No. 3: Apollo Way

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- ☐ Existing Condition
- ☑ Future Condition

Jurisdiction

- ☑ City of Hollister
- ☐ San Benito County

Project Benefit

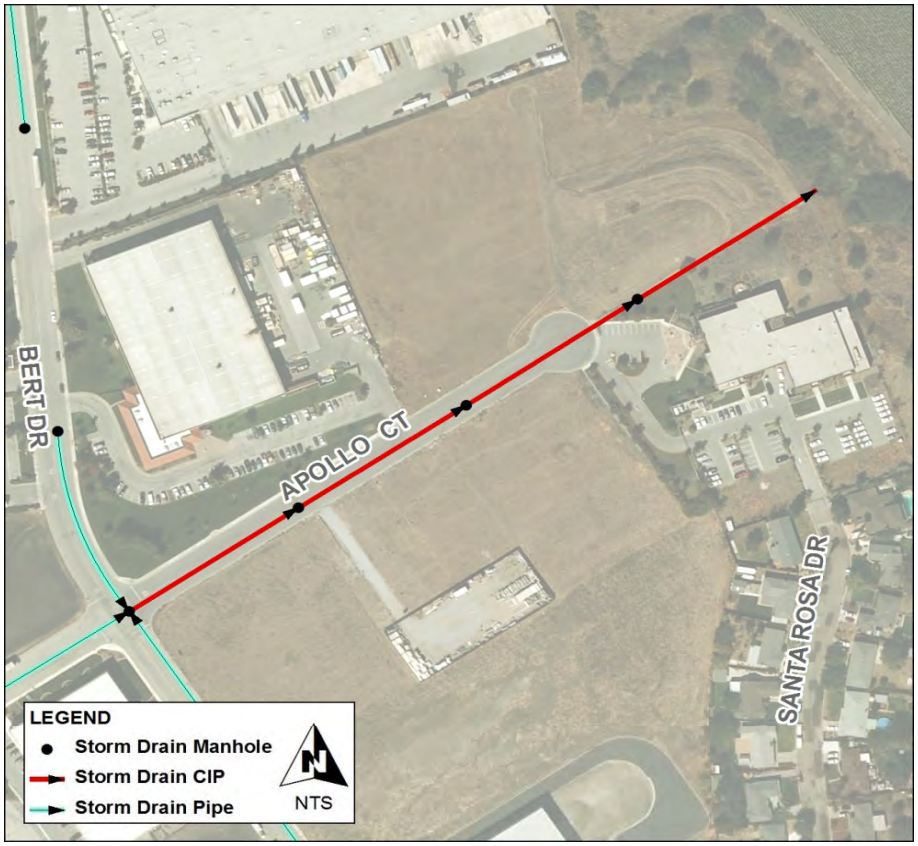
Existing Development	0%
New Development	100%

Project Components

- ☑ Upgrade Gravity Pipeline
- ☐ New Gravity Pipeline
- ☐ New Curb Inlet(s)
- ☐ Pipeline Rehabilitation/Repair
- ☐ Detention or Retention Facility
- ☐ Inspection and/or Analysis
- ☐ Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 6 weeks



Project Need

- ☐ Existing surface flooding
- ☐ Capacity for 10-yr storm
- ☑ Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$686,000
Planning, Engineering, CM, Legal/Admin (40%)	$274,400
Total Project Cost	**$960,400**

Project Description

This project will upgrade approximately 1,225 linear feet of existing 36-inch storm drain to 48-inch pipe in Apollo Way between Bert Drive and the Santa Ana River. This upgrade will provide 25-year storm capacity for future industrial development along Apollo Way and Bert Drive.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

3rd Priority Project No. 4: Nash Road

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- ☐ Existing Condition
- ☑ Future Condition

Jurisdiction

- ☑ City of Hollister
- ☐ San Benito County

Project Benefit

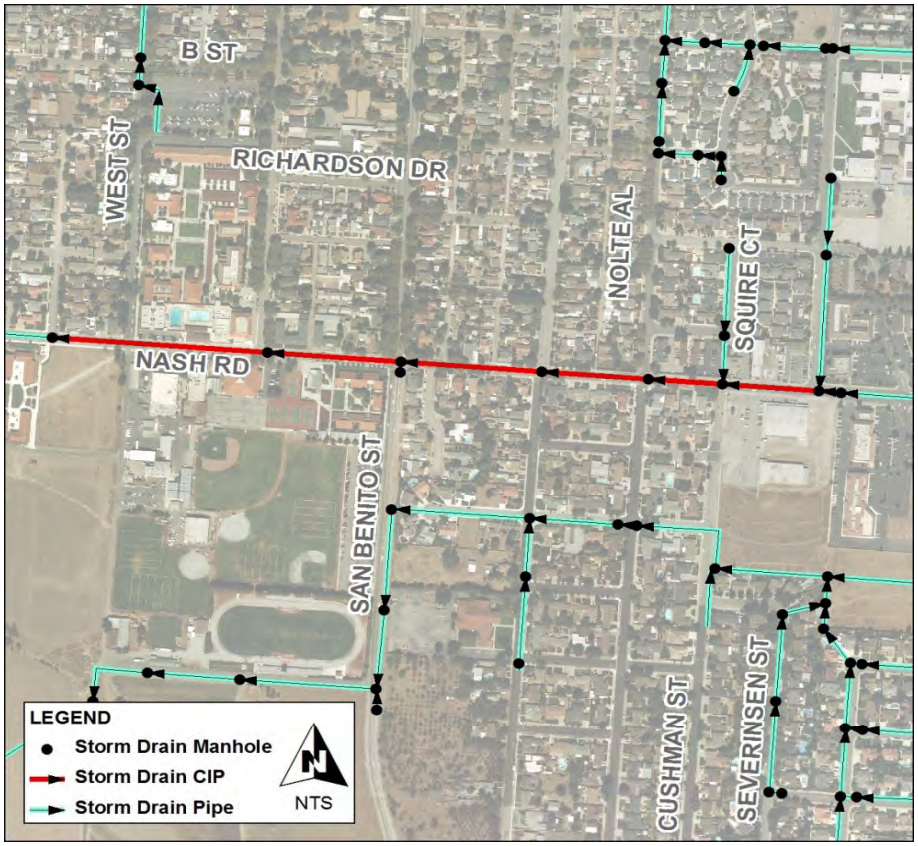
Existing Development	0%
New Development	100%

Project Components

- ☑ Upgrade Gravity Pipeline
- ☐ New Gravity Pipeline
- ☐ New Curb Inlet(s)
- ☐ Pipeline Rehabilitation/Repair
- ☐ Detention or Retention Facility
- ☐ Inspection and/or Analysis
- ☐ Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 8 weeks



Project Need

- ☐ Existing surface flooding
- ☐ Capacity for 10-yr storm
- ☑ Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$1,755,600
Planning, Engineering, CM, Legal/Admin (40%)	$702,240
Total Project Cost	**$2,457,840**

Project Description

This project will upgrade approximately 2,660 linear feet of existing 42-inch and 45-inch storm drain with 54-inch pipe, in Nash Road between Rancho Drive and Suiter Street. This upgrade will provide 25-year storm capacity for future development, including high density residential and mixed-use infill along Airline Highway and Sunnyslope Road, and high density residential along Valley View Road between Sunset Drive and Sunnyslope Road.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

3rd Priority Project No. 5: Airway Pond

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- ☐ Existing Condition
- ☑ Future Condition

Jurisdiction

- ☑ City of Hollister
- ☐ San Benito County

Project Benefit

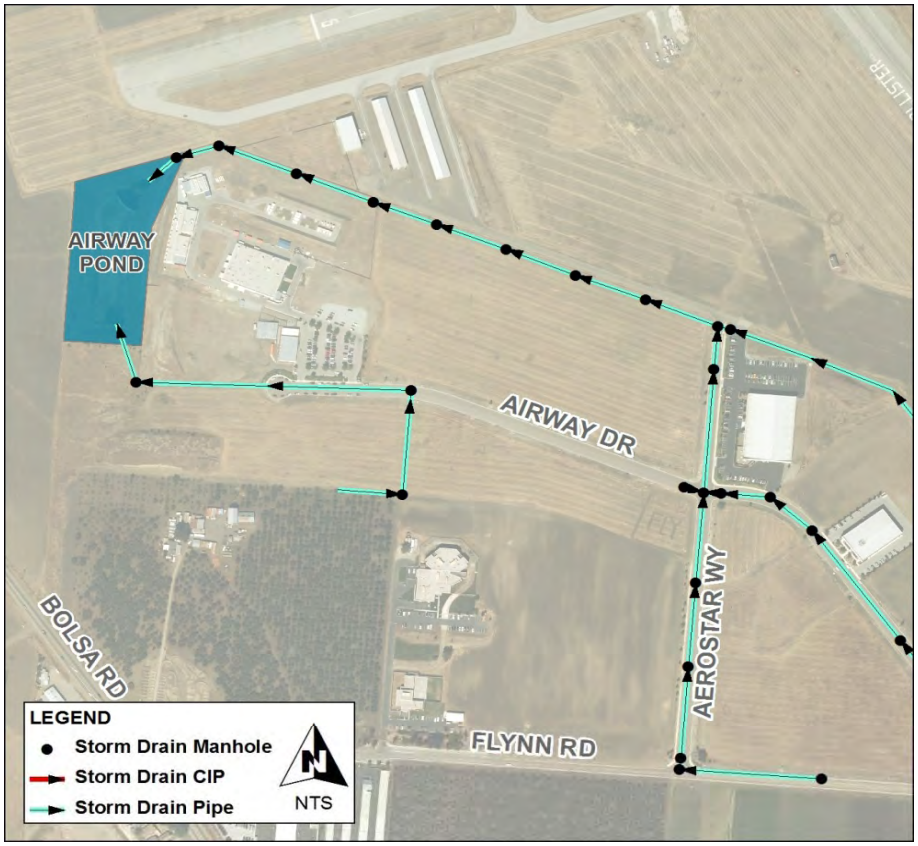
Existing Development	0%
New Development	100%

Project Components

- ☐ Upgrade Gravity Pipeline
- ☐ New Gravity Pipeline
- ☐ New Curb Inlet(s)
- ☐ Pipeline Rehabilitation/Repair
- ☑ Detention or Retention Facility
- ☑ Inspection and/or Analysis
- ☐ Curb and Gutter Repair

Project Scheduling

Not applicable



Project Need

- ☐ Existing surface flooding
- ☐ Capacity for 10-yr storm
- ☑ Capacity for 100-yr storm

Project Cost Breakdown

Project Cost[1]	$20,000
Planning, Legal/Admin (20%)	$4,000
Total Project Cost	**$24,000**

Project Description

The goal of this project is to analyze in-situ infiltration rates for the existing Airway stormwater basin, to determine if the basin has sufficient capacity to provide flood protection for it's tributary area. Dependent on results of the infiltration testing, the basin capacity may need to be increased to provide flood protection, or future development may need to retain flow onsite.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

3rd Priority Project No. 6: "A" Street

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- ☐ Existing Condition
- ☑ Future Condition

Jurisdiction

- ☑ City of Hollister
- ☐ San Benito County

Project Benefit

Existing Development	0%
New Development	100%

Project Components

- ☑ Upgrade Gravity Pipeline
- ☐ New Gravity Pipeline
- ☐ New Curb Inlet(s)
- ☐ Pipeline Rehabilitation/Repair
- ☐ Detention or Retention Facility
- ☐ Inspection and/or Analysis
- ☐ Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 4 weeks

Project Need

- ☐ Existing surface flooding
- ☐ Capacity for 10-yr storm
- ☑ Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$420,500
Planning, Engineering, CM, Legal/Admin (40%)	$168,200
Total Project Cost	**$588,700**

Project Description

This project will upgrade approximately 580 linear feet of existing 48-inch storm drain to 60-inch pipe, in "A" Street between West Street and Powell Street. This upgrade will provide 25-year storm capacity for future development including high density residential on Sherwood Drive and potential residential infill throughout the tributary area.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

3rd Priority Project No. 7: Miller Road

City of Hollister Capital Improvement Project Information Sheet
2011 Storm Drain Master Plan

Project Trigger

- ☐ Existing Condition
- ☑ Future Condition

Jurisdiction

- ☑ City of Hollister
- ☐ San Benito County

Project Benefit

Existing Development	0%
New Development	100%

Project Components

- ☑ Upgrade Gravity Pipeline
- ☐ New Gravity Pipeline
- ☐ New Curb Inlet(s)
- ☐ Pipeline Rehabilitation/Repair
- ☐ Detention or Retention Facility
- ☐ Inspection and/or Analysis
- ☐ Curb and Gutter Repair

Project Scheduling

Est. Construction Duration: 3 weeks

Project Need

- ☐ Existing surface flooding
- ☐ Capacity for 10-yr storm
- ☑ Capacity for 25-yr storm

Project Cost Breakdown

Construction Cost[1]	$154,800
Planning, Engineering, CM, Legal/Admin (40%)	$61,920
Total Project Cost	**$216,720**

Project Description

This project wil upgrade approximately 430 linear feet of 18-inch storm drain to 30-inch pipe, in Miller Road between Buena Vista Road and Central Avenue. This upgrade will provide 25-year storm capacity for future development, including residential development north of Buena Vista Road.

1. Construction costs are expressed in Year 2011 dollars, using an ENR construction Cost Index of 9027, and will need to be escalated to the year or years scheduled for the work.

PREPARED BY:
Wallace Group
www.wallacegroup.us
San Luis Obispo, CA

APPENDIX A

STORMWATER MANAGEMENT CODE REVIEW AND CHECKLISTS

Table A-1. Outfall Sampling Data: Pollutant Loading Summary

	Water Quality Objectives		CCAMP Status	Outfall 1 (West Marine)			Outfall 2 (Fallon Bridge)			Outfall 3 (Citation Park)			Outfall 4 (Rustic St)		
	Acceptable Threshold	Units	San Benito River at Y R	2007	2008	2009	2007	2008	2009	2007	2008	2009	2007	2008	2009
Cadmium	3	µg/L	---	ND	ND	ND	ND	ND	1	ND	ND	ND	ND	ND	ND
Chromium	50	µg/L	---	3	5	14	12	9	38	9	12	42	8	6	30
Coliform, E. coli[1]	400	MPN/100 ml	Very Impacted	200	46111	111987	3680	2655	41058	19560	3986	>241960	27550	198629	155312
Coliform, Total[2]	10,000	MPN/100 ml	Slightly Impacted	198628	>241690	>241690	>241920	>241960	>241960	92080	>241960	>241960	>241920	>241960	>241960
Copper	30	µg/L	---	12	18	43	14	21	104	33	14	54	23	26	82
Iron	5000	µg/L	---	603	1292	3710	3070	2271	7860	253	606	14500	3360	1278	10600
Lead	30	µg/L	---	ND	ND	ND	ND	ND	18	ND	ND	14	12	ND	16
Mercury	0.2	µg/L	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	200	µg/L	---	ND	12	30	11	15	38	ND	ND	58	14	11	51
Nitrate as NO3	45	mg/L	Slightly Impacted	2	3	19	4	4	5	ND	ND	ND	3	ND	ND
Oil & Grease[3]	15	mg/L	---	ND	ND	7	ND	ND	8	ND	ND	ND	ND	ND	62
pH (Laboratory)	7.0 to 8.3		Slightly Impacted	7.4	7.2	7.2	7.6	7.1	6.9	7.5	7.7	7.2	7.2	6.7	6.9
Specific Conductance (E.C)	750	µmho/cm	Slightly Impacted	159	153	570	171	153	340	1162	1555	685	115	162	369
Total Diss. Solids	1400	mg/L	Slightly Impacted	---	138	365	NA	131	217	NA	988	438	NA	140	236
Total Organic Carbon	---		---	13	28	120	13	24	86	17	20	85	18	41	110
Total Susp. Solids[4]	90	mg/L	Very Impacted	30	43	108	62	101	73	14	24	301	83	30	112
Zinc	200	µg/L	---	89	185	499	94	161	989	29	22	247	135	160	612

1. No more than 10% of samples exceeding. Numeric Target for Fecal Coliform, adopted as a TMDL specific to storm drain discharges to the San Benito River and Santa Ana Creek , approved by the Office of Administrative Law (OAL) 07/12/2010
2. Numeric Target per California Ocean Plan, as referenced by CCAMP.
3. Numeric Target per USEPA Multi-Sector General Permit 8.D.4.
4. Maximum duration of 49 days, maximum of 2 instances per year. Numeric Target adopted as TMDL for Pajaro River (including the San Benito River), approved by the OAL 11/27/2006.

Table A-1. Outfall Sampling Data: Pollutant Loading Summary

	Water Quality Objectives		CCAMP Status	Outfall 5 (Santa Ana Bridge)			Outfall 6 (Klauer Park)			Outfall 7 (Bridgevale - SB River)			Outfall 8 (Southside)		
	Acceptable Threshold	Units	San Benito River at Y R	2007	2008	2009	2007	2008	2009	2007	2008	2009	2007	2008	2009
Cadmium	3	µg/L	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	50	µg/L	---	ND	ND	ND	ND	2	14	8	3	10	4	3	32
Coliform, E. coli[1]	400	MPN/100 ml	Very Impacted	310	304	202	4710	13761	141361	32550	7936	13093	21400	32554	844
Coliform, Total[2]	10,000	MPN/100 ml	Slightly Impacted	41100	17216	>241960	199000	>241960	>241960	>241920	>241960	>241960	>242000	>241960	>241960
Copper	30	µg/L	---	7	ND	6	15	14	46	22	15	30	19	16	44
Iron	5000	µg/L	---	154	50	1340	1360	733	5900	3370	485	4370	7090	585	12500
Lead	30	µg/L	---	ND	ND	ND	ND	ND	12	8	ND	10	7	ND	18
Mercury	0.2	µg/L	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	200	µg/L	---	ND	ND	ND	ND	ND	20	12	ND	18	21	ND	47
Nitrate as NO3	45	mg/L	Slightly Impacted	ND	ND	ND	4	3	3	4	4	3	3	6	1
Oil & Grease[3]	15	mg/L	---	ND	ND	6	ND	ND	ND	ND	ND	ND	ND	ND	ND
pH (Laboratory)	7.0 to 8.3		Slightly Impacted	7.2	7.5	7.4	7.3	7	7.4	7.2	7.2	6.9	7.6	7.7	7.5
Specific Conductance (E.C)	750	µmho/cm	Slightly Impacted	290	778	589	320	231	120	156	194	110	317	504	177
Total Diss. Solids	1400	mg/L	Slightly Impacted	163	484	377	200	168	77	NA	139	70	215	333	113
Total Organic Carbon	---		---	9.2	7.9	12	11	21	25	21	20	28	10	21	25
Total Susp. Solids[4]	90	mg/L	Very Impacted	ND	ND	7	24	12	64	75	17	77	148	8.4	363
Zinc	200	µg/L	---	64	ND	45	83	43	259	115	119	157	142	59	127

1. No more than 10% of samples exceeding. Numeric Target for Fecal Coliform, adopted as a TMDL specific to storm drain discharges to the San Benito River and Santa Ana Creek , approved by the Office of Administrative Law (OAL) 07/12/2010
2. Numeric Target per California Ocean Plan, as referenced by CCAMP.
3. Numeric Target per USEPA Multi-Sector General Permit 8.D.4.
4. Maximum duration of 49 days, maximum of 2 instances per year. Numeric Target adopted as TMDL for Pajaro River (including the San Benito River), approved by the OAL 11/27/2006.

Table A-1. Outfall Sampling Data: Pollutant Loading Summary

	Water Quality Objectives		CCAMP Status	Outfall 9 (Cienega Road)			Outfall 10 (Terraces)			Outfall 11 (Apricot Lane)			Outfall 12 (Nash Road)		
	Acceptable Threshold	Units	San Benito River at Y R	2007	2008	2009	2007	2008	2009	2007	2008	2009	2007	2008	2009
Cadmium	3	µg/L	---	ND	ND	ND	ND	ND	ND	ND	0.5	ND	ND	ND	ND
Chromium	50	µg/L	---	3	6	7	7	2	5	17	23	4	5	6	7
Coliform, E. coli[1]	400	MPN/100 ml	Very Impacted	43520	104624	61314	241917	98039	24809	6010	>241960	30759	6700	104624	92084
Coliform, Total[2]	10,000	MPN/100 ml	Slightly Impacted	>241920	>241960	>241960	>241920	>241960	>241960	>241920	>241960	>241960	>241920	>241960	>241960
Copper	30	µg/L	---	17	24	22	4260	50	17	5670	78	15	17	29	17
Iron	5000	µg/L	---	665	4180	2880	3140	280	2430	9890	8196	2160	1600	1800	3500
Lead	30	µg/L	---	ND	5	ND	11	ND	ND	27	25	ND	ND	ND	5
Mercury	0.2	µg/L	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	200	µg/L	---	ND	12	ND	12	ND	ND	28	36	ND	ND	14	12
Nitrate as NO3	45	mg/L	Slightly Impacted	3	4	1	2	4	7	3	ND	2	2	ND	3
Oil & Grease[3]	15	mg/L	---	ND	ND	ND	ND	Trace	ND	ND	Trace	ND	ND	Trace	6
pH (Laboratory)	7.0 to 8.3		Slightly Impacted	7.3	6.7	7.5	6.9	7.2	6.9	5.5	7.3	7	5.5	6.8	7.3
Specific Conductance (E.C)	750	µmho/cm	Slightly Impacted	130	147	111	123	281	90	144	602	63	168	284	127
Total Diss. Solids	1400	mg/L	Slightly Impacted	NA	117	75	NA	218	58	NA	471	45	NA	257	81
Total Organic Carbon	---		---	17	26	10	25	29	24	25	59	14	29	72	19
Total Susp. Solids[4]	90	mg/L	Very Impacted	26	67	56	112	4.1	58	381	289	35	125	50	37
Zinc	200	µg/L	---	99	148	232	240	91	222	234	268	91	78	114	141

1. No more than 10% of samples exceeding. Numeric Target for Fecal Coliform, adopted as a TMDL specific to storm drain discharges to the San Benito River and Santa Ana Creek , approved by the Office of Administrative Law (OAL) 07/12/2010
2. Numeric Target per California Ocean Plan, as referenced by CCAMP.
3. Numeric Target per USEPA Multi-Sector General Permit 8.D.4.
4. Maximum duration of 49 days, maximum of 2 instances per year. Numeric Target adopted as TMDL for Pajaro River (including the San Benito River), approved by the OAL 11/27/2006.

BMP	Effectiveness Measurement	Current Outcome Level						Recommended Action	Future Outcome Level
		Level 1 – Documenting Activities	Level 2 – Raising Awareness	Level 3 – Changing Behavior	Level 4 – Reducing Loads from Sources	Level 5 – Improving Runoff Quality	Level 6 – Protecting Receiving Water Quality		
Public Outreach and Education									
PE-1 Web page	Number of total hits counted on SWMP specific website compared annually.	X	X			None			-
	Percentage of change based on hits counted on existing website.		X					Modify page reference to the City's stormwater website (currently full City website).	-
PE-2 Bulletins, Brochures and Fact Sheets	Number of contractors that implement BMPs on the fact sheet.	X						Modify to include percent, and percent of change over time.	Level 3
	Number of businesses that implement BMPs on the fact sheet.	X						Modify to include percent, and percent of change over time.	Level 3
PE-3 TV Advertising	Progress measure only, completed or not completed.	X				None			-
PE-4 Storm Drain Marking	Progress measure only, completed or not completed.	X				None			-
	Percentage change of marking over previous year.		X			None			-
PE-5 Storm Water Hotline	Number of phone call received; number of illicit discharges detected by the calls.	X	X	X		None			-

BMP	Effectiveness Measurement	Current Outcome Level						Recommended Action	Future Outcome Level
		Level 1 – Documenting Activities	Level 2 – Raising Awareness	Level 3 – Changing Behavior	Level 4 – Reducing Loads from Sources	Level 5 – Improving Runoff Quality	Level 6 – Protecting Receiving Water Quality		
PE-6 Event Participation	Number of individuals signing in compared to previous years and percentage change.	X	X			Modify		to include public survey on stormwater regulations like illicit discharge, and track changes over time.	Level 3
Public Participation and Involvement									
PP-1 Public Meetings	Number of comments on draft plan; number of individuals attending.	X	X			None			-
PP-2 Public Presentations	Number of individuals attending and annual percentage change.	X	X					Modify to include pre and post quizzes.	Improved Level 2
PP-3 Web Page	Number of comments received; Number of comments requiring a response.	X	X			None			-
PP-4 River Clean-Up Day	Number of volunteers compared to previous events.	X				None.			-
	Amount of trash/debris collected.	X	X	X		Modify		to include categorization of trash/debris to track reduced pollutant sources.	Level 4

BMP	Effectiveness Measurement	Current Outcome Level						Recommended Action	Future Outcome Level
		Level 1 – Documenting Activities	Level 2 – Raising Awareness	Level 3 – Changing Behavior	Level 4 – Reducing Loads from Sources	Level 5 – Improving Runoff Quality	Level 6 – Protecting Receiving Water Quality		
PP-5 City Employee Training	Number and percentage of employees trained each year.	X	X					Modify to include pre and post tests for trainings and/or survey of employee knowledge and changed behavior.	Level 3
Illicit Discharge Detection/ Prevention									
ID-1 Storm Drain Mapping	Progress measure only, completed or not completed.	X						Modify to include tracking of storm drain marking.	
ID-2 Discharge Testing & Inspection	Changes in pollutant level in each outfall each year.	X	X	X	X	X		Modify to include dry weather monitoring at select sites. Link outreach efforts to water quality standards not being met. Test for POCs.	Level 5
	Number and percent of identified illicit discharges located at inspected outfalls.	X	X	X		None			-
ID-3 Hazardous Waste Collection	Amount of material collected at each event and annual comparison with previous years.	X	X	X		None			-
ID-4 Illicit Discharge Ordinance	Progress measure only, completed or not completed.	X				Modify		to assess implementation of enforcement procedures for illicit discharge.	Level 3
ID-5 Video Surveillance Program	Number and percent of storm drain lines recorded annually.	X				Reduce		use of video surveillance to trouble areas.	-

BMP	Effectiveness Measurement	Current Outcome Level						Recommended Action	Future Outcome Level
		Level 1 – Documenting Activities	Level 2 – Raising Awareness	Level 3 – Changing Behavior	Level 4 – Reducing Loads from Sources	Level 5 – Improving Runoff Quality	Level 6 – Protecting Receiving Water Quality		
ID-6 Storm Water Hot Line	Number of phone call received; number of illicit discharges detected by the calls.	X	X						
Construction Site Stormwater Control									
CS-1 Grading Ordinance Adoption	Number and percentage of inspections resulting in enforcement actions; number and percentage of repeat offenders.	X	X	X		None			-
CS-2 Adoption of Construction BMPs	Progress measure only, completed or not completed.	X				Modify		to include inspections that show increased use of BMPs.	Level 3
CS-3 Construction Outreach Brochures	Number of brochures distributed annually and percentage of applicants receiving.	X	X			Modify		to include percentage of projects implementing BMPs.	Level 3
Post-construction Stormwater Management									
PC-1 General Plan Land Use Criteria	Progress measure only, completed or not completed.	X				None			-

BMP	Effectiveness Measurement	Current Outcome Level						Recommended Action	Future Outcome Level
		Level 1 – Documenting Activities	Level 2 – Raising Awareness	Level 3 – Changing Behavior	Level 4 – Reducing Loads from Sources	Level 5 – Improving Runoff Quality	Level 6 – Protecting Receiving Water Quality		
PC-2 Development Requirements	Progress measure only, completed or not completed.	X				None			-
Pollution Prevention / Good Housekeeping									
GH-1 Facility Surveys	Number and percent of buildings which have been evaluated	X						Modify to include a time interval for updating facility information.	
GH-2 Facility Maintenance	Number and percent of buildings which have been evaluated	X							
	Number of recorded maintenance operations occurring at each site	X						Modify to document change in required maintenance over time e.g. volume of trash collected.	Level 4
GH-3 City Employee Training	Number and percent of employees receiving training	X	X					Modify to include post training quizzes and survey.	Level 3

HYDROMODIFICATION & LID: CODE AND ORDINANCE REVIEW

TABLE OF CONTENTS

MUNICIPAL CODES 3

Licenses, permits, and regulations 3

Health & Safety 3

Vehicles & Traffic 3

Streets, Sidewalks, and Public Places 4

Public Services 5

Buildings & Construction 6

Grading 8

Fire 8

Subdivisions 10

Zoning 13

GENERAL PLAN – ELEMENTS 14

Land use 14

Circulation 16

Housing 17

Noise 19

Safety 19

Conservation and Open Space 20

Community Services and Facilities - Parks & Recreation 22

Community Services and Facilities - Water & Wastewater 22

ENGINEERING STANDARDS & DRAINAGE DESIGN 23

Standard Specifications 26

SPECIFIC / MASTER / CONSERVATION / MANAGEMENT PLANS 26

Management Plans: Sewer and Storm, ... 26

NOTE: The attached table was generated by the San Luis Obispo County Hydromodification Technical Advisory Committee to facilitate code and ordinance review for interim LID.

KEY

(1) Standards support:

1.	Increased infiltration
2.	Decreased impervious area
3.	Protection & retention of natural waterways & vegetation
4.	Water quality
5.	Flexible infiltration siting
6.	Sediment & runoff control
7.	Source Control

(2) Action:

1.	Change language to support hydromodification/LID concepts
2.	Add language to support hydromodification/LID concepts
3.	Changes not appropriate due to other regulatory requirements

Code / Guide / Policy / Element	Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
Municipal Codes				
Licenses, permits, and regulations				
Are utilities allowed in the public right-of-way to reduce the need for separate utility right of ways?	DS2.01A	Municipal code is silent on utilities in the ROW. Design standard requires all public utilities be in easements or public street ROW which are granted or dedicated for such use. All sewer pipes shall comply with all separation requirement setforth.	2.	No change needed.
Are there restrictions on utility company vegetation removal?	12.24.070 17.22.310	No; requires written authority to comply with safety.	3.	2. Add language minimizing vegetation removal to only that required for safety.
Health & Safety				
Is construction debris recycling required to reduce potential waste?	15.04.045	Yes; 50% must be diverted supporting water quality	7.	No change needed.
Vehicles & Traffic				
Are there vehicle weight restrictions for certain streets requiring additional streets or alleys?		Standard not found.	2.	No change needed.

Code / Guide / Policy / Element	Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
Streets, Sidewalks, and Public Places				
Do any streets have restricted uses resulting in the need for additional streets?		Standard not found.	2.	No change needed.
Are one way streets required under certain conditions increasing impervious area?		Standard not found.	2.	No change needed.
Are there required minimum number and widths for sidewalks potentially increasing impervious area?	DS3.03 E	Yes; Municipal code is silent, however Design Standards requires sidewalk to be a minimum of 5.5 ft wide as measured from face of curb.	2.	2. Change language to allow a minimum 4 ft. sidewalk and when practicable locate sidewalk only on one side of the street. Weigh the adverse impact to pedestrians prior to implementing narrower or reduced number of sidewalks.
Are there parking and driveway standards that result in increased impervious areas?	17.18.120 17.16.010 17.18.060 17.18.110	Yes; One driveway access point is permitted. Efforts shall be made to keep driveway lengths to a minimum. Single family: 2 off-street Multi-family: 2 per unit Commercial: range from one space for each 100 sq ft. to 1,000 sq. ft. Parking stall width 9 ft, length 18 ft.	2.	1. Consider changing language to reduce single family parking requirement.
Are shared driveways allowed to reduce impervious area?	17.18.120	Yes; Allowed by the Director	2.	2. Add language to preference for shared driveways

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
	Are there requirements for tree (grove) preservation?	12.24.130 17.16.080	Yes; Street tree protection and existing significant tree/grove preservation	3.	No change needed.
	Are there prohibitions or restrictions on placement or use of parks for stormwater management?	17.16.140	No; multi-use stormwater facilities in recreation areas is encouraged	5.	No change needed.
	Are there requirements for open space?	16.55.030 17.04.030 17.08.050 (E6)	Yes; for parks and recreation in subdivisions larger than 5 parcels Usable open space requirements R1: 1,000 sq. ft R2: 20% of lot area R3, R4,OT-M and OT-H: 500 sq. ft per unit	1 and 3.	No change needed.
	Are there prohibitions or restrictions on discharge of stormwater to open space?	17.16.140	No; multi-use stormwater facilities in recreation areas is encouraged. Municipal code is silent on open space.	5.	No change needed.
Public Services					
	Is water conservation required to limit pollution sources through runoff?	17.16.080 13.08.250	Yes; requires drought resistant landscaping and automatic irrigation systems. Cease and desist from nonessential and wasteful use of water.	7.	No change needed.

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
	Do water conservation requirements restrict use of vegetation for stormwater purposes?	13.08.250	No; landscaping shall be designed to detain stormwater runoff and capture sediment.	1.	No change needed.
Buildings & Construction					
	Are specific building materials (roofing, paving) required that would disallow those beneficial for stormwater?	16.24.020 17.16.080 D 17.18.110	Yes; Portland cement concrete for drainage ditches, sidewalks, walkways as required for applicable class of subdivision involved. Paving materials for landscaping are encouraged to be permeable. Off-street parking lots will be surfaced with four inches of Portland Cement Concrete or two inches of asphaltic concrete or oil surfacing.	-	2. Add language clarifying that roofing materials shall not be made of copper or other unprotected metals that could leach into runoff. Add language which would allow the use of pervious materials for drainage ditches, sidewalks and walkways. Consider eliminating the need for curb and gutters for areas able to incorporate swales without posing a public hazard.
	Are green roofs or roof gardens allowed?		Standard not found.	-	2. Add language promoting roof gardens as an option to minimize impervious area and/or performing as a detention basin.
	Are solar panels required, preventing the use of green roofs?	17.16.120	No; Solar energy development can be mounted on the roof, wall or ground.		No change needed. Solar panels can be a source control. They can also hinder the use of green roofs.
	Are there requirements that roof drainage discharge to impervious area promoting runoff?	17.16.140	No; Drainage from roof gutters shall be directed to landscaped areas.	1.	No change needed.

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
	Are driveway widths specified potentially increasing impervious area?	17.18.120 C	Yes; Residential • 12-30ft. width x 20ft length Commercial • 25-35ft width Industrial • 35-40ft width	2.	1. Change language to limit driveways with two car garages to a maximum of 20ft widths.
	Is paving around pools required?	17.16.020	No; must follow Uniform Swimming Pool Code	2.	No change needed.
	Do accessibility requirements potentially increase impervious areas?	17.18.120	No; one driveway access point is permitted for each ownership.	2.	No change needed.
	Are there requirements for waste reduction during construction?	15.04.045	Yes; required to divert minimum of 50% of construction or demolition waste.	7.	No change needed.
	Is temporary ponding of water allowed to increase infiltration?	16.24.060 17.16.080	Excess flows can be addressed with temporary ponding, and landscaping can have rain gardens and vegetated swales.	1 and 5.	No change needed.
	Is construction in flood zones regulated?	17.14.040	Yes in Floodplain Overlay Zone; New development shall be designed to avoid FEMA 100 yr flood zone and have at least 6,000 sq ft entirely outside flood hazard area.	4.	No change needed.

Code / Guide / Policy / Element	Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
Grading				
Is protection of natural vegetation required?	17.16.080 17.16.040	Yes; where possible, preserve existing significant trees. Disturb as little vegetation that has been determined to be significant to prevent erosion.	3.	2. Add language to Grading Ordinance (15.24) to preserve sensitive areas.
Is clearing of sensitive land prohibited?	17.22.280 17.22.100 17.14.010	Yes; telecommunications and hazardous waste transportation should avoid sensitive areas. Residential Performance Overlay Zone District can have clustered development that avoids environmental constraints	3.	1. Change language in Grading Ordinance to restrict grading and define land uses near environmentally sensitive areas like riparian buffers.
Is restoration of compacted soils (fluffing) required to increase infiltration?		Standard not found.	-	2. Add language that encourages or requires soil restoration in applicable areas.
Fire				
Are driveway widths specified, increasing impervious area?	17.18.120 C	Yes; Residential • 12-30ft. width x 20ft length Commercial • 25-35ft width Industrial • 35-40ft width	-	1. Change language to limit driveways with two car garages to a maximum of 20ft widths.

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
	Are hammerheads allowed in lieu of cul-de-sacs to reduce impervious surface?	16.20.020	No; shall terminate in a turnaround not less than 100 ft in diameter between lot lines; with the exception for cul-de-sacs less than 400 ft in length diameter may be 80 ft.	-	2. Add language allowing alternative turnarounds like hammerheads and cul-de-sacs with landscaped islands. Consider reducing diameter of all cul-de-sacs to 80 ft.
	Do regulations regarding storage tanks (access, cover) affect stormwater concepts?		Standard not found.	-	No change needed.
	Are there height restrictions, encouraging larger building footprint?	17.04.030	Yes; R1,R2: 30 ft R3: 35 ft R4: 45 ft OT-M: 30 ft OT-H: 50 ft	2.	No change needed.
	Are there restrictions on landscaping near buildings?	17.16.080	No; landscaping is encouraged.	1 and 5.	No change needed.
	Are there waste storage requirements that increase impervious area?	8.12.045	No; any premises where the volume of solid waste accumulates in excess of 2 cubic yards, solid waste will be stored in fire resistant container.	-	No change needed.

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
Subdivisions					
	Are there lot and street requirements that could result in higher levels of impervious area?	16.20.020	Yes; Cul-de-sac shall have turnaround of not less than 100ft in diameter. Right of way widths defined in Resolution 76-11. Subdivider will provide maximum off-street parking where economically feasible.	-	1. Change language to define off-street parking as maximum instead of minimum. Change language to reduce minimum allowable cul-de-sac diameter to 80 ft or less.
	Is garage / enclosure placement required to be setback from the street or at the rear, increasing driveway lengths?	17.18.120	Yes; Minimum length of single-family driveway shall be 20 feet measured from the property line to the front of the garage. Must comply with setbacks of zoning district.	-	No change needed.
	Are reductions made in parking requirements to recognize shared off-street parking, adjacent on-street parking, and proximity to transit?	17.18.090	Yes; Reduction of off-street parking requirements address proximity to public transit stop, and shared parking.	2.	No change needed.
	Can parking requirements be met partially through compact or motorcycle spaces to reduce impervious area?	17.18.110	Yes; Allows 40% of parking to be compact.	2.	No change needed.

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
	Are there incentives for parking structures over surface lots to reduce parking footprint?		Standard not found.	-	2. Add language that provides incentives for developers to provide parking within garages rather than surface parking lots to minimize impervious surface coverage, where appropriate.
	Is it allowable to reduced parking aisle widths to reduce impervious area?	17.18.110	No; Aisle width are 14-24 ft. depending on parking angle.	-	1. Consider reducing range of aisle widths to 14-20 ft.
	Are there established parking maximums?		Standard not found.	-	2. Add language setting parking maximums in addition to existing minimums to reduce impervious cover.
	Are there planted median island requirements, to reduce impervious area and increase infiltration?	17.18.110	Yes; Minimum of 10% of total off-street parking shall be landscaped to provide a minimum of 40% shade coverage. Planting islands shall be between each aisle. Bumper overhang areas allowed. Curbing,Irrigation. All areas containing plant materials shall be bordered by concrete curb at least 6 inches high and 6 inches wide and provided with an approved automatic irrigation system.	1 and 2.	2. Add language encouraging or requiring curb cuts, vegetated swales, porous pavement or other BMPs be integrated into parking lot design for infiltration and treatment.
	Can biological treatment areas be credited toward landscaping requirement?	16.24.060 16.24.070	Standard not found.	-	No change needed.

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
	Are there specific park and recreation zones limiting placements, and thereby use for stormwater management?		Standard not found.	5.	No change needed.
	Are there open space requirements?	16.52.090 16.55.030	Credit for private open space not to exceed 50%, may be given against land dedication requirements. Subdivider shall dedicate land, pay a fee in lieu or a combination of both for park or recreation purposes, including open space. Dedicated Land = Area per dwelling unit x Dwelling units in proposed subdivision. Single family: 3.52 Multi-family: 3.45	1 and 3.	No change needed.
	Is stream protection required?	16.24.170	No; Public easement is required, but not protection.	3.	2. Add language defining allowable uses in public stream easement that protect stream resources.
	Do hillside development standards protect natural contours, drainage and vegetation?	15.24.220	Standard not found. Grading Ordinance requires cut slopes no steeper than 2:1 unless approved by City, and defines use of terraces and drainage.	-	2. Add language encouraging or requiring protection of natural contours, drainage and vegetation.

Code / Guide / Policy / Element	Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
Zoning				
Are there height restrictions, encouraging larger building footprint?	17.04.030	No; R1,R2: 30 ft R3: 35 ft R4: 45 ft OT-M: 30 ft OT-H: 50 ft	2.	No change needed.
Are there creek setbacks?		Standard not found.	-	2. Add language in line with Conservation and Open space policy requiring creek setback of at least 100 ft. from top of bank or edge of riparian vegetation.
Do street and yard setbacks limit flexibility of building placement, and thereby stormwater BMPs?	17.04.010 F 17.04-4 16.20.040 D	No; Residential Performance Overlay Zone District applies to vacant land and allows for flexible standards including lot size, street pattern, and clustered development. RE1, 2: front yard at least 18 ft, side yard 6 ft, rear yard 20% of lot depth and minimum of 15 ft. R3, 4: front and side yard at 15 ft but not less than the height of the adjacent building wall. Rear yard at 20 ft. OT: front yard at 15-20 ft, side yard at 5 ft, rear yard at 10-15 ft. Flag lots not allowed unless there is no other alternative.	5.	No change needed.

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
	Are setback encroachments allowed for stormwater BMPs?	17.16.110	No; Municipal code is silent on stormwater BMPs.	-	2. Add language allowing stormwater BMPs within lot setbacks.
	Do requirements minimize lot frontage, so as to minimization street length?	16.20.040	No; Lots may have a frontage of not less than 35 ft on a public street.	2.	2. Add language defining maximum lot frontage at no more than 80 ft.
	Are there requirements for special design in historic or cultural areas which conflict with stormwater management concepts?		No; Zoning based on historic or cultural areas.	-	No change needed.
	Is property maintenance required?		Standard not found.	-	2. Add language defining required maintenance that supports stormwater.
Code / Guide / Policy / Element		**Location/ Section Number**	**Existing Standards**	**Standards support[1]…**	**Action[2]**
General Plan – Elements					
Land use					
	Is cluster development allowed to maximize area available for stormwater BMPs?	LU7.1	Partial; Site planning for cluster development is encouraged to facilitate providing a mix and range of housing types.	1 and 2.	No change needed.

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
	Are there incentives for infill development and redevelopment?	LU6.1	Yes; Infill development is encouraged by establishing an annexation policy in cooperation with the County of San Benito and LAFCo to annex unincorporated county areas surrounded by the City.	1 and 2.	No change needed.
	Are there limits to height of development, encouraging larger building footprint?	LU	North Gateway area is encouraged to have building 1-2 stories tall.	1 and 2.	1. Consider changing language to encourage taller building with a smaller footprint.
	Are there limits to intensity (% coverage) of site development encouraging compact development?	Table LU2	Yes; Maximum permitted intensity • LDR 1-8 du/acre • MDR 8-12 du/acre • HDR 12-35 du/acres • Downtown Commercial and Mixed Use 25-45 du/acre • General Commercial 2.0 FAR	1 and 2.	No change needed.
	Is connectivity for pathways discouraged between residential and commercial uses encouraging longer vehicle street connections?	LU1.1	Partial; To the greatest extent possible, eliminate intrusions, such as noise and commercial traffic and parking, into residential areas from nonresidential areas and provide landscaped buffers between incongruous land uses	2.	No change needed.
	Is street, sidewalk, and pathway connectivity reflective of need to limit impervious area?	LU4.4	No; Ensure that streets, paths and bikeways contribution to the system of a fully connected transportation network.	-	2. Add language to acknowledging balance of connected transportation network and minimized impervious area.

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
	Is there flexibility for site design to limit street system length and width, and parking?		Policy not found. Municipal codes allow some flexibility and encourage clustered development.	-	No change needed.
	Are there specific access requirements?		No; Access is encouraged.	-	No change needed.
	Do hillside development standards protect natural contours, drainage and vegetation?		Policy not found.	-	2. Add language to policy or regulation protecting natural contours, drainage and vegetation.
	Is open space required?		Policy not found. Municipal code requires park and open space.	1 and 2.	No change needed.
	Is protection of natural resources, including streams, and vegetation required?		Policy not found.	-	2. Add language protecting streams, riparian and native vegetation and other natural resources.
	Are LID concepts allowed / promoted?		Policy not found.	-	2. Add language encouraging LID principles.
Circulation					
	Are there restrictions for use of certain street types increasing the need for additional streets?		No; Policy and Municipal code are silent.	2.	No change needed.

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
	Are there neighborhood traffic management programs reducing connectivity and increasing the need for street networks?		Policy not found.	2.	No change needed.
	Are there trip reduction incentives and initiatives to reduce the need for street system capacity increases (transit, walking, biking, carpooling encouraged)?		No; There are public transit services, sidewalks and limited bicycle facilities.	2.	2. Add language and initiatives to encourage all modes of transportation.
	Are street widths (including sidewalks & bike lanes) specified increasing impervious area?	16.24.020 C	Policy not found. Municipal code states minimum right-of-way shall be 40 ft. with a one-foot non-access strip along the property line.	-	No change needed.
	Is there flexibility in meeting parking requirements (shared spaces, alternative vehicles) to reduce impervious area?	17.18.090	Partial; Policy is silent. Municipal code allows reduction of off-street parking requirements that address proximity to public transit stop, and shared parking.	-	2. Add language allowing reduced parking requirements with shared spaces, compact spaces and alternative vehicle only spaces.
	Is street (medians, parkways) vegetation promoted to increase infiltration?	16.24.020	No; Policy and Municipal code are silent. Street trees, as required by the planning commission.	-	2. Add language to encourage landscaped medians for infiltration.
Housing					
	Are there specific parking requirements?		Policy not found.	-	No change needed.

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
	Is there flexibility in meeting parking requirements (shared spaces, alternative vehicles)?	H3.4	Yes; Allows for flexibility in applying development standards including parking requirements to encourage land efficiency and sustainable development (i.e. shared spaces, off site parking leases, reduction if near transit).	2.	No change needed.
	Do street, sidewalk, and pathway requirements encourage impervious area?		No; Policy requirements do not encourage excessive impervious area.	-	No change needed.
	Is street (medians, parkways) vegetation promoted?		Policy not found.	-	2. Consider adding language that promotes street vegetation for interception of rain and infiltration of runoff.
	Are parks and open spaces encouraged through density, cluster or other flexible development?		Policy not found. Municipal code requires parks and recreation space.	-	2. Consider adding language encouraging cluster development for increased open space and park through incentives.
	Are setbacks required that either enhance or restrict the ability to implement LID?	H.EE (d)	No; Allows flexibility in design standards including setbacks.	5.	No change needed.
	Is stormwater management specified and if so does it support hydromodification, LID, and infiltration?		Policy not found.	-	2. Add language encouraging LID and infiltration.

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
	Are there incentives for infill and redevelopment?	H.EE (e) H.KK	Yes; Coordinate with service providers and other agencies to create opportunities for affordable housing developments. Identify new sites for multi-family infill housing through land use plans	1 and 2.	No change needed. Consider evaluating effectiveness of incentives for infill and consider others if necessary.
Noise					
	Is traffic volume reduction, or growth limit supported?	HS3.4	Partial; Strive to reduce traffic noise levels especially through truck traffic reduction and sounds barriers.	-	1. Change language to encourage traffic volume reductions through the use of other modes of transportation.
	Are there restrictions for use of certain street types increasing the need for additional streets?		Policy not found.	2.	No change needed.
	Is connectivity for pathways discouraged between residential and commercial uses encouraging longer vehicle street connections?		Policy not found.	2.	No change needed.
Safety					
	Is development in flood zones restricted?	HS.H	Partial; Apply flood control requirements to regulate new construction within flood zones.	-	2. Consider not allowing commercial and residential development in flood zones.
	Are natural creeks encouraged to be artificially channelized for flood protection?		Policy not found.	3.	2. Add language discouraging creek channelization for flood control and instead protecting undeveloped floodplain.

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
	Are setbacks from creeks required?		Policy not found.	-	2. Consider adding language in line with creek setback policy in the conservation and open space element.
	Are roofing materials specified that would increase impervious area?		Policy not found.	2.	No change needed.
	Are there limitations to where or how much vegetation on a site, restricting infiltration?		Policy not found.	1.	No change needed.
	Are there infiltration limitations?		Policy not found.	1.	No change needed.
Conservation and Open Space					
	Can open space be used for stormwater BMPs?	OS1.3	Policy not found. Site planning to preserve open space to minimize paved areas and maximize landscaping to reduce heat island effect.	-	2. Add language encouraging maximized landscaping and open areas for infiltration and storm water quality.
	Is public access to open space managed to minimize impervious surfaces?	OS1.5 OS1.8	Partial; Open space use is secondary to preservation. Encourage provisions of access to open space areas.	3.	No change needed.
	Is sedimentation and erosion of trails to be managed?	OS1.4	Yes; Open space should be managed to address erosion control.	6.	No change needed.

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
	Are there requirements for special design in historic or cultural areas which conflict with stormwater management concepts?		Policy not found.	5.	No change needed.
	Are solar roofs required, limiting green roofs?	NRC 3.1	No; Encourages renewable energies.	2.	No change needed.
	Is building placement, height, or orientation restricted for energy efficiency that may affect efficient site design for density, clustering, stormwater management and street network minimization?	NRC 3.3 NRC.J	No; Encourages site planning and development that reduce energy demand. Meet or exceed Title 24 energy conservation requirements and where possible make use of natural heating and cooling.	-	No change needed.
	Is alternative transportation supported to reduce the need for street system capacity increases?	NRC 3.3 NRC 3.6	Yes; Encourages site planning and development that support transportation alternatives. Encourage creation of energy efficient transportation programs.	-	No change needed.
	Is protection of natural resources, including streams, and vegetation required?	NRC 1.1	Yes; Protect or enhance environmental resources.	3.	No change needed.

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
	Are stream setbacks required?	NRC 1.6	Partial; Policy requires setback, creek enhancement and associated riparian habitat restoration for projects adjacent to creeks. Generally, all new structures and paved surfaces should be set back 100 ft from wetlands and creeks.	3.	No change needed.
	Is water quality protection required (streams, lakes, aquifers)?		Policy not found.	-	2. Consider adding policy that protects water quality.
Community Services and Facilities - Parks & Recreation					
	Can parkland be used for stormwater BMPs?		Policy not found.	-	2. Add language encouraging use of parkland for stormwater BMPs.
Community Services and Facilities - Water & Wastewater					
	Is water quality protection of water supply required?	CSF3.3	Yes; Continue to comply with local, State and Federal standards for water quality.	4.	No change needed.
	Is recharge of ground water through urban infiltration allowed?	CSF3.5	Yes; Require new development to identify sites which may be used for infiltration which may enhance water quality.	1.	No change needed.
	Is water conservation required?	CSF2.7	Partial; Encourages water-conserving practices and features in the design of structures and landscaping.	4.	No change needed.

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
	Does water allocation support infill and intensification to minimize sprawl?	CSF1.2	No; New development is required to identify impacts, mitigation or proportional fair share to maintain local public services.	-	No change needed.
	Is protection of natural discharge points for wastewater (streams, lakes, ocean) supported?		Policy not found.	-	2. Add design criteria for stormwater treatment by flow or volume.
Engineering Standards & Drainage Design					
	Are there specified street sections promoting impervious area?		Standard not found.	-	No change needed.
	Are parking lot dimensions specified, increasing impervious area?		Standard not found.	2.	No change needed.
	Is there driveway or access width requirements, increasing impervious area?	3.03 B DS-Appendix A (19)	Yes; Residential driveway widths shall be a minimum of 16 ft. and maximum 30 ft, and commercial driveway widths shall be 42 ft.	-	1. Change language to reduce minimum and maximum widths.
	Are Hollywood (two strip) driveways allowed, to reduce impervious area?		Standard not found.	-	2. Add language encouraging two strip driveways for decreased impervious area.

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
	Can sidewalks slope to landscaped areas (either parkways or private property buffers) to increase infiltration?	3.03 E(1)	No; Where sidewalks do not extend to the full width of the right-of-way the remaining open land shall be graded at 2% positive slope from the face of curb to the property line.	-	2. Add language allowing for sidewalks to slope to landscaped areas or private property buffers.
	Are there sidewalk width requirements?	3.03 E	Yes; Residential sidewalks shall be a minimum of 5.5 feet wide as measured from face of curb; commercial sidewalk width is not defined.		1. Change language allowing reduced sidewalk widths to 4 ft in low pedestrian use areas.
	Are there landscaping requirements, to increase infiltration?		Standard not found.	-	No change needed.
	Are parkway plantings required to increase infiltration?		Standard not found.	-	No change needed.
	Are open channel drainage systems allowed to increase filtration and infiltration?		Standard not found.	-	2. Add language allowing and encouraging open drainage systems for increased infiltration.
	Do irrigation standards include flow monitoring & control for automatic shut-off to reduce runoff from broken lines?		Standard not found.	-	2. Add language requiring automatic shut-offs for irrigation to conserve water when lines are broken. May be most appropriate in Municipal code.
	Do landscaping requirements align with planting for stormwater management?		Standard not found. Municipal code (17.16.080) does align landscaping with stormwater management.	-	No change needed.

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
	Are construction materials specified for parking lots, streets, sidewalks, pathways that increase impervious area?	Standard Plans A-4	Standards are silent on material type. A-4 requires compact subgrade and base material, and concrete surfaces to be treated with curing compound. Municipal code (16.24.020) requires Portland cement concrete curbs and gutters.	-	2. Add language which would allow the use of pervious materials for drainage ditches, sidewalks and walkways. Consider eliminating the need for curb and gutters for areas able to incorporate swales without posing a public hazard.
	Do waste enclosure requirements for materials and placement conflict with stormwater management?		Standard not found.	-	No change needed.
	Are there provisions for water quality protection that promote / conflict with LID?		Standard not found.	-	2. Consider adding language that promotes the protection of water quality.
	Are maintenance plans required for post-construction systems?		Standard not found.		
	Are hydromodification considerations required?		Standard not found.		
	Is LID required?		Standard not found.	.	2. Add language requiring LID and referencing LID Manual.

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
	Are there requirements for piped systems or detention limiting use of LID BMPs?	4.01 A(1)	Yes; Drainage ponds in commercial and residential areas shall be allowed only on an interim basis, in areas planned for permanent City storm drainage systems, with system improvement planned by the City Capital Improvement Budget or based upon an enforceable agreement with a developer to construct the improvements within two (2) years.		2. Standards should be revised to support on-site LID (micro-ponds) in advance of a central collection system.
Standard Specifications					
	Are construction materials specified for parking lots, streets, sidewalks, pathways that increase imperviousness?		Specifications are silent. Municipal code (16.24.020) defines construction materials.	-	No change needed.
	Is water pollution and sediment control required?		Specifications are silent.	-	No change needed.
Specific / Master / Conservation / Management Plans					
Management Plans: Sewer and Storm,					
	Are there facility requirements that promote impervious area?		No.	-	No change needed.

Code / Guide / Policy / Element		Location/ Section Number	Existing Standards	Standards support[1]…	Action[2]
	Is there flexibility for conveyance of stormwater to allow for filtering and infiltration?		Not applicable.	-	-
	Are there requirements for stormwater quality?		Not applicable.	-	-

m:\1011-hollister, city of\002-storm drain master plan\04 engineering\06 reports\03 task 4.4\code review\code_checklist_4-21-10.doc

City of Hollister MS4 General Permit: Attachment 4 Review

KEY

* Y	Fully Met
P	Partially Met
N	Not Met

MS4 Item	Topic	Paraphrased Criteria	Relevant City Codes	Recommendation/Notes	Met?*
A1	Receiving Water Limitations	Discharges cannot cause or contribute to an exceedance of water quality standards contained in a Statewide Water Quality Control Plan, the California Toxics Rule or applicable RWQCB Basin Plan.	17.16.140C Stormwater Quality requires all practicable measure to reduce pollution. Where practices guidelines or requirements have been adopted by any federal, State of California, regional or the City of Hollister, these shall be complied with.	Consider referencing, if applicable, RWQCB Basin Plans, California Toxics Rule, and Statewide Water Quality Control Plan.	Y
A2		Timely implementation of control measures and other actions to reduce pollutants in the discharges in accordance with the SWMP and other requirements of this permit.	15.24.131G requires BMP control measures to be reviewed by City Engineer prior to implementation. 15.24.300 Permittee shall provide written notice to the City Engineer within 72 hours of starting activities, completion of rough and finished grading, prior to installation of BMPs, and readiness for site inspection. 17.16.140C (2) requires compliance with federal, state, regional and city best management practices guidelines 17.16.140C (3) requires any site development covering one acre or more to submit a NOI and SWPPP to comply with SWRCB Water Quality Order 99-08.	Already meets attachment 4 criteria. Modify 17.16.140C to refer to “most current” SWRCB Order rather than list a specific order.	Y
A2a-d		City to report annually to RWQCB results of impaired water body implementation and monitoring programs.	The City has submitted three annual reports for February 2006 – June 30, 2007, July 1, 2007 – June 30, 2008 and July 1, 2008 – June 30, 2009. Annual reports are the responsibility of the Department of Public Works.	Verify that this task is in job description for at least one individual in the Public Works Dept.	Y

City of Hollister MS4 General Permit: Attachment 4 Review

MS4 Item	Topic	Paraphrased Criteria	Relevant City Codes	Recommendation/Notes	Met?*
B preamble		Applicable Discretionary Projects 1. Single-Family Hillside Residences. 2. 100,000 SF (2.3 acres) Commercial Developments. 3. Automotive Repair Shops 4. Retail Gasoline Outlets 5. Restaurants 6. Home Subdivisions with 10 or more housing units 7. Parking lots 5,000 SF or more or with 25 or more parking spaces and potentially exposed to storm water	See MS4 Items below for more detail. 17.16.140C requires any person engaged in activities which may result in pollutants entering the city storm drain system to undertake all practicable measures to reduce such pollutants, including, but not limited to grease and sediment collections facilities and shall be responsible for maintaining the facilities.	Attachment 4 Criteria is less stringent than 17.16.140C.	Y
B1		Conflicts with Local Practices Allows for stricter local design standards.	None	Not applicable.	_
B2a	Post-development peak storm water runoff discharge rates	Shall not exceed the estimated pre-development rate for developments where the increased peak storm water discharge rate will result in increased potential for downstream erosion.	17.16.140 requires all land use activities to be designed to detain stormwater runoff on the property to pre-development levels. Where unable to meet this standard, fees are collected (13.16). 17.14.040 regulates new residential development within FEMA 100-year floodplain to control development that may alter drainage patterns DS 4 identifies storm drainage design standards of 100 year flood so that discharge rate shall not exceed or cause flows to exceed the capacity of any portion of the existing downstream system.	Define procedure for the exception process in 17.16.140.	Y

MS4 Item	Topic	Paraphrased Criteria	Relevant City Codes	Recommendation/Notes	Met?*
B2b1	Conserve Natural Areas	Cluster Development to maximize open Space Areas	17.14.010 The intent of the Residential Performance Overlay Zone District is to foster development that meets the range of densities for the General Plan land use designation with the option for flexible standards to implement policies and programs in the General Plan that call for the following: 5.Clustered development that meets the average general plan density for the property while avoiding development in areas with environmental constraints	General Plan policies encourage clustered development. Review other zoning code for appropriateness.	P
B2b2		Limit clearing and grading of native vegetations	17.16.040B requires disturbing as little vegetation that has been determined to be significant to prevent erosion. 17.16.080 requires preservation of existing significant trees where possible.	Modify Grading Ordinance language on clearing limits of native vegetation to include reasons beyond preventing erosion.	P
B2b3		Maximize trees and other vegetation by planting additional vegetation, clustering tree areas and promoting the use of native and/or drought tolerant plants	17.16.080D (1) All setback areas, parkways, and nonwork/storage areas that are visible from a public street or from a parking lot available to the public shall be landscaped. (4)Trees and shrubs shall be planted that are low maintenance, drought resistant. (23) Where possible, preserve existing significant trees and tree grouping, and replace trees removed due to site development; (24)Where possible, plant drought-resistant native landscaping and including dual water lines for residential projects (one for clear water and one for recirculation of gray-water) 16.20.040I requires lots to be designed to preserve the maximum of trees and other natural amenities.	Already meets attachment 4 criteria.	Y

MS4 Item	Topic	Paraphrased Criteria	Relevant City Codes	Recommendation/Notes	Met?*
B2b4		Promote natural vegetation (parking lot islands and other landscape areas)	17.18.110I (1) Minimum of 10% of total off-street parking shall be landscaped to provide a minimum 40% shade coverage at tree maturity. (4a) Planting Islands shall be between each aisle with at least one twenty-four (24) inch box shade tree for every three spaces, and it shall be designed to provide shading for fifty percent (50%) of the parking lot area within a fifteen (15) year period.	Already meets attachment 4 criteria.	Y
B2b5		Preserve Riparian Areas and Wetlands	15.24.110 requires a grading permit for those grading within 100 feet of top of bank of waterbody. 16.20.010I requires preservation of trees and other natural amenities. 16.24.170A requires public easement and reasonable public access to stream bordering a subdivision. 17.22.280 prohibits telecommunications projects within designated sensitive habitat areas.	Modify Grading Ordinance to define restrictions/uses near environmentally sensitive areas like riparian areas and wetlands. Strengthen 16.20.040I by defining natural amenities to include riparian areas and wetlands.	N
B2c	Minimize Storm Water Pollutants of Concern	Identify BMPs that are suited for particular circumstance and pollutant.	15.24.131 requires minimum standards for appropriate interim BMP selection to be in accordance with the BMP Manual or as approved by City Engineer, and be included in an Interim BMP Control Plan. 15.24.132 requires Final BMP Control Plan.	CASQA BMP Manual includes matrix of best management practices.	Y

MS4 Item	Topic	Paraphrased Criteria	Relevant City Codes	Recommendation/Notes	Met?*
B2d1	Protect Slopes and Channels	Convey runoff safely from tops of slopes and stabilize disturbed slopes.	17.16.040A requires erosion and sediment control plan per City engineering standards 15.24.200A requires the soils engineer to be responsible for stability of all finish slopes, and engineering geologist responsible for stability of cut slopes with respect to need for sub drains or other ground water drainage devices. 15.24.220 requires drainage and terracing when cut slopes are steeper than 2 horizontal to 1 vertical for stability. 15.24.250E Paved interceptor drains shall be installed along the top of all cut slopes where the tributary drainage area above slopes towards the cut and has a drainage path greater than 40 feet measured horizontally from the top of all cut slopes. Interceptor drains shall be paved with a minimum of 3 inches of reinforced concrete or gunite with a minimum depth of 12 inches and a minimum paved width of 30 inches measured horizontally across the drain. The City Engineer shall approve the slope of drain. DS 4.03J requires bench drains to be concrete lined and designed to convey 100 year runoff. 17.16.040D requires revegetation of graded areas as soon as possible to minimize dust and erosion.		Y

MS4 Item	Topic	Paraphrased Criteria	Relevant City Codes	Recommendation/Notes	Met?*
B2d2		Utilize natural drainage systems to Maximum Extent Practicable.	15.24.250D All drainage facilities shall be designed to carry waters to the nearest practicable drainage approved by the City Engineer or other appropriate public agency as a safe place to deposit such waters. 16.20.040I requires lots to be designed to preserve the maximum of trees and other natural amenities. 16.24.060C requires adequate conduits, culverts, channels or other structure be provided to conduct stormwater into natural channels.	Modify to preserve existing natural drainages or topography, to the maximum extent practicable. Change 16.24.060C to utilize natural channels to convey stormwater, where practical	P
B2d3		Stabilize permanent channel crossings.	Design Standard 4.03I identifies design of open channels.	Clarify language on stabilizing channel crossings.	N
B2d4		Vegetate slopes with native or drought tolerant vegetation	17.16.040D requires revegetation of graded areas as soon as possible to minimize dust and erosion. 17.16.080D requires landscaping to be drought-resistant, native where possible.	Consider adding language identifying need to revegetate slopes with native or drought tolerant vegetation in grading ordinance.	Y
B2d5		Energy Dissipaters	15.24.250D requires all drainage facilities to install non-erosive downdrains or other devices to prevent ground erosion in the area of discharge. 4.03 J requires energy dissipaters or other adequate measures at changes of alignment and inlets to confine water within the channel of bench drains or diversion ditches		Y
B2e	Provide Storm Drain Stenciling	Indicate system drains or discharge to indicate water body as appropriate and dumping waste is prohibited.	None	Standard Plans could be amended to include storm drain stenciling/markers on new storm drains as they are installed.	N

City of Hollister MS4 General Permit: Attachment 4 Review

MS4 Item	Topic	Paraphrased Criteria	Relevant City Codes	Recommendation/Notes	Met?*
B2f1	Properly Design Outdoor Material Storage Areas.	Prevent stormwater contact with runoff or spillage	None	Incorporate stormwater diversion requirements.	N
B2f2		Impervious surface to contain leaks	17.16.130D (3) requires storage areas to have a concrete pad within the fenced or walled area(s) and a concrete apron which facilitates the handling of the individual bins or containers;		Y
B2f3		Covered storage area	17.16.030N (1) Screening for outdoor storage shall be determined by the height of the material or equipment being screened. When allowed, exterior storage shall be confined to portions of the site least visible to public view. Where screening is required, a combination of elements shall be used, including solid masonry walls, berms, and landscaping. 17.16.130D (4) Protect the areas and the individual bins or containers provided within from adverse environmental conditions which might render the collected materials unmarketable.	Consider modifying 17.16.130D to add language that protects materials from stormwater.	P
B2g1	Properly Design Trash Storage Areas.	Divert adjacent roof and pavement stormwater around enclosure		Incorporate stormwater diversion requirements.	N
B2g1		Secured or walled to prevent off-site transport of trash	17.16.130D (3) requires storage areas to have a concrete pad within the fenced or walled area(s) and a concrete apron which facilitates the handling of the individual bins or containers; 17.08.030P Solid waste and recycling receptacles shall be sited where associated odors and noise will not adversely affect residential use. Receptacles must be screened from residential dwelling units.	Screening is required to mitigate for visual impacts, not to prevent off-site transport of trash. Consider modifying wording to include additional reason for screening.	P

MS4 Item	Topic	Paraphrased Criteria	Relevant City Codes	Recommendation/Notes	Met?*
B2h	Proof of on-going maintenance	Identify who is required to maintain facility through legal agreements, covenants, CEQA mitigation requirements and/or Conditional Use Permits.	16.16.030 D (4) requires restrictive covenants and other legal documents controlling future maintenance activities of planned unit development be included in the use permit. 17.06.080F(2) requires new development with a comprehensive landscaping plan to file a maintenance agreement and easement subject to the approval of the City Attorney. 17.18.110L requires all parking facilities be permanently maintained by the property owner/tenant, free of litter and debris, potholes, obstructions, and stored material.	Strengthen covenants to include maintenance of stormwater facilities.	P
B2i	Design Standards for Treatment Control BMPs	Determination of design criteria for volume and flow treatments BMPs.	None.	Develop a standard to address numerical volume and flow treatment control standards.	N
B3a1	100,000 sf commercial developments – Loading Docks	Covered or designed to minimize stormwater run-on and runoff. Prohibits direct storm drain connections to depressed loading docks.	15.24.131 requires minimum standards for appropriate interim and final BMP selection to be in accordance with the BMP Manual or as approved by City Engineer, and be included in an Interim and Final BMP Control Plan.	In CASQA BMP Manual.	Y
B3a2	100,000 sf commercial developments – Maintenance Bays	Enclose Maintenance Bays to prevent stormwater run-on and runoff. Prohibits direct storm drain connections to bay sump.	15.24.131 requires minimum standards for appropriate interim and final BMP selection to be in accordance with the BMP Manual or as approved by City Engineer, and be included in an Interim and Final BMP Control Plan.	In CASQA BMP Manual.	Y
B3a3	100,000 sf com dev – Vehicle/Equipment Wash Areas	Self-contained and properly disposed of.	15.24.131 requires minimum standards for appropriate interim and final BMP selection to be in accordance with the BMP Manual or as approved by City Engineer, and be included in an Interim and Final BMP Control Plan.	In CASQA BMP Manual.	Y

MS4 Item	Topic	Paraphrased Criteria	Relevant City Codes	Recommendation/Notes	Met?*
B3b	Restaurants	Self-contained equipment/Accessory Wash Areas shall be equipped with a grease trap and be properly connected to a sanitary sewer. Outdoor areas must be covered, paved, have secondary containment and be disposed of properly	None.	There are no requirements for grease traps. Consider updating Municipal Code to include requirements for grease interceptor devices.	N
B3c1a	Retail Gasoline Outlets	Overhanging Fueling Area	15.24.131 requires minimum standards for appropriate interim and final BMP selection to be in accordance with the BMP Manual or as approved by City Engineer, and be included in an Interim and Final BMP Control Plan.	In CASQA BMP Manual.	Y
B3c1b		Concrete Fueling Area			
B3c1c		Fueling areas sloped of 2-4%			
B3c1d		Fueling area extend 6.5 ft for pump corner or pump hose plus 1 ft whichever is less			
B3d1a	Automotive Repair Shops	Overhanging Fueling Area	15.24.131 requires minimum standards for appropriate interim and final BMP selection to be in accordance with the BMP Manual or as approved by City Engineer, and be included in an Interim BMP and Final Control Plan. 17.08.030J (1) limits outdoor operations to pumping motor vehicle fluids, checking and supplementing various fluids, mechanical inspection and adjustments; 17.08.030K Commercial loading facilities and related service areas must be located away from and screened from view.	In CASQA BMP Manual.	Y
B3d1b		Concrete Fueling Area			
B3d1c		Fueling areas sloped of 2-4%			
B3d1d		Fueling area extend 6.5 ft for pump corner or pump hose plus 1 ft whichever is less			
B3d2		Enclose Maintenance Bays to prevent stormwater run-on and runoff. Prohibits direct storm drain connections to bay sump			
B3d3		Self-contained and/or covered vehicle/equipment Wash Area. Discharge to be pretreated and disposed of properly.			
B3d4		Loading/unloading docks covered or otherwise designed to minimize run-on and runoff. Direct connections to storm drains from depressed loading docks are prohibited.			

MS4 Item	Topic	Paraphrased Criteria	Relevant City Codes	Recommendation/Notes	Met?*
B3e1a	Parking Lots	Reduce impervious land coverage in parking areas	17.18.110 I (4) requires planting islands between parking aisles, 6 ft wide. Areas not used in a parking lot shall be landscaped. Bumper overhang areas of a maximum of 2 ft of the parking stall depth may be landscaped with low growth to increase the landscaped area while maintaining parking dimensions.	While not prohibited, there is no requirement to reduce impervious land coverage in parking areas or to use pervious pavement.	P
B3e1b		Infiltrate or treat runoff	17.16.140 C (1) requires persons owning parking lots, gas station pavement, contractor's equipment yard or similar structures having impermeable surfaces, shall clean such structures as frequently and thoroughly as practicable. Sweepings shall be collected in a manner that does not result in discharge of pollutants to the city storm drain system or surface water. 17.16.140 C (2) requires any activity, operation, or facility which may cause or contribute to stormwater pollution or contamination, illicit discharges, or discharge of non-stormwater to the stormwater system, every person undertaking such activity or operation, or owning or operating such facility, shall comply with federal, State of California, regional, or the City of Hollister adopted guidelines or requirements as may be prescribed by the City Manager.	Modify to promote alternative pervious surfaces.	P
B3e2a		Treat to remove oil and petroleum hydrocarbons at heavy used parking lots.	17.16.140 C (2) same as above.	Define when oil and grease separators are required.	P
B3e2b		Require routine maintenance	17.18.110L requires all parking facilities be permanently maintained by the property owner/tenant, free of litter and debris, potholes, obstructions, and stored material.	Already meets attachment 4 criteria.	Y

MS4 Item	Topic	Paraphrased Criteria	Relevant City Codes	Recommendation/Notes	Met?*
B4	Waiver	Grants waiver only when all other structural or treatment BMPs have been considered and rejected as infeasible. Infeasible may include: • Extreme limitations on space • Unfavorable soil conditions • Risk of ground water contamination	17.16.140A(3) Projects unable to meet the pre-drainage standards shall be required to pay fees for city-wide stormwater pollution control and management. Needs criteria to grant waiver.	Strengthen 17.16.140A by defining the exception process.	P
B5	Limitations on Use of Infiltration BMPs	Not permitted where stormwater will influence contaminated ground water.	None.	Define where stormwater infiltration should be limited.	N
B6	Alternative Certification for Storm Water Treatment Mitigation	Requires California registered civil engineer or architect to certify plan meets criteria established herein.	None.		N

KEY

* Y	Fully Met
P	Partially Met
N	Not Met

Abbreviations:

BMP	Best Management Practice	DS	Design Standards
CASQA	California Association of Storm Water Quality	E&SC	Erosion and Sediment Control
CBC	California Building Code	LID	Low Impact Development
CEQA	California Environmental Quality Act	RWQCB	Regional Water Quality Control Board

OUTFALL RECONNAISSANCE INVENTORY/ SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

Subwatershed:		Outfall ID:	
Today's date:		Time (Military):	
Investigators:		Form completed by:	
Temperature (°F):	Rainfall (in.): Last 24 hours:	Last 48 hours:	
Latitutde:	Longitude:	GPS Unit:	GPS LMK #:
Camera:		Photo #s:	

Land Use in Drainage Area (Check all that apply):

- ☐ Industrial
- ☐ Ultra-Urban Residential
- ☐ Suburban Residential
- ☐ Commercial
- ☐ Open Space
- ☐ Institutional
- Other: _____
- Known Industries: _____

Notes (e.g.., origin of outfall, if known):

Section 2: Outfall Description

LOCATION	MATERIAL	SHAPE		DIMENSIONS (IN.)	SUBMERGED
☐ **Closed Pipe**	☐ RCP ☐ CMP ☐ PVC ☐ HDPE ☐ Steel ☐ Other: _____	☐ Circular ☐ Eliptical ☐ Box ☐ Other: _____	☐ Single ☐ Double ☐ Triple ☐ Other: _____	Diameter/Dimensions: _____	In Water: ☐ No ☐ Partially ☐ Fully With Sediment: ☐ No ☐ Partially ☐ Fully
☐ **Open drainage**	☐ Concrete ☐ Earthen ☐ rip-rap ☐ Other: _____	☐ Trapezoid ☐ Parabolic ☐ Other: _____		Depth: _____ Top Width: _____ Bottom Width: _____	
☐ **In-Stream**	**(applicable when collecting samples)**				
Flow Present?	☐ Yes ☐ No ***If No, Skip to Section 5***				
Flow Description (If present)	☐ Trickle ☐ Moderate ☐ Substantial				

Section 3: Quantitative Characterization

FIELD DATA FOR FLOWING OUTFALLS				
PARAMETER		**RESULT**	**UNIT**	**EQUIPMENT**
☐Flow #1	Volume		Liter	Bottle
	Time to fill		Sec	
☐Flow #2	Flow depth		In	Tape measure
	Flow width	_____' _____"	Ft, In	Tape measure
	Measured length	_____' _____"	Ft, In	Tape measure
	Time of travel		S	Stop watch
Temperature			°F	Thermometer
pH			pH Units	Test strip/Probe
Ammonia			mg/L	Test strip

Outfall Reconnaissance Inventory Field Sheet

Section 4: Physical Indicators for Flowing Outfalls Only

Are Any Physical Indicators Present in the flow? ☐ Yes ☐ No *(If No, Skip to Section 5)*

INDICATOR	CHECK if Present	DESCRIPTION	RELATIVE SEVERITY INDEX (1-3)		
Odor	☐	☐ Sewage ☐ Rancid/sour ☐ Petroleum/gas ☐ Sulfide ☐ Other:	☐ 1 – Faint	☐ 2 – Easily detected	☐ 3 – Noticeable from a distance
Color	☐	☐ Clear ☐ Brown ☐ Gray ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:	☐ 1 – Faint colors in sample bottle	☐ 2 – Clearly visible in sample bottle	☐ 3 – Clearly visible in outfall flow
Turbidity	☐	See severity	☐ 1 – Slight cloudiness	☐ 2 – Cloudy	☐ 3 – Opaque
Floatables -Does Not Include Trash!!	☐	☐ Sewage (Toilet Paper, etc.) ☐ Suds ☐ Petroleum (oil sheen) ☐ Other:	☐ 1 – Few/slight; origin not obvious	☐ 2 – Some; indications of origin (e.g., possible suds or oil sheen)	☐ 3 - Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

Are physical indicators that are not related to flow present? ☐ Yes ☐ No *(If No, Skip to Section 6)*

INDICATOR	CHECK if Present	DESCRIPTION	COMMENTS
Outfall Damage	☐	☐ Spalling, Cracking or Chipping ☐ Peeling Paint ☐ Corrosion	
Deposits/Stains	☐	☐ Oily ☐ Flow Line ☐ Paint ☐ Other:	
Abnormal Vegetation	☐	☐ Excessive ☐ Inhibited	
Poor pool quality	☐	☐ Odors ☐ Colors ☐ Floatables ☐ Oil Sheen ☐ Suds ☐ Excessive Algae ☐ Other:	
Pipe benthic growth	☐	☐ Brown ☐ Orange ☐ Green ☐ Other:	

Section 6: Overall Outfall Characterization

☐ Unlikely ☐ Potential (presence of two or more indicators) ☐ Suspect (one or more indicators with a severity of 3) ☐ Obvious

Section 7: Data Collection

1. Sample for the lab?	☐ Yes	☐ No	
2. If yes, collected from:	☐ Flow	☐ Pool	
3. Intermittent flow trap set?	☐ Yes	☐ No	If Yes, type: ☐ OBM ☐ Caulk dam

Section 8: Any Non-Illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?

APPENDIX B

STORM MODEL REFERENCE INFORMATION

TECHNICAL MEMORANDUM NO. 1

Date: MARCH 30, 2010

To: DAVID RUBCIC, CITY OF HOLLISTER

From: KARI WAGNER, WALLACE GROUP

Subject: ADDRESSING PROBLEM AREAS IN THE MASTER PLAN

Wallace Group and the City of Hollister staff attended a kickoff meeting for the Storm Drain Master Plan on March 4, 2010. Following the completion of the kickoff meeting, we were given a tour of the drainage problem areas in the City of Hollister as identified by the City Operations Staff. Wallace Group took notes and photos of the sites and listened to the concerns of City Staff. Subsequent to the meeting, we received photos of the same locations that were taken by City staff during an earlier rainstorm when the flooding problems were more evident.

Per our approach in our Proposal, Wallace Group assumed that there were less than 10 problem areas that would be needed to be evaluated beyond just modeling the impacts to the storm drain model. At this time, the City has identified 19 areas of concern. These areas of concern are primarily related to surface conditions that cause flooding in intersections that are visible to the public. Based on the information provided to Wallace Group, Table 1 was developed, which describes the following:

- A description of the problem
- Possible solution(s) identified to date
- Additional survey requirements
- Approach to addressing the problem in the Master Plan

A photo exhibit is also included to show the location of the problem areas and to illustrate the drainage problem. In general, Wallace Group intends to provide sufficient information in the Storm Drain Master Plan to include a proposed solution in the CIP section with estimated costs for budgeting purposes for all 18 problem areas. Some of the solutions to the problem areas are simple and can be identified without any additional survey. However, many of the problem areas do need additional survey to understand the complexities of the situation. Wallace Group has ranked the problem areas (Table 2) in the order we felt were most critical. Please review this table and provide us with your concurrence or comments regarding our recommendations. Once we obtain your concurrence, we will proceed with obtaining additional survey necessary to analyze the sites. If there are more than 10 sites to be analyzed, Wallace Group may need additional funds to properly analyze the problem areas.

If you have any questions, please do not hesitate to contact me at (805) 544-4011.

Table 1. City of Hollister Problem Areas

ID	Location	Description of Problem	Possible Solution(s)	Survey needs	Proposed Approach in Master Plan CIP
P1	San Benito &Vine	Bubbler system overwhelmed on east side of T-intersection. Flows to north @ 0.3%. Root uplift along gutter. Unknown if gutter has sufficient capacity.	Install cross gutter through intersection. Repair curb & gutter. Determine worst case spread and evaluate needs for storm drain.	Survey bubbler elevations, curb & gutter grades, and crown	Cost estimate for x-gutter and replace downstream curb & gutter. Determine need for new storm drain.
P2	San Benito & Palm	Bubbler system overwhelmed on east side of T-intersection. Flows to north @ 0.3%. Root uplift along gutter. Unknown if gutter has sufficient capacity.	Install cross gutter through intersection. Repair curb & gutter. Determine worst case spread and evaluate needs for storm drain.	Survey bubbler elevations, curb & gutter grades, and crown	Cost estimate for x-gutter and replace downstream curb & gutter. Determine need for new storm drain.
P3	San Benito & Olive	Bubbler system overwhelmed on east side of T-intersection. Flows to north @ 0.3%. Root uplift along gutter. Unknown if gutter has sufficient capacity.	Install cross gutter through intersection. Repair curb & gutter. Determine worst case spread and evaluate needs for storm drain.	Survey bubbler elevations, curb & gutter grades, and crown	Cost estimate for x-gutter and replace downstream curb & gutter. Determine need for new storm drain.
P4	San Benito & Park	Bubbler system overwhelmed on east side of T-intersection. Flows to north @ 0.3%. Root uplift along gutter. Unknown if gutter has sufficient capacity.	Install cross gutter through intersection. Repair curb & gutter. Determine worst case spread and evaluate needs for storm drain.	Survey bubbler elevations, curb & gutter grades, and street crown	Cost estimate for x-gutter and replace downstream curb & gutter. Determine need for new storm drain.
P5	San Benito & 6th	Flooding runs north-south on east side of San Benito. Very flat area with x-gutter. No obvious blockage.	Extend underground system to this location. Model will help identify best connection point.	Survey corners, x-gutter, and street crown.	Additional analysis required.
P6	Monterey & Hawkins	NW & SW corners are flooded. Bubblers carry flow across the corners but are overwhelmed. East corners have curb inlets and 18" SD runs to west in Hawkins. Roots of tree on south side of Hawkins have raised gutter to block flow to west.	Install drainage inlets and laterals to 18” SD in Hawkins.	Survey both corners to determine locations and number of drainage inlets needed. Survey street crown.	Additional analysis required.

ID	Location	Description of Problem	Possible Solution(s)	Survey needs	Proposed Approach in Master Plan CIP
P7	West & 5th	NE & SE corners flood in small storms, entire intersection floods in large. No bubblers or cross gutters. Flow may go west or south but unclear.	Possible x-gutters across 5th to south.	Survey all four corners and curb & gutter to south and west. Survey street crown.	Additional analysis required.
P8	West & 4th	SE corner floods	Possible x-gutter to west or connect to 18" line in 3rd.	Survey all four corners and curb & gutter to south and west. Survey street crown.	Additional analysis required.
P9-10	4th between Mapleton & Line	The north side of 4th floods at Mapleton and continues flooding to west to Line St. Very flat gutter (0.2%). Tree roots and bulging driveway block flow to west in gutter.	Correct humps in gutter on north side of 4th or reconstruct entire length of curb & gutter.	Survey of curb & gutter on 4th will show if the problem is confined to isolated points or if there are more extended problems.	Additional analysis required.
P11	Locust near W. 2nd	Gutter flooded @ "DIP" sign on west side of Locust. Transition from curb and gutter to no gutter is an obstacle to flow. It appears that the dirt swale has been paved over.	City already has project (extend curb & gutter to south)	None	Project should be completed prior to Final Storm Drain Master Plan.
P12	College & 5th	Bubblers at all 4 corners are overwhelmed by collection of flow from fairly large drainage area. All bubblers cut the corners in an attempt to make it possible for pedestrians to cross, but is not successful. Flooding at mortuary.	Flow should be directed to south. Determine drainage area and size x-gutter or (new) pipes.	Survey bubblers to determine where they are connected. Also survey curb & gutter to south and west to determine blockage. Survey street crown.	Additional analysis required.
P13	Hwy 25 @ Meridian	Vertical dry well does not have capacity for flows to this area. Once full, the area floods to the highway	Future development will resolve this with curb & gutter to west. Temporary fix would be to grade a ditch to west	None	Describe as part of street improvements to be required of developer of adjacent parcel. Additional analysis required to size necessary facilities.

ID	Location	Description of Problem	Possible Solution(s)	Survey needs	Proposed Approach in Master Plan CIP
P14	Sunnyslope @ Vet Clinic	Westward flow along north side of Sunnyslope leaves the roadside and enters a dirt parking area at the vet clinic and flows towards some homes. No roadside ditch exists. Natural slope is to northwest.	Curb & gutter on Sunnyslope stops to the east. Either grade a ditch to drain west or extend curb & gutter and add catch basin. 30" storm drain runs to the west in Sunnyslope.	None (survey required for final design only)	Cost estimate for various options.
P15	Memorial Dr north of Sunnyslope	Right lane is an inverted crown. Gutter has limited capacity and overtops into inverted crown which flows north to a grate opening in the middle of the travel lane. Spread flooding at grate in middle of traffic.	City has project identified for this problem area.	None	Project is anticipated to be completed prior to Final Storm Drain Master Plan
P16	Rail Road ditch flowing to San Benito	2,000 feet of RR ditch on west side of tracks intercepts drainage and directs to the gutter in San Benito between 1st & Santa Ana. Numerous culverts along the way can get clogged. The final reach is a bubbler that terminates in a grate that gets clogged from the underside.	Trash rack on last culvert before underground system. Direct connection to existing storm drain and eliminate bubbler. Install storm drain through entire reach. Need to discuss with City. WG to only analyze outlet, not entire reach of culvert.	Survey exit of culver to determine drainage options.	Additional analysis required.
P17	Open ditch on east side of San Felipe at car dealer	East side of street has an open ditch that creates a safety hazard. Accidents have occurred in the psat.	Replace ditch with pipe or re-route ditch through property to existing drainage basin.	Survey grades to drainage basin.	Cost estimates for various options.
P18	Flynn Rd & San Felipe	Flooding on north side of Flynn Road near the Flynn Road Pond may be caused by the absence or burial of storm drain inlets to the west at AeroStar Way.	Determine if inlets exist. If so, uncover/repair. Otherwise, install new ones at Aerostar.	Survey to investigate location of storm drains (if any).	Cost estimate for various options.

Table 2. Storm Drain Ranking

Ranking	ID	Location	Survey and Additional Analysis Needs	Ranking	ID	Location	Survey and Additional Analysis Needs
1	P17	Open ditch on San Felipe Rd.	Survey grades to drainage basin.	**10**	P1	San Benito & Vine	Survey bubbler elevations, curb & gutter grades, and crown.
2	P6	Monterey & Hawkins	Survey both corners to determine locations and number of drainage inlets needed. Survey street crown.	**11**	P2	San Benito & Palm	Survey bubbler elevations, curb & gutter grades, and crown.
3	P8	West & 4th	Survey all four corners and curb & gutter to south and west. Survey street crown.	**12**	P3	San Benito & Olive	Survey bubbler elevations, curb & gutter grades, and crown.
4	P12	College & Fifth	Survey bubblers to determine where they are connected. Also survey curb & gutter to south and west to determine blockage. Survey street crown.	**13**	P4	San Benito & Park	Survey bubbler elevations, curb & gutter grades, and crown.
5	P9	Mappleton & 4th	Survey of curb & gutter on 4th will show if the problem is confined to isolated points or if there are more extended problems	**14**	P18	Flynn Rd.	Survey to investigate location of storm drains (if any)
6	P10	Line & 4th	Survey of curb & gutter on 4th will show if the problem is confined to isolated points or if there are more extended problems.	**15**	P14	Bella Vista & Sunnyslope	No survey, SDMP to provide options and costs
7	P7	West & 5th	Survey all four corners and curb & gutter to south and west. Survey street crown.	**16**	P13	Hwy 25 & Meridian	To be analyzed by Developer.
8	P5	San Benito & 6th	Survey corners, x-gutter, and street crown.	**17**	P11	Locust near W. 2nd	No survey required. City working on project already.
9	P16	San Benito from RR	Survey exit of culver to determine drainage options.	**18**	P15	Memorial & Sunnyslope	No survey required. City working on project already.

P1—San Benito and Vine

Bubbler systems at these intersections are overwhelmed on east side of each T-intersection. Drainage flows to north @ 0.3%, with no cross gutters. Gutter uplift by tree roots also causes ponding in some locations.

P2—San Benito and Palm

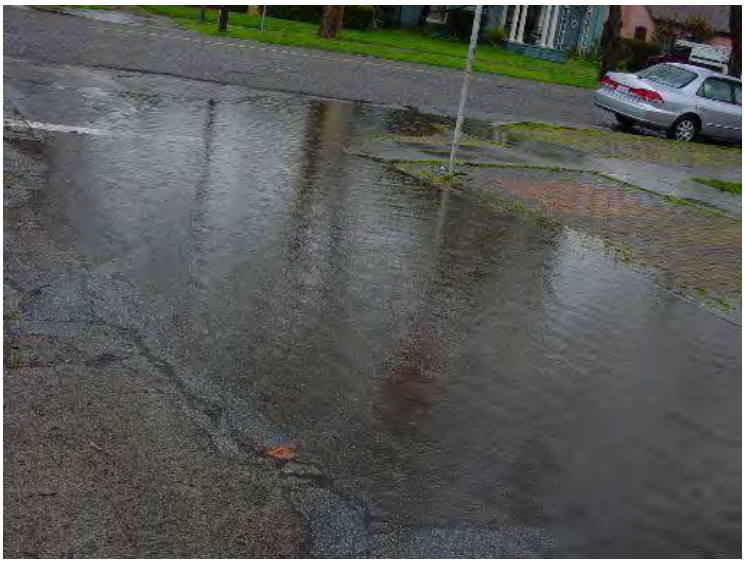
P4—San Benito and Park

P3—San Benito and Olive

Flooding runs north-south on east side of San Benito. Very flat area with x-gutter. No obvious blockage.

P5—San Benito and 6th

NW & SW corners are flooded. Bubblers carry flow across the corners but are overwhelmed. East corners have curb inlets and 18" SD runs to west in Hawkins. Roots of tree on south side of Hawkins have raised gutter to block flow to west.



P6—Monterey and Hawkins

NE & SE corners flood in small storms, entire intersection floods in large. No bubblers or cross gutters. Flow may go west or south but unclear. Nearest storm drain is two blocks away.

P7—West & Fifth

Flooding on SE corner. Storm drain is one block to north

P8—West and 4th

The north side of 4th floods at Mapleton and continues flooding to west to Line St. Very flat gutter (0.2%), tree roots and bulging driveway block the flow to west in gutter. Storm drain inlets are located at Line & 4th.

P10—Line & Fourth

P9—Mapleton & Fourth

Gutter flooded @ “DIP” sign on west side of Locust. Transition from curb and gutter to no gutter is an obstacle to flow. It appears that the dirt swale has been paved over.

P11—Locust near W. 2nd

Bubblers at all 4 corners are overwhelmed by collection of flow from fairly large drainage area. All bubblers cut the corners in an attempt to make it possible for pedestrians to cross.

P12—College & Fifth

P13—Hwy 25 & Meridian

Vertical French Drain does not have capacity for flows to this area. Once full, the area floods to the highway

P15—Memorial & Sunnyslope

P14—Bella Vista & Sunnyslope

Right lane has an inverted crown. Gutter has limited capacity and overtops into inverted crown which flows north to a grate opening in the middle of the travel lane. Spread flooding at grate.

Westward flow along north side of Sunnyslope leaves the roadside and enters a dirt parking area at the vet clinic and flows towards some homes. No roadside ditch exists. Natural slope is to northwest. Existing curb and gutter on north side of Sunnyslope terminates near Clearview Dr.

2000' feet of RR ditch on west side of tracks intercepts drainage and directs to the gutter in San Benito between 1st & Santa Ana. Numerous culverts along the way can get clogged. The final reach is a bubbler that terminates in a grate that gets clogged from the underside

P16—Flooded area on San Benito from RR ditch

East side of street has open ditch that creates a safety hazard. A motorcycle went into this ditch and crashed.

P17—Open ditch on east side of San Felipe in front of car dealership

Flooding on north side of Flynn Road near the Flynn Road Pond may be caused by the absence or burial of storm drain inlets to the west at AeroStar Way.

P18—Flooded area on Flynn Rd

ITEM	STANDARD	CURRENT	COMMENT	MEETING MINUTES
1	Storm Drain Surcharging	Not allowed	Many agencies allow this – its essentially a safety factor	WG suggested modifying this policy to allow surcharging. The City's standards specify a minimum of 1.25 feet freeboard if surcharging is allows. WG stated this minimum could also be reduced.
2	Flood Waters	Contain in right-of-way at all times	Need to define "Flood Waters"	The City stated that flood waters are the 100-year storm
3	Flood Water depth	No more than 0.70 feet at gutter	Need to define "Flood Waters"	
4	100-yr storm	Contain in right-of-way at all times	Same as #2?	
5	SD Profile	Match crowns	Not necessary, but can contribute to efficient flow.	WG suggested to allow offset inverts if this works better for existing street slopes.
6	Basins	Only interim	This does not appear to be current practice	This standard needs to relate to storm water quality requirements. The City stated that regional basins are preferred to smaller onsite basins.
7	Basins	All shall flow to permanent SD Systems	This does not appear to be current practice	
8	Percolation Ponds	Not allowed unless shown not to be detrimental	Suggest defined criteria – drain a 50-10-10 storm in 7-days, etc.	50-10-10 represents a 50-yr storm with 10-hr duration and intensity. This is the standard practice for the County of San Luis Obispo and has worked well so far. WG suggested infiltration testing is done by the double-infiltrometer method, and that basins are field tested after construction. The City stated that field testing could be beneficial but it must take into account minimizing potable water use, by testing in the winter time (rain) or using recycled water.
9	Ponds	No outlet, or no perc = not allowed	Good Policy	
10	Subdivision Lot Grading	Flat slopes required	Sounds overly restrictive. Also hard to understand – suggest a diagram.	

ITEM	STANDARD	CURRENT	COMMENT	MEETING MINUTES
11	SD – WL separation	10-ft wherever possible, or per Plan B-13	Good Policy – need procedures for exceptions?	
12	Tabulation Sheet	Use form Page 31	Good form – but its not very legible. Recommend allowing comparable computer output.	
13	Design Storms and procedures'	Rational allowed up to 10-sq miles and for basins Hydrograph allowed for 10 sq miles and basins	Recommend revisions – see attached.	Typical cutoff for the Rational Method is 200 acres (approximate 1/3 sq mile)
14	C-values	Values are listed for seven land uses.	These are pretty low…should be reviewed. Recommend a tabulated approach – it works for a greater variety of land uses.	WG will suggest C values corresponding to the City's General Plan land use categories and NRCS soil types. Overall, a combination of higher C values and allowing surcharging in systems may result in similar system design as the current City standards.
15	TC formulas		These are under review	
16	I-value formulas		These are under review	
17	Pipe size	15-inch minimum for laterals	City okay with this? Many agencies use 18-inch	The City stated that the use of 15-inch laterals has not caused maintenance issues.
18	LID		Recommend references to City Ordinance 1053	
19	Hydromodification		Recommend references to long term watershed protection – need to amend the sections on basins to allow hydromodification basins. Need related std details.	

EXISTING CONDITIONS FLOODING SUMMARY

25-year Storm – Tributary Area Greater than 50 acres or sump condition

San Felipe Road at Fallon Road (F5-4)

- Highest flooding volume
- Could impede traffic on San Felipe Road (high traffic, access to airport)
- Some storage available in easterly shoulder (not accounted for)
- portion of system downstream from F5-2 is within 100-yr floodplain.
- Stormwater CAD basemap shows 48-inch and 54-inch in San Felipe flowing to Fallon.

Rustic Basin

- Rustic Basin has 12-foot total depth. Design freeboard unknown. Assume 2-foot design freeboard, therefore 10-foot design water depth. Need to increase basin depth by 2.2 feet due to rim elevation of inlets on Gateway Drive.
- Assume same dimensions with inv 2.2 feet lower.
- With increased depth and zero percolation flooding still occurred during 25-yr storm (10-yr not checked).
- NRCS Soils
    - SrA Sorrento silty clay loam
    - Depth to water table > 200 cm (6.56 ft)
    - Well drained, HSG B
    - Ksat = 4.0 micrometers per second (0.567 in/hr)
    - Available water capacity = 0.19 (in/in)
- With 4-foot depth increase and 0.5 inches/hour infiltration flooding still occurs

San Felipe Road upstream of Rustic Basin (F9-3)

- Could impede traffic on San Felipe Road (high traffic, access to airport)
- Infiltration in basin not accounted for

Rustic Street at Rustic Basin

- Tailwater from Basin
- Basin infiltration not accounted for

Pacific Way at Rustic Basin

- Infiltration in basin not accounted for
- Would flow to ag field then Hwy 25 bypass

Citation Way Upstream of Citation Bus Park Pond

- Infiltration in basin not accounted for
- Would flow to Flynn Road and likely reach the Airway Pond, or the Airport if flooding is extreme

Hillcrest Road

- Would flow west to Memorial, then north on Memorial
- Floods during 10-yr storm
- 27-inch pipe flows to 24-inch pipe just north of Memorial Park

Line Street @ 2nd (Sump)

- Overland escape at approx 10 inches flow depth
- Would flow to Westside/San Juan sump (**no overland escape**)

Powell and South (Powell Street)

- No overland escape
- Flooding due to backwater effect from 84-inch in 7th Street (HGL on 7th higher than Powell/South intersection)

Suiter at Powell (Suiter)

  - Collects 10.2 acres without diversion from slide gate
  - Collects 46.2 with diversion from slide gate
  - **Only required to capture 10-year storm**
  - **Would flow to Powell/South sump, therefore recommend 25-yr design storm**

Felice Drive at Central Avenue

- Collects flow from Calaveras Elem School – upstream system not modeled
- Total area approx 16.8 acres, likely designed for 10-yr.
- Cosco Court is sump condition, overland escape at 8 inches
- Recommend design for 25-yr due to sump condition
- Would flow west on Central Ave after breaching sump

Clearview Drive at El Camino de Vida (Clearview at Hillcrest)

- Significant portion of contributing SD system not modeled
- Would flow north on Clearview, then likely reach the undeveloped parcel adjacent to El Cerro Drive

Knight Lane at Squire Court (Knight Lane)

- Tributary less than 50 acres
- Sump condition, therefore recommend 25-year design
- Would flow north on Prune Street

Rancho Drive at Knight Lane

  - Tributary area = 12.5 acres, 10-yr storm only
  - Flooded during 10-yr storm

Nash at Powell (Nash Road)

- Picks up flow from High School and undeveloped area south of High School
- Would flow west on Nash to San Benito River

Sunnyslope Road on East side of Hwy 25 bypass (Sunnyslope Road)

- Would pond on southeast side of intersection (sump conditions), then flow to Hwy 25
- Overland escape at 18 inches
- Increase in diameter from 36-inch to 42-inch results in
- Memorial Drive upgrade exacerbates modeled flooding at this sump due to flow through the 18-inch diversion at Memorial Drive & Sunnyslope

Memorial at Sunnyslope (Memorial Drive)

- Would flow north to Sunnyslope, then west to Hwy 25 bypass
- Large number of inlets at Sunnyslope would likely capture flow before reaching the bypass

Valley View Road at Sunset Drive

  - South of Sunset is 45.9 acres tributary, 10-yr storm only
  - Flooded during 10-yr storm

Central Avenue

- North side of Street would flow west on Central. If not picked up at Line Street, would flow north to Line/2nd sump. South side of street would flow to 4th/Line (problem area).
- Flow from Hill Street area (potentially silt problem?)

<u>10-year Storm - Tributary area less than 50 acres</u>

Clearview Drive at Sunnyslope (Clearview Drive)

- South of Gabilan is less than 50-acre, 10-yr storm only
- Flooded during 10-yr storm

South at Monterey (South Street)

- Tributary area = 16.2 acres, 10-yr storm only
- Flooded during 10-yr storm

South at East (South Street IWWTP)

- Tributary area = 17.8 acres, 10-yr storm only
- Flooded during 10-yr storm
- Recommended design for 25-yr because would surface flow to sump

3rd @ East

- Tributary less than 50 acres
- Flooded during 10-yr storm

Hawkins – McCray to West

- 29.8 acres tributary, 10-yr design storm only
- Upstream of slide gate
- Flooded during 10-yr storm

<u>No Project – Location Notes Only</u>

Mimosa at Yarrow (upstream of Enterprise Pond)

- Significant portion of SD system not modeled, all flows assigned to this manhole
- Based on record dwg A3-112 the two pipe segments in Yarrow are 36-inch, between Mimosa and Glenview. Need to update GIS.
- No flooding after pipe data updated.

Valley View @ Union

- 29.7 acres tributary, 10-yr storm only
- OK – no project

East of Memorial Park

- Less than 50 acre tributary upstream of H12-52, 10-yr storm only
- OK – no project

El Toro

- Tributary area = 34 acres, 10-yr storm only
- OK – no project

Santa Ana Road at Sally
- Tributary area less than 50 acres (approximately 12 acres), 10-yr storm only
- OK – no project

South of Tres Pinos
- Less than 50 acres, 10-yr storm only
- OK – no project

"A" at Suiter
- Very short flood time (0.16 hours = less than 10 minutes)
- No project

Union at Southside
- County system, no project

Enterprise Road
- County system, no project

Cerra Vista
- South of Sunset less than 50 acres contributing, therefore 10-year only
- Would flow north on Cerra Vista to Santa Ana Creek
- OK – no project

Brighton Drive
- Glenview Drive is less than 50 acre tributary
- Significant portion of upstream tributary not modeled
- Would flow north on Valley View Road, then to Airline Highway
- Flooding time is less than 10 minutes, likely no flood. System appears to be designed adequately.

Apollo Way
- Upstream from G4-5 less than 50 acres, 10-yr storm only
- No flooding during 10-yr storm
- Would flow through vacant parcel to Santa Ana Creek

Veterans Memorial Park – no project
- Trib area less than 50 acres, 10-yr storm only
- Minor flooding during 10-year storm
- Stomwater likely retained onsite in ballfield

FUTURE CONDITIONS FLOODING SUMMARY

"A" at Suiter Street
- Would flow to Powell/South sump
- Potential for residential infill on vacant and under-utilized lots

- Vacant parcel east of Sherwood Drive (approx 3 ac), GP land use is HDR. Soils are HSG B.
- Good place to allow for in-lieu fee, as SD slated to be redirected to IWWTP for treatment.

Airway Pond

- Industrial development along airway Drive and south of Flynn Road
- No infiltration accounted for (HSG D) in basin. Design infiltration 1.25 inches/hour.
- Potential to overflow to airport
- All modeled flooding from E4-2. Flooded volume ~ 3.9 ac feet with no contribution south of Flynn, 30+ acre feet if all development directed to Pond.
- Based on design perc rate, would perc approx 3.5 ac-ft in 24 hours.
- Some storage available in ditch along PL
- Minimize impact by requiring development south of Flynn Road to match existing hydrology. Soils transition to HSG B on southern half of undeveloped parcels, may provide better opportunity for infiltration.
- Flynn Rd at Aerostar way
    - No upgrade needed if development south Flynn required to match existing.
    - Downstream system does not have capacity, not recommended to allow to connect unless flow AND volume is mitigated.

Meridian at Hwy 25

- GP land use is Mixed use west of Hwy 25 (approx 30 ac) and MDR east of Hwy 25 (approx 44 acres).
- MDR mostly HSG B, while mixed use mostly HSG D.
- Outfall to SB River via 4th Street/San Juan outfall
- Mixed use is Lowe's development
    - Majority of site flows through onsite detention to MH G11-20
    - Per model, existing flow (total for Lowe's area) = 6.63 cfs
    - Some flow directly to Meridian Street
    - Assume match existing conditions for parcel
    - Check flow from basin, assume max capacity of basin outlet
        - 12-inch pipe, 350 linear feet, assume HDPE.
        - Upstream HGL = 286, downstream HGL = 285.4 (max 25-yr existing)
        - Per Flowmaster, max flow = 1.74 cfs

Fallon Road

- Incorporate into existing project
- Industrial development south of Fallon Road on Lana Lane and Shelton Dirve, and development on the east side of San Felipe Road between McCloskey and Fallon.
- Pipe req'd to be upsized to 60-inch and 66-inch for future conditions.
- Look for opportunities to decrease developed runoff. Most soils are HSG D, may be difficult to accomplish onsite retention.
- Consider developing regional retention basin in planned open space adjacent to Santa Ana Creek to mitigate impacts from future development.

Westside Blvd

- New residential development between South Street and Apricot Lane
- Less than 50 acres, 10-yr storm only

- Flooded during 10-yr for future conditions.
- **Recommend 25-yr storm due to sump condition**

Apollo Way

- New industrial development along Apollo Way and Bert Drive
- Upstream from G4-5 less than 50 acres, 10-yr storm only
- Flooded during 10-yr event

Miller Road

- New residential development north of Buena Vista Road.
- Soils are HSG B and HSG D. May be some opportunity for retention/infiltration closer to Buena Visa Road.
- Existing upstream manhole is sump condition with overland escape at ~12 inch depth

Squire Court and Rancho Drive (sump)

- Backwater effect from Nash Road
- Flooding at this location could eventually reach 7th/Powell sump.
- Development contributing to Nash SD includes:
    - City GP "Public" west of San Benito High School
    - HDR and mixed use infill along Airline Highway and Sunnyslope Road. Majority of soil is HSG B, some HSG D.
    - HDR infill along Valley View Road between Sunset Drive and Sunnyslope Road. Soil is HSG D.

<u>Location Notes – No Project</u>

Capitola Drive

- Built-out
- GP Land use is LDR
- Req'd for 10-yr only

Black Forest Drive - 10-yr storm

- GP land use is general commercial (Approx 6 acres existing ag) between Hwy 25 and existing residential
- Soils are HSG B
- undeveloped parcel is currently jurisdiction of County
- Downstream system does not have capacity for additional flow – recommend retain/infiltrate onsite for future project, or look for potential to connect to the Hwy 25 system.
- Likely flow to SD through Memorial Park is overestimated due to flow being detained and/or infiltrated onsite in the ball fields. Note that soil at park is classified HSG D.

Storm Drain Model Test Run

1. Proposed runoff coefficients evaluated with "dummy" subcatchment with total size of 20 acres and varying Tc values.
    - Hydrograph peak flow values calculated in HydroCAD, using SCS methodology, proposed storm distribution, and Ia = 0.05S.
    - Rational method peak flows calculated based on City's equation for rainfall intensity.
    - Value for C (**100% impervious**) adjusted until reasonably close to HydroCAD results for CN = 98.
    - CN values for **pervious** adjusted until HydroCAD results within 5 to 10% of Rational Method, using C values calculated by Caltrans methodology.
    - Final C and CN values compared to industry standards for final verification.

Table 1. Runoff coefficients for 100% Impervious and 100% Pervious Surfaces

		Rational Method		Hydrograph Method		
	Time of Concentration (minutes)	C Value	Peak Flow (CFS)	CN Value	Peak Flow (CFS)	Percent Difference
Impervious Surfaces	10	0.85	31.07	98	28.17	-9.3%
	15	0.85	25.37	98	23.78	-6.3%
	20	0.85	21.97	98	20.33	-7.5%
Pervious Surfaces						
HSG A	10	0.22	8.04	68	7.13	-11.3%
	15	0.22	6.57	68	5.99	-8.8%
	20	0.22	5.69	68	5.17	-9.1%
HSG B	10	0.28	10.24	73	9.07	-11.4%
	15	0.28	8.95	73	8.38	-6.4%
	20	0.28	7.24	73	6.57	-9.2%
HSG C	10	0.3	10.97	76	9.97	-9.1%
	15	0.3	8.95	76	8.38	-6.4%
	20	0.3	7.75	76	7.21	-7.0%
HSG D	10	0.37	13.53	80	12.59	-6.9%
	15	0.37	11.04	80	10.58	-4.2%
	20	0.37	9.56	80	9.09	-5.0%

2. 3 subcatchments identified for InfoSWMM model test run
    - Single land use for each subcatchment: low density residential, general commercial, and industrial
    - Representative slope and gutter flow length for the City
    - HSG B and D (very little C and A in study area)
    - 10-year storm analyzed
    - City's time of concentration equation compared to TR-55 methodology with acceptable results.

Table 2. Summary of Subcatchments for Model Test Run

	Low Density Residential	Industrial	General Commercial
Area (acres)	44	27	40
HSG	B	D	B
CN	81	96	93
Rational C	0.45	0.78	0.74
Gutter flow length (ft)	326	506	525
Slope	0.52%	0.23%	0.38%
Tc by City Stds (min)	15.1	17.9	18.3
Tc by TR-55 (min)	13.7	18.7	17.0

3. Rational Method Results compared to InfoSWMM results with varying methodologies.
    - NRCS infiltration created non-realistic "spikes" in infiltration. Infiltration rate varied proportionally with rainfall intensity.
    - Horton's infiltration produced good results, with soil parameters set based on infiltration rate calculated using NRCS methodology.
    - EPA SWMM Methodology found to be most reasonable for all 3 subcatchments.
    - SBUH underestimated industrial and commercial, and overestimated residential.
    - NRCS matched industrial and commercial well, and overestimated residential.
4. EPA SWMM Methodology Notes
    - Method does not calculate Tc directly. Inputs are as follows:
        - % impervious
        - Subcatchment Width, defined as the width of the subcatchment perpendicular to the flow direction
        - Subcatchment Slope
        - Manning's n for pervious portion (set to 0.050)
        - Manning's n for impervious portion (set to 0.015)
        - Depression storage for pervious and impervious portion (set to 0.00)
5. Subcatchment Manager Extension in InfoSWMM evaluated for same 3 subcatchments using the EPA SWMM hydrology methodology.
    - 4 methods available to calculate subcatchment width
    - 2 method available to calculate slope
        - Average over entire subcatchment
        - Average over "flow line," where flow line is defined by analyzing the DEM based on "accumulation area"
        - Accumulation area is the minimum land area draining to a DEM pixel before a flow path is considered a "flow line"
    - The "Square Root" method for Subcatchment Width and "Flow Line" method with minimum accumulation of 1/2 acre most accurately emulated HydroCAD results.
    - See printout summary comparison of HydroCAD, Rational Method, and EPA SWMM results. Tc for HydroCAD and Rational Method based on City standard.
6. Next Steps
    - Calculate peak flows in InfoSWMM for additional subcatchments, using the Subcatchment Manager and EPA SWMM.
    - Compare results to known problem areas, and Rational Method for select subcatchments.

Table B-1. Summary of Peak Flow Based on EPA SWMM Methodology

LOW DENSITY RESIDENTIAL

HydroCAD Flow = 24.2 cfs
Rational Method Flow = 31.0 cfs

		Subcatchment Slope Methodology					
		Average of Subcatchment		Flow Line - Minimum Accumulation Area			
				1/2 acre		1 acre	
Subcatchment Width Methodology	Flow Line	24.5 cfs	2%	16.9 cfs	-30%	17.5 cfs	-28%
	1.7 x Max of Height or Width	43.5 cfs	80%	33.4 cfs	38%	34.2 cfs	41%
	1/2 Perimiter	43.1 cfs	78%	33.1 cfs	37%	33.9 cfs	40%
	Square Root	32.8 cfs	36%	23.6 cfs	-3%	24.3 cfs	1%

INDUSTRIAL

HydroCAD Flow = 25.3 cfs
Rational Method Flow = 28.1 cfs

		Subcatchment Slope Methodology					
		Average of Subcatchment		Flow Line - Minimum Accumulation Area			
				1/2 acre		1 acre	
Subcatchment Width Methodology	Flow Line	18.3 cfs	-28%	17.5 cfs	-31%	17.1 cfs	-32%
	1.7 x Max of Height or Width	35.6 cfs	40%	34.4 cfs	36%	33.9 cfs	34%
	1/2 Perimiter	35.3 cfs	39%	34.0 cfs	34%	33.6 cfs	33%
	Square Root	26.6 cfs	5%	25.4 cfs	0%	25.0 cfs	-2%

COMMERCIAL

HydroCAD Flow = 36.4 cfs
Rational Method Flow = 40.2 cfs

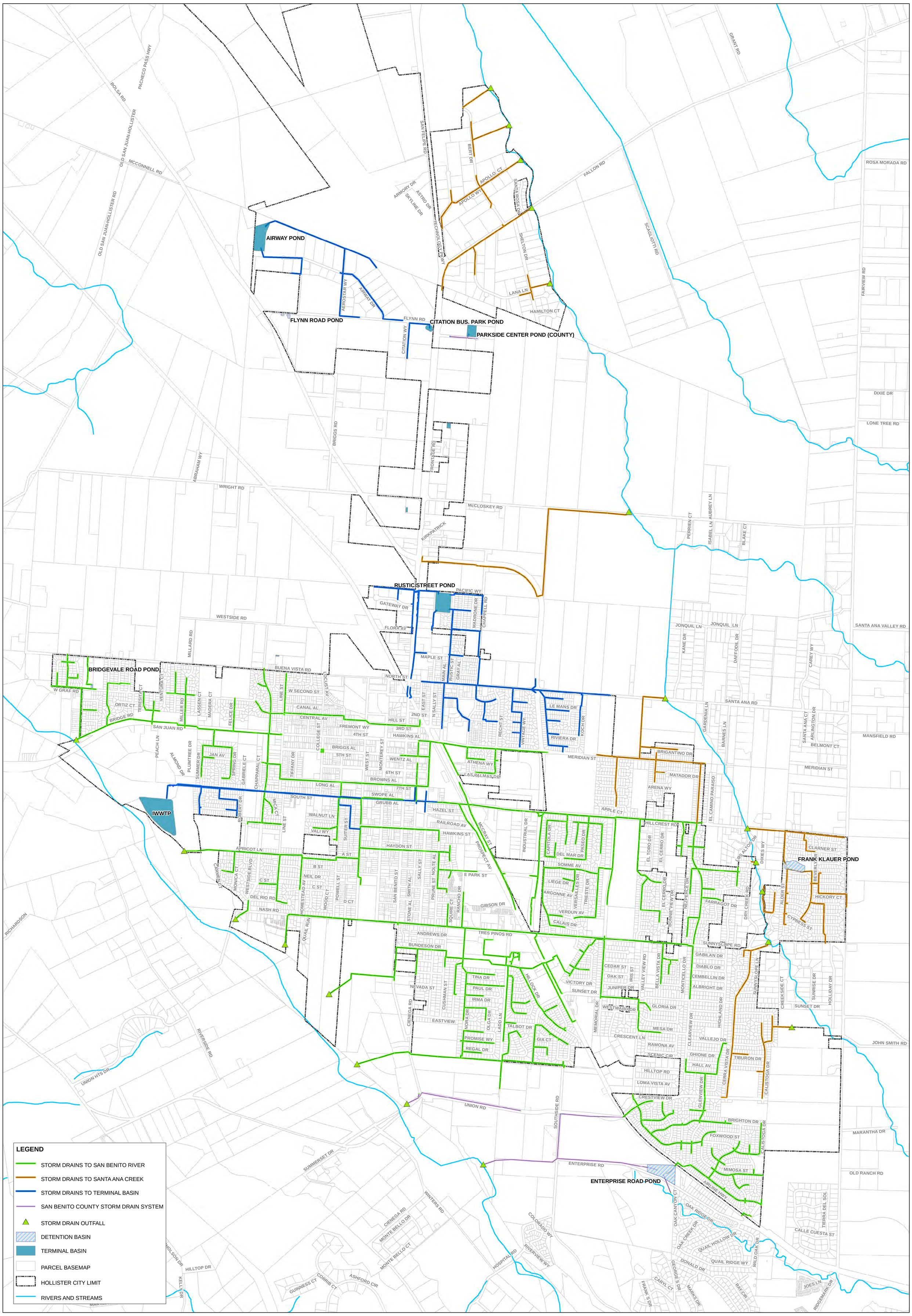
		Subcatchment Slope Methodology					
		Average of Subcatchment		Flow Line - Minimum Accumulation Area			
				1/2 acre		1 acre	
Subcatchment Width Methodology	Flow Line	39.2 cfs	8%	28.0 cfs	-23%	27.1 cfs	-26%
	1.7 x Max of Height or Width	63.1 cfs	73%	53.1 cfs	46%	52.0 cfs	43%
	1/2 Perimiter	60.6 cfs	66%	49.2 cfs	35%	48.1 cfs	32%
	Square Root	47.6 cfs	31%	34.7 cfs	-5%	33.9 cfs	-7%

Notes:

1. Percent difference based on HydroCAD peak flow.
2. Highlighted cells reprsent values within +/- 10% of HydroCAD calculation.
3. HydroCAD peak flow calculated using the NRCS infiltration methodology with Ia = 0.05*S, and proposed rainfall pattern and CN values per the SDMP.

APPENDIX C

EXHIBITS



CIVIL ENGINEERING
CONSTRUCTION MANAGEMENT
LANDSCAPE ARCHITECTURE
MECHANICAL ENGINEERING
PLANNING
PUBLIC WORKS ADMINISTRATION
SURVEYING/GIS SOLUTIONS
WATER RESOURCES
WALLACE SWANSON INTERNATIONAL
612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011 F 805 544-4294
www.wallacegroup.us
WALLACE GROUP

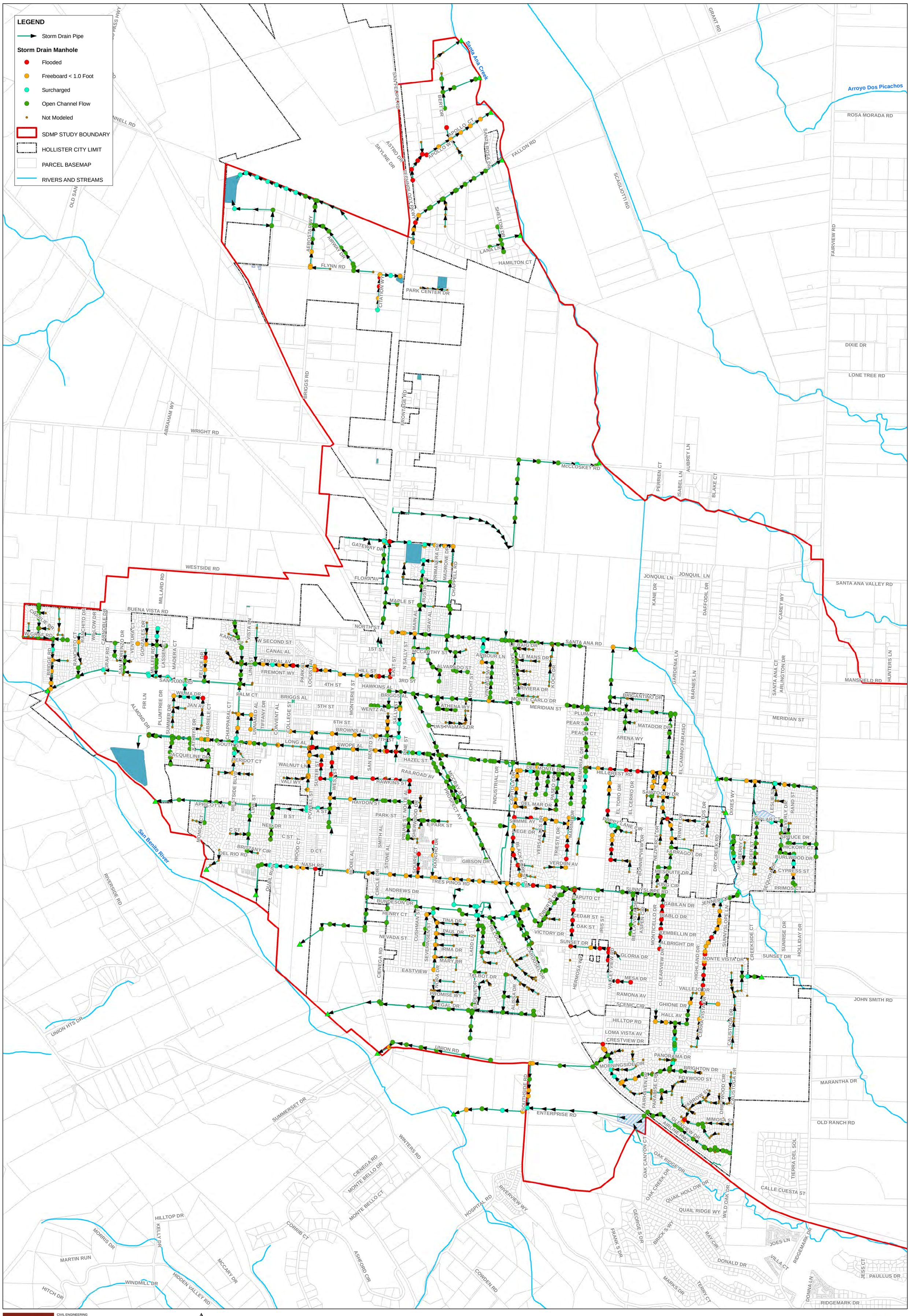
1 inch = 1,000 Feet

0 500 1,000

CITY OF HOLLISTER
2011 SDMP

EXHIBIT 1:
STORM DRAIN MS4 MAP

NOTES:
WALLACE GROUP DID NOT PERFORM BOUNDARY SURVEY SERVICES FOR THIS MAP. NOT A LEGAL DOCUMENT.



WALLACE GROUP
CIVIL ENGINEERING
CONSTRUCTION MANAGEMENT
LANDSCAPE ARCHITECTURE
MECHANICAL ENGINEERING
PLANNING
PUBLIC WORKS ADMINISTRATION
SURVEYING/GIS SOLUTIONS
WATER RESOURCES
WALLACE SWANSON INTERNATIONAL
612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011 F 805 544-4294
www.wallacegroup.us

N

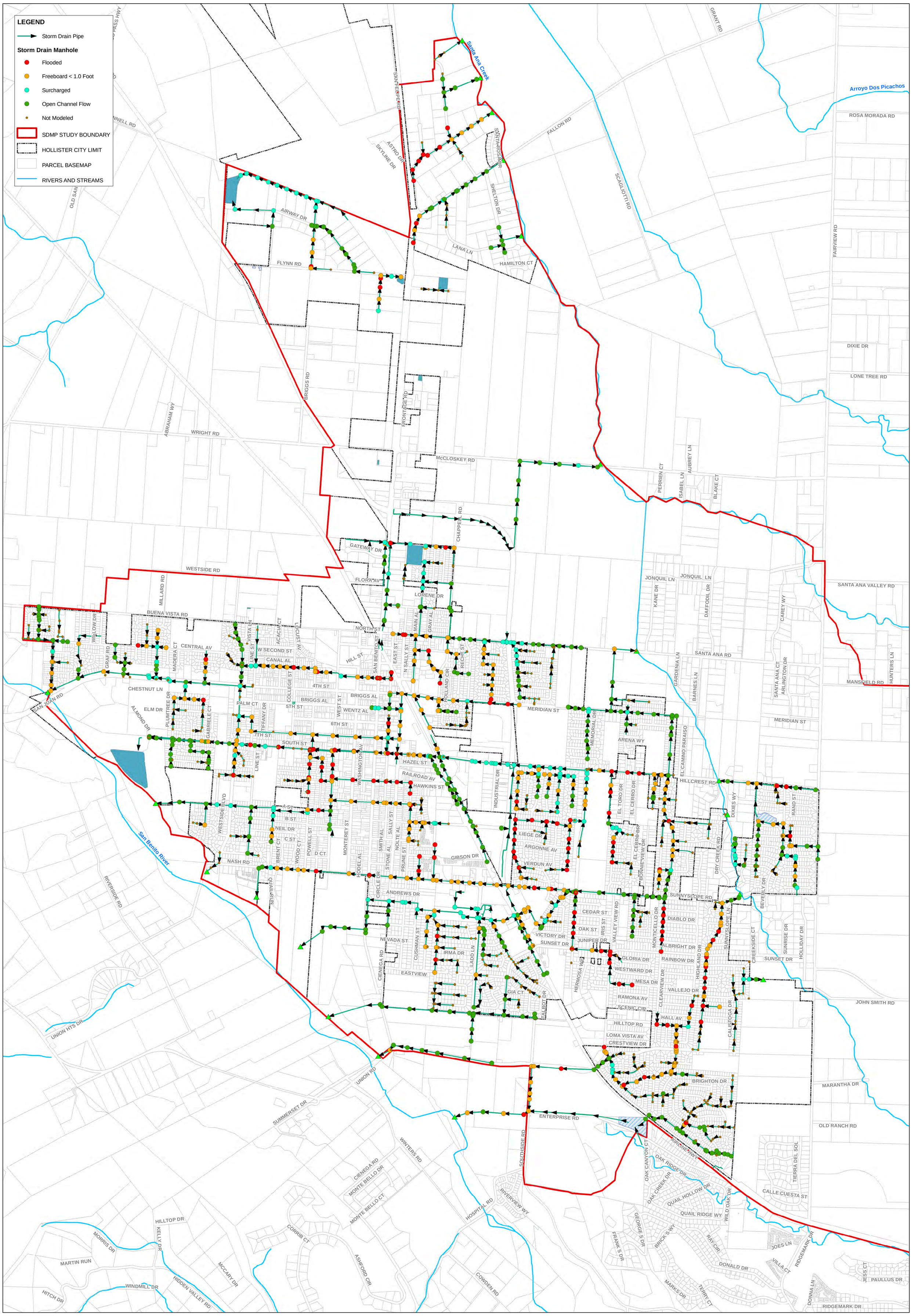
1 inch = 1,000 Feet

0 250 500 1,000

CITY OF HOLLISTER
2011 SDMP

EXHIBIT 2: MODEL RESULTS
10-YR STORM, EXISTING CONDITIONS

NOTES:
WALLACE GROUP DID NOT PERFORM BOUNDARY SURVEY SERVICES FOR THIS MAP. NOT A LEGAL DOCUMENT.



WALLACE GROUP
CIVIL ENGINEERING
CONSTRUCTION MANAGEMENT
LANDSCAPE ARCHITECTURE
MECHANICAL ENGINEERING
PLANNING
PUBLIC WORKS ADMINISTRATION
SURVEYING/GIS SOLUTIONS
WATER RESOURCES
WALLACE SWANSON INTERNATIONAL
612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011 F 805 544-4294
www.wallacegroup.us

N

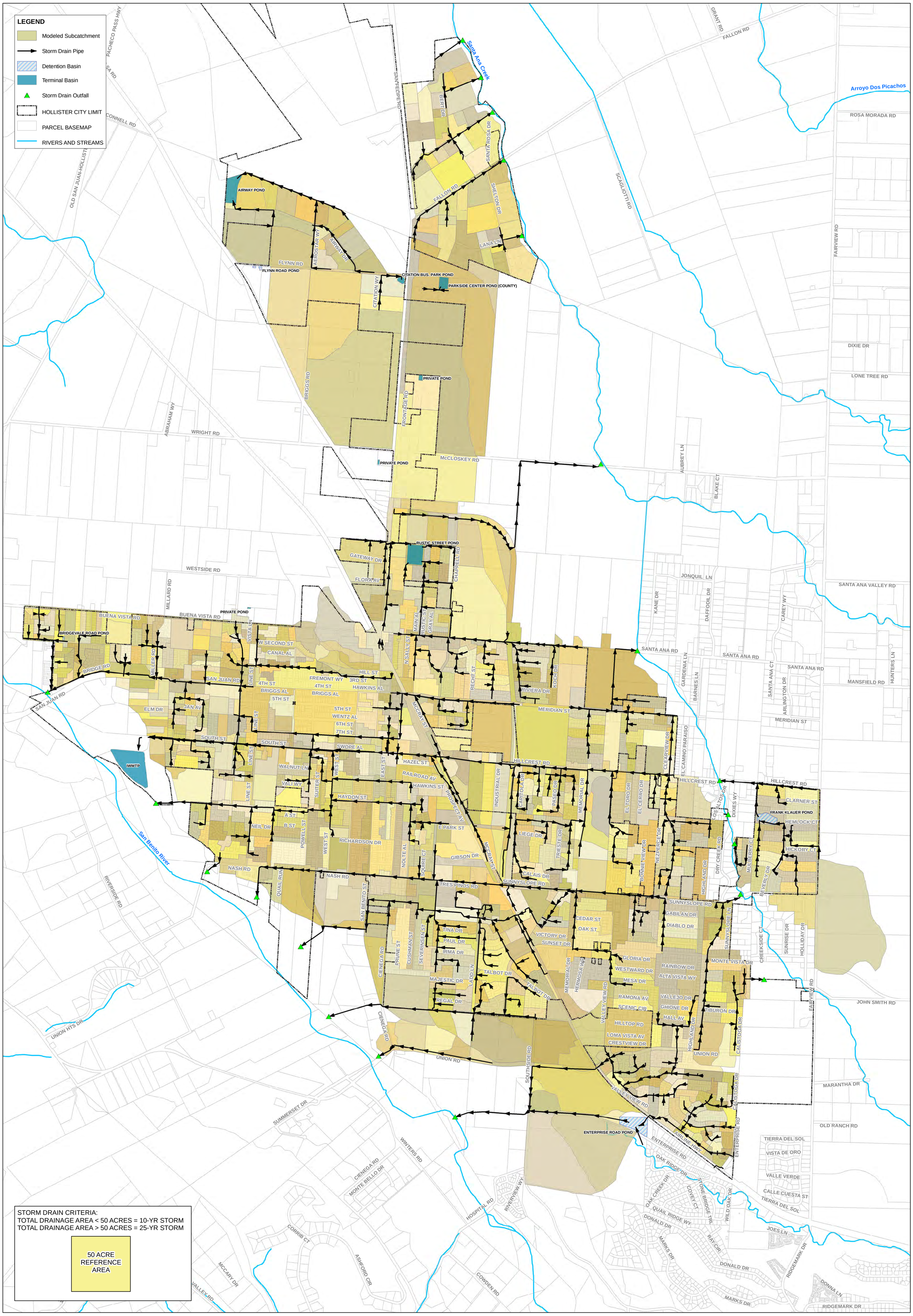
1 inch = 1,000 Feet

0 250 500 1,000

CITY OF HOLLISTER
2011 SDMP

EXHIBIT 3: MODEL RESULTS
25-YR STORM, EXISTING CONDITIONS

NOTES:
WALLACE GROUP DID NOT PERFORM BOUNDARY SURVEY SERVICES FOR THIS MAP. NOT A LEGAL DOCUMENT.



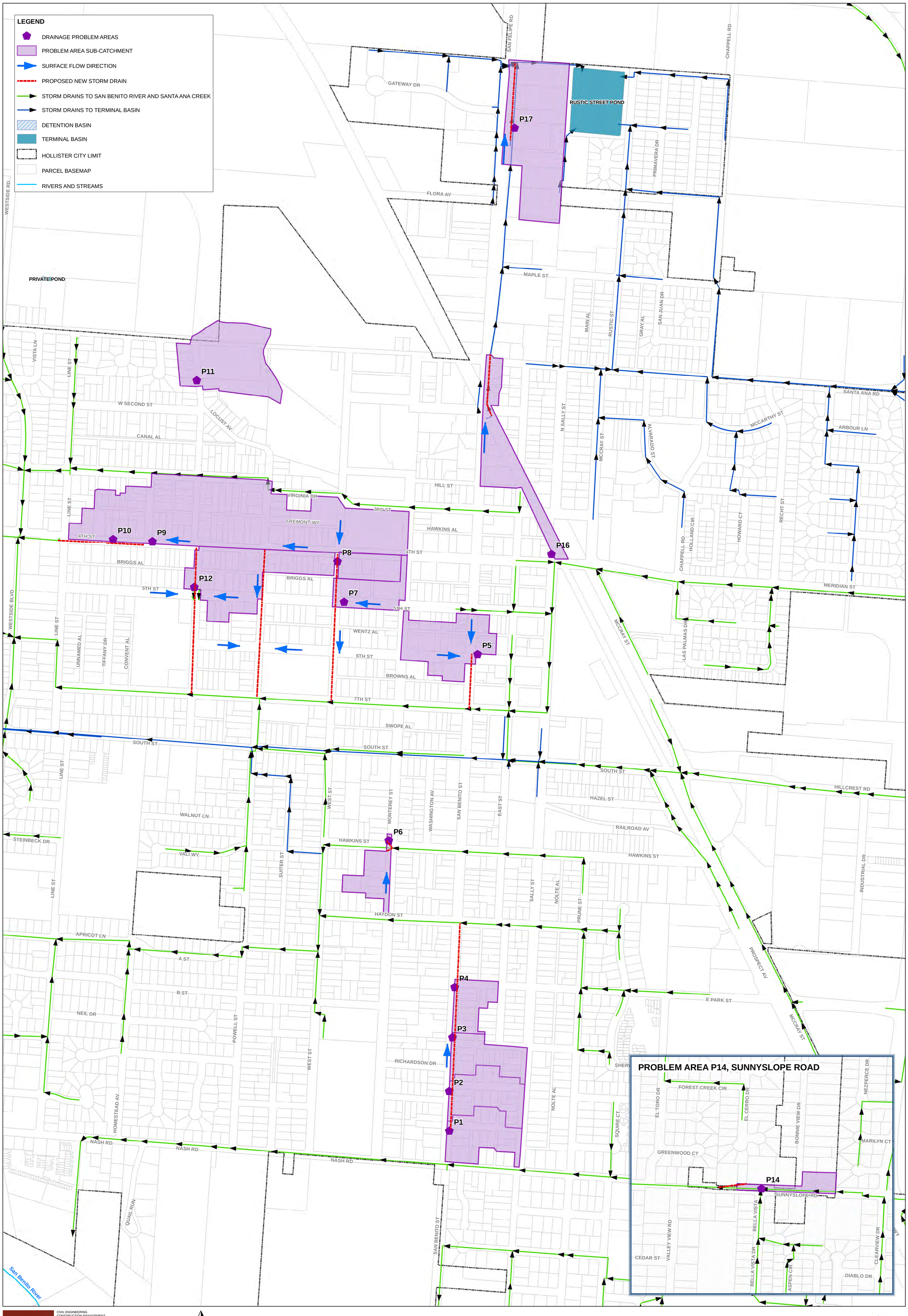
WALLACE GROUP
CIVIL ENGINEERING
CONSTRUCTION MANAGEMENT
LANDSCAPE ARCHITECTURE
MECHANICAL ENGINEERING
PLANNING
PUBLIC WORKS ADMINISTRATION
SURVEYING/GIS SOLUTIONS
WATER RESOURCES
WALLACE SWANSON INTERNATIONAL
612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011 F 805 544-4294
www.wallacegroup.us

1 inch = 1,000 Feet
0 250 500 1,000

CITY OF HOLLISTER
2011 SDMP

EXHIBIT 4: STORM DRAIN MODEL CATCHMENT AREAS

NOTES:
PARCEL BASEMAP PROVIDED BY SAN BENITO COUNTY. WALLACE GROUP DID NOT PERFORM BOUNDARY SURVEY SERVICES FOR THIS MAP. NOT A LEGAL DOCUMENT. MAP PRODUCED APRIL 2011.



CIVIL ENGINEERING
CONSTRUCTION MANAGEMENT
LANDSCAPE ARCHITECTURE
MECHANICAL ENGINEERING
PLANNING
PUBLIC WORKS ADMINISTRATION
SURVEYING/GIS SOLUTIONS
WATER RESOURCES
WALLACE SWANSON INTERNATIONAL
612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011 F 805 544-4294
www.wallacegroup.us
WALLACE GROUP

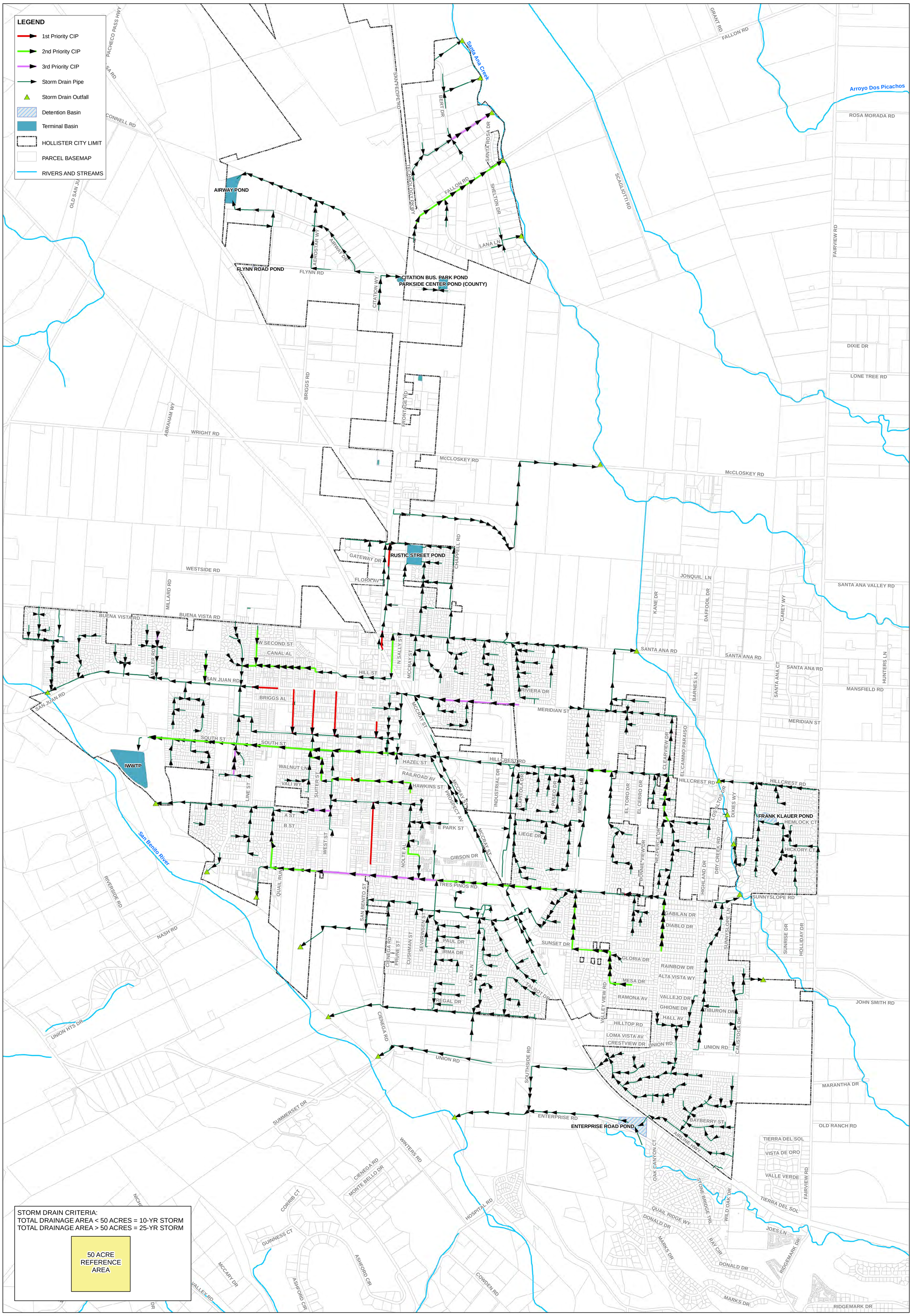
1 inch = 300 Feet

0 75 150 300

CITY OF HOLLISTER
2011 SDMP

EXHIBIT 5: DRAINAGE PROBLEM AREAS

NOTES:
PARCEL BASEMAP PROVIDED BY SAN BENITO COUNTY. WALLACE GROUP DID NOT PERFORM BOUNDARY SURVEY SERVICES FOR THIS MAP. NOT A LEGAL DOCUMENT. MAP PRODUCED APRIL 2011.



WALLACE GROUP
CIVIL ENGINEERING
CONSTRUCTION MANAGEMENT
LANDSCAPE ARCHITECTURE
MECHANICAL ENGINEERING
PLANNING
PUBLIC WORKS ADMINISTRATION
SURVEYING/GIS SOLUTIONS
WATER RESOURCES
WALLACE SWANSON INTERNATIONAL
612 CLARION COURT
SAN LUIS OBISPO, CA 93401
T 805 544-4011 F 805 544-4294
www.wallacegroup.us

1 inch = 1,000 Feet
0 250 500 1,000

CITY OF HOLLISTER
2011 SDMP

EXHIBIT 6: CAPITAL IMPROVEMENT PROGRAM OVERVIEW

NOTES:
PARCEL BASEMAP PROVIDED BY SAN BENITO COUNTY. WALLACE GROUP DID NOT PERFORM BOUNDARY SURVEY SERVICES FOR THIS MAP. NOT A LEGAL DOCUMENT. MAP PRODUCED APRIL 2011.