Groundwater Sustainability Commission
for the San Luis Obispo Valley Groundwater Basin

Agenda
<u>December 11, 2019</u>

NOTICE IS HEREBY GIVEN that the Groundwater Sustainability Commission for the San Luis Obispo Valley Groundwater Basin will hold a meeting at **3:30 P.M. on Wednesday, December 11, 2019** at the **Ludwick Community Center**, 864 Santa Rosa St, San Luis Obispo, CA 93401.

NOTE: If you need disability-related modifications or accommodations, including translation services, to participate in this meeting, please contact Joey Steil at (805) 781-4076. The Groundwater Sustainability Commission reserves the right to limit each speaker to three (3) minutes per subject or topic.

Adam Hill, Member, County of San Luis Obispo
Bob Schiebelhut, Chair, EVGMWC
Dennis Fernandez, Member, ERMWC/VRMWC
Mark Zimmer, Vice Chair, GSWC
Andy Pease, Member, City of San Luis Obispo

Bruce Gibson, Alternate, County of San Luis Obispo
George Donati, Alternate, EVGMWC
James Lokey, Alternate, ERMWC/VRMWC
Toby Moore, Alternate, GSWC
Aaron Floyd, Alternate, City of San Luis Obispo

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1. **Call to Order** (Chair)
2. **Roll Call** (County Staff: Mychal Boerman)
3. **Pledge of Allegiance** (Chair)
4. **Public Comment – Items not on Agenda** (Chair)
5. **Approval of Meeting Minutes** (Chair)
   a) September 11, 2019
6. **Project Status Updates** (City and County Staff: Mychal Boerman and Dick Tzou)
   a) Overview of Governance
   b) Project Activity Updates
      i. Stakeholder Groups Outreach Efforts
      ii. Comments on Draft Chapters 1 and 2
      iii. Additional Data Collection
7. **Draft GSP Chapters 3 and 4 for Review and Comment** (WSC Consultant Team: Michael Cruikshank and David O'Rourke)

   <u>Recommendation</u>

   a) Consider recommending that each GSA receives and files Draft GSP Chapters 3 and 4 and provide direction as necessary.
      - Chapter 3 – Description of Plan Area
      - Chapter 4 – Basin Setting

8. **An Overview on Groundwater Conditions** (WSC Consultant Team: Dave O'Rourke)

   Recommendation

   a) Receive a general overview on the basin groundwater conditions.

9. **Geophysical Survey Results** (WSC Consultant Team: Spencer Harris)

   Recommendation

   a) Receive a presentation on the results of the geophysical survey in the vicinity of the bedrock divide identified in the 2018 SLO Basin Characterization Report.

10. **An Overview on Water Budget** (WSC Consultant Team: Spencer Harris)

    Recommendation

    a) Receive a presentation on the basin water budget framework.

11. **Integrated Groundwater/Surface Water (GW/SW) Modeling Update** (WSC Consultant Team: Dave O'Rourke)

    Recommendation

    a) Receive an update on the integrated GS/SW modeling efforts.

12. **A Preview of What's Next?** (WSC Consultant Team: Michael Cruikshank)

    Recommendation

    a) Receive a preview of upcoming SGMA activities and provide direction as necessary.
       i. Timeline of Events
       ii. Newsletter #3
       iii. Upcoming Chapters to review
       iv. Workshop #2

13. **Future Items** (Chair)

    a) Review of Draft Chapters 5 and 6
    b) Data Management System
    c) Sustainable Management Criteria

14. **Next Regular Meeting: March 11, 2020**

15. **Adjourn** (Chair)

Groundwater Sustainability Commission
Regular Meeting Minutes (DRAFT)
September 11, 2019

The following members or alternates were present:

Bob Schiebelhut, Chair, EVGMWC
Mark Zimmer, Vice Chair, GSWC
Dennis Fernandez, Member, ERMWC/VRMWC
Andy Pease, Member, City of San Luis Obispo
Adam Hill, Member, County of San Luis Obispo (joined meeting at 4:35 pm)

1. Call to Order

Chair Schiebelhut: calls the meeting to order at 3:30 PM.

2. Roll Call

County Staff, Dick Tzou: calls roll.

3. Pledge of Allegiance

Chair Schiebelhut: leads the Pledge of Allegiance.

4. Public Comment – Items not on Agenda

Chair Schiebelhut: opens the floor for public comment.

Jean-Pierre Wolff: comments on the recent County Board of Supervisors decision regarding cloudseeding in the Lopez Lake watershed area; would like to see GSAs included in future EIR report review, annual monitoring of precipitation levels in the SLO Basin watershed, and to include cloudseeding as a potential aquifer resource in the GSP.

5. Approval of Meeting Minutes

a) June 12, 2019

Chair Schiebelhut: opens discussion for Agenda Item 5 – Approval of Meeting Minutes for the June 12, 2019 Groundwater Sustainability Commission Meeting and asks for comments from the Commission; there are none.

Motion By: Chair Schiebelhut
Second By: Member Pease
Motion: The Commission moves to approve the June 12, 2019 Meeting Minutes.

Members	Ayes	Noes	Abstain	Recuse
Bob Schiebelhut (Chair)	x			
Mark Zimmer (Vice Chair)	x			
Andy Pease (Member)	x			
Dennis Fernandez (Member)	x			

6. Project Status Updates

County Staff, Dick Tzou: presents a project status update covering SGMA and GSP governance timelines, the development of the Communication and Engagement Plan, an overview of SLO Basin stakeholders and how the they can participate in the GSP development process.

This presentation can be accessed by visiting: https://www.slowaterbasin.com/resources.

	Member Pease: asks for an update on outreach efforts from Commission Members; would like to ensure that stakeholders are aware of the GSP development process as early as possible. Member Fernandez: comments that notifications have been sent to Edna Valley area stakeholders with information on how they can participate in the GSP development process. Vice Chair Zimmer: comments that Golden State Water plans to post GSP development information online and attached to billing statements; can also be discussed at future public meetings. Chair Schiebelhut: asks meeting attendees if they are aware of anybody residing within the basin that has not received a mailed notice (no response); asks to be notified if anybody needs additional information on the GSP development process who has not yet been engaged; asks for additional comments from the public; there are none.
7. Draft GSP Chapters 1 & 2 for Review and Comment	WSC Consultant, Michael Cruikshank: presents an overview of GSP Draft Chapters 1 & 2, including an overview of the GSP development timeline, DWR's prioritization timeline for the SLO Basin, SGMA and GSP governance timelines and how the public can submit comments on Draft GSP Chapters 1 & 2 by visiting the SLOWaterBasin.com portal during the public comment period. This presentation can be accessed by visiting: https://www.slowaterbasin.com/resources. The below Draft Chapters can be accessed by visiting: https://www.slowaterbasin.com/review-documents. • GSP Draft Chapter 1- Introduction to the SLO Basin GSP • GSP Draft Chapter 2 - Agency Information Member Pease: comments on the process of releasing Draft Chapters; suggests further clarifying which Draft Chapters are being released for review and to continue messaging the timeline and status of each Draft Chapter as they are released, i.e. stating the Draft Chapters are "pending", "draft", etc. Chair Schiebelhut: opens the floor for comments from the public; there are none. **Motion By:** Vice Chair Zimmer **Second By:** Member Pease **Motion:** The Commission moves to recommend that each GSA receives and files Draft GSP Chapters 1 & 2 and provide direction as necessary.

Members	Ayes	Noes	Abstain	Recuse
Bob Schiebelhut (Chair)	x			
Mark Zimmer (Vice Chair)	x			
Andy Pease (Member)	x			
Dennis Fernandez (Member)	x			

8. A Presentation on Basin Setting	GSI Water Solutions, Dave O'Rourke: provided a presentation on the Basin Setting for the SLO Basin. This presentation can be accessed by visiting https://www.slowaterbasin.com/resources.
9. Integrated Groundwater/Surface Water (GW/SW) Modeling Update	GSI Water Solutions, Dave O'Rourke: provides a presentation on the The Integrated Groundwater/Surface Water model. This presentation can be accessed by visiting https://www.slowaterbasin.com/resources.
10. A Preview of What's Next?	WSC Consultant, Michael Cruikshank: presents an overview of upcoming events related to GSP development, including a timeline of upcoming events and Draft Chapters that will be released for review and public comment, an upcoming quarterly newsletter on GSP development and an overview of the next public workshop that will be focused on sustainability indicators for the SLO Basin. This presentation can be accessed by visiting https://www.slowaterbasin.com/resources.
11. An Update on the GSP Review Process	County Staff, Dick Tzou: presents an overview of the GSP Draft Chapter review process, the roles of the consultant team and GSAs in the internal review protocols, how the public can provide comments and input on Draft Chapters, and what the GSP approval process will entail. This presentation can be accessed by visiting https://www.slowaterbasin.com/resources.
12. Future Items	(None)
13. Next Regular Meeting	Wednesday, December 11, 2019 at 3:30 Ludwick Community Center 864 Santa Rosa St, San Luis Obispo, CA 93401
14. Adjourn	**Motion By:** Chair Schiebelhut **Second By:** Vice Chair Zimmer **Motion:** The Commission moves to adjourn the meeting at 5:15 PM

Members	Ayes	Noes	Abstain	Recuse
Bob Schieblhut (Chair)	x			
Mark Zimmer (Vice Chair)	x			
Andy Pease (Member)	x			
Dennis Fernandez (Member)	x			
Adam Hill (Member)	x			

DRAFTED BY: City Staff, Hayley Sabatini
County Staff, Joey Steil

GROUNDWATER SUSTAINABILITY COMMISSION
for the San Luis Obispo Valley Groundwater Basin
September 11, 2019

Agenda Item 6 – Project Status Update
(Presentation Item)

Prepared By
Mychal Boerman and Dick Tzou, County and City of San Luis Obispo

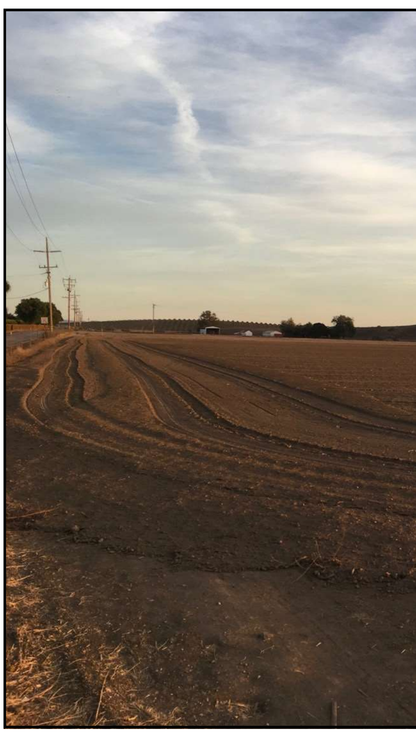
Discussion
The purpose of this item is to provide a status update on the GSP project. A brief overview on the GSA governance structure will be presented. The GSP development process is well underway and we are on track both in tasks and budget. We had made minor adjustment to the GSP chapter completion schedule so that we can complete them a month earlier than originally planned. The current GSP efforts have been focused on the technical such as defining the hydrogeologic conceptual model and groundwater conditions, developing a water budget, and constructing a numerical integrated surface water and groundwater model. Updates on the technical efforts will be presented in separate agenda items by the consultant team.

We are closing in on the outreach efforts and have updated contact information for some of the target categories in the environmental and conservation organizations and economic development. The contact information for the following groups have been updated: Save Our Water, SLO County Land Conservancy, State Division of Drinking Water, SLO Economic Vitality Corporation, and SLO Coast Wine. To notify the customers of Golden State Water Company (GSWC) about SLO Basin GSP development who have opted out of email billing, GSWC is attaching a note on the hard bills to inform them as they are mailed out. To reach out to the business community, Council Member Andy Pease and Supervisor Hill and City and County staff, Mychal Boerman and Dick Tzou spoke at the SLO Chamber of Commerce's Economic Development and Legislative Action Committees meeting on November 7, 2019 regarding SGMA and GSP development efforts in the SLO Basin.

The County Board of Supervisors have received and filed the draft GSP Chapters 1 and 2 on October 22, 2019. The comment period for draft GSP Chapters 1 and 2 is now closed (October 31, 2019), and all comments received are now published online and may be viewed at: *https://www.slowaterbasin.com/review-documents*
Public or GSA comments received during each draft GSP chapter/section's comment period will be considered when sections are compiled into a complete public draft GSP document, slated for further public review in summer of 2021. However, if there are critical comments by the public or GSC members that needed immediate attention so that the project can continue to progress in the right direction, staff may bring forward these issues to the GSC for resolution and further direction on a case by case basis during the following GSC meeting.

Consultant team is continuing in collecting additional well data to fill temporal and spatial data gaps from individual private agriculture and domestic pumpers, mutual water and water companies, City, and other studies for water budget and modeling development.

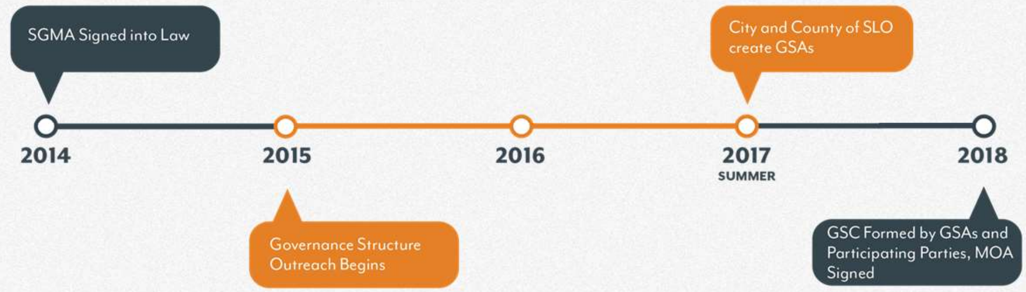
Attachment:
1. Presentation



PROJECT STATUS UPDATE

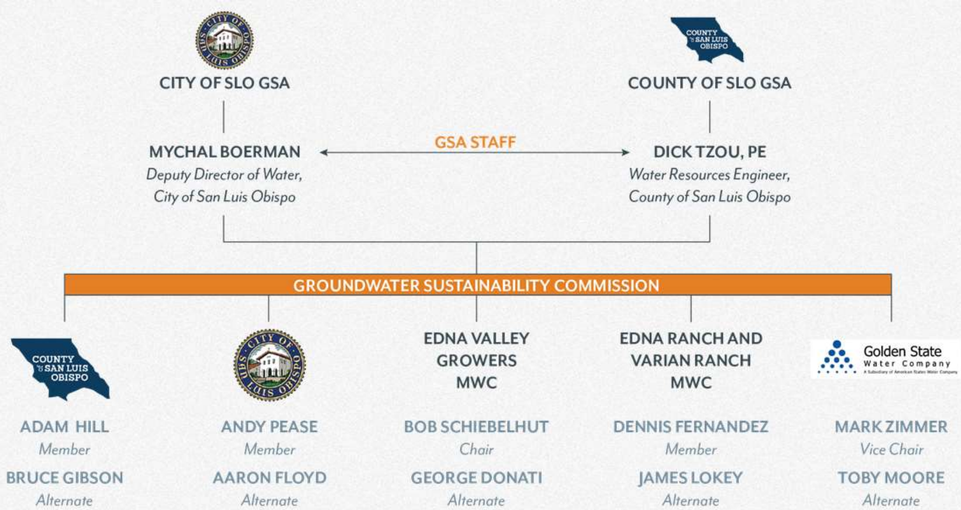
Mychal Boerman and Dick Tzou, City and County of San Luis Obispo

GOVERNANCE TIMELINE

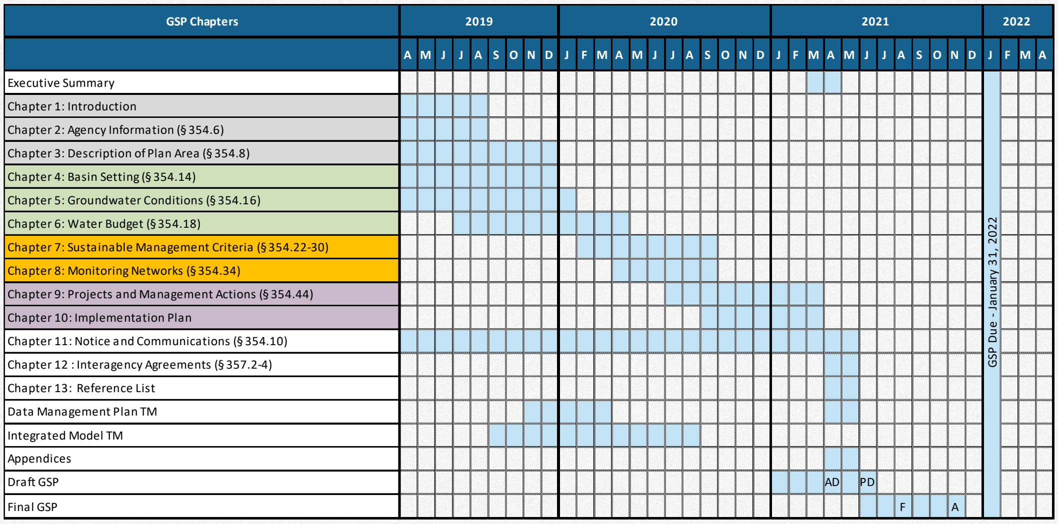


GSP GOVERNANCE

Groundwater Sustainability Agencies (GSA) | Groundwater Sustainability Commission



SLO BASIN GSP CHAPTER SCHEDULE

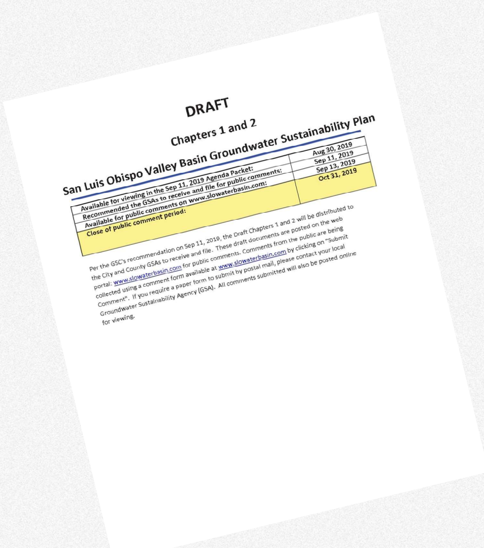


PROJECT ACTIVITY UPDATES

- Stakeholder Outreach
- Comments for Draft Chapters 1 & 2
- Additional Data Collection

SLO BASIN STAKEHOLDERS

COMMENTS ON CHAPTERS 1 & 2



DRAFT

Chapters 1 and 2

San Luis Obispo Valley Basin Groundwater Sustainability Plan

Available for viewing in the Sep 11, 2019 Agenda Packet:	Aug 30, 2019
Recommended the GSAs to receive and file for public comments:	Sep 11, 2019
Available for public comments on www.slowaterbasin.com:	Sep 13, 2019
Close of public comment period:	Oct 31, 2019

Per the GSC's recommendation on Sep 11, 2019, the Draft Chapters 1 and 2 will be distributed to the City and County GSAs to receive and file. These draft documents are posted on the web portal: www.slowaterbasin.com for public comments. Comments from the public are being collected using a comment form available at www.slowaterbasin.com by clicking on "Submit Comment". If you require a paper form to submit by postal mail, please contact your local Groundwater Sustainability Agency (GSA). All comments submitted will also be posted online for viewing.

SLO Groundwater Sustainability Plan Public Comments
Updated: 11/22/19

Name	Document	Comment	Date/Time	Attachment(s)
James Waldsmith	GSP Chapters 1 & 2 - DRAFT	Could you send me a copy of the presentations presented on 9-11-19 in PDF format? In reviewing the available download of chapters 1 and 2 I do not find any of the Hydrology data presented. Please confirm receipt of this communication.	9/14/19 13:24	None
Toby Moore	GSP Chapters 1 & 2 - DRAFT - Agency Information	Golden State Water Company is of the opinion that an advisory body, similar or with the same structure of the current Groundwater Sustainability Commission (GSC), may be beneficial and perhaps necessary for GSP implementation.¬† The MOU establishing the GSC contemplates this and does have language stating the following, "Depending on the content of the GSP the Parties may decide to enter into a new agreement to coordinate implementation."¬† Inclusion of this language in Section 2.3.2 is recommended. Please consider the addition of the following text before the last sentence in Section 2.3.2. "The Parties may decide to enter into a new agreement to coordinate GSP implementation."	10/31/19 9:17	None
Toby Moore	Communication and Engagement Plan	Appendix B of the plan describes the Groundwater Communication Portal's functionality which includes a repository of comments provided by stakeholders. However, it does not indicate whether the comments submitted will be visible or available via other means for stakeholders to review. Currently there appears to not be such functionality. As a member of the Groundwater Sustainability Commission, I feel this functionality is helpful and would encourage its implementation.	8/29/19 9:20	None

ADDITIONAL DATA COLLECTION

- **Well Data for Water Budget, Modeling, and Data Gap Filling**
  - Ag. and Domestic Pumpers
  - Mutual Water and Water Companies
  - City and Other Studies

GROUNDWATER SUSTAINABILITY COMMISSION

for the San Luis Obispo Valley Groundwater Basin

December 11, 2019

Agenda Item 7 – Draft GSP Chapters 3 & 4 for Review and Comment (Action Item)

Recommendation

a) Consider recommending that each GSA receives and files Draft GSP Chapters 3 & 4 and provide direction as necessary.

Prepared by

Michael Cruikshank, WSC and Dave O'Rourke, GSI

Discussion

The WSC Team, has been tasked with the preparation of the Groundwater Sustainability Plan (GSP) for the SLO Basin to meet the requirements of SGMA. Chapter 3: Description of Plan Area and Chapter 4: Basin Setting have been released as part of this Agenda packet. Chapter 3 provides an introduction to the SLO Basin with a description of existing and future land use plans, density of wells, and existing monitoring and management programs. Chapter 4 describes the regional and local basin geology, principal aquifers, and surface water bodies. An interactive presentation of the SLO Basin aquifers will be shown using 3D visualization software.

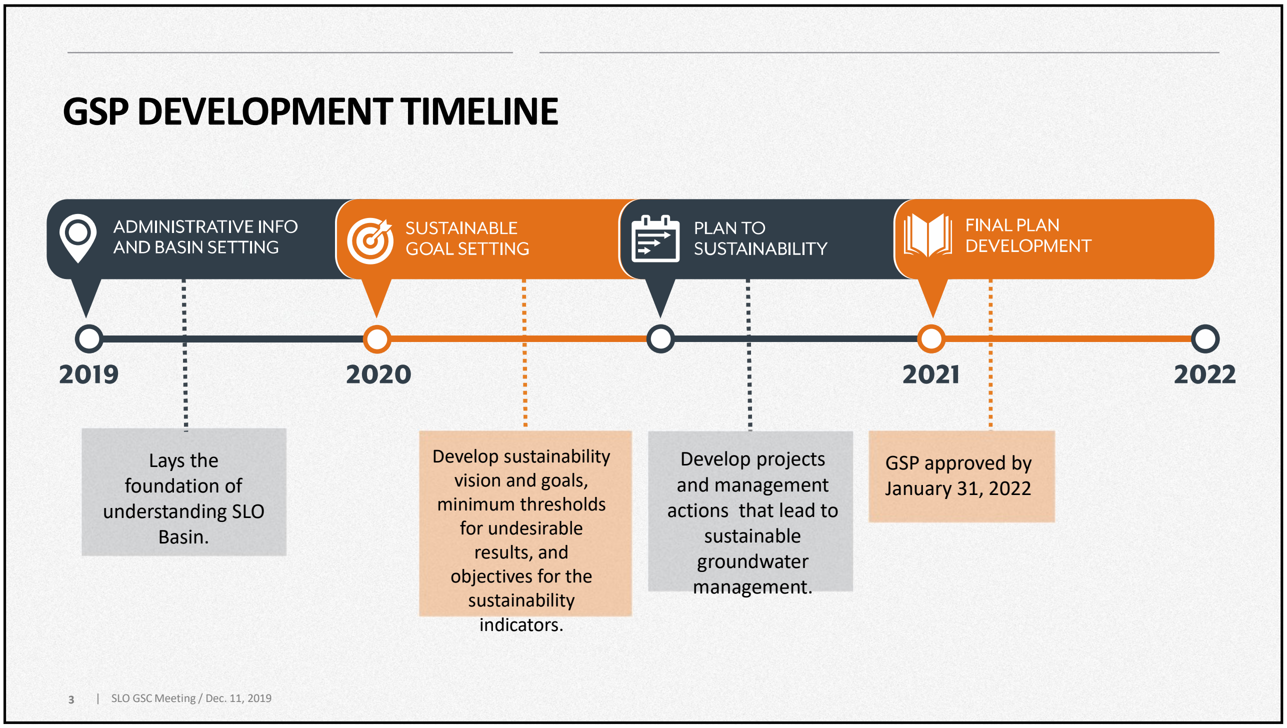
Chapters 3 & 4 will be uploaded to SLOWaterBasin.com for review during public comment period after the GSC has recommended that each GSA receives and files the draft chapters. The WSC Team will present an overview of Chapters 3 and 4 and show the attendees how to use SLOWaterBasin.com to download and provide comments.

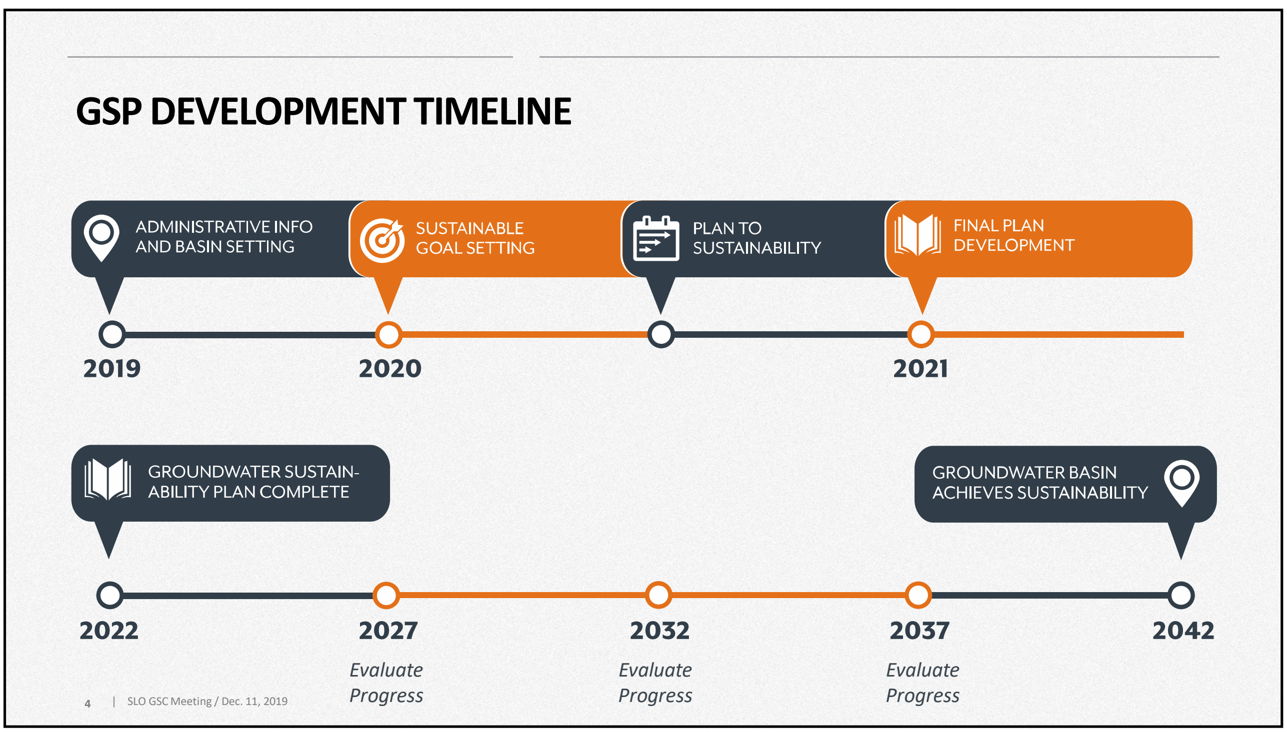
Attachments:

1. Presentation
2. Draft Chapters 3 and 4

SLO GSP: DRAFT CHAPTERS 3 & 4

Michael Cruikshank, WSC
Dave O'Rourke, GSI

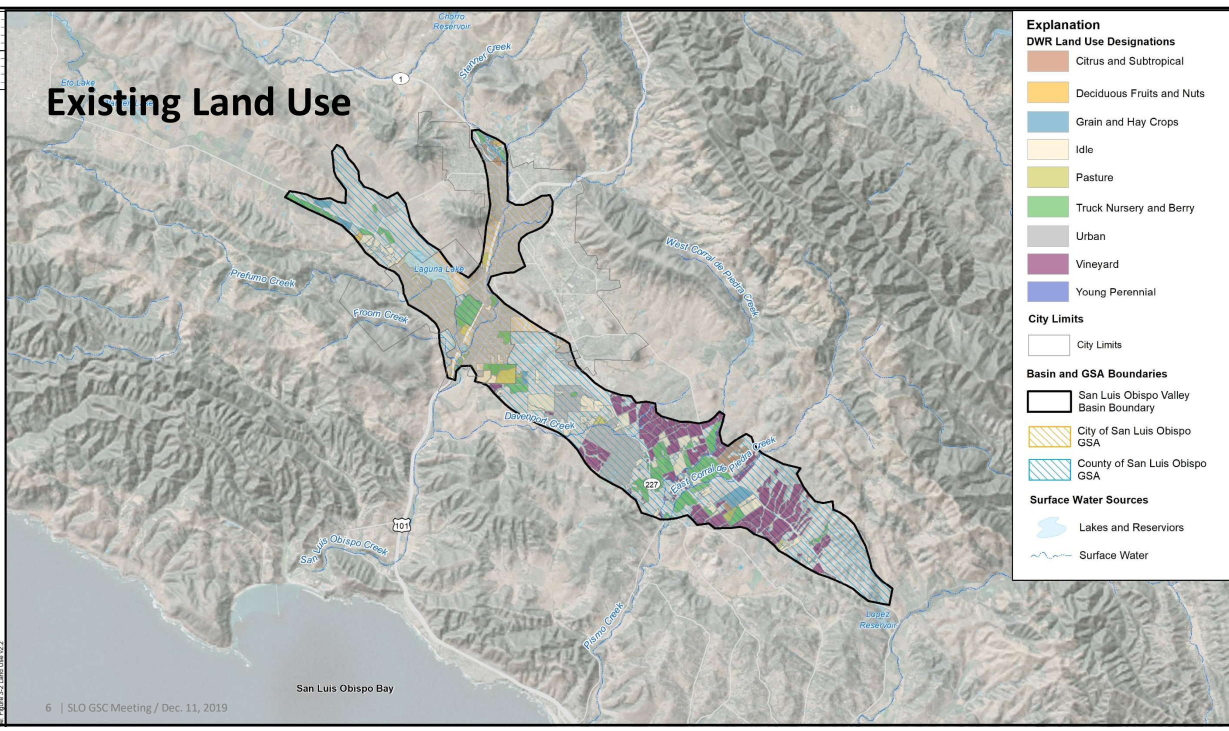

GSP DEVELOPMENT TIMELINE
ADMINISTRATIVE INFO AND BASIN SETTING
SUSTAINABLE GOAL SETTING
PLAN TO SUSTAINABILITY
FINAL PLAN DEVELOPMENT
2019
2020
2021
2022
Lays the foundation of understanding SLO Basin.
Develop sustainability vision and goals, minimum thresholds for undesirable results, and objectives for the sustainability indicators.
Develop projects and management actions that lead to sustainable groundwater management.
GSP approved by January 31, 2022
3 | SLO GSC Meeting / Dec. 11, 2019

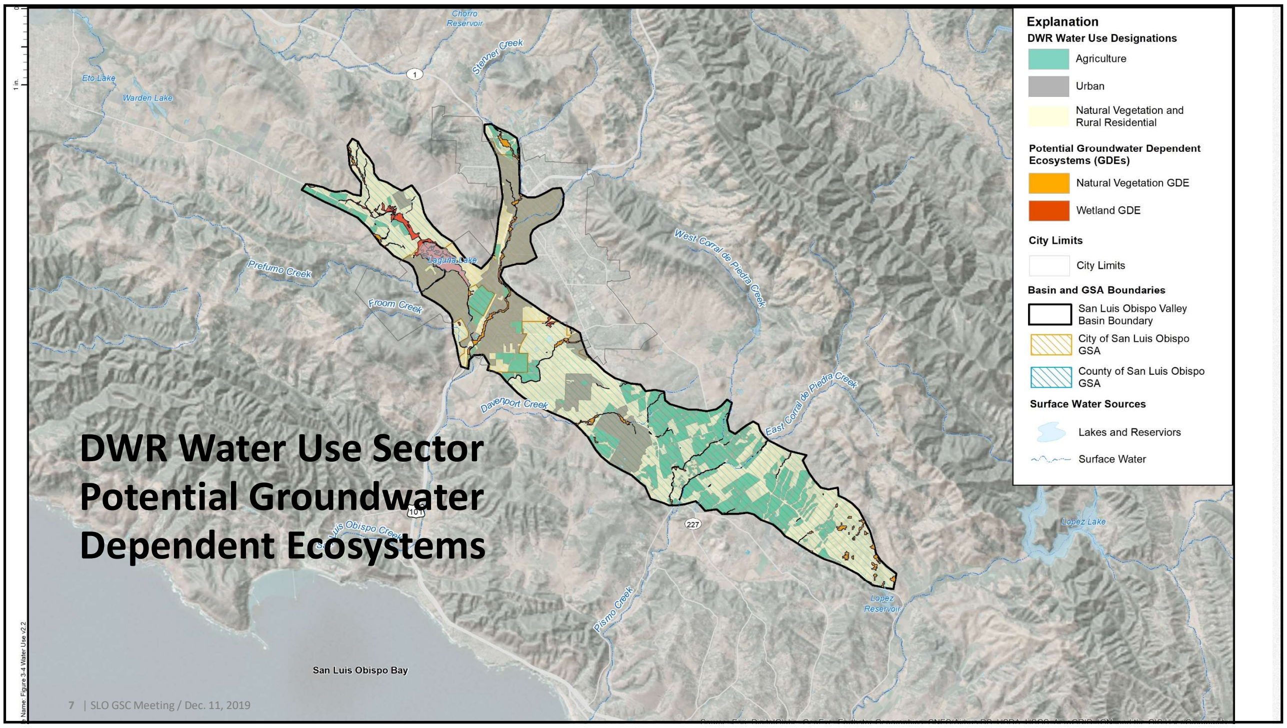

GSP DEVELOPMENT TIMELINE
ADMINISTRATIVE INFO AND BASIN SETTING
SUSTAINABLE GOAL SETTING
PLAN TO SUSTAINABILITY
FINAL PLAN DEVELOPMENT
2019
2020
2021
GROUNDWATER SUSTAIN-ABILITY PLAN COMPLETE
GROUNDWATER BASIN ACHIEVES SUSTAINABILITY
2022
2027
2032
2037
2042
Evaluate Progress
Evaluate Progress
Evaluate Progress
4 | SLO GSC Meeting / Dec. 11, 2019

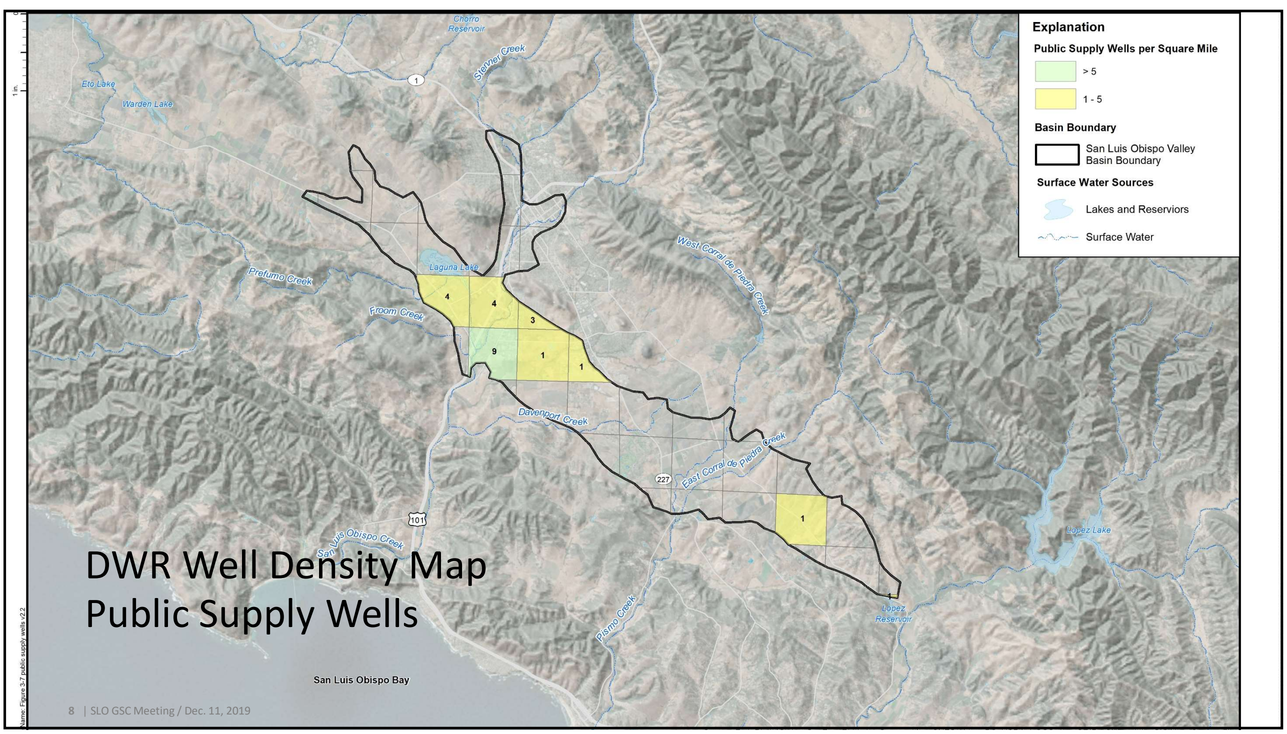
GSP CHAPTER 3:
Description of Plan Area

- Chapter 3 – Description of Plan Area
  - SLO Basin Introduction
  - Existing Land Use
  - Density of Wells
  - Existing Monitoring and Management Programs
  - Land Use Plans

Existing Land Use




DWR Water Use Sector
Potential Groundwater
Dependent Ecosystems
Explanation
DWR Water Use Designations
Agriculture
Urban
Natural Vegetation and
Rural Residential
Potential Groundwater Dependent
Ecosystems (GDEs)
Natural Vegetation GDE
Wetland GDE
City Limits
City Limits
Basin and GSA Boundaries
San Luis Obispo Valley
Basin Boundary
City of San Luis Obispo
GSA
County of San Luis Obispo
GSA
Surface Water Sources
Lakes and Reserviors
Surface Water
Chorro Reservoir
Stenner Creek
Eto Lake
Warden Lake
Prefumo Creek
Froom Creek
Laguna Lake
West Corral de Piedra Creek
East Corral de Piedra Creek
Davenport Creek
San Luis Obispo Creek
Pismo Creek
Lopez Lake
Lopez Reservoir
San Luis Obispo Bay
7 | SLO GSC Meeting / Dec. 11, 2019


DWR Well Density Map
Public Supply Wells
Explanation
Public Supply Wells per Square Mile
> 5
1 - 5
Basin Boundary
San Luis Obispo Valley
Basin Boundary
Surface Water Sources
Lakes and Reserviors
Surface Water
Chorro Reservoir
Stenner Creek
Eto Lake
Warden Lake
Prefumo Creek
Froom Creek
Laguna Lake
West Corral de Piedra Creek
East Corral de Piedra Creek
Davenport Creek
San Luis Obispo Creek
Pismo Creek
Lopez Lake
Lopez Reservoir
San Luis Obispo Bay
4
4
3
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1
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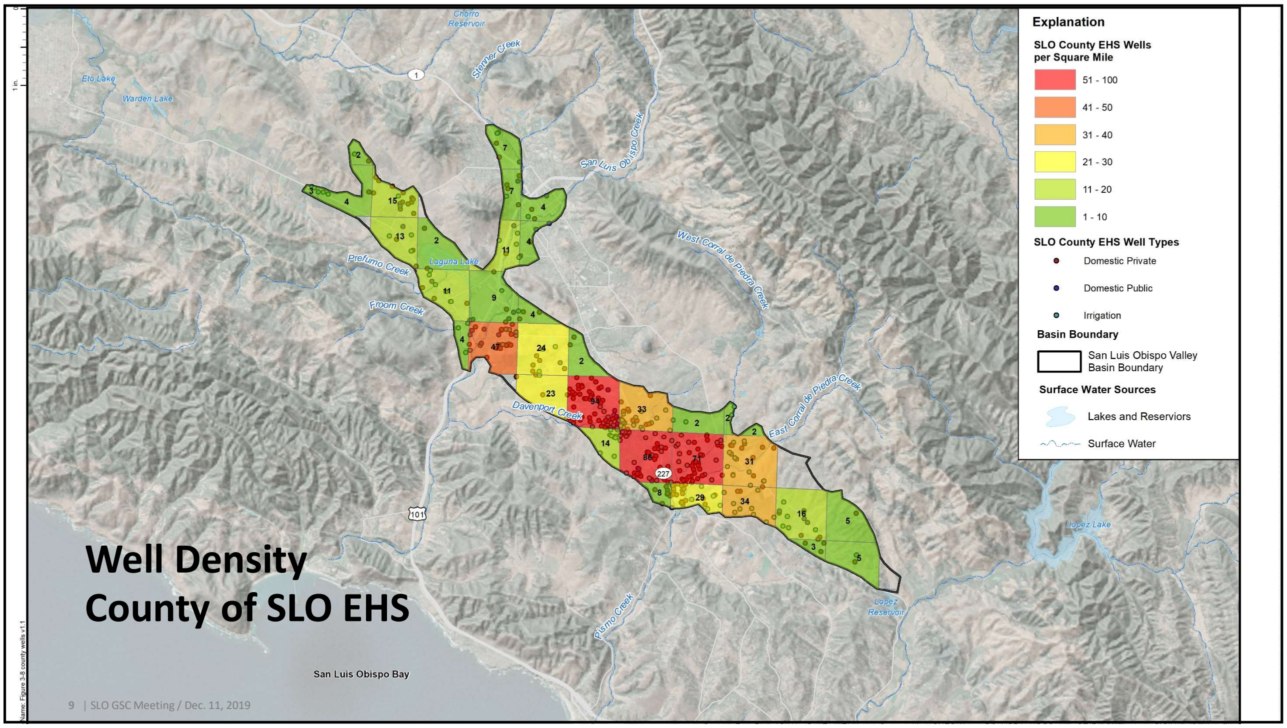
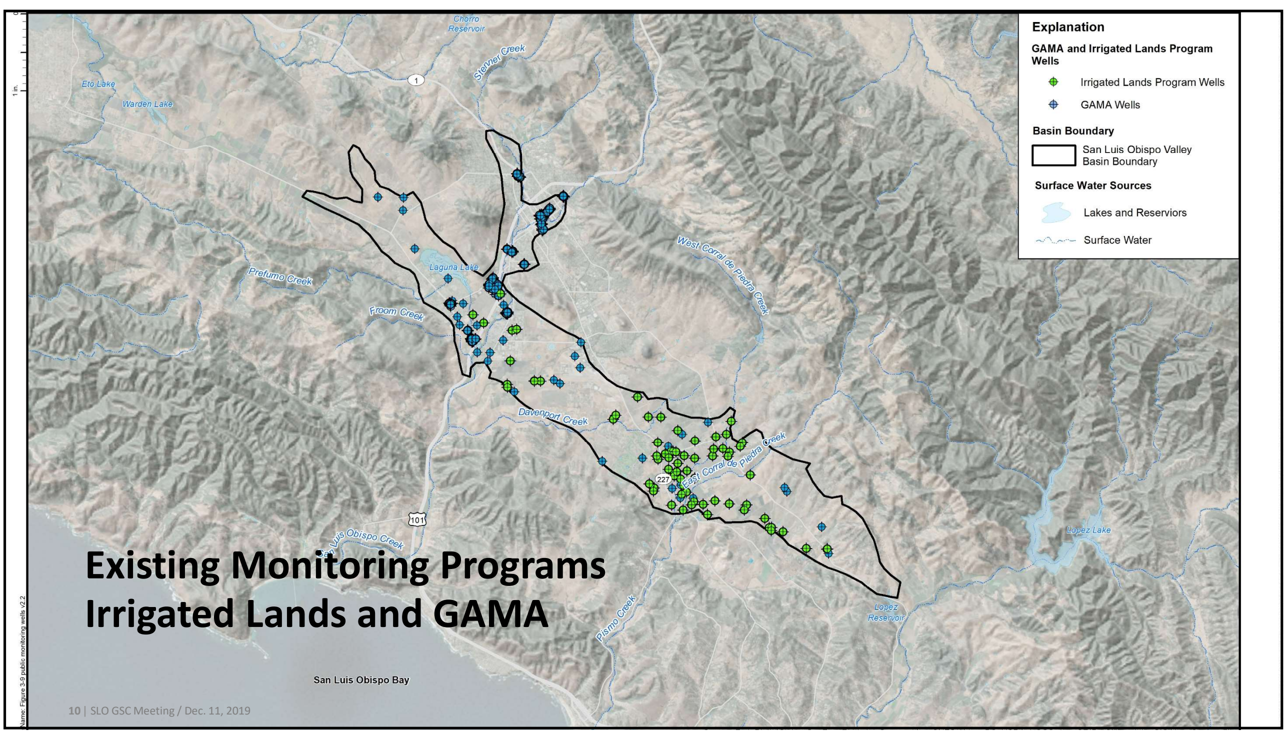
1
8 | SLO GSC Meeting / Dec. 11, 2019


Well Density
County of SLO EHS
Explanation
SLO County EHS Wells per Square Mile
51 - 100
41 - 50
31 - 40
21 - 30
11 - 20
1 - 10
SLO County EHS Well Types
Domestic Private
Domestic Public
Irrigation
Basin Boundary
San Luis Obispo Valley Basin Boundary
Surface Water Sources
Lakes and Reservoirs
Surface Water
Chorro Reservoir
Stenner Creek
Eto Lake
Warden Lake
San Luis Obispo Creek
West Corral de Piedra Creek
Prefumo Creek
Laguna Lake
Froom Creek
Davenport Creek
East Corral de Piedra Creek
Lopez Lake
Lopez Reservoir
Pismo Creek
San Luis Obispo Bay
9 | SLO GSC Meeting / Dec. 11, 2019


Existing Monitoring Programs
Irrigated Lands and GAMA
Explanation
GAMA and Irrigated Lands Program Wells
Irrigated Lands Program Wells
GAMA Wells
Basin Boundary
San Luis Obispo Valley Basin Boundary
Surface Water Sources
Lakes and Reservoirs
Surface Water
Chorro Reservoir
Stenner Creek
Eto Lake
Warden Lake
West Corral de Piedra Creek
Prefumo Creek
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East Corral de Piedra Creek
San Luis Obispo Creek
Lopez Lake
Lopez Reservoir
Pismo Creek
San Luis Obispo Bay
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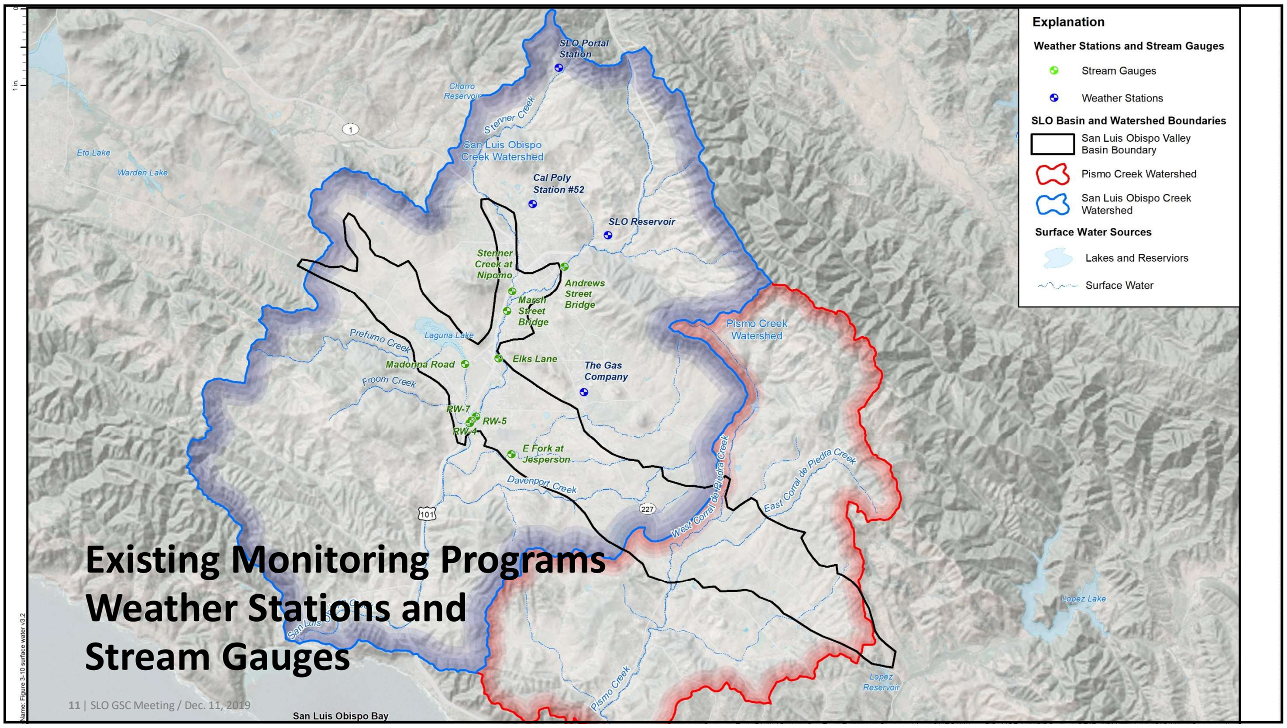
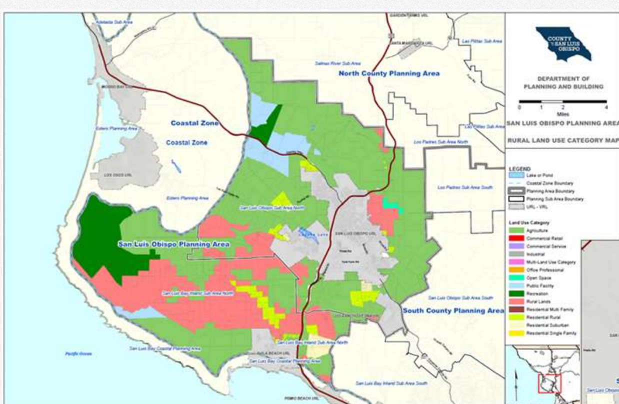
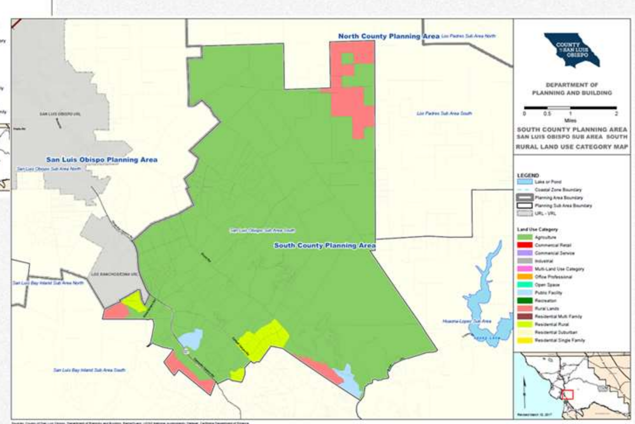


Existing Monitoring Programs Weather Stations and Stream Gauges



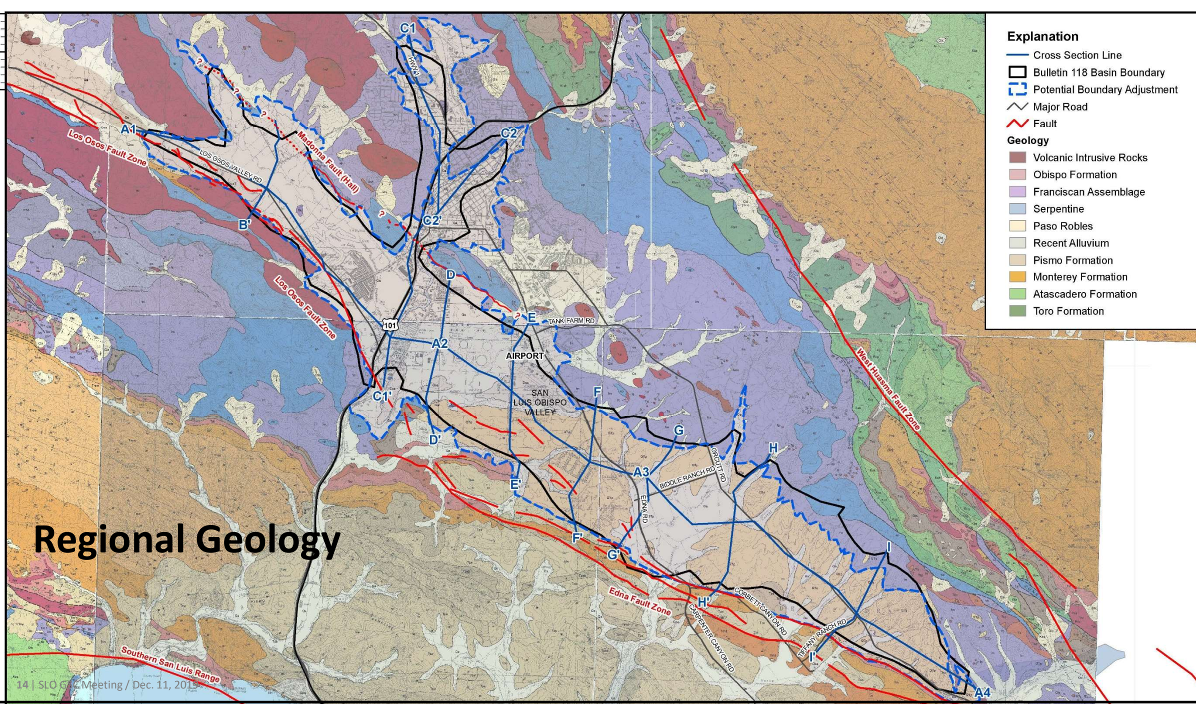
County Land Use Plan

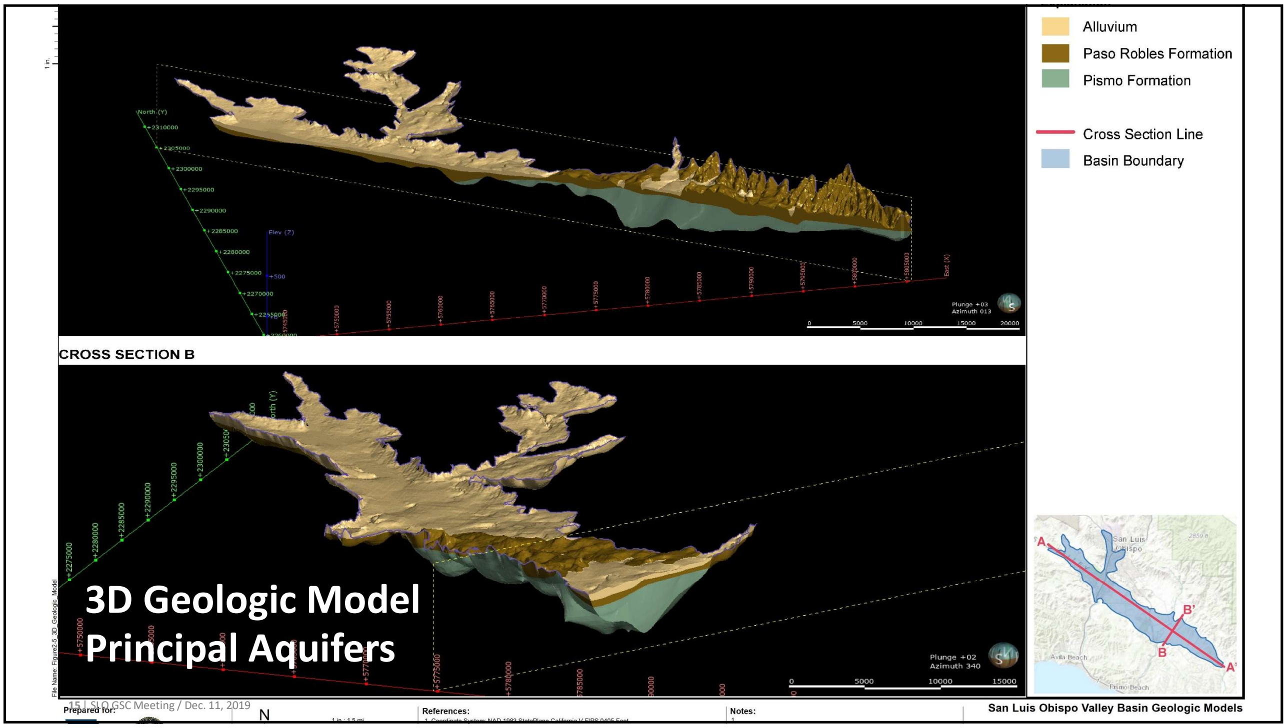


GSP CHAPTER 4:
Basin Setting

- Chapter 4 – Basin Setting
  - Regional Geology
  - Principal Aquifers

Regional Geology





HOW TO SUBMIT PUBLIC COMMENT

REVIEW AND COMMENT.

GSP Chapters 3 & 4
Public comment closes
1/31/2020 -- 50 days

Download the chapters from the homepage. Click on "Comment" to submit your comment(s).

MEETINGS.

GSC Public Meeting
March 11 • 3:30pm-5:30pm

Learn more or take action at
SLOWaterBasin.com

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Draft

Groundwater Sustainability Plan Chapter 3 – Description of Plan Area and Chapter 4 - Basin Setting

for the

San Luis Obispo Valley Groundwater Basin Groundwater Sustainability Agencies

Prepared by

12/2/2019

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LIST OF FIGURES

TABLES

APPENDICES

LIST OF TERMS USED

Abbreviation	Definition
AB	Assembly Bill
ADD	Average Day Demand
AF	Acre Feet
AFY	Acre Feet per Year
AMSL	Above Mean Sea Level
Basin Plan	Water Quality Control Plan for the Central Coast Basin
Cal Poly	California Polytechnic State University
CASGEM	California State Groundwater Elevation Monitoring program
CCR	California Code of Regulations
CCRWQCB	Central Coast Regional Water Quality Control Board
CCGC	Central Coast Groundwater Coalition
CDFM	Cumulative departure from the mean
CDPH	California Department of Public Health
CIMIS	California Irrigation Management Information System
City	City of San Luis Obispo
County	County of San Luis Obispo
CPUC	California Public Utilities Commission
CPWS-52	Cal Poly Weather Station 52
CRWQCB	California Regional Water Quality Control Board
CWC	California Water Code
DDW	Division of Drinking Water
Du/ac	Dwelling Units per Acre
DWR	Department of Water Resources
EPA	Environmental Protection Agency
ERMWC	Edna Ranch Mutual Water Company
ET_0	Evapotranspiration
EVGMWC	Edna Valley Growers Ranch Mutual Water Company
°F	Degrees Fahrenheit
FAR	Floor Area Ratio
FY	Fiscal Year
GAMA	Groundwater Ambient Monitoring and Assessment program
GHG	Greenhouse Gas
GMP	Groundwater Management Plan
GPM	Gallons per Minute
GSA	Groundwater Sustainability Agency
GSC	Groundwater Sustainability Commission
GSP	Groundwater Sustainability Plan
GSWC	Golden State Water Company
IRWMP	San Luis Obispo County Integrated Regional Water Management Plan
kWh	Kilowatt-Hour
LUCE	Land Use and Circulation Element
LUFTs	Leaky Underground Fuel Tanks
MAF	Million Acre Feet
MCL	Maximum Contaminant Level

Abbreviation	**Definition**
MG	Million Gallons
MGD	Million Gallons per Day
Mg/L	Milligrams per Liter
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MWR	Master Water Report
NCDC	National Climate Data Center
NOAA	National Oceanic and Atmospheric Administration
NWIS	National Water Information System
RW	Recycled Water
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SGMA	Sustainable Groundwater Management Act
SGMP	Sustainable Groundwater Management Planning
SGWP	Sustainable Groundwater Planning
SLO Basin	San Luis Obispo Valley Groundwater Basin
SLOFCWCD	San Luis Obispo Flood Control and Water Conservation District
SCML	Secondary Maximum Contaminant Level
SOI	Sphere of Influence
SNMP	Salt and Nutrient Management Plan
SWRCB	California State Water Resources Control Board
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
USGS	United States Geological Survey
USFW	United States Fish and Wildlife Service
USTs	Underground Storage Tanks
UWMP	Urban Water Management Plan
UWMP Act	Urban Water Management Planning Act
UWMP Guidebook	Department of Water Resources 2015 Urban Water Management Plan Guidebook
VRMWC	Varian Ranch Mutual Water Company
WCS	Water Code Section
WMP	Water Master Plan
WPA	Water Planning Areas
WRF	Water Reclamation Facility
WRCC	Western Regional Climate Center
WRRF	Water Resource Recovery Facility
WSA	Water Supply Assessment
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

This section to be completed after GSP is complete.

3 DESCRIPTION OF PLAN AREA (§ 354.8)

3.1 SLO BASIN INTRODUCTION

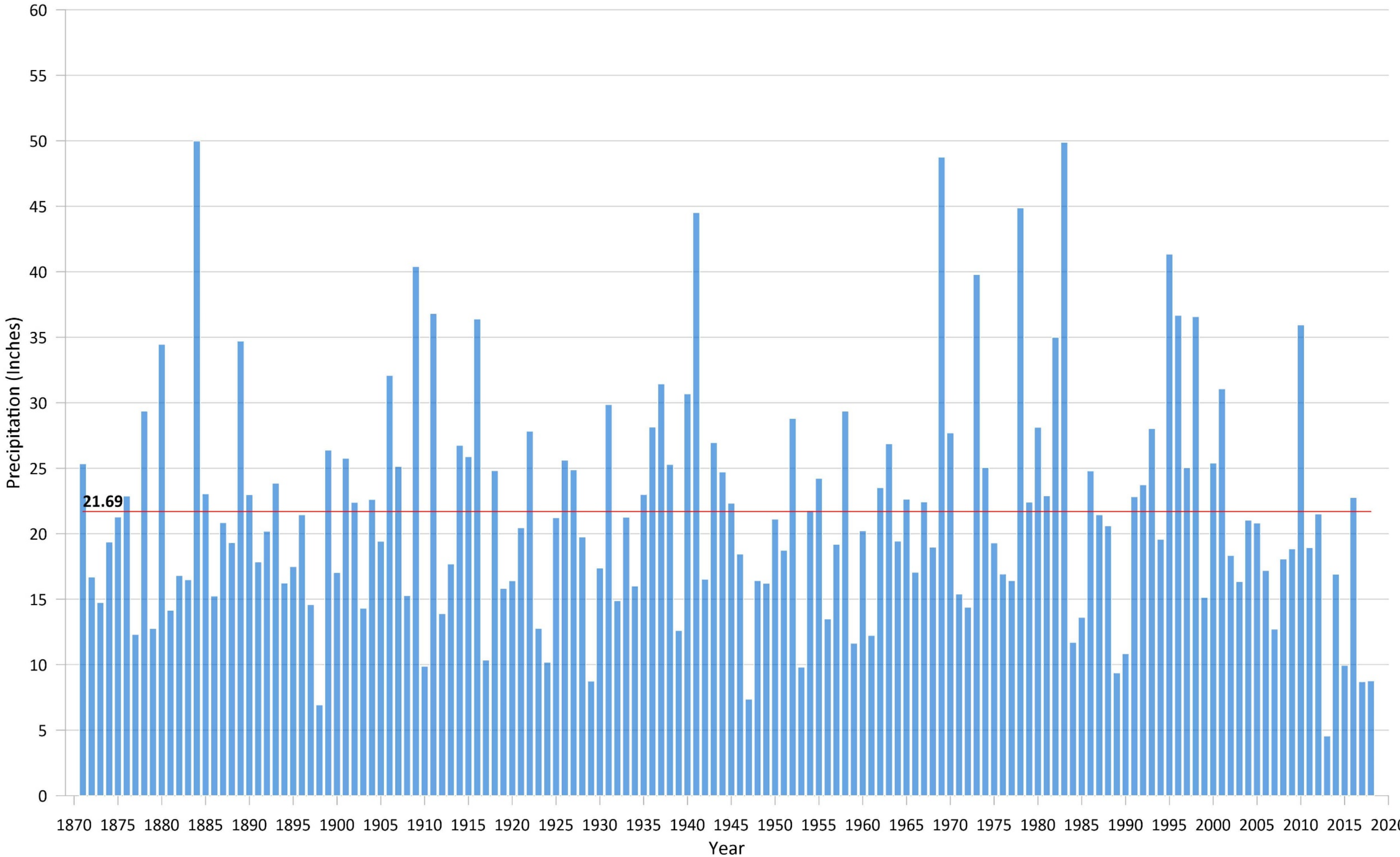
The SLO Basin is oriented in a northwest-southeast direction and is composed of unconsolidated or loosely consolidated sedimentary deposits. It is approximately 14 miles long and 1.5 miles wide. It covers a surface area of about 12,700 acres (19.9 square miles). The SLO Basin is bounded on the northeast by the relatively impermeable bedrock formations of the Santa Lucia Range, and on the southwest by the formations of the San Luis Range and the Edna fault system. The bottom of the SLO Basin is defined by the contact of permeable sediments with the impermeable bedrock Miocene-aged and Franciscan Assemblage rocks. The SLO Basin is commonly referenced as being composed of two distinct valleys, with the San Luis Valley in the northwest and the Edna Valley in the southeast.

The San Luis Valley comprises approximately the northwestern half of the SLO Basin. It is the area of the SLO Basin drained by San Luis Obispo Creek and its tributaries (Prefumo Creek and Stenner Creek west of Highway 101, Davenport Creek and smaller tributaries east of Highway 101). Surface drainage in San Luis Valley drains out of the SLO Basin, flowing to the south along the course of San Luis Obispo Creek, toward the coast in the Avila Beach area, approximately along the course of Highway 101. The San Luis Valley includes part of the City and California Polytechnic State University (Cal Poly) jurisdictional boundaries, while the remainder of the San Luis Valley is unincorporated land. Land use in the City is primarily single- and multi-family residential, commercial, industrial, and a small amount of land in agricultural uses. The area in the northwest part of the SLO Basin, along Los Osos Valley Road, has significant areas of irrigated agriculture, primarily row crops.

The Edna Valley comprises approximately the southeastern half of the SLO Basin. The primary creeks that drain the SLO Basin are the east and west branches of Corral de Piedras Creek, which join to form Pismo Creek, draining south out of the Edna Valley into Price Canyon. Smaller unnamed tributaries drain south from the SLO Basin in the extreme southeastern part of Edna Valley, ultimately joining Pismo Creek. Some of the unincorporated lands in Edna Valley are served by various private water purveyors. The primary land use in the Edna Valley is agriculture. During the past two decades wine grapes have become the most significant crop type in the Edna Valley.

The physical definition of the SLO Basin boundary is the contact between the unconsolidated or loosely consolidated sediments and the basement rock of the Miocene-aged formations and Franciscan Assemblage. There is a topographic high point in the underlying bedrock elevation between the San Luis and Edna sub-basins. The watershed divide and the bedrock divide are not coincident. The sediments of the Edna Valley have significantly greater thickness than those of the San Luis Valley. Precipitation that falls west of that divide ultimately flows to Davenport and San Luis Obispo Creeks, and precipitation that falls east of that divide flows to Corral de Piedras Creek or the other small tributaries, ultimately flowing to Pismo Creek south of the SLO Basin.

The primary weather patterns for the SLO Basin derive from seasonal patterns of atmospheric conditions that originate over the Pacific Ocean and move inland. As storm fronts move in from the coast, rainfall in the area falls more heavily in the mountains, and the SLO Basin itself receives less rainfall because of a muted rain shadow effect. Average annual precipitation ranges from approximately 18 inches throughout most of the SLO Basin to about 22 inches in relatively higher elevation areas near the City and Cal Poly. Figure 3-1 presents the time series of annual precipitation for the period of record from 1870 to 2018 at the Cal Poly weather station No. 52. The average historical rainfall at this location to date is 21.69 inches, with a standard deviation of 8.75 inches. The historical maximum is 49.99 inches, which occurred in 1884. The historical minimum is 4.56 inches, which occurred in 2013.



Prepared for:

Author: EC
11/26/2019
SAN LUIS OBISPO VALLEY BASIN GSP

Legend
Precipitation (Annual)
Historical Average Precipitation

Notes:
1. Data Source: Cal Poly State University, Cal Poly/NOAA Station

San Luis Obispo Historical Annual Precipitation

Figure 3-1

3.2 ADJUDICATED AREAS
The SLO Basin is not an adjudicated basin.

3.3 JURISDICTIONAL AREAS
In addition to MOA Parties, there are several entities that have some degree of water management authority in the SLO Basin. Each entity is discussed below.

3.3.1 Federal Jurisdictions
There are no federal agencies with land holdings in the SLO Basin.

3.3.2 Tribal Jurisdiction
The two prominent Native American tribes in the County are the Obispeño Chumash and Salinan Indian Tribes. The Chumash occupied the coast between San Luis Obispo and northwestern Los Angeles County, inland to the San Joaquin Valley. They were divided into two broad groups, of which the Obispeño were the northern group. The Salinan were northern neighbors of the Chumash, and although the presence of a firm boundary between the Chumash and the Salinan is uncertain, ethnographic accounts have placed Salinan territories in the northern portion of the County. However, these two tribes do not have any recognized tribal land in the SLO Basin.

3.3.3 State Jurisdictions
The State of California University system owns and operates land that is associated with California Polytechnic State University, San Luis Obispo (Cal Poly) located in the northern edge of the SLO Basin off Hwy 1. Cal Poly is a significant user of local water sources and manages their water supply in conjunction with the City. The City treats the wastewater generated from Cal Poly. There are no California State Parks or other State-owned lands or entities located within the SLO Basin.

3.3.4 County Jurisdictions
The County of San Luis Obispo and the associated San Luis Obispo County Flood Control and Water Conservation District (SLOFCWCD) (see section under Special Districts below) have jurisdiction over the entire County including the SLO Basin. The County owns approximately 300 acres of land in the SLO Basin and is primarily located in the vicinity of the SLO County Airport which makes up the majority of the land owned by the County.

3.3.5 City and Local Jurisdictions
The City is centrally located in the SLO Basin and has land and water management authority over its incorporated area. The City has four primary water supply sources including Whale Rock Reservoir, Salinas Reservoir, Nacimiento Reservoir, and recycled water (for irrigation), with groundwater serving as a fifth supplemental source. Three major mutual water companies exist in the SLO Basin: Edna Valley Growers, Varian Ranch, and Edna Ranch Mutual Water Companies. One investor owned utility exists within the SLO Basin: Golden State Water Company (GSWC). GSWC provides groundwater that is pumped from the Edna Valley Basin to residential and agriculture customers.

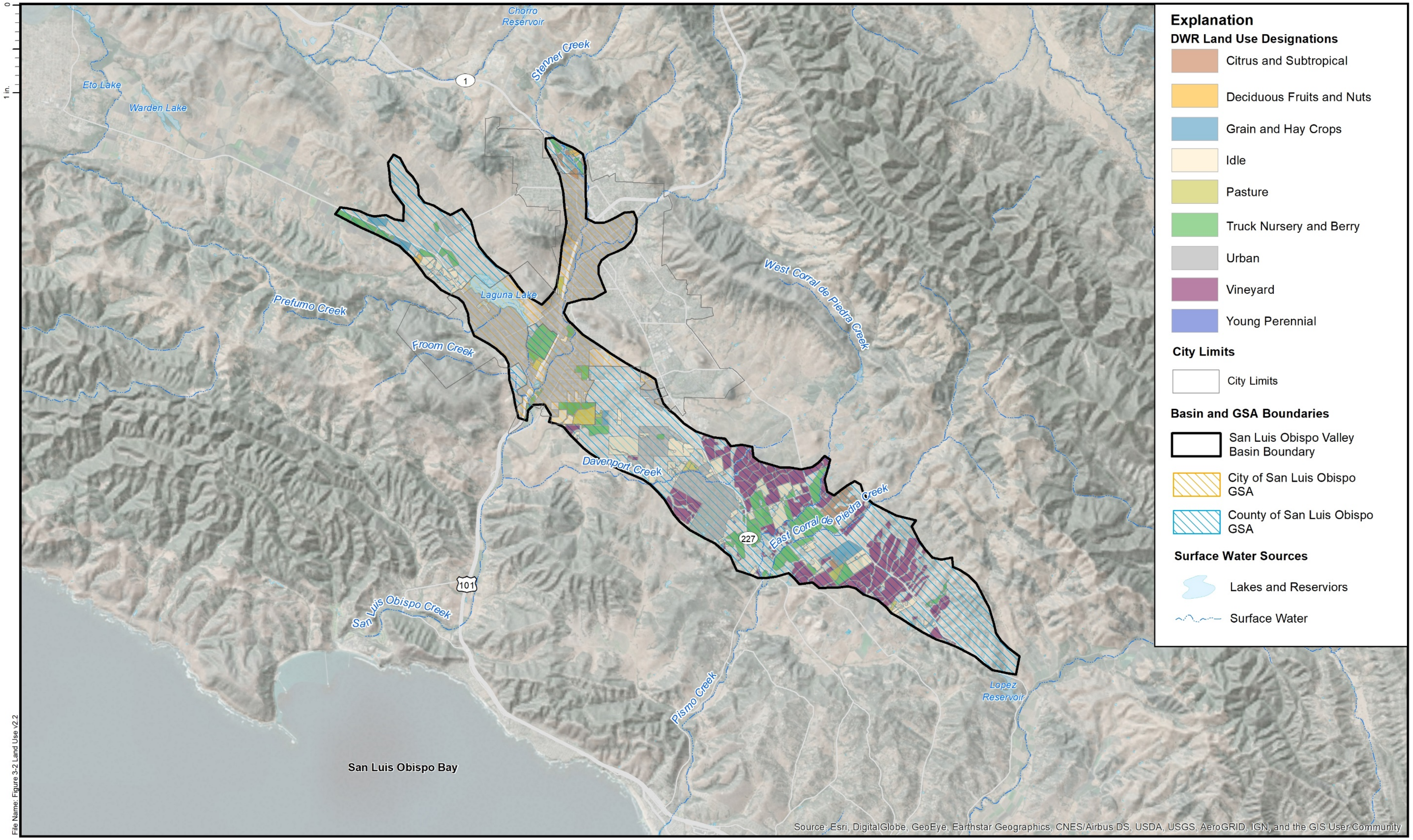
3.3.6 Special Districts
The San Luis Obispo Flood Control and Water Conservation District (SLOFCWCD) is a dependent Special District governed by the County Board of Supervisors. It has jurisdiction over all of the County including the SLO Basin and was established as a resource to help individuals and communities in San Luis Obispo County identify and address flooding problems with the purpose "to provide for control, disposition and distribution of the flood and storm waters of the district and of streams flowing into the district...".

3.4 LAND USE

The County, City and State have land use authority in the SLO basin within their respective jurisdictions. Land use information for the SLO Basin was based on DWR's land use database (DWR, 2014). The 2014 land use in the SLO Basin is shown on Figure 3-2 and is summarized by group in . All land use categories except native vegetation listed in Table 3-1 are provided by DWR (DWR, 2014). The areas of the basin that did not have a land use designation were assumed to be native vegetation.

Table 3-1: Agricultural Land use categories defined for the SLO Basin by DWR (2014).

Land Use Category	**Acres**
Citrus and subtropical	136
Deciduous fruits and nuts	21
Grain and hay crops	183
Idle	713
Pasture	179
Truck nursery and berry crops	1079
Urban	6,412
Vineyard	1,929
Young perennial	2
Native vegetation	<1
Total	**10,656**



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SAN LUIS OBISPO VALLEY BASIN GSP

Author: EC
Date: 11/22/2019

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References:
1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
2.
3.

Notes:
1. Land Use Designations from DWR (2014); data obtained from gis.water.ca.gov
2.
3.

San Luis Obispo Valley Basin Land Use Designations

Figure 3-2

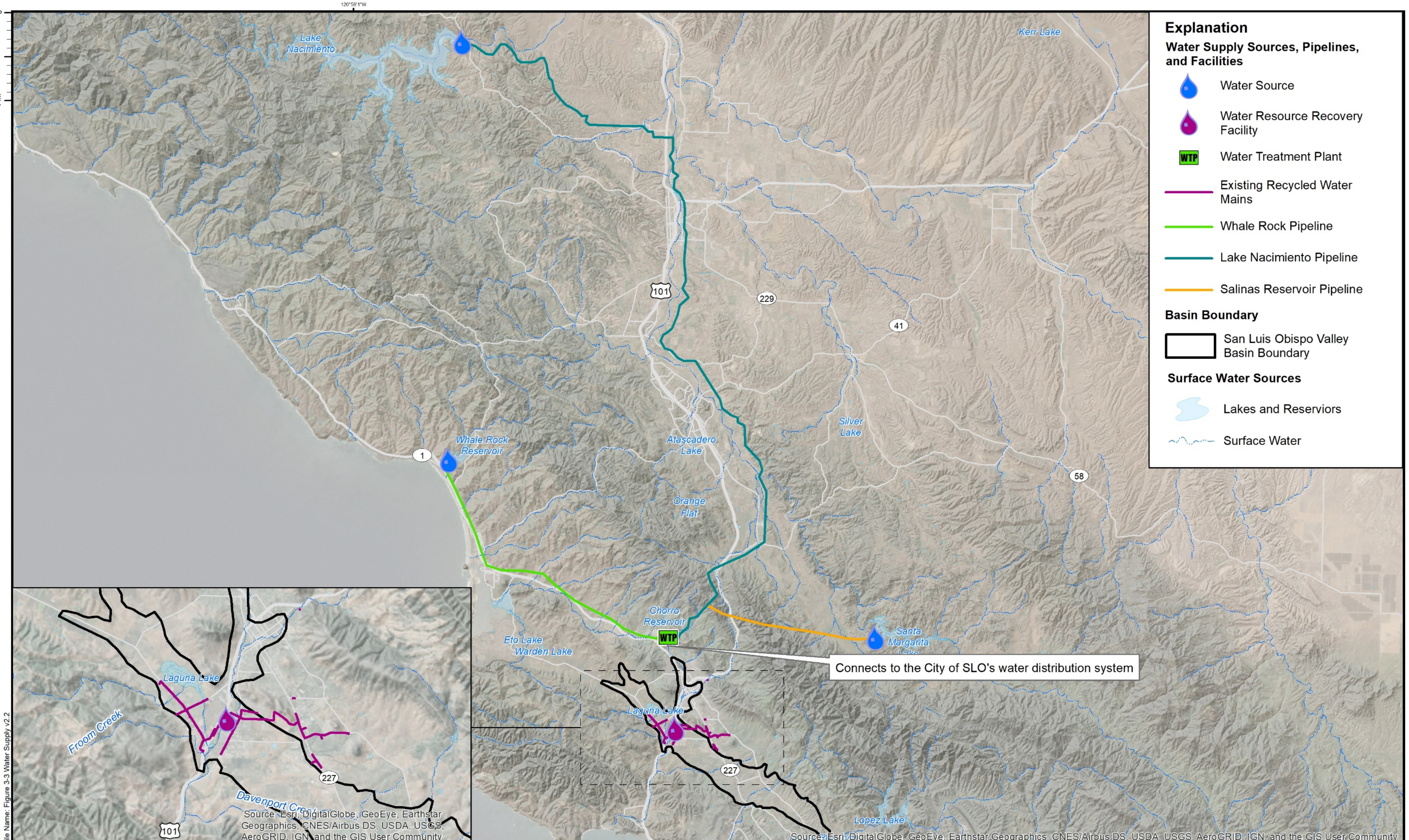
3.4.1 Water Source Types

Entities in the SLO Basin utilize three types of water sources to meet the demands: groundwater, surface water, and recycled water. Excluding the City, Cal Poly, and Edna Valley Golf Course, all water demand in the SLO Basin are met with groundwater. Cal Poly has rights to 33.71% of water from Whale Rock Reservoir and the rest of their water supply comes from local groundwater. The City has an entitlement to water from the Nacimiento Water Project, rights to Salinas Reservoir (Santa Margarita Lake), rights to 55.05% of water in Whale Rock Reservoir, SLO Basin groundwater, and recycled water from the City's Water Resource Recovery Facility (WRRF). The City has imported supplies from Salinas Reservoir, located near the community of Santa Margarita, since 1944, Whale Rock Reservoir, located near the community of Cayucos, since 1961, and Lake Nacimiento since 2011. Table 3-2 summarizes the surface water supply available from each source and Table 3-3 shows the location of water supply source types within the SLO Basin.

Table 3-2: Summary of surface water supply sources available to the SLO Basin.

Supply Sources	Amount Available (AFY)
Nacimiento Reservoir- City	5,482[1]
Salinas Reservoir - City	4,910[1]
Whale Rock Reservoir - City	
Recycled Water - City	~1,000[1]
Total	**11,392**

[1] City of San Luis Obispo, General Plan, Water and Wastewater Management Element, 2018..



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Author: EC
Date: 11/18/2019

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0 1.5 3 6 Mi
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References:
1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
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Notes:
1.
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San Luis Obispo Valley Basin Water Supply Sources

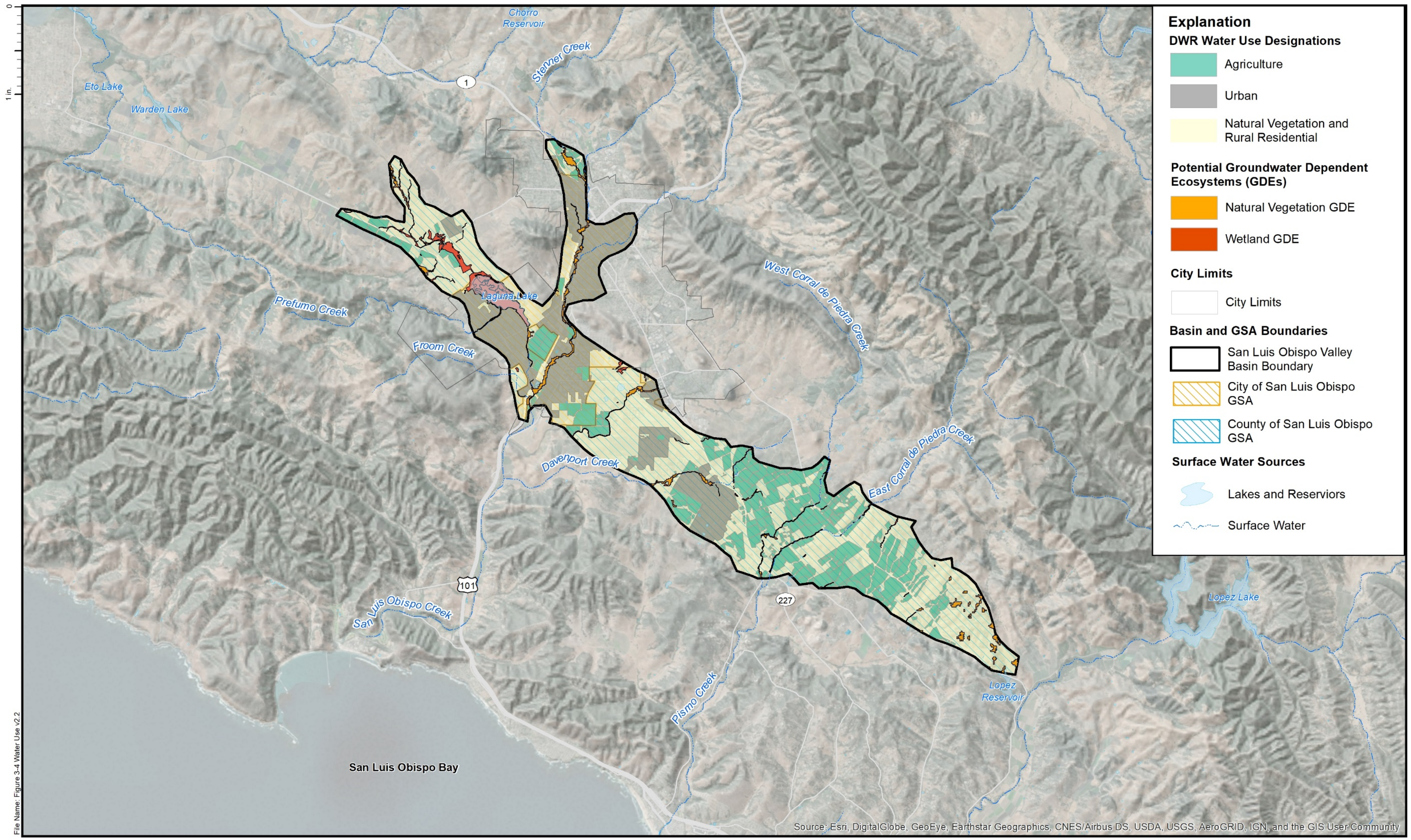
Figure 3-3

3.4.2 Water Use Sectors

Water demand in the SLO Basin is organized into the six water use sectors identified in the GSP Emergency Regulations. These include:

- **Urban-** Urban water use is assigned to non-agricultural water uses in the City and census-designated places. Domestic use outside of census-designated places is not considered urban use.
- **Industrial-** There is limited industrial use in the SLO Basin. The DWR land use designations in the SLO Basin does not include industrial uses.
- **Agricultural-** This is the largest groundwater use sector in the SLO Basin by water demand.
- **Managed wetlands-** There are several managed wetlands in the SLO Basin that are managed by both federal, state, and local agencies. In general, wetlands in the area are managed by either of the following agencies: (1) City of San Luis Obispo, (2) California Department of Fish and Wildlife, (3) California State Water Resources Control Board, (4) U.S. Fish and Wildlife Service, and (5) U.S. Army Corps of Engineers. The wetlands and natural vegetation areas that are potentially dependent ecosystems include Laguna Lake and reaches of the San Luis Obispo Creek, Prefumo Creek, Stenner Creek, Davenport Creek, East and West Corral De Piedra Creeks, and Pismo Creek. Water use for these ecologically sensitive areas will be addressed in the water budget and modeling scope of this GSP in order to designate appropriate management actions and proposed projects to provide adequate water supply for natural water use of these areas.
- **Managed recharge-** There is no managed recharge in the SLO Basin. Recycled water discharge to creeks and applied irrigation is included in the urban water use sector.
- **Native vegetation-** This is the largest water use sector in the SLO Basin by land area. This sector includes rural residential areas.

Figure 3-4 shows the distribution of the water use sectors and potential groundwater dependent ecosystems in the SLO Basin.



Prepared for:

Author: EC
Date: 11/22/2019

SAN LUIS OBISPO VALLEY BASIN GSP

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References:
1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
2.
3.

Notes:
1. Land Use Designations from DWR (2014); data obtained from gis.water.ca.gov
2. GDE data obtained from gis.water.ca.gov
3.

San Luis Obispo Valley Basin Water Use Sectors and Potential Groundwater Dependent Ecosystems (GDEs)

Figure 3-4

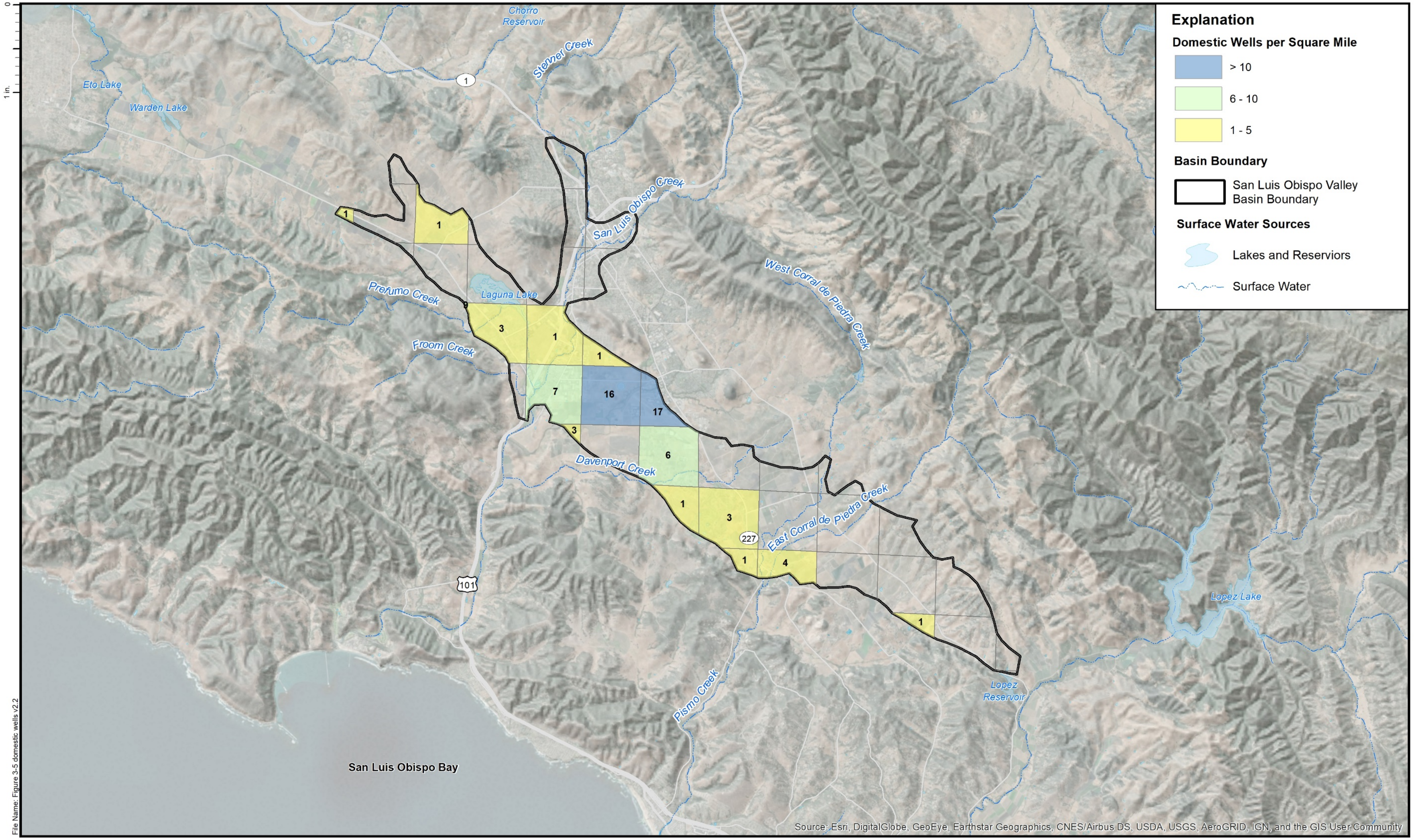
3.5 DENSITY OF WELLS

Well types, well depth data, and well distribution data were downloaded from DWR's well completion report map application (DWR, 2018). DWR categorizes wells in this mapping application as either domestic, production, or public supply. These categories are based on the well use information submitted with the well logs to DWR. Well information was also collected from County of San Luis Obispo Environmental Health Services (EHS). The EHS dataset was compiled from information gained from the well construction permit application process. Table 3-3 summarizes the types of wells by use for all well logs submitted to DWR and EHS.

Table 3-3: DWR and County Wells

Well Data Source	Type of Well	Total No. of Wells
DWR	Domestic	75
	Production	71
	Public Supply	24
	Total	*170*
County EHS	Domestic Private	355
	Domestic Public	43
	Irrigation	231
	Total	*629*

Figure 3-5, Figure 3-6, and Figure 3-7 show the density of wells in the SLO Basin by their types of use. The DWR data used to develop these maps is not necessarily the same set of well data held EHS as shown in Figure 3-8. DWR data was used to develop maps of well densities because they are organized for easy mapping of well density per square mile. These maps should be considered representative of well distributions, but are not definitive. It is also important to note that both the DWR and EHS well databases are not updated with information regarding well status and the well locations are not verified in the field. Therefore, it is uncertain whether the wells in these databases are currently active or have been abandoned or destroyed.



Prepared for:

Author: EC
Date: 11/24/2019

SAN LUIS OBISPO VALLEY BASIN GSP

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References:
1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
2.
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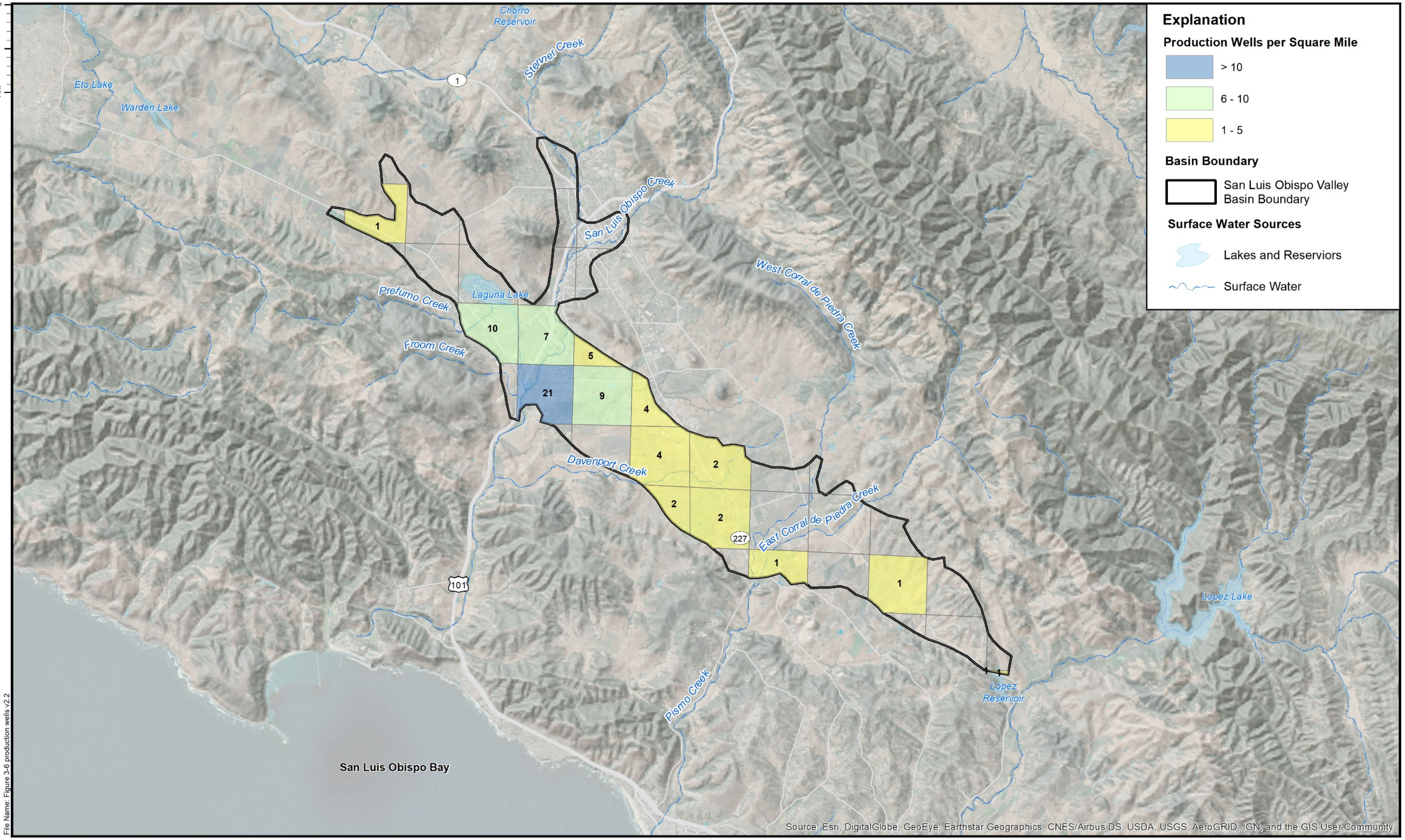
Notes:
1. Well data provided by DWR (2018); data obtained from gis.water.ca.gov
2.
3.

San Luis Obispo Valley Basin Domestic Well Density

Figure 3-5



Prepared for:

Author: EC
Date: 11/24/2019

SAN LUIS OBISPO VALLEY BASIN GSP

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1 in : 1.5 mi
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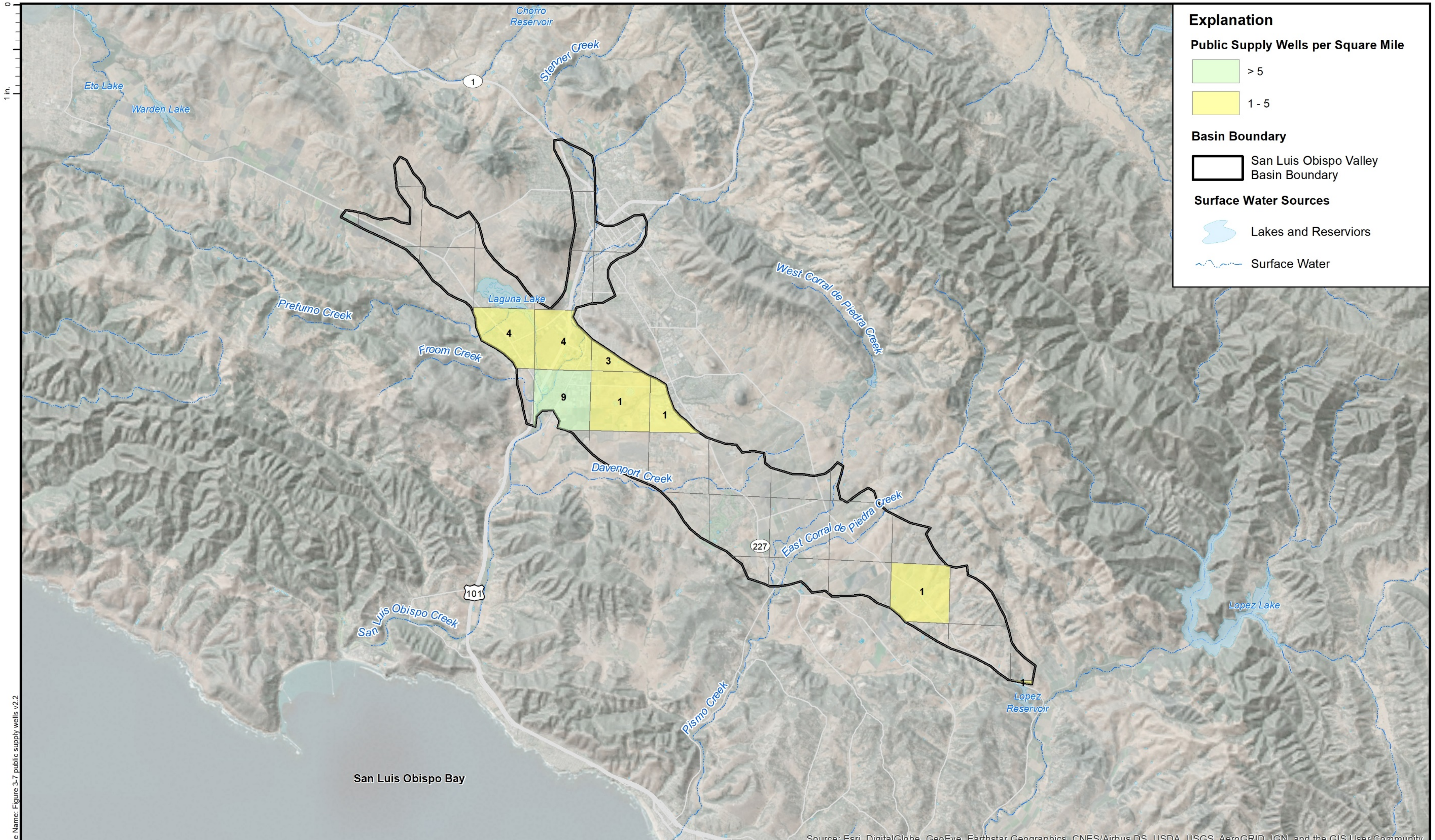
References:
1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
2.
3.

Notes:
1. Well data provided by DWR (2018); data obtained from gis.water.ca.gov
2.
3.

San Luis Obispo Valley Basin Production Well Density

Figure 3-6



Prepared for:

Author: EC
Date: 11/24/2019

SAN LUIS OBISPO VALLEY BASIN GSP

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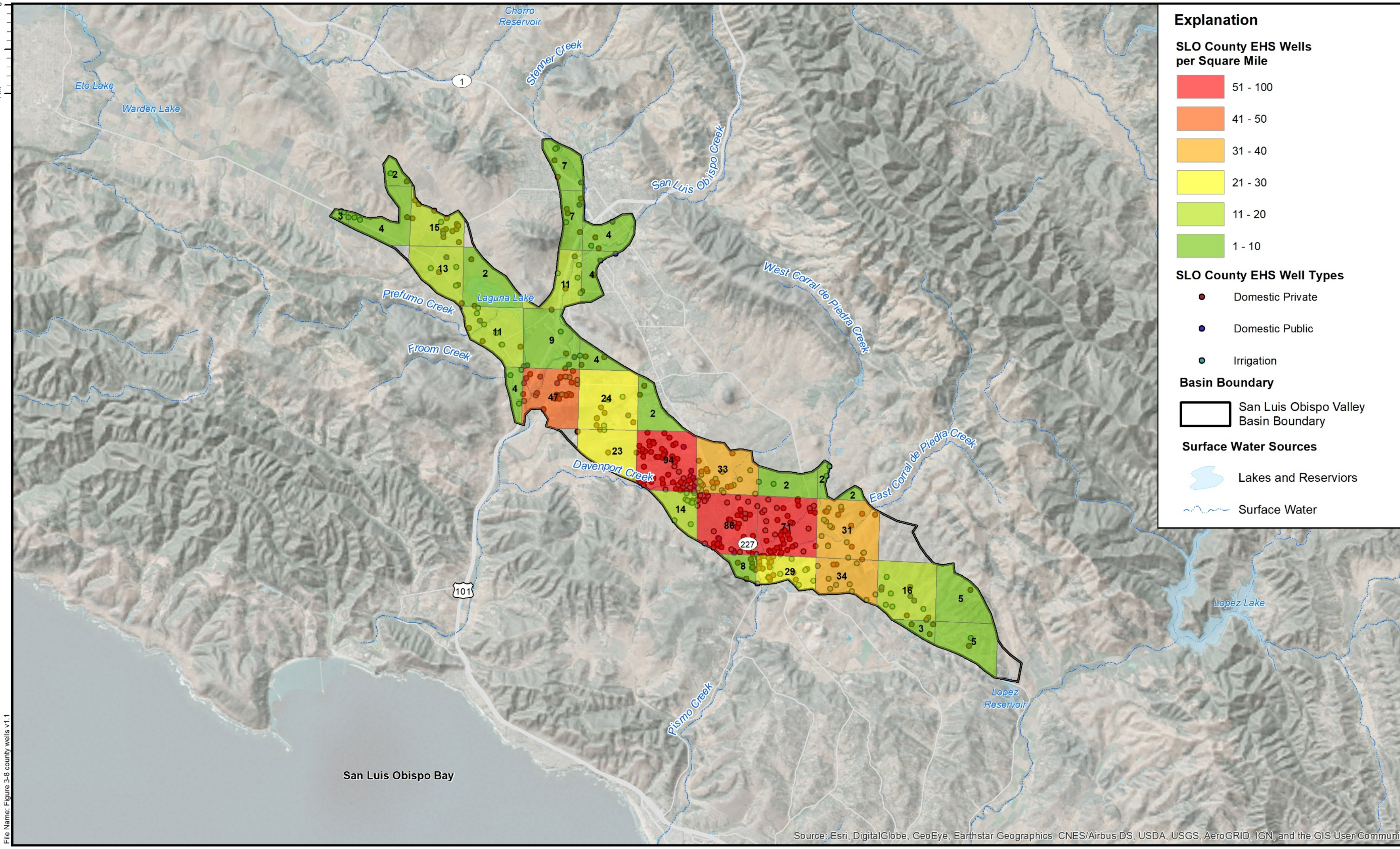
References:
1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
2.
3.

Notes:
1. Well data provided by DWR (2018); data obtained from gis.water.ca.gov
2.
3.

San Luis Obispo Valley Basin Public Supply Well Density

Figure 3-7



File Name: Figure 3-8 county wells v1.1

Prepared for:

Author: EC
Date: 11/25/2019

SAN LUIS OBISPO VALLEY BASIN GSP

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References:
1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
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Notes:
1.
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San Luis Obispo Valley Basin County Environmental Health Services Well Density

Figure 3-8

3.6 EXISTING MONITORING AND MANAGEMENT PROGRAMS

3.6.1 Groundwater Monitoring

Groundwater levels and quality are currently measured in the SLO Basin by the SLOFCWCD and a variety of other agencies as described below. Figure 3-9 shows the locations of monitored wells identified in the Groundwater Ambient Monitoring and Assessment (GAMA) program (i.e. publicly available data) that are monitored by several public agencies, the SLOFCWCD, and the Central Coast Regional Water Quality Control Board (CCRWQCB) Irrigated Lands Program. The monitoring network also includes other wells in the area designated as private that are not shown on this map (Figure 3-8). Additional evaluation of the current monitoring program will be conducted for the GSP to establish a representative monitoring network of public and private wells that will be used during plan implementation to track groundwater elevations and ensure that minimum thresholds have not been exceeded.

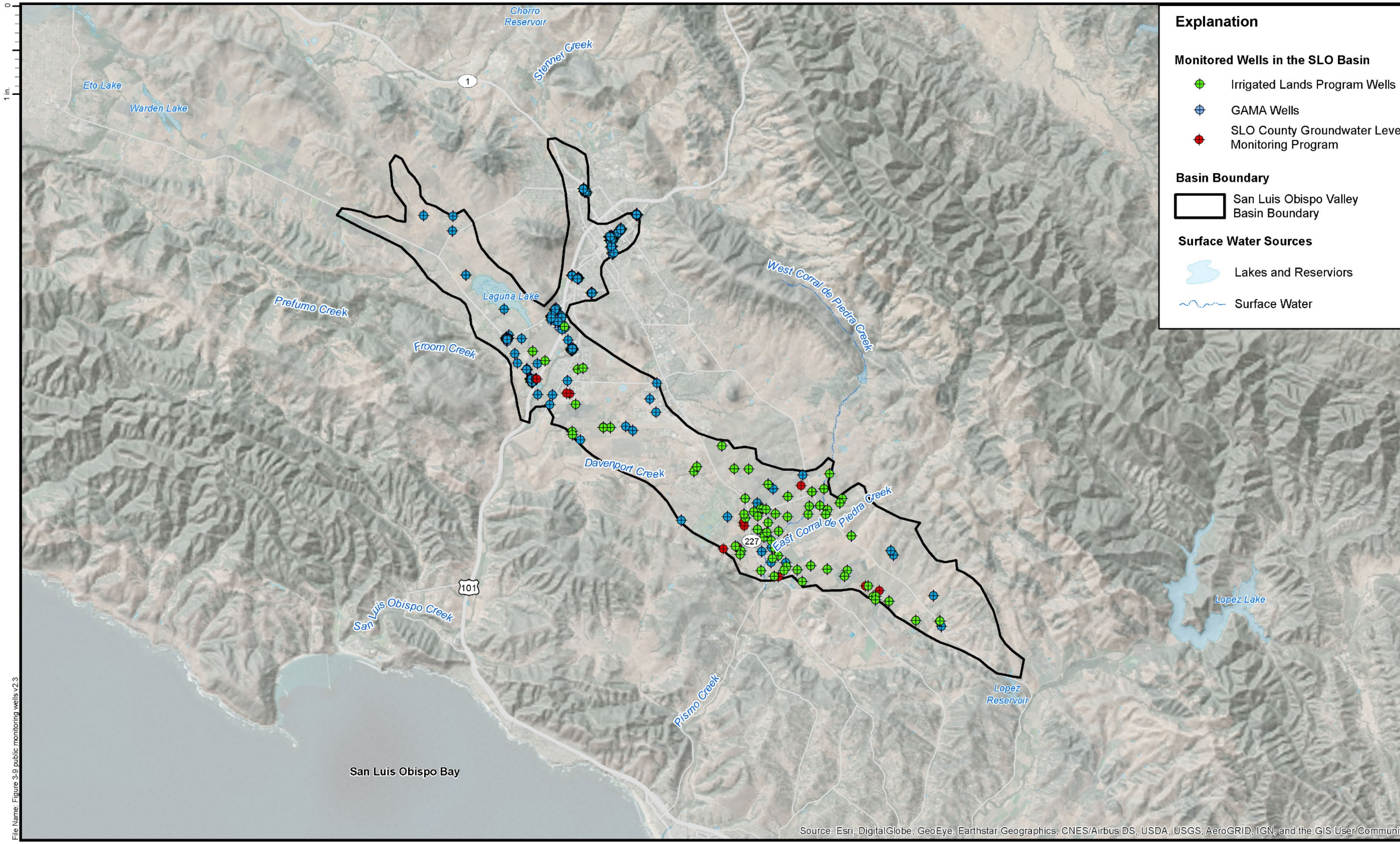
3.6.1.1 Groundwater Level Monitoring

The SLOFCWCD has been monitoring groundwater levels county-wide on a semi-annual basis for more than 50 years to support general planning and for engineering purposes. Groundwater level measurements are taken once in the spring and once in the fall. The monitoring takes place from a voluntary network of wells. In the SLO Basin, there are 16 active wells in this program (Figure 3-9). The voluntary monitoring network has changed over time as access to wells has been lost or new wells have been added to the network.

3.6.1.2 Groundwater Quality Monitoring

Groundwater quality is monitored/reported under several different programs and by different agencies including:

- Municipal and community water purveyors must collect water quality samples on a routine basis for compliance monitoring and reporting to the California State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW).
- The USGS collects water quality data on a routine basis under the GAMA program. These data are stored in the State's Geotracker GAMA system.
- There are multiple sites that are monitoring groundwater quality as part of investigation or compliance monitoring programs through the CCRWQCB. See Figure 3-9 for CCRWQCB well monitoring locations through the GEotracker GAMA system.
- The CCRWQCB under Agricultural Order No. R3-2017-0002, a Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands, requires all growers to implement groundwater monitoring, either individually or as part of a cooperative regional monitoring program. Growers electing to implement individual monitoring (i.e., not participating in the regional monitoring program implemented by the Central Coast Groundwater Coalition [CCGC] within the SLO Basin) are required to test all on-farm domestic wells and the primary irrigation supply wells for nitrate or nitrate plus nitrite, and general minerals (including, but not limited to, TDS, sodium, chloride, and sulfate).
- California Water Data Library contains groundwater level and water quality monitoring stations. The data available from this resource has been used above.



Prepared for:

Author: EC
Date: 12/2/2019

SAN LUIS OBISPO VALLEY BASIN GSP

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1 in : 1.5 mi
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References:
1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
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Notes:
1. Well location data obtained from geotracker.waterboards.ca.gov
2.
3.

Monitored Wells in the San Luis Obispo Valley Basin

Figure 3-9

3.6.1.3 Surface Water Monitoring

The Water Resources Division of the SLO County Public Works maintains six (6) real-time data monitoring stream gauges within the San Luis Obispo Creek watershed and all except Andrews St. Bridge is located within the SLO Basin. As summarized in Table 3-4, each stream gauge measures stage at 15-minute intervals. Stage-discharge relationships, or rating curves, for each of the five stream gauge stations were generated by Questa Engineering Corps in 2007 as part of the San Luis Obispo Creek Watershed Hydrology and Hydraulic Model Calibration Study. More recently (2018/2019), Central Coast Salmon Enhancement has approximated rating curves for the Andrews St., Elks Lane, and Stenner Creek gauge stations based on recorded stage data and measured flows. The location of the five County gauges are presented in Figure 3-10.

In addition to the County gauges, the City of San Luis Obispo routinely estimates flow at four locations (RW-4, RW-5, RW-7, RW-8) along San Luis Obispo Creek in the vicinity of the City's WRRF outfall as part of its National Pollutant Discharge Elimination System permitting program. RW-8 at South Higuera Bridge is located outside of the SLO Basin. Flow at the four locations (RW-4, RW-5, RW-7, and RW-8) is calculated weekly from April through the end of October based on the depth measurements recorded along the creek cross-section and are located within the Basin.

Table 3-4: Stream gauges and summary of records available.

Stream Gage	Source	Data Recorded	Data Interval	Year Data Begins	Datum[1]
Andrews St Bridge	SLO County	Stage	15 Minutes	2006	NAVD 88
Stenner Creek at Nipomo	SLO County	Stage	15 Minutes	2005	NAVD 88
Elks Ln	SLO County	Stage	15 Minutes	2005	NAVD 88
Madonna Rd	SLO County	Stage	15 Minutes	2005	NAVD 88
E. Fork at Jespersen Rd	SLO County	Stage	15 Minutes	2005	NAVD 88
Marsh Street Bridge	SLO County	Stage	15 Minutes	2019	NAVD 88
RW-4	City of SLO	Depth, Flow	Weekly	2005	-
RW-5	City of SLO	Depth, Flow	Weekly	2005	-
RW-7	City of SLO	Depth, Flow	Weekly	2005	-
RW-8	City of SLO	Depth, Flow	Weekly	2005	-

[1]Prior to 5/23/2017 County data was recorded on NGVD 29 datum. Conversion is 2.86 feet.

3.6.1.4 Climate Monitoring

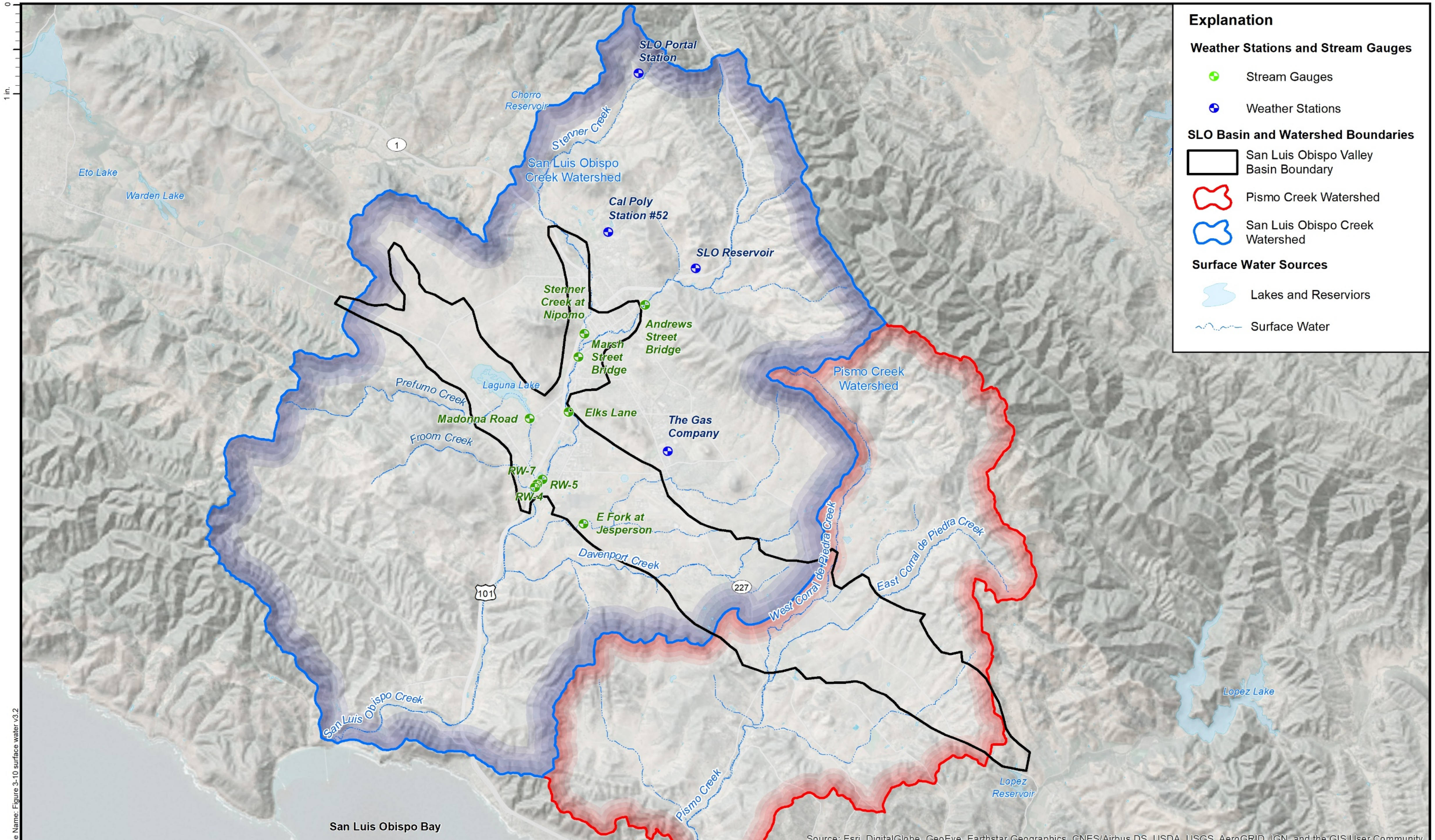
Climate monitoring in the SLO Basin includes stations that collect data related to temperature, evapotranspiration, relative humidity, atmospheric pressure, precipitation, and other climate parameters. Four stations monitored by San Luis Obispo County Public Works collect one or more climate parameters in the SLO Basin. The locations of these stations are shown on Figure 3-10.

The National Climatic Data Center has three stations within the County of San Luis Obispo and one station within the SLO Basin that collect climate data. These stations do not have extensive historic data. The station with the most precipitation data not associated with the National Climatic Data Center, Cal Poly Weather Station 52 (CPWS-52), began recording data in 1870. The Cal Poly Weather Station 52 measures daily temperatures and other climate parameters in addition to precipitation. Daily records are available from April 1986 to present. Table 3-5 lists the climate stations and summary of records available.

The long-term precipitation and cumulative departure from the mean (CDFM) measurements at CPWS-52 are shown in Figure 3-11 from 1870 - 2018. Average annual precipitation at this station varies from approximately 7 to 55 inches with a mean annual average precipitation of 21.95 inches. The longest dry period on record occurred from 1943 – 1965 and the longest wet period on record occurred from 1899 – 1916. Table 3-6 provides a summary of average monthly rainfall, temperature, and evapotranspiration (ET_0) for the SLO Basin from CPWS-52.

Table 3-5: Weather station Information and summary of records available.

Station	Source	Data Recorded	Data Interval	Year Data Begins
Cal Poly Weather Station 52	CIMIS	Precipitation, Temperature, Evapotranspiration	Daily	1986
SLO Reservoir	SLO County	Precipitation	12-Hour	2005
The Gas Company	SLO County	Precipitation	12-Hour	2005
South Portal	SLO County	Precipitation	12-Hour	2005
SLO County Farm Bureau	Weather Element	Precipitation, Temperature	Daily	2015



Prepared for:

Author: EC
Date: 11/24/2019

SAN LUIS OBISPO VALLEY BASIN GSP

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References:

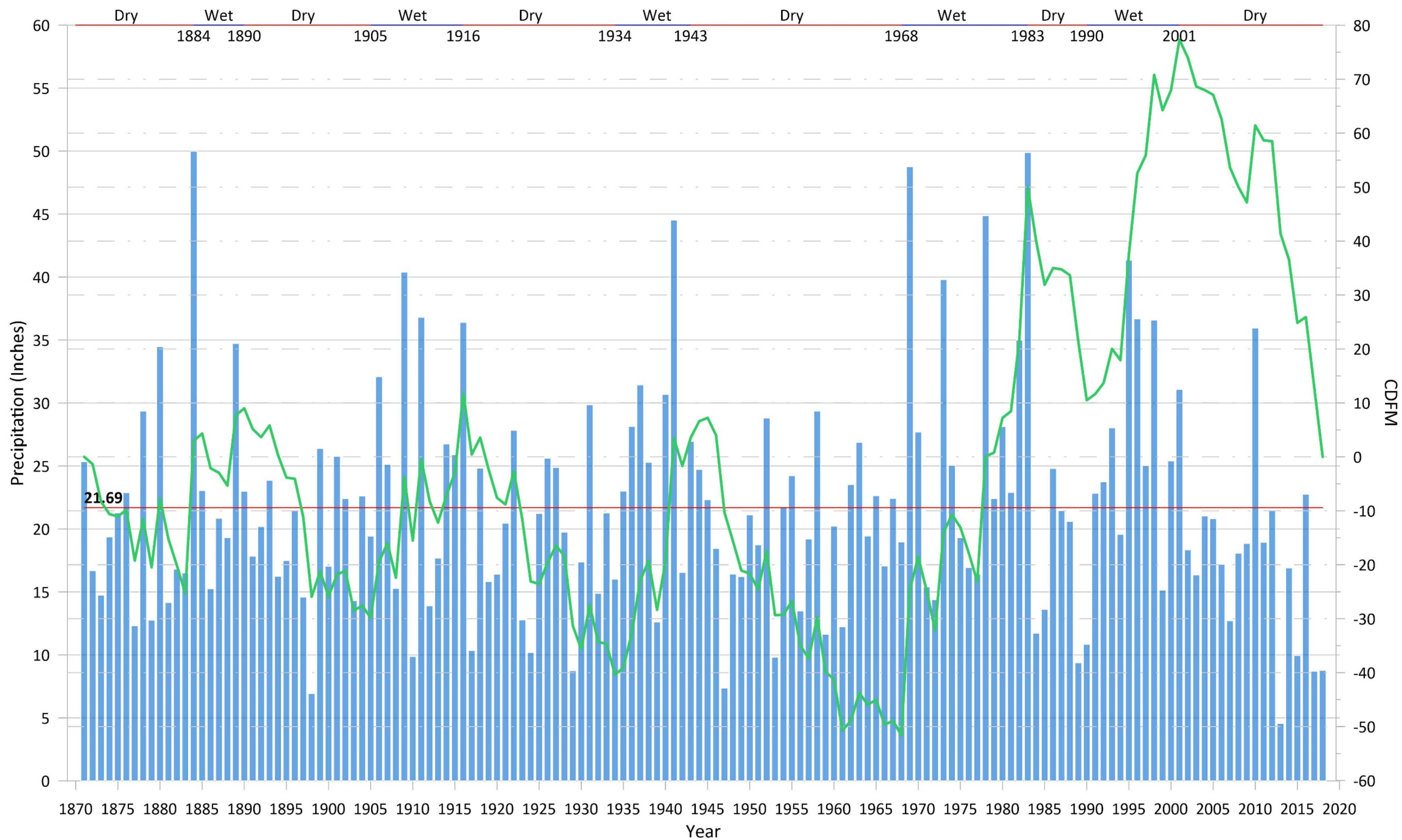
1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
2.
3.

Notes:

1. Stream gauge and weather station locations provided by the County and Natioanl Climatic Data Center
2. Pismo Creek watershed and the combined upper and lower San Luis Obispo Creek watersheds are based on USGS Hydrologic Units (HUC-12)
3.

San Luis Obispo Valley Basin Surface Water Features, Weather Stations, and Stream Gauges

Figure 3-10



Prepared for:

Author: EC

11/26/2019

SAN LUIS OBISPO VALLEY BASIN GSP

Legend

Precipitation (Annual)

CDFM

Historical Average Precipitation

Notes:

1. Data Source: Cal Poly State University, Cal Poly/NOAA Station

San Luis Obispo Historical Annual Precipitation and CDFM

Figure 3-11

Table 3-6. Average Monthly Climate Summary 1987 – 2018 at Cal Poly Weather Station 52.

Month	Average Precipitation (inches)[a]	Average ET_0 (inches)[a]	Average Temperature (°F)[a]
January	0.14	0.07	54
February	0.15	0.09	54
March	0.11	0.12	56
April	0.03	0.16	57
May	0.02	0.18	59
June	0.01	0.2	62
July	0	0.2	64
August	0.13	0.19	64
September	0.2	0.16	64
October	0.04	0.13	63
November	0.05	0.09	58
December	0.11	0.07	53
Monthly Average	0.08	0.14	59
Average Calendar Year	21.69[b]	0.14	59

Notes:
[a] Average of monthly data at Cal Poly SLO Weather Station 52 1987 – 2018.
[b] Average Calendar Year is not the sum of the monthly average, but rather a historical annual average over the period of record from 1871 – 2018.

3.6.2 Existing Management Plans

There are numerous groundwater and water management plans and study reports that cover either the whole or portion of the SLO Basin. These plans and reports are described in the following subsections, along with brief descriptions of how they relate to the management of current water supply, projected water supplies, and land use.

3.6.2.1 SLO Basin Characterization and Monitoring Well Installation

The SLO Basin Characterization and Monitoring Well Installation documents the available published reports, private well reports, well completion reports, geologic logs, and other data that were reviewed to generate a comprehensive compilation of the current understanding of the hydrogeologic setting of the SLO Basin. This information is intended to provide the basis of knowledge for future planning and management activities performed under the requirements of GMA, including the development of a hydrogeologic conceptual model, construction of a numerical groundwater model, and development of a GSP.

3.6.2.2 San Luis Obispo County Master Water Report (2012)

The County's Master Water Report (MWR) is a compilation of the current and future water resource management activities being undertaken by various entities within the County and is organized by Water Planning Areas (WPA). The MWR explores how these activities interrelate, analyzes current and future supplies and demands, identifies future water management strategies and ways to optimize existing strategies, and documents the role of the MWR in supporting other water resource planning efforts. The MWR evaluates and compares the available water supplies to the water demands for the different water planning areas. This was accomplished by reviewing or developing the following:

- Current water supplies and demands based on available information

- Forecast water demands and water supplies available in the future under current land use policies and designations
- Criteria under which there is a shortfall when looking at supplies versus demands
- Criteria for analyzing potential water resource management strategies, projects, programs, or policies
- Potential water resource management strategies, projects, programs, or policies to resolve potential supply deficiencies

3.6.2.3 San Luis Obispo County Integrated Regional Water Management Plan (2014)

The San Luis Obispo County Integrated Regional Water Management Plan (IRWMP) was initially developed and adopted by the SLOFCWCD in 2005 (GEI Consultants, 2005), and has been updated several times. The SLOFCWCD, in cooperation with the SLOFCWCD's Water Resources Advisory Committee (WRAC), prepared the 2014 IRWMP (San Luis Obispo County, 2014) to align the region's water resources management planning efforts with the State's planning efforts. The IRWMP is used to support the region's water resource management planning and submittal of grant applications to fund these efforts.

The IRWMP includes goals and objectives that provide the basis for decision-making and are used to evaluate project benefits. The goals and objectives reflect input from interested stakeholders on the region's major water resources issues. These goals and objectives help secure and enhance the water supply reliability, water quality, ecosystems, groundwater, flood management and water-related communication efforts across the entire region. In addition, the IRWMP identifies resource management strategies, recognizes other funding opportunities and includes a list of action items (projects, programs, and studies) that agencies around the region are undertaking to achieve and further these goals and objectives.

The IRWMP is currently being updated with a DWR submittal target date of December 2019 and adoption by local agencies scheduled for Summer 2020.

3.6.2.4 City of San Luis Obispo 2015 Urban Water Management Plan (2016)

The City's Urban Water Management Plan (UWMP) describes the City's current and future water demands, identifies current water supply sources, and assesses supply reliability for the City. The UWMP describes the City's use of groundwater and its support for efforts to avoid overdraft by developing additional sources. The UWMP provides a forecast of future growth, water demand, and water sources for the City through 2035. These sources include water conservation, Nacimiento Water Project, Salinas Reservoir (Santa Margarita Lake), Whale Rock Reservoir, SLO Basin groundwater, and recycled water from the WRRF. The UWMP identifies beneficial impacts to groundwater quality through the use of these sources.

3.6.3 Existing Groundwater Regulatory Programs

3.6.3.1 Groundwater Export Ordinance (2015)

In 2015, County of San Luis Obispo adopted an Exportation of Groundwater ordinance (County Code Chapter 8.95) that requires a permit for the export of groundwater out of a groundwater basin or out of the County. An export permit is only approved if the Department of Public Works Director or his/her designee finds that moving the water would not have any adverse impacts to groundwater resources, such as causing aquifer levels to drop, disrupting the flow of neighboring wells, or resulting in seawater intrusion. Export permits are only valid for one year.

3.6.3.2 Countywide Water Conservation Program Resolution 2015-288 (2015)

The ordinance also identified areas of severe decline in groundwater elevation and properties overlying these areas would be further restricted from planting new or expanding irrigated agriculture except for those converting irrigated agriculture on the same property into a different crop type. This resolution applies to the Nipomo Mesa Water Conservation Area which is part of the Santa Maria Groundwater Basin, the Los Osos Groundwater Basin, and the Paso Robles Groundwater Basin. Therefore, it is not applicable to the SLO Basin.

3.6.3.3 Agricultural Order R3-2017-002 (2017)

In 2017 the CCRWQCB issued Agricultural Order No. R3-2017-0002, a Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands. The permit requires that growers implement practices to reduce nitrate leaching into groundwater and improve surface receiving water quality. Specific requirements for individual growers are structured into three tiers based on the relative risk their operations pose to water quality.

Growers must enroll, pay fees, and meet various monitoring and reporting requirements according to the tier to which they are assigned. All growers are required to implement groundwater monitoring, either individually or as part of a cooperative regional monitoring program. Growers electing to implement individual monitoring (i.e., not participating in the regional monitoring program implanted by the Central Coast Groundwater Coalition [CCGC]) are required to test all on-farm domestic wells and the primary irrigation supply wells for nitrate or nitrate plus nitrite, and general minerals (including, but not limited to, TDS, sodium, chloride, and sulfate).

3.6.3.4 Water Quality Control Plan for the Central Coast Basins (2017)

The Water Quality Control Plan for the Central Coastal Basin (Basin Plan) was most recently updated in September 2017 by the SWRCB. The objective of the Basin Plan is to outline how the quality of the surface water and groundwater in the Central Coast Region should be managed to provide the highest water quality reasonably possible.

The Basin Plan lists beneficial users, describes the water quality that must be maintained to allow those uses, provides an implementation plan, details SWRCB and CCRWQCB plans and policies to protect water quality, and a statewide surveillance and monitoring program as well as regional surveillance and monitoring programs.

Present and potential future beneficial uses for inland waters in the SLO Basin are: surface water and groundwater as municipal supply (water for community, military or individual water supplies); agricultural; groundwater recharge; recreational water contact and non-contact; sport fishing; warm fresh water habitat; wildlife habitat; rare threatened or endangered species; and spawning, reproduction, and/or early development of fish.

Water Quality Objectives for both groundwater (drinking water and irrigation) and surface water are provided in the Basin Plan.

3.6.3.5 California DWR Well Standards (1991)

Under the CWC Sections 13700 to 13806, DWR has the responsibility for developing well standards. DWR maintains these standards to protect groundwater quality. California Well Standards, published as DWR Bulletin 74, represent minimum standards for well construction, alteration, and destruction to protect groundwater. Cities, counties, and water agencies in California have regulatory authority over wells and can adopt local well ordinances that meet or exceed the statewide Well Standards. When a well is constructed, modified or destroyed a well completion report is required to be submitted to DWR.

3.6.3.6 Requirements for New Wells (2017)

Senate Bill 252 effective on January 1, 2018. SB 252 requires well permit applicants in critically overdrafted basins to include information about the proposed well, such as location, depth, and pumping capacity. The bill also requires the permitting agency to make the information easily accessible to the public and the GSA. As of 2019, these requirements are under review by DWR. This bill is not applicable because the SLO Basin is not a critically overdrafted basin.

3.6.3.7 Title 22 Drinking Water Program (2018)

The 2018 SWRCB DDW regulates public water systems in the State to ensure the delivery of safe drinking water to the public. A public water system is defined as a system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year. Private domestic wells, wells associated with drinking water systems with less than 15 residential service connections, and industrial and irrigation wells are not regulated by the DDW. Additional information regarding the public water systems can be found using the following link:
https://sdwis.waterboards.ca.gov/PDWW/JSP/WaterSystems.jsp?PointOfContactType=none&number=&name=&county=San%20Luis%20Obispo

The SWRCB DDW enforces the monitoring requirements established in Title 22 of CCR for public water system wells, and all the data collected must be reported to the DDW. Title 22 also designates the regulatory limits (e.g., maximum contaminant levels [MCLs]) for various waterborne contaminants, including volatile organic compounds, non-volatile synthetic organic compounds, inorganic chemicals, radionuclides, disinfection byproducts, general physical constituents, and other parameters.

3.6.3.8 Waterway Management Plan – San Luis Obispo Creek Watershed (2003)

The San Luis Obispo Creek Watershed Waterway Management Plan was created in response to several damaging floods that occurred in 1969, 1973, and 1995 that caused widespread damage throughout the watershed that includes out-of-bank flooding and extensive bank erosion. This plan identifies management problems and needs of the waterways, detailed hydrologic analyses of the watershed and its main tributaries. The plan also presents a Stream Management and Maintenance Program for the waterways of the watershed that outlines the planning, design, and permitting required to fully implement the program and a Drainage Design Manual that contains revised policies for floodplain and stream corridor management and redesigned flows for stream channels within the City boundary.

3.6.3.9 Incorporation Into GSP

Information in these various plans mentioned above has been incorporated into this GSP for consideration in the development of Sustainability Goals, when setting Minimum Thresholds and Measurable Objectives, and was considered during development of Projects and Management Actions to provide consistency among the above listed plans to achieve groundwater sustainability in the SLO Basin.

3.6.3.10 Limits to Operational Flexibility

Some of the existing management plans and ordinances will limit operational flexibility. These limits to operational flexibility have already been incorporated into the sustainability projects and programs included in this GSP. Examples of limits on operational flexibility include:

- The Groundwater Export Ordinance requires county approval to export of water out of the SLO Basin. This is likely not a significant limitation because exporting water out of the SLO Basin hinders sustainability.
- Title 22 Drinking Water Program regulates the quality of water that can be recharged into the SLO Basin.

3.7 CONJUNCTIVE USE PROGRAMS

There are no active conjunctive use programs currently operating within SLO Basin.

3.8 LAND USE PLANS

The County and City have land use authority in the SLO Basin and the other MOA Parties do not. However, SGMA requires the GSAs to consider land use documents by the overlying governing agencies when making decisions. Government Code Section 65350.5 and 65352 require review and consideration of groundwater requirements before the adoption or any substantial amendment of a city's or county's general plan. The planning agency shall review and consider GSPs and any proposed action should refer to the GSA and GSP. Land use is an important factor in water management as described below. The following sections provide a general description of these land use plans and how implementation may affect groundwater supply.

3.8.1 City of San Luis Obispo General Plan

The General Plan is the principal tool the City uses when evaluating municipal service improvements and land use proposals. Every service the City provides to its citizens can trace its roots back to goals and policies found in the General Plan. General Plan goals, policies, and implementation measures are based on an assessment of current and future needs and available resources. The land use element designates the general distribution and intensity of land uses, including the location and type of housing, businesses, industry, open space, and education, public buildings, and parks. Figure 3-12 shows the City's Land Use Map.

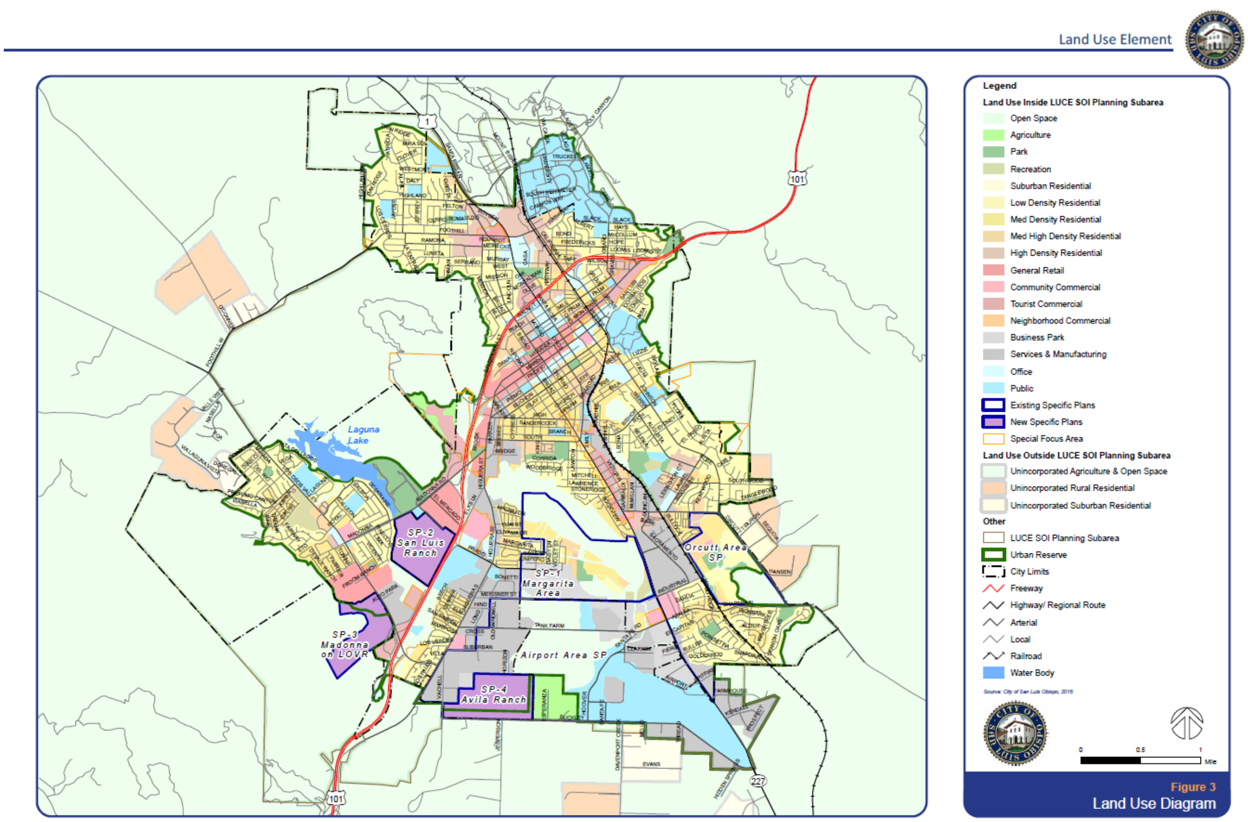


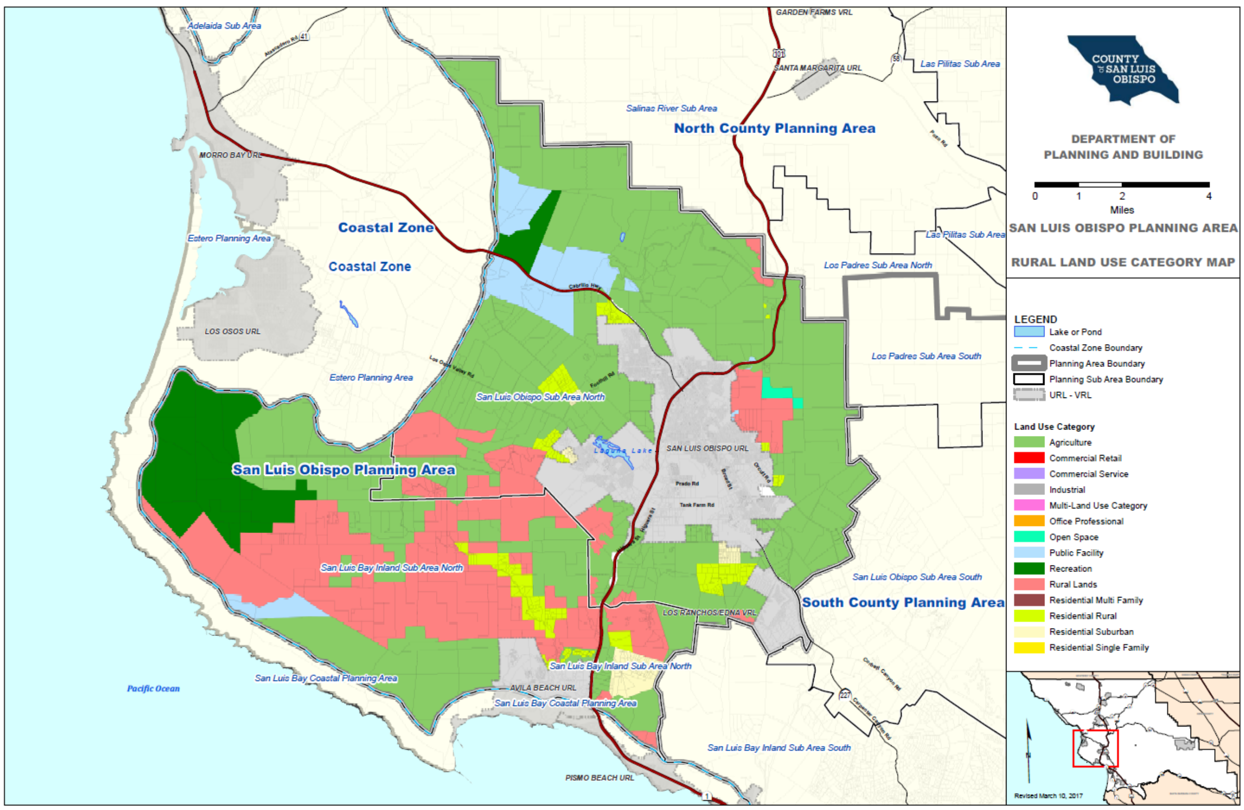
Figure 3-12. City Land Use Map

The City manages its housing supply growth so that it does not exceed one percent per year on average, excluding dwellings affordable to residents with extremely low, very low or low incomes as defined by the Housing Element. The City decided to adopt a Water and Wastewater Element addressing water resources and wastewater services because of the vital role of these resources and the far-reaching impacts of water policies on community growth and character. This element translates the Land Use Element's capacity for development into potential demand for water supply and wastewater services. This element outlines how the City plans to provide adequate water and wastewater services for its citizens, consistent with the goals and policies of other General Plan elements. As stated in the General Plan, the City has an adequate water supply to serve the community's existing and future water needs. The City envisions groundwater playing an important role in ensuring continued resiliency in its water supply portfolio.

3.8.2 County of San Luis Obispo General Plan

The 2014 County General Plan contains three pertinent elements that are related to land use and water supply. Pertinent sections include the Land Use, Agricultural, and Inland Area Plans elements.
The County's General Plan also contains programs that are specific, non-mandatory actions or policies recommended by the Land Use and Circulation Element (LUCE) to achieve community or area wide objectives. Implementing each LUCE program is the responsibility of the County or other public agency that is identified in the program. Programs are recommended actions rather than mandatory requirements. Implementation of any program by the County should be based on consideration of community needs and substantial community support for the program and its related cost.

The SLO Basin is within the San Luis Obispo Planning Area and South County Planning Area. The planning areas do not conform to the SLO Basin boundaries but do provide a general representation of the land use in the areas. Figure 3-13 and Figure 3-14 shows the planning areas and land uses.



Sources: County of San Luis Obispo, Department of Planning and Building, ParcelQuest, USGS National Hydrography Dataset, California Department of Finance

Figure 3-13. County Land Use Map (San Luis Obispo Planning Area)

The General Plan Framework for Planning does not provide tabular assessment of land use types and acres, or population projection estimates within the San Luis Obispo Planning Area and South County Planning Area. Therefore, projected demands and supplies based on land use aren't identified for the SLO Basin in the Land Use element.

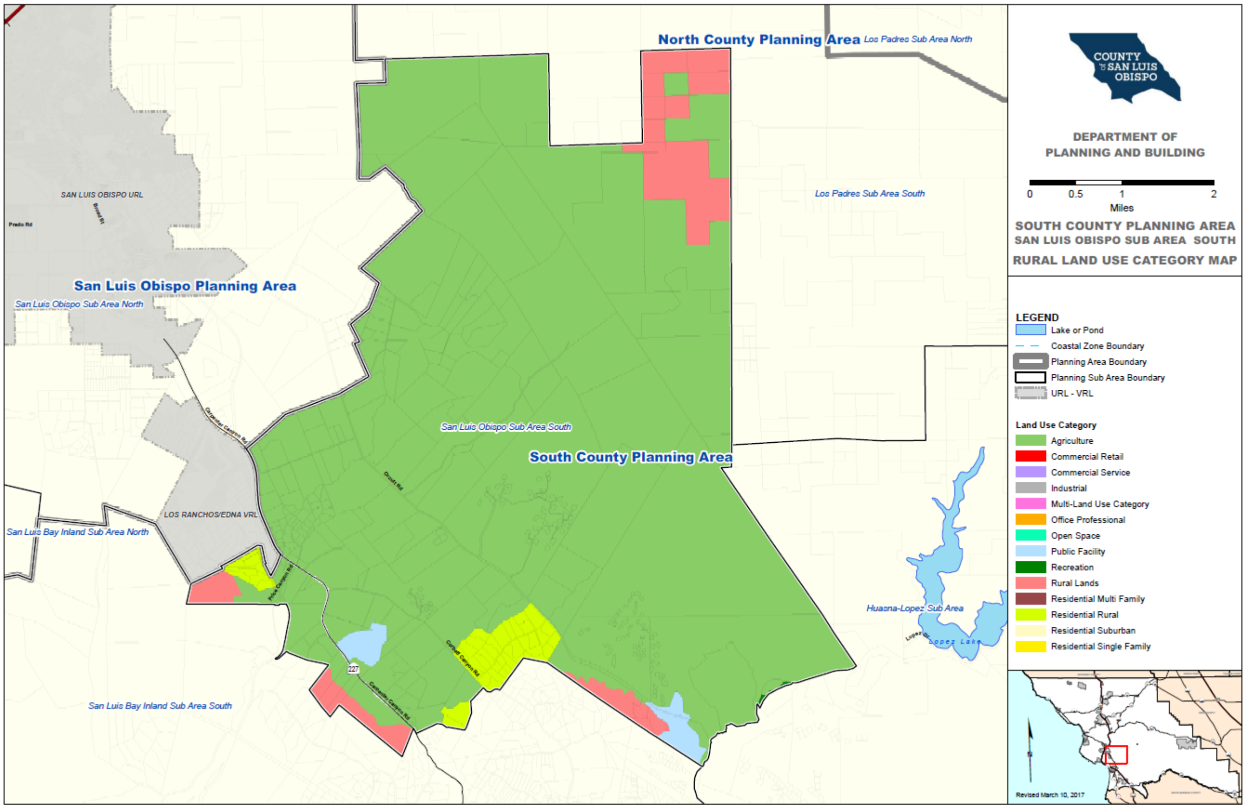


Figure 3-14. County Land Use Map (South County Planning Area)

3.8.3 Los Ranchos/Edna Village Plan

More specifically, the Los Ranchos/Edna Village Plan establishes a vision for the future that will guide land use and transportation over the next 20 years. This village plan is part of Part III of the LUCE of the County General Plan within the San Luis Obispo Planning Area. The Framework for Planning (LUCE Part I) is the central policy document, while this plan contains programs more specifically applicable to the Los Ranchos/Edna village area. In accordance with the Framework for Planning, allowable densities (intensity of land use) are established (Figure 3-15). The San Luis Obispo Area Plan contains regional land use and circulation goals, policies, and programs that also apply to Los Ranchos/Edna. Table 3-7 and summarize the acreage and distribution of each land use category in Los Ranchos/Edna village. Rural land use acreage is summarized in the Framework for Planning.

Table 3-7. Los Ranchos/Edna Land Use Acreage

Land Use Categories	Acreage
Agriculture	0
Rural Lands	0
Recreation	235
Open Space	0
Residential Rural	394
Residential Suburban	259
Residential Single Family	59
Residential Multi-Family	0
Office and Professional	0
Commercial Retail	0
Commercial Service	0
Industrial	0
Public Facilities	10
Dalidio Ranch	0
Total	**957**

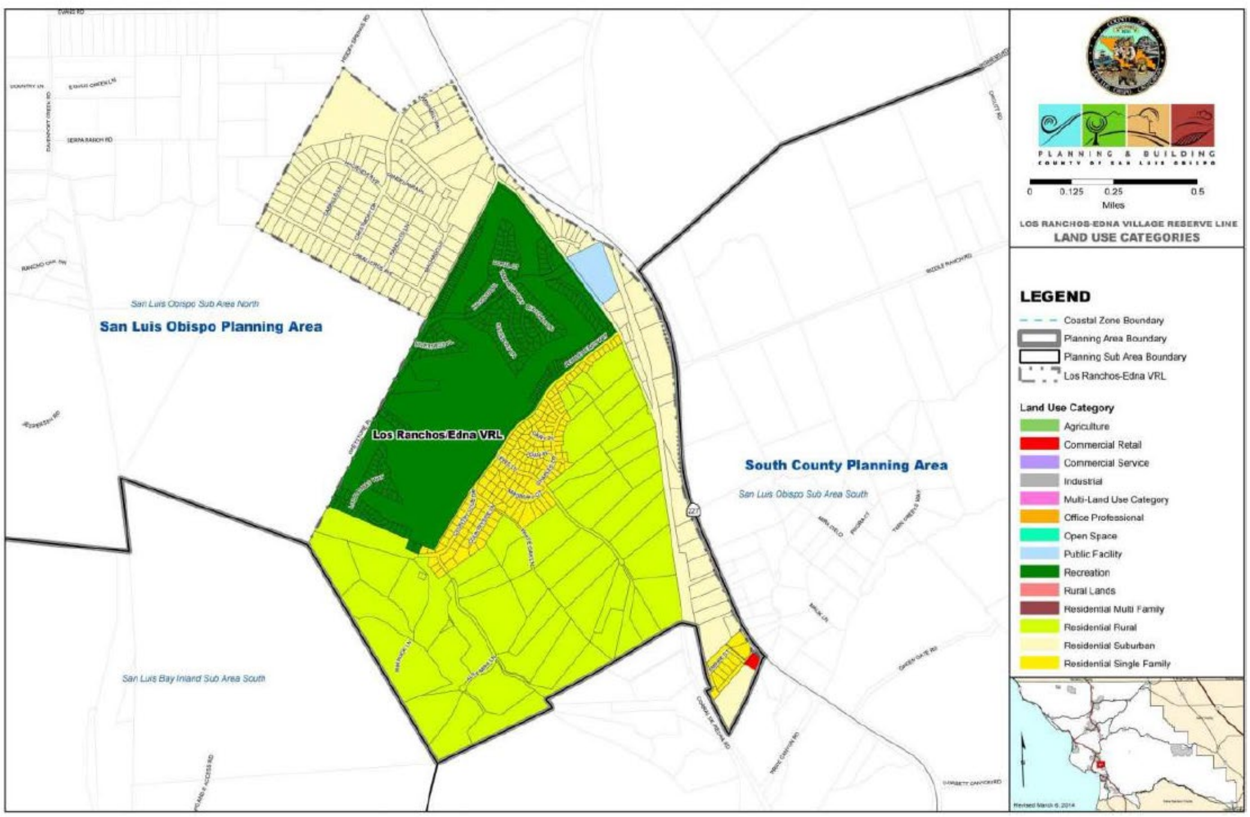


Figure 3-15. Los Ranchos/Edna Land Use Map

3.8.4 Plan Implementation Effects on Existing Land Use

This section to be completed after GSP is complete.

3.8.5 Plan Implementation Effects on Water Supply

This section to be completed after GSP is complete.

3.8.6 Well Permitting/Ordinance

This section to be completed after GSP is complete.

3.8.7 Land Use Plans Outside of Basin

The Parties submitting this GSP have not included information regarding the implementation of land use plans outside of the SLO Basin as adjacent basins are also required to implement SGMA and their GSPs will require them to achieve sustainable groundwater management.

3.9 MANAGEMENT AREAS

This section to be completed after GSP is complete.

3.9.1 Reason for Creation

3.10 ADDITIONAL GSP ELEMENTS, IF APPLICABLE

4 BASIN SETTING (§ 354.14)

This section describes the geologic setting of the San Luis Obispo Valley Groundwater Basin (Basin), including the Basin boundaries, geologic formations and structures, principal aquifer units, geologic cross sections, and hydraulic parameter data. The information presented in this chapter, when considered with the information presented in Chapter 5 (Groundwater Conditions) and Chapter 6 (Water Budget), comprises the basis of the Hydrogeologic Conceptual Model (HCM) of the Basin. This section draws upon previously published studies, primarily a hydrogeologic and geologic investigation prepared by GSI for the San Luis Obispo County Flood Control and Water Conservation District (SLOCFCWCD) in 2018, as well as a 1997 draft report, "San Luis-Edna Groundwater Basin Study, Draft Report" (DWR, 1997), which was prepared but never finalized for official publication, and a 1991 report by Boyle Engineering (Ground Water Basin Evaluation) that was prepared for the City. The data and information presented in this section is not intended to be exhaustive but is a summary of the relevant and important aspects of the Basin geology that influence groundwater sustainability. More detailed information can be found in the original reports discussed above. This section presents the framework for subsequent sections on groundwater conditions and water budgets.

As part of the GSP process, a numerical groundwater model is being developed for the Basin to use as a tool in the planning process (Appendix ZZ). Much of the information comprising the HCM presented in Chapters 4, 5, and 6 of the GSP is applied directly to the development of the groundwater model. Physical data on the geology and hydrogeologic parameters of the Basin presented in Chapter 4 are used to develop the model structure and parameterization. Data on groundwater conditions and water budget presented in Chapters 5 and 6 are used in model calibration.

Multiple sources and types of data are presented in Chapters 4, 5, and 6. Some of this data, such as rainfall amounts, depth to groundwater, and depth to bedrock, is directly measurable and involves a low degree of uncertainty. Other data, such as aquifer transmissivity, is based on calculations and interpretations of observed data, but is not directly measurable, and so involves a greater amount of uncertainty than direct measurements. And finally, values presented in the water budget are primarily derived from analysis of related data; almost none of the water budget components are directly measurable, and so involve more uncertainty than the previously discussed data types.

4.1 BASIN TOPOGRAPHY AND BOUNDARIES

The Basin is oriented in a northwest-southeast direction and is composed of unconsolidated or loosely consolidated sedimentary deposits. It is approximately 14 miles long and 1.5 miles wide. It covers a surface area of about 12,700 acres (19.9 square miles). The Basin is bounded on the northeast by the relatively impermeable bedrock formations of the Santa Lucia Range, and on the southwest by the formations of the San Luis Range and the Edna fault system. The bottom of the Basin is defined by the contact of permeable sediments with the impermeable bedrock Miocene-aged and Franciscan Assemblage rocks (DWR, 2003). A topographic map displaying the Basin boundaries is presented in Figure 4-1, which also displays the watershed areas of the San Luis Obispo Creek and Pismo Creek drainages. An aerial photo of the Basin area is presented in Figure 4-2. Elevations within the Basin range from over 500 feet above mean seal level in the southeastern extent of Edna Valley, to under 100 feet above mean sea level where San Luis Obispo Creek flows out of the Basin.

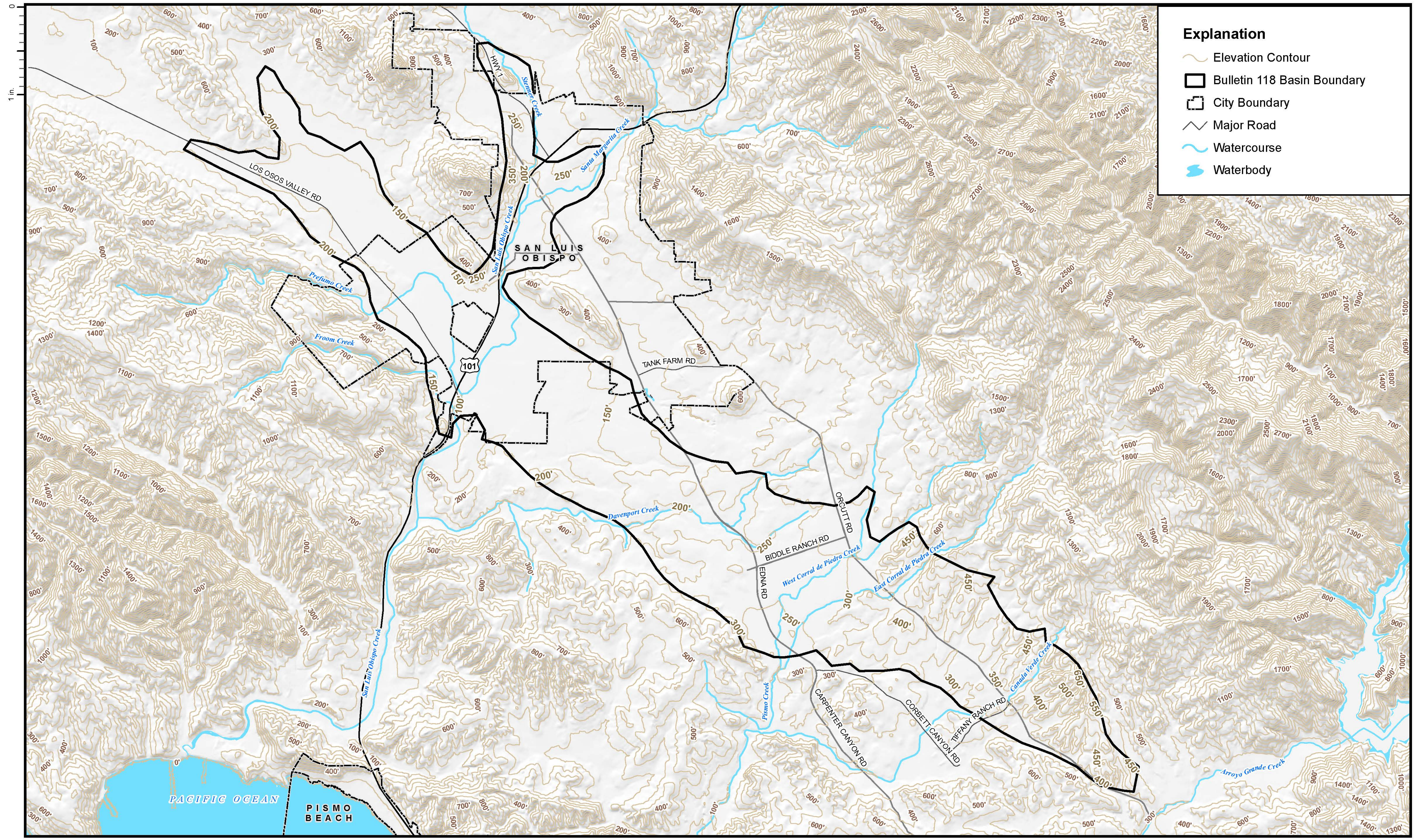
The Basin is commonly referenced as being composed of two distinct valleys, with the San Luis Valley in the northwest and the Edna Valley in the southeast. The San Luis Valley comprises approximately the northwestern half of the Basin. It is the area of the Basin drained by San Luis Obispo Creek and its tributaries (Prefumo Creek and Stenner Creek west of Highway 101, Davenport Creek and smaller tributaries east of Highway 101). Surface drainage in San Luis Valley drains out of the Basin flowing to the south along the course of San Luis Obispo Creek toward the coast in the Avila Beach area, approximately along the course of Highway 101. The San Luis Valley includes part of the City and California Polytechnic University (Cal Poly) jurisdictional boundaries, while the remainder of the valley is unincorporated land. Land use in the City is primarily municipal, residential, and industrial. The area in the northwest part of the Basin, along Los Osos Valley Road, has significant areas of irrigated agriculture, primarily row crops.

The Edna Valley comprises approximately the southeastern half of the Basin. The primary creeks that drain the Basin are the east and west branches of Corral de Piedras Creek; the Corral de Piedras Creek tributaries join to form Pismo Creek, draining south out of the Edna Valley into Price Canyon. Canada de Verde Creek is also a significant tributary that flows south out of the Basin in the extreme southeastern part of Edna Valley, ultimately joining Pismo Creek (Figures 4-1 and 4-2). The Edna Valley includes unincorporated lands, including lands associated with various private water purveyors. The primary land use in the Edna Valley is agriculture. During the past two decades, wine grapes have become the most significant crop type in the Edna Valley.

The primary weather patterns for the Basin are derived from seasonal patterns of atmospheric conditions that originate over the Pacific Ocean and move inland. As storm fronts move in from the coast, rainfall in the area falls more heavily in the mountains, and the Basin itself receives less rainfall because of a muted rain shadow effect. Average annual precipitation ranges from approximately 18 inches throughout most of the Basin to about 22 inches in relatively higher elevation areas near the City and Cal Poly (Figure 4-3). The time series of annual precipitation for the period of record from 1871 to 2018 at the Cal Poly weather station is presented in Figure 3-11. The average rainfall at this location is 21.69 inches, with a standard deviation of 8.71 inches. The historical maximum is 49.99 inches, which occurred in 1884. The historical minimum is 4.56 inches, which occurred in 2013.

The physical definition of the Basin boundary is the occurrence of unconsolidated or loosely consolidated saturated sediments down to the contact with the basement rock of the Miocene-aged formations and Franciscan Assemblage. (The geologic units will be described in more detail Section 4-4.) Figure 4-4presents a surface defining the bottom boundary of the Basin, based on the elevation of bedrock surface below the Basin sediments. There is a topographic high point in the underlying bedrock elevation between the San Luis Valley and Edna Valley sub-areas. As shown, the watershed divide and the bedrock divide are not coincident.

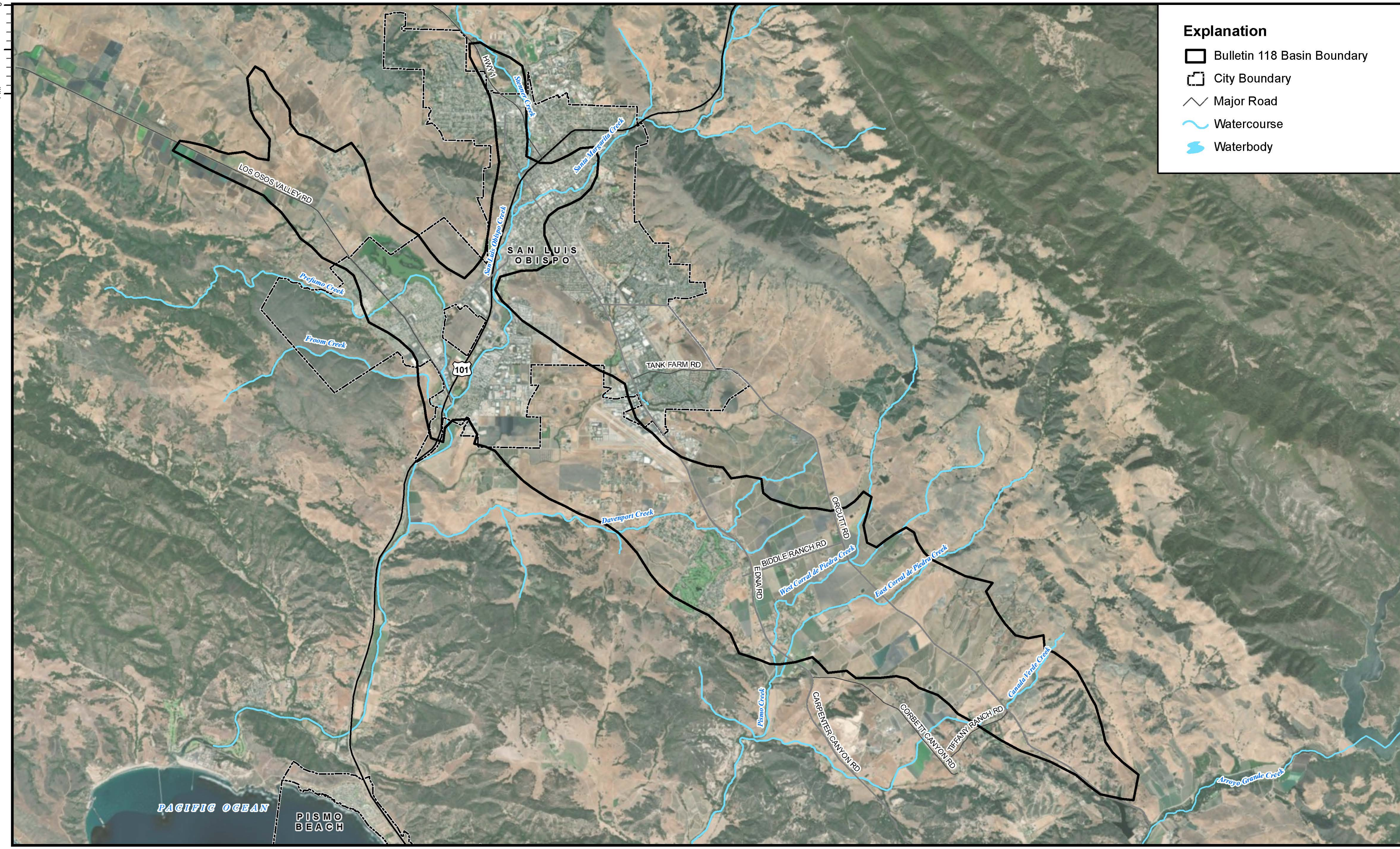
Figure 4-5 presents contours of total thickness of the Basin sediments; the inset figure displays the thickness of sediments in a longitudinal cross section. It is apparent from Figure 4-6 that the sediments of the Edna Valley have significantly greater thickness than those of the San Luis Valley. The longitudinal profile of the Basin from the northwest on the left of the figure to the southeast on the right indicates the watershed divide present in the vicinity of Biddle Ranch Road, indicated on Figure 4-4 and Figure 4-5. Precipitation that falls west of that divide ultimately flows to Davenport and San Luis Obispo Creeks, and precipitation that falls east of that divide flows to Corral de Piedras Creek or the other small tributaries, ultimately flowing to Pismo Creek south of the Basin.



References:
1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
2.San Luis Obispo County
3. USGS

Topographic Map

Figure 4-1



Prepared for:

Author: AB
Date: 11/25/2019

SAN LUIS OBISPO VALLEY BASIN GSP

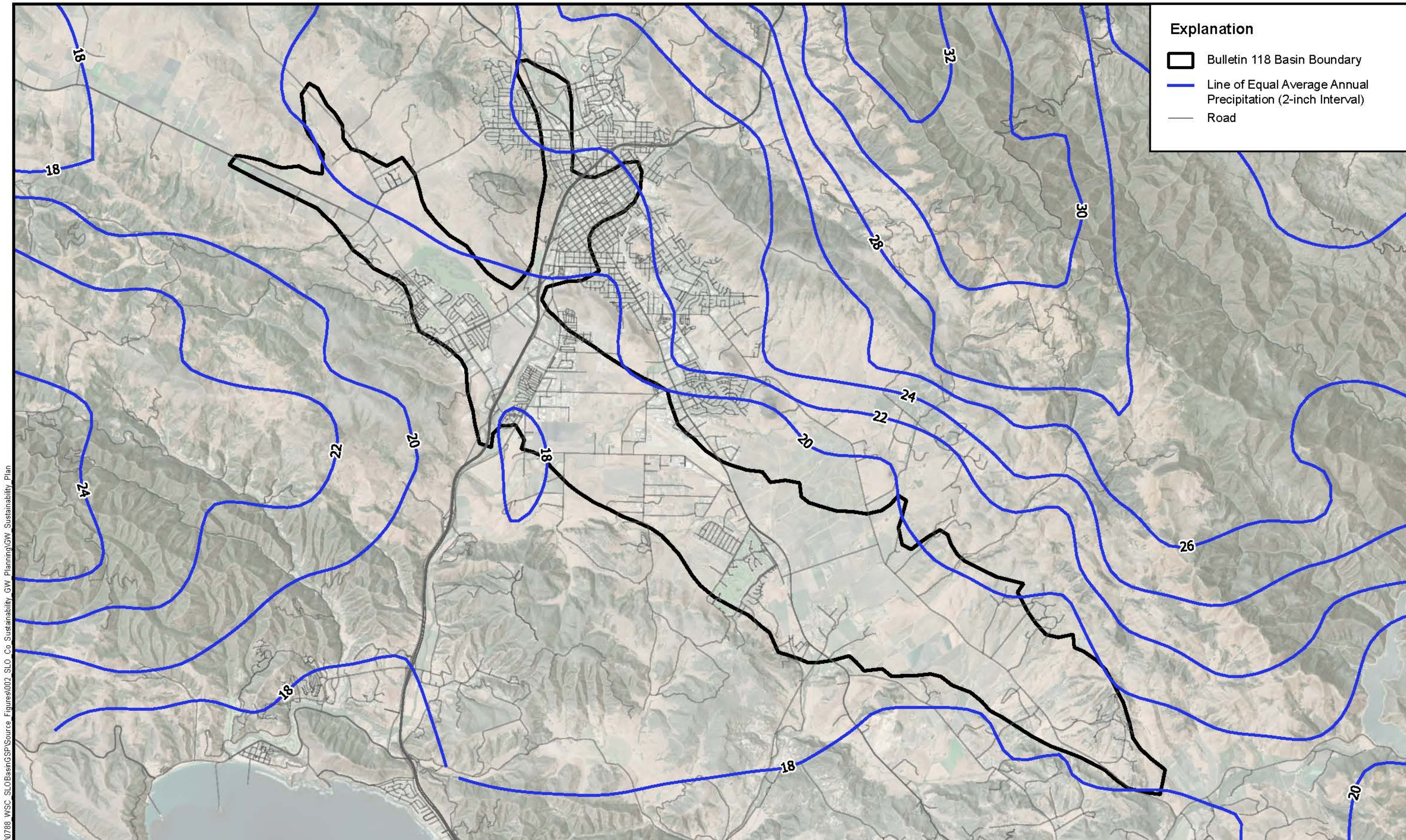
N

0 0.25 0.5 1 Miles
0 0.425 0.85 1.7 Kilometers

References:
1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
2.San Luis Obispo County
3. Digiglobe 2018

Aerial Photograph

Figure 4-2



Prepared for:

Author: NP
Date: 10/31/2019

SAN LUIS OBISPO VALLEY BASIN GSP

N

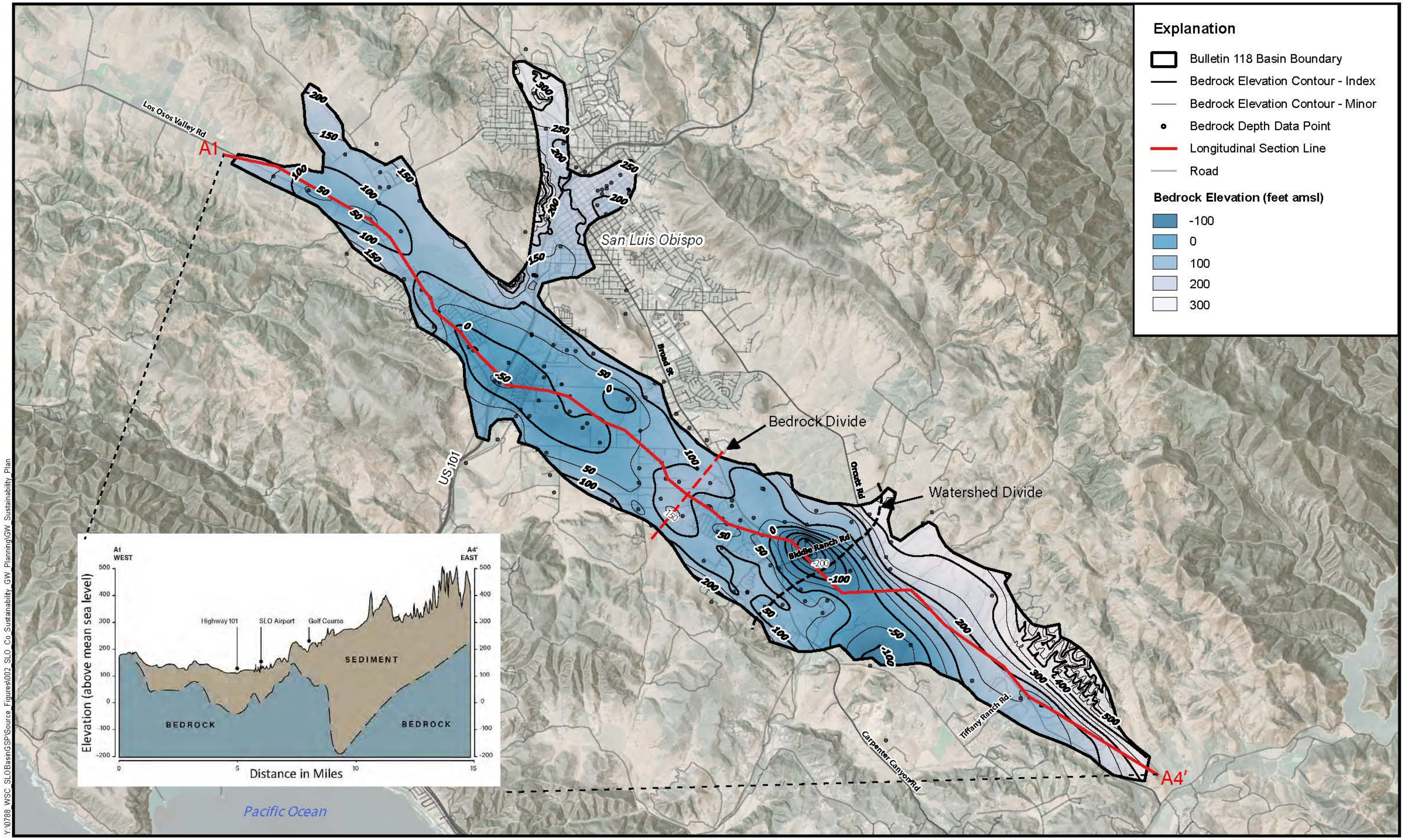
0 0.25 0.5 1 Miles
0 0.425 0.85 1.7 Kilometers

References:
1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
2. San Luis Obispo County
3. PRISM Climate Group (Oregon State University)

Notes:
1. Precipitation data from: PRISM 30 yr Normal sataset (1981-2010)

Annual Precipitation

Figure 4-3



Prepared for:

Author: NP
Date: 10/31/2019

SAN LUIS OBISPO VALLEY BASIN GSP

N

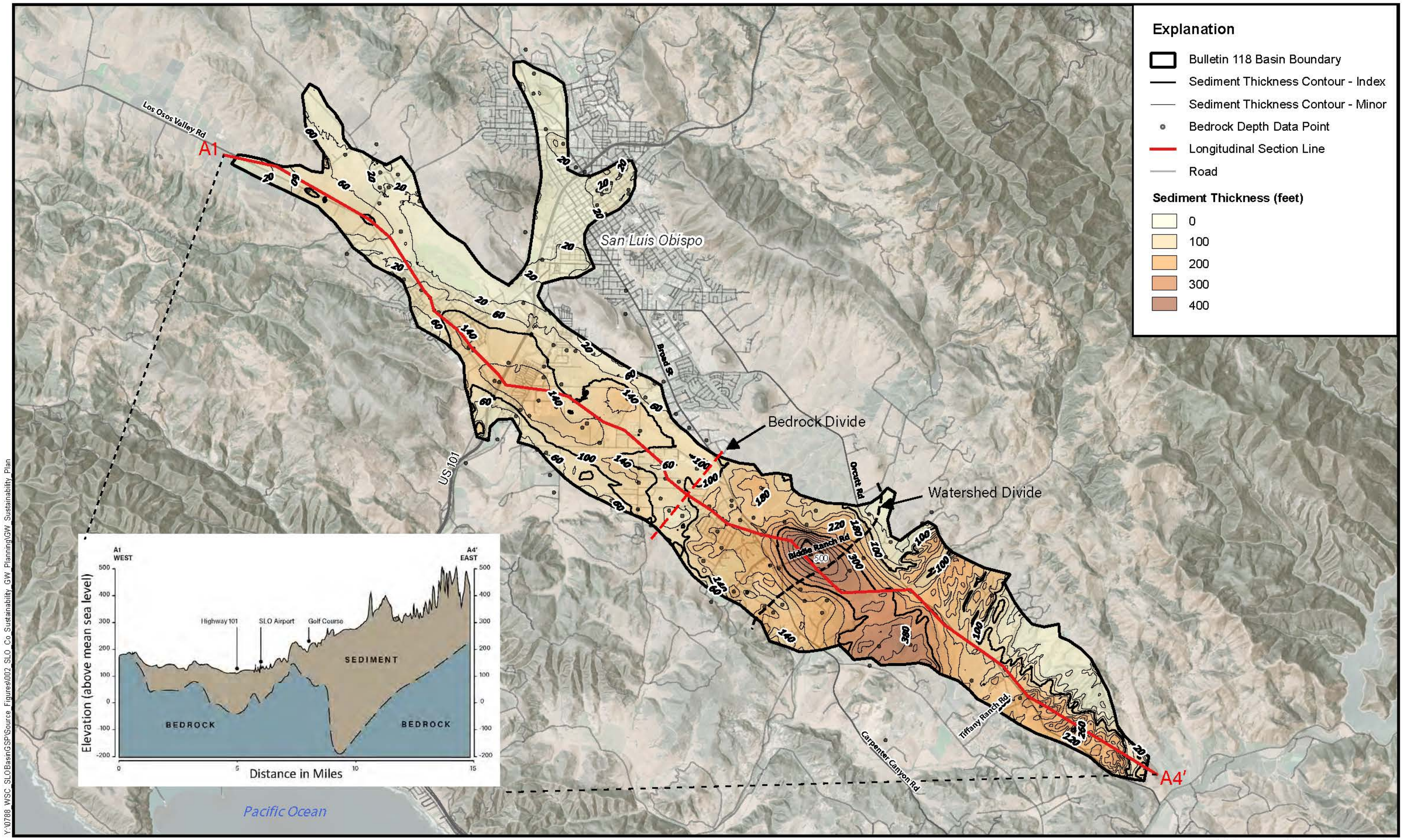
0 0.25 0.5 1 Miles

0 0.425 0.85 1.7 Kilometers

References:
1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
2. San Luis Obispo County
3. USGS

Bottom Elevation of Basin

Figure 4-4



Prepared for:

Author: NP
Date: 10/31/2019

SAN LUIS OBISPO VALLEY BASIN GSP

N

0 0.25 0.5 1 Miles
0 0.425 0.85 1.7 Kilometers

References:
1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
2. San Luis Obispo County
3. USGS

Notes:
1. Contour Interval = 40 feet

Thickness of Basin Sediments

Figure 4-5

4.2 PRIMARY USERS OF GROUNDWATER

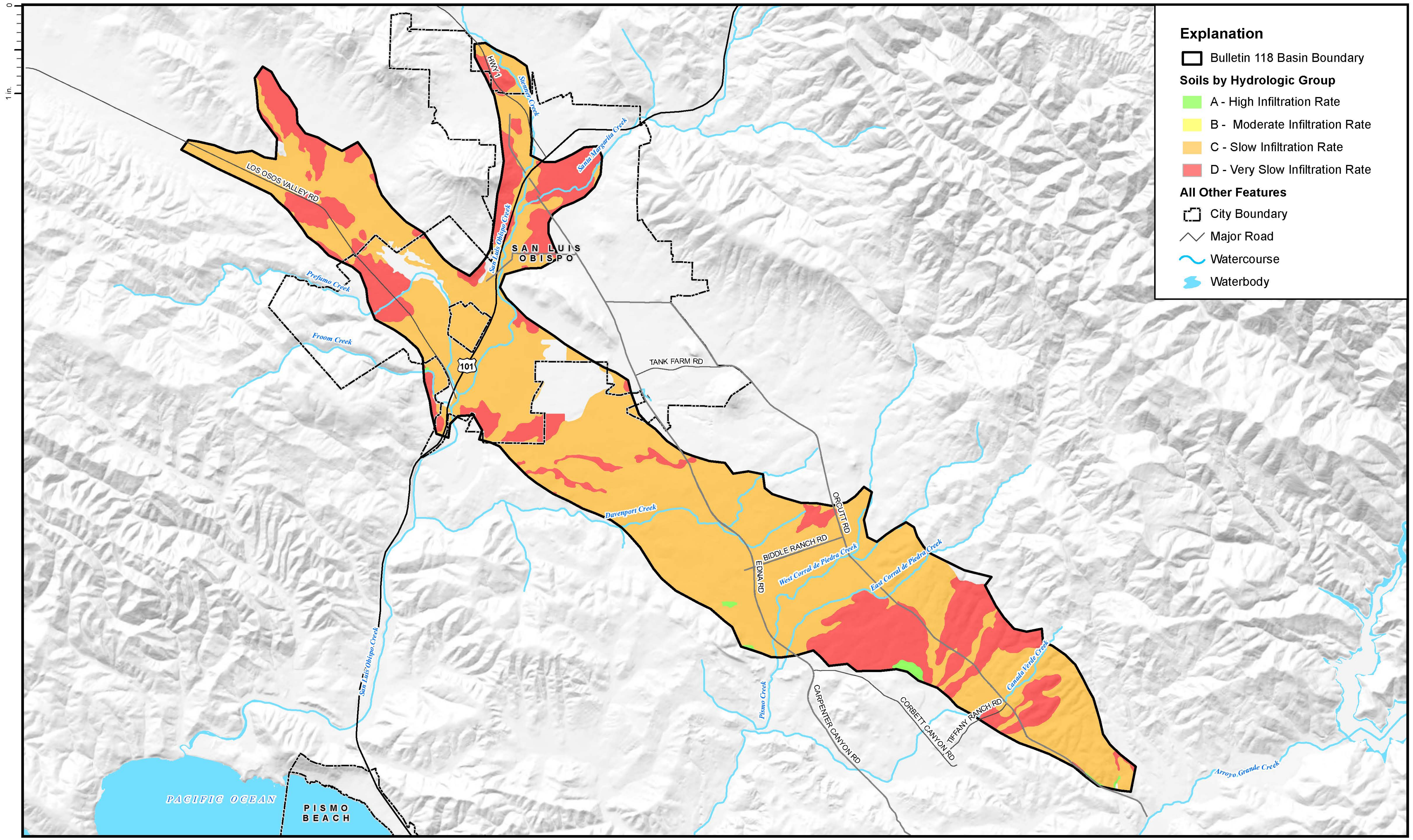
The primary groundwater users in the Basin include municipal, agricultural, and domestic (i.e., rural residential, small community water systems, and small commercial entities). These entities are discussed in more detail in Chapter 2 of this report. The City currently receives most or all of its supply from surface water sources including Whale Rock Reservoir, Santa Margarita Reservoir, Nacimiento Reservoir, and recycled water (Figure 3-3). However, it maintains its network of production wells in standby mode for emergency supply and intends to utilize groundwater as a resource to meet future water demand. The mutual and private water companies, domestic and agricultural users in the Edna Valley rely almost exclusively on groundwater, although some have water rights along East and West Corral de Piedras Creeks. No surface water points of diversion along San Luis Obispo Creek are present in the Basin.

4.3 SOILS INFILTRATION POTENTIAL

Saturated hydraulic conductivity of surficial soils is a good indicator of the soil's infiltration potential. Soil data from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO) (USDA NRCS, 2007) is shown by the four hydrologic groups on Figure 4-6. The soil hydrologic group is an assessment of soil infiltration rates that is determined by the water transmitting properties of the soil, which includes hydraulic conductivity and percentage of clays in the soil relative to sands and gravels. The groups are defined as:

- Group A – High Infiltration Rate: water is transmitted freely through the soil; soils typically less than 10 percent clay and more than 90 percent sand or gravel.
- Group B – Moderate Infiltration Rate: water transmission through the soil is unimpeded; soils typically have between 10 and 20 percent clay and 50 to 90 percent sand
- Group C – Slow Infiltration Rate: water transmission through the soil is somewhat restricted; soils typically have between 20 and 40 percent clay and less than 50 percent sand
- Group D – Very Slow Infiltration Rate: water movement through the soil is restricted or very restricted; soils typically have greater than 40 percent clay, less than 50 percent sand

A higher soil infiltration capacity does not necessarily correlate to higher transmissivity in the underlying aquifer, but it may correlate to greater recharge potential in localized areas. This will be discussed in more detail in Chapter 5.



Prepared for:

Author: EC
Date: 11/25/2019

SAN LUIS OBISPO VALLEY BASIN GSP

N

0 0.25 0.5 1 Miles
0 0.425 0.85 1.7 Kilometers

References:
1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
2. San Luis Obispo County
3. USGS

Soil Hydrologic Groups

Figure 4-6

4.4 REGIONAL GEOLOGY

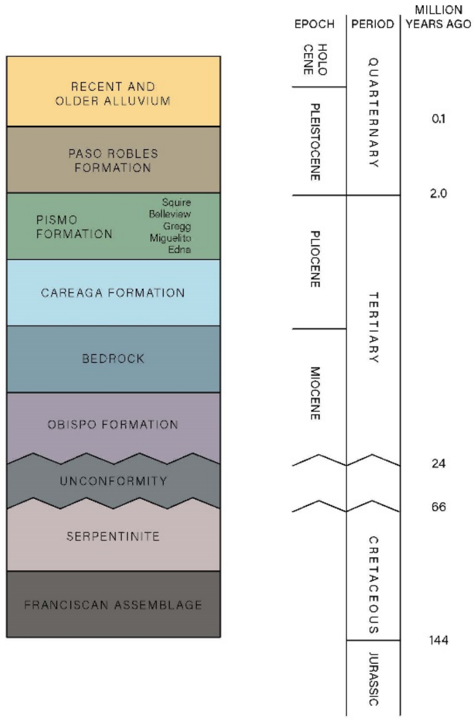
This section provides a description of the geologic formations and structures in the Basin. These descriptions are summarized from previously published reports. Figure 4-7 displays a stratigraphic column presenting the significant geologic formations within the Basin. Figure 4-8 presents a surficial geologic map of the Basin and surrounding area. Figure 4-9 displays the locations of lithologic data used for this plan, and the section lines corresponding to cross sections in the following figures. Geologic cross sections are presented in Figure 4-10 through 4-22. The selected geologic cross sections illustrate the relationship of the geologic formations that comprise the Basin and the geologic formations that underlie and bound the Basin. The cross sections displayed on Figure 4-10 through Figure 4-21were directly adopted from the SLO Basin Characterization Report (GSI, 2018).

4.4.1 Regional Geologic Structures

The primary geologic structures of significance to the hydrogeology of the Basin are the Edna Fault Zone and the adjacent Los Osos Fault Zone, which together form the southwestern boundary of the Basin through the uplift of the Franciscan and Monterey Formation strata in the San Luis Range southwest of the faults. The Edna and Los Osos Faults are normal faults, indicating primary displacement motion is vertical rather than lateral (Figure 4-8). There are some disconnected and unnamed fault splays mapped in the area south of the airport.

4.4.2 Geologic Formations within the Basin

For the purpose of this plan, the geologic units in the Basin and vicinity may be considered as two basic groups; the Basin sediments and the consolidated bedrock formations surrounding and underlying the Basin. The consolidated bedrock formations range in age and composition from (1) Jurassic-aged serpentine and marine sediments to (2) Tertiary-aged marine and volcanic depositions. Compared to the saturated sediments that comprise the Basin aquifers, the consolidated bedrock formations are not considered to be significantly water-bearing. Although bedding plane and/or structural fractures in these rocks may yield small amounts of water to wells, they do not represent a significant portion of the pumping in the area. The delineation of the Basin boundaries is defined both laterally and vertically by the contacts of the Basin sedimentary formations with the consolidated bedrock formations. From a hydrogeologic standpoint, the most important strata in the Basin are the sedimentary basin fill deposits that define the vertical and lateral extents of the Basin. These include recent and older deposits of terrestrial sourced sediments, underlain in the Edna Valley by older marine sedimentary units. Figure 4-7 presents a stratigraphic column of the significant local geologic units. Figure 4-8 presents a map of the Basin vicinity (assembled from a mosaic of the Dibblee maps from the San Luis Obispo, Pismo Beach, Lopez Mountain, and Arroyo Grande NE quadrangles) showing where the various formations crop out at the surface. Fault data displayed in Figure 4-8 were acquired via the USGS Earthquake Hazards Program. The Quaternary fault and fold database from which the shapefiles are derived was published in 2006 and cites a wide variety of published sources. Fault traces within the shapefile represent surficial deformation caused by earthquakes during the Quaternary Period (the last 1.6 million years). Figure 4-8 also displays the Basin boundaries defined in DWR Bulletin 118. Inspection of Figure 4-8 indicates that the Bulletin 118 Boundary lines for the Basin boundary do not match up precisely with the most recently mapped extent of the water-bearing formations based on GSI (2018). This is likely an artifact of previous mapping being performed at a larger (statewide) scale. The water-bearing sedimentary formations and the non-water-bearing bedrock formations are briefly described below.



Prepared for:

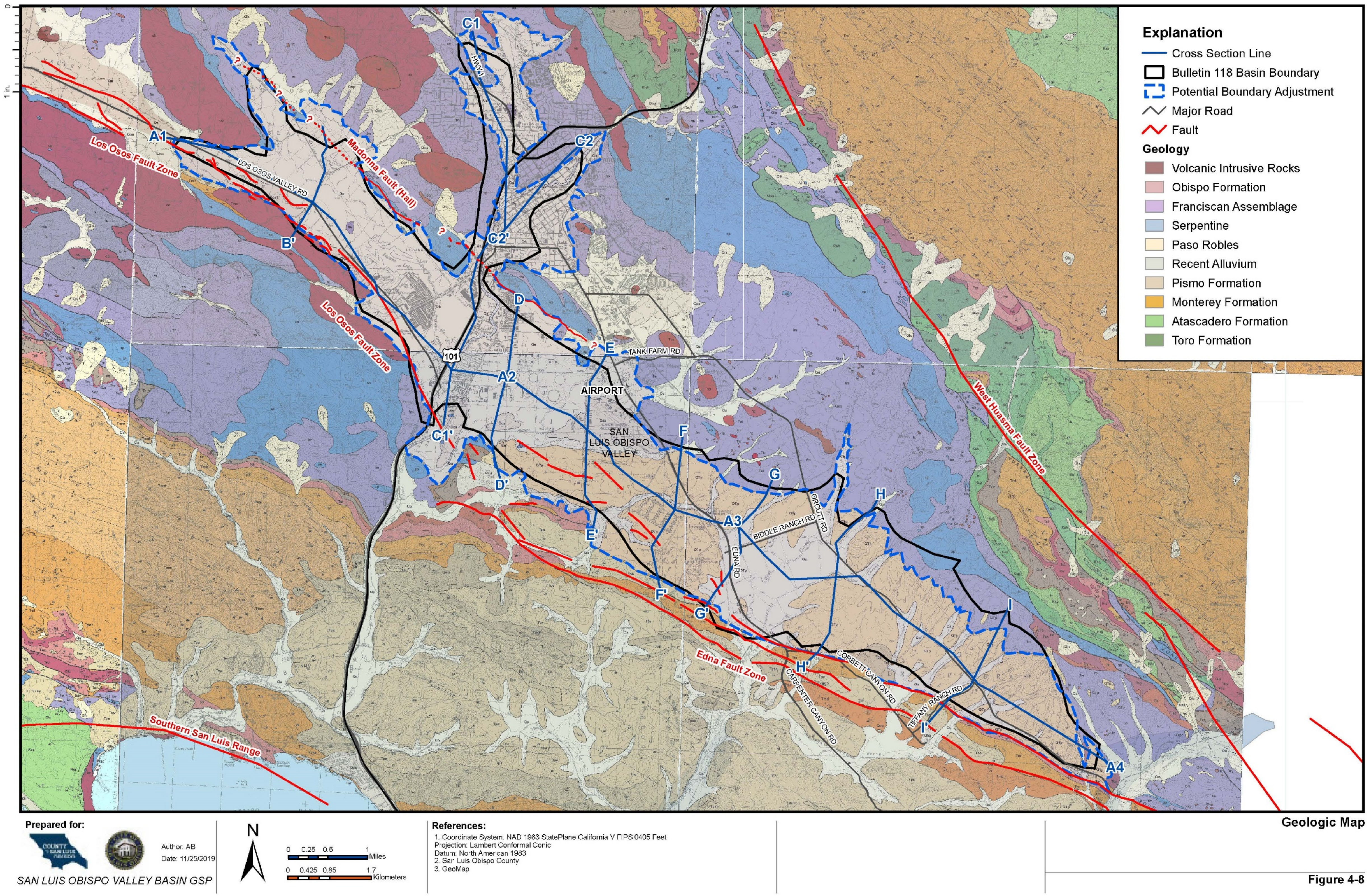
Author: NP
Date: 10/31/2019

SAN LUIS OBISPO VALLEY BASIN GSP

Notes:
1. Adapted from Chipping, 1987.

Stratigraphic Column

Figure 4-7


Explanation
Cross Section Line
Bulletin 118 Basin Boundary
Potential Boundary Adjustment
Major Road
Fault
Geology
Volcanic Intrusive Rocks
Obispo Formation
Franciscan Assemblage
Serpentine
Paso Robles
Recent Alluvium
Pismo Formation
Monterey Formation
Atascadero Formation
Toro Formation
Los Osos Fault Zone
Madonna Fault (Hall)
West Huasma Fault Zone
Edna Fault Zone
Southern San Luis Range
SAN LUIS OBISPO VALLEY
AIRPORT
LOS OSOS VALLEY RD
TANK FARM RD
BIDDLE RANCH RD
ORCUTT RD
EDNA RD
CORBETT CANYON RD
CARPENTER CANYON RD
TIFFANY RANCH RD
HWY 1
101
A1
A2
A3
A4
B'
C1
C1'
C2
C2'
D
D'
E
E'
F
F'
G
G'
H
H'
I
I'
Prepared for:
Author: AB
Date: 11/25/2019
SAN LUIS OBISPO VALLEY BASIN GSP
N
0 0.25 0.5 1 Miles
0 0.425 0.85 1.7 Kilometers
References:
1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
2. San Luis Obispo County
3. GeoMap
Geologic Map
Figure 4-8

4.4.2.1 Alluvium

The Recent Alluvium is the mapped geologic unit composed of unconsolidated sediments of gravel, sand, silt, and clay, deposited by fluvial processes along the courses of San Luis Obispo Creek, Davenport Creek, East and West Corral de Piedras Creeks, and their tributaries. Lenses of sand and gravel are the productive strata within the Recent Alluvium. These strata have no significant lateral continuity across large areas of subsurface within the Basin. Thickness of Recent Alluvium may range from just a few feet to more than 50 feet. Well pumping rates may range from less than 10 gallons per minute (gpm) to more than 100 gpm. However, wells screened exclusively in Recent Alluvium are generally less productive than wells that screen significant thicknesses of the Paso Robles and/or Pismo Formations.

4.4.2.2 Paso Robles Formation

The Paso Robles Formation underlies the Recent Alluvium throughout most of the Basin, and overlies the Pismo Formation where present. It is composed of poorly sorted, unconsolidated to mildly consolidated sandstone, siltstone, and claystone, with thin beds of volcanic tuff in some areas. The Paso Robles Formation was deposited in a terrestrial setting on a mildly sloping floodplain that has been faulted, uplifted, and eroded since deposition. The Paso Robles Formation is exposed at the surface throughout much of the Edna Valley, except in areas where existing streams have deposited Recent Alluvium on top of it. It is not readily distinguishable from alluvium in geophysical well logs. Locally, the Paso Robles Formation is sometimes distinguished as being yellow in color, with sticky clay. DWR Well Completion Reports with these types of descriptions generally were identified as Paso Robles Formation for the purpose of interpreting the geology in the cross sections. However, it was sometimes difficult to distinguish between Recent Alluvium and Paso Robles Formation in driller's descriptions, and professional judgment and broader context within the Basin were often used when defining the contact between these two units. Wells that screen both the Recent Alluvium and Paso Robles Formation have reported yields from less than 100 to over 500 gpm.

4.4.2.3 Pismo Formation

The oldest geologic water-bearing unit with significance to the hydrogeology of the Basin is the Pismo Formation. The Pismo Formation is a Pliocene-aged sequence of marine deposited sedimentary units composed of claystone, siltstone, sandstone, and conglomerate. There are five recognized members of the Pismo Formation (Figure 4-7). While all members are part of the Pismo Formation, each member reflects different depositional environments, and the variations in geology may affect the hydrogeologic characteristics of the strata. From the oldest to youngest, the members are:

- The Edna Member, which lies unconformably atop the Monterey Formation, and is locally bituminous (hydrocarbon-bearing)
- The Miguelito Member, primarily composed of thinly bedded grey or brown siltstones and claystones
- The Gragg Member, usually described as a medium-grained sandstone
- The Bellview Member, composed of interbedded fine-grained sandstones and claystones
- The Squire Member, generally described as a medium- to coarse-grained fossiliferous sandstone of white to grey sands

Previous reports have identified the significant thicknesses of sand at depth beneath the Paso Robles Formation in the Edna Valley as the Squire Member of the Pismo Formation. However, it is not clear whether these are accurately assigned as Squire. Other members of the Pismo Formation may be part of the sequence, and there is some ambiguity as to the actual member assignment. Even in the adjacent Pismo Beach and Arroyo Grande NE quadrangle geologic (Dibblee 2006a, 2006b), there is ambiguity in the geologic nomenclature. In the adjacent geologic maps these quadrangles, a continuous exposure of this unit across the boundary between the two maps is referred to as Pismo Formation in one map (Dibblee 2006b), and Squire Sandstone in the other (Dibblee 2006a). Therefore, it is probably more accurate to generally refer to these units as the Pismo Formation, and not to specifically identify the member designations. This convention will be followed for the remainder of this report.

The Pismo Formation is extensive below the Paso Robles Formation in the Edna Valley. Thicknesses of Pismo Formation up to 400 feet are reported or observed in well completion reports and in the cross sections (Figure 4-5). The presence of sea shells in the lithologic descriptions of well completion reports is clearly diagnostic of the Pismo Formation because of its marine origin. Many of the well completion reports in the Edna Valley document the presence of water-bearing blue and green sands beneath the Paso Robles Formation, and these are considered to be largely diagnostic of the Pismo Formation as well. Wells that are completed in both the Paso Robles and Pismo Formations are reported to yield from less than 100 gpm to approximately 700 gpm.

4.4.3 Geologic Formations Surrounding the Basin

Older geologic formations that underlie the Basin sediments typically have lower permeability and/or porosity and are generally considered non-water-bearing. In some cases, these older beds may occasionally yield flow adequate for local or domestic needs, but wells drilled into these units are also often dry or produce groundwater less than 10 gpm. Generally, the water quality from the bedrock units is poor in comparison to the Basin sediments. In general, the geologic units underlying the basin include Tertiary-age consolidated sedimentary and volcanic beds (Monterey and Obispo Formations), and Cretaceous-age sedimentary and metamorphic rocks (Franciscan Assemblage).

4.4.3.1 Monterey Formation

The Monterey Formation is a thinly bedded siliceous shale, with layers of chert in some locations. In other areas of the County outside of the Basin, the Monterey Formation is the source of significant oil production. While fractures in consolidated rock may yield small quantities of water to wells, the Monterey Formation is not considered to be an aquifer for the purposes of this GSP. Regionally, the unit thickness is as great as 2,000 feet, and the unit is often highly deformed. Water wells completed in the Monterey Formation are occasionally productive if a sufficient thickness of highly deformed and fractured shale is encountered. More often, however, the Monterey shale produces groundwater to wells in very low quantities. Groundwater produced from the Monterey Formation often has high concentrations of Total Dissolved Solids (TDS), hydrogen sulfide, total organic carbon, and manganese.

4.4.3.2 Obispo Formation

The Obispo Formation and associated Tertiary volcanics are composed of materials associated with volcanic activity along tectonic plate margins approximately 20 to 25 million years ago. The Obispo Formation is composed of ash and other material expelled during volcanic eruptions. Although fractures in consolidated volcanic rock may yield small quantities of water to wells, the Obispo Formation is not considered to be an aquifer for the purposes of this GSP.

4.4.3.3 Franciscan Assemblage

The Franciscan Assemblage contains the oldest rocks in the Basin area, ranging in age from late Jurassic through Cretaceous (150 to 66 million years ago). The rocks include a heterogeneous collection of basalts, which have been altered through high-pressure metamorphosis associated with subduction of the oceanic crust beneath the North American Plate before the creation of the San Andreas Fault. The current assemblage includes ophiolites, which weather to serpentinites and are common in the San Luis and Santa Lucia Ranges. Although fractures may yield small quantities of water to wells, the Franciscan Assemblage is not considered to be an aquifer for the purposes of this GSP.

4.5 PRINCIPAL AQUIFERS AND AQUITARDS

Water-bearing sand and gravel beds that may be laterally and vertically discontinuous are generally grouped together into zones that are referred to as aquifers. The aquifers can be vertically separated by fine-grained zones that can impede movement of groundwater between aquifers, referred to as aquitards. Three aquifers exist in the Basin:

- Alluvial Aquifer – A relatively continuous aquifer comprising alluvial sediments that underlie the San Luis Obispo Creek and tributary streams, as well as East and West Corral de Piedras Creeks and tributary streams;
- Paso Robles Formation Aquifer – An interbedded aquifer comprised of terrestrially-derived sand and gravel lenses in the Paso Robles Formation.
- Pismo Formation Aquifer - An interbedded aquifer comprised of marine sand and gravel lenses in the Pismo Formation.

There are no significant aquitards that vertically separate the three aquifers in the Basin over large areas. There may be deposits of clay and silt that are not laterally extensive that locally separate two aquifers, but there is no recognized aquitard in the Basin that separates the aquifers over significant areas.

4.5.1 Cross Sections

Eleven cross sections were prepared for this report; three (A1-A2, A2-A3, A3-A4) are oriented along the longitudinal axis of the Basin and eight (B-B' through I-I') are oriented across the Basin, perpendicular to the longitudinal axis (Figure 4-9). All lithologic data was reviewed during the selection of the section line locations. The cross sections display lithology, interpretations of geologic contacts based on available data, well screen intervals, and interpreted and mapped faults. If the geologic interpretation was not clear from the points on the cross section lines, nearby data from other locations was reviewed to provide broader geologic context. Each geologic cross section is discussed in the following paragraphs. The longitudinal axis of the Basin is much longer than the cross basin section lines, the longitudinal axis was divided into three separate cross sections for the sake of clarity and presentation of detail.
As part of the work performed for the GSP, CHG performed a passive seismic geophysical plan in the area along Buckley Road south of the airport (Appendix ZZ). Data from this plan resulted in slight adjustments in three of the previously developed cross sections. These data have been incorporated into the cross sections.

- Cross Section A1-A2 (Figure 4-10) extends approximately 6.5 miles from the northwest extent of the Basin at its boundary with the Los Osos Basin to about 1 mile east of Highway 101. Land surface elevation is about 200 feet AMSL at the northwest extent, and slopes gently downward to about 120 feet AMSL at the southeast extent. Recent Alluvium is exposed at the surface for the entire length of this cross section, ranging in thickness from less than 50 feet near the Los Osos Valley Basin boundary to about 80 feet near the center of the section. The Paso Robles Formation is relatively thin in the northeast where it has been significantly eroded by the alluvium, but thickens to approximately 70 feet in the southeastern part of the section. Marine sands of the Pismo

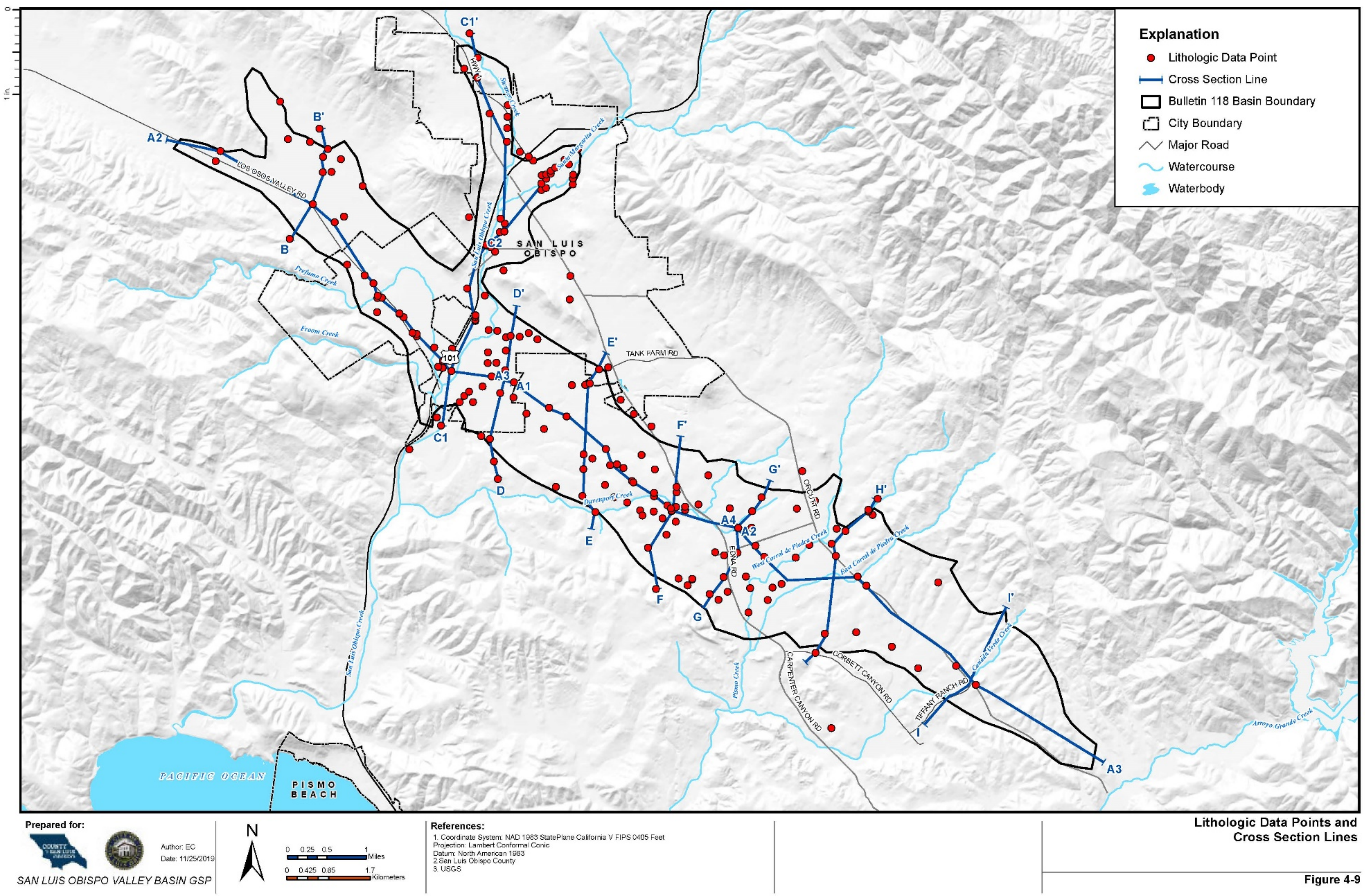
Formation occur below the Paso Robles Formation in the southeastern part of the section, with a maximum thickness of about 50 feet.

- Cross Section A2-A3 (Figure 4-11) extends approximately 4 miles along the longitudinal Basin axis, starting near Tank Farm Road and cutting obliquely across Buckley Road to just past Edna Road in the southeast. Land surface elevation ranges from approximately 120 feet AMSL in the northwest to more than 270 feet AMSL in the southwest. Along the northwest half of the section line, alluvium is exposed at the surface, with an approximate thickness of 40 to 50 feet. The alluvium is primarily underlain by the Paso Robles Formation with thicknesses ranging from approximately 40 to 80 feet. Just southeast of the airport, the Paso Robles Formation is exposed at the surface, beginning at the point where there is a noticeable rise in land surface elevation. This is approximately coincident with the maximum elevation of the underlying bedrock formations (the bedrock divide that approximates the dividing line between the Edna Valley and the San Luis Valley). A recent geophysical investigation by Cleath-Harris Geologists in the area of the high bedrock elevation has provided greater detail on the Basin geometry in this area. The thickness of the Paso Robles Formation in this area is up to 120 feet. Pismo Formation sediments underlie the Paso Robles Formation in this area, with thickness of about 50 feet in the area of Davenport Creek. The Pismo Formation thickness starts to increase significantly along this section line to the southeast, with about 250 feet of Pismo sediments evident at the southeastern extent of the section line. Several of the borings in this section indicate wells are partially or completely screened in bedrock formations, indicating that the relatively thin saturated portions of the water-bearing sediments did not yield enough water for the purposes of the wells.
- Cross section A3-A4 (Figure 4-12) extends about 6.5 miles along the Basin axis from approximately Biddle Ranch Road to the southeast extent of the Basin. Land surface elevation rises from about 250 feet AMSL on the northwest end of the section to over 500 feet AMSL in the southeast. Relatively thin occurrences (40 feet or less) of Recent Alluvium associated with Corral de Piedras Creek and its tributaries are evident in some areas on the western half of this section. In the southeastern extent of the section, the Paso Robles Formation crops out at the surface where the land is beginning to rise to the northern mountains, and is dissected by small streams and valleys in this area. The Pismo Formation sediments reach their maximum thickness of more than 400 feet along the northwestern extent of this section; the thickness of the Pismo gradually thins to about 90 feet at the southwestern extent of the section.
- Cross section B-B’ (Figure 4-13) extends about 1.5 miles across the Basin perpendicular to the Basin axis in the vicinity of Foothill Boulevard and Los Osos Valley Road. The section line has a land surface elevation of about 180 feet AMSL on the northern end, sloping downward to about 130 feet AMSL along the Basin’s long axis, and rising again to about 230 feet AMSL on the southern end. Recent Alluvium is exposed at the surface along this entire section, with thicknesses of about 20 to 30 feet. In the northern half of the section, alluvium is deposited directly on underlying basement rock. In the southern half of the section, the Paso Robles Formation underlies the alluvium with a maximum thickness of about 45 feet. The southern extent of the section crosses the Los Osos Fault Zone.
- Cross Section C1-C1’ (Figure 4-14) extends from the northern lobes of the Basin boundary, which are formed from alluvium from Stenner and San Luis Obispo Creeks, and trends southward approximately 5.5 miles across the Basin from Cal Poly through the City, approximately along the path of Highway 101. Land surface elevation is about 350 feet at the northern end of the section line on some noticeable hilltops along the line, and slopes downward to an approximate altitude of 80 feet on the southern end. Most of the northern extent of this section has alluvium of about 20 to 40 feet of thickness deposited directly on underlying bedrock. Only in the southernmost 1½ miles of the section line, where it crosses the main body of the Basin, do Paso Robles Formation sediments underlie the alluvium. The Paso Robles Formation is about 90 feet thick here, and it is in turn underlain by about 60 feet of Pismo Formation sediments.

- Cross Section C2-C2' (Figure 4-15) extends about 1½ miles southward through the eastern lobe of the northern part of San Luis Valley. Alluvium is deposited directly on top of basement rock along this section. Alluvium is thin here, ranging from less than 10 feet to about 40 feet.
- Cross Section D-D' (Figure 4-16) extends about 2.5 miles southward from a prominent serpentine ridge in the north to the southern Basin boundary. Land surface elevation is about 160 feet on the northern end of the section, sloping down to about 110 feet in the Basin center, and rising to about 180 feet on the southern end. Recent Alluvium is exposed at the surface along most of this section, reaching a maximum thickness of about 80 feet. The alluvium is deposited directly on basement rock through the northern half of the section. In the southern half of the section, approximately 20 to 30 feet of Paso Robles Formation underlies the alluvium. Near the southern extent of the Basin, the section line crosses into the combined Edna-Los Osos Fault Zone, at which point the land surface elevation rises steeply and the Paso Robles Formation crops out at the surface due to the upthrown formations south of the faults.
- Cross Section E-E' (Figure 4-17) extends about 2½ miles across the Basin in the vicinity of the airport and the area south of Buckley Road. Land surface elevation ranges from about 170 feet on the northern end to 230 feet in the southern end. In the northern half of this section, Recent Alluvium are exposed at the surface. In the southern half, the Paso Robles Formation is exposed. Alluvial thickness in the northern half of the section ranges from about 20 to 70 feet, and is underlain by about 30 to 35 feet of Paso Robles Formation. In the southern half of the section, it crosses into the Edna-Los Osos Fault Zone, and the Paso Robles Formation is upthrown to the point that it is exposed at the surface. Paso Robles Formation thickness ranges from 50 feet to about 100 feet. Sediments of the Pismo Formation underlie the Paso Robles Formation in this area, and are about 25 to 70 feet thick.
- Cross Section F-F' (Figure 4-18) extends about 2 miles north to south in the western extent of the Edna Valley area. The Paso Robles Formation is exposed at the surface along most of this section. One small pod of alluvium associated with Davenport Creek is evident in the center of the section. The Paso Robles Formation has a maximum thickness of about 175 feet in this section. It is underlain by about 50 to 60 feet of Pismo Formation sediments in the area north of the Edna Fault Zone. To the south, the section line extends into the Edna Fault Zone. South of the fault, the formations are upthrown, resulting in a small area of Pismo Formation sediments exposed at the surface.
- Cross Section G-G' (Figure 4-19) extends about 2 miles through the heart of the Edna Valley area. Land surface elevation ranges from about 300 feet on the north end to more than 350 feet on the south end. A thin veneer of alluvium, about 20 feet thick, that is associated with Corral de Piedras Creek and tributaries is exposed at the surface along much of this section. The Paso Robles Formation crops out in the north of the section, and underlies the alluvium with an average thickness of about 50 to 60 feet. The Pismo Formation displays its largest thickness along this section, with a maximum thickness of about 450 feet near where this section intersects with cross section A3-A4. The southern end of the section line crosses into the Edna Fault zone, and sediments are displaced such that the Pismo Formation sediments are exposed at the surface on the southern slopes of the Basin in this area.
- Cross Section H-H' (Figure 4-20) extends approximately 2½ miles through the Edna Valley. Land surface is approximately 350 feet on the northern end, sloping downward to about 230 feet near Corbett Canyon Road, then quickly rising to nearly 400 feet on the south end of the section on the upthrown side of the Edna Fault. The Paso Robles Formation is exposed at the surface for nearly the entire section. The section line crosses a small exposure of Recent Alluvium associated with Corral de Piedras Creek. In the northern half of the section, the Paso Robles Formation sediments are deposited directly on the basement rock formations, with a maximum thickness of about 80 feet. In the southern half of the section, the basement rock elevation plunges and the thickness of the Paso Robles Formation is about 150 to 230 feet. The Pismo Formation underlies the Paso

Robles Formation sediments in the southern half of the section, with a maximum thickness of about 200 feet. In the Corbett Canyon area, the section crosses the Edna Fault; south of the fault the basement rock formations are thrust up to the surface, and represent the boundary of the Basin.

- Cross Section I-I' (Figure 4-21) crosses the southern extent of the Edna Valley. The northern part of the section lies along the lower slopes of the Santa Lucia Range, and displays Paso Robles Formation sediments deposited on top of bedrock formations. A small pod of Recent Alluvium associated with Corral de Piedras Creek is displayed. Along the center of the Edna Valley, the Paso Robles Formation thickness is about 200 feet, and is underlain by about 100 feet of Pismo Formation sediments. The section crosses the Edna Fault Zone, which shows Pismo Formation sediments upthrown to land surface on the south side of one fault splay, and bedrock of the Monterey Formation upthrown to land surface elevation south of a second fault splay.


Explanation
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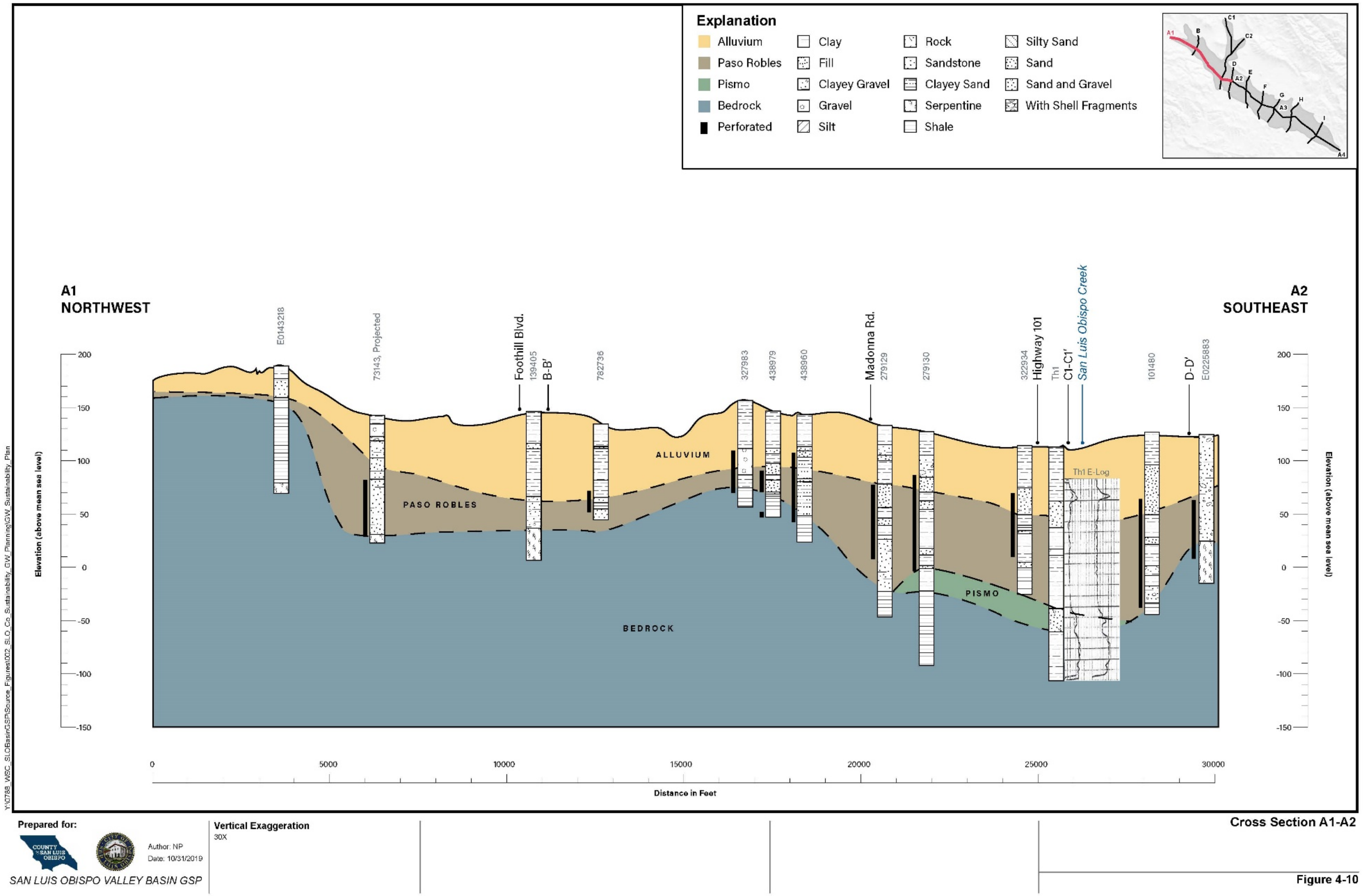
Major Road
Watercourse
Waterbody
SAN LUIS OBISPO
PACIFIC OCEAN
PISMO BEACH
LOS OSOS VALLEY RD
TANK FARM RD
ORCUTT RD
EDNA RD
CORBETT CANYON RD
CARPENTER CANYON RD
TIFFANY RANCH RD
Prepared for:
Author: EC
Date: 11/25/2019
SAN LUIS OBISPO VALLEY BASIN GSP
N
Miles
Kilometers
References:
1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
2.San Luis Obispo County
3. USGS
Lithologic Data Points and Cross Section Lines
Figure 4-9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Paso Robles
Pismo
Bedrock
Perforated
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Fill
Clayey Gravel
Gravel
Silt
Rock
Sandstone
Clayey Sand
Serpentine
Shale
Silty Sand
Sand
Sand and Gravel
With Shell Fragments
A1
NORTHWEST
A2
SOUTHEAST
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B-B'
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438879
438960
Madonna Rd.
279129
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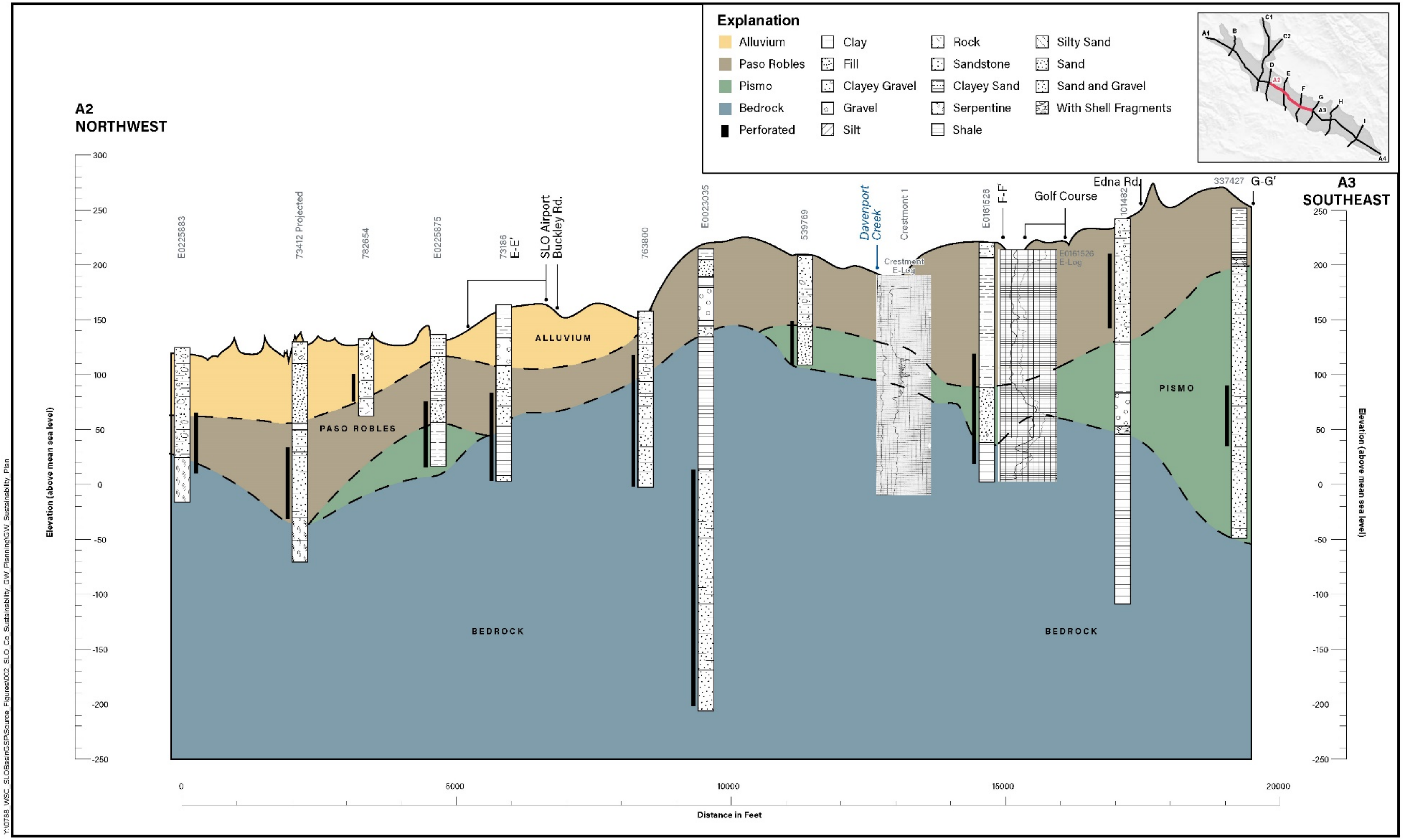
322934
Highway 101
Th1
C1-C1'
San Luis Obispo Creek
101480
D-D'
E0225883
ALLUVIUM
PASO ROBLES
PISMO
BEDROCK
Th1 E-Log
Elevation (above mean sea level)
Distance in Feet
Prepared for:
Author: NP
Date: 10/31/2019
SAN LUIS OBISPO VALLEY BASIN GSP
Vertical Exaggeration
30X
Cross Section A1-A2
Figure 4-10



Prepared for:

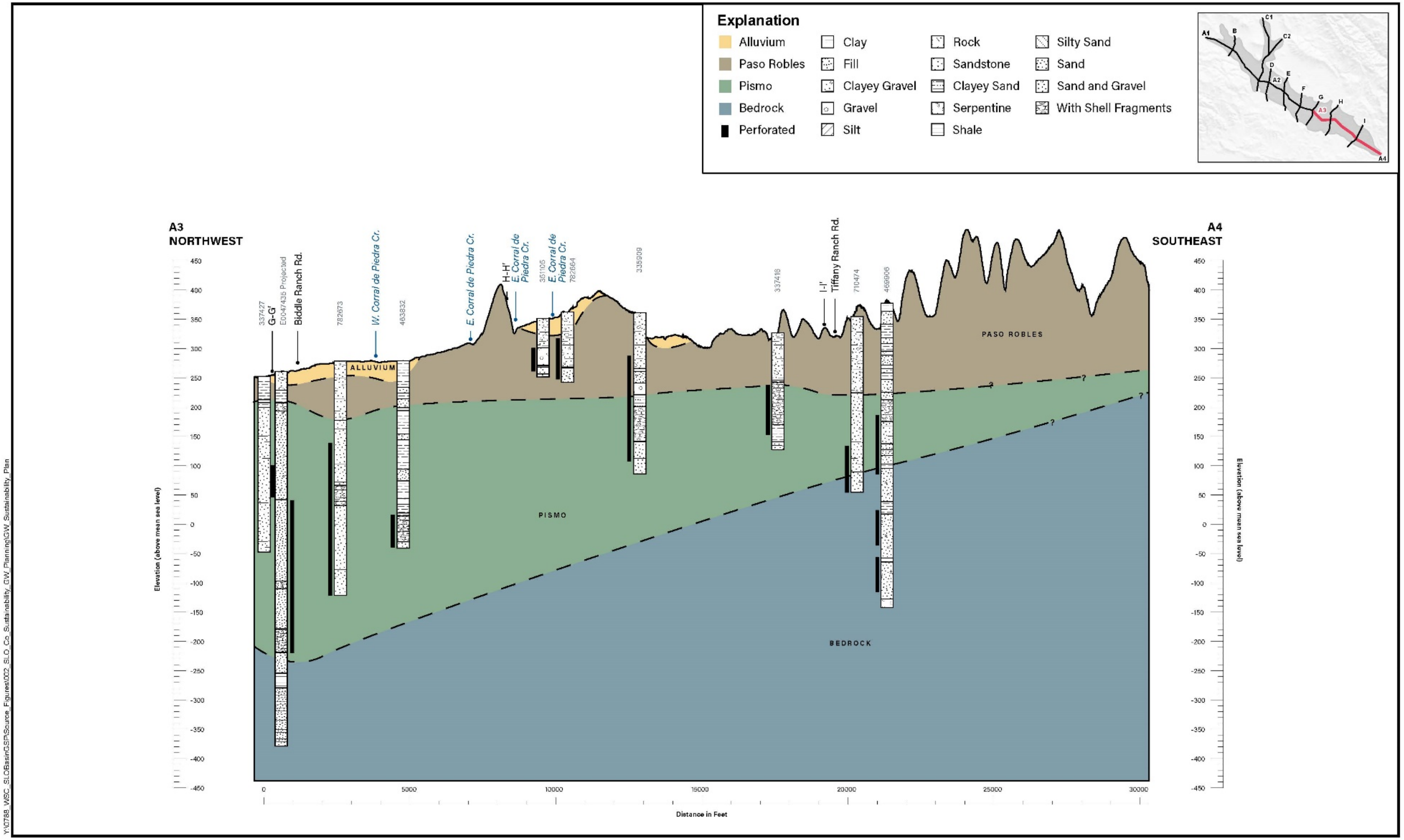
Author: NP
Date: 10/31/2019

SAN LUIS OBISPO VALLEY BASIN GSP

Vertical Exaggeration
20X

Cross Section A2-A3

Figure 4-11



Prepared for:

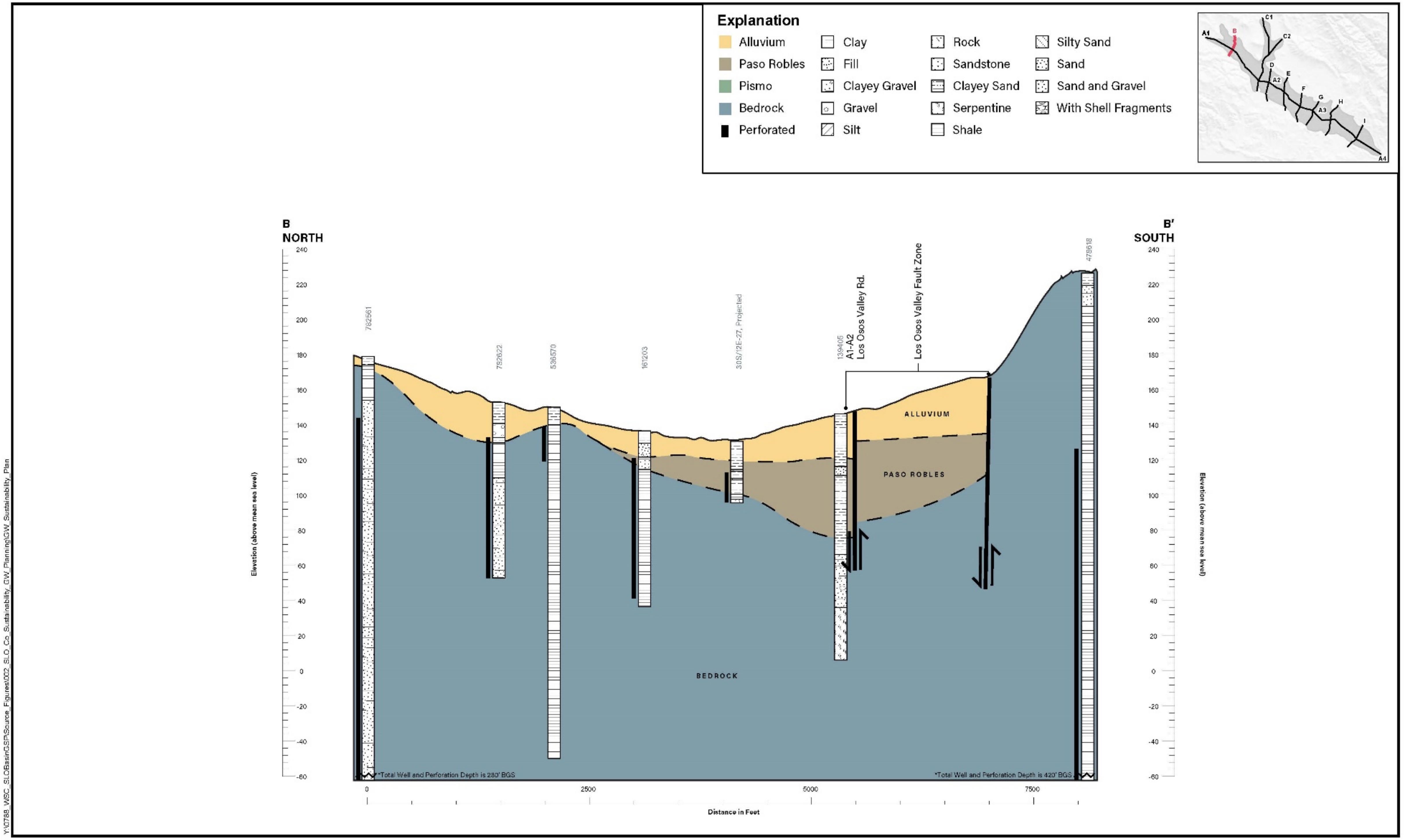
Author: NP
Date: 10/31/2019

SAN LUIS OBISPO VALLEY BASIN GSP

Vertical Exaggeration
20X

Cross Section A3-A4

Figure 4-12



Prepared for:

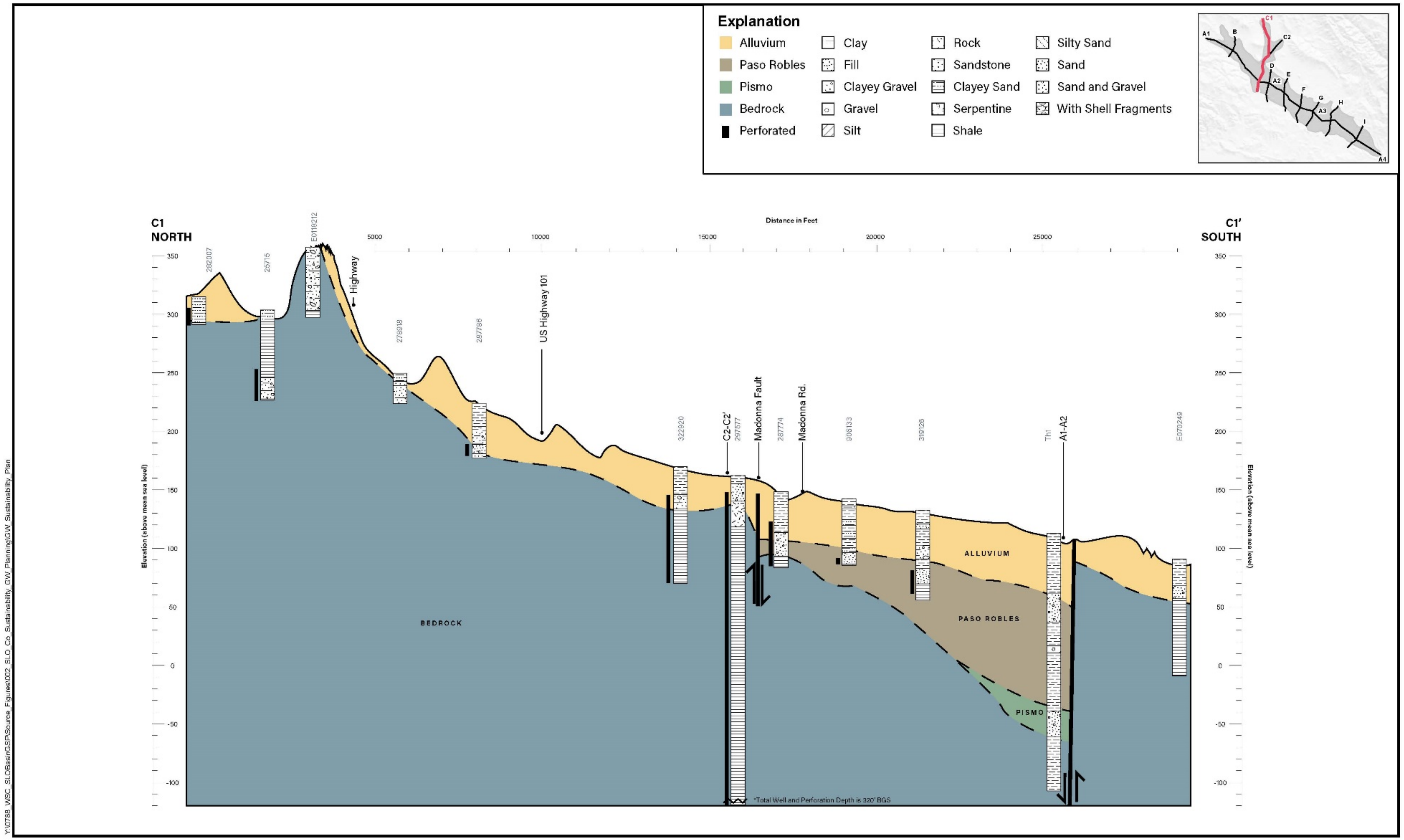
Author: NP
Date: 10/31/2019

SAN LUIS OBISPO VALLEY BASIN GSP

Vertical Exaggeration
20X

Cross Section B-B'

Figure 4-13



Prepared for:

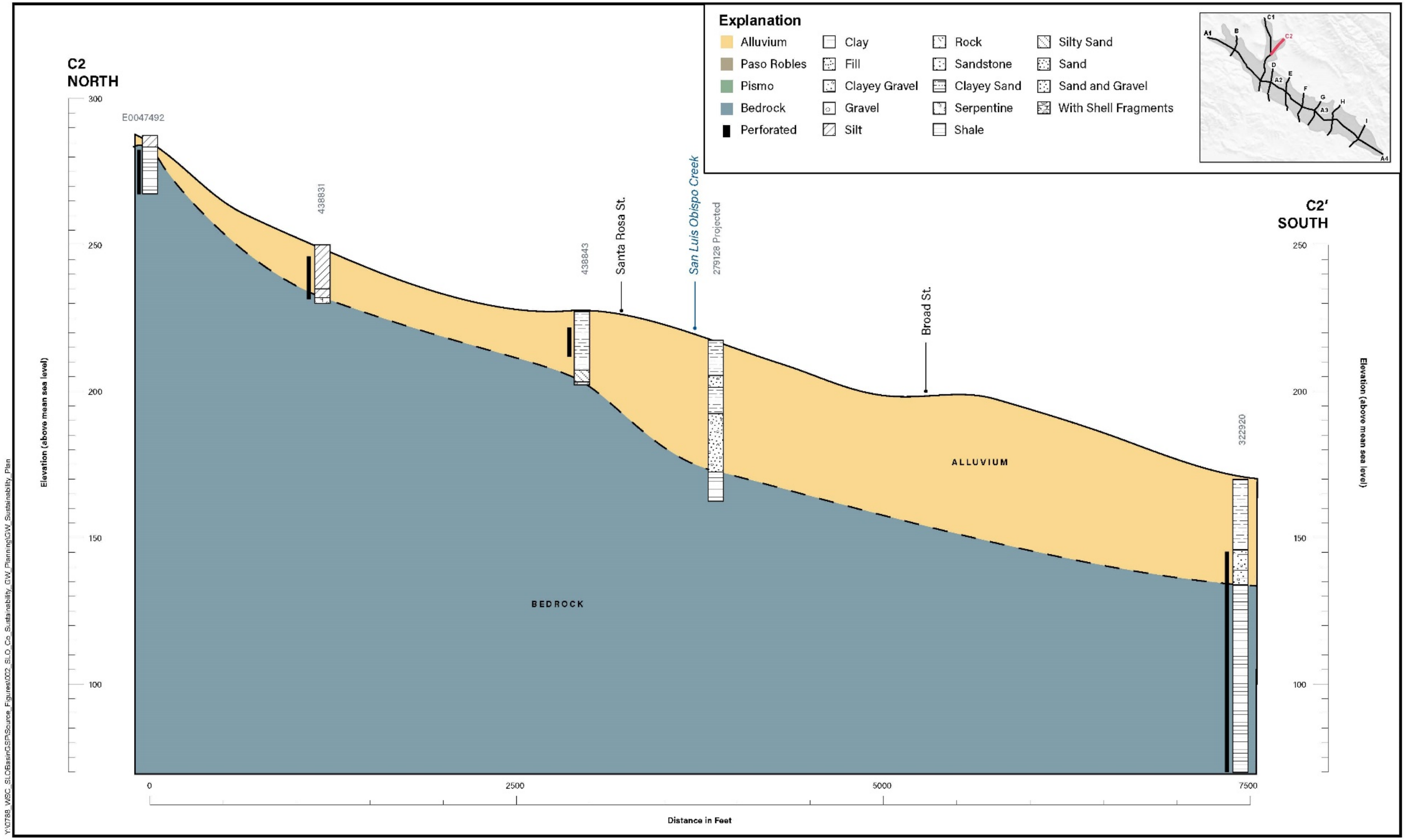
Author: NP
Date: 10/31/2019

SAN LUIS OBISPO VALLEY BASIN GSP

Vertical Exaggeration
35X

Cross Section C1-C1'

Figure 4-14



Prepared for:

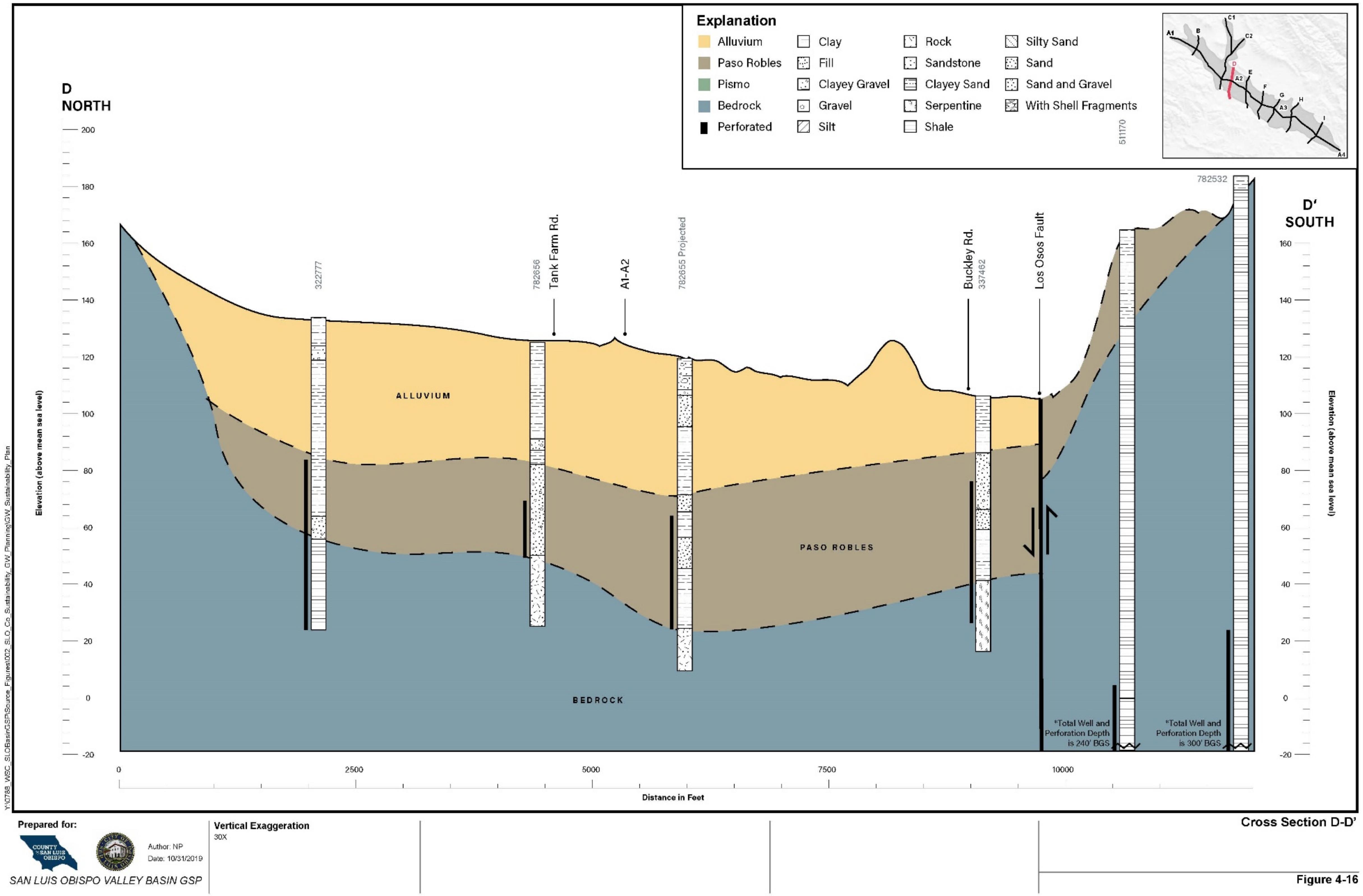
Author: NP
Date: 10/31/2019

SAN LUIS OBISPO VALLEY BASIN GSP

Vertical Exaggeration
20X

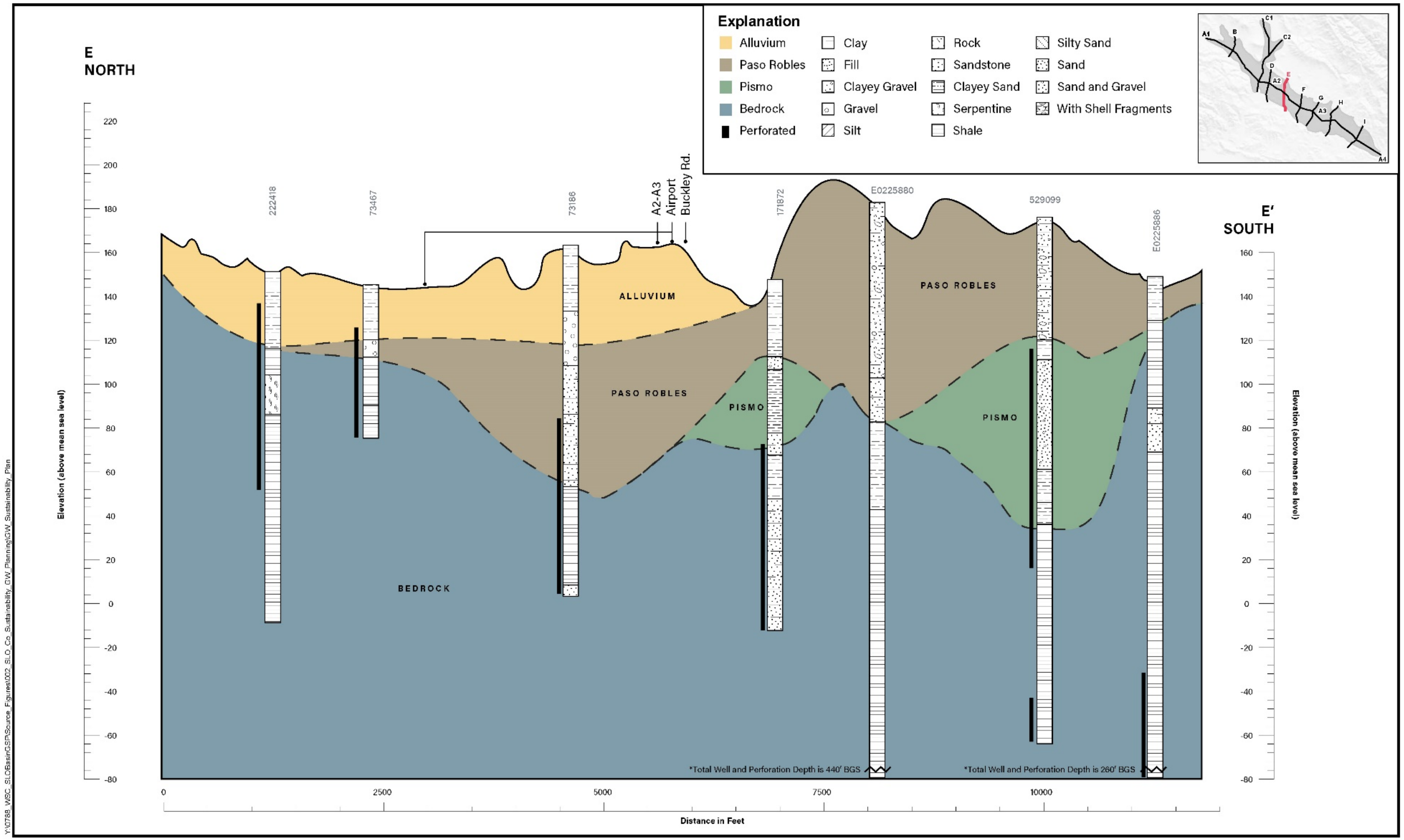
Cross Section C2-C2'

Figure 4-15



Cross Section D-D'

Figure 4-16



Prepared for:

Author: NP
Date: 10/31/2019

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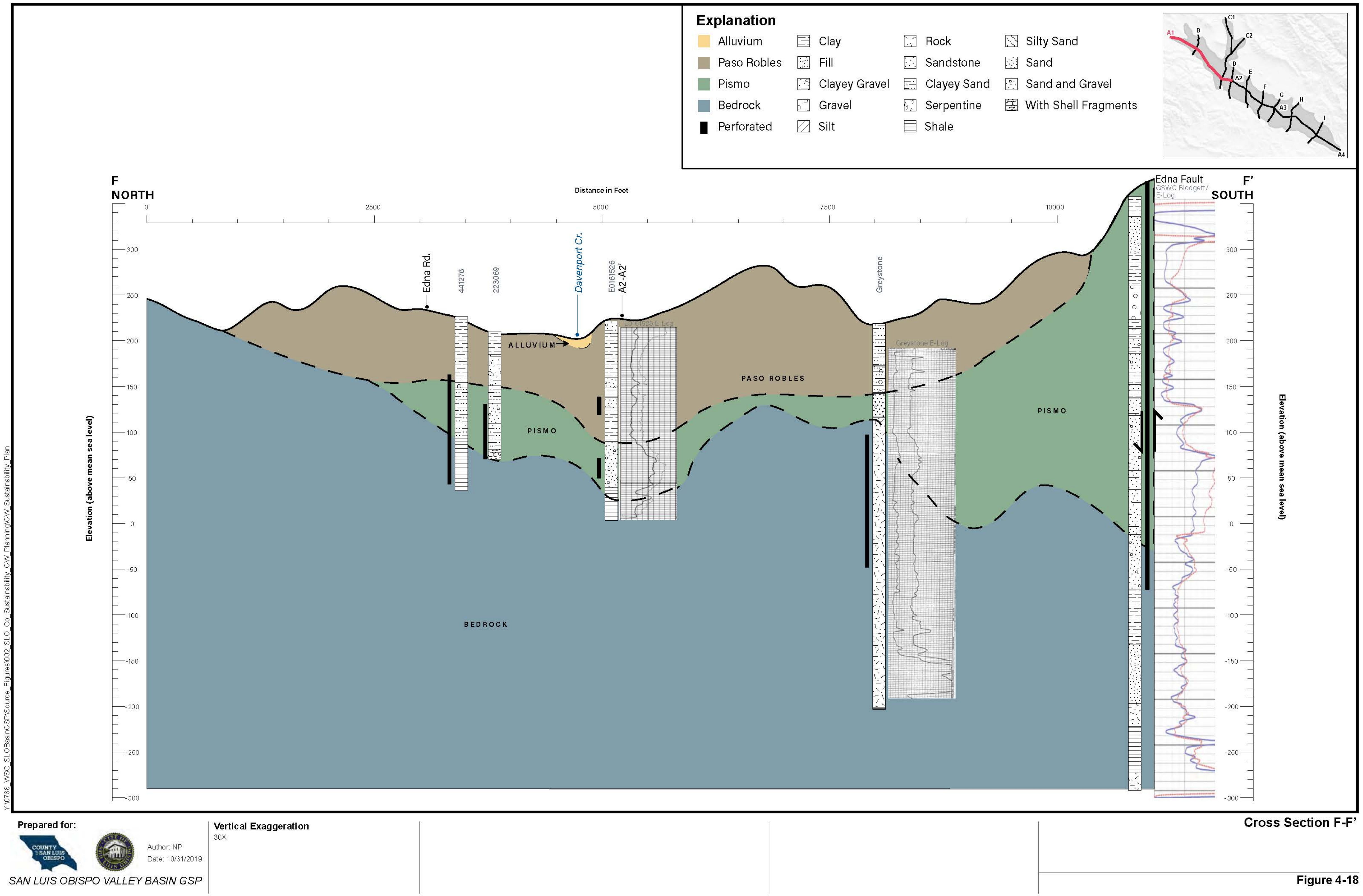
Vertical Exaggeration
25X

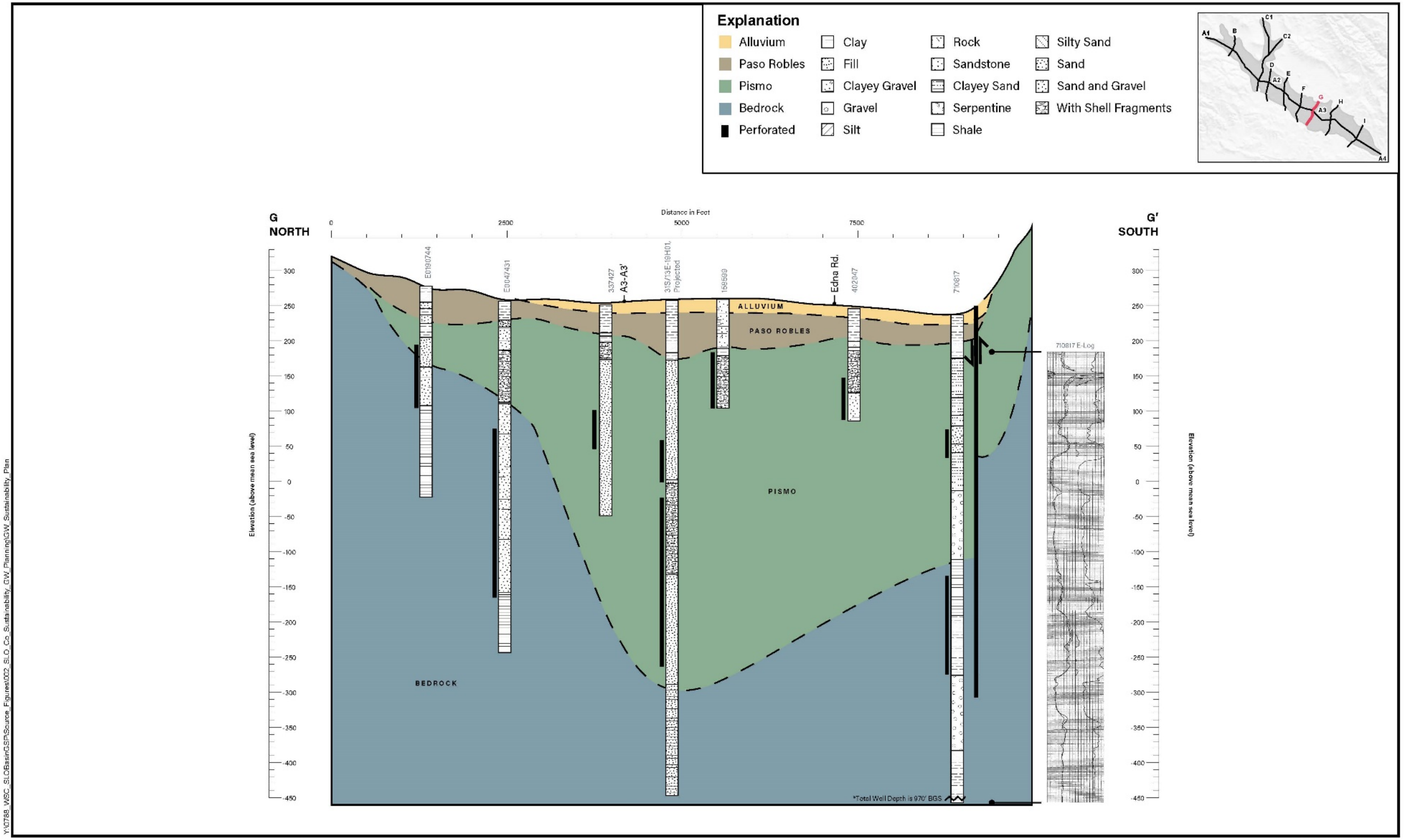
Cross Section E-E'

Figure 4-17



Cross Section F-F'

Figure 4-18



Prepared for:

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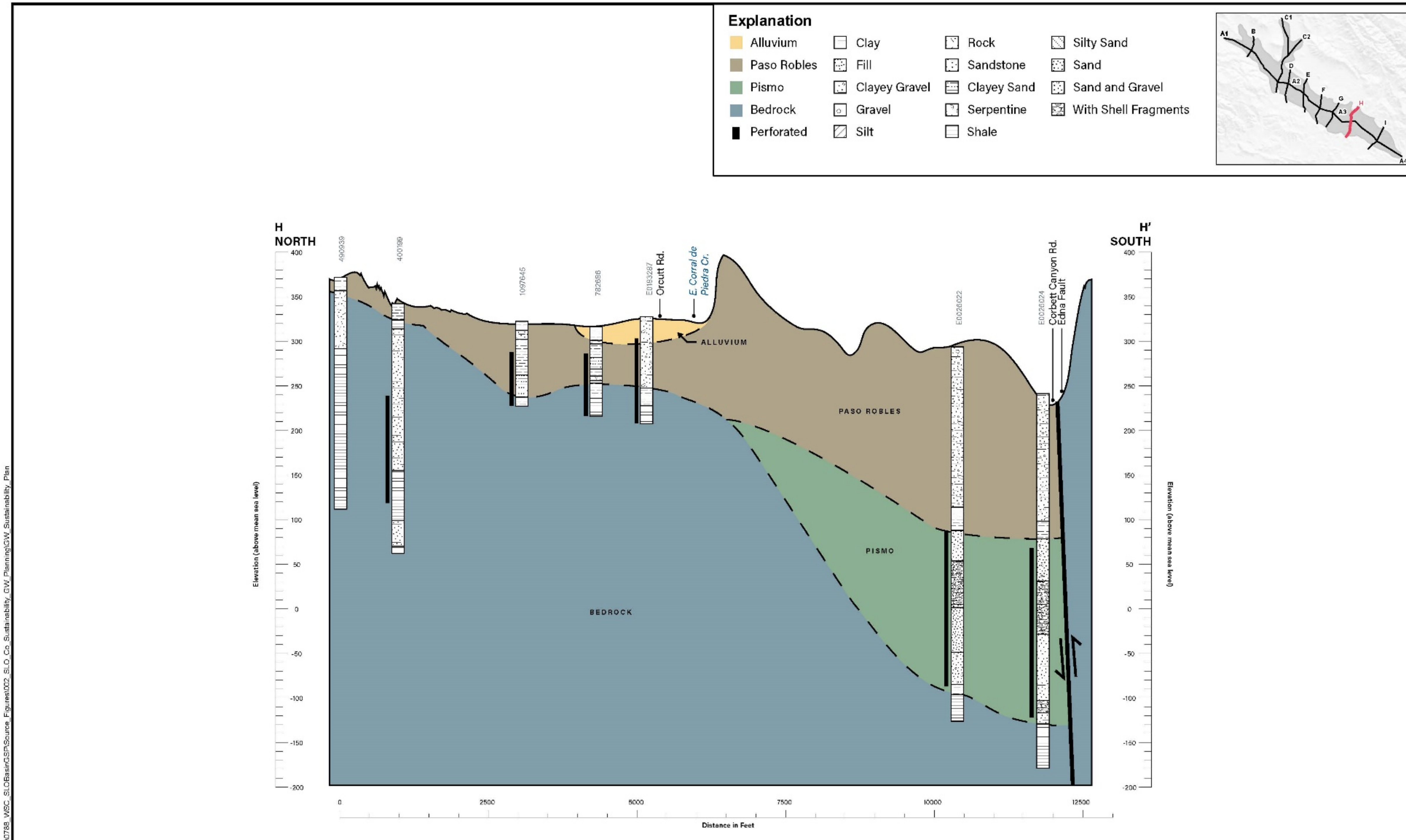
Author: NP
Date: 10/31/2019

Vertical Exaggeration
10X

Cross Section G-G'

Figure 4-19



Prepared for:

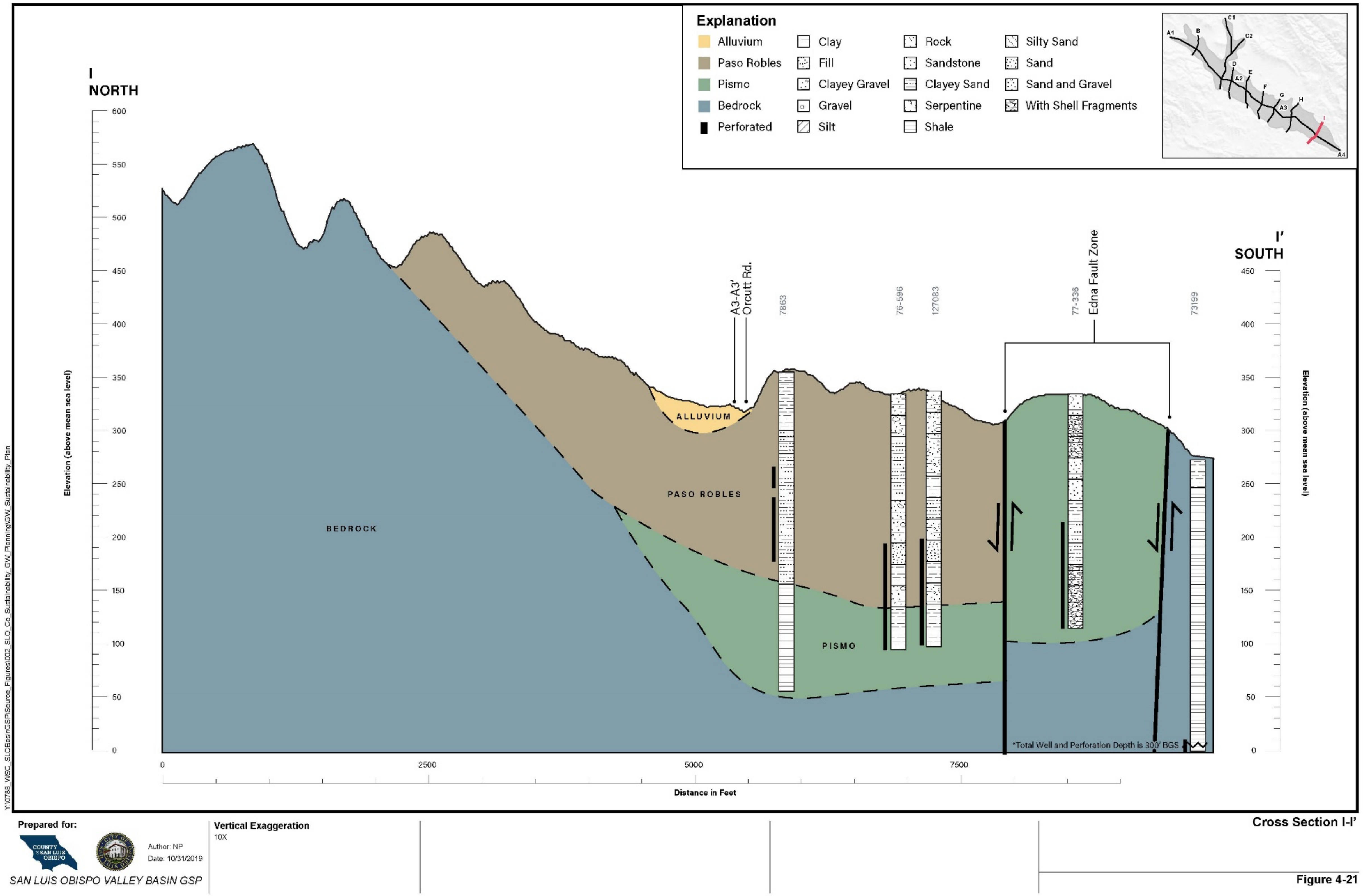
SAN LUIS OBISPO VALLEY BASIN GSP

Author: NP
Date: 10/31/2019

Vertical Exaggeration
15X

Cross Section H-H'

Figure 4-20



Cross Section I-I'

Figure 4-21

4.5.2 Aquifer Characteristics

The relative productivity of an aquifer can be expressed in terms of transmissivity, hydraulic conductivity, or specific capacity. The most robust method is measuring transmissivity using a long-term (frequently 24 hours or more) constant-rate pumping test. Water level drawdown data collected during this test can be analyzed and used to calculate transmissivity. Specific capacity is a simple measure of flow rate (gpm) divided by drawdown (feet), routinely measured by well service contractors during well maintenance and reported in units of gpm per foot of drawdown (gpm/ft). Specific capacity measurements may be affected by well construction details, and, therefore, are not only related to aquifer characteristics. Nevertheless, the following commonly accepted empirical relationships allows transmissivity to be estimated from specific capacity measurements.

T (gpd/ft) = SC (gpm/ft) * (1,500 – 2,000), where
T = Transmissivity (gpd/ft)
SC = Specific Capacity (gpm/ft)
1500 – 2000 = Empirical factor, (1,500 used for unconfined, 2,000 for confined aquifer)

Data describing these data from water wells throughout the Basin were compiled. The data was obtained from Previous regional studies or reports, previous pumping tests and well service information provided by local stakeholders. All available reports and documents that were made available through data requests, report reviews, etc., were reviewed for technical information, and included in this summary if the data were judged to be sufficient.

DWR (1958) reports a range of irrigation well pumping rates from 300 to 600 gpm, and a range of specific capacity values of 15 to 20 gpm/ft for the Basin, corresponding to transmissivity estimates from 22,500 to 40,000 gallons per day per foot (gpd/ft). Boyle (1991) evaluated five constant-rate aquifer tests for City wells, all in the San Luis Valley, and reported transmissivity values ranging from 11,200 to 71,000 gpd/ft, with an average of 41,240 gpd/ft. DWR (1997) discussed the range of hydraulic conductivity values used in the preparation of its groundwater model, which averaged about 15 ft/day in the San Luis Obispo Creek Valley, and about 6 ft/day in the Edna area.

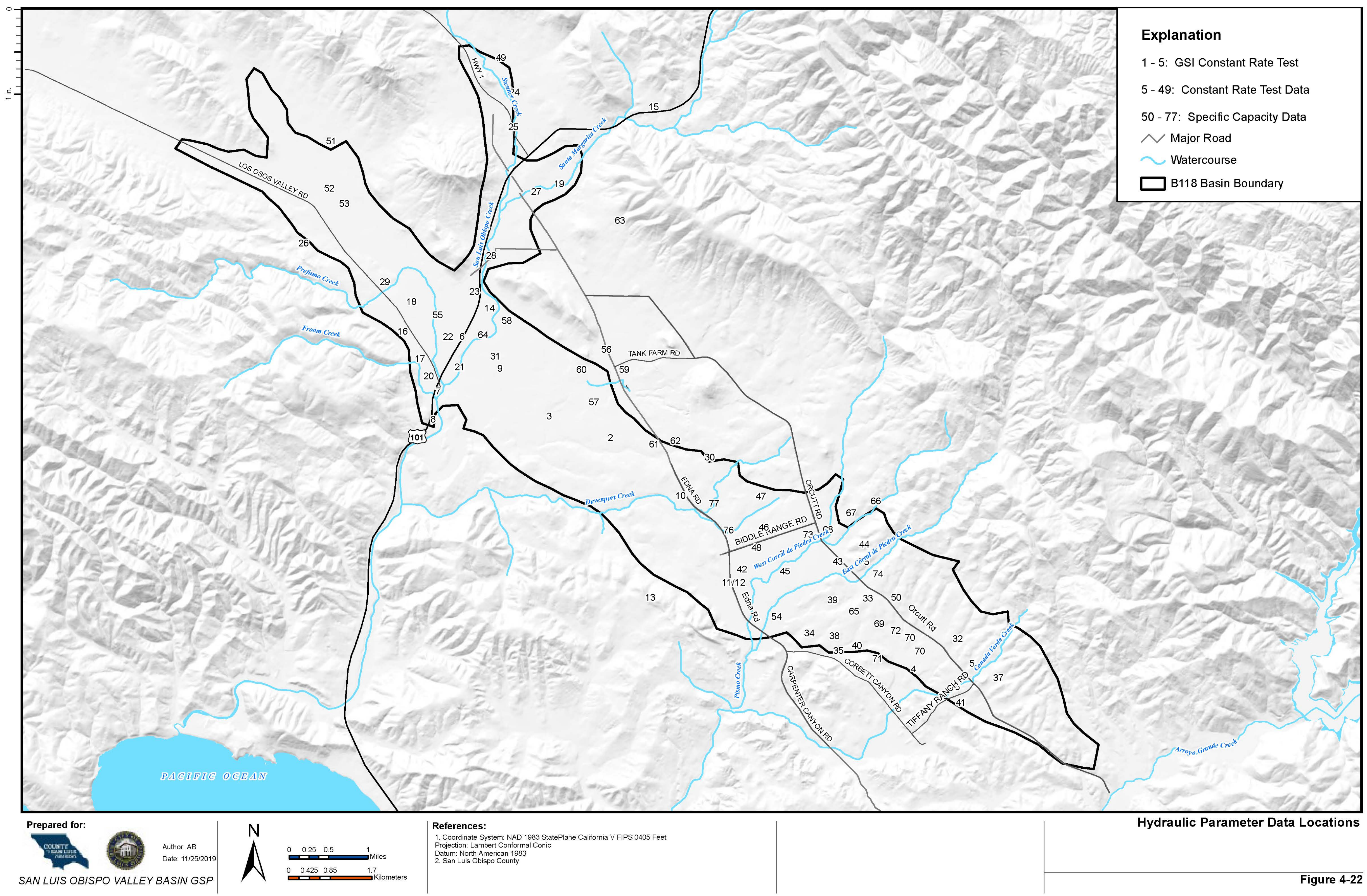
Figure 4-22 displays the spatial distribution of the available data locations for well tests in the Basin. Inspection of Figure 4-22 indicates a good spatial coverage of locations, with reasonable data density throughout the Basin.

Table 4-1 presents a compilation of all constant rate aquifer test data compiled during the preparation of this GSP. Table 4-2 presents a compilation of the specific capacity data. This information is used in the groundwater model development, and in the technical work supporting preparation of the GSP for the Basin.

Table 4-1 presents a data summary for the constant rate aquifer test that was available, including information on pumping rate, static and pumping water levels, screened intervals, total depth, and formations screened. It was not always readily apparent which formations are screened from the available data, and sometimes well screens may span more than one formation. If there is uncertainty regarding this designation, it is indicated with a question mark in Table 4-1. Calculated transmissivity values range from less than 1,000 gpd/ft to a maximum of 158,400 gpd/ft. (The highest reported transmissivity value of 158,400 gpd/ft is an outlier, and was likely influenced by recharge from a nearby stream.

Table 4-2 presents all available information for the specific capacity well tests identified. Table 4-2 includes a transmissivity estimate based on the empirical relationship discussed previously.

Data presented tables 4-1 and 4-2 indicate that wells screened in the Alluvium and Paso Robles Formation have transmissivities ranging from about 5,000 to 158,000 gallons per day per foot (gpd/ft), and averaging over 42,000 gpd/ft. Wells screened in Paso Robles and Pismo Formations have transmissivities ranging from less than 1,000 to about 40,000 gpd/ft, and average about 10,000 gpd/ft.



Hydraulic Parameter Data Locations

Figure 4-22

Table 4-1 - San Luis Obispo Valley Groundwater Basin Water Well Pump Test Data Summary

Label No.	Date Drilled	Pump Test Date	Pumping Rate (GPM)	Static Water Level (feet bgs)	Pumping Water Level (feet bgs)	Drawdown (feet)	Specific Capacity (gpm/foot)	Est. Transmissivity (gpd/foot)	Screen Length (feet)	Hydraulic Conductivity (ft/day)	Total Depth (feet)	Perforations	Formation Screened
1		7/31/2017	60	74.3	133	58.7	1.02	2,880 - 4,525	280	1.37 - 2.15	440	180-200; 240-380; 320-440	Pismo
2		8/8/2017	27	21	27.5	6.5	4.2	3,605 - 4,620			98		Paso Robles
3		8/24/2017	55	15.58	78	62.42	0.9	3,227 - 4,840					Paso Robles
4		11/21/2017	265	67.6	155.2	87.6	3.03	1,600	300	2.82 - 3.11	500	200-500	Pismo
5	12/4/2017	12/9/2017	37	132	144.9	12.9	2.87	5,692 - 9,678	200	3.8 - 6.5	300	90-290	Paso Robles/Pismo
6	2/7/2003	2/18-21/2003	350	7.5	39.6	32.1	11	23,100	60	51.3	145	45-85; 115-135	Alluvium/Paso Robles
7	1/31/2003	2/6/2003	400-450	8.92	28.67	19.75	33.3	66,600	45	197.3	80	25-70	Alluvium/Paso Robles
8	2/10/2003	2/19/2003	250	5.5	28.92	23.42	9.3	18,600	30	82.7	70	30-60	Alluvium/Paso Robles
9	4/18/1996	4/19-21/1996	3.7	11.86	23.36	11.5	0.32	187	15	1.7	70	52-67	Alluvium
10	1/23/2013	2/5-9/2013	135	46.78	114.41	67.63	2	3,992	60	8.9		80-100; 140-180	Paso Robles/Pismo
11	8/18/1992	5/31/1992	656	52.4	122.3	69.90	9.38	5,773	200	3.8	440	130-190; 290-430	Pismo/Bedrock
12	4/4/2001	5/9/2001	500	70	85	15	33.33	66,667	180	49.4	520	160-200; 370-510	Pismo/Bedrock
13		5/12-16/2014	149	258.25	295.1	36.85	4.35	8,700	190	6.1	550	280-420; 490-540	Pismo/Obispo or Bedrock
14	6/15/1988	6/30/1988	135	20.5	25.9	5.4	25	50,000	20	333.3	80	50-70	Alluvium/Paso Robles
15	7/12/1988	7/15/1988	80	24	42	18	4.44	8,889	30	39.5	57	27-57	Alluvium
16	7/22/1988	7/26/1988	300	11.5	Incomplete Data						140	40-130	Alluvium/Paso Robles
17	4/20/1989	5/16/1989	250	11.5	53.3	41.8	5.98	15,000	70	28.6	140	60-130	Alluvium/Paso Robles
18	7/27/1988	9/2/1988	95	22	59	37.0	2.57	5,135	70	9.8	180	55-125	Alluvium/Paso Robles
19	7/25/1988	8/4/1988	70	24	27.3	3.3	21.21	42,424	20	282.8	48	28-48	Alluvium
20	10/6/1989	10/24/1989	375	10.42	33.58	23.16	16.19	21,300	95	29.9	175	60-120; 140-175	Paso Robles/Pismo
21	6/28/1989	7/6/1989	200	10.4	38.5	28.1	7.12	21,120	60	46.9	175	50-90; 150-170	Alluvium/Paso Robles
22	4/26/1989	5/10/1989	900	11	39.3	28.3	31.80	63,604	80	106.0	140	42-122	Alluvium/Paso Robles
23		6/14/1989	500	20	47	27	18.52	37,037			60	?	Alluvium
24	12/22/1989	12/27/1989	50	11	31.2	20.2	2.48	4,950	15	44.0	53	33-48	Bedrock
25	4/18/1989	4/20/1989	100	14	26	12	8.33	16,667	10	222.2	44	34-44	Alluvium
26		7/18/1986	60	55	280	225	0.27	533	80	0.9	296	220-300	Bedrock
27		5/15/1989	80	9.92	31	21.08	3.80	26,400	20	176	49	29-49	Alluvium
28		4/22/1993	165	19.63	33.4	13.77	11.98	87,120	30	387.2	65	30-60	Alluvium
29		10/10/1990	25	39.5	78.5	39	0.64	400	80	0.67	145	60-140	Paso Robles
30		7/20/2011	20	46.5	272	225.5	0.09	177	140	0.169	300	160-300	Bedrock
31		6/26/1991	100	20	58	38	2.63	24,000	40	80	140	90-130	Paso Robles
32		4/12/1994	90	53.46	120	66.54	1.35	2,640	85	4.141	170	85-170	Pismo
33		6/26/1989	596	51.2	147.5	96.3	6.19	3,311	280	1.577	400	60-120; 160-360; 380-400	Paso Robles/Squire
34		6/15/2007	350	65.5	138	72.5	4.83	10,266				200-?	
35		6/15/2007	300	37.5	134	96.5	3.11	7,401				170-?	
36		6/9/1985	295	36.25	98.45	62.2	4.74	33,807			240		Paso Robles/Pismo
37		2/10/1997	300	110.2(?)	131.3	21.2	14.15	39,600	220	24	490	190-290; 350-410; 430-490	Pismo
38		8/6/2014	150	166	215	49	3.06	3,046			300		
39		8/7/2014	158	171	219	48	3.29	3,627			310		
40		12/12/2008	170	116	186	70	2.43	5,081					
41		12/22/2005	350	39.6	82	42.4	8.25	18,480	230	10.71	430?	200-430	
42		6/29/2016	150	131.8	226.1	94.3	1.59	10,850	100	14.47	290	180-280	Pismo
43		6/30/1993	100	39.66	78.83	39.17	2.55	1,508	60	3.35	110	50-110	Paso Robles
44		7/21/1993	70	10.5	21.5	11	6.36	2,174	40	7.25	100	20-40; 80-100	Paso Robles/Bedrock
45		3/25/2008	200	76.7	219.3	142.6	1.40	3,105	200	2.07	400	130-170; 220-380	Pismo
46		4/3/2007	300	34.6	112.3	77.7	3.86	9,542	260	4.89	480	220-480	Bedrock
47		4/9/2007	400	28.3	78	49.7	8.05	26,400	240	14.67	420	180-420	Pismo
48		12/17/2015	150	114	266	152	0.99	851 - 1,414	?		299	?	Pismo
49		10/28/2010	600	26.5	32.3	5.8	103.45	158,400					Alluvium/Paso Robles

Table 4-2 - San Luis Obispo Valley Groundwater Basin Water Well Specific Capacity Data Summary

Label No.	Specific Capacity Test Date	Pumping Rate (GPM)	Static Water Level (feet bgs)	Pumping Water Level (feet bgs)	Drawdown (feet)	Specific Capacity (gpm/foot)	Duration (hours)	Est. Transmissivity (gpd/foot)	Screen Length (feet)	Estimated Hydraulic Conductivity (ft/day)	Total Depth (feet)	Perforations	Formation Screened
50		435				6-10		10,000-20,000			250?		Paso Robles/Pismo
51	May 1999	12	10	24	14	0.86	4	1,714	?		30		Alluvium
52	2002	18	19	63	44	0.41	12	818			86		Alluvium/Paso Robles
53	2003	3.5	16	42	26	0.13	72	269			80		Alluvium/Paso Robles
54	7/18/1966	130			60	2.17	20	4,333	30	19.3	90	60-90	Paso Robles
55	4/15/1987	200			30	6.67	12	13,333	30	59.3	110	80-110	Paso Robles
56	12/22/1972	60			30	2	8	4,000	25	21.3	75	50-75	Alluvium
57	1980	24			110	0.22	8	436	80	0.7	160	80-160	Bedrock
58	9/11/1991	15			13	1.15	8	2,308	40	7.7	90	50-90	Alluvium
59	9/12/1959	1.25			8	0.16	4	313	10	4.2	28	18-28	Alluvium
60	3/4/1957	45			18	2.5	12	5,000	17	39.2	37	20-37	Alluvium
61	3/15/1961	12			6	2	5	4,000	5	106.7	85	40-43; 75-77	Alluvium/Paso Robles
62	3/30/1956	8			4	2	2	4,000	15	35.6	32	17-32	Paso Robles
63	9/18/1989	5			20	0.25	1	500	10	6.7	50	40-50	Bedrock
64	8/29/1990	4			14	0.29	4	571	30	2.5	50	20-50	Alluvium
65	8/7/2014	47	206	257	51	0.92	1.5	1,843			340		Unknown
66	7/21/1993	75	22	33	11	6.82	4	13,636	50	36.36	100	50-100	Bedrock
67	7/23/1993	69	11	16.25	5.25	13.14	4.5	26,286	55	63.72	100	25-65; 85-100	Paso Robles/Bedrock
68	July 1993?	32	40	95?			4				120	60-120	Paso Robles
69	7/19/2012 5/19/2014 4/24/2017	83 104 109	45 82 178	87 123 212	42 41 34	2.0 2.5 3.2							Paso Robles/Pismo
70	5/9/2014 4/24/2017	94 124	182 85	196 117	14 32	6.7 3.9							Paso Robles/Pismo
71	4/24/2017	206	100	123	23	9.0							Paso Robles/Pismo
72	7/19/2012 5/19/14 4/24/17	320 367 483	98 133 104	101 183 141	3 50 37	106.7 7.3 13.1							Paso Robles/Pismo
73	12/5/12 5/19/14 4/24/17	93 55 81	86 140 50	101 65 152	15 12 15	6.2 4.6 5.4							Paso Robles/Pismo
74	12/11/12 4/24/17	23 30	55 25	57 26	2 1	15.5 30.0							Paso Robles/Pismo
75	12/11/2012	17	62	66	4	4.7							Paso Robles/Pismo
76	12/5/2012 5/19/14 4/24/17	133 104 127	73 96 89	98 152 126	25 56 37	5.3 1.9 3.4							Paso Robles/Pismo
77	12/5/2012 5/19/14 4/24/17	96 91 91	71 94 85	98 123 99	27 29 14	3.6 3.1 6.5							Paso Robles/Pismo
34	7/19/2012 5/19/14 4/24/17	183 169 259	107 86 75	135 132 135	28 46 60	6.5 3.7 4.3							Paso Robles/Pismo
33	4/24/2017	311	116	176	60	5.2							Paso Robles/Pismo
1	4/24/2017	65	29	49	20	3.3							Paso Robles/Pismo

4.5.3 Aquitards

An aquitard is a layer of low permeability, usually comprised of fine-grained materials such as clay or silt, which vertically separates adjacent layers of higher permeability formations that may serve as aquifers. Although there is some amount of clay present in nearly all of the boring logs reviewed for this plan, there are no formally defined or laterally continuous clay layers that function as aquitards within the Basin. In the San Luis Valley, wells are commonly screened across both the Recent Alluvium and the underlying Paso Robles Formation, and these two formations essentially function as a single hydrogeologic unit is this area. Similarly, in the Edna Valley, wells are commonly screened across both the Paso Robles Formation and the underlying Pismo Formation, and these two formations essentially function as a single hydrogeologic unit is this area.

4.6 SURFACE WATER BODIES

Surface water/groundwater interactions represent a small, but significant, portion of the water budget of an aquifer system. In the Basin, these interactions occur primarily at streams and lakes.

As previously discussed, there are several named creeks that flow across the Basin. In the San Luis Valley area of the Basin, these include San Luis Obispo Creek, Stenner Creek, Prefumo Creek, Froom Creek, and Davenport Creek, in addition to smaller unnamed tributaries. In the Edna Valley these include East and West Corral de Piedras Creeks (which join to form Pismo Creek just south of the Basin Boundary), and Canada de Verde Creek in southeastern Edna Valley. The watersheds support important habitat for native fish and wildlife, including the federally threatened South-Central California Coast steelhead (*Oncorhynchus mykiss)* (Stillwater Sciences et al. 2012, Stillwater Sciences 2014).

Laguna Lake is the only lake in the Basin. It is a naturally occurring lake just north of Los Osos Valley Road and west of Highway 101. The downstream outlet of the lake flows into the Prefumo Creek culvert under Madonna Road. In the past, flashboards were used to maintain water elevation in the lake to support recreation and maintain wildlife habitat. However theseare no longer used.. The water in the lake is partially supplied by seasonal flow in Prefumo Creek, which flows into Laguna Lake. and at least partially supplied by subsurface groundwater inflow.

Groundwater interaction with streams in the Basin is not well quantified, but it is recognized as an important component of recharge in the water budget. Where the water table is above the streambed and slopes toward the stream, the stream receives groundwater flow from the aquifer; this is known as a gaining reach (i.e., the stream gains flow as it moves through the reach). Where the water table is beneath the streambed and slopes away from the stream, the stream loses water to the aquifer; this is known as a losing reach. During seasonal dry flow conditions, it is clear that groundwater elevation is deeper than the streambed. Therefore, it is generally understood that the streams in the Basin discharge to the underlying aquifer, at least in the first part of the wet-weather flow season. If there is constant seasonal surface water flow, it is possible that groundwater elevations may rise to the point that they are higher than the stream elevation, and the creek may become a seasonally gaining stream in some reaches. Groundwater modeling can help evaluate surface water groundwater interaction..

The amount of flow in surface water/groundwater interaction is difficult to quantify. Boyle (1991) assumed that 10 percent of the measured surface water flow coming into the Basin in San Luis Obispo Creek and Stenner Creek was recharged to the aquifer, and used an average rate of 430 acre-feet/yr (AFY). In its draft report, DWR (1997) reports model-generated estimates ranging from streams gaining 2,700 AFY from the aquifer, to streams losing 680 AFY to the aquifer.

The County, through its coordination with Zone 9 and the City, maintains a network of five stream gauges in the San Luis Valley Basin to record heights of flow throughout the year for flood warning purposes (Figure 3-10). The gauges were constructed in November 2001 and have periods of record from that year to the present. Continuous data monitoring of height of flow at the gages is recorded, but equivalent discharge (cubic feet per second) is not recorded.

4.7 SUBSIDENCE POTENTIAL

Subsidence is the gradual settling or sinking of the earth's surface due to material movement at depth in a location, and is frequently associated with groundwater pumpage, and is one of the undesired results identified in SGMA. Subsidence has been documented in parts of the San Luis Valley. The most severe subsidence that has occurred in the Basin was in the 1990s along the Los Osos Valley Road corridor. Subsidence occurred within young organic soil (i.e., peat) in response to extraction of groundwater within a relatively shallow aquifer and resulted in significant settlement of the ground surface. The settlement caused local damage to businesses and homes in that area as local groundwater pumping dewatered the soft soil units beneath buildings and the surrounding area. Subsidence of more than 1 foot of settlement of the ground surface in some locations damaged buildings and resulted in reconstruction or retrofitting buildings.

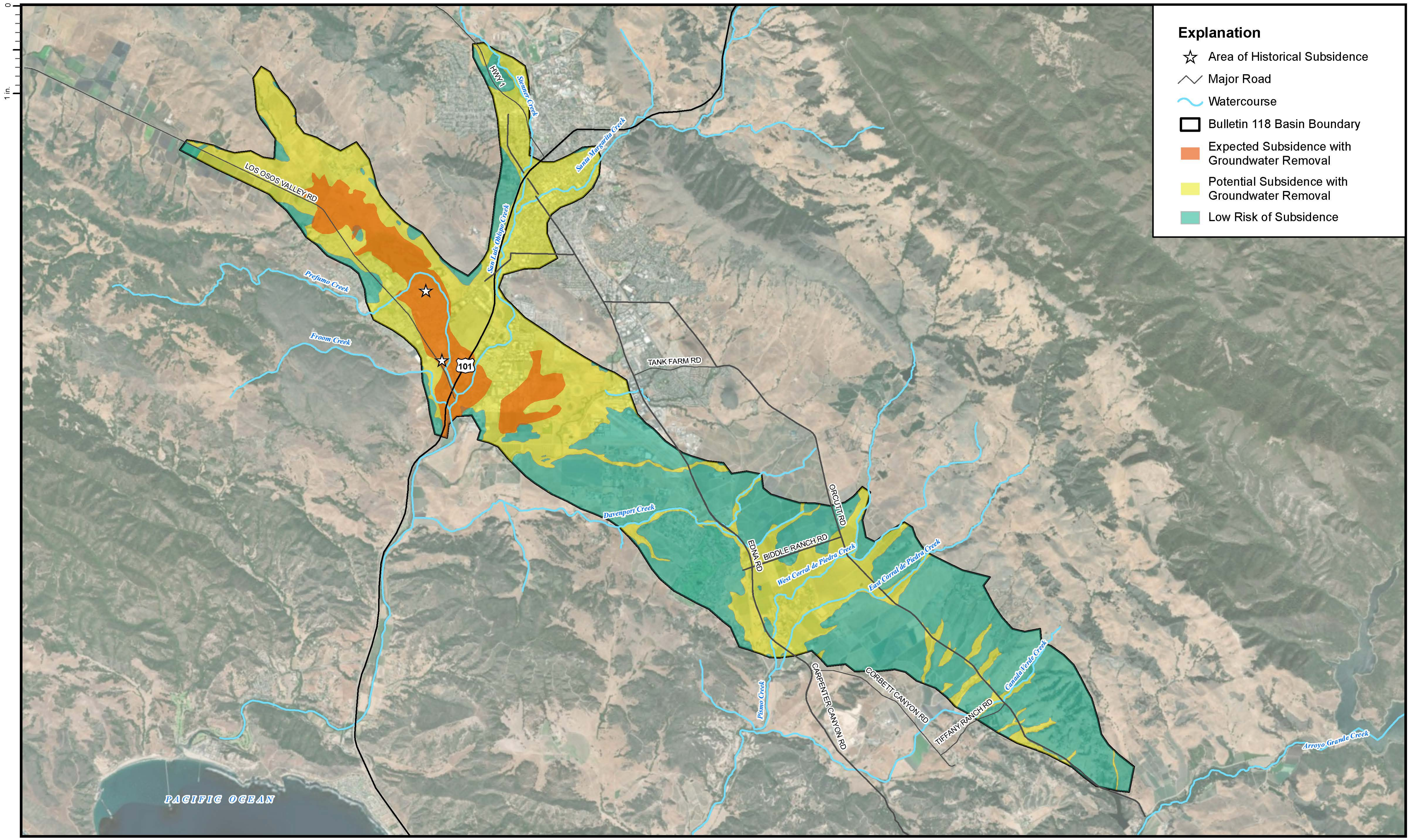
Another area of known subsidence is along the shores of Laguna Lake. Homes located along the shoreline have experienced settlement that has cracked foundations, patios, and window and door openings. Many homes in that area have been retrofitted to address the settlement. While the subsidence near Laguna Lake is not specifically related to extraction of groundwater, lowering of the groundwater table in that area could result in further settlement and subsidence.

The historical manifestation of subsidence generally has been limited to a the area along Los Osos Valley Road and downstream, where compressible soil types that were particularly vulnerable to large settlements in response to lowering of the local groundwater table. This history emphasizes the importance of considering subsurface conditions that may be associated with subsidence. Not all soil and rocks are vulnerable to the type of subsidence that occurred along Los Osos Valley Road. The potential for subsidence to occur, and the severity of the subsidence, is dependent on the geology, groundwater levels, and the properties of the soil and rock that may be dewatered in association with groundwater pumping. The subsidence evaluation consisted of a review of published data and studies performed by local, state, and federal agencies, as well as a familiarity of local geology and soil. The following is a summary of the key findings.

DWR identifies the Basin as having a low subsidence potential. However, historical subsidence is known to have occurred in specific geographic areas of the Basin because of groundwater pumping. The Basin was evaluated on the basis of the extent of known and mapped geologic units within the Basin (Yeh, 2018). The relative potential for subsidence was divided into three categories and delineated as shown in Figure 4-23.

- Category 1. Category 1 has the highest likelihood of future subsidence if subject to lowered groundwater levels in the future. Based on a review of public data and consultant reports, alluvium mapped in these areas contains young organic soil known in areas around Los Osos Valley Road, Laguna Lake, and low-lying wetland areas near Tank Farm Road. These areas are known to have experienced historical subsidence or to contain soft or organic soil and were identified as having a potential for subsidence in relation to geology and groundwater pumping. These areas are identified as Category 1 in in Figure 4-23, with star symbols marking approximate areas of known historical subsidence. Extraction of groundwater resources in these areas could cause further subsidence.

- Category 2. Low-lying topographic areas in the Basin that are mapped as young alluvial soil were identified as potentially containing soft or organic soil layers that may have a potential for subsidence in relation to groundwater pumping, but currently there is no historical or subsurface information to further evaluate those areas. Those areas are mostly located along Prefumo Creek and San Luis Obispo Creek and the main drainages through the west end of the Edna Valley near Price Canyon. These areas are identified as Category 2 in in Figure 4-23. This screening criteria recognizes the unconsolidated nature typical of young alluvium that has been mapped in these areas potentially could subside because of compaction of the aquifer if groundwater levels were lowered.
- Category 3. Geographic areas in the Basin that were mapped as bedrock or older surficial sediments, and are not known to be underlain by young organic soil or young alluvium, were identified as Category 3 in in Figure 4-23. These areas were evaluated and characterized as not having factors known to be susceptible to subsidence in relation to groundwater pumping. Generally, these are upland areas where bedrock is shallow or where bedrock is mapped at the ground surface, such as in the areas around the airport and Orcutt Road (in Figure 4-23).



Prepared for:

Author: AB
Date: 11/25/2019

SAN LUIS OBISPO VALLEY BASIN GSP

N

0 0.25 0.5 1 Miles
0 0.425 0.85 1.7 Kilometers

References:
1. Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983
2. San Luis Obispo County
3. Digiglobe 2018

Subsidence Potential

Figure 4-23

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GROUNDWATER SUSTAINABILITY COMMISSION
for the San Luis Obispo Valley Groundwater Basin
December 11, 2019

Agenda Item 8 – An Overview on Groundwater Conditions
(Presentation Item)

Recommendation
a) Receive a general overview on the basin groundwater conditions.

Prepared by
Dave O'Rourke, GSI

Discussion
The WSC Team has been tasked with the preparation of the Groundwater Sustainability Plan (GSP) for the SLO Basin to meet the requirements of SGMA. The presentation will introduce the concepts addressed in Chapter 5: Groundwater Conditions to be released on the March 11, 2020 GSC Meeting and show maps of groundwater level changes from 1997 to present. The Groundwater Conditions Chapter will include historical and current groundwater elevation contour maps, change in storage maps, water quality distribution and trends, and a discussion of interconnected surface water.

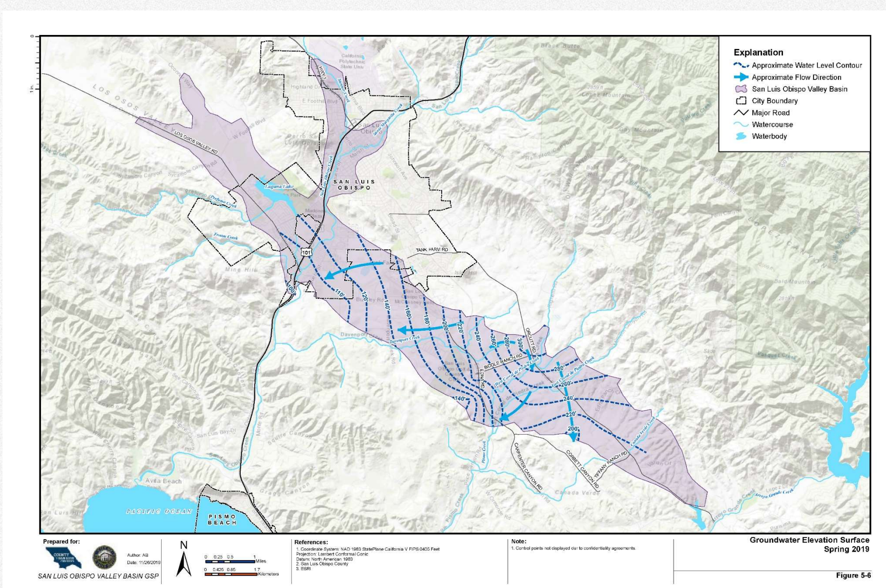
Attachments:
1. Presentation

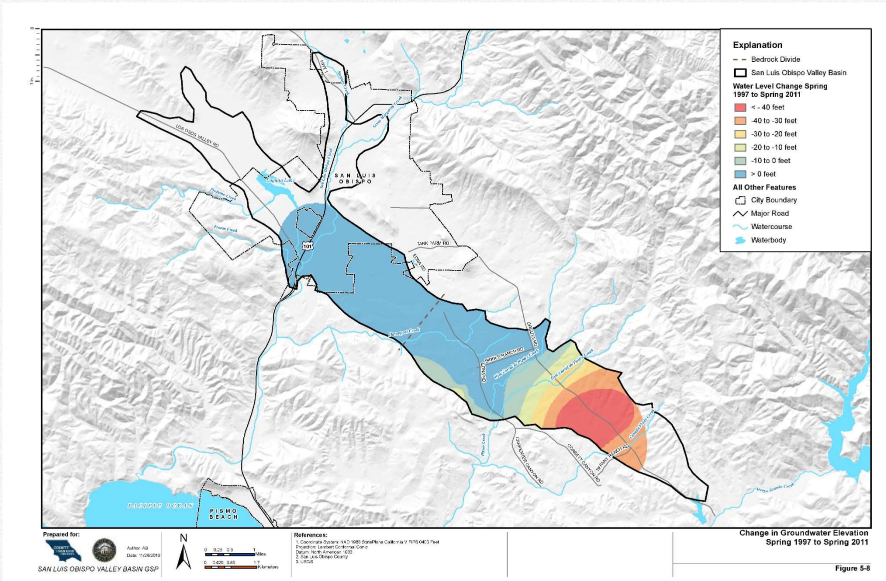
An Overview on Groundwater Conditions

Dave O'Rourke, GSI

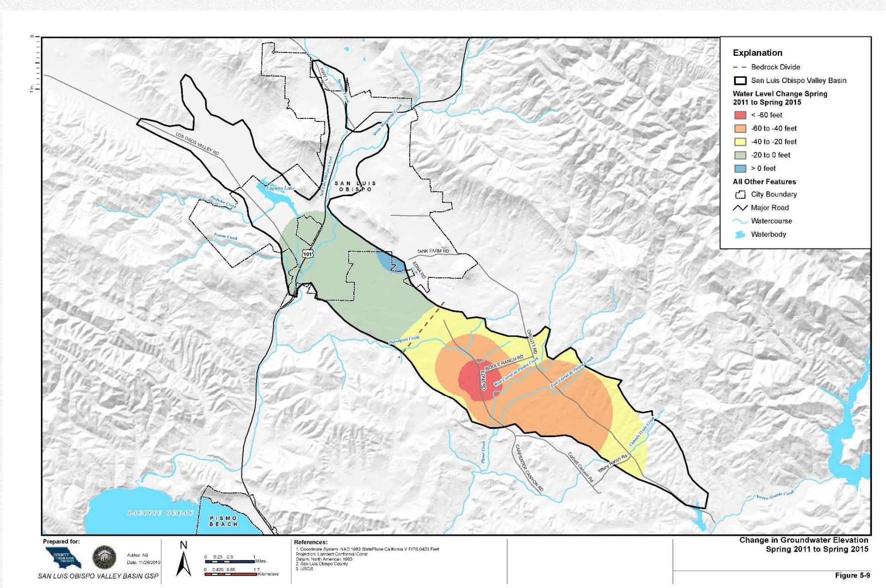
Groundwater Conditions Overview

- Groundwater Elevation Maps
- Hydrographs
- Changes in Groundwater Elevation
- Groundwater/Surface Water Interaction/Groundwater Dependent Ecosystems (GDEs)
- Water Quality Distribution and Trends
  - Total Dissolved Solids (TDS)
  - Arsenic
  - Nitrates
  - Point Source Groundwater Contamination Cases

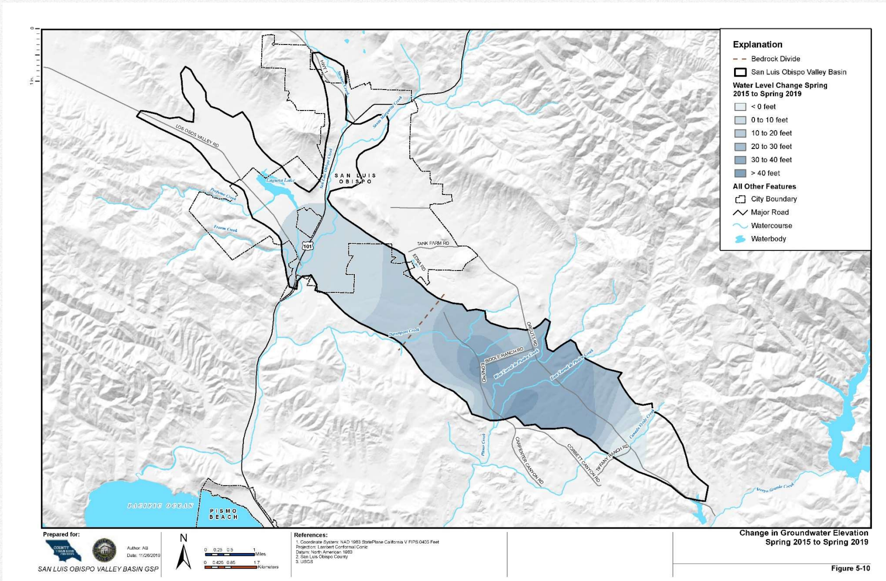




5 | SLO GSC Meeting / Dec. 11, 2019



6 | SLO GSC Meeting / Dec. 11, 2019



7 | SLO GSC Meeting / Dec. 11, 2019

GROUNDWATER SUSTAINABILITY COMMISSION
for the San Luis Obispo Valley Groundwater Basin
December 11, 2019

Agenda Item 9 – Geophysical Survey Results
(Presentation Item)

Recommendation

a) Receive a presentation on the results of the geophysical survey in the vicinity of the bedrock divide identified in the 2018 SLO Basin Characterization Report.

Prepared by

Spencer Harris, CHG

Discussion

The WSC Team, has been tasked with the preparation of the Groundwater Sustainability Plan (GSP) for the SLO Basin to meet the requirements of SGMA. An optional task of the GSP Task 2.4B Geophysical Survey was approved by County and City staff. The geophysical survey was performed to better characterize a bedrock divide identified in the 2018 SLO Basin Characterization Report. To complete the investigation of the bedrock divide between the San Luis Valley and Edna Valley portions of the groundwater basin, CHG reviewed and interpreted existing well completion reports, reviewed existing surface geology maps, and performed a geophysical survey of the area of interest. The passive seismic data collected during the survey was postprocessed, calibrated, and modeled to estimate the depth to bedrock across the area of interest. Data sets from well completion reports, surface maps, and the geophysical survey were then used to generate contours of the depth of permeable sediments and a saturated thickness map across the area of interest.

The geophysical survey conducted by CHG has confirmed the presence of a bedrock divide between the Edna Valley and San Luis Obispo portions of the groundwater basin. This divide ranges in elevation from approximately 100 feet above mean sea level to 180 feet above mean sea level. Saturated thickness across this interval ranged from none to an estimated 50 feet. Additionally, the geophysical survey identified two synclines and an anticline which underlie the area. These structures, along with the bedrock divide, affect groundwater flow within this portion of the basin and will be incorporated into the groundwater flow model.

A technical memorandum describing the results of the geophysical survey and will be included as an appendix to the GSP.

Attachments:

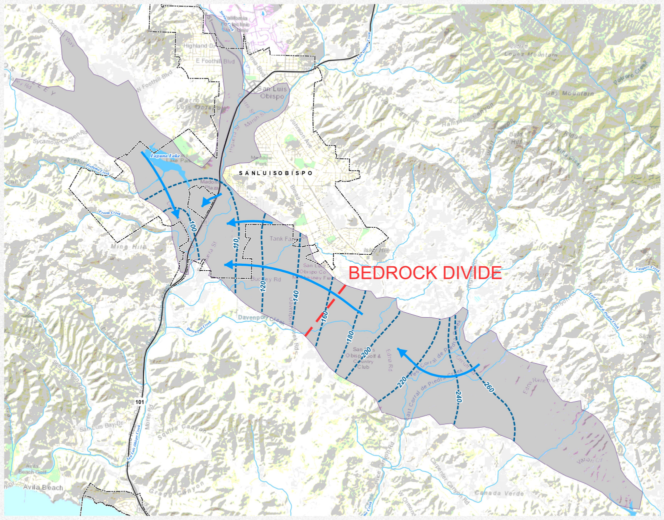
1. Presentation

Geophysical Survey

Spencer Harris, CHG

CHG

Define the base of permeable sediments in the vicinity of the bedrock divide

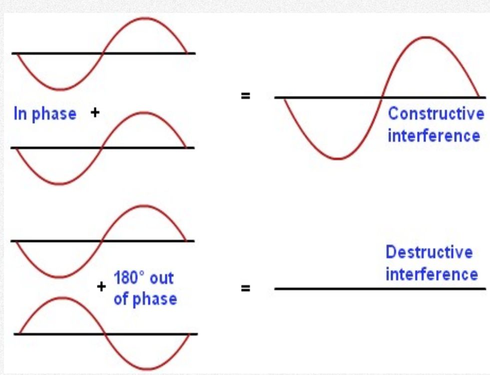


Applicable to

- Water Budget
- Flow Model
- Basin Management

HVSR Theory

ACOUSTIC WAVE RESONANCE



EMPIRICAL FORMULA
(SIMPLE 2-LAYER MODEL)

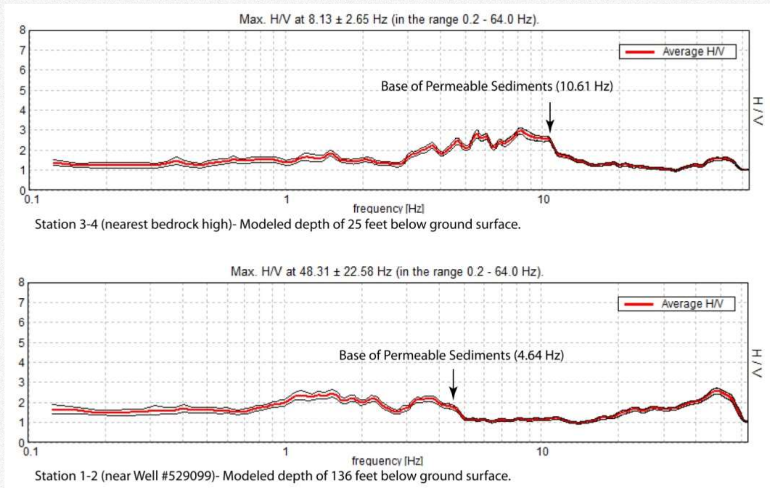
$$f = \frac{v}{4h}$$

f = FREQUENCY AT PEAK HVSR AMPLITUDE (Hz)

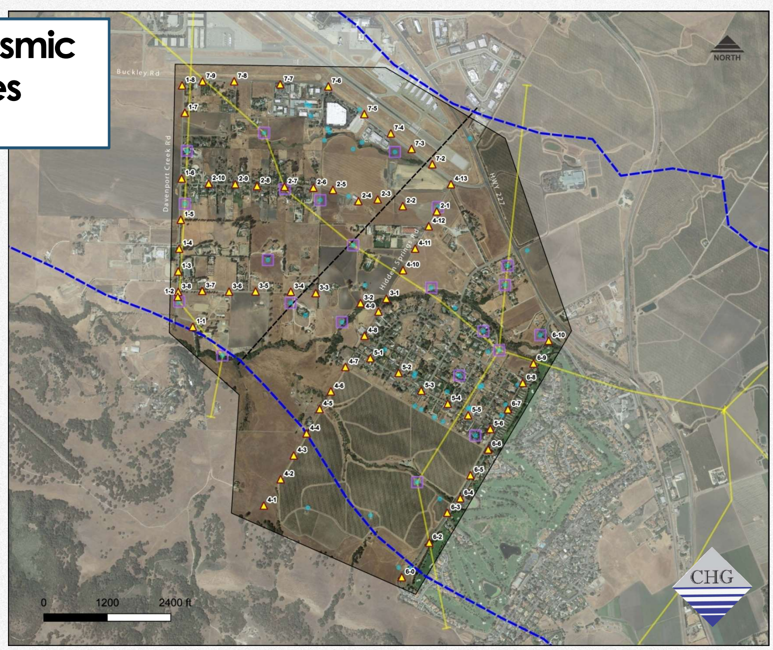
v = UPPER LAYER SHEAR WAVE VELOCITY (m/s)

h = UPPER LAYER THICKNESS (m)

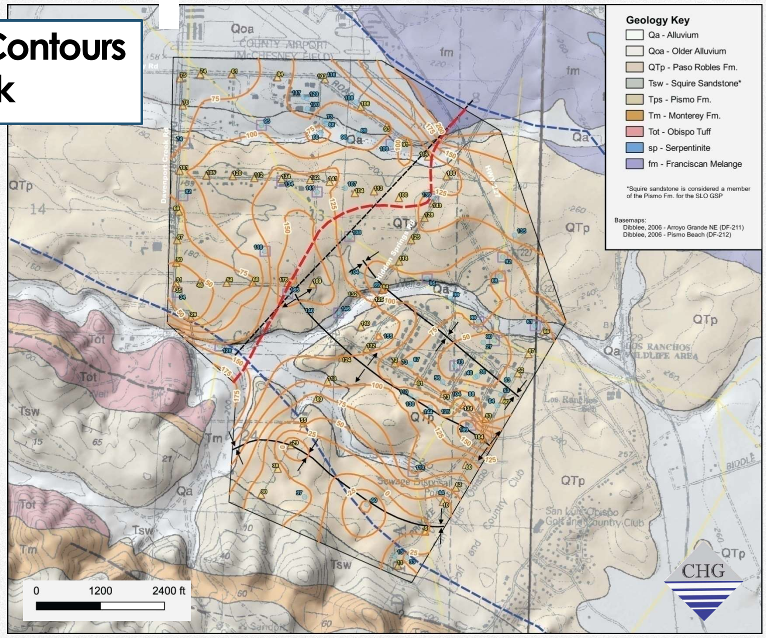
Depth-Frequency Relationship



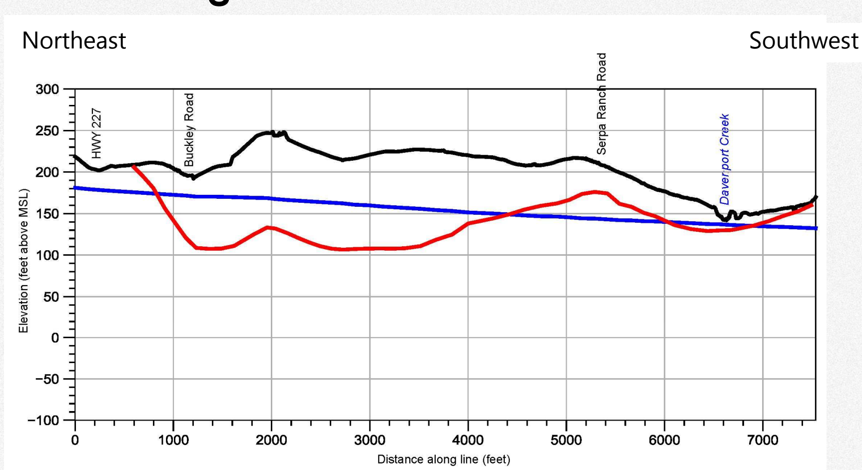
Passive Seismic Survey Lines



Elevation Contours on Bedrock



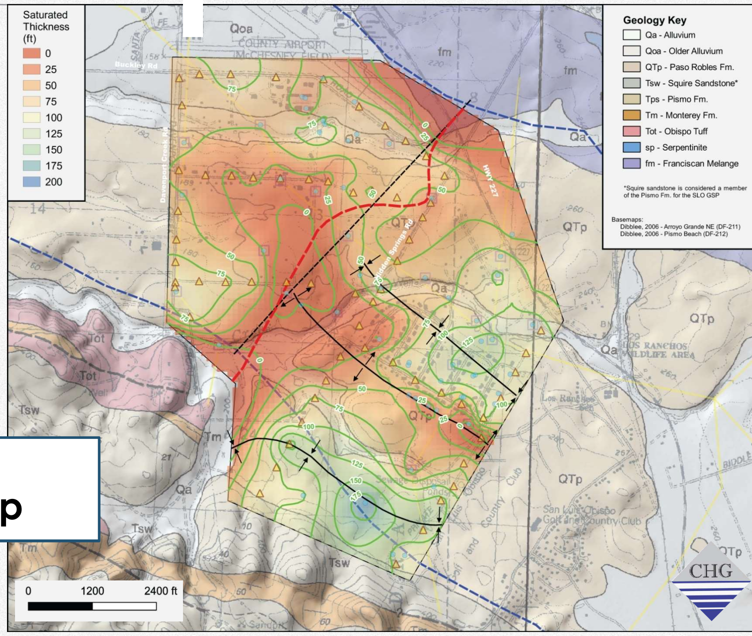
Elevation Profile along Bedrock Divide



Groundwater elevation (Spring 2019)

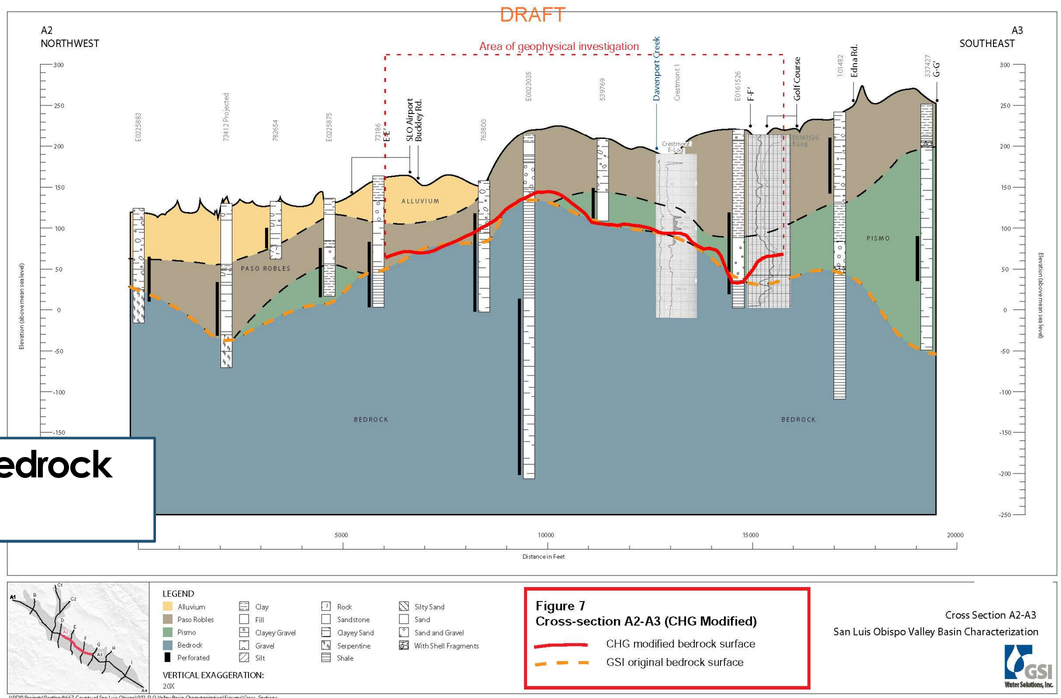
Bedrock elevation

Saturated Thickness Map

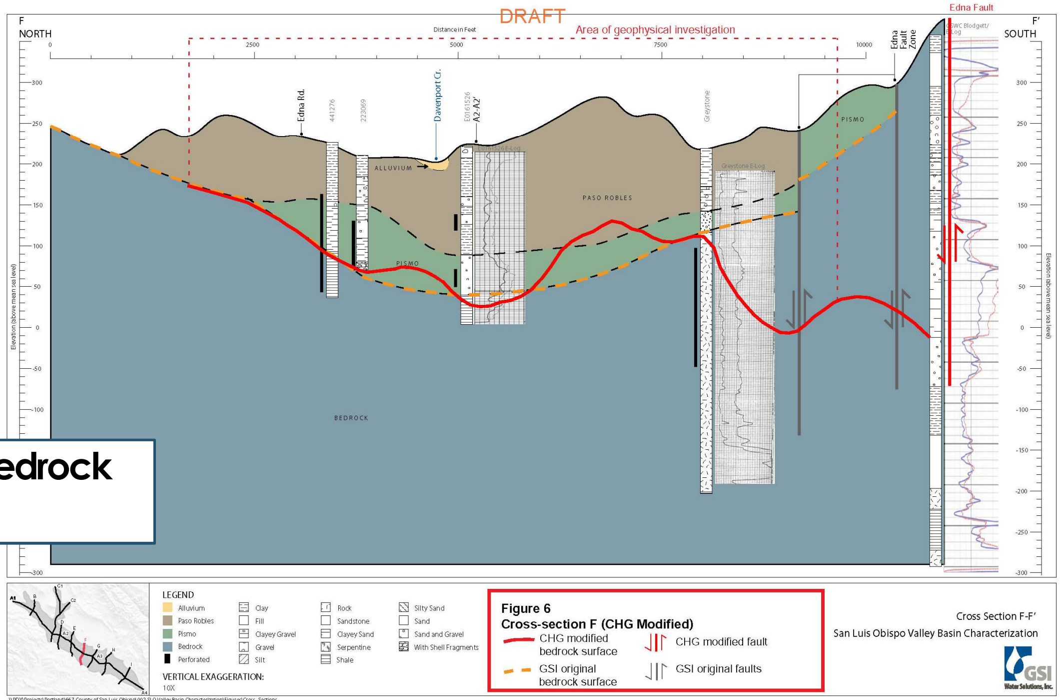


10

Revised Bedrock Surface



Revised Bedrock Surface



11

GROUNDWATER SUSTAINABILITY COMMISSION
for the San Luis Obispo Valley Groundwater Basin
December 11, 2019

Agenda Item 10 – An Overview on Water Budget
(Presentation Item)

Recommendation

a) Receive a presentation on the basin water budget framework.

Prepared by

Spencer Harris, CHG

Discussion

The WSC Team, has been tasked with the preparation of the Groundwater Sustainability Plan (GSP) for the SLO Basin to meet the requirements of SGMA. The initial water budget is developed using analytical methods for the historical and current time periods and will be used to guide the development of the integrated groundwater/surface water model. The model will be calibrated and used to refine the historical and current water budgets, and will provide the future water budgets. This presentation will introduce the concepts of a water budget and how it is used in the GSP. Chapter 6 - Water Budget is anticipated to be released at the June 10, 2020 GSC meeting.

Attachments:

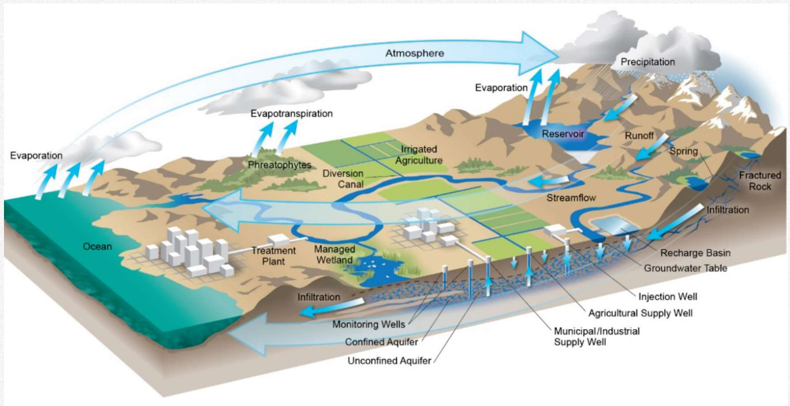
1. Presentation

Water Budget Overview

Spencer Harris, CHG

CHG

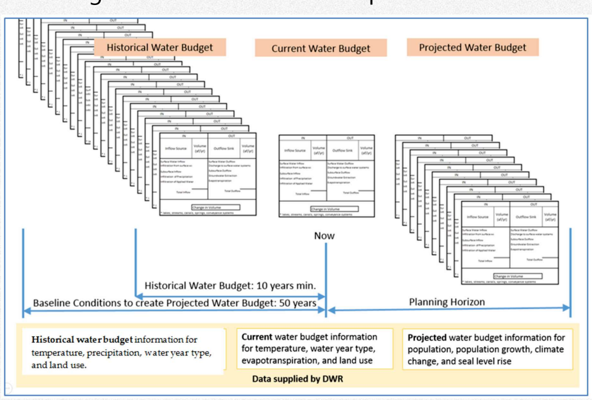
The Hydrologic Cycle (Water Cycle)



Department of Water Resources (Water Budget BMP, 2016)

GSP §354.18 Water Budget

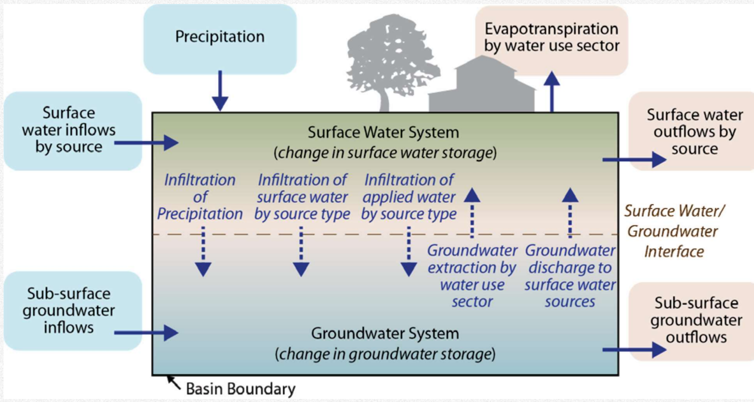
(a) Each Plan shall include a water budget for the basin that provides an accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the basin, including historical, current, and projected water budget conditions, and the change in the volume of water stored. Water budget information shall be reported in tabular and graphical form.



Department of Water Resources (Water Budget BMP, 2016)

Water Budget Equation

INFLOW – OUTFLOW = CHANGE IN STORAGE



Department of Water Resources (Water Budget BMP, 2016)

CHG

Sustainable Yield and Overdraft

GSP Regulations §354.18(b): The water budget shall quantify the following, either through direct measurement or estimates based on data:

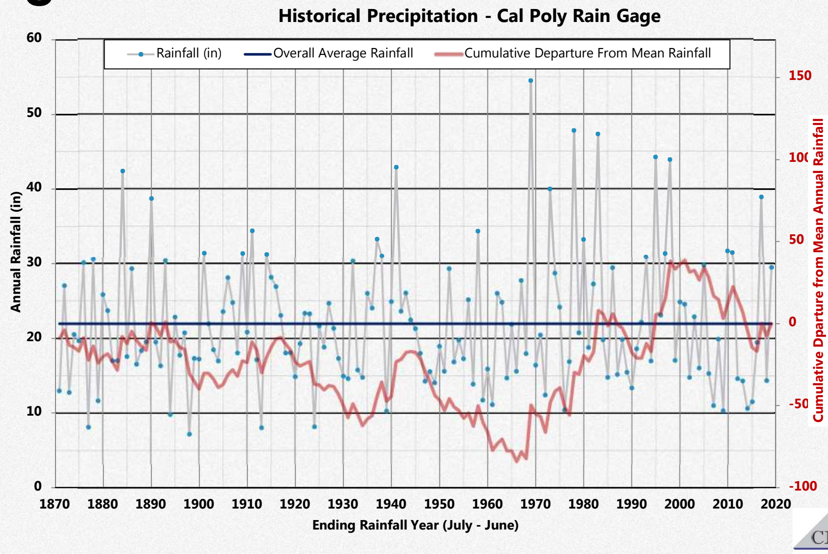
(5) If overdraft conditions occur, as defined in Bulletin 118, the water budget Shall include a quantification of overdraft for a period of years during which water year and water supply conditions approximate average conditions.

(7) An estimate of sustainable yield for the basin.

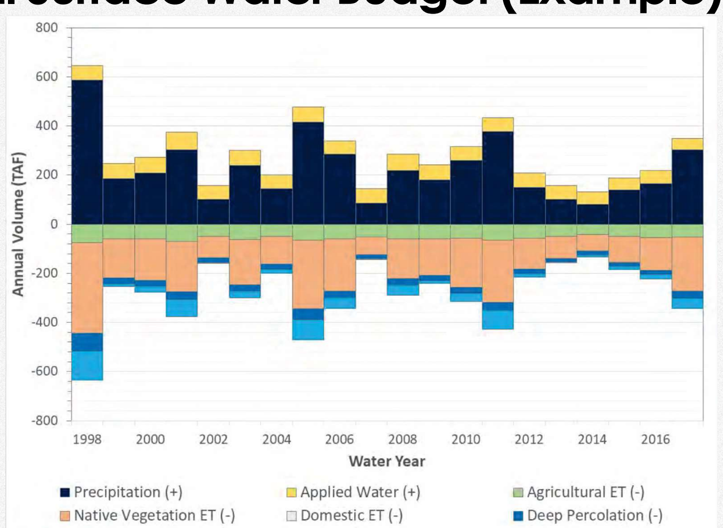
> Sustainable Yield – the maximum quantity of water, calculated over A base period representative of long term conditions in the basin and Including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result. (SGMA)
>
> Overdraft – The condition of a groundwater basin or subbasin where the amount of water withdrawn by pumping exceeds the amount of water over a period of years, during which the water supply conditions approximate average conditions. (DWR Bulletin 118)

CHG

Hydrologic Base Period

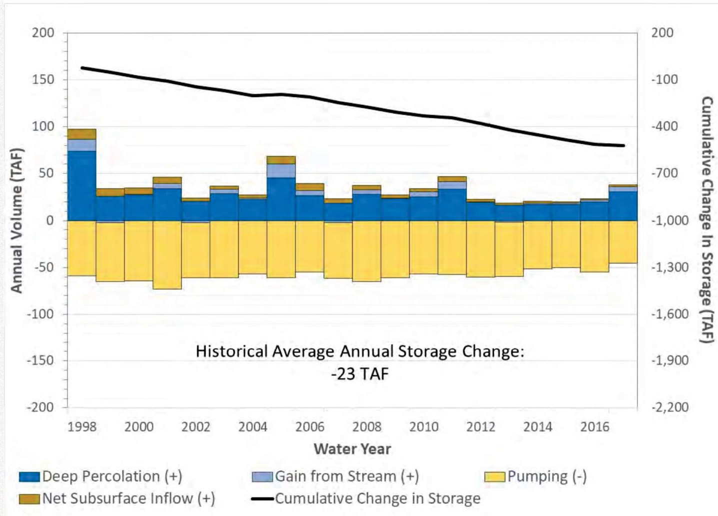


Historical Surface Water Budget (Example)



Draft GSP, Cuyama Groundwater Basin (Woodard & Curran, April 2019)

Historical Groundwater Budget (Example)



Draft GSP, Cuyama Groundwater Basin (Woodard & Curran, April 2019)

CHG

GROUNDWATER SUSTAINABILITY COMMISSION
for the San Luis Obispo Valley Groundwater Basin
December 11, 2019

Agenda Item 11 – Integrated Groundwater/Surface Water (GW/SW) Modeling Update (Update Item)

Recommendation
a) Receive an update on the integrated GW/SW modeling efforts.

Prepared by
Dave O'Rourke, GSI

Discussion
The WSC Team, led by GSI Water Solutions, Inc. (GSI), and supported by WSC and Cleath Harris Geologists (CHG) has been tasked with the development of an integrated groundwater/surface water flow model for use in supporting the GSP development. The model will be used to estimate future groundwater levels in the basin, and to demonstrate the effects that various proposed projects and management actions will have on the goal of achieving sustainability by 2042. A brief update on the modeling task will be provided to the GSC.

Attachments:
1. None

GROUNDWATER SUSTAINABILITY COMMISSION
for the San Luis Obispo Valley Groundwater Basin
December 11, 2019

Agenda Item 12 – A Preview of What's Next?
(Presentation Item)

Recommendation

a) Receive a preview of upcoming SGMA activities and provide direction as necessary

Prepared by

Michael Cruikshank, Water Systems Consulting, Inc.

Discussion

The WSC Team, has been tasked with the preparation of the Groundwater Sustainability Plan (GSP) for the SLO Basin to meet the requirements of SGMA. The WSC Team will present the near term SGMA activities related to outreach and future GSP Chapter releases and review. Volume 3 of the Quarterly Update Newsletter of the SLO Basin GSP Development will be released in January 2020 via SLOWaterBasin.com. The Newsletter will provide recent meeting summaries, project milestones, opportunities to participate, project timeline, and key terms. The following chapters or technical memoranda are scheduled to be released at the March 11, 2020 Groundwater Sustainability Commission (GSC) meeting: Chapter 5 – Groundwater Conditions and Data Management Plan TM. Workshop #2 is anticipated to take place in April 2020 and will be focused on establishing a sustainability vision and goals for the SLO Basin.

Attachments:

1. Presentation

GSC QUARTERLY MEETING

For the Development of the SLO Basin Groundwater Sustainability Plan (GSP)

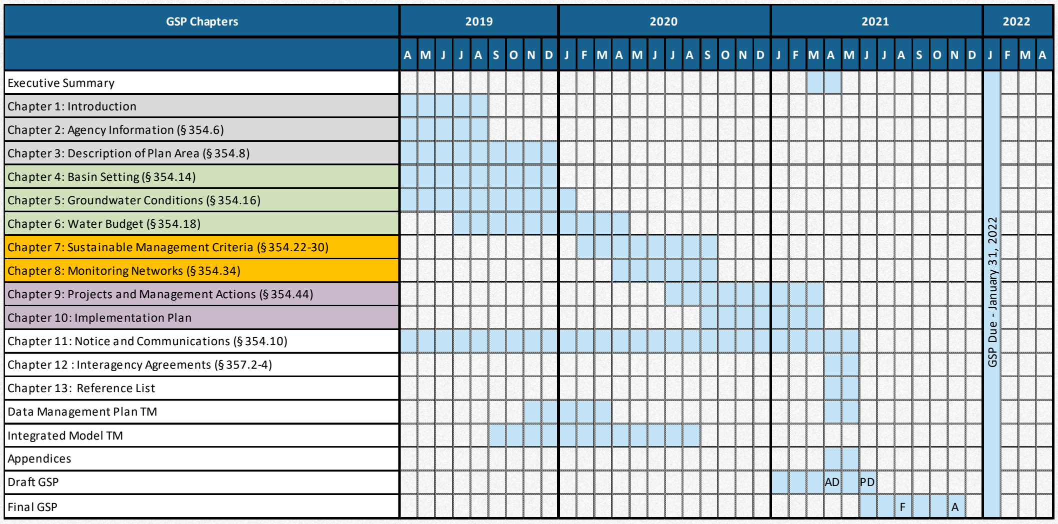
December 11, 2019

PREPARED BY WATER SYSTEMS CONSULTING

A PREVIEW OF WHAT'S NEXT

Michael Cruikshank, WSC

SLO Basin GSP Chapter Schedule



Timeline of Events

SLO Basin GSP Development Quarterly Newsletter Volume 3

Released in January via
SLOWaterBasin.com

- Meeting Summaries
- Project Milestones and Opportunities to Participate
- Project Timeline
- Key Terms


SECURING SUSTAINABLE GROUNDWATER in the SLO Basin

A QUARTERLY UPDATE OF THE SLO BASIN GROUNDWATER SUSTAINABILITY PLAN DEVELOPMENT
VOLUME 2 | OCTOBER 2019

In this issue
MEETING SUMMARIES – page 2
HOW TO PARTICIPATE – page 3
PROJECT TIMELINE — page 4
ACCOMMODATIONS — page 4

More than 50 in Attendance at August Public Workshop

Workshop Covered SGMA and Groundwater 101

The City and County of San Luis Obispo would like to thank all who attended the first public workshop on August 14, 2019. GSP workshops provide an important method for stakeholders to learn about and inform the development of the SLO Basin Groundwater Sustainability Plan (GSP).

During the two-hour workshop, presenters from the GSP consultant team provided an educational program that was well received by attendees. Topics included:

- Sustainable Groundwater Management Act (SGMA) requirements and key deadlines
- Principles of groundwater flows and the data considered to assess the groundwater conditions of the Basin
- The time scale difference of how surface water flows compare to groundwater
- Current groundwater data gaps within the SLO Basin
- A snapshot of the current groundwater levels within the SLO Basin
- Details on how stakeholders can actively participate in the development of the SLO Basin GSP

Learn about these topics and more — listen to the workshop audio recording or view workshop slides at: SLOWaterBasin.com/resources.

Why am I receiving this?

» You live or work in the SLO Basin
» You may be affected by the SLO Basin's groundwater use
» You subscribed to receive updates about SGMA or GSP development

Throughout the duration of the SLO Basin GSP development, this newsletter will be distributed quarterly to all subscribers of the SLOWaterBasin.com Portal and made available at GSC meetings and stakeholder workshops. To stop receiving these newsletters, go to SLOWaterBasin.com, scroll to the bottom of the page and click "unsubscribe."

How can we improve this newsletter?

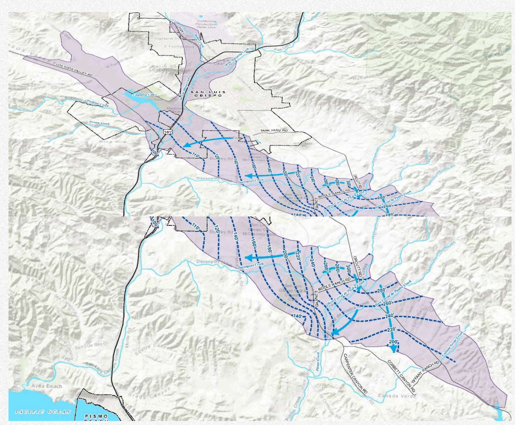
Please share your feedback on what else you'd like to read in this newsletter and how we can improve our stakeholder outreach. Submit your feedback at SLOWaterBasin.com click on "Comment."

LEFT: David O'Rourke, a hydrogeologist from GSI Water Solutions, educates stakeholders about the key tools and data that will be used to understand the groundwater conditions of the SLO Basin. Such tools include hydrographs (an example is shown in the photo to the left), water level maps, changes in water levels, and the water budget.

SLOWaterBasin.com — GET INVOLVED NOW

Upcoming Chapters For Review Released at the December GSC Meeting

- Chapter 5 – Groundwater Conditions
- Data Management Plan TM



Workshop #2
Sustainability vision and goals for SLO Basin

TBD: April 2020

GROUNDWATER SUSTAINABILITY INDICATORS

- Chronic Lowering of Groundwater Levels
- Reduction of Groundwater Storage
- Land Subsidence
- Water Quality Degradation
- Interconnected Surface Water Depletions
- Seawater Intrusion