



Santa Clara Valley Water District Board Policy and Monitoring Committee Meeting

HQ. Bldg. Boardroom, 5700 Almaden Expressway, San Jose, California
Join Zoom Meeting: <https://valleywater.zoom.us/j/81170871803>

REGULAR MEETING AGENDA

**Tuesday, March 17, 2026
11:00 AM**

District Mission: Provide Silicon Valley safe, clean water for a healthy life, environment and economy.

BOARD COMMITTEE MEMBERS:

Nai Hsueh, Chairperson
Director District 5
Tony Estremera, Vice Chairperson
Director District 6
Shiloh Ballard, Member
Director District 2

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COMMITTEE LIAISONS:

Candice Kwok-Smith
ckwok-smith@valleywater.org
Theresa Chinte
tchinte@valleywater.org
Stephanie Simunic
COB Liaison
1-408-630-2408
ssimunic@valleywater.org

Note: The finalized Board Agenda, exception items and supplemental items will be posted prior to the meeting in accordance with the Brown Act.

Santa Clara Valley Water District
Board Policy and Monitoring Committee
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AGENDA

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IMPORTANT NOTICES AND PARTICIPATION INSTRUCTIONS

Santa Clara Valley Water District (Valley Water) Board of Directors/Board Committee meetings are held as a “hybrid” meetings, conducted in-person as well as by telecommunication, and is compliant with the provisions of the Ralph M. Brown Act.

To maximize public safety while still maintaining transparency and public access, members of the public have an option to participate by teleconference/video conference or attend in-person. To observe and participate in the meeting by teleconference/video conference, please see the meeting link located at the top of the agenda. If attending in-person, you are required to comply with Ordinance 22-03 - AN ORDINANCE OF THE SANTA CLARA VALLEY WATER DISTRICT SPECIFYING RULES OF DECORUM FOR PARTICIPATION IN BOARD AND COMMITTEE MEETINGS located at <https://s3.us-west-2.amazonaws.com/valleywater.org.if-us-west-2/f2-live/s3fs-public/Ord.pdf>

In accordance with the requirements of Gov. Code Section 54954.3(a), members of the public wishing to address the Board/Committee during public comment or on any item listed on the agenda, may do so by filling out a Speaker Card and submitting it to the Clerk or using the “Raise Hand” tool located in the Zoom meeting application to identify yourself in order to speak, at the time the item is called. Speakers will be acknowledged by the Board/Committee Chair in the order requests are received and granted speaking access to address the Board.

- Members of the Public may test their connection to Zoom Meetings at: <https://zoom.us/test>
- Members of the Public are encouraged to review our overview on joining Valley Water Board Meetings at: <https://www.youtube.com/watch?v=TojJpYCxXm0>

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<https://valleywater.zoom.us/j/81170871803>

Meeting ID: 811 7087 1803

Join by Phone:

1 (669) 900-9128, 81170871803#

1. CALL TO ORDER:

1.1. Roll Call.

2. TIME OPEN FOR PUBLIC COMMENT ON ANY ITEM NOT ON THE AGENDA.

Notice to the public: Members of the public who wish to address the Board/Committee on matters not listed on the agenda may do so by completing a Speaker Card and submitting it to the Clerk, or by using the "Raise Hand" feature within the Zoom meeting application to request recognition. Speakers will be acknowledged by the Board/Committee Chair in the order requests are received and, when recognized, will be granted speaking access to address the Board/Committee.

Public comments shall be limited to three (3) minutes per speaker, or such other time as determined by the Chair. State law does not permit the Board/Committee to take action on, or engage in extended discussion of, any item not appearing on the posted agenda, except as otherwise authorized under applicable law. If Board/Committee action is requested, the matter may be scheduled for consideration at a future meeting.

All public comments requiring a response will be referred to staff for a written reply. The Board/Committee may take action on any item of business appearing on the posted agenda.

3. APPROVAL OF MINUTES:

- 3.1. Approval of the February 9, 2026 Board Policy and Monitoring Committee (BPMC) Minutes. [26-0239](#)
Recommendation: Approve the February 9, 2026 BPMC Minutes.
Manager: Wendy Ho, 408-630-3874
Attachments: [Attachment 1: 02092026 BPMC Minutes](#)
Est. Staff Time: 5 Minutes

4. REGULAR AGENDA:

- 4.1. Receive Update on Final Results for the Flood Control and Water Supply Development Impact Fee Analyses and Provide Recommendation to the Board as needed. [26-0241](#)
Recommendation: Receive update on final results for the Flood Control and Water Supply Development Impact Fee Analyses and provide recommendations to the Board as needed.
Manager: Darin Taylor, 408-630-2068
Attachments: [Attachment 1: PowerPoint](#)
[Attachment 2: Final Study Report](#)
Est. Staff Time: 20 Minutes
- 4.2. Provide Feedback for the Upcoming Audit of the Board Appointed Officers Complaint Process. [26-0283](#)
Recommendation: Provide feedback for the upcoming audit of the Board Appointed Officers Complaint Process.
Manager: Wendy Ho, 408-630-3874
Est. Staff Time: 10 Minutes
- 4.3. Receive and Discuss Board Member Travel Policy. [26-0216](#)
Recommendation: A. Receive and discuss Board Member travel policies to determine if additional language is necessary related to cancellations.
B. Provide direction to staff as needed;
C. Recommend additions to GP-10 be presented to the full board for approval.
Manager: Candice Kwok-Smith, 408-630-3193
Attachments: [Attachment 1: Governance Process - GP-10](#)
Est. Staff Time: 5 Minutes
- 4.4. Review and Discuss the 2026 Board Policy and Monitoring Committee (BPMC) Work Plan and Make Adjustments as Necessary. [26-0240](#)

Recommendation: Review and discuss the 2026 BPMC Work Plan and make adjustments as necessary.

Manager: Wendy Ho, 408-630-3874

Attachments: [Attachment 1: 2026 BPMC Committee Work Plan](#)

Est. Staff Time: 5 Minutes

5. CLERK REVIEW AND CLARIFICATION OF COMMITTEE REQUESTS.

This is an opportunity for the Clerk to review and obtain clarification on any formally moved, seconded, and approved requests and recommendations made by the Committee during the meeting.

6. ADJOURN:

6.1. Adjourn. The Next Regular Meeting is Scheduled at 11:00 a.m., on Tuesday April 21, 2026.



Santa Clara Valley Water District

File No.: 26-0239

Agenda Date: 3/17/2026
Item No.: 3.1.

COMMITTEE AGENDA MEMORANDUM Board Policy and Monitoring Committee

Government Code § 84308 Applies: Yes No
(If "YES" Complete Attachment A - Gov. Code § 84308)

SUBJECT:

Approval of the February 9, 2026 Board Policy and Monitoring Committee (BPMC) Minutes.

RECOMMENDATION:

Approve the February 9, 2026 BPMC Minutes.

SUMMARY:

In accordance with the Ralph M. Brown Act, a summary of Committee discussions, and details of all actions taken by the Board Policy and Planning Committee, during all open and public Committee meetings, is transcribed and submitted for review and approval.

Upon Committee approval, minutes transcripts are finalized and entered into the District's historical records archives and serve as historical records of the Committee's meetings.

ENVIRONMENTAL JUSTICE IMPACT:

The approval of minutes is not subject to environmental justice impact analysis.

ATTACHMENTS:

Attachment 1: 02092026 BPMC Minutes

UNCLASSIFIED MANAGER:

Wendy Ho, 408-630-3874



BOARD POLICY AND MONITORING
COMMITTEE MEETING

DRAFT MINUTES

**SPECIAL MEETING
MONDAY, FEBRUARY 9, 2026
11:00 AM**

(Paragraph numbers coincide with agenda item numbers)

1. CALL TO ORDER:

A special meeting of the Santa Clara Valley Water District (Valley Water) Board Policy and Monitoring Committee (Committee) was called to order by Chairperson Hsueh in the Valley Water Headquarters Building Boardroom at 5700 Almaden Expressway, San Jose, California, and by Zoom teleconference, at 11:00 a.m.

1.1. Roll Call.

Committee members in attendance were: District 5 Director Nai Hsueh, Chairperson presiding, District 6 Director Tony Estremera, Vice Chairperson, and District 2 Director Shiloh Ballard.

Staff members in attendance were: John Bourgeois, Theresa Chinte, Rosie Cofre, Rachael Gibson, Wendy Ho, Ryan McCarter, Patrice McElroy, Carlos Orellana, Stephanie Simunic, and Tina Yoke.

2. TIME OPEN FOR PUBLIC COMMENT ON ANY ITEM NOT ON THE AGENDA:

Chairperson Hsueh declared time open for public comment on any item not on the agenda. There was no one who wished to speak.

**2.1. Election of 2026 Board Policy and Monitoring Committee (BPMC)
Chairperson and Vice Chairperson.**

**Recommendation: Nominate and elect the 2026 BPMC Chairperson and
Vice Chairperson.**

Public Comments: None.

On a motion by Vice Chairperson Estremera, seconded by Director Ballard, and unanimously approved, Chairperson Hsueh was reelected as Committee Chairperson and Director Ballard was elected as Committee Vice Chairperson.

3. APPROVAL OF MINUTES:

3.1 Approval of December 10, 2025 Board Policy and Monitoring Committee (BPMC) Minutes.

Recommendation: Approve the December 10, 2025 BPMC minutes.

The BPMC considered the minutes of the December 10, 2025 BPMC meeting.

Public Comments: None.

It was moved by Director Varela, seconded by Vice Chairperson Ballard, and unanimously approved that the minutes be approved as presented.

4. REGULAR AGENDA:

4.1 Review and Approve 2026 Board Policy and Monitoring Committee (BPMC) Work Plan and 2026 Proposed Meeting Schedule.

Recommendation: A. Review and approve the 2026 BPMC Work Plan and make adjustments as necessary; and B. Confirm dates for the 2026 BPMC Committee meetings.

The Committee reviewed the information on this item, per the attached Committee Agenda Memo; and per the information contained in the attachments.

The Committee discussed and reviewed the items and their timing on the BPMC workplan, including a deeper process and content review of the development of the Draft FY26-27 Board Work Plan, coordination regarding the upcoming audit of the BAO complaint process, and adding an update of Veterans and disabled hires and NextGen hiring initiatives.

Theresa Chinte stated that Fiscal staff requested the Water Supply and Flood Protection Development Impact Fee Study (Phase 1 results) be placed on the March BPMC agenda.

Public Comment: None.

The Committee determined the March BPMC agenda will include three items, the Impact Fee Study, roles and responsibilities of Board Members on JPA's, and Board Member travel cancellation policies.

The Committee approved a schedule of monthly meetings on the third Tuesday at 11:00 a.m.

On a motion by Vice Chairperson Ballard, seconded by Director Estremera, the Committee approved the 2026 BPMC Work Plan with edits and proposed meeting schedule.

5. CLERK REVIEW AND CLARIFICATION OF COMMITTEE REQUESTS.

Stephanie Simunic confirmed that the 2026 workplan with edits and a 2026 monthly schedule was approved.

6. ADJOURN:

6.1. Adjourn.

Chairperson Hsueh adjourned the meeting at 11:36 a.m.

Date Approved:

Stephanie Simunic
Assistant Deputy Clerk II



Santa Clara Valley Water District

File No.: 26-0241

Agenda Date: 3/17/2026
Item No.: 4.1.

COMMITTEE AGENDA MEMORANDUM Board Policy and Monitoring Committee

Government Code § 84308 Applies: Yes No
(If "YES" Complete Attachment A - Gov. Code § 84308)

SUBJECT:

Receive Update on Final Results for the Flood Control and Water Supply Development Impact Fee Analyses and Provide Recommendation to the Board as needed.

RECOMMENDATION:

Receive update on final results for the Flood Control and Water Supply Development Impact Fee Analyses and provide recommendations to the Board as needed.

SUMMARY:

NBS Government Finance Group was retained in 2021 to perform a comprehensive Water Supply and Flood Protection Development Impact Fee Analysis (Study) for Valley Water.

Broadly defined, a development impact fee is a one-time charge imposed by local governments on new construction projects to fund infrastructure to serve that development, such as water service or flood protection services. Development impact fees shift capital costs from general rate or tax payers to new developers, ensuring growth pays for its fair share of growth.

Local governments, like cities and counties (also referred to as land use agencies) typically collect development impact fees along with building permit fees. Valley Water is not a land use agency.

Phase 1 of the Study:

Over the last several years, separate analyses were conducted for both Water Supply and Flood Protection to determine if development impact fees are feasible, and if so, calculate what the fee could be. Attachment 1 is a PowerPoint summarizing methodology and results of the Study. Attachment 2 is the Final Report for the Study.

Phase 2 of the Study:

Pending Committee recommendations, and ultimately direction from the Board, Phase 2 of the project would be to engage with other agencies and the local development community to implement

development impact fees.

Should the Board decide to pursue implementation of development impact fees, the first step would be to initiate discussions with all 15 Cities in Santa Clara County as well as the County of Santa Clara, to determine the feasibility/willingness of collecting development impact fees on behalf of Valley Water. Valley Water would need the voluntary cooperation of the Cities and Santa Clara County in order to implement.

Background:

In November 2017, Santa Clara Valley Water District (Valley Water) received a report from financial consultant, William C. Statler analyzing available revenue options that could potentially offset water rate increases. The report concluded that while there are fewer non-rate options for special districts compared with cities and counties, there was nonetheless a broad range of reasonable revenue options available to Valley Water. However, the ones with the greatest revenue potential would require either majority property owner approval (property-related fees or assessments) or two-thirds voter approval for special taxes.

The report further concluded that there is only one significant revenue option available to Valley Water that could be implemented by the Board without some form of voter approval: development impact fees.

A portion of the Valley Water Capital Improvement Plan (CIP) would likely benefit new development for both water supply and flood protection projects. The completed Study was prepared to assess new development's share of cost, and the estimated potential development impact fee revenue and charges.

It should be noted that typically, this type of fee is collected by cities and counties along with building permit fees. However, wholesale agencies like Valley Water do not issue building permits. In these cases, wholesale agencies often enter into agreements with their Cities to collect these fees on the agency's behalf and remit them monthly. Accordingly, Valley Water's ability to charge and collect such fees is contingent on the cooperation of the Cities in Santa Clara County.

Next Steps:

The Study has progressed slower than anticipated, primarily due to limited bandwidth of Valley Water staff to support the effort. Consequently, the Capital Improvement Plan (CIP) data as well as the Water Supply Master Plan (WSMP) data used in the Study is outdated. Nevertheless, the resulting output is sufficiently accurate to provide the Board with a sense of what the development impact fee would be, as well as what the annual revenue collection would be. If the Board were to decide to pursue implementation of development impact fees as part of a Phase 2 effort, the CIP and WSMP inputs would be updated to reflect the most current data available.

Staff is seeking Committee feedback regarding Phase 1 results of the Study and a recommendation, if any, for the Board regarding whether or not to pursue Phase 2, which would initially entail engaging with all 15 Cities in Santa Clara County and the County of Santa Clara to determine

feasibility/willingness of collecting Development Impact Fees on behalf of Valley Water.

ENVIRONMENTAL JUSTICE IMPACT:

There are no environmental justice impacts associated with receiving information on the Study.

ATTACHMENTS:

Attachment 1: PowerPoint

Attachment 2: Final Study Report

UNCLASSIFIED MANAGER:

Darin Taylor, 408-630-2068

Water Supply & Flood Protection Development Impact Fee Study

Board Policy & Monitoring Committee | March 17, 2026

Presented by: Carmen Narayanan, Financial Planning & Revenue Manager, Valley Water
Allan Highstreet, Principal Consultant, NBS

Study Background & Goals

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- Direction from the Board in late 2018 to explore revenue alternatives
- **Development impact fees (DIF)**, also called **capacity fees** or **system development fees**, were identified as a potential source of new revenue
 - **Intent is new growth pays for its fair share of system capacity**, otherwise existing customers would incur these costs
- A key benefit of DIFs is that the revenue generated reduces future rate and charge increases
 - Positive impact to both retailers and direct customers

Phased Study Approach

Phase I

Determine how to calculate development impact fees.

Estimate what development impact fees could be.

Phase II

Would determine how to implement fees.

Would engage with all 15 Cities in Santa Clara County, the County of Santa Clara, Water Retailer's and the local development community

Mitigation Fee Act Background

- The Mitigation Fee Act (California Government Code sections 66010-66025) authorizes an agency to establish, increase, or impose fees as a condition for approval of a development project.
- The fees need to have a reasonable relationship between the amount of the fee and the cost of the public facilities attributable to the new development.
- The fees can only be used for the purpose for which the fee was collected.
- These fees may be imposed by a majority vote of the governing legislative body.

Because Valley Water does not approve development projects, impact fees would need to be done in collaboration with local government agencies in Santa Clara County who have land use authority.

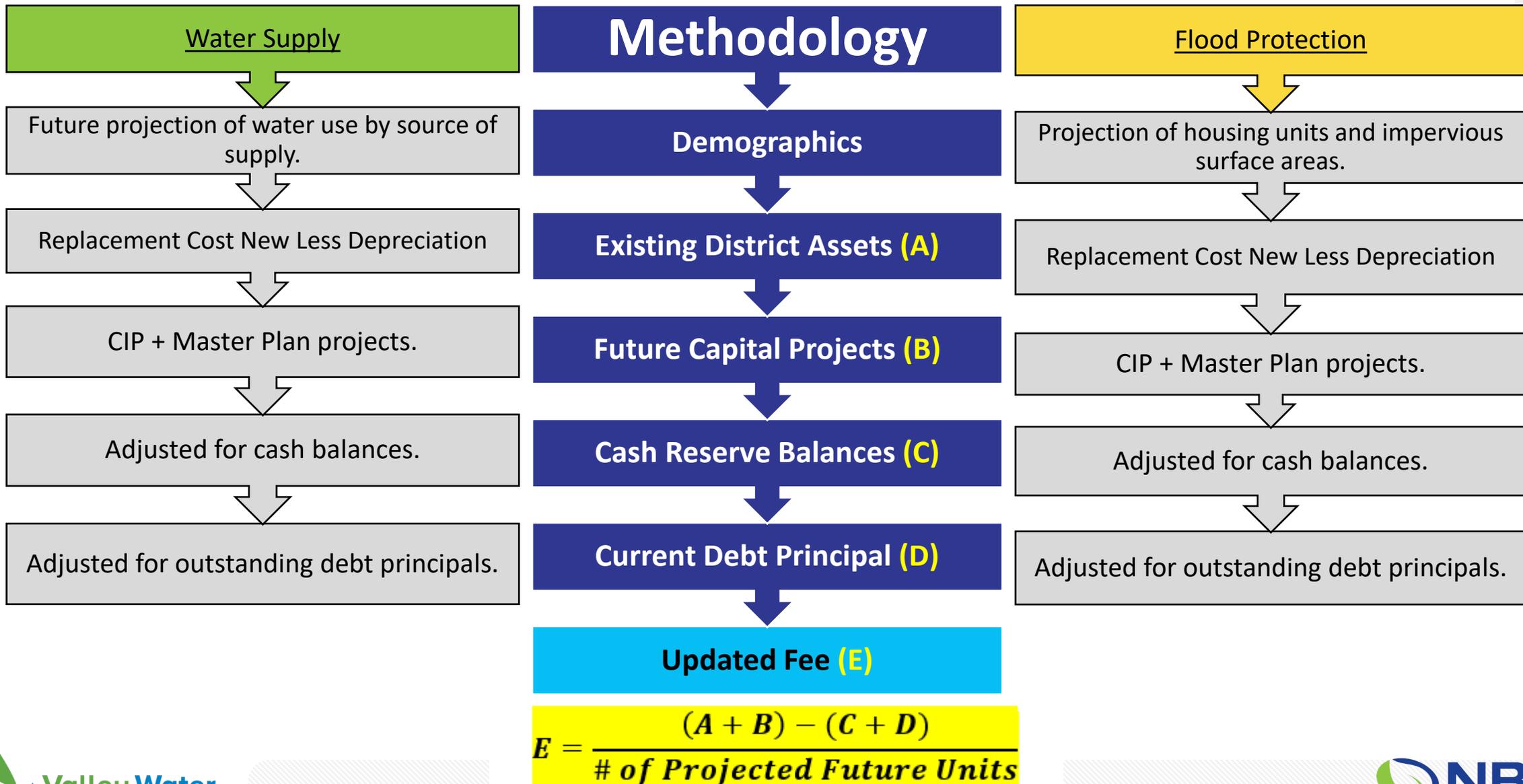
General Methodology

- In its simplest form, costs allocated to future development are divided by the number of units of new development.
- Costs allocated to future development can include portions of existing facilities available to new users and their fair share of planned future improvements.
- Many factors are considered in selecting the best methodology (incremental, buy-in, or a combination), including data availability, prior financing plans, and current capacity available for future users.

“Combination” methodology used for purposes of this study

Impact Fee Methodology

6



valleywater.org

WATER SUPPLY Development Impact Fee Results

Water Supply DIF Calculation

| System Asset Values Allocated to Future Development | |
|---|-------------------------|
| System Buy-In and Expansion Components | |
| Existing System Buy-In ¹ | \$ 61,986,136 |
| Future System Expansion ² | 957,508,028 |
| Subtotal: System Buy-In and Expansion Components | \$ 1,019,494,164 |
| Adjustments to Cost Basis: | |
| Cash Reserves ³ | \$ (50,513,856) |
| Outstanding Long-Term Debt (Principal) ⁴ | (94,117,533) |
| Subtotal: Adjustments to Cost Basis | \$ (144,631,389) |
| Total: Cost Basis for New Development | \$ 874,862,774 |
| Projected Water Supply (through 2040) | 40,000 |
| Water Supply Capacity Fee (Per AF) | \$ 21,900 |

Water Supply DIF & Revenue

| ANNUAL REVENUE ESTIMATE | 100% CIP | 50% CIP |
|--|-----------------|----------------|
| <i>Growth Estimate through 2040 (AF)</i> | 40,000 | 40,000 |
| <i>Years until 2040</i> | 18 | 18 |
| <i>Annual Water Supply Growth</i> | 2,222 | 2,222 |
| <i>Fee per Acre Foot</i> | \$21,900 | \$9,900 |
| <i>Typical Single Family Residential Fee *</i> | \$8,760 | \$3,960 |
| <i>Annual Capacity Fee Revenue Estimate</i> | \$ 48,666,667 | \$ 22,000,000 |

* Typical Single Family uses 0.4 acre feet of water per year

FLOOD PROTECTION Development Impact Fee Results

valleywater.org

Flood Protection DIF Calculation

| System Asset Values Allocated to Future Development | |
|--|-----------------------|
| <i>System Asset Values Allocated to New Development</i> | |
| Existing System Buy-In | \$ 45,409,156 |
| Future System Expansion | 237,561,049 |
| Total: Existing & Future System Costs | \$ 282,970,205 |
| <i>Adjustments to Cost Basis:</i> | |
| Cash Reserves | \$ (15,307,098) |
| Outstanding Long-Term Debt (Principal) | (7,262,354) |
| Total: Adjustments to Cost Basis | \$ (22,569,451) |
| Total Adjusted Cost Basis for New Development | \$ 260,400,754 |

| | |
|--|------------------|
| Projected Growth of Impervious Surface Acres (ISA) through 2050 | 21,564 |
| Maximum Base Capacity Fee per Impervious Acre | \$ 12,100 |

Typical Flood Protection DIF by Land Use

| Land Use | % of Impervious Area per Acre | Typical Capacity Fee per Acre |
|---|-------------------------------|-------------------------------|
| SINGLE FAM RES & SML MULTI | 49% | \$ 5,929 |
| COMMERCIAL AND INDUSTRIAL | 81% | \$ 9,801 |
| DISTURBED RURAL, VCNT, AGRIC | 4% | \$ 484 |
| INSTITUTIONS AND APARTMENT | 14% | \$ 1,694 |
| MIXED ASSESSMENT | 80% | \$ 9,680 |
| RURAL UNDIST AG. BRUSH, FOR | 2% | \$ 242 |
| UNDISTRBD AGRIC, MARSH, PONDS | 2% | \$ 242 |
| WELL SITE | 44% | \$ 5,324 |
| Maximum Flood Protection Impact Fee Per Acre | | \$ 12,100 |

Flood Protection DIF & Revenue

| ANNUAL REVENUE ESTIMATE | 50% CIP | 100% CIP |
|---|--------------|--------------|
| <i>Growth Estimate through 2050 (ISA)</i> | 21,564 | 21,564 |
| <i>Years until 2050</i> | 28 | 28 |
| <i>Annual ISA growth</i> | 770 | 770 |
| <i>Fee per Impervious Acre</i> | \$ 6,600 | \$12,100 |
| <i>Typical Single Family Lot*</i> | \$ 594 | \$1,089 |
| <i>Annual ISA capacity fee revenue estimate</i> | \$ 5,082,839 | \$ 9,318,539 |

* Typical Single Family Lot has 0.09 acres of impervious area. (8,000 sq ft per lot / 43,560 sqft/acre x .49 impervious area per acre)

Flood Control Development Impact Fee Comparison for Selected Agencies

| Agency | Basis for Fee | Fee (residential) | Fee Converted to 8,000 Sq. Ft. Residential Lot |
|--|---------------------------|---|--|
| Contra Costa Flood Control District | Impervious Area | Varies by Drainage Area, \$0.36 to \$2.59 per sq ft | \$5,783 <i>assumes fee of \$1.45/sq ft.</i> |
| Alameda County Flood Control & Water Conservation District, Zone 7 | Impervious Area | \$1 per square foot | \$3,920 |
| Sacramento Area Flood Control Agency | Damageable Square Footage | \$2.10 per square foot of damageable area (building sq. ft) | \$5,250 <i>assumes 2,500 sq ft residence.</i> |
| Los Angeles County Flood Control District, Antelope Valley Drainage Area | Residential Lots | \$5,500 per residential lot | \$5,500 |

Typical single-family residence has 0.09 acres of impervious area (based on an 8,000 square foot lot size), or about 3,920 square feet.

Findings

- Valley Water has the cost data required for impact fees.
- More effort would be needed to refine future water demands and future water users.
- Valley Water would need to rely on local government agencies to calculate and collect the impact fees.
- It would be best implemented if all the local government agencies approved implementing the impact fees.

Next Steps

- Provide feedback to Staff.
- Make recommendation(s), if any, to the Board.

QUESTIONS



Water Supply DIF Q&A

| | |
|--|---|
| | |
| <p>What is future system expansion based on? Are Purified Water Projects included?</p> | <p>The study used FY 23 CIP. Purified Water Projects was included from WSMP 2040 (\$1.2B Palo Alto / Los Gatos Ponds)</p> |
| <p>Is inflation included on WSMP 2040 future projects? How is inflation factored into fee calculation overall?</p> | <p>No, future projects are in today's dollars. The value of the existing assets are based on replacement cost new less depreciation, so that value has been brought up to today's value.</p> |
| <p>How would actual Development Impact Fee be calculated for a new house, versus new Commercial and Industrial building, versus new multi-family housing building?</p> | <p>Fees are based on water demand for all customers.</p> <ul style="list-style-type: none"> - New single-family residential home – establish a typical amount of water used per year and base fee calculation on that. - New Commercial building – The planning department for the permitting agency would need to estimate the water demand for the new development and base fee calculation on water demand. - New multi-family building – Similar to single-family, establish a typical amount of water used per year per unit, and base fee calculation on that. |
| <p>How would the actual Development Impact Fee calculation work for an area in the County that is primarily served by SFPUC, or even partially served by SFPUC (such as Mountain View)?</p> | <p>If Valley Water did not provide the water, then the fee would not be applicable. This could pose a challenge at the City level, knowing when a fee would be applicable based on service address.</p> |
| <p>What would the fee be by Groundwater Benefit zone?</p> | <p>The DIF Study did a preliminary analysis on DIF by zone. To establish fees by Groundwater Benefit Zone (note, not by City) further work would need to be completed analyzing cost allocations and demand projections by zone.</p> |
| <p>Would there be a development impact fee levied by Valley Water for a new well?</p> | <p>In theory yes, for new groundwater use (or demand). A fee would not be charged for a replacement well.</p> |
| <p>What capital projects could the fee revenue be spent on?</p> | <p>The revenue could be used for all projects identified in the CIP or in the water supply master plan projects identified in the report (in alignment with the "Combination" method used to calculate the fee). An annual development fee report would be prepared and would need to include how much revenue was received, on which projects it was spent, along with the other financing sources for those projects.</p> |

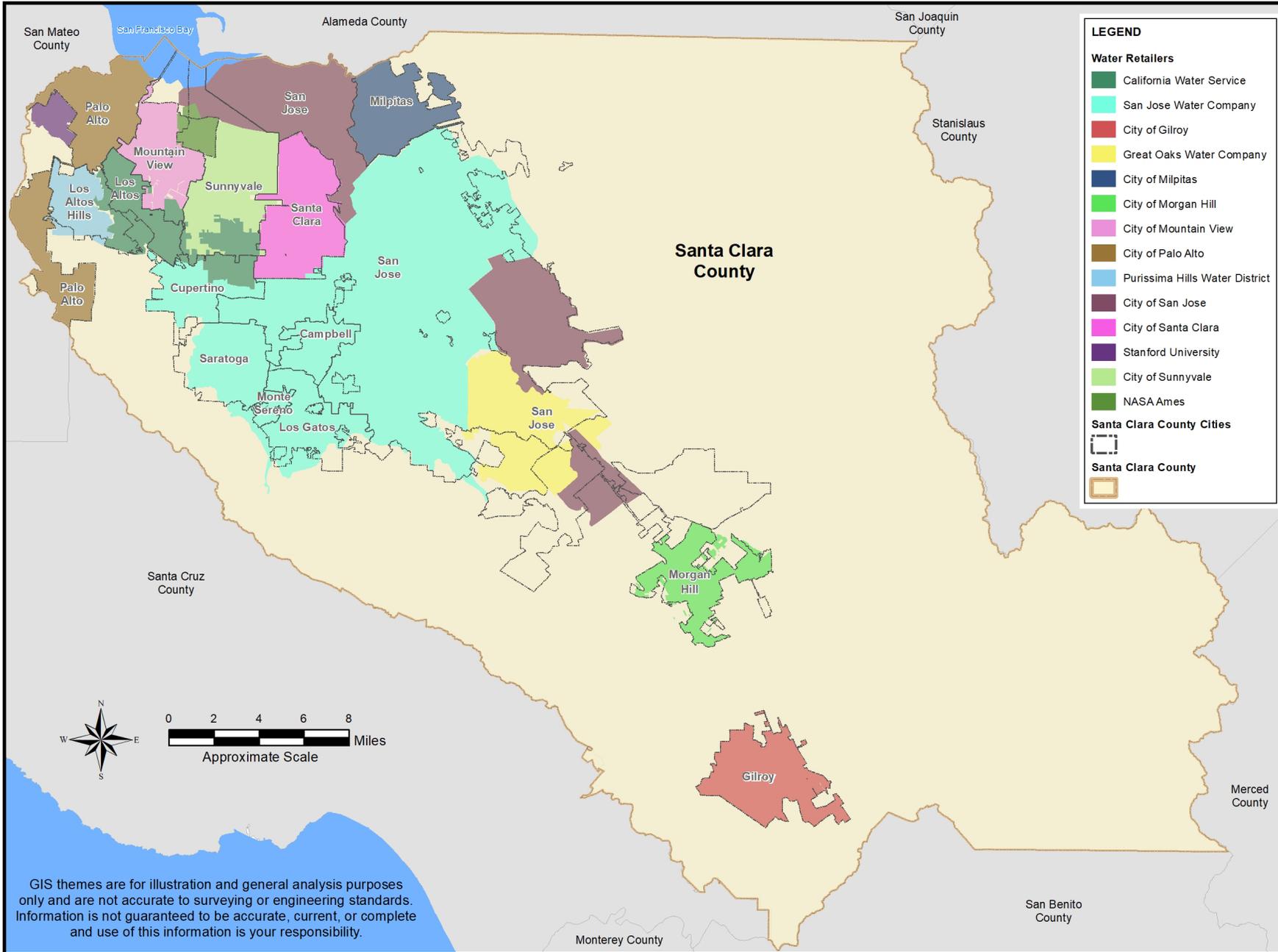
Flood Protection DIF Q&A

| | |
|---|---|
| | |
| <p>How would actual Development Impact Fee be calculated for a new house, versus new Commercial and Industrial building, versus new multi-family housing building?</p> | <p>The fee is based on the amount of impervious area in square feet. New single-family residential home – the fee would be easiest to administer if a typical lot size is defined and the impervious area calculation followed (at 49% of impervious area per acre). New Commercial building – The planning department for the permitting agency would need to determine the impervious area of the new development. New multi-family building – Same methodology as commercial.</p> |
| <p>Would the fee be applicable in an area that is already well protected against floods or would it apply to entire county?</p> | <p>The fee would be applicable to the service area of Valley Water.</p> |
| <p>What capital projects could the fee revenue be spent on?</p> | <p>The revenue could be used for projects identified in the CIP as part of the fee calculation. An annual development fee report would be prepared and would need to include how much revenue was received, on which projects it was spent, along with the other financing sources for those projects.</p> |
| <p>What projects were considered in the future system expansion and how are USACE partnered projects factored in?</p> | <p>The analysis did not consider USACE or any outside funding sources. If we anticipate some type of grant funding, that would need to be considered in the analysis. The fee calculation is based on Valley Water’s local portion of the UWACE partnered projects.</p> |
| <p>Recently a NAFSMA member agency discussed something similar with a higher focus on commercial related fees and lower on residential fees. Is a non-uniform fee schedule allowable (or typical)?</p> | <p>For defensibility, the unit cost should be the same on an impervious area basis. That said, the Board could charge less than the full calculated cost, but it would be problematic to charge commercial or residential development at different rates.</p> |
| <p>Why are Valley Water projected fees per residential lot smaller than the selected comparator agencies?</p> | <p>That can be a function of several factors, including the amount of projects expected, grant funding, and/or the last time the fee was calculated.</p> |

Water Retailers in Santa Clara County



Water Retailers in Santa Clara County



LEGEND

Water Retailers

- California Water Service
- San Jose Water Company
- City of Gilroy
- Great Oaks Water Company
- City of Milpitas
- City of Morgan Hill
- City of Mountain View
- City of Palo Alto
- Purissima Hills Water District
- City of San Jose
- City of Santa Clara
- Stanford University
- City of Sunnyvale
- NASA Ames

Santa Clara County Cities

- Santa Clara County

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Valley Water

Clean Water • Healthy Environment • Flood Protection

SANTA CLARA VALLEY WATER DISTRICT

Final Report

*Water Supply and Flood Protection
Development Impact Fee Analysis*

September 2025

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1. Introduction

1.1 Background

For several years Santa Clara Valley Water District (Valley Water) has explored potential new revenue sources that could offset future water rate increases. In November 2017, Valley Water received a report from William C. Statler analyzing available revenue options that could potentially offset water rate increases.¹ The report concluded that while there are fewer non-rate options for special districts compared to cities and counties, there was nonetheless a broad range of reasonable revenue options available to Valley Water. This report further explores one of the options: development impact fees.

REVENUE OPTIONS ASSESSMENT

In November 2017, Valley Water received a report from William C. Statler analyzing available revenue options that could potentially offset water rate increases. The report concluded that while there are fewer non-rate options for special districts compared to cities and counties, there was nonetheless a broad range of reasonable revenue options available to Valley Water. The District performed additional research and had the following recommendations for further study²:

- Special Parcel Tax — Conduct polling to determine whether a ballot measure based on a suite of projects (water storage projects for example) with the Pacheco Reservoir Expansion as the anchor project would be approved by voters.
- Benefit Assessment, Creekside Properties — Work with community leaders to generate interest in a community or property-owner led effort to establish a benefit assessment zone for properties that back to a creek, which could fund District activities to remove debris, address encampments, and construct environmental enhancements for example.
- Investigate the concept of fund raising via donations and partnering with like-minded agencies to help preserve agricultural land or open space — Staff to further research the feasibility of a donation funding concept and develop a roadmap of actions that could be taken to establish a program, including investigation of Corporate Social Responsibility funding sources.
- Evaluate potential state ballot measures that would refine Proposition 13 such that commercial and industrial property — but not homes and small businesses — would be regularly reassessed and taxed at their full property value.
- Development Impact Fees, Water Utility — Engage a consultant to undertake the comprehensive development impact fee study that would generate revenue for the development and expansion of the water supply system. Begin campaign to reach out to land use agencies to gain their necessary cooperation.
- Development Impact Fees, Flood Protection — Engage a consultant to undertake a comprehensive development impact fee. Begin to reach out to land use agencies to gain their

¹ *Revenue Options Assessment, November 2017, Santa Clara Valley Water District, prepared by William C. Statler.*

² *Santa Clara Valley Water District, Handout 2.8-A1, 04/23/19, Attachment A, Memorandum entitled Research of the Feasible Revenue Sources allowed by the District Act, October 31, 2018*

necessary cooperation. Investigate opportunities for developers to pay for the impact of development via mitigation.

Ultimately, the opportunities with the greatest revenue potential would require either majority property owner approval (property-related fees or assessments) or two-thirds voter approval for special taxes. It is worth noting that subsequent to the 2017 report, AB 939 passed, which provides the authority for Valley Water to put a general obligation bond tax on the ballot as of January 1, 2024.

The 2017 report further concluded that there is only one significant revenue option available to Valley Water that could be implemented by the Board without some form of voter approval: developer impact fees.

The 2017 report recognized that comprehensive impact fee studies would be needed to closely assess new development's share of capital improvements and then assign benefit based on land-use type (residential, commercial, industrial, institutional) in setting fees. The report provided a "high level assessment" of potential water impact fees by allocating CIP costs between current and new development based on projected growth.

This assessment resulted in an estimate of potential annual impact fees of \$24 million, a fee of about \$3,000 per equivalent dwelling unit (EDU) and the potential to offset water rates by 11%. However, the report stressed that if Valley Water is interested in pursuing this concept, comprehensive analysis would be required by a highly qualified consultant with experience in performing this type of study in accordance with Government Code 66000, which sets "nexus" and other standards for development impact fees.

THE DISTRICT

The Santa Clara Valley Water District (Valley Water) was created by an act of the California Legislature (the Santa Clara Valley Water District Act (Chapter 1405 of the Statutes of 1951), referred to here as the 'District Act'), and operates as a state of California Special District, with jurisdiction throughout Santa Clara County. The District Act has been amended several times since its initial passage.

According to the Santa Clara Valley Water District website, *the powers and purposes of Valley Water include:*

To provide comprehensive water management for all beneficial uses and protection from flooding within Santa Clara County; to protect Santa Clara County from floodwater and stormwater of the district, including tidal floodwater and the floodwater and stormwater of streams that have their sources outside the district but flow into the district; to protect from floodwater or stormwater the public highways, life and property in the district, and the watercourses and watersheds of streams flowing within the district; to provide for the conservation and management of floodwater, stormwater, or recycled water, or other water from any sources within or outside the watershed for beneficial and useful purposes, including spreading, storing, retaining, and causing the water to percolate into the soil within the district; to protect, save, store, recycle, distribute, transfer, exchange, manage, and conserve in any manner any of the waters; to increase and prevent the waste or diminution of the water supply in the district; to obtain, retain, protect, and recycle drainage, stormwater, floodwater, or treated wastewater, or other water from any sources, within or outside the watershed in which the district is located for any beneficial uses within the district; to enhance, protect, and restore streams, riparian corridors, and natural resources in connection with carrying out the

purposes set forth in this section; and to preserve open space in Santa Clara County and support the county park system.

Valley Water is a countywide wholesale water provider and groundwater management agency and relies on local retailers (municipalities and private companies) to deliver water. These retailers enact and implement local water use ordinances and bill their customers directly.

So, while it is apparent that Valley Water has a major role in the County’s water management efforts, the challenge is that Valley Water does not have the land use authority. Therefore, Valley Water will need to work with the local agencies to implement any new impact fees.

1.2 Scope of Work

NBS was contracted to analyze the potential for implementing water supply and flood protection development impact fees that would result in new development paying its fair share of the facilities that provide it service, prepared in accordance with the requirements of the Mitigation Fee Act.

The scope is crafted into a two phased approach. Phase I is the technical analysis described in this report. This study identifies new development’s share of existing infrastructure and planned improvements for flood protection and water supply and the resulting development impact fees. If Valley Water moves ahead with Phase 2, Valley Water would coordinate with potential implementing agencies that would be needed to assist with the fee collection.

2. Methodology

2.1 Review of Mitigation Fee Act

The Mitigation Fee Act authorizes a local agency to establish, increase, or impose various fees as a condition of approval of a development project, if specified requirements are met. California Government Code Section 66013 authorizes public agencies to impose capacity charges on new customers connecting to an existing utility. That section defines a “capacity charge” as “a charge for public facilities in existence at the time a charge is imposed or charges for new public facilities to be acquired or constructed in the future that are of proportional benefit to the person or property being charged, including supply or capacity contracts for rights or entitlements, real property interests, and entitlements and other rights of the local agency involving capital expense relating to its use of existing or new public facilities.” It authorizes public agencies to impose capacity charges on customers connecting to or upsizing their connection to the system to ensure that they pay their fair share of the existing utility asset costs plus the costs of new facilities needed to serve them.

California Government Code Section 66013 also calls for an annual report, prepared within 180 days after the last day of the fiscal year. The report will describe the charges deposited into the fund, the beginning and ending balance of the fund, and how those funds have been spent.

In 2019, California passed SB 13, AB 881, and AB 68, which added language to encourage the construction of more housing in the form of Accessory Dwelling Units. Specifically, a local agency, special district, or water corporation shall not impose any impact fee upon development of an accessory dwelling unit less than 750 square feet.

In September 2021, AB602 was signed into law requiring additional requirements for establishing or increasing development impact fees as well as transparency requirements. Some of the key requirements include:

- Beginning January 1, 2022, an impact fee nexus study must be prepared and adopted to establish the basis for the new fee.
- Nexus studies must be updated at least every eight years.
- Nexus studies and associated impact fee programs must be adopted at a public hearing with at least thirty days’ notice to the public (previously only ten days).

Whereas user charge increases imposed on existing customers require a protest ballot procedure (under Proposition 218), capacity charges do not because they are considered an appropriate funding mechanism for facilities that benefit new development district wide. These charges may be imposed by a majority vote of the governing legislative body, which in this case is Valley Water’s Board of Directors. This report provides the documentation and findings necessary for the adoption of the proposed capacity charges.

2.2 Overview of Capacity Charge Methodology

Various methodologies have been and are currently used to calculate capacity fees. The following lists the most common methodologies from the American Water Works Association’s Principles of Water Rates, Fees and Charges³, also referred to as Manual M1:

- The value of existing (historical) system assets, often called a “system buy-in” methodology.
- The value of planned future improvements, also called the “incremental” or “system development” methodology.
- A combination of these two approaches.

This analysis uses the “Combination Approach,⁴” which requires new customers to pay both their fair share of existing system assets as well as their share of the planned future capital improvements needed to provide them with capacity in the City’s water and wastewater systems.

In its simplest form, capacity fees are calculated by dividing the costs allocated to future development by the anticipated number of units for new development as defined below:

- Costs of planned future facilities and improvements required to serve new development are those that can reasonably be allocated to future development.
- The number of new units (i.e., growth) are those units projected to occur within the timeframe covered by the capacity fee analysis.

Capacity fees are one-time fees intended to reflect the cost of existing infrastructure and planned improvements available to new services, which place new utility customers (or existing customers requesting an increase in service capacity) on equal basis — from a financial perspective — with existing customers. Once new customers are added to the system, they then incur the obligation to pay the same service charges or water and wastewater rates that existing rate customers pay.

While there is not a similar industry standard for a flood protection capacity fee, the same approach applies to flood protection as well. **Figure 1** shows the steps involved in calculating the capacity fees.

³ *Principles of Water Rates, Fees, and Charges, Manual of Water Supply Practices, Manual M1, American Water Works Association (AWWA), Seventh Edition, 2017.*

⁴ *Method of calculating capacity fees (also known as System Development Fees, Connection Fees, Capital Facility Fees) are set forth in the American Water Works Association’s Principles of Water Rates, Fees and Charges Seventh Edition (2017) pages 311 to 347.*

Figure 1. Calculating Capacity Fees

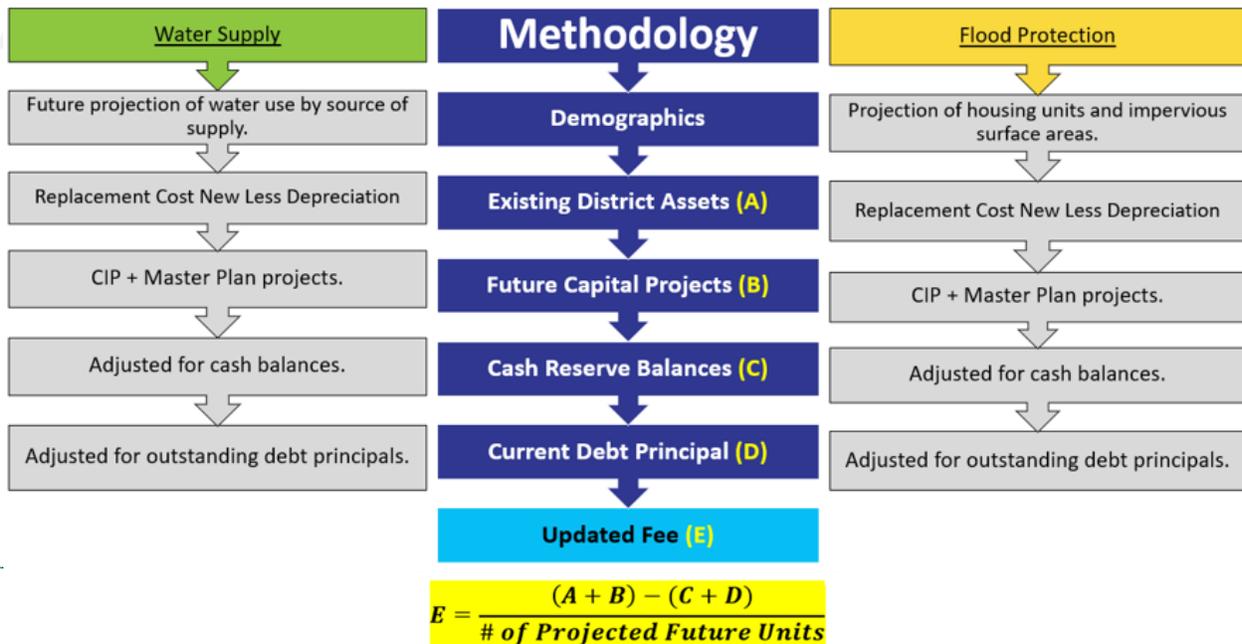


Figure 1 shows a six-step process for calculating the development impact fees. These steps are described below.

1. **Understanding the Demographics.** The initial step involves understanding the existing users of the system as well as the projected growth requiring service. The goal is to determine the users of the existing system and how much of the current assets they are utilizing, with the remainder available for new customers. Future investments also need to be allocated between existing users and future users.
2. **Valuing the Existing Assets.** Installed system assets are valued using an approach called “replacement cost less depreciation.” Replacement values were calculated by escalating original costs from the date installed. The escalated assets were then depreciated based on the remaining useful life. These assets are proportioned to existing and future users.
3. **Estimating the Costs of Future Improvements.** The costs to meet future development or system upgrades are estimated based on Valley Water’s planning efforts. These assets are proportioned to existing and future users.
4. **Adjustments for Existing Cash Assets.** Cash assets are treated as a credit as they can be applied to offset the costs allocated to future users.
5. **Adjustments for Outstanding Debt Principal.** Since new development pay their share of existing asset values, including the debt payment principals (on those same assets would double count the asset values included in the capacity fees. Therefore, debt service principal is subtracted from the total system assets.
6. **Calculating the Impact Fee.** The existing and future assets proportioned to future users, adjusted by cash and debt service principal, are divided by the future capacity available to calculate the future impact fee.

3. Water Supply Capacity Charge

3.1 Identifying New Development Share of Projects

Valley Water retained NBS to conduct a Water Supply Impact Fee Analysis to: (1) ensure that the fees are developed in compliance with legal requirements and industry standards, and (2) ensure that the capacity fees reflect the cost of capital infrastructure needed to serve new connections, or any person requesting additional capacity in Valley Water’s water utility (referred to throughout as “future customers”).

This impact fee study and the recommended fees assume a given level of development activity over the course of the study period based on data available from Valley Water’s water supply projections from the Water Supply Master Plan 2040 and the 2020 Urban Water Management Plan. The development that occurs may result in both different impacts and fee revenues than those that are calculated in this study. For that reason, regular updates are recommended to adjust the fees to match the needs created by the rate of actual development.

In developing the proposed fees, NBS worked cooperatively with District staff. The fees presented in this study reflect input provided by District staff regarding financial matters, available capacity in the current water supply, existing asset values, and planned capital improvements.

IDENTIFY CURRENT WATER USE

Valley Water is an independent special district that provides wholesale water supply and groundwater management in Santa Clara County, California. In order to determine Valley Water’s current water demand, NBS relied on the 2020 Urban Water Management Plan (Plan) which outlines both historical and projected water use based on population growth over the last 20 years. The Plan analyzes current water demand by sector, or customer class, (i.e., Single Family Residential, Commercial, etc.) and by type of use (i.e., Retailer Demand, Agricultural Irrigation, Independent Groundwater Pumping, and Untreated Surface Water). Total water demand in 2020 was estimated at 306,000 AF and is projected to grow to 345,000 AF by 2045, an increase of almost 13%. Of the projected future water demand, retailer demand accounts for approximately 90% of all Valley Water’s water use.

PROJECT FUTURE WATER USE

The 2020 Urban Water Management Plan assumes that future water use through 2045 will increase over time with population growth. Therefore, it is reasonable to assume that the extent of future water use in the projection of housing demand on Valley Water can be addressed by looking at the estimated population growth for Santa Clara County. The current population of approximately 2 million is expected to increase by about 36% to 2.7 million by 2045. In addition, overall water supply projections are expected to increase by 11%, or by 41,000 AF, over the next 20 years. The expected increases in population as well as increases in water demand will greatly impact the housing demands of Valley Water’s future customers. **Figure 2** shows the estimated growth by population based on the 2020 Urban Water Management Plan.

Figure 2. Projected Population Growth in Santa Clara County

| Agencies / Cities | Projected Population Growth | | | | | | |
|--------------------|-----------------------------|-----------|-----------|-----------|-----------|-----------|----------|
| | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | % Growth |
| Santa Clara County | 1,986,340 | 2,098,695 | 2,217,750 | 2,387,165 | 2,538,320 | 2,699,046 | 35.9% |

METHODOLOGIES FOR ESTIMATING FUTURE WATER USE

The development of the proposed water supply capacity fee requires a comparison of the projected future water use to the existing water use. NBS considered three ways to calculate future water use based on 1) population growth, 2) projected water demand by member agencies, and 3) increase in planned water supplies. This projected increase is used to calculate the proportional share of costs that future customers will be required to pay to connect to Valley Water’s water system. The share, or percentage, attributed to future customers will be used throughout the analysis to determine their share of existing system assets as well as their share of the planned future capital improvements needed to provide them with capacity in Valley Water’s water system. As a result, future customers connecting to Valley Water’s water system would enter as equal participants (compared to existing customers) regarding their financial commitment and obligations to Valley Water.

Population Growth – The county is comprised of 13 cities that receive water from various water suppliers. NBS researched the estimated population growth for these 13 cities by relying on City websites and documents made available to the public (e.g., Annual Comprehensive Financial Plans). The analysis assumed growth based on the average population growth from 2016 to 2020, unless otherwise noted. For any City showing a decrease in average population growth over the last 5 years, the growth rate is set at 0%. **Figure 3** shows the estimated population growth by water agency over the next 25 years which estimates a 14% increase in total population.

Figure 3. Projected Population Growth in Valley Water Service Areas Only

| Agencies / Cities | Projected Population Growth | | | | | | |
|-------------------------------------|-----------------------------|----------------|----------------|----------------|----------------|----------------|--------------|
| | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | % Growth |
| Campbell ^{1,2} | 42,288 | 42,377 | 42,466 | 42,555 | 42,644 | 42,734 | 1.1% |
| Cupertino ^{1,3} | 59,549 | 59,549 | 59,549 | 59,549 | 59,549 | 59,549 | 0.0% |
| Gilroy ⁴ | 57,084 | 57,946 | 58,821 | 59,709 | 60,611 | 61,526 | 7.8% |
| Los Altos ⁵ | 30,876 | 31,086 | 31,297 | 31,510 | 31,724 | 31,940 | 3.4% |
| Los Gatos ^{1,6} | 31,439 | 31,634 | 31,830 | 32,027 | 32,226 | 32,426 | 3.1% |
| Milpitas ⁷ | 75,663 | 75,701 | 75,739 | 75,777 | 75,814 | 75,852 | 0.3% |
| Monte Sereno ^{1,8} | 3,511 | 3,512 | 3,513 | 3,513 | 3,514 | 3,515 | 0.1% |
| Morgan Hill ⁹ | 46,454 | 47,453 | 48,473 | 49,515 | 50,580 | 51,667 | 11.2% |
| Mountain View ¹⁰ | 81,302 | 81,863 | 82,428 | 82,997 | 83,569 | 84,146 | 3.5% |
| San Jose ^{1,11} | 132,644 | 150,368 | 168,092 | 194,983 | 217,685 | 222,661 | 67.9% |
| Santa Clara ¹² | 129,104 | 130,821 | 132,561 | 134,324 | 136,111 | 137,921 | 6.8% |
| Saratoga ^{1,13} | 31,030 | 31,080 | 31,129 | 31,179 | 31,229 | 31,279 | 0.8% |
| Sunnyvale ¹⁴ | 154,252 | 155,825 | 157,415 | 159,020 | 160,642 | 162,281 | 5.2% |
| Total Population | 875,196 | 899,214 | 923,312 | 956,659 | 985,899 | 997,497 | 14.0% |
| Annual Growth (2020 to 2045) | 35,008 | 35,969 | 36,932 | 38,266 | 39,436 | 39,900 | |

1. SJW provides service to most of the cities of San Jose and Cupertino, the entire cities of Campbell, Monte Sereno, Saratoga, the Towns of Los Gatos, and parts of unincorporated Santa Clara County. Information available on the City's website. Website: <https://www.sjwater.com/sites/default/files/2021-06/2020%20UWMP%20FINAL%20with%20Appendices.pdf>, page 3-6.
2. Information available on the City's website. Website: <https://www.campbellca.gov/ArchiveCenter/ViewFile/Item/1642>, page 126.
3. Information available on the City's website. Website: <https://www.cupertino.org/home/showpublisheddocument/29190/637534959803230000>, page 112.
4. Information available on the City's website. Website: <https://www.cityofgilroy.org/DocumentCenter/View/11644/FY-2020-ACFR?bidId=>, page 209.
5. Information available on the City's website. Website: https://www.losgatosca.gov/sites/default/files/fileattachments/administrative_services/page/34881/final_-los_altos_acfr_fy21.pdf, page 155.
6. Information available on the City's website. Website: <https://www.losgatosca.gov/DocumentCenter/View/29618/FY-202021-ACFR?bidId=>, page 146.
7. Information available on the City's website. Website: <https://www.milpitas.gov/wp-content/uploads/2021/12/Milpitas-2021-Web-ACFR.pdf>, page 157.
8. Population for Monte Sereno is based on information available from the United States Census Bureau. Website: <https://www.census.gov/>.
9. Information available on the City's website. Website: <https://www.morgan-hill.ca.gov/DocumentCenter/View/37500/2020-Annual-Comprehensive-Financial-Report-6-30-20-PDF?bidId=>, page 208.
10. Information available on the City's website. Website: <https://www.mountainview.gov/civicax/filebank/blobdload.aspx?BlobID=33599>, page 178.
11. Population is defined as the population served by San Jose Municipal Water System. Information available on the City's website. Website: <https://www.sanjoseca.gov/home/showpublisheddocument/422/637602045327100000>, page ES-2.
12. Information available on the City's website. Website: <https://www.santaclaraca.gov/home/showpublisheddocument/76049/637769033936730000>, page 231.
13. Information available on the City's website. Website: <https://www.saratoga.ca.us/ArchiveCenter/ViewFile/Item/1921>, page 123.
14. Information available on the City's website. Website: <https://www.sunnyvale.ca.gov/home/showpublisheddocument/938/637819888578970000>, page 219.

Water Demand – In addition to looking at population growth by City, NBS also looked at water demand. NBS researched the estimated water demand growth for these 13 cities by relying on City websites and documents made available to the public (e.g., Urban Water Management Plans and Water Supply Master Plans). This was a 2-step process which involved determining the total projected water demand and then Valley Water’s portion of the projected water demand. **Figure 4** shows the estimated future growth based on future water demand by the various water agencies served by Valley Water.

Figure 4. Projected Water Demand Growth Through 2045

| Agencies / Cities | Water Provider | Total Projected Water Demand (AF) | | | | | | |
|--------------------------------------|-----------------------------------|-----------------------------------|----------------|----------------|----------------|----------------|----------------|--------------------|
| | | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | % Growth |
| San Jose Water Company (Retail Only) | San Jose Water Company | 121,503 | 132,917 | 132,775 | 133,312 | 134,917 | 136,308 | 12% |
| Campbell | San Jose Water Company | | | | | | | <i>incl. above</i> |
| Cupertino | San Jose Water Company | 2,639 | 2,924 | 2,921 | 2,933 | 2,968 | 2,999 | 14% |
| | Cal Water | | | | | | | |
| Gilroy | Gilroy Communities Services | 8,271 | 8,645 | 9,314 | 10,035 | 10,810 | 11,645 | 41% |
| Los Altos | Cal Water | 13,023 | 13,006 | 13,005 | 13,325 | 13,667 | 14,097 | 8% |
| Los Gatos | San Jose Water Company | | | | | | | <i>incl. above</i> |
| Milpitas | City of Milpitas Community | 10,526 | 12,045 | 12,506 | 12,969 | 13,429 | 13,862 | 32% |
| Monte Sereno | San Jose Water Company | | | | | | | <i>incl. above</i> |
| Morgan Hill | City of Morgan Hill | 7,808 | 8,671 | 9,482 | 10,123 | 10,808 | 11,473 | 47% |
| Mountain View | City of Mountain View Public | 10,036 | 11,610 | 12,100 | 12,616 | 13,159 | 13,715 | 37% |
| San Jose | San Jose Water Company | 17,546 | 21,080 | 24,156 | 27,343 | 32,815 | 33,552 | 91% |
| | San Jose Municipal Water | | | | | | | |
| | Suctam | | | | | | | |
| Santa Clara | Santa Clara Valley Water District | 18,302 | 19,473 | 20,348 | 21,111 | 21,649 | 22,189 | 21% |
| | San Francisco Public Utilities | | | | | | | |
| Saratoga | San Jose Water Company | | | | | | | <i>incl. above</i> |
| Sunnyvale | City of Sunnyvale | 19,193 | 19,287 | 19,639 | 22,901 | 24,386 | 25,967 | 35% |
| | Cal Water | | | | | | | |
| Total | | 228,848 | 249,658 | 256,246 | 266,668 | 278,609 | 285,807 | 25% |

Water Supply – Finally, NBS calculated future growth by examining the water supply projection by source of supply in Valley Water’s Water Supply Master Plan 2040. Based on the Master Plan, water supply projections are expected to increase from 352,000 AF to 392,000 AF by 2040. The water supply projections assume an increase of 3,000 AF every 5 years for the next 20 years, an increase of more than 11% by 2040. **Figure 5** shows the estimated increase in water supply requirements by source of supply.

Figure 5. Projected Water Supply Growth Through 2040

| Source of Supply (AF) | Supply Projections | | | | | |
|---|--------------------|----------------|----------------|----------------|----------------|------------|
| | 2020 | 2025 | 2030 | 2035 | 2040 | % Growth |
| Natural Groundwater Recharge | 61,000 | 61,000 | 61,000 | 61,000 | 62,000 | 2% |
| Local Surface Water | 53,000 | 53,000 | 64,000 | 63,000 | 57,000 | 8% |
| Reuse | 21,000 | 27,000 | 48,000 | 50,000 | 52,000 | 148% |
| San Francisco Public Utilities Commission | 55,000 | 57,000 | 58,000 | 59,000 | 60,000 | 9% |
| Delta-Conveyed | 162,000 | 165,000 | 133,000 | 147,000 | 161,000 | -1% |
| Total Supply | 352,000 | 363,000 | 364,000 | 380,000 | 392,000 | 11% |

PROJECTED FUTURE WATER USE

After extensive analysis of future water use projects and discussions with District staff, NBS determined that water supply projections from the Master Plan presented the best method for calculating the proportional share of costs to be paid by future customers. Water supply projections include all water provided to Valley Water’s customers and not just the water retailers. As a result, it is a better representation of future demand on Valley Water’s water system.

Valley Water relies on various water supply sources that range from natural groundwater recharge to the purchased Delta-conveyed water from the State Water Project (SWP). **Figure 6** shows water supply projections across all water resources based on Valley Water’s 2020 Water Supply Master Plan.

Figure 6. Summary of Water Supply

| Source of Supply (AF) | Supply Projections | | | |
|---|--------------------|----------------|---------------|------------|
| | 2020 | 2040 | Difference | % Growth |
| Natural Groundwater Recharge | 61,000 | 62,000 | 1,000 | 2% |
| Local Surface Water | 53,000 | 57,000 | 4,000 | 8% |
| Reuse | 21,000 | 52,000 | 31,000 | 148% |
| San Francisco Public Utilities Commission | 55,000 | 60,000 | 5,000 | 9% |
| Delta-Conveyed | 162,000 | 161,000 | (1,000) | -1% |
| Average Supply | 352,000 | 392,000 | 40,000 | 11% |

NET FUTURE WATER USE

The projected water supply usage shown in **Figure 6** estimates an additional 40,000 acre feet (AF) are needed to serve future customers through 2040. In other words, the impact fee analysis estimates that future customers will be responsible for approximately 10% of all future costs for existing infrastructure and planned capital improvements that are, or will be, available to future customers who will enter as equal participants regarding their financial commitment and obligations to Valley Water’s water system. The allocation to future customers shown in **Figure 7** and will be used as a proxy to calculate the future needs of Valley Water’s current and future assets, as described in the following sections.

Figure 7. Projected Water Supply Growth

| Agencies / Cities | Current Water Supply | Expected Future Water Supply (thru FY 2039/40) | Total | Allocation Factors | | |
|----------------------------------|----------------------|--|----------------|--------------------|------------------|-------------|
| | | | | Existing Customers | Future Customers | Total |
| Water Supply Growth Through 2040 | 352,000 | 40,000 | 392,000 | 89.8% | 10.2% | 100% |

3.2 New Development Share of Infrastructure

The capital assets addressed in this study include existing assets and planned capital improvements (i.e., the system buy-in and incremental assets). An important aspect of this study is how the value of existing utility assets is determined. For example, the purchase price does not account for wear and tear, and current book value (i.e., purchase price less accumulated depreciation) typically underestimates the “true value” of facilities as it does not account for cost increases over time. Therefore, this study uses the replacement-cost-new-less-depreciation (RCNLD) approach to estimate existing asset values that reflect estimated cost inflation and depreciation.

VALUE OF EXISTING INFRASTRUCTURE

Valley Water manages and operates a complex and integrated water supply infrastructure, including dams, reservoirs, pipelines, pump stations, treatment plants, and recycled water facilities. All the assets put into service are tracked in Valley Water’s Asset Management Planning Tool (AMPT), which tracks installation date, original costs, asset life, and also estimates replacement costs.

METHODOLOGY – REPLACEMENT COST LESS DEPRECIATION

In general, the RCNLD is calculated by escalating the book value of existing assets to current-day values using inflation factors from various construction indices; however, in the case of Valley Water, we used the escalated values from Valley Water’s AMPT. Replacement values were calculated by escalating the original values from service date to 2021 values using historical cost inflation factors provided by Valley Water. For this analysis, assets that have exceeded their useful life (as defined in Valley Water’s asset records) were considered to have no remaining value. This approach was used for all assets, except land, which does not depreciate and is excluded from the analysis.

DATA SOURCES

For existing assets, NBS relied on reports generated by Valley Water’s Asset Management Planning Tool (AMPT). NBS used the data provided in these reports to calculate the following costs:

- Original Asset Cost is calculated by multiplying the Activity Cost (also referred to as the Replacement/Program Cost) by the number of units.
- Depreciation is calculated by multiplying the Original Asset Cost by the Consumed value.
- Book Value is the Original Asset Cost less Depreciation.
- System Buy-In Cost Basis is the replacement value of the asset (i.e., the Escalated Activity Cost) multiplied by the number of units, less accumulated depreciation.

Once these costs were calculated, we were able to determine the System Buy-in Cost Basis which would be allocated between existing and future customers using the allocation shown in **Figure 7**.

For new projects, NBS relied on Valley Water’s 15-Year Capital Improvement Program (FY 2023 through FY 2037) provided by District staff. NBS also included “Master Plan” projects from the 2020 Water Supply Master Plan, excluding all other “active” and “inactive” projects. Total costs of the “Master Plan” projects were allocated over a 20-year period. The cost estimates for planned future improvements, used to calculate the system development component of the capacity fee, are allocated using the same allocation basis found in **Figure 7**, as these projects benefit both current and future customers.

ESTIMATED VALUE OF EXISTING INFRASTRUCTURE

The existing assets for the water supply analysis include various asset classes from Valley Water’s asset management system. The total system buy-in cost basis is estimated at \$607 million to be allocated between existing and future customers based on the allocation factors in **Figure 7**.

Figure 8 shows the allocation of the \$607 million in system buy-in costs to existing and future customers. Future customers are allocated approximately \$62 million of the existing water supply assets, or about 10.2%.

Figure 8. Existing Water Supply Assets

| Asset Class ¹ | System Buy-In Cost Basis ² | Allocation Basis (%) ³ | | Distribution of Cost Basis (\$) | |
|-----------------------------|--|-----------------------------------|------------------|---------------------------------|----------------------|
| | | Existing Customers | Future Customers | Existing Customers | Future Customers |
| Civil | 325,047,182 | 89.8% | 10.2% | 291,879,103 | 33,168,080 |
| Electrical | 99,894,861 | 89.8% | 10.2% | 89,701,508 | 10,193,353 |
| Fleet | 758,835 | 89.8% | 10.2% | 681,403 | 77,432 |
| Instrumentation | 19,286,481 | 89.8% | 10.2% | 17,318,473 | 1,968,008 |
| Mechanical | 98,988,387 | 89.8% | 10.2% | 88,887,531 | 10,100,856 |
| Planning & Engineering Cost | 52,233,151 | 89.8% | 10.2% | 46,903,237 | 5,329,913 |
| WQL Lab | 11,255,236 | 89.8% | 10.2% | 10,106,743 | 1,148,494 |
| Total: Fixed Assets | \$ 607,464,133 | | | \$ 545,477,997 | \$ 61,986,136 |
| | <i>Percentage of Total Asset Value</i> | | | <i>89.8%</i> | <i>10.2%</i> |

1. The original asset cost provided by the District and depreciation calculated by NBS (depreciation is as of June 1, 2022).
2. Replacement values are calculated by escalating the original values from service date to 2022 values using historical cost inflation factors provided by the District in its *Asset Management Planning Tool*.
3. The Allocation Basis is based on the proportionate allocation between existing and future customers.

PROJECTED NEW PROJECTS

Projected new projects are outlined in several sources; Valley Water’s 15-Year Capital Improvement Program (FY 2023 through FY 2037) provided by District staff. NBS also included “Master Plan” projects from the 2020 Water Supply Master Plan, excluding all other “active” and “inactive” projects. Total costs of the “Master Plan” projects were allocated over a 20-year period.

CAPITAL IMPROVEMENT PLANS

Valley Water currently has a 15-year capital improvement plan for future expansion of the existing water infrastructure that spans from FY 2022/23 through FY 2039/40. **Figure 9** summarizes the total planned capital projects by funded status and cost center. Of the \$7.3 billion of planned capital projects, an estimated \$745 million is allocated to future customers.

Figure 9. Estimated Capital Improvement Projects –Water Supply

| Funded Status | Cost Center | Current Cost Estimate (\$000s) ² | System Development Cost Basis ³ | % Allocation ⁴ | | Distribution of Cost Basis (\$) ⁴ | |
|---|---|---|--|---------------------------|------------------|--|-----------------------|
| | | | | Existing Customers | Future Customers | Existing Customers | Future Customers |
| Capital Improvement Program¹ | | | | | | | |
| Funded Capital | Source of Supply | \$ 2,291,269,836 | \$ 2,291,269,836 | 89.8% | 10.2% | \$ 2,057,466,791 | \$ 233,803,044 |
| | Raw Water Transmission & Distribution | 288,683,000 | 288,683,000 | 89.8% | 10.2% | 259,225,551 | 29,457,449 |
| | Water Treatment | 2,707,358,000 | 2,707,358,000 | 89.8% | 10.2% | 2,431,096,980 | 276,261,020 |
| | Treated Water Transmission & Distribution | 8,305,000 | 8,305,000 | 89.8% | 10.2% | 7,457,551 | 847,449 |
| | Administration and General | 218,301,000 | 218,301,000 | 89.8% | 10.2% | 196,025,388 | 22,275,612 |
| | Miscellaneous Projects | 185,631,788 | 185,631,788 | 89.8% | 10.2% | 166,689,769 | 18,942,019 |
| | Capital Placeholder | 1,327,071,000 | 1,327,071,000 | 89.8% | 10.2% | 1,191,655,592 | 135,415,408 |
| | Miscellaneous Projects | 8,957,446 | 8,957,446 | 89.8% | 10.2% | 8,043,421 | 914,025 |
| Fund Transfers for Capital Projects | Raw Water Transmission & Distribution | \$ - | \$ - | 89.8% | 10.2% | \$ - | \$ - |
| | General Fund | 17,806,800 | 17,806,800 | 89.8% | 10.2% | 15,989,780 | 1,817,020 |
| | Information Technology | 30,637,800 | 30,637,800 | 89.8% | 10.2% | 27,511,494 | 3,126,306 |
| Unfunded Capital Projects | Source of Supply | \$ 207,513,000 | \$ 207,513,000 | 89.8% | 10.2% | \$ 186,338,204 | \$ 21,174,796 |
| | Water Treatment | 5,844,000 | 5,844,000 | 89.8% | 10.2% | 5,247,673 | 596,327 |
| Grand Total (Excl. Projects from Water Supply Master Plan) | | \$ 7,297,378,670 | \$ 7,297,378,670 | | | \$ 6,552,748,194 | \$ 744,630,477 |

1. The 15-year Capital Improvement Program (CIP) was provided by District staff. Source file: FY23 CIP By Fund v8.xlsx.
2. The District's CIP costs are based on current year dollars.
3. Cost basis for consideration is calculated as current cost estimate less any known external funding sources (e.g., grants, contributions, bond proceeds).
4. Capital projects are allocated proportionately based on expected customer growth. See Figure 7.

MASTER PLAN

In addition to Valley Water’s 15-Year Capital Improvement Program, the impact fee analysis includes “Master Plan” projects from Valley Water’s 2020 Water Supply Master Plan which were allocated over a 20-year period. The summary of the master plan projects are shown in **Figure 10**. Using the percent allocation factors from **Figure 7**, an estimated \$213 million of the estimated \$2 billion in the system development cost bases is allocated to future customers. Valley Water may have additional capital projects that are needed to serve future developments and will be evaluated on a case-by-case basis as part of the development review process.

Figure 10. Estimated Long-Term Capital Improvement Plan for Water Supply Projects¹

| Funded Status | Current Cost Estimate (\$000s) | System Development Cost Basis | % Allocation | | Distribution of Cost Basis (\$) | |
|-----------------------------|--------------------------------|-------------------------------|--------------------|------------------|---------------------------------|------------------|
| | | | Existing Customers | Future Customers | Existing Customers | Future Customers |
| Master Plan Projects | \$ 2,086,200,000 | \$ 2,086,200,000 | 89.8% | 10.2% | \$ 1,873,322,449 | \$ 212,877,551 |

¹Source file: Water Supply Master Plan 2040_11.01.2019_v2.pdf, Appendix H.

VALUE OF PROJECTED PROJECTS

Valley Water’s combined short- and long-term projects for the water supply system total approximately \$9.4 billion as shown in **Figure 11**.

Figure 11. Estimated Total Water Supply Capital Projects

| Funded Status | Cost Center | Current Cost Estimate (\$000s) |
|--|-------------|--------------------------------|
| Capital Improvement Program | | |
| Grand Total (Excl. Project from Water Supply Master Plan) | | \$7,297,378,670 |
| | | |
| Grand Total (Incl. Project from Water Supply Master Plan) | | \$9,383,578,670 |

FUTURE USERS SHARE OF PROJECTED PROJECTS

Valley Water’s capital improvement plans for the water supply system extend to FY 2039/40. Some of the cost estimates for planned future improvements used to calculate the system development component of the impact fees are allocated using the allocation factors developed in **Figure 7**, as these projects benefit both current and future customers. **Figure 12** includes a summary of future capital improvement projects, where future customers are allocated about \$958 million of the planned asset costs.

Figure 12. Future Users’ Share of Projected Capital Improvement Projects – Water Supply

| Funded Status | Cost Center | Current Cost Estimate (\$000s) ² | System Development Cost Basis ³ | % Allocation ⁴ | | Distribution of Cost Basis (\$) ⁴ | |
|---|---|---|--|---------------------------|------------------|--|-----------------------|
| | | | | Existing Customers | Future Customers | Existing Customers | Future Customers |
| Capital Improvement Program¹ | | | | | | | |
| Funded Capital | Source of Supply | \$ 2,291,269,836 | \$ 2,291,269,836 | 89.8% | 10.2% | \$ 2,057,466,791 | \$ 233,803,044 |
| | Raw Water Transmission & Distribution | 288,683,000 | 288,683,000 | 89.8% | 10.2% | 259,225,551 | 29,457,449 |
| | Water Treatment | 2,707,358,000 | 2,707,358,000 | 89.8% | 10.2% | 2,431,096,980 | 276,261,020 |
| | Treated Water Transmission & Distribution | 8,305,000 | 8,305,000 | 89.8% | 10.2% | 7,457,551 | 847,449 |
| | Administration and General | 218,301,000 | 218,301,000 | 89.8% | 10.2% | 196,025,388 | 22,275,612 |
| | Miscellaneous Projects | 185,631,788 | 185,631,788 | 89.8% | 10.2% | 166,689,769 | 18,942,019 |
| | Capital Placeholder | 1,327,071,000 | 1,327,071,000 | 89.8% | 10.2% | 1,191,655,592 | 135,415,408 |
| | Miscellaneous Projects | 8,957,446 | 8,957,446 | 89.8% | 10.2% | 8,043,421 | 914,025 |
| Fund Transfers for Capital Projects | Raw Water Transmission & Distribution | \$ - | \$ - | 89.8% | 10.2% | \$ - | \$ - |
| | General Fund | 17,806,800 | 17,806,800 | 89.8% | 10.2% | 15,989,780 | 1,817,020 |
| | Information Technology | 30,637,800 | 30,637,800 | 89.8% | 10.2% | 27,511,494 | 3,126,306 |
| Unfunded Capital Projects | Source of Supply | \$ 207,513,000 | \$ 207,513,000 | 89.8% | 10.2% | \$ 186,338,204 | \$ 21,174,796 |
| | Water Treatment | 5,844,000 | 5,844,000 | 89.8% | 10.2% | 5,247,673 | 596,327 |
| Grand Total (Excl. Projects from Water Supply Master Plan) | | \$ 7,297,378,670 | \$ 7,297,378,670 | | | \$ 6,552,748,194 | \$ 744,630,477 |
| Master Plan Projects | | \$ 2,086,200,000 | \$ 2,086,200,000 | 89.8% | 10.2% | \$ 1,873,322,449 | \$ 212,877,551 |
| Grand Total (Incl. Projects from Water Supply Master Plan) | | \$ 9,383,578,670 | \$ 9,383,578,670 | | | \$ 8,426,070,643 | \$ 957,508,028 |

1. The 15-year Capital Improvement Program (CIP) was provided by District staff. Source file: FY23 CIP By Fund v8.xlsx.
2. Valley Water’s CIP costs are based on current year dollars.
3. Cost basis for consideration is calculated as current cost estimate less any known external funding sources (e.g., grants, contributions, bond proceeds).
4. Capital projects are allocated proportionately based on expected customer growth. See Exhibit 1. Demographics.

ADJUSTMENTS

Before the impact fees are developed, an adjustment is applied to the cost basis to account for existing unrestricted cash reserves and outstanding debt principal.

Adjustments for Cash Balances

Existing cash reserves are available to pay for capital costs of the utility that future customers will benefit from, once connected. The existing cash reserves allocated to current and future customers are summarized in **Figure 13** using the same allocation factors from **Figure 7**. Future customers are allocated about \$50.5 million in cash reserves. This amount will be credited against the capital costs allocated to future customers.

Figure 13. Cash Reserves Allocated to Future Development

| Cash Reserves | Cash Amount ¹ | % Allocation ² | | \$ - Allocation ² | |
|--|--------------------------|---------------------------|------------------|------------------------------|----------------------|
| | | Existing Customers | Future Customers | Existing Customers | Future Customers |
| Restricted Net Position (Fund 61) | | | | | |
| WU Debt Service Reserves | \$ 6,999.04 | 89.8% | 10.2% | \$ 6,285 | \$ 714 |
| WU San Felipe Emergency Reserve | 3,348,085.79 | 89.8% | 10.2% | 3,006,444 | 341,641 |
| GP5 Reserve | 9,669,736.00 | 89.8% | 10.2% | 8,683,028 | 986,708 |
| WU Rate Stabilization Reserve | 25,069,620.00 | 89.8% | 10.2% | 22,511,496 | 2,558,124 |
| WU State Water Project Tax Reserve | TBD | 89.8% | 10.2% | - | - |
| WU State Water Project - Encumbrances | TBD | 89.8% | 10.2% | - | - |
| WUE SVAWPC Reserve | 1,298,138.00 | 89.8% | 10.2% | 1,165,675 | 132,463 |
| WU Supplemental Water Supply Reserve | 15,477,000.00 | 89.8% | 10.2% | 13,897,714 | 1,579,286 |
| Drought Reserve | 10,000,000.00 | 89.8% | 10.2% | 8,979,592 | 1,020,408 |
| Unrestricted Net Position | | | | | |
| <i>Committed Fund Balance</i> | | | | | |
| Current Authorized Projects Reserve | 85,292,965.00 | 89.8% | 10.2% | 76,589,601 | 8,703,364 |
| Operating and Capital Reserve* | 86,984,133.11 | 89.8% | 10.2% | 78,108,201 | 8,875,932 |
| Water Inventory Reserve | 129,968,912.00 | 89.8% | 10.2% | 116,706,778 | 13,262,134 |
| <i>Assigned Fund Balance</i> | | | | | |
| Encumbrances Reserve | 125,525,283.20 | 89.8% | 10.2% | 112,716,581 | 12,808,702 |
| Market Valuation Reserve | 2,394,921.40 | 89.8% | 10.2% | 2,150,542 | 244,380 |
| Total Beginning Cash | \$ 495,035,794 | | | 444,521,937 | 50,513,856 |
| Cash Net of Unspent Capacity Fees | \$ 495,035,794 | 89.8% | 10.2% | \$ 444,521,937 | \$ 50,513,856 |

1. Total beginning cash balance for FY 2020/21 provided by District staff in source file: 2021 Reserve WS to Budget.pdf.

2. Cash reserves are allocated proportionately in the same manner as existing assets (in total) in Figure G.

Adjustments for Debt Principals

Since new development pay their share of existing asset values, including the debt payment principals on those same assets would double count the asset values included in the capacity fees. Therefore, future customers are credited approximately \$57.3 million as shown in **Figure 14**.

Figure 14. Debt Service Credited to Future Development – Water Supply

| Description of Debt | Principal Amount | % Allocation ² | | \$ - Allocation | |
|---------------------|-----------------------|---------------------------|------------------|-----------------------|----------------------|
| | | Existing Customers | Future Customers | Existing Customers | Future Customers |
| 2016 Bonds | \$ 181,530,000 | 89.8% | 10.2% | \$ 163,006,531 | \$ 18,523,469 |
| 2016 COPs | 71,585,000 | 89.8% | 10.2% | 64,280,408 | 7,304,592 |
| 2017 Bonds | 47,750,000 | 89.8% | 10.2% | 42,877,551 | 4,872,449 |
| 2019 Bonds | 126,615,000 | 89.8% | 10.2% | 113,695,102 | 12,919,898 |
| 2020 Bonds | 92,650,000 | 89.8% | 10.2% | 83,195,918 | 9,454,082 |
| 2020 COPs | 41,765,000 | 89.8% | 10.2% | 37,503,265 | 4,261,735 |
| Total | \$ 561,895,000 | | | \$ 504,558,776 | \$ 57,336,224 |

DEVELOPMENT IMPACT FEE

The sum of the existing and future planned asset values (i.e., the system buy-in and system development costs), along with the adjustment for cash reserves and debt principals, defines the total cost basis allocated to future customers. The total adjusted cost basis is then divided by the projected water supply growth (in AF) expected to be developed through 2040. **Figure 15** summarizes the adjusted cost basis allocated to future customers.

Figure 15. Summary of Cost Basis Allocated to Future Customers – Water Supply

| System Asset Values Allocated to Future Development | |
|---|-------------------------|
| System Buy-In and Expansion Components | |
| Existing System Buy-In ¹ | \$ 61,986,136 |
| Future System Expansion ² | 957,508,028 |
| Subtotal: System Buy-In and Expansion Components | \$ 1,019,494,164 |
| Adjustments to Cost Basis: | |
| Cash Reserves ³ | \$ (50,513,856) |
| Outstanding Long-Term Debt (Principal) ⁴ | (94,117,533) |
| Subtotal: Adjustments to Cost Basis | \$ (144,631,389) |
| Total: Cost Basis for New Development | \$ 874,862,774 |
| Projected Water Supply (through 2040) | 40,000 |
| Water Supply Capacity Fee (Per AF) | \$ 21,900 |

- 1. See Figure 8.
- 2. See Figure 12.
- 3. See Figure 13.
- 4. See Figure 14.

DEVELOPMENT IMPACT FEE POTENTIAL REVENUE ESTIMATES

At the request of Valley Water, NBS calculated the annual capacity fee revenue based on funding 100% of capital expenses, as well as the revenue if only 50% of the capital expenses were included in the analysis. **Figure 16** shows a summary of potential revenue from water supply impact fees both 50% and 100% of capital costs. Figure 16 also shows the typical single family residential fee, based on a typical single family residential family using 0.4 acre feet of water per year.



Figure 16. Potential Revenue Estimates Based on CIP Funding

| ANNUAL REVENUE ESTIMATE | 100% CIP | 50% CIP |
|---|-----------------|----------------|
| <i>Growth Estimate through 2040</i> | 40,000 | 40,000 |
| <i>Years until 2040</i> | 18 | 18 |
| <i>Annual Water Supply Growth</i> | 2,222 | 2,222 |
| <i>Fee per Acre Foot</i> | \$21,900 | \$9,900 |
| <i>Typical Single Family Residential Fee*</i> | \$8,760 | \$3,960 |
| <i>Annual Capacity Fee Revenue Estimate</i> | \$ 48,666,667 | \$ 22,000,000 |

* Typical Single Family uses 0.4 acre feet of water per year

4. Flood Protection Impact Fee

4.1 Identifying New Development Share of Projects

This impact fee study and the recommended fees assume a given level of development activity over the course of the study period based on data available from Valley Water’s parcel count, parcel area, and the User’s Guide for the California Impervious Surface Coefficients. The development that occurs may result in both different impacts and fee revenues than those that are calculated in this study. For that reason, regular updates are recommended to adjust the fees to match the needs created by the rate of actual development.

In developing the proposed fees, NBS worked cooperatively with District staff. The fees presented in this study reflect input provided by District staff regarding financial matters, available capacity in the flood protections system, existing asset values, and planned capital improvements.

IDENTIFY FUTURE DEVELOPMENT

Future land development is estimated using impervious surface area data. Using the User’s Guide for the California Impervious Surface Coefficients⁵ (referred to as ‘Guide’ in this report) research, the estimated impervious surface acres can be calculated for current and future users. Impervious surface area (ISA) represents the hardened surface area in a given area used to calculate stormwater runoff. The ISA does not allow water to seep into the ground and simply allows water to run off the area into storm drains or nearby bodies of water. Asphalt, for example, is highly impervious.

Future land development and the impervious area can be estimated by using historical population growth as a proxy. The following sections go into more detail on the methodology used to identify future development estimates.

METHODOLOGIES FOR ESTIMATING FUTURE LAND USE

This analysis uses future population growth as a variable to estimate the future impervious surface area expected to be developed. The growth of ISA is calculated using the current parcel data along with the coefficients developed in the Guide. The calculation of the coefficient is the acres of hardened surface divided by the total acres developed in the Guide for various land uses. **Figure 17** shows the total parcel count and acreage currently in Santa Clara County.

⁵ Washburn, Barbara, PhD, Yancey, Katie, Jonathan Mendoza; *User’s Guide for the California Impervious Surface Coefficients*, December 2010, Ecotoxicology Program, Office of Environmental Health Hazard Assessment, California Environmental Protection Agency.

Figure 17. Summary of Parcel Count and Area by Land Use in Santa Clara County

| Land Use | Sum of Parcel Count | Sum of Total Parcel Area |
|-------------------------------|---------------------|--------------------------|
| SINGLE FAM RES & SML MULTI | 858,178 | 177,457 |
| COMMERCIAL AND INDUSTRIAL | 36,554 | 57,318 |
| DISTURBED RURAL, VCNT, AGRIC | 13,379 | 75,160 |
| INSTITUTIONS AND APARTMENT | 12,945 | 18,924 |
| MIXED ASSESSMENT | 135 | 10,960 |
| RURAL UNDIST AG. BRUSH, FOR | 2,262 | 237,976 |
| UNDISTRBD AGRIC, MARSH, PONDS | 1,744 | 87,272 |
| WELL SITE | 35 | 1 |
| TOTALS | 925,232 | 665,068 |

POPULATION GROWTH

Historical population growth serves as a reasonable assumption to the growth in impervious acreage expected to be developed. Projecting the population growth for Valley Water’s retailers is shown in **Figure 18**, where an estimated 14% growth is expected in a 25-year period from 2020-2045. NBS believes this is a reasonable assumption to use in calculating fees through 2050. This growth pattern will be used to estimate future impervious surface acreage growth in this analysis.

Figure 18. Projected Population Growth in Valley Water Service Area Only

| Agencies / Cities | Projected Population Growth | | | | | | |
|-------------------------------------|-----------------------------|----------------|----------------|----------------|----------------|----------------|--------------|
| | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | % Growth |
| Campbell ¹ | 42,288 | 42,377 | 42,466 | 42,555 | 42,644 | 42,734 | 1.1% |
| Cupertino ² | 59,549 | 59,549 | 59,549 | 59,549 | 59,549 | 59,549 | 0.0% |
| Gilroy ³ | 57,084 | 57,946 | 58,821 | 59,709 | 60,611 | 61,526 | 7.8% |
| Los Altos ⁴ | 30,876 | 31,086 | 31,297 | 31,510 | 31,724 | 31,940 | 3.4% |
| Los Gatos ⁵ | 31,439 | 31,634 | 31,830 | 32,027 | 32,226 | 32,426 | 3.1% |
| Milpitas ⁶ | 75,663 | 75,701 | 75,739 | 75,777 | 75,814 | 75,852 | 0.3% |
| Monte Sereno ⁷ | 3,511 | 3,512 | 3,513 | 3,513 | 3,514 | 3,515 | 0.1% |
| Morgan Hill ⁸ | 46,454 | 47,453 | 48,473 | 49,515 | 50,580 | 51,667 | 11.2% |
| Mountain View ⁹ | 81,302 | 81,863 | 82,428 | 82,997 | 83,569 | 84,146 | 3.5% |
| San Jose ¹⁰ | 132,644 | 150,368 | 168,092 | 194,983 | 217,685 | 222,661 | 67.9% |
| Santa Clara ¹¹ | 129,104 | 130,821 | 132,561 | 134,324 | 136,111 | 137,921 | 6.8% |
| Saratoga ¹² | 31,030 | 31,080 | 31,129 | 31,179 | 31,229 | 31,279 | 0.8% |
| Sunnyvale ¹³ | 154,252 | 155,825 | 157,415 | 159,020 | 160,642 | 162,281 | 5.2% |
| Total Population | 875,196 | 899,214 | 923,312 | 956,659 | 985,899 | 997,497 | 14.0% |
| Annual Growth (2020 to 2045) | 35,008 | 35,969 | 36,932 | 38,266 | 39,436 | 39,900 | |

1. Information available on the City's website. Website: <https://www.campbellca.gov/ArchiveCenter/ViewFile/Item/1642>, page 126.
2. Information available on the City's website. Website: <https://www.cupertino.org/home/showpublisheddocument/29190/637534959803230000>, page 112.
3. Information available on the City's website. Website: <https://www.cityofgilroy.org/DocumentCenter/View/11644/FY-2020-ACFR?bidId=>, page 209.
4. Information available on the City's website. Website: https://www.losaltosca.gov/sites/default/files/fileattachments/administrative_services/page/34881/final_-los_altos_acfr_fy21.pdf, page 155.
5. Information available on the City's website. Website: <https://www.losgatosca.gov/DocumentCenter/View/29618/FY-202021-ACFR?bidId=>, page 146.
6. Information available on the City's website. Website: <https://www.milpitas.gov/wp-content/uploads/2021/12/Milpitas-2021-Web-ACFR.pdf>, page 157.
7. Population for Monte Sereno is based on information available from the United States Census Bureau. Website: <https://www.census.gov/>.
8. Information available on the City's website. Website: <https://www.morgan-hill.ca.gov/DocumentCenter/View/37500/2020-Annual-Comprehensive-Financial-Report-6-30-20-PDF?bidId=>, page 208.
9. Information available on the City's website. Website: <https://www.mountainview.gov/civicax/filebank/blobdload.aspx?BlobID=33599>, page 178.
10. Population is defined as the population served by San Jose Municipal Water System. Information available on the City's website. Website: <https://www.sanjoseca.gov/home/showpublisheddocument/422/637602045327100000>, page ES-2.
11. Information available on the City's website. Website: <https://www.santaclaraca.gov/home/showpublisheddocument/76049/637769033936730000>, page 231.
12. Information available on the City's website. Website: <https://www.saratoga.ca.us/ArchiveCenter/ViewFile/Item/1921>, page 123.
13. Information available on the City's website. Website: <https://www.sunnyvale.ca.gov/home/showpublisheddocument/938/637819888578970000>, page 219.

LAND USE PROJECTIONS

From Valley Water’s number of parcels and total acreage, the density per acre can be calculated by dividing the number of APNs by the total acreage in each customer class. Combining the acreage with the Impervious Surface Area (ISA) coefficient, the estimated current impervious surface acreage in Valley Water can be determined as shown in **Figure 19**.

Figure 19. Summary of Estimated Current Impervious Surface Area

| Land Use | Number of APN | Total Acreage | Density per Acre | Impervious Surface Coefficient ² | Estimated Impervious Acres | % of Impervious Area |
|-----------------------------|----------------|----------------|------------------|---|----------------------------|----------------------|
| SINGLE FAM RES & SML MULTI | 858,178 | 177,457 | 4.8 | 0.49 | 86,954 | 56.35% |
| COMMERCIAL AND INDUSTRIAL | 36,554 | 57,318 | 0.6 | 0.81 | 46,428 | 30.09% |
| DISTURBED RURAL,VCNT,AGRIC | 13,379 | 75,160 | 0.2 | 0.04 | 3,006 | 1.95% |
| INSTITUTIONS AND APARTMENT | 12,945 | 18,924 | 0.7 | 0.14 | 2,649 | 1.72% |
| MIXED ASSESSMENT | 135 | 10,960 | 0.01 | 0.80 | 8,768 | 5.68% |
| RURAL UNDIST AG. BRUSH, FOR | 2,262 | 237,976 | 0.01 | 0.02 | 4,760 | 3.08% |
| UNDISTRBD AGRIC,MARSH,PONDS | 1,744 | 87,272 | 0.02 | 0.02 | 1,745 | 1.13% |
| WELL SITE | 35 | 0.61 | 57.4 | 0.44 | 0 | 0.00% |
| TOTAL | 925,232 | 665,068 | | | 154,311 | 100% |

1. Parcel count from District via source file: SCVWD_Parcel_data_09-12-2022.xlsx

2. Average impervious surface coefficient by land use in Source file: User's Guide for the California Impervious Surface Coefficients.pdf, Table 1 and Table 2.

PROJECTED FUTURE LAND USE

The projected land use growth can be determined using the 14% growth pattern found from historical population growth in **Figure 18**. With this percentage as a proxy, an estimated 21,564 impervious acres are expected to be developed through 2050. This leads to an estimated 12.3% of future costs allocated to future customers as shown in **Figure 20**.

Figure 20. Projected Growth in Flood Protection Area

| Estimated Impervious Surface Area Growth (Acres) | Current | Net Growth 2022-2050 | % Current | % Future | Estimated ISA Growth | % ISA Growth |
|--|---------|----------------------|-----------|----------|----------------------|--------------|
| | 154,311 | 175,874 | 87.7% | 12.3% | 21,564 | 14.0% |

4.2 New Development Share of Infrastructure

The capital assets addressed in this study include existing assets and planned capital improvements (i.e., the system buy-in and incremental assets). An important aspect of this study is how the value of existing utility assets is determined. For example, the purchase price does not account for wear and tear, and current book value (i.e., purchase price less accumulated depreciation) typically underestimates the “true value” of facilities as it does not account for cost increases over time. Therefore, this study uses the replacement-cost-new-less-depreciation (RCNLD) approach to estimate existing asset values that reflect estimated cost inflation and depreciation.

VALUE OF EXISTING INFRASTRUCTURE

Valley Water has a wide range of creek and river projects to provide flood protection across Valley Water. The projects also include tide gates and shoreline protection. These projects are cataloged in Valley Water’s Asset Management Planning Tool (AMPT).

METHODOLOGY – REPLACEMENT COST LESS DEPRECIATION

In general, the RCNLD is calculated by escalating the book value of existing assets to current-day values using inflation factors from various construction indices; however, in the case of Valley Water, we used the escalated values from Valley Water’s AMPT. Replacement values were calculated by escalating the original values from service date to 2021 values using historical cost inflation factors provided by Valley Water. For this analysis, assets that have exceeded their useful life (as defined in Valley Water’s asset records) were considered to have no remaining value. This approach was used for all assets, except land, which does not depreciate and is excluded from the analysis.

DATA SOURCES

Valley Water currently uses an asset management program which was used to establish the current value of the existing flood protection watershed assets. Projected new projects were outlined in Valley Water’s 5-Year Capital Improvement Program (FY 2023 - FY 2027) provided by District staff. This 5-Year CIP also included a 15 year projection of projects through FY 2037.

ESTIMATED VALUE OF EXISTING INFRASTRUCTURE

The existing assets for the flood protection system include all watershed assets from Valley Water’s asset management system. The total system buy-in costs are estimated to be more than \$370 million, in which just over \$45 million is allocated to future customers using the factors calculated in **Figure 20**. The summary of existing watershed assets are shown in **Figure 21**.

Figure 21. Existing Watershed Assets

| Flood Protection Assets | System Buy-In Cost Basis |
|-------------------------------|--------------------------|
| Annual Inspection | \$ 541,605 |
| Concrete-Bank | \$ 131,759,239 |
| Concrete-Bed | \$ 95,748,526 |
| Debris Removal | \$ 1,749,659 |
| Fish Ladder Maintenance | \$ 1,492,101 |
| FishLadder | \$ 70,753,660 |
| Herbicide | \$ 50,965 |
| Levee Maintenance | \$ 2,777,802 |
| RockLined-Bank | \$ 50,945,589 |
| RockLined-Bed | \$ 9,201,086 |
| Sediment Removal | \$ 2,493,757 |
| Vegetation Removal | \$ 2,846,886 |
| Total Capital Assets | \$ 370,360,875 |
| <i>Existing Users (87.7%)</i> | <i>\$ 324,951,720</i> |
| <i>Future Users (12.3%)</i> | <i>\$ 45,409,156</i> |

Replacement cost new, less depreciation used to calculate the system buy in cost basis

PROJECTED NEW PROJECTS

Valley Water’s capital improvement plan has been segregated between short-term and long-term projects. The short-term projects represent projects planned in the next five years, the long-term projects represent projects planned for six to fifteen years from now.

Short-Term Capital Improvement Plans

Valley Water currently has a short-term capital improvement plan spanning through 2027 for watershed and flood protection additions. **Figure 22** summarizes the total planned capital projects for each individual watershed through 2027. Of the \$1.69 billion of capital projects, an estimated \$207 million are allocated to future customers.

Figure 22. Estimated Capital Improvement Projects

| Watershed | Total Planned Thru 2027 |
|-------------------------------|-------------------------|
| COYOTE WATERSHED | \$ 423,343,000 |
| GUADALUPE WATERSHED | 270,007,000 |
| LOWER PENNISULA WATERSHED | 283,143,800 |
| MULTIPLE WATERSHED | 281,366,000 |
| UVAS LLAGAS WATERSHED | 344,053,000 |
| WEST VALLEY WATERSHED | 70,383,000 |
| TRANSMISSION | 16,338,000 |
| TOTALS | \$ 1,688,633,800 |
| <i>Existing Users (87.7%)</i> | <i>\$ 1,481,594,017</i> |
| <i>Future Users (12.3%)</i> | <i>\$ 207,039,783</i> |

Long-Term Capital Improvement Plans

Valley Water also currently has estimated long-term capital plans spanning through 2037. The summary of projects planned for the long-term are shown in **Figure 23** where an estimated \$30.5 million of the total \$248 million are allocated to future customers.

Figure 23. Estimated Long-Term Capital Improvement Plan for Watersheds Detail

| Watershed | Total Planned FY 2028/36 |
|-------------------------------|--------------------------|
| COYOTE WATERSHED | \$ 92,901,000 |
| GUADALUPE WATERSHED | 51,377,000 |
| LOWER PENNISULA WATERSHED | 5,845,000 |
| MULTIPLE WATERSHED | 98,611,000 |
| UVAS LLAGAS WATERSHED | - |
| WEST VALLEY WATERSHED | - |
| TRANSMISSION | 200,000 |
| TOTALS | \$ 248,934,000 |
| <i>Existing Users (87.7%)</i> | <i>\$ 218,412,734</i> |
| <i>Future Users (12.3%)</i> | <i>\$ 30,521,266</i> |

Value of Projected Projects

Combining the short- and long-term projects valued for the flood protection system, total planned capital exceeds about \$1.93 billion, as shown in **Figure 24**.

Figure 24. Flood Protection Costs by Watershed

| Watershed | Total Planned Projects |
|---------------------------|-------------------------|
| COYOTE WATERSHED | \$ 516,244,000 |
| GUADALUPE WATERSHED | 321,384,000 |
| LOWER PENNISULA WATERSHED | 288,988,800 |
| MULTIPLE WATERSHED | 379,977,000 |
| UVAS LLAGAS WATERSHED | 344,053,000 |
| WEST VALLEY WATERSHED | 70,383,000 |
| TRANSMISSION | 16,538,000 |
| TOTALS | \$ 1,937,567,800 |

FUTURE USERS SHARE OF PROJECTED PROJECTS

Valley Water’s capital improvement plans for multiple watersheds in the County extend to FY 2037. Some of the cost estimates for planned future improvements used to calculate the system development component of the impact fees are allocated using the allocation factors developed in **Figure 20**, as these projects benefit both current and future customers. **Figure 25** includes a summary of future capital improvement projects, where future customers are allocated about \$237 million of the planned asset costs.

Figure 25. Future Users Share of Projected Capital Improvement Projects

| Watershed | Total Planned Projects | % Allocation ² | | \$ - Allocation | |
|---------------------------|-------------------------|---------------------------|--------------|-------------------------|-----------------------|
| | | Existing Users | Future Users | Existing Users | Future Users |
| COYOTE WATERSHED | \$ 516,244,000 | 87.7% | 12.3% | \$ 452,948,426 | \$ 63,295,574 |
| GUADALUPE WATERSHED | 321,384,000 | 87.7% | 12.3% | 281,979,794 | 39,404,206 |
| LOWER PENNISULA WATERSHED | 288,988,800 | 87.7% | 12.3% | 253,556,501 | 35,432,299 |
| MULTIPLE WATERSHED | 379,977,000 | 87.7% | 12.3% | 333,388,832 | 46,588,168 |
| UVAS LLAGAS WATERSHED | 344,053,000 | 87.7% | 12.3% | 301,869,397 | 42,183,603 |
| WEST VALLEY WATERSHED | 70,383,000 | 87.7% | 12.3% | 61,753,491 | 8,629,509 |
| TRANSMISSION | 16,538,000 | 87.7% | 12.3% | 14,510,311 | 2,027,689 |
| TOTALS | \$ 1,937,567,800 | 87.7% | 12.3% | \$ 1,700,006,751 | \$ 237,561,049 |

Source file: FY23 CIP by Fund v8.xlsx, for Funds 12 and 26

Inflation is factored into CIP estimates.

ADJUSTMENTS

Before the impact fees are developed, an adjustment is applied to the cost basis to account for existing unrestricted cash reserves and outstanding debt principal.

Adjustments for Cash Balances

Before the impact fees are developed, an adjustment is applied to the cost basis to account for existing unrestricted cash reserves and outstanding debt principal. Existing cash reserves are available to pay for capital costs of the utility that future customers will benefit from, once connected. The existing cash reserves allocated to current and future customers are summarized in **Figure 26** using the same allocation factors from **Figure 20**. Future customers are allocated about \$15.3 million in cash reserves. This amount will be credited against the capital costs allocated to future customers.

Figure 26. Cash Reserves Allocated to Future Development

| Flood Protection Cash Reserves | Beginning Cash ¹ | % Allocation | | \$ - Allocation | |
|--|-----------------------------|----------------|--------------|-----------------------|----------------------|
| | | Existing Users | Future Users | Existing Users | Future Users |
| Watershed & Stream Fund 12 - Operating & Capital | \$ 97,803,767 | 87.7% | 12.3% | \$ 85,812,256 | \$ 11,991,511 |
| Safe Clean Water Fund 26 - Operating & Capital Reserve | \$ 27,042,203 | 87.7% | 12.3% | \$ 23,726,616 | \$ 3,315,587 |
| Total | \$ 124,845,971 | 87.7% | 12.3% | \$ 109,538,873 | \$ 15,307,098 |

1. Total beginning cash and investments balances are per District.
Source file: 2021 Reserve WS to Budget.pdf

Adjustments for Debt Principals

Since new development pay their share of existing asset values, including the debt payment principals on those same assets would double count the asset values included in the capacity fees. Therefore, future customers are credited approximately \$7.2 million as shown in **Figure 27**.

Figure 27. Debt Service Credited to Future Development

| Outstanding Debt | Total Amount | % Allocation ² | | \$ - Allocation | |
|---|----------------------|---------------------------|--------------|----------------------|---------------------|
| | | Existing Users | Future Users | Existing Users | Future Users |
| 2012A COPs Debt Service Schedule | | | | | |
| <i>West Valley (N. Central)</i> | | | | | |
| Outstanding Principal | \$ 3,238,594 | 87.7% | 12.3% | \$ 2,841,517 | \$ 397,077 |
| <i>Guadalupe (Central)</i> | | | | | |
| Outstanding Principal | \$ 8,100,585 | 87.7% | 12.3% | \$ 7,107,389 | \$ 993,195 |
| <i>Coyote (East)</i> | | | | | |
| Outstanding Principal | \$ 3,360,821 | 87.7% | 12.3% | \$ 2,948,758 | \$ 412,063 |
| Subtotal | \$ 14,700,000 | 87.7% | 12.3% | \$ 12,897,664 | \$ 1,802,336 |
| 2017A WS (Refunding of 2004A and 2007A COPs) | | | | | |
| <i>Lower Peninsula (10993008)</i> | | | | | |
| Outstanding Principal | \$ 16,159,018 | 87.7% | 12.3% | \$ 14,177,795 | \$ 1,981,223 |
| <i>Guadalupe (30993008)</i> | | | | | |
| Outstanding Principal | \$ 5,471,391 | 87.7% | 12.3% | \$ 4,800,555 | \$ 670,836 |
| <i>West Valley (20993008)</i> | | | | | |
| Outstanding Principal | \$ 4,847,296 | 87.7% | 12.3% | \$ 4,252,979 | \$ 594,317 |
| <i>Coyote (40993008)</i> | | | | | |
| Outstanding Principal | \$ 14,545,982 | 87.7% | 12.3% | \$ 12,762,530 | \$ 1,783,452 |
| | \$ 3,508,676 | 87.7% | 12.3% | 3,078,485 | 430,191 |
| Subtotal | \$ 44,532,363 | 87.7% | 12.3% | \$ 39,072,345 | \$ 5,460,018 |
| Grand Total | \$ 59,232,363 | 87.7% | 12.3% | \$ 51,970,010 | \$ 7,262,354 |

1. Payment Schedule found in source file: Watershed Debt Service as of 03-29-22.xlsx

DEVELOPMENT IMPACT FEE

The sum of the existing and future planned asset values (i.e., the system buy-in and system development costs), along with the adjustment for cash reserves and debt principals, defines the total cost basis allocated to future customers. The total adjusted cost basis is then divided by the projected growth of impervious surface acres expected to be developed through 2050. **Figure 28** summarizes this calculation.

Figure 28. Summary of Cost Basis Allocated to Future Customers

| System Asset Values Allocated to Future Development | |
|--|-----------------------|
| <i>System Asset Values Allocated to New Development</i> | |
| Existing System Buy-In ¹ | \$ 45,409,156 |
| Future System Expansion ² | 237,561,049 |
| Total: Existing & Future System Costs | \$ 282,970,205 |
| <i>Adjustments to Cost Basis:</i> | |
| Cash Reserves ³ | \$ (15,307,098) |
| Outstanding Long-Term Debt (Principal) ⁴ | (7,262,354) |
| Total: Adjustments to Cost Basis | \$ (22,569,451) |
| Total Adjusted Cost Basis for New Development | \$ 260,400,754 |
| Projected Growth of Impervious Surface Acres (ISA) through 2050 | 21,564 |
| Maximum Base Capacity Fee per Impervious Acre | \$ 12,100 |

1. See Figure 21.

2. See Figure 25.

3. See Figure 26.

4. See Figure 27.

Based on the combined system buy-in and incremental capacity fee methodology, and the assumptions used in this analysis, NBS has calculated the new flood protection impact fees by land use, as shown in **Figure 29**. The updated fees represent the typical fees that the Valley Water can charge for new development per acre while funding 100% of the capital improvement program.

Figure 29. Typical Flood Protection Impact Fee by Land Use

| Land Use | % of Impervious Area per Acre | Typical Capacity* Fee per Acre |
|---|-------------------------------|--------------------------------|
| SINGLE FAM RES & SML MULTI | 49% | \$ 5,929 |
| COMMERCIAL AND INDUSTRIAL | 81% | \$ 9,801 |
| DISTURBED RURAL, VCNT, AGRIC | 4% | \$ 484 |
| INSTITUTIONS AND APARTMENT | 14% | \$ 1,694 |
| MIXED ASSESSMENT | 80% | \$ 9,680 |
| RURAL UNDIST AG. BRUSH, FOR | 2% | \$ 242 |
| UNDISTRBD AGRIC, MARSH, PONDS | 2% | \$ 242 |
| WELL SITE | 44% | \$ 5,324 |
| Maximum Flood Protection Impact Fee Per Acre | | \$ 12,100 |

DEVELOPMENT IMPACT FEE POTENTIAL REVENUE

Valley Water can also choose to fund less than 100% of capital expenses with impact fees. **Figure 30** shows a summary of potential revenue from flood protection impact fees for both 50% and 100% of capital costs. Figure 30 also shows the typical single family residential fee, based on a single family lot size of 8,000 sq ft with a 49% impervious surface area.

Figure 30. Potential Revenue Estimate from Flood Protection Impact Fees

| ANNUAL REVENUE ESTIMATE | 50% CIP | 100% CIP |
|---|--------------|--------------|
| <i>Growth Estimate through 2050 (ISA)</i> | 21,564 | 21,564 |
| <i>Years until 2050</i> | 28 | 28 |
| <i>Annual ISA growth</i> | 770 | 770 |
| <i>Fee per Impervious Acre</i> | \$ 6,600 | \$12,100 |
| <i>Typical Single Family Lot*</i> | \$ 594 | \$1,089 |
| <i>Annual ISA capacity fee revenue estimate</i> | \$ 5,082,839 | \$ 9,318,539 |

* Typical Single Family Lot has 0.09 acres of impervious area. (8,000 sq ft per lot / 43,560 sqft/acre x .49 impervious area per acre)

5. Development Impact Fee Comparison

Many local agencies have used development impact fees to help recover infrastructure costs for future growth. Impact fees have been used for a wide range of infrastructure, such as transportation, schools, parks, and utilities. A majority of those agencies have the land use authority to regulate new development, which makes adopting and administering an impact fee somewhat easier. The purpose of this section is to look for development impact fees from similar regional authorities that don't have land use approval.

5.1 Water Supply Impact Fees

There are many regional authorities that have water impact fees. These fees have a variety of names, as shown in **Figure 31** below, but those names also represent what infrastructure the fee is being used for (as described in the notes). There are instances where the agency has more than one impact fee and/or a fee that varies by region or another factor. In those cases, costs were allocated to those attributes and distributed across those future users. Most of these fees also vary by water meter size. These agencies typically work with local agencies to collect these impact fees.

Figure 31. Impact Fees of Similar Agencies

| Agency | Fee | Residential Fee (3/4" meter) | Notes |
|---|-----------------------------|--|---|
| East Bay Municipal Utility District | System Capacity Charge | Varies by region \$13,280 to \$39,140 | Covers the cost of system-wide facilities buy-in, regional facilities buy-in, and future water supply. |
| | Water Demand Mitigation Fee | Varies by territory \$8,300 to \$12,810 | Funds conservation programs to achieve water savings that offset water demand. |
| Inland Empire Utilities Agency | Water Capacity Charge | \$1,896 | Covers cost to buy into system facilities. Based on UWMP growth. |
| San Diego County Water Authority | System Capacity Charge | \$5,700 | Covers the cost of conveyance and storage facilities. |
| | Water Treatment Capacity | \$159 | Cost to connect to the Twin Oaks Valley Water Treatment Plant; excludes Escondido, Poway, and Del Mar, which cannot be served by the Twin Oaks Plant. |
| San Francisco Public Utilities Commission | Water Capacity Charge | \$3,335 | Cost to buy into system facilities. |
| Zone 7 Water Agency | Water Connection Fee | Varies by City/meter type \$50,595 to \$101,190 | Costs are for expanding Zone 7 water treatment and distribution system to serve new development. |

5.2 Flood Protection Impact Fees

Flood protection impact fees are much rarer than other impact fees. By the very nature of flood protection, agencies involved with flood protection are usually regional agencies. Fees from a few selected agencies are shown in **Figure 32**. These agencies work with local agencies to collect the impact fees. Some of these agencies vary their impact fees by the drainage area. Most of these fees use impervious area as the basis for distributing costs to individual customers.

Figure 32. Comparison of Flood Protection Impact Fees

| Agency | Basis for Fee | Fee (residential) |
|--|--|---|
| Contra Costa Flood Control District | Impervious Area | Varies by Drainage Area, \$0.36 to \$2.59 per sq ft |
| Alameda County Flood Control & Water Conservation District, Zone 7 | Impervious Area | \$1 per square foot |
| Sacramento Area Flood Control Agency | Damageable Square Footage, varies by land use category | \$2.10 per square foot of damageable area for single family residential |
| Los Angeles County Flood Control District, Antelope Valley Drainage Area | Residential Lots | \$5,500 per residential lot |

6. Recommendations

6.1 Results of Analysis

This study examined all the key elements required for implementing a development impact fee for flood protection and water supply. The results of the analysis are summarized below.

- *Valley Water has the cost data required for impact fees.* The Water Supply Master Plan, the Operating and Capital Budget, the Protection and Augmentation of Water Supplies Annual Report, and the 5-Year Capital Improvement Program Report provide an excellent basis for the project costs. Combined with the asset management reports for the existing assets, there is a solid basis for the costs included in the analysis. There needs to be additional discussion on what long range projects should be included in the impact fee analysis. Including long range projects in the fee calculation that are not implemented could trigger the need for a rebate.
- *More effort is needed to refine future water demands and future water users.* If Valley Water wants to move forward with the water supply impact fee, there should additional effort on determining the future water needs of Valley Water as the wholesaler, informed by growth and future water needs at the City level. There is significant difference between the water demand data over period using member agency data (25% growth) compared to the Water Supply Master Plan (11% growth).
- *There is significant revenue generation potential from development impact fees.* Depending on the future capital improvement projects included in the analysis, the impact fee could generate \$30M annually, while the flood protection fee could generate \$6M annually.
- *Valley Water will need to rely on member agencies to calculate and collect the impact fee.* The planning or development department for the member agency will be granting the land use permits. They would need to calculate the water supply and flood protection impacts for the new development based on specific characteristics for the development. Fee revenue would be passed through to Valley Water.
- *It would be best implemented if all of the member agencies approved implementing the impact fees.* Normally, impact fees are used to offset capital costs that would otherwise be paid through user charges. If there was not a unanimous buy-in from the member agencies, to be equitable, there should be a user charge difference between those agencies that collect the impact fee and those agencies that do not.

6.2 Next Steps

While Valley Water needs to decide if they wish to proceed with approaching member agencies, the next steps in implementing a development impact fee are described below.

6.3 Implementing Development Impact Fees

There are three general phases in the process of developing and implementing a development impact fee. In the first phase, information is gathered and a defensible nexus study is prepared. The second phase is getting agency approval. The last phase occurs after the fee is adopted and consists of the annual tasks required to administer the fee.

PREPARING A DEFENSIBLE NEXUS STUDY

A defensible nexus study needs to be based on the challenges the agency is facing in terms of expected infrastructure required to meet growth as well as the expected growth in development. The nexus study (required by AB602) will also have to be based on an approved capital improvement plan (AB602 also requires large jurisdictions (*population over 250,000*) to adopt a capital improvement plan as the basis for the nexus study). This study would need some refinement but otherwise would serve as the nexus study.

ADOPTING THE DEVELOPMENT IMPACT FEE

Once a nexus study has been prepared, the next step is to get management and board approval. Typically, management and the board have already signaled an interest in implementing the development impact fee by authorizing the nexus study. But because Valley Water is a regional authority with member agencies having the land use approval authority, member agencies need to buy-in to implement an impact fee. For member agencies, the primary benefit would be the creation of a new revenue source to potentially lower their revenue requirements from user charges.

While having all member agencies buy-in is not mandatory, to follow cost of service principles, those member agencies that do not implement an impact fee would need to generate an equivalent amount of revenue from a different mechanism to compensate for the lost revenue in that jurisdiction. To be most efficient with the least administration for Valley Water, the impact fee should be unanimously endorsed by the member agencies.

Valley Water should conduct a concerted effort to inform the member agencies of the potential benefits of an impact fee as well as assess their interest in implementing an impact fee. But even before reaching out to member agencies, Valley Water should get the approval to move forward with the member agencies by the Board.

When deciding on whether to implement an impact fee, it is important to consider all the cumulative impact fees from the local and regional jurisdictions. Looking at the total amount of impact fees, there may be opposition from developers or others regarding the upfront cost of building new housing. Valley Water should reach out to the Building Industry Association to gain possible support or lessen opposition. One analysis typically done during these efforts is to look at the total fees compared to the overall development cost for a typical residential development. This might result in a phase in period or just adopting a lower fee than is supported by the nexus study.

If the Board and member agencies decide to move forward, the nexus study needs to be adopted by the Board at a public hearing with a minimum 30 day notice. A public notice needs to be published twice, at least five days apart. An ordinance that describes how to administer the fee program needs to be prepared. It is typically adopted by resolution. The effective date is sixty days after adoption.

THINGS TO DO AFTER FEES ARE ADOPTED

There are several requirements to fulfill after the impact fees are adopted. There are accounting, reporting, and other transparency requirements. Any fees collected must be deposited in a separate account or fund. Agencies must adopt annual reports within 180 days of the close of each fiscal year. These reports should

detail what moneys have been collected, the beginning and ending balance of the accounts, how the money was spent, and when the identified projects will be constructed, and any refunds.

California Government Code 66001 (d)(1) requires that *“Following the fifth fiscal year following the first deposit into the account or fund, and every five years thereafter, the local agency shall make all of the following findings with respect to that portion of the account or fund remaining unexpended, whether committed or noncommitted:*

- (A) Identify the purpose to which the fee is to be put.*
- (B) Demonstrate a reasonable relationship between the fee and the purpose for which it is charged.*
- (C) Identify all sources and amounts of funding anticipated to complete financing in incomplete improvements identified...*
- (D) Designate the approximate dates on which the funding referred to in subparagraph (C) is expected to be deposited into the appropriate account or fund.*

Failure to make these findings could result in refund requirements. It is also good practice to alert finance staff and the implementing department staff on what the funds can be used for.

While the nexus study should be reviewed every few years, the California Government Code requires that the nexus study needs to be updated every 8 years. This implies that the master plans, capital improvement plans, and other documents used in the nexus study be updated as well.

Appendix A. Abbreviations & Acronyms⁶

| | |
|------------|--|
| AAF | Average Annual Flow |
| AF | Acre Foot, equal to 435.6 HCF/CCF or 325,851 gallons |
| Alt. | Alternative |
| Avg. | Average |
| AWWA | American Water Works Association |
| BMP | Best Management Practice |
| BOD | Biochemical Oxygen Demand |
| CA | Customer |
| CAP | Capacity |
| CCF | Hundred Cubic Feet (same as HCF); equal to 748 gallons |
| CCI | Construction Cost Index |
| COD | Chemical Oxygen Demand |
| COM | Commodity |
| Comm. | Commercial |
| COS | Cost of Service |
| COSA | Cost of Service Analysis |
| CPI | Consumer Price Index |
| CIP | Capital Improvement Program |
| DU | Dwelling Unit |
| Excl. | Exclude |
| ENR | Engineering News Record |
| EDU | Equivalent Dwelling Unit |
| Exp. | Expense |
| FP | Fire Protection |
| FY | Fiscal Year (e.g., July 1st to June 30th) |
| FY 2022/23 | July 1, 2022 through June 30, 2023 |
| GPD | Gallons per Day |
| GPM | Gallons per Minute |
| HCF | Hundred Cubic Feet; equal to 748 gallons or 1 CCF |
| Ind. | Industrial |
| Irr. | Irrigation |
| ISA | Impervious Surface Area |
| LAIF | Local Agency Investment Fund |
| Lbs. | Pounds |
| MFR | Multi-Family Residential |
| MGD | Million Gallons per Day |
| MG/L | Milligrams per Liter |
| Mo. | Month |
| Muni. | Municipal |
| NH3 | Ammonia |
| NPV | Net Present Value |
| N/A | Not Available or Not Applicable |
| O&M | Operational & Maintenance Expenses |
| Prop 13 | Proposition 13 (1978) – Article XIII A of the California Constitution which limits taxes on real property to 1% of the full cash value of such property. |
| Prop 218 | Proposition 218 (1996) – State Constitutional amendment expanded restrictions of local government revenue collections. |

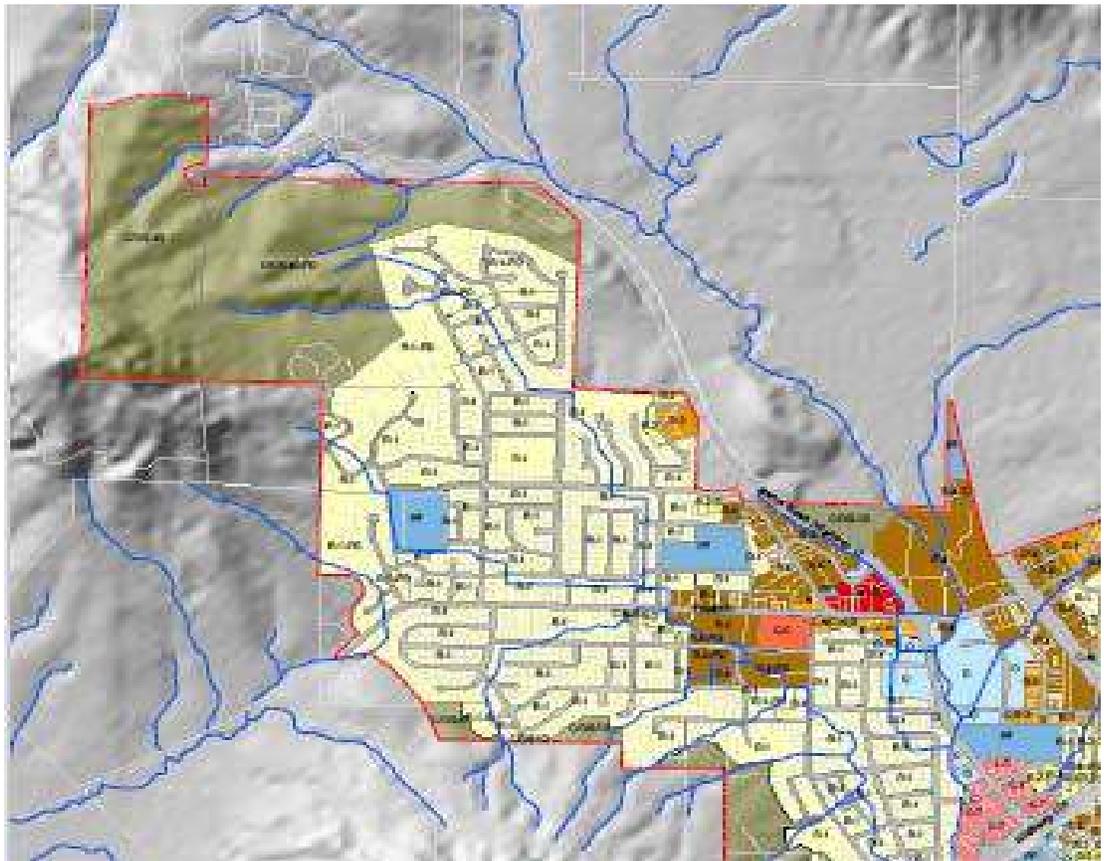
⁶ This appendix identifies abbreviations and acronyms that may be used in this report. This appendix has not been viewed, arranged, or edited by an attorney, nor should it be relied on as legal advice. The intent of this appendix is to support the recognition and analysis of this report. Any questions regarding clarification of this document should be directed to staff or an attorney specializing in this particular subject matter.

Appendix A, continued

| | |
|---------------|---------------------------------------|
| Req't | Requirement |
| Res. | Residential |
| Rev. | Revenue |
| RTS | Readiness-to-Serve |
| R&R | Rehabilitation & Replacement |
| SFR | Single Family Residential |
| SRF Loan | State Revolving Fund Loan |
| SWRCB | State Water Resources Control Council |
| TSS / SS | Total Suspended Solids |
| V. / Vs. /vs. | Versus |
| WWTP | Wastewater Treatment Plant |

Appendix B. User's Guide for the California Impervious Surface Coefficients

USER'S GUIDE FOR THE CALIFORNIA IMPERVIOUS SURFACE COEFFICIENTS



Ecotoxicology Program
Integrated Risk Assessment Branch
Office of Environmental Health Hazard Assessment

User's Guide for the California Impervious Surface Coefficients

December 2010

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Office of Environmental Health Hazard Assessment
California Environmental Protection Agency

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List of Acronyms

| | |
|----------|---|
| AF | acre-feet, measurement of runoff volume |
| ANOVA | Analysis of Variance |
| APN | Assessor's Parcel Number |
| B-IBI | Benthic Index of Biotic Integrity |
| BMI | benthic macroinvertebrates |
| BMP | Best Management Plan |
| Caltrans | CA Department of Transportation |
| CN | curve number |
| DCIA | directly connected impervious area |
| DOQ | digital orthophoto quadrangles |
| du/ac | dwelling units per acre |
| EMAP | Environmental Monitoring and Assessment Program |
| FAR | Floor-Area Ratio |
| GIS | Geographical Information System |
| HDR | High Density Residential |
| HSG | Hydrologic Soil Groups |
| IA | Impervious Area |
| IC | Impervious Cover |
| ICC | Impervious Cover Calculator |
| ISAT | Impervious Surface Analysis Tool |
| ISC | Impervious Surface Coefficient |
| LDR | Low Density Residential |
| LUC | Land Use Category |
| LULC | land use/land cover |
| MDR | Medium Density Residential |
| NEMO | Non-Point Source Education for Municipal Officials |
| NLCD | National Land Cover Dataset |
| NOAA | National Oceanographic and Atmospheric Administration |
| NPCF | Non-conforming Parcel Correction Factor |
| NRCS | Natural Resource Conservation Service |
| OS | Open Space |
| PQP | Public/Quasi-Public |
| ROW | right-of-way |
| SACOG | Sacramento Area Council of Governments |

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PREFACE

In rapidly developing regions of California, small streams, including those utilized by anadromous fish such as salmon and steelhead, are increasingly surrounded with new residential developments and shopping malls. Signs of degradation, such as incision and sedimentation, in the aquatic habitat have become abundant.

Understanding the chemical and physical stressors affecting these watersheds will help local governments and others assess which factors contributed to the observed changes. Stormwater engineers, land use planners, and natural resource managers struggle to quantify impervious cover, one of the hallmarks of urbanization.

Office of Environmental Health Hazard Assessment became interested in the estimation of impervious cover (IC) while performing a watershed assessment. OEHHA sought a method with a high degree of accuracy and modest cost that would be easy to implement.

As a first step, a variety of approaches were reviewed:

- LANDSAT imagery was of low resolution (30 meters) so that it could not be reliably used to analyze imperviousness at smaller scales.
- IKONOS Satellite imagery had high resolution (1 meter) but was quite costly to obtain (Goetz et al., 2003).
- The Non-Point Source Education for Municipal Officials (NEMO) Program had been working on the analysis of imperviousness in Connecticut for many years and was continually evolving more refined methods of analysis. At the time OEHHA learned about their work, they had recently published a refinement of a set of coefficients for land cover, including some for urban uses (Prisloe et al., 2002). Yet even these refinements only applied three categories to classify developed areas.

Focusing on an urbanizing watershed, OEHHA worked to develop a set of impervious surface coefficients (ISCs) that reflected the percent of hardened surfaces using the land-use categories described by the Sacramento Area Council of Governments (SACOG). For example, SACOG classifies land uses into approximately 20 commonly used categories. If impervious surface coefficients could be developed for each category, then local governments, planners, stormwater engineers, and natural resource staff could more easily calculate the total impervious area at build-out for a future development or current imperviousness of an urbanized area.

OEHHA developed these statewide ISCs with support from U.S. EPA and the State Water Resources Control Board. This User's Guide describes the methods used to develop the ISCs, and provides applications of the coefficients to a variety of situations.

SECTION I. BACKGROUND

A number of organizations, including the Non-Point Source for Municipal Officials (NEMO) Program and the Center for Watershed Protection, advocate the use of impervious cover for land-use planning purposes. NEMO developed the Impervious Surface Analysis Tool (ISAT) to facilitate these calculations. The Natural Resources Conservation Service (NRCS) developed a set of impervious surface coefficients (ISCs) as a tool for calculating stormwater runoff (NRCS, 1986). NRCS

developed these coefficients to estimate the amount of imperviousness associated with seven land use categories. A detailed discussion of this method and curve numbers is provided in Section 5, Stormwater Application. In addition to this dataset, the National Oceanographic and Atmospheric Administration's (NOAA) Coastal Services Center has collaborated with others to develop the National Land Cover Dataset, which includes impervious cover datasets developed from 30 meter Landsat data. These data are available via NOAA's Digital Coast website.

The NRCS and NOAA datasets possess some limitations. For instance, Landsat data has a relatively low level of resolution that does not provide sufficient accuracy for analysis of sub-watershed and local planning areas. A limitation of the NRCS values is the modest number of CNs for urban land uses, in contrast with the large number of values for agricultural uses. Most California cities have identified 15 – 20 land use categories in their general plans; some communities have many more. Today, the range of densities for residential land uses varies from 1 dwelling unit per acre to 15-plus units/acre. This higher value likely will increase as communities emphasize higher-density development. The limited number and scope of NRCS values introduced uncertainty into the analysis of impervious cover, especially for smaller watersheds on which we and many others were conducting assessments.

For all of the above reasons, the Office of Environmental Health Hazard Assessment has developed a set of ISCs that focus on urban land uses that are commonly used throughout California.

Impervious Surface Coefficient (ISC):

The percent of the area within a given land use category that is made up of hardened surfaces.

$$ISC = \frac{\text{Acres hardened surface}}{\text{Total acres}}$$

SECTION II. HOW THE IMPERVIOUS SURFACE COEFFICIENTS WERE DEVELOPED

OEHHA first selected three cities to represent California's diverse land use classifications: the Sacramento region, Irvine, and Santa Cruz.¹ In selecting these cities, OEHHA employed a few key criteria, including geographical location, the availability of high-resolution aerial photography and digitized land use maps, and the willingness of the planning departments within each municipality to assist us with the project. The three cities selected are described below:

- **Sacramento**, a fast-growing city in the Central Valley where greenfield conversions occurred at a rapid pace during the housing boom. High percentages of Sacramento's development are suburban (not high-density). Data from the western portion of Placer county (part of the Sacramento metropolitan region) include portions of the Sierra foothills, providing additional diversity to the dataset. Since the original data from the Sacramento region was collected from sites from northern Sacramento and western Placer counties, OEHHA expanded the geographical range to include sites south of the American River.
- **Irvine**, a southern California city that has been built out, containing primarily densely populated urban development, yet retaining some land zoned as rural/agricultural preserves.
- **Santa Cruz**, a mid-sized, coastal community with a few land uses unique to coastal areas of the state.

Before scaling up the project, we reviewed a variety of methods for impervious surface analysis. For the original project, we used an interactive approach using a geographical information system (GIS). It involved digitizing impervious areas off of high-resolution aerial photographs and land use data layers. This and other methods were reviewed and determined to have the benefits of high accuracy and precision, relatively modest cost, and the availability of the data layers. (See Summary Table at the end of this chapter, Sturman 2007). Consequently, OEHHA decided to continue using the interactive GIS method to develop the California coefficients.

The following section describes the methods used to derive the ISCs.

Step 1: *Assemble the necessary GIS layers.*

The data layers used included:

- Current high resolution digital aerial orthophotographs of each city. The resolution of the photographs ranged from 6 inches to 2-feet per pixel.
- Land use data layer. Land uses are typically defined in the general plans. Local jurisdictions may have multiple types of layers that contain land use information. This data layer was obtained directly from the cities of Irvine and Santa Cruz. For the Sacramento

¹ We considered Fresno as an example of a southern Central Valley urban area; however, due to budgetary constraints and the lack of availability of data, this city was dropped from the group.

region, data were obtained from the Sacramento Area Council of Governments (SACOG). This data layer was developed from current and planned uses of land and derived from existing zoning as well as General and Specific Plans.

Step 2: *Test digitizing methods.*

Three GIS analysts took part in the data collection. To standardize the interpretation of the aerial photographs the analyst digitized impervious cover associated with residential and commercial land uses. After reviewing the work to identify potential discrepancies, the analysts adopted a set of common guidelines for interpretation of the aerial photography and digitization, in order to minimize 'between-analyst' variability. Some of the guidelines adopted include:

- a) Gravel driveways in rural areas were treated as impervious areas;
- b) Detention ponds in commercial areas, especially industrial sites, were assumed to be non-porous and therefore digitized as impervious areas,
- c) Roadways within apartment complexes used for internal circulation or parking were digitized as part of the impervious cover of high density residential uses and not evaluated as typical roads (e.g., local or arterial roads); and
- d) When tree canopy blocked the view of the land surface below, the line and angles of exposed impervious cover were followed, based on the best interpretation and general familiarity with the land use. For example, cars parked under trees in a paved lot were assumed to be parked on pavement.

Step 3: *Select ample sites and digitize impervious cover on a preliminary set of sites.*

OEHHA adopted a stratified random sample design similar to the one used by the US EPA's Environmental Monitoring and Assessment Program (EMAP). Using Hawth's tool in ArcGIS, 100 randomly selected sites for each land use category (LUC) in each city were identified, a sample point was placed on the land use map, and a unique identifier was assigned to each point (Figure 1). To select the area to be examined, analysts drew a square of 40,000 square meters (about 9 acres) around the sample point (Figure 2). All occurrences of the same LUC in which the sample point fell were analyzed for impervious cover. For example, if the sample point was located in the low density residential LUC, impervious areas for all low density residential LUCs within the square outlined digitally. If the selected point fell on a LUC that did not correspond to the current land use, as evidenced by inspection of the aerial photograph, OEHHA disregarded this sample site. This circumstance commonly occurred when the general plan designated an



Figure 1. Sampling Points. 100 points were randomly generated for each LUC in each city. Then impervious areas within each LUC were digitized in the order identified by the random selection of sites.

area for development, but the current land use, as interpreted from the aerial photograph, remained in a 'less developed' condition. Applying this principle, land currently used as rangeland but zoned for future commercial development would be disregarded.



Figure 2. Analysis Box. An example of a randomly generated sample point around which a 40,000 sq. meter box, approximately 9 acres, was constructed. All impervious areas within the LUC on which the point was found and within the box were digitized.

Step 4: Determine sample size required for each LUC to obtain the desired level of accuracy and precision and collect data.

To determine the minimum number of sites for analysis to obtain 90 percent confidence with a 10 percent level of precision, we initially collected data from about 10 sites for each land use category in each city. Sample sizes were determined using a standard sample size calculation for proportions (Daniel 1978):

$$n = (pq)/(d^2/z^2)$$

where,

p = decimal percent imperviousness,

q = decimal percent perviousness,

d = level of precision, in this case 10 percent,

z = value from the z table associated with 90 percent confidence

Based on the results of this analysis, additional samples from each LUC for each city were collected. Sample sizes for various land use categories ranged from 10 to more than 40 sites/LUC/city, depending on the variability. In general, there was less variability in imperviousness among commercial and retail sites than residential sites, with the result that residential sample sizes were typically larger than commercial sample sizes. Sufficient sites were then analyzed to achieve the desired level of accuracy and precision.

Step 5: Statistically analyze the results and calculate impervious surface coefficients for residential and non-residential LUCs.

We analyzed the data based on three major land-use categories: 1) commercial and other non-residential uses, 2) residential land uses, and 3) roads (See Step 6 for further discussion of roads).

- The goal of the non-residential LUC analysis was to identify a set of coefficients that represented land uses common to the three cities. Non-residential LUCs were grouped into

three major categories; retail, office, and industrial, each of which contained two classifications. There were five additional non-residential categories of a singular nature: public/quasi-public, mixed use, open space, coastal development, and agriculture. Frequently, different communities used different names to describe essentially the same land-use category. We reviewed the descriptions in the general plans to identify equivalent uses regardless of name. Analysis of variance was used to determine if the mean ISCs for any single commercial LUC differed. Where differences were identified, Tukey's Honestly Significant Difference test was used to differentiate between cities. All data analysis was performed using Statistica (Statsoft, Tulsa, OK). Ten basic categories of commercial land use were identified, with an 11th category, coastal development, specifically found only in Santa Cruz. The 10 non-residential LUCs were: Retail, Retail/Office, Office Park, Urban Office, Light Industry, Heavy Industry, Public/Quasi Public, Mixed Use, Open Space, and Agriculture.

- Residential land uses were analyzed by density or dwelling units per acre (du/ac). After exploring a number of different methods for analyzing imperviousness of residential land uses, OEHHA determined that a regression approach offered the greatest flexibility for the user. Over 330 sites from residential LUCs were analyzed by regressing density against the percentage of impervious cover. These data were fitted to linear, logarithmic, and exponential relationships, using the Box-Cox transformation to optimize the fit. While the Box-Cox linear regression equation minimized residuals for most of the data, it did not adequately reflect percent impervious cover for high density housing due to the small number of sample sites in this category. We believe that a logarithmic relationship most accurately represents the percent IC for a range of housing densities between 1 – 50 units/acre. Details of the basis for this approach are discussed in Section III.

Step 6: *Determine a set of impervious surface coefficients for roads.*

Data was collected from the three study cities for local, collector, and arterial roads as well as highways. The right-of-ways (ROW) polygons were extracted from the local jurisdiction's centerline shapefiles. The extraction was accomplished by creating a new polygon data layer by subtracting the total area of all LUC polygons from the total areal extent of the analysis; the remaining area representing the ROW. Using this geometry, sampling sites (n=356) were identified using the same process used for the residential and commercial land uses. All impervious surfaces were digitized and the percent IC associated with each road type for each city was calculated. Private roads such as those within apartment complexes were not included in the analysis of roads but as part of the impervious area of the land use category.

Due to limited resources, most of the road sample sites (total sample size = 265) were drawn from the Sacramento region; 30 sites were analyzed in Irvine and 61 in Santa Cruz. The disproportionate amount of data collected from Sacramento meant that the level of accuracy and precision of the impervious estimates was greater for this city. To reflect this, weighted averages were used in the final calculation of percent IC for urban/suburban roads, rural roads, and highways.

OEHHA determined the proportion of local, collector, and arterial roads in the Sacramento region and used this ratio for weighting the ISC values. To calculate the urban/suburban roads ISC, we took the weighted average of the ISC for the 3 road types from each city. We calculated the overall average for suburban/urban roads, weighting the data to reflect the higher level of confidence in the Sacramento values due to the larger sample size than the other two communities. The procedure for rural roads was similar. Rural roads data were only available from Sacramento and Santa Cruz, since there are no rural areas in Irvine. Highway data were derived only from the Sacramento region. Because highways are built with standard specifications under the auspices of a state agency, Caltrans, these should be relatively uniform throughout the state.

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Summary of Methods of Impervious Cover (IC) Analysis Reviewed for this Project

| Name of Method | Method Category | Summary | Limitations |
|---|--|--|---|
| Contra Costa County | Aerial photogrammetry | Used aerial photography to estimate the amount of IC for a given lot size in each zoning district type. Measurements were not meant to give a precise measure of % IC, but to create a tiered scale for flooding fees on the basis of zoning district and lot size. | Lack of documentation, use of older technology. Analysis by NEMO found that IC estimation based on lot size was much less accurate than techniques relying on more modern land use/land cover (LULC) analysis |
| Maine Combo | Aerial photogrammetry and digital data | Users digitized polygons across the state, estimated the number of buildings within an acre, and used a graduate student's formula to determine the % IC for residential areas or for commercial-industrial-transport areas. A corrective multiplier was used to adjust the student's formula closer to the results of detailed watershed studies previously performed. | There is little documentation related to this method, especially as to how the formulas and algorithms were determined. Assumptions such as buildings per acre and the corrective multiplier would be specific to the region. Estimations were performed on only two land cover categories |
| Native Communities Development Corporation | Satellite remote sensing | Commercial vendors of satellite imagery can produce highly accurate measurements of IC over areas of great size, but measurements are for current construction only and cannot be repeated (without purchasing additional services). This method would provide accurate IC measurements but would require further analysis, with LULC layers for example, to create a useful tool. | Because of the high cost of purchasing satellite imagery, this method is most cost-effective for analysis of very large areas, such as statewide. However, some suggest digital orthophoto quadrangles (DOQs) can be used. Studies as recent as 2003 (Herold et al.) found several issues with this method, including haze, shadow, and clouds affecting the multispectral analysis; inaccuracies due to canopy cover; difficulty in attaining quality images after repeated attempts; and time/knowledge required to train the software before analysis. |

| Name of Method | Method Category | Summary | Limitations |
|--|---|---|--|
| Frederick County Point Sampling | Aerial photogrammetry | This project laid a grid of sampling points over DOQs, and users visually identified whether the point rested on an IC or a pervious surface. The %IC could then be determined for a given area. Custom tools had been created so the analysis could be done quickly and accurately | Different density point sampling grids returned similar %IC measurements, random sampling points are preferred over systematic sampling (though systematic is easier to conduct), and the greatest variability occurred between analysts' visual judgment of surface types. This method could be used for areas that do not have GIS data. A NEMO study (Chabaeva et al. 2004) found this technique to be less accurate than others. |
| Wayne County | Ground survey, existing maps, aerial photogrammetry | Aerial photography was used to digitize and directly measure the impervious area (IA) from a sampling of photos in each watershed. These results were then extrapolated to the total area of the watersheds. Directly Connected IA (DCIA) was based on 300 field surveys. | While this method can estimate the DCIA in an area, it would be costly and time consuming to perform the field surveys. |
| Utah State University Extension | Existing maps and digital data | This project was typical of others using digitizing over LULC and aeriels to calculate IC across a given area. | Factors contributing to low accuracy include digitizing areas of development rather than individual buildings and the use of ISC that were not designed specifically for Utah. Detailed documentation is lacking for this method. |
| Direct Digitizing | Imagery and existing maps or digital data | This method refers to hand digitizing all IC features in a watershed or other boundary. | Because of the time required, this method is best suited for small study areas or areas with little development, as was the case in the Cook Inlet Keeper project. Accuracy is very high because all features are captured, but depends on the resolution of the imagery used or on the quality of the planimetric data. Because of the increased availability of planimetric data, hand digitizing might be unnecessary. |

| Name of Method | Method Category | Summary | Limitations |
|----------------------------------|--------------------------------|---|--|
| Parcel Size (NEMO) | Existing maps or digital data | To derive a set of ISCs, the ArcMap Union tool was used to combine 1990 Census tracts, LULC, and impervious features for nine Connecticut towns. Impervious surface coefficients could then be determined as a calculation of the total area of IC within each land cover within each tract. Instead of relying on the towns' definitions of high, medium, and low density (for a residential area, for example), a scale was used to designate tracts as high, medium, and low density. Modifications were made to the method to accommodate areas with high IC but low population density, such as commercial and industrial. | While the report concluded that the results were accurate, it did note that error might occur when analyzing small geographic areas (less than several hundred acres). Correlating population density data while developing the coefficients might increase the accuracy as other methods have used LULC and planimetric data only. Having the population density data also allowed the researchers to experiment with the Impervious Surface Analysis Tool (ISAT), produced by NEMO and NOAA. |
| UConn Regression Model | Existing maps and digital data | This method used the ArcMap Union tool to combine planimetric and LULC data from several Connecticut and surrounding municipalities to develop a set of ISCs and a regression model (adding in population density) to estimate IC using a national dataset such as the NLCD. This model could then be applied to Connecticut communities having poor planimetric data but are covered by the national dataset. | While this method provides coefficients for future use, they are based on Census data and NLCD, which have up to 10-year gaps before they are updated. Using population density data might provide better results as an addition to other methods relying on planimetric and LULC data only. Relying on direct measurements of quality planimetric data (assuming it is available) is likely preferred over this method. |
| Population Density (NEMO) | Existing maps or digital data | Developed a set of IC coefficients by using the ArcMap Union tool to combine 1990 Census tracts, LULC, and impervious features for nine Connecticut towns. ISC could then be determined as a calculation of the total area of IC within each land cover within each tract. Instead of relying on the towns' definitions of high, medium, and low density (for a residential area, for example), a scale was used to designate high, medium, and low density tracts. Modifications to the method were applied to accommodate areas with high IC but low population density, such as commercial and industrial areas. | While the report concluded that the results were accurate (and more accurate than the Parcel Size method by NEMO), it did note that error might occur when analyzing small geographic areas (less than several hundred acres). Correlating population density data while developing the coefficients might increase the accuracy as other methods have used LULC and planimetric data only. Having the population density data also allowed the researchers to experiment with the Impervious Surface Analysis Tool (ISAT), produced by NEMO and NOAA. |

SECTION III. RESULTS: A SET OF IMPERVIOUS SURFACE COEFFICIENTS FOR CALIFORNIA

A. Non-Residential Land Uses

The results of the analysis yielded a set of 11 ISCs, shown in Table 1, followed by a brief description of each category. Table 1 (below) identifies the non-residential categories and their corresponding mean, 95% confidence interval, and sample size (n).

1. Retail

Commercial land uses refers to retail shopping areas such as downtown commercial areas, malls, and big-box outlets, where office uses are only a minor or non-existent component. A total of 123 sites were analyzed in this land use category in the three cities. The ISC values for the 4 commercial categories ranged from 75 – 93 percent impervious. This data fell into two major categories: those retail uses in which office uses were trivial or non-existent and those uses with greater than 5-10 percent office. The former tended to have a higher percent impervious cover uses compared to those with greater total area devoted to office uses. OEHHA divided the two types of commercial land uses into two categories: 1) **Retail** – characterized by neighborhood, community or regional malls or shopping areas in which office uses are less than 5 percent of the total area, and 2) **Retail/office**, where office comprises greater than 5 percent. **The ISCs are 86 percent and 80 percent respectively.**

Table 1. Non-Residential ISCs

| Non-Residential ISCs | |
|----------------------|---------------------|
| Land Use | California ISC |
| Retail | .86 (83-88; n=83) |
| Retail/Office | .80 (76-84; n=40) |
| Coastal Development | .23 (16-31; n=10) |
| Office Park | .69 (65-73; n=51) |
| Urban Office | .85 (82-89; n= 51) |
| Light Industry | .81 (77-85; n=54) |
| Heavy Industry | .91 (86-96; n=24) |
| Public/Quasi-Public | .44 (37-51; n=40) |
| Mixed Use | .80 (76-85; n=50) |
| Open Space | .02 (1.3-3.1; n=50) |
| Agriculture | .04 (2.7-5.3; n=25) |

Two issues of interest should be kept in mind when performing analysis of the commercial LUC.

- Sacramento's retail land had lower levels of impervious cover (IC) than either Irvine or Santa Cruz. We suspect this is due to the fact that much retail development in Sacramento occurs in greenfields where space is not an issue as it is in highly urbanized Irvine or in Santa Cruz, where space is limited by the coastline. As a consequence, we suggest using the Retail/Office ISC for all development that occurs in greenfields, regardless of the amount of office space.
- No differences in impervious cover existed between shopping centers with neighborhood or regional scopes. Therefore, although most cities have a few categories of commercial land uses (e.g. neighborhood, community, and regional retail); they basically contain the same amount of impervious cover. Inclusion of office space in the commercial development had a greater influence on IC percentages than the scale of the commercial development.

2. Office

The Office LUC refers to urban and suburban office buildings. Based on the results of ANOVA, followed by Tukey's test (n=104), suburban office parks had a lower amount of imperviousness than urban offices. Suburban offices have considerably more green space and landscaping surrounding them than offices found in a more urban setting. As a consequence, we identified two ISCs for office uses: *Urban Office* (sometimes called high intensity office); and *Office Park* (commonly found in outlying areas and suburbs), which contain **85** and **69 percent** impervious cover respectively.

3. Industrial

OEHHA identified two types of industrial LUCs by analyzing 78 sites with individual LUC names such as Light Industry, Urban Industry, and Heavy Industry. The statistical analysis showed that these sites could be separated into two categories: Heavy Industry composed of sites with little greenspace, and Light or General Industry, composed of some warehouses and manufacturing campuses (information technology companies serve as a good example) that contain more landscaping. The ISCs are **91** and **81** percent respectively.

4. Coastal Development

The LUC Coastal Development is unique to Santa Cruz and other coastal communities in California. This LUC describes businesses along wharfs and marinas such as restaurants and retail shops. The sites analyzed also included water within their footprints. Since Santa Cruz was the only coastal community analyzed and since the sample size was small (n=10), the ISC of **23 percent** should be interpreted as provisional.

5. Mixed Use

Mixed Use refers to a variety of urban land uses that include a mix of medium to high density residential development, commercial, public/institutional uses (e.g., child care centers, dance studios), and offices. Thirty-six sites were analyzed in Irvine and Sacramento in this category. At the time our analysis was performed, Santa Cruz did not identify a separate Mixed Use category. Instead, this category was folded into the Community Commercial designation. Since that time, Santa Cruz has updated their general plan and has a separate Mixed Use category. The ISC for the Mixed Use LUC of **80 percent** is based on analysis of sites in Sacramento and Irvine.

6. Public/Quasi-Public

Public/Quasi-Public (PQP) represents a unique land use category, because the designation is based on ownership, not the type of use. As such, it had the greatest variability of any of the LUCs that were analyzed. Analysis was drawn from data (n=40) from Santa Cruz and Sacramento because there is no PQP LUC in Irvine. The mean percent IC in Sacramento was 37 percent while in Santa Cruz, it was 64 percent. The California ISC is **44 percent**, with a coefficient of variation of 50% (CV = standard deviation/mean). There is no single recommended ISC we can suggest due to the large difference we observed. Users of the coefficients should consider characterizing the nature of the lands within the PQP category in their community and select from one of these three values (37, 64, or 44 percent).

OEHHA visually inspected all PQP sites in Sacramento and found they included a number of schools, one junior college, a cemetery, a building associated with an airport, and public utility buildings. If these types of buildings characterize the PQP in your community, perhaps the Sacramento PQP ISC of 37 percent might be best. If local land uses are more intensive, then a higher value might be more appropriate. Since this category does not account for large amounts of land, errors associated with an inappropriate ISC will likely not affect the overall impervious cover analysis.

7. Open Space and Agriculture

The open space LUC comprises parks, nature preserves, and forested areas. Fifty sites were analyzed with the average **ISC of 2 percent**. An agricultural LUC was found in all three cities. Even in the middle of the Los Angeles Metropolitan Area, Irvine's General Plan provides for protection of a small agricultural reserve area within the city limits. The California **ISC for agriculture is 4 percent**.

B. Residential Impervious Surface Coefficients

Residential land uses vary from city to city, but are usually defined as a given density range, reported as dwelling units per acre (du/acre). It is common to find low, medium-low, medium, medium-high, and high residential LUCs in each city plan. These residential LUCs are somewhat subjective depending on what an individual city defines as low or high density. For example, there is a range of definitions for the "medium density" LUC. Sacramento defines "medium density" as a residential development with a density of 8-12 du/acre; Irvine defines it as 5-10 du/acre; and Santa Cruz defines it as 20-30 du/acre. The difficulties of using narrative classifications for various residential ISC became apparent quickly. To address this source of variability, we based the California residential ISCs on a regression equation that relates the density (dwelling units/acre) and impervious cover. This equation can be used to determine the ISC that is appropriate for any density of residential development, from rural residential to densities as high as 50 du/acre. The regression equation that best describes the relationship between residential density and impervious cover is shown in Figure 3.

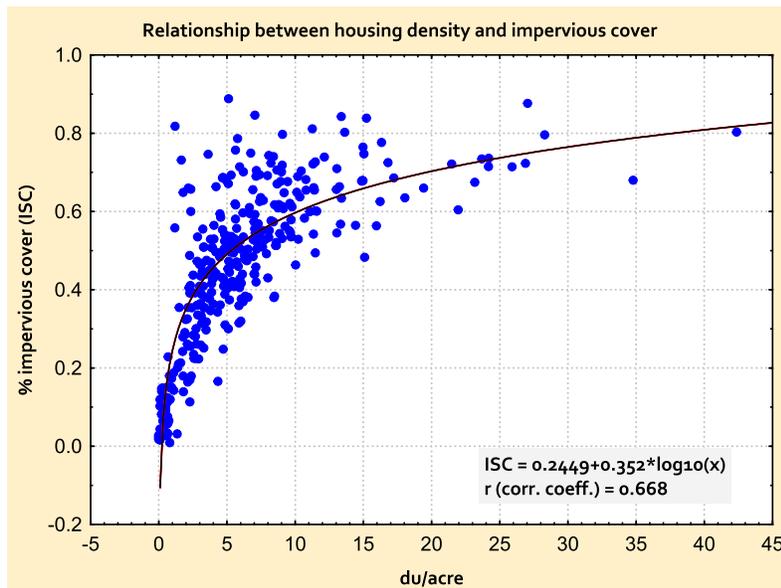


Figure 3. Regression relationship between housing density and percent impervious cover. A logarithmic fit best describes this relationship ($ISC = 0.2449 + 0.352 \times \log_{10}(x)$). It reflects that past a certain percent IC, buildings go up, not out. Most communities have requirements for a certain percentage of greenspace for residential housing so adding more units requires building up.

The logarithmic relationship can be linearized by using a semi-log plot (Figure 4), shown below.

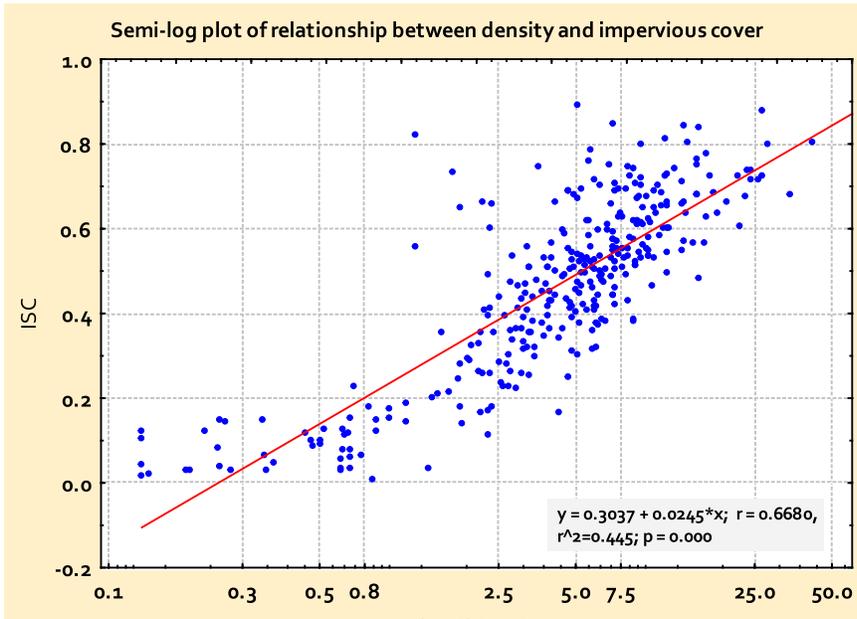


Figure 4. Regression relationship of the log housing density vs. the percent impervious cover. The equation is: $ISC = 0.3037 + 0.0245x$, where x is the log of the density.

We also investigated various exponential relationships using the Box-Cox transformation to identify the exponent that best fits the data and therefore, the best regression relationship. The Box-Cox procedure transforms the original data in a way that the new variable will have a distribution as close to normality as possible. Through an iterative process, the exponent is identified which minimizes the variability, essentially reducing the noise of the data. For our dataset (n=333), this exponent was 0.3425 and the resulting regression equation is shown in Figure 5.

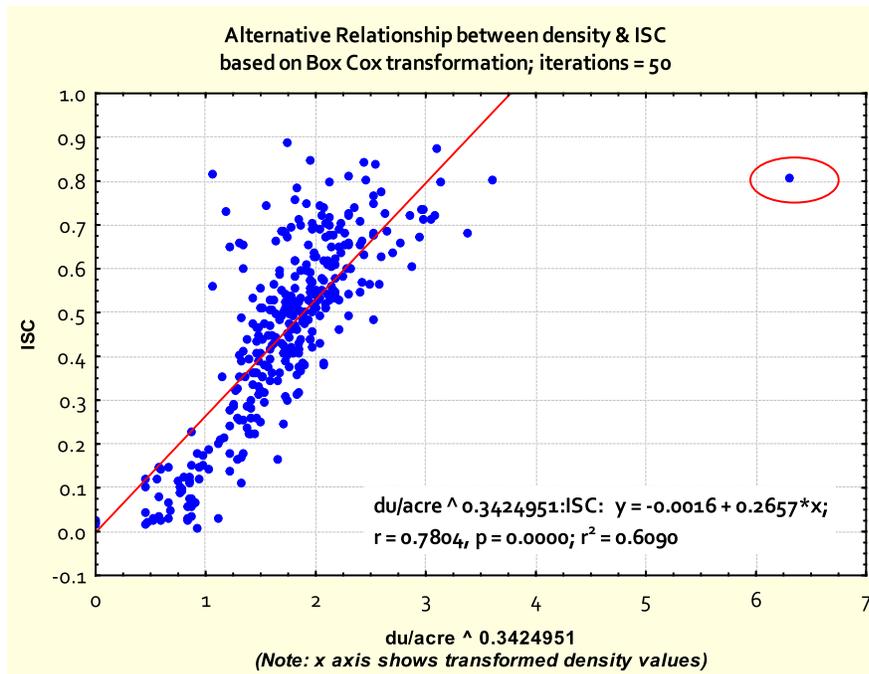


Figure 5. Regression relationship between housing density and percent IC based on Box-Cox transformed data.

The limitation of using an equation based on the transformed data ($y = -0.0016 + 0.2657 x$, where x is du/acre raised to the 0.3425 power) is that it doesn't accurately describe high density residential housing. Our dataset contained only a single site with high density housing (about 50 du/acre, data point circled in Figure 5). The impervious cover at this high density site in Irvine was about 80 percent, applying the equation above. However, when using the equation in 100 percent. Other sites with high density produced equally unrealistic ISCs. We had an insufficient number of high density sites in our dataset to accurately characterize this high end of the curve. Therefore, until additional analysis is possible, the best equation that describes the relationship between density and ISC is the original equation: **ISC = 0.2449 + 0.352*log x**.

Table 2. Residential ISCs.

| Residential ISC | |
|-------------------|----------------|
| Density (du/acre) | California ISC |
| 0.5 | 0.14 |
| 1 | 0.24 |
| 2 | 0.35 |
| 3 | 0.41 |
| 4 | 0.46 |
| 5 | 0.49 |
| 6 | 0.52 |
| 7 | 0.54 |
| 8 | 0.56 |
| 9 | 0.58 |
| 10 | 0.60 |
| 11 | 0.61 |
| 12 | 0.62 |
| 13 | 0.64 |
| 14 | 0.65 |
| 15 | 0.66 |
| 20 | 0.70 |
| 25 | 0.74 |
| 30 | 0.76 |
| 35 | 0.79 |
| 40 | 0.81 |
| 45 | 0.83 |
| 50 | 0.84 |

Table 2 (right) provides a look-up table that summarizes the ISC for a wide range of housing densities. The ISC is the decimal value that reflects the percent of any level of residential density that is covered with hardscape.

C. Roads

There were three ISCs developed for roads: urban/suburban roads, rural roads, and highways. A total of 253 local, collector, and arterial roads were identified on the aerial photographs, then analyzed for impervious cover. More specifically, the area (acres) of the right-of-way (ROW, the road itself plus the adjacent land over which local jurisdictions reserve for the purposes of maintenance or expansion of the existing road), was determined either by: a) obtaining a shapefile with a data layer outlining the right-of-way, or b) constructing the polygons that make up the right-of-way by subtracting the area associated with the land use polygons from the total area. What remained is the area associated with the right-of-ways. The results are as follows:

1. Urban/Suburban Roads

Local, collector, and arterial ROWs in urban and suburban areas in Irvine, Santa Cruz, and Sacramento were used to determine the urban/suburban ISC. Because a greater number of sites were analyzed in the Sacramento region than the other two (n= 193 vs. n=60 Irvine & Santa Cruz), our analysis of imperviousness was weighted to reflect this fact. We noted that roads in the Sacramento area tended to have higher ISCs than in Santa Cruz or Irvine. This might be associated with the easy availability of land that has led to an expansive pattern of development in many Central Valley cities. The lower values for arterials in the other cities are likely associated with wider boulevards and landscaped areas adjacent to the sidewalks.

TABLE 3 (below) contains the ISCs calculated for each road type in each city.

| Road Type | Sacramento | Irvine | Santa Cruz |
|-----------|------------|--------|------------|
| Local | 88 | 85 | 88 |
| Collector | 95 | 87 | 87 |
| Arterial | 89 | 66 | 76 |

Table 3. ISCs for major road types from the three communities.

We used the above ISC values from each city (Table 3) and a weighting factor that reflects the percent of the total ROW area that each road type occupied relative to the total area of roads, to calculate the weighted-average for urban/suburban roads. The distribution of road types were: local roads: 20 percent; collectors: 67 percent; and arterials, 13 percent of the total area of all interior roads (non-highways). This calculation resulted in three ISCs for suburban/urban road as follows:

| City | Urban/Suburban ISC |
|-------------------------|--------------------|
| Sacramento area | 93% |
| Irvine | 84% |
| Santa Cruz | 86% |
| Weighted Average | 91% |

Table 4. Percent imperviousness associated with roads in the three study cities.

The overall mean was also calculated using a weighting factor, in this case the weighting reflected the sample size from each city. Data from Sacramento was weighted more heavily due to the larger sample size. The overall weighted mean, and the value we recommend for determining the percent imperviousness associated with roads, is **91 percent**.

2. Rural Roads

The rural roads ISC was based on a sample size of 43 sites along rural roads from Santa Cruz and Sacramento. The same weighted-average approach was used to calculate the mean ISC of 45 percent. One limitation of this approach is that the weighting of the three road types was based on urban/suburban ratios. It is doubtful that this ratio is accurate for rural areas, which are dominated by two lane roads that don't fit neatly into the urban roads categories. Yet, when the simple average was calculated, the results were the same; the ISC was **45 percent**.

3. Highways

Unlike interior roads which can vary from city to city based on local policies and ordinances, highways are overseen by a state department, Caltrans, and standards for construction and design are the same throughout the state. Highway data was analyzed only in Sacramento. Although most people think of highways as the epitome of urban life and hardscape, they have wide right-of-ways as well as large amounts of green space associated with on-off ramps. Consequently, the percent imperviousness for highways is surprisingly low: **47 percent**.

SECTION IV. CALCULATING CURRENT AND BUILD-OUT IMPERVIOUS COVER

Calculating current and build-out (future) impervious cover is a relatively straightforward process, assuming the availability of land-use data layers. Build-out analysis can be easily done on a spreadsheet. The only information required is knowledge of the total acreage for each land-use category within the area of interest. If generalized land-use categories are not available, zoning categories can be used, but will likely require aggregation into more general land use categories comparable to those in Section II.

Calculating current impervious cover is a bit more complicated because it requires information about parcels that currently are not built-out as designated in the general plan. City and county general plans commonly designate land use 20 years into the future, although those lands often have a completely different use at the present time. For example, land could be zoned for office development, but is currently being used as farmland. This is a common occurrence in communities surrounded by greenfields. This section presents the method for performing both sets of IC calculations.

A. Future or Build-Out Impervious Cover

The calculation of impervious cover at build-out, when all lands are developed as specified in the general plan, is very straightforward. It involves multiplying the total acreage for each LUC by the ISC and summing the values for all LUCs. The following example illustrates this process.

Assume the area for analysis is a 1500 acre sub-division (or a watershed, or any other area with identified boundaries) with a single land use, low density residential (ISC=52%) with roads (ISC = 91%). In some cases, the area of the right-of-way is known. In this example, we calculated it, based on the typical patterns found in new development, where ROW accounts for approximately 22% of the total land.

Build-Out Imperviousness:

1. $1500 \times .22$ (% of development that is ROW) = 330 acres of ROW
2. $330 \text{ acre ROW} \times 0.91$ (ISC for suburban roads) = 300 acre impervious ROW
3. Total low density residential (LDR) (5 du/acre use) = 1170 acres
4. 1170×0.52 (ISC) = 608 acres of impervious LDR
5. $608 + 300 = 908$ acres impervious in 1500 acre sub-division.

Future level of imperviousness = 61%

An Impervious Cover Calculator was developed to facilitate these calculations. This Calculator is available on OEHA's website (www.oehha.ca.gov/ecotox.html). Using the same hypothetical development described above, a sample calculation using the Calculator is shown below:

| | INPUTS | | | | OUTPUTS | | |
|---------------------------------|-------------------------------|--------------------------------|---|-------------------------------------|--|---|--|
| | Column 1 Land Use Category | Column 2 Total Area [acres] | Column 3 Non-conforming Area [acres] | Column 4 Current Conforming Area | Column 5 Impervious Surface Coefficient | Column 6 Buildout Impervious Cover [acres] | Column 7 Current Impervious Cover [acres] |
| Residential | 6 du/acre residential | 1170 | | | 0.52 | 607 | 0 |
| | [Select LUC Here] | | | | 0.00 | 0 | |
| | [Select LUC Here] | | | | 0.00 | 0 | |
| | [Select LUC Here] | | | | 0.00 | 0 | |
| Non-Residential | [Select LUC Here] | | | | 0.00 | 0 | |
| | [Select LUC Here] | | | | 0.00 | 0 | |
| | [Select LUC Here] | | | | 0.00 | 0 | |
| Roads | Urban/Suburban | 330 | | | 0.91 | 300 | 0 |
| | [Select LUC Here] | | | | 0.00 | 0 | |
| | [Select LUC Here] | | | | 0.00 | 0 | |
| Nonconforming Land Uses [acres] | | | | | | | |
| Nonconforming Land Uses | [Select LUC Here] | | | | 0.00 | | 0 |
| | [Select LUC Here] | | | | 0.00 | | 0 |
| | [Select LUC Here] | | | | 0.00 | | 0 |
| | [Select LUC Here] | | | | 0.00 | | 0 |
| TOTAL ACRES | | 1500 | 0 | 0 | | | |
| TOTAL IMPERVIOUS ACRES | | | | | | 907 | 0 |
| PERCENT IMPERVIOUSNESS | | | | | | 60 | 0 |

To use the Calculator, identify the land use categories within the geographic area of interest. A drop-down menu is provided for residential, non-residential, and road land uses. For residential, select the density of the development, input the acres of that particular LUC, the impervious surface coefficient and total impervious acres are then calculated. For non-residential uses and roads, a similar drop-down menu is available for selecting the appropriate LUC and other input parameters.

B. Current or Transitional Impervious Cover

To determine the current amount of imperviousness, additional steps are needed to account for the current use of lands that might be designated for different uses. We identify these parcels as **non-conforming** because they are not being used in accordance with their General Plan designation. For example, an area designated as medium density residential may instead be currently used for irrigated agriculture or rural residential.

Before using the ISC, a series of checks should be performed to correct for non-conforming parcels. They include:

- Adjustment of non-conforming parcels
- Identification of vacant lots
- Adjustment of the build-out impervious acres to reflect current use, using the non-conforming parcel correction factor (NPCF).

Step 1: Identify and recategorize non-conforming parcels

To determine the current amount of imperviousness within a given area, non-conforming parcels must be re-categorized based on their existing use. By re-categorizing the non-conforming LUC acreage, the total area of the designated future LUC is adjusted to reflect the current or transitional land use.

Step 1a: Visual Inspection of Aerial Photographs

The simplest method for identifying non-conforming parcels is to visually inspect each land use category for the presence of inappropriate land uses. In the majority of cases, the non-conforming use is less developed than their designation in the general plan; they are relatively easy to identify using a high resolution orthophotograph and a land use data layer. Depending on the state of development, it is easiest to track either a) those parcels that conform to the designated land use OR b) those that do not. As the current land uses are identified the records in the attribute file of the GIS project should be updated to reflect the land use shown in the aerial. Thus the date the aerial was taken should guide the selection of the land use layer.



Figure 6. A Non- Conforming Parcel. This house was designated as low density residential in the land use layer, yet it is on a three acre parcel, a density better characterized as rural residential. The ISC for this parcel must be adjusted to reflect current conditions.

For non-conforming parcels in transition due to redevelopment or down zoning such as conversion of former industrial sites to residential, use the descriptions in Section II of the User's Guide for suggestions on how to reclassify a land use that does not conform to its identified type and description. During the adjustment of the non-conforming parcels it may be difficult to determine the designated use of vacant or fallow land. **Vacant Land** is property that, *in its entirety*, is not being used for its designated use.

Best practices would be to:

- Look at the size, configuration, and surrounding land uses to help determine the vacant lot land use. A non-conforming area that is small in size and has a shape similar to its neighborhood's is likely an undeveloped sub-division or commercial park.
- Do not re-classify vacant parcel with commercial, planned open space and recreation, or residential uses. This circumstance will be addressed in Step 2 (below).
- Re-categorize working lands (agriculture) if the general plan contemplates more intense use. Differentiating between agricultural land and planned open space, such as a nature

reserve, is sometimes difficult. Comparing the size of the parcel to surrounding lands is one way to identify planned open space. Nature reserve/open space is often cross-cut by trails or natural groupings of vegetation, features rarely seen in agricultural parcels. It will likely be sized larger and shaped differently from surrounding parcels. On the other hand, agricultural land likely will sit nearby other agricultural land, and possess visible signs of the land being worked, such as rows of plantings or trees and narrow dirt roads neatly bisecting property.

Step 1b: Non-Visual Identification of Non-Conforming Parcels that are Vacant

A non-visual method can be used to identify non conforming parcels that are vacant. This approach relies on obtaining data from the appropriate local government department to identify vacant parcels. This information may be found in one or more of the following databases:

- The Housing Element in a General Plan or General Plan Update contains a vacant land inventory. The inventory contains the Assessor's Parcel Number (APN), the size of the parcel, and the LUC for which it is zoned. The total acreage for each LUC can be used to determine the amount of vacant land in each land use. However, as General Plans are updated every five years or more, this inventory may be out of date.
- The County Assessor's Office maintains a list of parcels with their assessed values that are calculated by combining the value of the land and the structure(s) on it. Lots with nominal or no improvement value are likely vacant. Generally, structures such as schools, churches, and government building are not assessed by the county, so they have no assessed improvement value. This circumstance is most commonly seen in the Public/Quasi Public and Open Space LUCs. Identify these land uses on the aerial photograph when determining if an area is vacant.

Whether the visual inspection method or a combination of visual inspection and reviewing of local databases are used to identify the area of vacant land within each LUC, efforts should be made to match the date of the assessor's data with the date of the aerial.

Step 2: Application of the Non-Conforming Parcel Correction Factor (NPCF)

After adjusting the land-use layer for the current or transitional use and identifying vacant lots, the area of non-conforming parcels is subtracted from the total. Then the calculation of impervious cover can be performed in a similar way as for build out, i.e. by multiplying the total acreage for each LUC by the ISC and summing all values.

The sample calculation below illustrates how to perform an analysis of current conditions.

Assume the area for analysis is the same 1500 acre sub-division (or watershed, or any other area with identified boundaries) used above for the build-out calculation, ie., with a single land use, low density residential (ISC=52% with roads ISC = 91%).

Current Imperviousness

1. $1500 \times .22$ (% of development that is ROW) = 330 acres of ROW
 2. Total low density residential (LDR) (5 du/acre use) = 1170 acres
 3. 1170 LDR acres - 400 acres of non-conforming land that is vacant (NPCF) = 770 acres developed
 4. 770×0.49 = 378 acres of impervious LDR
 5. 330 acre ROW \times 0.91 (ISC for suburban roads) = 300 acre impervious ROW
 6. $378 + 300 = 678$ acres impervious in 1500 acre sub-division
- Current level of imperviousness = 45 %

| | INPUTS | | | | OUTPUTS | | |
|--|-----------------------|--------------------|-----------------------------|-------------------------|--------------------------------|-----------------------------------|----------------------------------|
| | Column 1 | Column 2 | Column 3 | Column 4 | Column 5 | Column 6 | Column 7 |
| | Land Use Category | Total Area (acres) | Non-conforming Area (acres) | Current Conforming Area | Impervious Surface Coefficient | Buildout Impervious Cover (acres) | Current Impervious Cover (acres) |
| Residential | 6 du/acre residential | 400 | | 400 | 0.52 | 208 | 208 |
| | 1 du/acre residential | 200 | | 200 | 0.24 | 49 | 49 |
| | 1 du/acre residential | 200 | | 200 | 0.24 | 49 | 49 |
| | [Select LUC Here] | | | | 0.00 | 0 | 0 |
| | [Select LUC Here] | | | | 0.00 | 0 | 0 |
| Non-Residential | [Select LUC Here] | | | | 0.00 | 0 | 0 |
| | Agriculture | 0 | | | 0.04 | 0 | 0 |
| | [Select LUC Here] | | | | 0.00 | 0 | 0 |
| Roads | Urban/Suburban | 150 | | 150 | 0.91 | 137 | 137 |
| | Rural | 50 | | 50 | 0.43 | 22 | 22 |
| | [Select LUC Here] | | | | 0.00 | 0 | 0 |
| Nonconforming Land Uses (acres) | | | | | | | |
| Nonconforming Land Uses | [Select LUC Here] | | | | 0.00 | | 0 |
| | [Select LUC Here] | | | | 0.00 | | 0 |
| | [Select LUC Here] | | | | 0.00 | | 0 |
| | [Select LUC Here] | | | | 0.00 | | 0 |
| TOTAL ACRES | | 1000 | 0 | 1000 | | | |
| TOTAL IMPERVIOUS ACRES | | | | | | 463 | 463 |
| PERCENT IMPERVIOUSNESS | | | | | | 46 | 46 |

Use the Calculator to perform this calculation as illustrated above. The 400 acres that are identified under the 5 du/acre land use category were determined to be rural residential land that was non-conforming. Those 400 acres were then listed as 0.5 du/acre under the land use category and a new calculation at 14% IC was performed for those acres at 0.5 du/acre. Factoring in the imperviousness associated with roads, the total impervious acres added up to 734 out of 1900 or 39% IC currently.

In summary, calculation of impervious cover at build-out is a simple process that can be performed using a spreadsheet, assuming the areas of the pertinent land uses are known. Analysis of current conditions becomes slightly more complicated because non-conforming land uses must be identified and adjustments made to the acreage of relevant LUCs.

Appendix 1: Comparison of Impervious Cover for Residential Land Uses in 3 Study Cities

| City of Irvine LUC | Irvine Description | City of Irvine ISC | SACOG LUC | SACOG Description | SACOG ISC | City of Santa Cruz LUC | SC description | City of Santa Cruz ISC |
|---------------------|--------------------|----------------------------------|---------------------|-------------------|---------------|------------------------|----------------|------------------------|
| Estate Density | 0-1 du/ac | Not Analyzed; Too few parcels | Rural | 0-1.0 du/ac | 6 | Very-Low Density | 0.1-1 du/ac | 12 |
| Low Density | 1.1-5 du/ac | 43 | Very Low Density | 1.1-4.0 du/ac | 30 | Low Density | 1-10 du/ac | 46 |
| | | | Low Density | 4.1-8.0 du/ac | 44 | | | |
| Medium Density | 5.1-10 du/ac | 61 | Medium Density | 8.1-12.0 du/ac | 53 | | | |
| Medium-High Density | 10.1-25 du/ac | 72 | | | | Low-Medium Density | 10.1-20 du/ac | 52 |
| | | | Medium-High Density | 12.1-25 du/ac | 53 | | | |
| | | | | | | Medium Density | 20.1-30 du/ac | 68 |
| High Density | 25.1-40 du/ac | 69 | High Density | 25.1-50 du/ac | 67 | | | |
| | | | | | | High Density | 30.1-55 du/ac | Not used n=1 |
| | | | Urban | 50.1-100+ du/ac | Not Available | | | |
| | | | Medium-High Density | 12.1-25 du/ac | 53 | | | |

Appendix 2: Comparisons of Impervious Cover for Non-Residential Land Uses in 3 study cities

| City of Irvine | | | SACOG | | | City of Santa Cruz | | |
|--|---|-----|---------------------------------------|--|-----|------------------------------------|--|-----|
| LUC | Description | ISC | LUC | Description | ISC | LUC | Description | ISC |
| Neighborhood Commercial | Any retail/business serving immediate neighborhood | 87 | Community/ Neighborhood Retail | (0.2-0.3 FAR) ² 100% Retail | 80 | Neighborhood Commercial | (0.25-1.5 FAR) Small-scale commercial serving residential neighborhoods | 87 |
| Regional Commercial | Shopping/retail areas with regional scope (includes office uses) | 86 | Regional Retail | (0.2-0.3 FAR) 95% Retail 5% Office | 82 | Community Commercial | (0.25-1.75 FAR) Retail & services serving needs of the local community | 93 |
| Vehicle Commercial (Not a LUC category, but a zoning category) | Fast food rest., car dealerships, rentals, and vehicle storage | 87 | | | | Regional Visitor Commercial | (0.25-3.5 FAR) Commercial uses that serve Santa Cruz residents as well as visitors | 89 |
| Community Commercial | Industry or business that serves the community (includes office uses) | 77 | | | | | | |
| N/A | | | N/A | | | Coastal Development | coastal commercial development | 23 |
| Retail/ Office (Not a LUC in Irvine, but created from a subset of LUC during analysis) | subset of Community and regional office uses are subcategories of commercial categories | 76 | Moderate-Intensity Office | (0.3-1.0 FAR) 5% Retail and 95% Office | 68 | Office | (0.25-1.75 FAR) Small-scale office uses and mixed-use projects | 65 |
| | | | High-Intensity Office | (1.1+ FAR) 5% Retail and 95% Office | 85 | | | |

² FAR refers to floor-area ratio, the ratio of the total floor area of a building to the size of the land at that location.

SECTION V. APPLICATION OF THE COEFFICIENTS TO STORMWATER RUNOFF CALCULATIONS

A. Introduction

Impervious surface coefficients can be used to estimate stormwater runoff. Unlike suburban land use patterns found throughout the U.S., California's suburbs are typically denser with more dwelling units per acre of land. Consequently, use of non-California ISCs can underestimate the amount of impervious cover at low residential densities, leading to an underestimation of the volume of stormwater runoff. In other cases, non-California ISCs may overestimate runoff from a site, such as office parks. This chapter describes how California ISCs were used to develop a set of alternative curve numbers (CN) and how they can be applied to estimate storm water runoff.

B. Overview of the Curve Number and Curve Number Method

Developed by the National Resource Conservation Service (NRCS), the Curve Number Method is widely used to estimate stormwater runoff. This method assumes that impervious areas are connected via a stormwater conveyance system (e.g. storm drain) so that almost all of the rain that falls on impervious areas will become runoff. The runoff calculation is dependent on the amount of precipitation, the CN, and soil moisture before a storm event (antecedent moisture conditions). In addition to antecedent soil moisture conditions, four hydrologic soil groups, based on the porosity of soil, are also considered in the calculation. The CN itself is a unit-less parameter, usually ranging between thirty and one hundred, derived from the amount of impervious cover. A lower CN value indicates the area will have less runoff and more soil infiltration; conversely, a higher CN value suggests a larger amount of runoff.

Hydrologic Soil Groups (HSG)

HSGs are classified into four groups. These groups are divided by infiltration rates.

- Group A** – Infiltration rate greater than 0.3 in/hr.
Mostly sand or gravel soils.
Low runoff potential.
- Group B** – Infiltration rate 0.15 to 0.30 in/hr.
Moderately coarse soils.
- Group C** – Infiltration rate 0.05 to 0.15 in/hr.
Moderately fine to fine soils.
Can impede water flow.
- Group D** – Infiltration rate is less than 0.05 in/hr
Mostly fine soils (clays).
High runoff potential.

The Curve Number Method

Stormwater runoff estimates are calculated as follows:

$$S = (1000/CN) - 10$$

Where:

S = the potential abstraction (maximum potential retention of water by the soil after runoff begins)

CN = the CN for the given LUC and HSG

Once the potential abstraction has been calculated, it can be used in the following equation:

$$Q = (P - 0.2S)^2 / (P + 0.8S)$$

Where:

Q = depth of runoff (inches)

P = precipitation (inches)

S = the potential abstraction

To produce runoff, P must be greater than 0.2S. If P is less than or equal to 0.2S, then the runoff amount is essentially zero. When P is greater than 0.2S, multiplying the Q value by the area of the site gives the volume of runoff produced.

C. Derivation of California Curve Numbers

An alternative set of curve numbers were developed, using OEHHA's California ISCs for residential and non-residential development as well as roads. The following equation is used to calculate these values:

$$CN = [(CN_{OS}) \times (1 - ISC_i)] + [(98) \times (ISC_i)]$$

Where:

CN_{OS} = the runoff potential of the soil assuming the area is open space (OS), in good hydrologic condition, and that the soil is not frozen; the four CN_{OS} for HSGs A, B, C, and D (see text box above) are 39, 61, 74, and 80, respectively (National Engineering Handbook, 2004),

1-ISC = the percent of land use category *i* that is pervious,

98 = maximum potential runoff,

ISC = the percent of land use category *i* that is impervious.

The NRCS ISCs and CNs identify six residential densities ranging from 1/2 to 8 du/acre, with no values provided for residential densities greater than 8 du/acre. While these values reflect low or medium density development patterns in many California cities, some medium or high density developments in California contain 12, 15 or even 20 du/acre. The more limited range of densities used to develop the original NRCS curve numbers could lead to an under-estimation of potential runoff from higher density developments.

Table 5 illustrates similarities and differences between the ISCs used by the NRCS and those developed by OEHHA. Dashes indicate no NRCS value is available. The NRCS classification scheme only provides

two categories for non-residential development. One ISC and CN value for the commercial/business LUC and one for the industrial LUC are available. In California, however, most cities have multiple commercial and industrial LUC with different amounts of impervious cover. OEHHA developed CNs for three commercial, two industrial, and two office LUCs which are reflective of varying amounts of impervious cover for each land use type.

Table 5. California and NRCS Impervious Surface Coefficients for Non-Residential and Residential Land Uses

| Non-Residential ISCs | | | Residential ISCs | | |
|----------------------|----------------|----------|-------------------|----------------|----------|
| Land Use | California ISC | NRCS ISC | Density (du/acre) | California ISC | NRCS ISC |
| Retail | 0.86 | 0.72 | 0.5 | 0.14 | 0.12 |
| Retail/Office | 0.80 | 0.72 | 1 | 0.24 | 0.20 |
| Coastal Development | 0.23 | -- | 2 | 0.35 | 0.25 |
| Office Park | 0.69 | 0.72 | 3 | 0.41 | 0.30 |
| Urban Office | 0.86 | 0.72 | 4 | 0.46 | 0.38 |
| Light Industry | 0.81 | 0.85 | 5 | 0.49 | 0.38 |
| Heavy Industry | 0.91 | 0.85 | 6 | 0.52 | 0.38 |
| Public/Quasi-Public | 0.44 | -- | 7 | 0.54 | 0.38 |
| Mixed Use | 0.80 | -- | 8 | 0.56 | 0.65 |
| Open Space | 0.02 | -- | 9 | 0.58 | 0.65 |
| Agriculture | 0.04 | -- | 10 | 0.60 | 0.65 |
| | | | 11 | 0.61 | 0.65 |
| | | | 12 | 0.62 | 0.65 |
| | | | 13 | 0.64 | 0.65 |
| | | | 14 | 0.65 | 0.65 |
| | | | 15 | 0.66 | 0.65 |
| | | | 20 | 0.70 | 0.65 |
| | | | 25 | 0.74 | 0.65 |
| | | | 30 | 0.76 | 0.65 |
| | | | 35 | 0.79 | 0.65 |
| | | | 40 | 0.81 | 0.65 |
| | | | 45 | 0.83 | 0.65 |
| | | | 50 | 0.84 | 0.65 |

Table 6 contains CNs for hydrologic soil group A, the most pervious soil classification. The CNs are based on the CA set of impervious surface coefficients. Look up tables for all 4 hydrologic soil groups can be found in the Appendices to this section.

Table 6. Comparison of California and NRCS curve numbers for residential and non-residential land uses.

| Non-Residential CN for HSG A | | |
|------------------------------|---------------|---------|
| LUC | California CN | NRCS CN |
| Retail | 90 | 89 |
| Retail/Office | 86 | 89 |
| Coastal Development | 53 | 89 |
| Office Park | 80 | 89 |
| Urban Office | 89 | 89 |
| Light Industrial | 87 | 81 |
| Heavy Industrial | 93 | 81 |
| Public/Quasi-Public | 69 | - |
| Mixed Use | 86 | - |
| Open Space | 40 | 39 |
| Agriculture | 41 | Varies |
| Roads | | |
| Urban/Suburban | 93 | 98 |
| Rural | 64 | 83 |
| Highways | 69 | 83 |

| Residential CN for HSG A | | |
|--------------------------|---------------|---------|
| Density (du/acre) | California CN | NRCS CN |
| 0.5 | 47 | 46 |
| 1 | 53 | 51 |
| 2 | 60 | 54 |
| 3 | 63 | 57 |
| 4 | 66 | 61 |
| 5 | 68 | 61 |
| 6 | 70 | 61 |
| 7 | 71 | 61 |
| 8 | 72 | 77 |
| 9 | 73 | 77 |
| 10 | 74 | 77 |
| 11 | 75 | 77 |
| 12 | 76 | 77 |
| 13 | 77 | 77 |
| 14 | 77 | 77 |
| 15 | 78 | 77 |
| 20 | 80 | 77 |
| 25 | 82 | 77 |
| 30 | 84 | 77 |
| 35 | 86 | 77 |
| 40 | 87 | 77 |
| 45 | 88 | 77 |
| 50 | 89 | 77 |

D. Using the California ISCs and CNs: An Example

A runoff calculation is presented here for a hypothetical 100 acre development using both the NRCS and California CNs. The following assumptions were made for this purpose:

- One inch rain event
- 100 acre parcel divided into four major LUCs and roads:
 - Residential (55 acres)
 - Office park (10 acres)
 - Retail (10 acres)
 - Open space/parks (5 acres)
 - Right of way for roads and sidewalks (20 acres)
 - The 55 acre residential area divided equally into three 18.33 acre residential LUCs of 4, 10, and 20 du/acre (LDR, MDR, and HDR, respectively)

Because the NRCS handbook does not provide ISC or CN values for residential densities greater than 8 du/acre, the closest value provided for a comparable LUC (8 du/acre) value was used for all densities greater than 8 du/acre. Also, the NRCS commercial/business CN was applied to the retail LUC. The commercial CN was applied to offices and office parks since the NRCS does not provide any values for these LUCs. Using the CA ISCs and CN values for the four hydrological soil groups (HSGs), we calculated stormwater runoff amounts for the same development scenario built on the different HSGs. Figures 7 – 10 highlight the total and individual LUC calculated runoff volumes, converted to acre-feet.

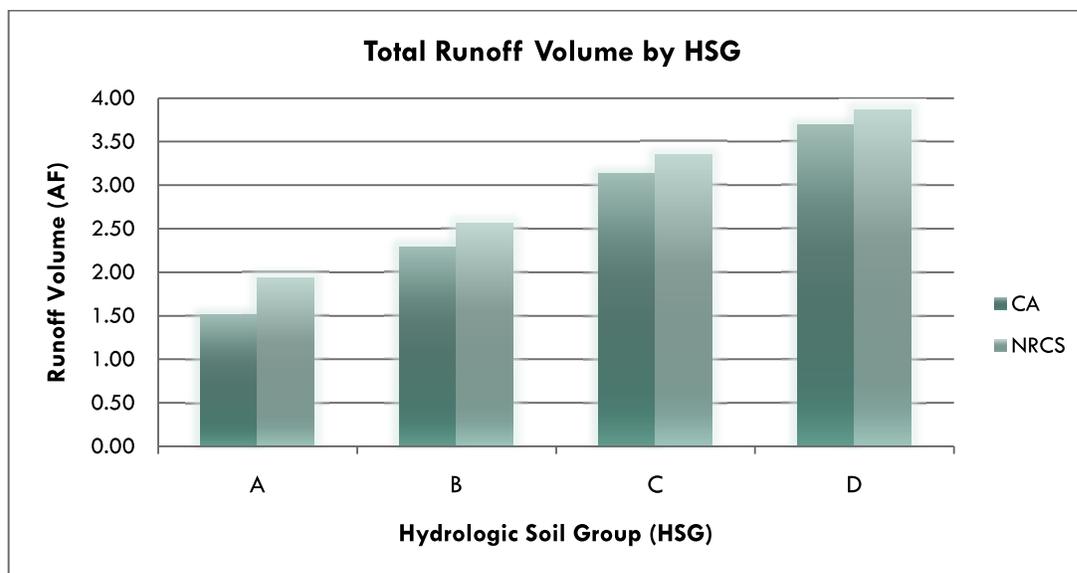


Figure 7 . Total runoff volume by HSG for a 1” rain event on a 100 acre development.

Figure 7 illustrates the differences in total runoff for the development using the California and NRCS CNs. The differences between the California and NRCS runoff estimates are greatest when soils are more permeable (HSG A). In HSG A, the NRCS runoff estimate is 20% greater than the

California runoff estimate. In other words, the California and NRCS estimates differ by 0.43 acre-feet (approximately 140,000 gallons). When the native soil has low permeability (HSG D), the NRCS runoff estimate is only 3% greater than the estimates based on the California CNs. For the HSG D scenario, the difference was 0.17 acre-feet or approximately 55,000 gallons. The differences in runoff are 5.5% and 4% respectively for HSGs B and C.

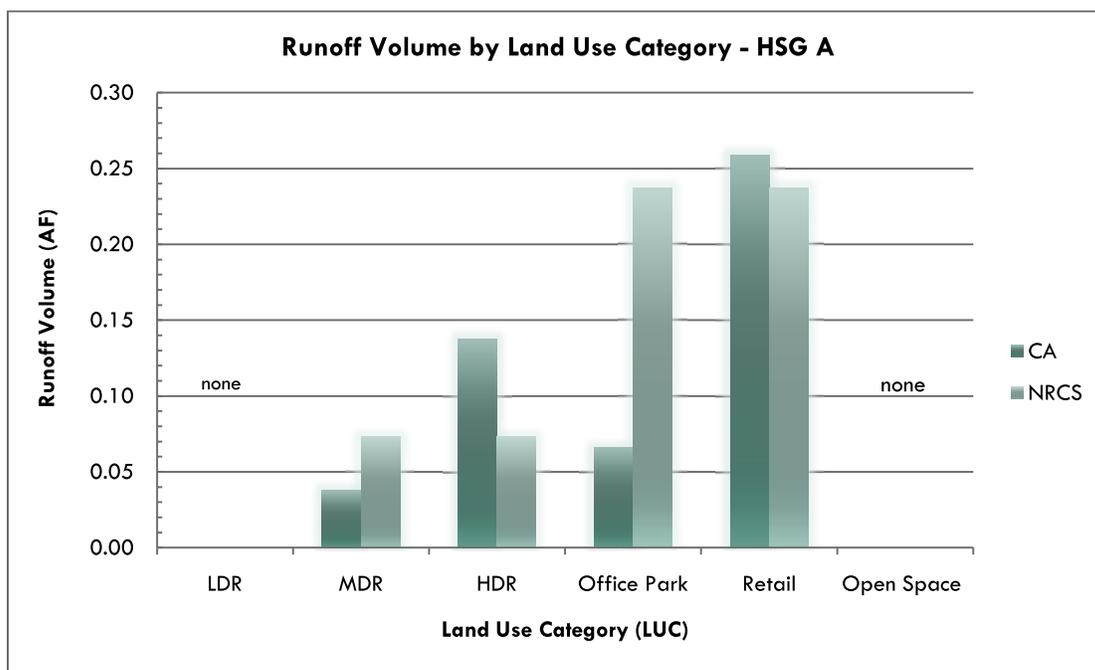


Figure 8. Runoff volume by land use category (excluding roads) for HSG A. Each bar represents the volume of runoff in acre-feet (AF) for the hypothetical 100 acre development. Values were calculated using the California (CA) and NRCS set of curve numbers. LDR = low density residential, MDR = medium density residential, HDR = high density residential. Due to the high permeability of Type A soil, there was no runoff from the LDR or Open Space LUCs.

As illustrated in Figure 8, the differences between the C and NRCS CN are greatest in highly permeable soils, where the differences in the ISC values can be detected easily. For example, there is 3.5-fold less runoff volume for the Office Park LUC when using the California CNs. This difference is linked to the fact that office parks have less impervious cover than most commercial LUCs. The opposite is true for high density residential where the estimate of runoff using the California CN yields about two-fold greater runoff volume.

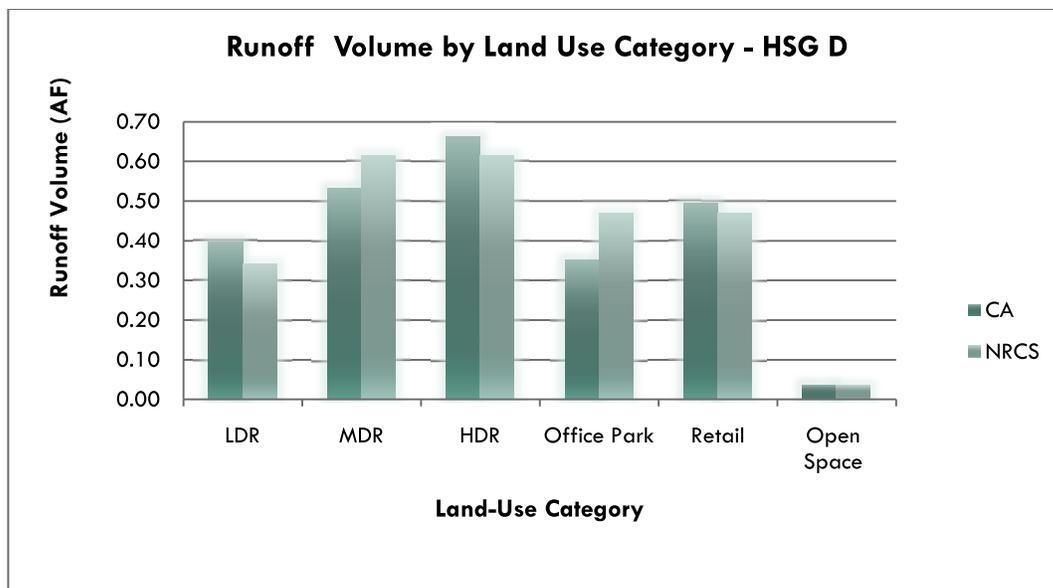


Figure 9. Runoff Volume by LUC for HSG D. Abbreviations are the same as for Figure 8.

Figure 9 illustrates the same relationships but for HSG D, which has much less permeability than HSG A. Due to the reduced difference between bare soil and impervious cover in D soils, runoff volume for Office Park is 1.3-fold greater compared to 3.5 for HSG A using the NRCS CN and California CNs. In contrast, runoff from HDR is just 15% larger than estimated using the NRCS CN compared to approximately 50% for HSG A. The total runoff volume is about 10% greater when using the NRCS CNs than with the California values.

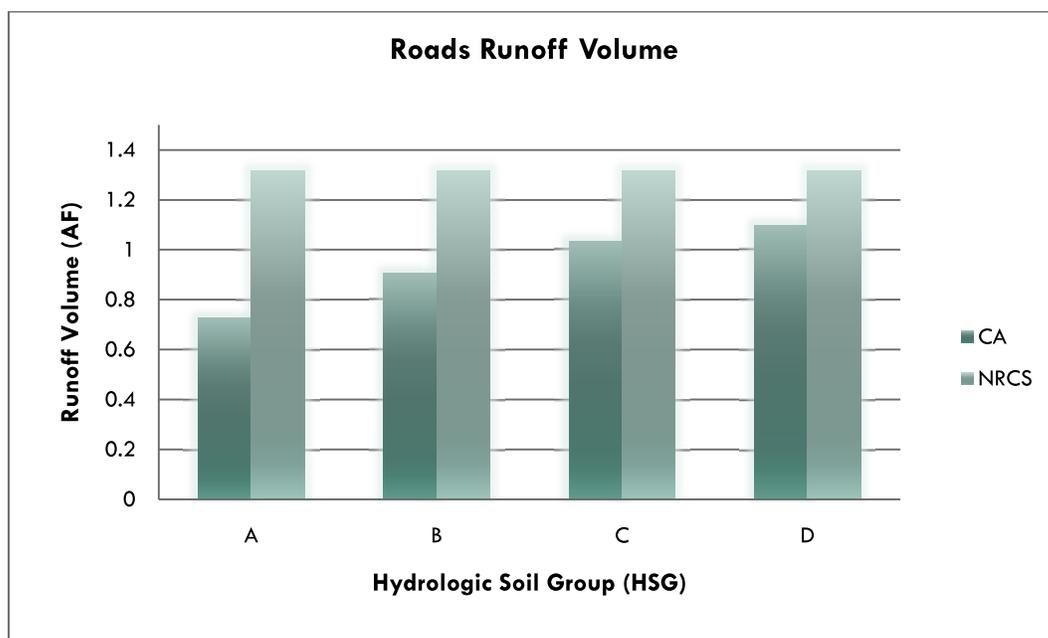


Figure 10. Runoff volume from right-of-way (roads) for all soil types.

Figure 10 illustrates differences in stormwater runoff from roads. The pattern is similar to the previous comparisons; the differences between the two runoff volumes are greater for more porous soil. For HSG A, use of the California CN would yield 38% less runoff from roads than the volume calculation using the NRCS value. This difference diminishes to 13% (for HSG D) as the soil becomes less pervious. Overall, runoff volumes are consistently lower when using California CNs.

Although not evident from this example, the differences in road runoff would be even larger if the area of analysis included rural roads and highways. The following table illustrates the percent reduction in runoff using California and NRCS CNs for the 4 hydrologic soil groups for the 3 major road categories.

| Percent reduction in runoff volume from roads using California CNs | | | | |
|--|-------|-------|-------|-------|
| Road Type | HSG-A | HSG-B | HSG-C | HSG-D |
| Suburban/Urban | 3.2 | 3.2 | 2.0 | 2.0 |
| Rural | 23 | 13 | 8.7 | 5.4 |
| Highway | 19 | 12 | 7.6 | 4.3 |

Table 7. Estimated reduction in roadway stormwater runoff when calculating volume using the California CNs compared to the NRCS CNs. The values reflect the percent reduction in the runoff volume. CN for highways are not available from the NRCS. Therefore, when estimating runoff volumes, we made the assumption that NRCS CN for highways has the same CN as rural roads because rural roads typically do not have storm drains as is the case for highways. These estimates are on the conservative side for a few reasons: a) many locations in California are hilly which would increase actual runoff, and b) California has many higher intensity land uses than those provided by the NRCS.

D. Conclusion

The California CNs support accurate estimations of stormwater runoff. The California ISC and companion CNs can be used as a tool for sizing stormwater facilities of all types. They can also be used to help implement hydromodification management plans which call for no net change or limited change in the hydrograph post-development. Use of the ISC is one of the most accurate ways to estimate current levels of runoff, laying the basis for determining the size of bioretention cells, detention/retention basins, and swales needed to prevent changes in the hydrograph. In addition to meeting regulatory requirements, appropriate sizing of stormwater management structures helps ensure they are cost-effective.

References

National Engineering Handbook, Part 630: Hydrology. 2004. Nat. Resources Cons. Service, Ch. 9, pp 9-1: 9-14 Washington, DC.

Appendix A: Non-Residential Curve Numbers

The following set of look up tables provide a quick reference for the set of Non-Residential CA CNs for the 4 hydrologic soil groups.

| HSG A - Non-Residential CN | | |
|-----------------------------------|----------------------|----------------|
| LUC | California CN | NRCS CN |
| Retail | 90 | 89 |
| Retail/Office | 86 | 89 |
| Coastal Development | 53 | 89 |
| Office Park | 80 | 89 |
| Urban Office | 89 | 89 |
| Light Industrial | 87 | 81 |
| Heavy Industrial | 93 | 81 |
| Public/Quasi-Public | 69 | - |
| Mixed Use | 86 | - |
| Open Space | 40 | 39 |
| Agriculture | 41 | Varies |
| Roads | | |
| Urban/Suburban | 93 | 98 |
| Rural | 64 | 83 |
| Highways | 69 | 83 |

| HSG B - Non-Residential CN | | |
|-----------------------------------|----------------------|----------------|
| LUC | California CN | NRCS CN |
| Retail | 93 | 92 |
| Retail/Office | 91 | 92 |
| Coastal Development | 70 | 92 |
| Office Park | 87 | 92 |
| Urban Office | 92 | 92 |
| Light Industrial | 91 | 88 |
| Heavy Industrial | 95 | 88 |
| Public/Quasi-Public | 80 | - |
| Mixed Use | 91 | - |
| Open Space | 62 | 61 |
| Agriculture | 62 | Varies |
| Roads | | |
| Urban/Suburban | 95 | 98 |
| Rural | 77 | 89 |
| Highways | 78 | 89 |

| HSG C - Non-Residential CN | | |
|-----------------------------------|----------------------|----------------|
| LUC | California CN | NRCS CN |
| Retail | 95 | 94 |
| Retail/Office | 93 | 94 |
| Coastal Development | 80 | 94 |
| Office Park | 91 | 94 |
| Urban Office | 94 | 94 |
| Light Industrial | 93 | 91 |
| Heavy Industrial | 96 | 91 |
| Public/Quasi-Public | 86 | - |
| Mixed Use | 93 | - |
| Open Space | 74 | 74 |
| Agriculture | 75 | Varies |
| Roads | | |
| Urban/Suburban | 96 | 98 |
| Rural | 84 | 92 |
| Highways | 85 | 92 |

| HSG D - Non-Residential CN | | |
|-----------------------------------|----------------------|----------------|
| LUC | California CN | NRCS CN |
| Retail | 95 | 95 |
| Retail/Office | 94 | 95 |
| Coastal Development | 84 | 95 |
| Office Park | 92 | 95 |
| Urban Office | 95 | 95 |
| Light Industrial | 95 | 93 |
| Heavy Industrial | 96 | 93 |
| Public/Quasi-Public | 89 | - |
| Mixed Use | 94 | - |
| Open Space | 80 | 80 |
| Agriculture | 81 | Varies |
| Roads | | |
| Urban/Suburban | 96 | 98 |
| Rural | 88 | 93 |
| Highways | 89 | 93 |

Appendix B: Residential Curve Numbers

The following look-up table provides a quick reference for residential curve numbers.

| HSG A - Residential CN | | |
|------------------------|---------------|---------|
| Density (du/acre) | California CN | NRCS CN |
| 0.5 | 47 | 46 |
| 1 | 53 | 51 |
| 2 | 60 | 54 |
| 3 | 63 | 57 |
| 4 | 66 | 61 |
| 5 | 68 | 61 |
| 6 | 70 | 61 |
| 7 | 71 | 61 |
| 8 | 72 | 77 |
| 9 | 73 | 77 |
| 10 | 74 | 77 |
| 11 | 75 | 77 |
| 12 | 76 | 77 |
| 13 | 77 | 77 |
| 14 | 77 | 77 |
| 15 | 78 | 77 |
| 20 | 80 | 77 |
| 25 | 82 | 77 |
| 30 | 84 | 77 |
| 35 | 86 | 77 |
| 40 | 87 | 77 |
| 45 | 88 | 77 |
| 50 | 89 | 77 |

| HSG B - Residential CN | | |
|------------------------|---------------|---------|
| Density (du/acre) | California CN | NRCS CN |
| 0.5 | 66 | 65 |
| 1 | 70 | 68 |
| 2 | 74 | 70 |
| 3 | 76 | 72 |
| 4 | 78 | 75 |
| 5 | 79 | 75 |
| 6 | 80 | 75 |
| 7 | 81 | 75 |
| 8 | 82 | 85 |
| 9 | 82 | 85 |
| 10 | 83 | 85 |
| 11 | 84 | 85 |
| 12 | 84 | 85 |
| 13 | 85 | 85 |
| 14 | 85 | 85 |
| 15 | 85 | 85 |
| 20 | 87 | 85 |
| 25 | 88 | 85 |
| 30 | 89 | 85 |
| 35 | 90 | 85 |
| 40 | 91 | 85 |
| 45 | 92 | 85 |
| 50 | 92 | 85 |

| HSG C - Residential CN | | |
|-------------------------------|----------------------|----------------|
| Density (du/acre) | California CN | NRCS CN |
| 0.5 | 77 | 77 |
| 1 | 80 | 79 |
| 2 | 82 | 80 |
| 3 | 84 | 81 |
| 4 | 85 | 83 |
| 5 | 86 | 83 |
| 6 | 86 | 83 |
| 7 | 87 | 83 |
| 8 | 88 | 90 |
| 9 | 88 | 90 |
| 10 | 88 | 90 |
| 11 | 89 | 90 |
| 12 | 89 | 90 |
| 13 | 89 | 90 |
| 14 | 90 | 90 |
| 15 | 90 | 90 |
| 20 | 91 | 90 |
| 25 | 92 | 90 |
| 30 | 92 | 90 |
| 35 | 93 | 90 |
| 40 | 93 | 90 |
| 45 | 94 | 90 |
| 50 | 94 | 90 |

| HSG D - Residential CN | | |
|-------------------------------|----------------------|----------------|
| Density (du/acre) | California CN | NRCS CN |
| 0.5 | 83 | 82 |
| 1 | 84 | 84 |
| 2 | 86 | 85 |
| 3 | 87 | 86 |
| 4 | 88 | 87 |
| 5 | 89 | 87 |
| 6 | 89 | 87 |
| 7 | 90 | 87 |
| 8 | 90 | 92 |
| 9 | 90 | 92 |
| 10 | 91 | 92 |
| 11 | 91 | 92 |
| 12 | 91 | 92 |
| 13 | 91 | 92 |
| 14 | 92 | 92 |
| 15 | 92 | 92 |
| 20 | 93 | 92 |
| 25 | 93 | 92 |
| 30 | 94 | 92 |
| 35 | 94 | 92 |
| 40 | 95 | 92 |
| 45 | 95 | 92 |
| 50 | 95 | 92 |

SECTION V. APPLICATION OF THE IMPERVIOUS SURFACE COEFFICIENTS TO NATURAL RESOURCES MANAGEMENT

A. Introduction

It has been recognized for many years that when impervious cover increases, conditions of the aquatic ecosystem decline. Impervious cover can affect the diversity and abundance of benthic macroinvertebrates (insects that spend part of their life in the streambed) and fish, habitat conditions such as canopy cover, percent fines in bedded sediment, stability of stream banks and beds, and water quality (summarized in a review by OEHHA, 2009). For these reasons and others, quantifying the amount of impervious cover has become a valuable indicator of watershed conditions.

Since impervious cover serves as a surrogate for disturbance, percent IC has also been used to identify reference streams, those to which conditions of streams can be compared. Recognizing that there are few if any pristine waterways remaining in California, those streams located in less disturbed watersheds can be used as reference points for waterways found in more disturbed areas.

Impervious surface coefficients can be used to estimate the amount of impervious cover within a watershed, within a sub-watershed, and even within stream buffers. In urbanized areas with storm drain conveyance systems, runoff from distant areas within the watershed can impact conditions in the waterway. In areas that do not have a storm drain system, imperviousness within a buffer appears to have a greater impact on the conditions in a stream than IC in the watershed overall (Brabec, 2002; Snyder et al., 2005). This chapter reviews the application of the ISC to the estimation of IC at various areal extents, with the goal of better understanding watershed conditions and improving watershed management.

B. Calculating Imperviousness within Watersheds

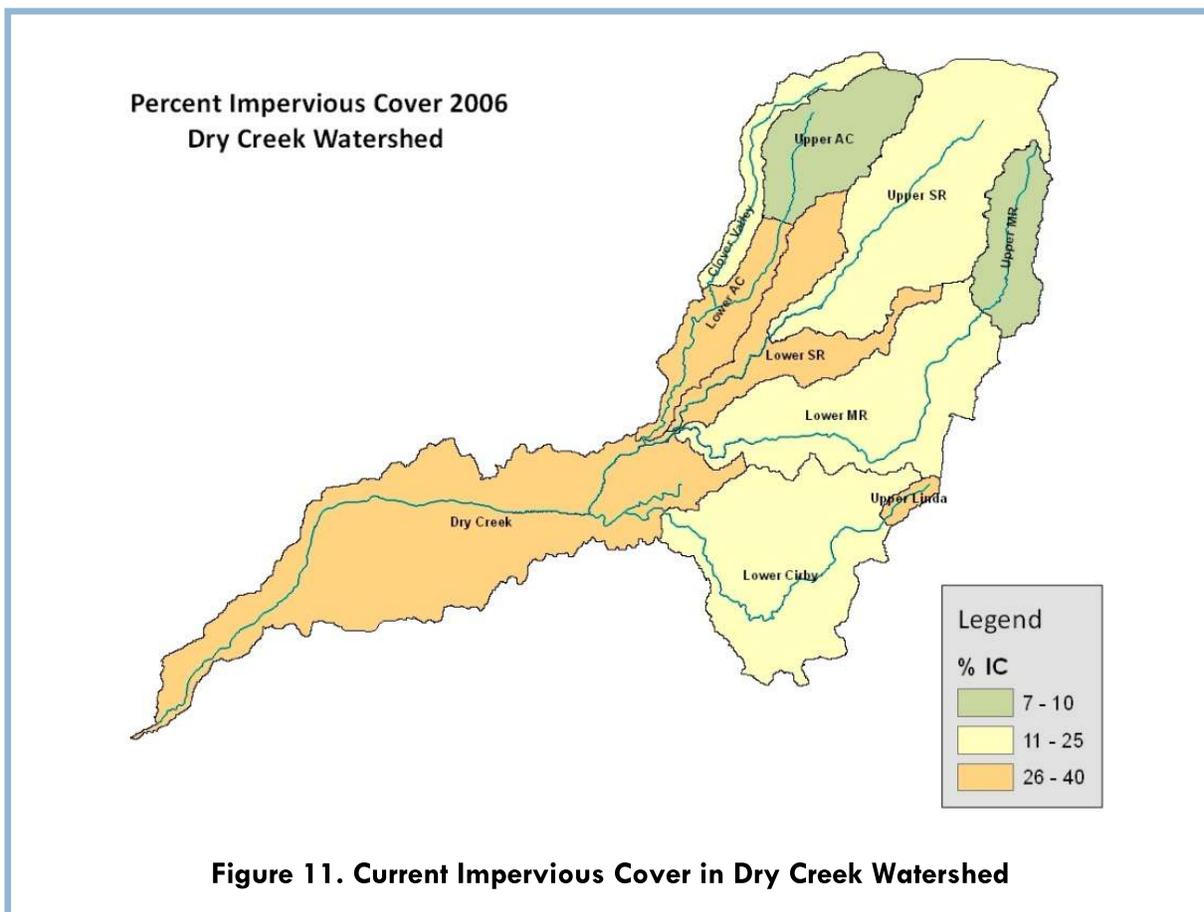
A common application of impervious cover analysis is to estimate total watershed imperviousness. The relationship between IC and stream quality and its usefulness as an indicator of potential hazard was highlighted by Schueler (1995). A geographic information system (GIS) offers the easiest way to calculate IC in a watershed or sub-watershed. The process is almost identical to that of calculating current imperviousness, with the exception that the watershed boundary defines the areal extent of the analysis. This analysis requires two key data layers: a map of the watershed boundaries and land-use maps from all relevant municipalities. If the analyst plans to calculate current IC by visually identifying non-conforming parcels for which alternative ISC should be used, then an aerial photograph will also be required.

The data can be obtained in a few different ways:

- If you have GIS capabilities, the data layers mostly reside in the public domain, so local municipalities or regional councils of government usually will make them available.
- In some cases, city staff may assist with the analysis. Because most planning departments work with GIS data, staff may have the capacity to sum up the total acreage in each

land-use category within a defined boundary. This will require providing staff with the boundary of the watershed that falls within the city limits. The outputs from various municipalities can be assembled into a single spreadsheet to determine the build-out impervious acreage by LUC.

- Frequently, paper maps are available which contain the information needed to calculate the acreage of each land use category within different neighborhoods. The watershed boundary can be outlined and manual estimates can be made of the total acreage of each LUC, one of the inputs for the calculation of IC.
- With these data in hand, the Impervious Cover Calculator (ICC) can be used to perform the calculation for build-out. The method was reviewed in Section III, Calculating Current and Future Impervious Cover. Current imperviousness is more relevant because this metric can be correlated with habitat and biological conditions within the waterways. The details of the method for calculating current IC can be found in Section III. An example of a map of current percent IC is shown in Figure 11, in which sub-watersheds were grouped into 3 categories that reflected low, medium, and high levels of impervious cover.

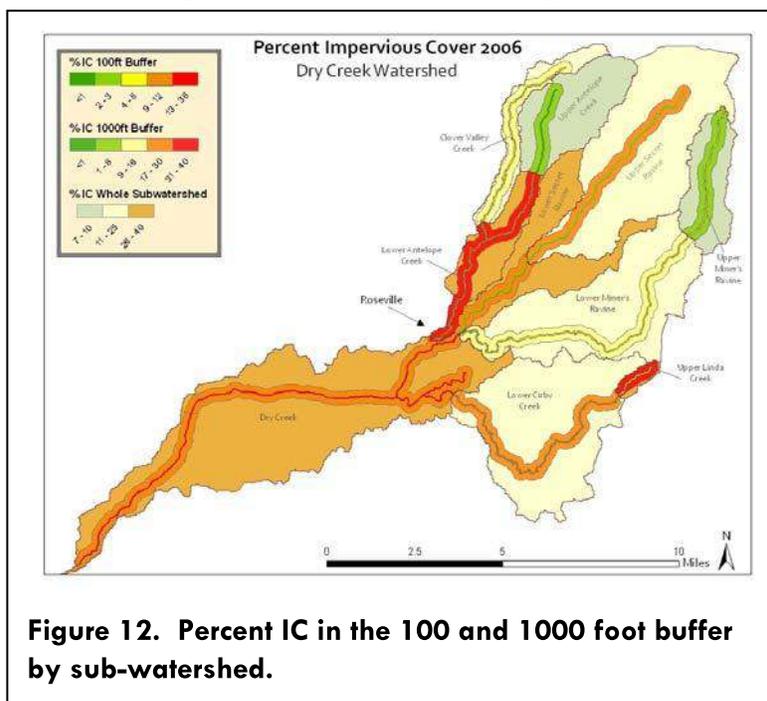


C. Calculation and Application of Impervious Cover Data within a Stream Buffer

The IC within a stream or riparian buffer is another metric of interest to many natural resource managers and those concerned about watershed health. It can serve as an important predictor of the condition of the aquatic ecosystem (Brabec, 2002), especially where buffer disturbance can directly impact conditions in the waterway. The ISC can be used to estimate impervious cover within a stream buffer for approximately 2 acres or larger (discussed in detail below).

Figure 12 illustrates an analysis of % IC within 2 stream buffers having a width of 100 and 1,000 feet. This example is drawn from data on the Dry Creek watershed, a 100 square mile watershed in the foothills east of Sacramento.

The shaded, thin, inner lines around the waterways reflects the 5 categories of IC in the 100 foot buffer; the wider shaded line reflects IC in the 1,000 foot buffer, while the shading in the larger sub-watershed reflects 3 levels of overall IC. In general, IC in the 100 foot buffer was quite low, although in one degraded sub-watershed, greater than 20 percent IC was identified. Percent IC in the 1,000 foot buffer generally reflected the overall IC in the sub-watershed. Later in this section, these estimates will be related to metrics measuring the health of benthic macroinvertebrates, useful indicators of the health of the aquatic ecosystem.



The Issue of Spatial Scale when Using the ISCs

The ISCs were not designed for analysis on smaller spatial scales. This can become an issue when looking at IC in a narrow stream corridor, because buildings are typically not randomly distributed on a streamside parcel. Buildings are usually situated out of the 100 year floodplain and away from water. The narrower the buffer, the more difficult it becomes to analyze impervious cover. To investigate this potential limitation, all impervious surfaces within 100 feet of a waterway in 5 sub-watersheds within the Dry Creek watershed were analyzed. Current IC within the 100 foot buffer was calculated in 2 ways: a) using the ISC with data on the areal extent of each land use category within the buffer, then correcting for non-conforming use, as described in Section III, and b) digitizing all impervious cover from high resolution aerial photographs (1 foot resolution) and comparing the results. In each case, estimates of the area

derived from using the ISCs in a calculation were double that obtained from direct digitizing off of aerial photos. The results of this analysis are summarized below.

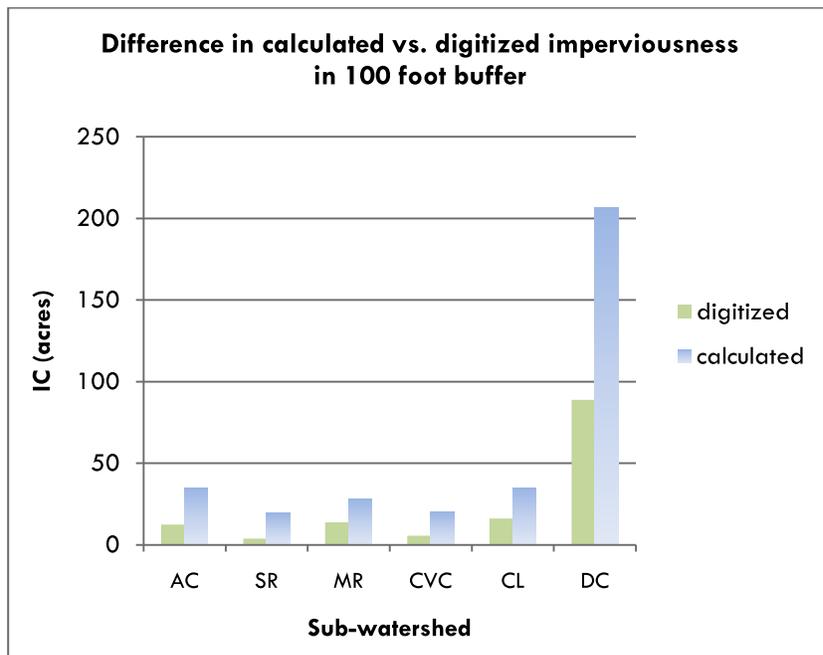


Figure 13. Differences in % IC in the 100 foot buffer using two methods of calculation. The percent IC was determined digitizing all hardscape and by calculation with the ISCs (summation of the area of IC in each sub-watershed x ISC for each LUC).

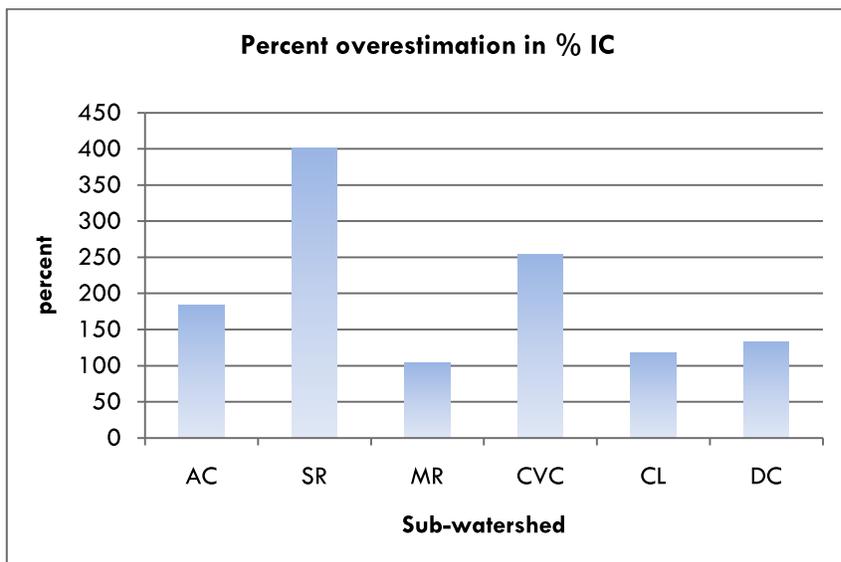


Figure 14. Percent overestimation of impervious cover using ISCs. Another way of viewing the data if Figure 3a is to calculate the percent overestimation that results from calculating impervious cover at a finer scale. For example, in the SR sub-watershed, percent IC in the 100 ft. buffer was 400 percent greater when estimates were made with calculations instead of heads-up digitizing.

This difference is not associated with the resolution of the aerial imagery, but with the method used to develop the ISCs, i.e., the fact that a 9 acre site was digitized to develop coefficients for each land use category. The discrepancy in impervious area confirms that the ISCs should not be applied to small areas; in this case, areas that were 100 feet wide. *Pending further study, we suggest not using the ISCs for sites of less than 2 acres or for a stream buffer that is less than 300 feet wide.* This recommended minimum would account for restrictions of the location of a structure

on a parcel, such as when local ordinances or a floodplain might restrict the siting of a house, building, or pavement that would restrict the random distribution of hardscape on a parcel.

Figure 15 illustrates the differences in IC at three different scales (100 and 1000 foot stream buffer and within the entire sub-watershed) in urban vs. rural sub-watersheds in the Dry Creek watershed. This analysis was performed to determine if greater IC was found in riparian buffers in urban sub-watersheds. In fact, the percent IC in the 100-foot buffer was twice as great in urban areas of the watershed, although the overall percent was less than 1 percent in both cases. The urban sub-watersheds have twice the amount of IC in the 1000 foot buffer, 25 percent compared to 12 percent. This relationship is the same for the entire sub-watershed. Probably of greatest interest is the fact that the level of IC in the urbanized sub-watersheds of Dry Creek is quite high, well above the level associated with adverse impacts on stream health (OEHHA, 2008).

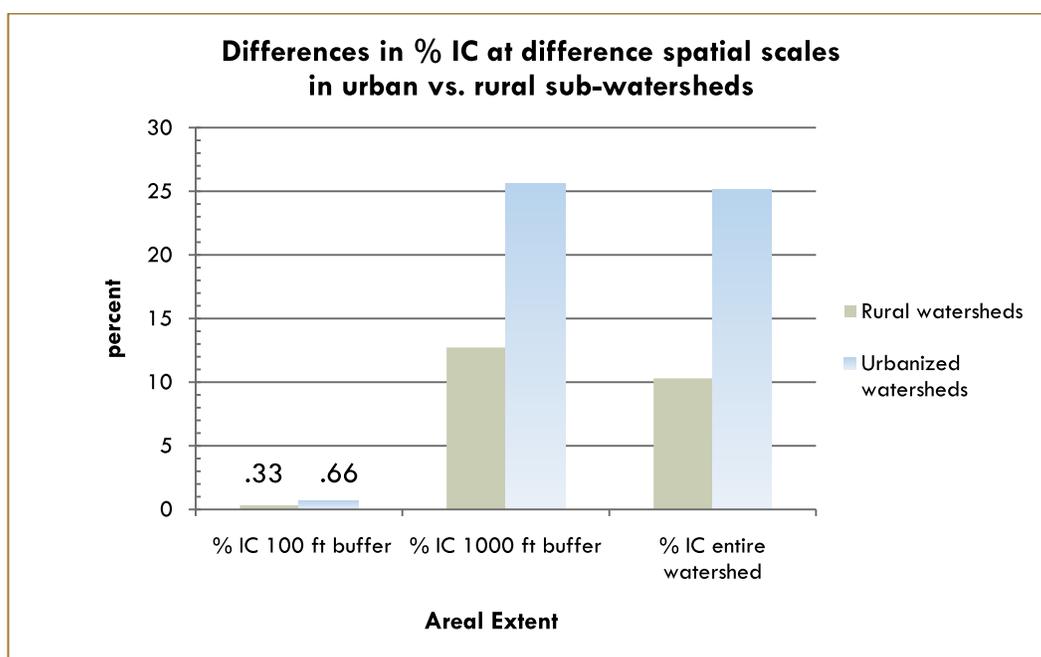


Figure 15. Comparison of % IC at 3 different spatial scales in rural and urbanized watersheds. Bars represent average % IC (n = 4-5) within the defined area.

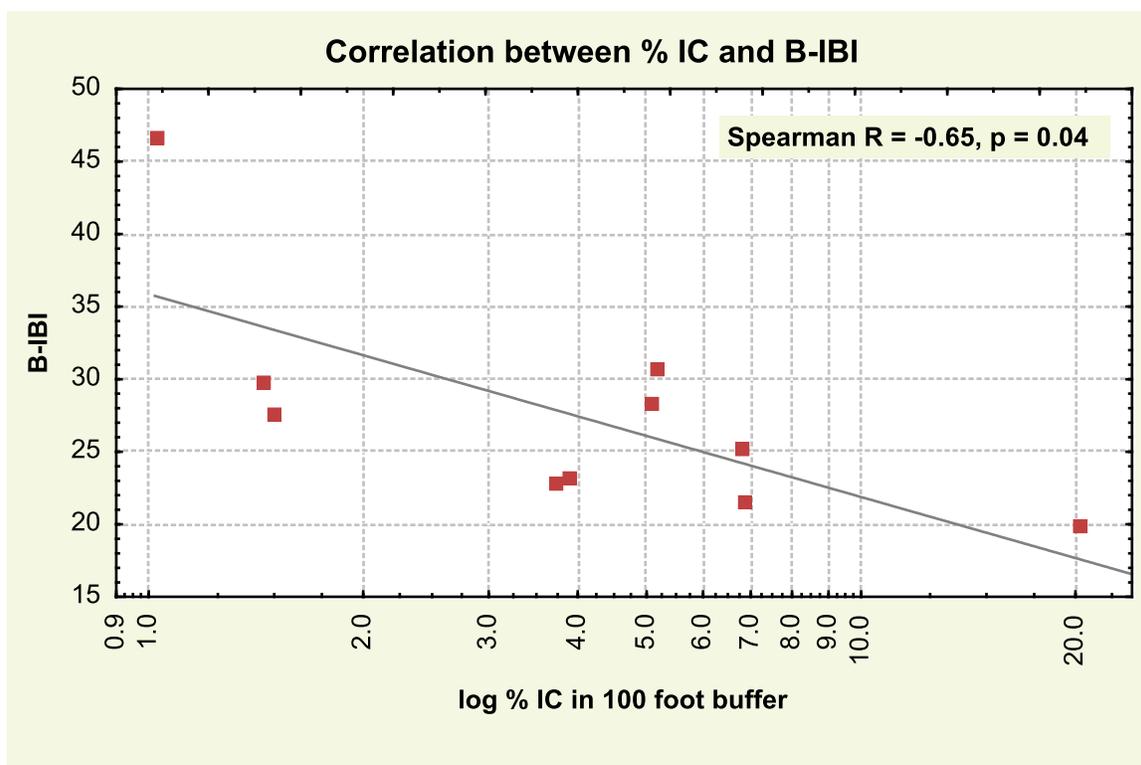
D. Examples of the Relationship between Impervious Cover and Aquatic Life

Significant efforts have been made to understand the relationship between impervious cover and aquatic life and habitat. In 1995, work by Schueler called attention to this linkage when he identified the general benchmarks of 10 percent and 25 percent impervious cover as indicators of threatened and degraded stream quality respectively. These relationships were established from data on waterways in the eastern United States. In the arid west, these benchmarks do not necessarily hold. Research done by Coleman et al. (2005) suggests that changes in aquatic

habitat, specifically stream widening, occurs at imperviousness as low as 2 or 3 percent in southern California.

Relating impervious cover to various benthic macroinvertebrate indices (BMI) can be used as another indicator of potential impacts. Measurement of the abundance and diversity of benthic macroinvertebrates serves as an indicator for all types of stressors, both chemical and physical, over time. Further, because benthic invertebrates share the same riffle habitat as salmonids, these indices can serve as a surrogate for conditions that might impact salmon and steelhead. This is especially useful because factors that impact the population of salmonids can be the result of conditions both in the ocean and in freshwater. In contrast, the aquatic phase of the life of insects is restricted to freshwater. Therefore, BMIs can help to explain the extent to which freshwater habitat might be influencing the health of anadromous fish without the confounding factors of oceanic conditions. This information can help guide watershed management as well as natural resource and land use policy.

One of the most commonly used metrics of aquatic life is the benthic index of biotic integrity (B-IBI). A B-IBI has been developed for Southern/Central California (Ode, Rehn, & May, 2005). This B-IBI is frequently used throughout California, even though the index is based on conditions in the southern part of the state. In addition to the B-IBI, metrics based on the abundance (percent contribution of dominant taxa), diversity (# of taxa), tolerance to perturbation (percent tolerant species) and feeding groups (e.g., percent scrapers) are also commonly used to characterize the population of macroinvertebrates.



In Figure 16 (above) the relationship between impervious cover within a 100 foot buffer around each tributary are correlated with the B-IBI. It appears that imperviousness, a surrogate for disturbance, close to the waterways adversely affects aquatic macroinvertebrate abundance and diversity.

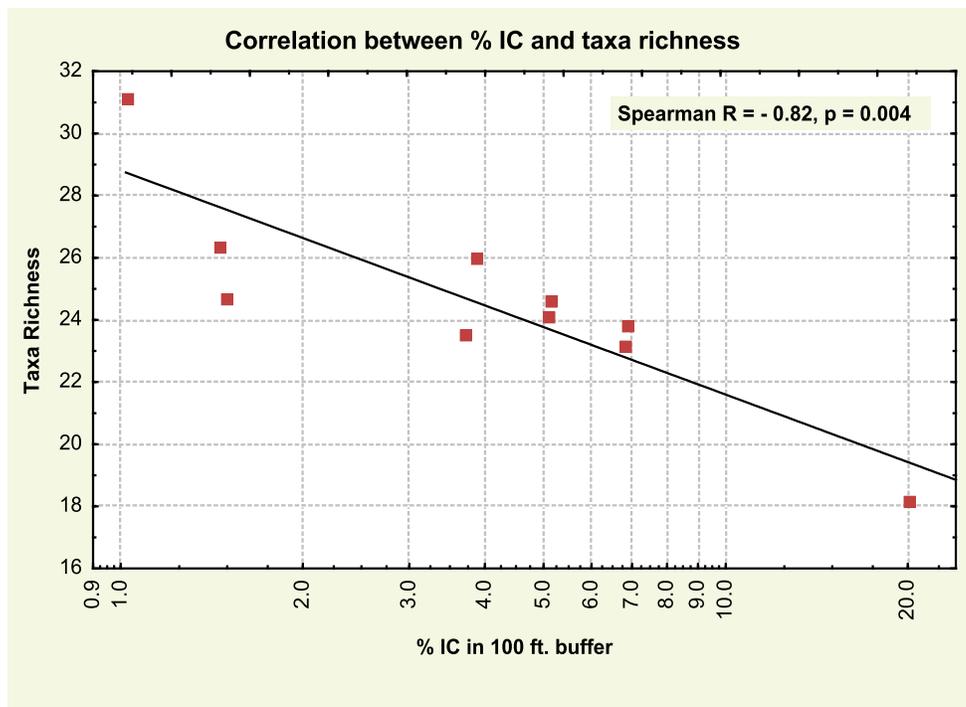


Figure 17. Impervious cover and taxa richness.

Figure 17 (above) illustrates the relationship between imperviousness in the 100 foot buffer and taxa richness, a measure of the diversity of benthic insects, in the Dry Creek watershed. A highly significant negative correlation was identified between these two factors. Data from Figures 5 and 6, as well as other findings, suggest that in the Dry Creek watershed that a 100 foot riparian buffer is inadequate to protect aquatic life. Additional data would be required to validate this hypothesis since the one data point at 20 percent impervious cover has a large influence on the relationship. This relationship might be useful to land use planners since it illustrates the importance of protecting wide streamside buffers to prevent adverse impacts on aquatic habitat and life.

One final example of how the analysis of imperviousness can be used to understand watershed conditions is illustrated in Figure 18 (below). The Shannon Index is a relative measure of species richness and evenness (i.e., the proportional distribution of organisms in the different taxa). Lower values suggest that fewer taxa were counted in the samples collected and that a few taxa accounted for the majority of the sample collected. This index provides a relative comparison of species abundance and distribution at different sites in the watershed. As impervious cover increases in the sub-watershed, abundance and evenness of species falls. One explanation for this and similar findings is that hydromodification, changes in the watershed hydrology associated with greater impervious cover, has altered the habitat for benthic macroinvertebrates, adversely impacting diversity. In the Dry Creek watershed, there is a mix of urban and rural residential

development. In rural areas, roadside ditches are used to route stormwater away from homes while other areas have a developed storm drain system that connects impervious cover and drains directly into the local creeks. The mix of land uses is one factor that complicates the analysis of the data. These issues and related factors are discussed further in the chapter on Benthic Macroinvertebrates in the *California Watershed Assessment Manual*, Vol. II (Shilling, 2008).

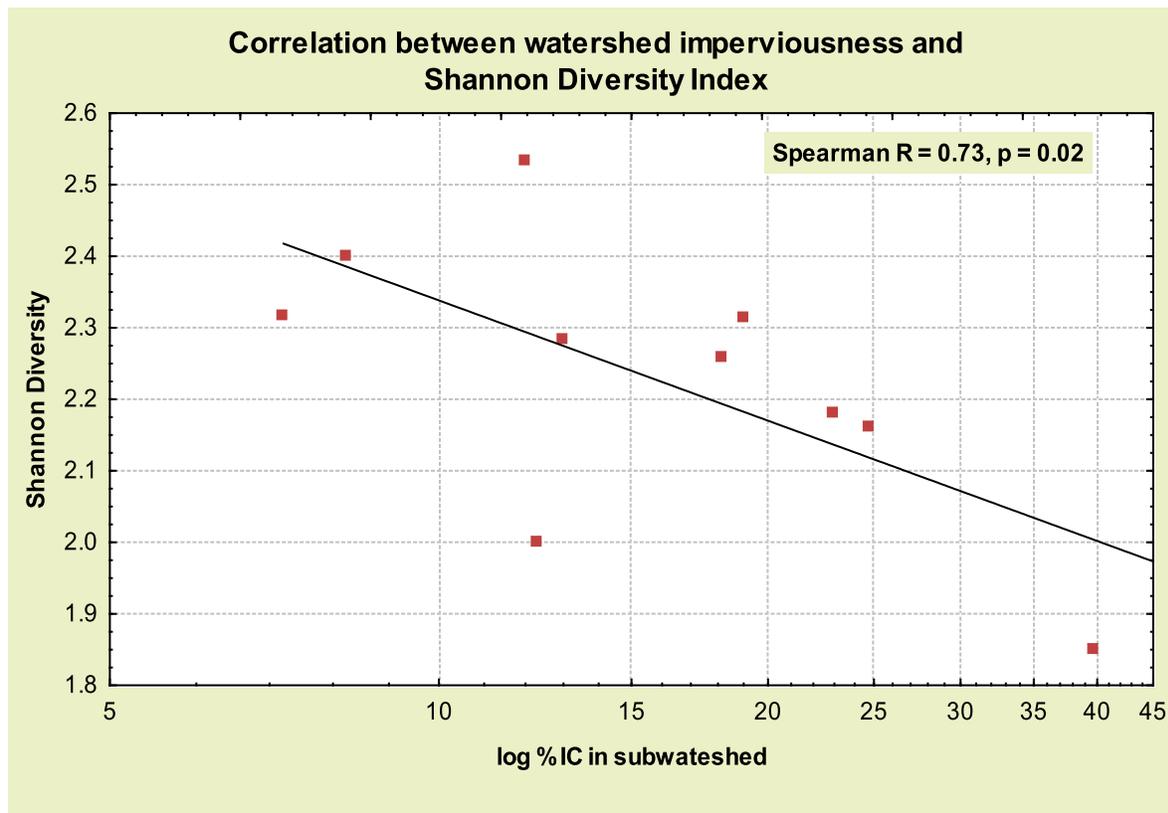


Figure 18. Correlation between impervious cover and Shannon Index.

Overall, percent impervious cover at various spatial scales and similar landscape metrics such as percent developed vs. natural land cover, can be helpful in interpreting metrics of aquatic life. One limitation of the measurement of imperviousness using the ISCs however, is that they do not assess *connected* impervious area, the uninterrupted network of hardscape and pipes. While connected impervious area is the most relevant metric for determining effects on aquatic life and habitat, it can be difficult and time consuming to measure (Sutherland, 1995).

E. Conclusion

Watershed impervious cover serves as a valuable metric for evaluation of the potential effects of hydromodification and urbanization in a watershed. The areal extent of imperviousness and its proximity to waterways influences the degree of impact caused by these alterations. The use of imperviousness as an indicator of habitat quality rests on the assumption that IC is connected, allowing rain that falls on hardscape to flow into the storm drain system and discharge into the

local waterway. This is generally the case. However as California advances requirements for stormwater and hydromodification management, including infiltration of stormwater at or near the source, the linkage between IC and stream health might not remain as strong. For the present, however, percent total imperviousness can be used as an indicator of landscape disturbance and a useful metric estimating the degree of alteration or, conversely, the degree to which more natural conditions are likely to exist in the waterway.

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SECTION VI. OVERALL SUMMARY

A set of California specific impervious surface coefficients have been developed; 11 for commercial land uses, a large set for residential land uses, and 3 for roads. They were developed from randomly selected sites in a coastal city, Santa Cruz; an interior valley city, Sacramento, and a Southern California city, Irvine. Sample sizes were determined in order to provide 90% confidence in the values with a 10% degree of precision. These ISC can be used in stormwater management, watershed and natural resources analysis, as well as for land-use planning. To facilitate the use of the ISCs, an Impervious Surface Calculator has been developed which simplifies the calculation of current and future impervious cover.

The California ISCs can be used in the analysis of stormwater runoff and sizing of stormwater management infrastructure as well as in the assessment of watershed health. Hydromodification is an important factor that links stormwater runoff to the health of the aquatic ecosystem. Impervious cover both cuts off sediment sources, increases runoff volume, and is a path for the introduction of toxic chemicals into stormwater. These chemical and physical stressors threaten to further degrade the state's waterways as regions of the state continue to urbanize. Impervious cover within riparian buffers, a surrogate for disturbance, appears to have a particularly strong correlation with adverse effects on aquatic life. The ISCs can be used by local and regional planning agencies as well as the development community to assess the potential impacts of new development projects and identify ways to 'plan with nature in mind'.

Additional information about hydromodification, including an easy-to-read fact sheet and more in-depth technical information, can be found at www.oehha.ca.gov. Click on the Ecotoxicology tab to navigate.

Staff of OEHHA's Ecotoxicology Program are available to answer questions or provide assistance in the use of the impervious surface coefficients.

Table 8: California Impervious Surface Coefficients

| Non-Residential Land Uses | | Residential Land Uses | |
|----------------------------|----------------|-----------------------|----------------|
| Land Use | California ISC | Density (du/acre) | California ISC |
| <i>Retail</i> | 86 | 0.5 | 0.14 |
| <i>Retail/Office</i> | 80 | 1 | 0.24 |
| <i>Coastal Development</i> | 23 | 2 | 0.35 |
| <i>Office Park</i> | 69 | 3 | 0.41 |
| <i>Urban Office</i> | 85 | 4 | 0.46 |
| <i>Light Industrial</i> | 81 | 5 | 0.49 |
| <i>Heavy Industrial</i> | 91 | 6 | 0.52 |
| <i>Public/Quasi-Public</i> | 50 | 7 | 0.54 |
| <i>Mixed Use</i> | 80 | 8 | 0.56 |
| <i>Open Space</i> | 2 | 9 | 0.58 |
| <i>Agriculture</i> | 4 | 10 | 0.60 |
| Roads | | 11 | 0.61 |
| <i>Urban/Suburb</i> | 91 | 12 | 0.62 |
| <i>Rural</i> | 43 | 13 | 0.64 |
| <i>Highways</i> | 47 | 14 | 0.65 |
| | | 15 | 0.66 |
| | | 20 | 0.70 |
| | | 25 | 0.74 |
| | | 30 | 0.76 |
| | | 35 | 0.79 |
| | | 40 | 0.81 |
| | | 45 | 0.83 |
| | | 50 | 0.84 |

Regression equation from which the values were derived:
 $Y=0.2449+0.352 \times \log \text{ density}$

USER'S NOTE PAGE

Appendix C. Water Development Impact Fees by Zone



MEMORANDUM—WATER DIFs BY ZONE ANALYSIS

TO: Carmen Narayanan/Valley Water

FROM: Allan Highstreet, NBS

DATE: November 3, 2023

SUBJECT: Santa Clara Valley Water District – Water Development Impact Fees by Zone

Background

Santa Clara Valley Water District (Valley Water) contracted with NBS to prepare development impact fees (DIF) for water supply and flood protection infrastructure. The DIFs calculated by NBS looked at Districtwide impact fees. After reviewing these fees, the District was interested in exploring whether it was possible to calculate a water impact fee by water zone. This memorandum describes the analysis of preparing water impact fees by zones.

Calculating Water Impact Fees by Zone

This memorandum steps through the same calculations as the Districtwide calculations. The main difference is in the demographics. Those changes then flow through the analysis.

DEMOGRAPHICS

The Districtwide water impact fee was based on the projected water supply growth expected in the Water Supply Master Plan 2040. That source did not forecast the growth by zone. The District provided data used in their financial projections, showing a breakdown of water demand growth by south county zones. This data is shown in Figure 1. It should be noted that the Districtwide impact fee calculation used projected demand for 2040, while the finance data is through 2050.

Figure 1. Water Growth Projections by Zone

| Water Use by Type | % of Current Water Demand | Current Water Demand ¹ | Estimated Yearly Growth (AF) ² | | | | | | |
|--------------------------------|---------------------------|-----------------------------------|---|--------------|-------------|-------------|---------------|----------------|-------------|
| | | | 2050 | | | | Total Demand | Total Growth | % Growth |
| | | | Zone W-2 | Zone W-5 | Zone W-7 | Zone W-8 | | | |
| Groundwater | 19% | 70,157 | 7,550 | 1,845 | 516 | 39 | 9,950 | 80,107 | 19% |
| Treated Water | 81% | 296,843 | 42,100 | 0 | 0 | 0 | 42,100 | 338,943 | 81% |
| Total Water Growth | | 367,000 | 49,650 | 1,845 | 516 | 39 | 52,050 | 419,050 | 100% |
| <i>Percent of Total Growth</i> | | | <i>95.4%</i> | <i>3.5%</i> | <i>1.0%</i> | <i>0.1%</i> | | | |

1. Estimated water demand for 2025. Source file: *Water Supply Master Plan 2040_11.01.2019_v2.pdf*, page 20.

2. Source files: *Water Supply Master Plan 2040_11.01.2019_v2.pdf*, page 20 & *Water_Demand_Growth_Finance Data Request_08-18-2023.xlsx*.

Water growth projections were then proportioned to existing and future customers by zone. This is shown in Figure 2. Figure 2 shows that existing customers represent 87.6 percent of the future demand, with 12.4 percent for future customers. In the Districtwide impact fees, they were slightly different, 87.7 percent for existing customers, 12.3 percent for future customers. This variation stems from the different future demand estimates, FY 2040 in the Districtwide analysis versus 2050 for the zone analysis.

Figure 2. Existing vs. Future Customers Allocation

| Agencies / Cities | Current Water Supply | Expected Future Water Supply (thru FY 2049/50) | Total | Allocation Factors | | | | | | | | |
|----------------------------------|----------------------|--|----------------|----------------------------|----------|----------|----------|--------------------------|----------|----------|----------|---------------|
| | | | | Existing Customers - 87.6% | | | | Future Customers - 12.4% | | | | Total |
| | | | | Zone W-2 | Zone W-5 | Zone W-7 | Zone W-8 | Zone W-2 | Zone W-5 | Zone W-7 | Zone W-8 | |
| Water Supply Growth Through 2050 | 367,000 | 52,050 | 419,050 | 83.5% | 3.1% | 0.9% | 0.1% | 11.8% | 0.4% | 0.1% | 0.0% | 100.0% |

VALUE OF EXISTING ASSETS

All the assets put into service are tracked in the District’s Asset Management Planning Tool (AMPT), which tracks installation date, original costs, asset life, and also estimates replacement costs. The existing assets are summarized in Figure 3, allocated by zone.

Figure 3. Original and Replacement Values

| Asset Class ¹ | Program Cost ¹ | | Asset Cost Less Depreciation | Replacement Values ² | | System Buy-In Cost Basis | | | | |
|--|---------------------------|-----------------------|------------------------------|---------------------------------|-----------------------|--------------------------|----------------------|----------------------|-------------------|-----------------------|
| | Asset Cost | Depreciation to Date | | Asset Cost | Depreciation to Date | Zone W-2 | Zone W-5 | Zone W-7 | Zone W-8 | Total |
| | | | | | | | | | | |
| Subtotal: Electrical | \$ 66,631,014 | \$ 728,709 | \$ 65,902,304 | \$ 100,653,534 | \$ 758,672 | \$ 86,752,732 | \$ 5,838,419 | \$ 7,302,398 | \$ 1,313 | \$ 99,894,861 |
| Subtotal: Fleet | \$ 637,411 | \$ - | \$ 637,411 | \$ 758,835 | \$ - | \$ 621,216 | \$ 59,774 | \$ 77,844 | \$ - | \$ 758,835 |
| Subtotal: Instrumentation | \$ 16,266,480 | \$ 967,889 | \$ 15,298,591 | \$ 20,524,753 | \$ 1,238,272 | \$ 18,255,253 | \$ 726,915 | \$ 301,564 | \$ 2,749 | \$ 19,286,481 |
| Subtotal: Mechanical | \$ 74,960,125 | \$ 3,655,442 | \$ 71,304,682 | \$ 103,281,307 | \$ 4,292,920 | \$ 91,150,083 | \$ 5,856,883 | \$ 1,962,321 | \$ 19,100 | \$ 98,988,387 |
| Subtotal: Planning & Engineering Cost | \$ 50,711,797 | \$ - | \$ 50,711,797 | \$ 52,233,151 | \$ - | \$ 26,116,575 | \$ 26,116,575 | \$ - | \$ - | \$ 52,233,151 |
| Subtotal: WQL Lab | \$ 7,589,903 | \$ 1,741 | \$ 7,588,162 | \$ 11,257,029 | \$ 1,793 | \$ 8,602,143 | \$ 2,653,093 | \$ - | \$ - | \$ 11,255,236 |
| Total: Fixed Assets | \$ 600,685,807 | \$ 132,567,223 | \$ 468,118,584 | \$ 762,965,058 | \$ 155,500,925 | \$ 521,749,120 | \$ 62,820,153 | \$ 22,725,166 | \$ 169,695 | \$ 607,464,133 |

1. The original asset cost provided by the District and depreciation calculated by NBS (depreciation is as of June 1, 2022).

2. Replacement values are calculated by escalating the original values from service date to 2022 values using historical cost inflation factors provided by the District in its Asset Management Planning Tool.

The existing assets were then distributed to existing and future customers, also disaggregated by zones. These results are shown in Figure 4.

Figure 4. Cost Allocation to Existing and Future Customers

| Asset Class ¹ | System Buy-In Cost Basis ² | Distribution of Cost Basis (\$) | | | | | | | | | | Total System Buy-In |
|-----------------------------|---------------------------------------|---------------------------------|----------------------|----------------------|-------------------|--------------------------|----------------------|---------------------|---------------------|------------------|------------------------|-----------------------|
| | | Existing Customers | | | | | Future Customers | | | | | |
| | | Zone W-2 | Zone W-5 | Zone W-7 | Zone W-8 | Total Existing Customers | Zone W-2 | Zone W-5 | Zone W-7 | Zone W-8 | Total Future Customers | |
| Civil | 325,047,182 | \$ 254,199,165 | \$ 18,889,480 | \$ 11,456,249 | \$ 128,333 | \$ 284,673,227 | \$ 36,051,952 | \$ 2,679,012 | \$ 1,624,790 | \$ 18,201 | \$ 40,373,955 | \$ 325,047,182 |
| Electrical | 99,894,861 | 75,977,216 | 5,113,232 | 6,395,371 | 1,150 | 87,486,968 | 10,775,515 | 725,187 | 907,027 | 163 | 12,407,893 | 99,894,861 |
| Fleet | 758,835 | 544,055 | 52,350 | 68,175 | - | 664,580 | 77,161 | 7,425 | 9,669 | - | 94,255 | 758,835 |
| Instrumentation | 19,286,481 | 15,987,777 | 636,625 | 264,107 | 2,407 | 16,890,916 | 2,267,476 | 90,290 | 37,457 | 341 | 2,395,565 | 19,286,481 |
| Mechanical | 98,988,387 | 79,828,375 | 5,129,402 | 1,718,582 | 16,727 | 86,693,086 | 11,321,708 | 727,481 | 243,739 | 2,372 | 12,295,300 | 98,988,387 |
| Planning & Engineering Cost | 52,233,151 | 22,872,648 | 22,872,648 | - | - | 45,745,296 | 3,243,927 | 3,243,927 | - | - | 6,487,855 | 52,233,151 |
| WQL Lab | 11,255,236 | 7,533,675 | 2,323,554 | - | - | 9,857,229 | 1,068,468 | 329,539 | - | - | 1,398,008 | 11,255,236 |
| Total: Fixed Assets | \$ 607,464,133 | \$ 456,942,912 | \$ 55,017,291 | \$ 19,902,484 | \$ 148,617 | \$ 532,011,304 | \$ 64,806,209 | \$ 7,802,861 | \$ 2,822,682 | \$ 21,078 | \$ 75,452,829 | \$ 607,464,133 |
| | | | | | | 87.6% | | | | | 12.4% | 100.0% |

1. The original asset cost provided by the District and depreciation calculated by NBS (depreciation is as of June 1, 2022).

2. Replacement values are calculated by escalating the original values from service date to 2022 values using historical cost inflation factors provided by the District in its Asset Management Planning Tool. See Exhibit 2. Existing Assets Detail from the Excel model.

VALUE OF FUTURE IMPROVEMENTS

Projected new projects are outlined in several sources; Valley Water’s 15-Year Capital Improvement Program (FY 2023 through FY 2037) provided by District staff. NBS also included “Master Plan” projects from the 2020 Water Supply Master Plan, excluding all other “active” and “inactive” projects. Total costs of the “Master Plan” projects were allocated over a 20-year period. Figure 5 shows the future assets, split between existing and future users, as well as by zone.



Figure 5. Summary of Planned Capital Projects

| Funded Status | Cost Center | Distribution of Cost Basis (\$)² | | | | | | | | | | |
|---|---|----------------------------------|-----------------------|-----------------------|---------------------|--------------------------|-----------------------|----------------------|----------------------|---------------------|-------------------------|-------------------------------|
| | | Existing Customers | | | | | Future Customers | | | | | Total System Development Cost |
| | | Zone W-2 | Zone W-5 | Zone W-7 | Zone W-8 | Total Existing Customers | Zone W-2 | Zone W-5 | Zone W-7 | Zone W-8 | Total Future Customers | |
| Capital Improvement Program¹ | | | | | | | | | | | | |
| Funded Capital Projects | Source of Supply | \$ 1,789,661,761 | \$ 100,939,031 | \$ 115,983,994 | \$ 87,520 | \$ 2,006,672,306 | \$ 253,819,876 | \$ 14,315,740 | \$ 16,449,501 | \$ 12,413 | \$ 284,597,530 | \$ 2,291,269,836 |
| | Raw Water Transmission & Distribution | 242,926,510 | 4,431,529 | 5,463,479 | 4,304 | 252,825,823 | 34,453,201 | 628,504 | 774,861 | 610 | 35,857,177 | 288,683,000 |
| | Water Treatment | 2,027,607,949 | 207,027,280 | 135,469,732 | 973,397 | 2,371,078,358 | 287,566,740 | 29,361,771 | 19,213,078 | 138,053 | 336,279,642 | 2,707,358,000 |
| | Treated Water Transmission & Distribution | 7,273,440 | - | - | - | 7,273,440 | 1,031,560 | - | - | - | 1,031,560 | 8,305,000 |
| | Administration and General | 162,445,075 | 20,987,438 | 7,349,661 | 403,762 | 191,185,937 | 23,038,872 | 2,976,556 | 1,042,370 | 57,264 | 27,115,063 | 218,301,000 |
| | Miscellaneous Projects | 162,574,553 | - | - | - | 162,574,553 | 23,057,236 | - | - | - | 23,057,236 | 185,631,788 |
| | Capital Placeholder | 891,232,853 | 208,579,343 | 58,139,515 | 4,284,435 | 1,162,236,146 | 126,399,646 | 29,581,893 | 8,245,672 | 607,643 | 164,834,854 | 1,327,071,000 |
| | Project Carryforward - Miscellaneous Projects | 6,015,632 | 1,407,866 | 392,429 | 28,919 | 7,844,846 | 853,171 | 199,671 | 55,657 | 4,101 | 1,112,600 | 8,957,446 |
| Fund Transfers for Capital Projects | Raw Water Transmission & Distribution | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - |
| | General Fund | 11,958,671 | 2,798,743 | 780,123 | 57,489 | 15,595,026 | 1,696,046 | 396,933 | 110,641 | 8,153 | 2,211,774 | 17,806,800 |
| | Information Technology | 20,575,699 | 4,815,426 | 1,342,254 | 98,914 | 26,832,294 | 2,918,161 | 682,951 | 190,366 | 14,029 | 3,805,506 | 30,637,800 |
| Unfunded Capital Projects | Source of Supply | \$ 155,905,884 | \$ 16,140,111 | \$ 9,517,951 | \$ 173,964 | \$ 181,737,910 | \$ 22,111,448 | \$ 2,289,081 | \$ 1,349,889 | \$ 24,673 | \$ 25,775,090 | \$ 207,513,000 |
| | Water Treatment | 4,390,636 | 454,539 | 268,045 | 4,899 | 5,118,120 | 622,705 | 64,465 | 38,016 | 695 | 725,880 | 5,844,000 |
| Grand Total (Excl. Projects from Water Supply Master Plan) | | \$ 5,482,568,662 | \$ 567,581,307 | \$ 334,707,185 | \$ 6,117,603 | \$ 6,390,974,757 | \$ 777,568,662 | \$ 80,497,567 | \$ 47,470,052 | \$ 867,633 | \$ 906,403,913 | \$ 7,297,378,670 |
| Master Plan Projects | | \$ 1,567,375,802 | \$ 162,262,118 | \$ 95,687,254 | \$ 1,748,922 | \$ 1,827,074,096 | \$ 222,294,034 | \$ 23,012,924 | \$ 13,570,904 | \$ 248,042 | \$ 259,125,904 | \$ 2,086,200,000 |
| Grand Total (Incl. Projects from Water Supply Master Plan) | | \$ 7,049,944,464 | \$ 729,843,425 | \$ 430,394,439 | \$ 7,866,525 | \$ 8,218,048,853 | \$ 999,862,696 | \$103,510,491 | \$ 61,040,955 | \$ 1,115,675 | \$ 1,165,529,817 | \$ 9,383,578,670 |

1. The 15-year Capital Improvement Program (CIP) was provided by District staff. Source file: FY23 CIP By Fund v8.xlsx & FY24_Adopted_CIP_WUE_Fund_61_08-02-2023.xlsx.
2. Capital projects are allocated proportionately based on expected customer growth. See Figure 1.

ADJUSTMENTS FOR CASH RESERVES AND DEBT

Before the impact fees are developed, an adjustment is applied to the cost basis to account for existing unrestricted cash reserves and outstanding debt principal.

Adjustments for Cash Balances. Existing cash reserves are treated as an asset because they were funded by current customers and are available to pay for capital and/or operating costs of the utility that future customers will benefit from, once connected. The cash reserves are, in a sense, no different than any other utility asset. The existing cash reserves allocated to current and future customers are summarized in Figure 6 using the same allocation factors from Figure 2.

Figure 6. Cash Reserves Accumulated by Existing Water System Customers

| Cash Reserves | Cash Amount ¹ | \$ - Allocation ² | | | | | | | | | | |
|--|--------------------------|------------------------------|----------------------|---------------------|-------------------|--------------------------|----------------------|---------------------|-------------------|------------------|------------------------|--|
| | | Existing Customers | | | | | Future Customers | | | | | |
| | | Zone W-2 | Zone W-5 | Zone W-7 | Zone W-8 | Total Existing Customers | Zone W-2 | Zone W-5 | Zone W-7 | Zone W-8 | Total Future Customers | |
| Restricted Net Position (Fund 61) | | | | | | | | | | | | |
| WU Debt Service Reserves | \$ 6,999 | \$ 5,847 | \$ 217 | \$ 61 | \$ 5 | \$ 6,130 | \$ 829 | \$ 31 | \$ 9 | \$ 1 | \$ 869 | |
| WU San Felipe Emergency Reserve | 3,348,086 | 2,797,018 | 103,928 | 29,084 | 2,192 | 2,932,222 | 396,689 | 14,740 | 4,125 | 311 | 415,864 | |
| GP5 Reserve | 9,669,736 | 8,078,177 | 300,158 | 83,998 | 6,330 | 8,468,663 | 1,145,692 | 42,570 | 11,913 | 898 | 1,201,073 | |
| WU Rate Stabilization Reserve | 25,069,620 | 20,943,366 | 778,185 | 217,772 | 16,412 | 21,955,734 | 2,970,306 | 110,367 | 30,886 | 2,328 | 3,113,886 | |
| WU State Water Project Tax Reserve | TBD | - | - | - | - | - | - | - | - | - | - | |
| WU State Water Project - Encumbrances | TBD | - | - | - | - | - | - | - | - | - | - | |
| WUE SVAWPC Reserve | 1,298,138 | 1,084,475 | 40,295 | 11,277 | 850 | 1,136,897 | 153,806 | 5,715 | 1,599 | 121 | 161,241 | |
| WU Supplemental Water Supply Reserve | 15,477,000 | 12,929,613 | 480,421 | 134,444 | 10,132 | 13,554,609 | 1,833,750 | 68,136 | 19,068 | 1,437 | 1,922,391 | |
| Drought Reserve | 10,000,000 | 8,354,082 | 310,409 | 86,867 | 6,546 | 8,757,905 | 1,184,823 | 44,024 | 12,320 | 928 | 1,242,095 | |
| Unrestricted Net Position | | | | | | | | | | | | |
| <i>Committed Fund Balance</i> | | | | | | | | | | | | |
| Current Authorized Projects Reserve | 85,292,965 | 71,254,443 | 2,647,574 | 740,912 | 55,837 | 74,698,767 | 10,105,705 | 375,494 | 105,080 | 7,919 | 10,594,198 | |
| Operating and Capital Reserve* | 86,984,133 | 72,667,259 | 2,700,070 | 755,603 | 56,944 | 76,179,876 | 10,306,079 | 382,939 | 107,164 | 8,076 | 10,804,258 | |
| Water Inventory Reserve | 129,968,912 | 108,577,096 | 4,034,358 | 1,128,998 | 85,084 | 113,825,536 | 15,399,013 | 572,175 | 160,121 | 12,067 | 16,143,376 | |
| <i>Assigned Fund Balance</i> | | | | | | | | | | | | |
| Encumbrances Reserve | 125,525,283 | 104,864,852 | 3,896,424 | 1,090,397 | 82,175 | 109,933,848 | 14,872,522 | 552,613 | 154,646 | 11,654 | 15,591,435 | |
| Market Valuation Reserve | 2,394,921 | 2,000,737 | 74,341 | 20,804 | 1,568 | 2,097,449 | 283,756 | 10,543 | 2,951 | 222 | 297,472 | |
| Cash Net of Unspent Capacity Fees | \$ 495,035,794 | \$ 413,556,965 | \$ 15,366,379 | \$ 4,300,216 | \$ 324,074 | \$ 433,547,634 | \$ 58,652,970 | \$ 2,179,346 | \$ 609,881 | \$ 45,962 | \$ 61,488,159 | |

1. Total beginning cash balance for FY2020/21 provided by District Staff. Source file: 2021 Reserve WS to Budget.pdf.
2. Cash reserves are allocated proportionately in the same manner as existing assets (in total) in Figure 4.

Adjustments for Debt Principal. Since new development pay their share of existing asset values, including the debt payment principals on those same assets would double count the asset values included in the capacity fees. Therefore, future customers are credited approximately \$69.8 million as shown in Figure 7.

Figure 7. Outstanding Water System Debt Principal

| Description of Debt ¹ | Principal Amount | \$ - Allocation ² | | | | | | | | | | |
|----------------------------------|-----------------------|------------------------------|----------------------|---------------------|-------------------|--------------------------|----------------------|---------------------|-------------------|------------------|------------------------|--|
| | | Existing Customers | | | | | Future Customers | | | | | |
| | | Zone W-2 | Zone W-5 | Zone W-7 | Zone W-8 | Total Existing Customers | Zone W-2 | Zone W-5 | Zone W-7 | Zone W-8 | Total Future Customers | |
| 2016 Bonds | \$ 181,530,000 | \$ 151,651,652 | \$ 5,634,863 | \$ 1,576,892 | \$ 118,838 | 158,982,246 | \$ 21,508,089 | \$ 799,168 | \$ 223,644 | \$ 16,854 | \$ 22,547,754 | |
| 2016 COPs | 71,585,000 | 59,802,697 | 2,222,066 | 621,836 | 46,863 | 62,693,461 | 8,481,554 | 315,146 | 88,192 | 6,646 | 8,891,539 | |
| 2017 Bonds | 47,750,000 | 39,890,742 | 1,482,205 | 414,789 | 31,259 | 41,818,995 | 5,657,529 | 210,215 | 58,828 | 4,433 | 5,931,005 | |
| 2019 Bonds | 126,615,000 | 105,775,210 | 3,930,249 | 1,099,863 | 82,888 | 110,888,211 | 15,001,634 | 557,410 | 155,989 | 11,756 | 15,726,789 | |
| 2020 Bonds | 92,650,000 | 77,400,571 | 2,875,944 | 804,821 | 60,653 | 81,141,988 | 10,977,383 | 407,882 | 114,144 | 8,602 | 11,508,012 | |
| 2020 COPs | 41,765,000 | 34,890,824 | 1,296,425 | 362,799 | 27,341 | 36,577,389 | 4,948,412 | 183,866 | 51,454 | 3,878 | 5,187,611 | |
| Total | \$ 561,895,000 | \$ 469,411,695 | \$ 17,441,753 | \$ 4,881,000 | \$ 367,843 | \$ 492,102,291 | \$ 66,574,601 | \$ 2,473,687 | \$ 692,251 | \$ 52,170 | \$ 69,792,709 | |

1. Source file: WU Debt Service Schedule as of 03-29-22.xlsx.
2. Outstanding debt is allocated proportionately in the same manner as existing assets (in total) in Figure 4.



DEVELOPMENT IMPACT FEE

The sum of the existing and future planned asset values (i.e., the system buy-in and system development costs), along with the adjustment for cash reserves and debt principals, defines the total cost basis allocated to future customers. The total adjusted cost basis is then divided by the projected water supply growth (in AF) expected to be developed through 2050. Figure 8 summarizes the adjusted cost basis allocated to future customers. Figure 9 shows the calculation of the water supply capacity fee by zone. As Figure 9 shows, there is a wide variance on what the fee would be by zone, driven by the small amount of projected water supply in every zone but Zone W-2.

Figure 8. Development of the Cost Basis for New Customers

| System Asset Values Allocated to Future Development | Zone W-2 | Zone W-5 | Zone W-7 | Zone W-8 |
|---|-------------------------|-----------------------|----------------------|---------------------|
| System Buy-In and Expansion Components | | | | |
| Existing System Buy-In ¹ | \$ 64,806,209 | \$ 7,802,861 | \$ 2,822,682 | \$ 21,078 |
| Future System Expansion ² | 999,862,696 | 103,510,491 | 61,040,955 | 1,115,675 |
| Subtotal: System Buy-In and Expansion Components | \$ 1,064,668,904 | \$ 111,313,352 | \$ 63,863,637 | \$ 1,136,752 |
| Adjustments to Cost Basis: | | | | |
| Cash Reserves ³ | \$ 58,652,970 | \$ 2,179,346 | \$ 609,881 | \$ 45,962 |
| Outstanding Long-Term Debt (Principal) ⁴ | (66,574,601) | (2,473,687) | (692,251) | (52,170) |
| Subtotal: Adjustments to Cost Basis | \$ (7,921,631) | \$ (294,341) | \$ (82,370) | \$ (6,208) |
| Total: Cost Basis for New Development | \$ 1,056,747,273 | \$ 111,019,011 | \$ 63,781,267 | \$ 1,130,545 |

1. Refer to Figure 4.
2. Refer to Figure 5.
3. Refer to Figure 6.
4. Refer to Figure 7.

Figure 9. Development of the Water Supply Capacity Fee

| Capacity Fee Development | Total Capacity Fee | | | |
|---|--------------------|-----------------|------------------|-----------------|
| | Zone W-2 | Zone W-5 | Zone W-7 | Zone W-8 |
| Cost Basis for New Development | \$ 1,056,747,273 | \$ 111,019,011 | \$ 63,781,267 | \$ 1,130,545 |
| Projected Water Supply (through 2050) ¹ | 49,650 | 1,845 | 516 | 39 |
| Water Supply Capacity Fee (Per AF)² | \$21,300 | \$60,200 | \$123,500 | \$29,100 |

1. Refer to Figure 1 for growth projections.
2. For example, if a typical single family household uses 0.4 acre feet of water per year, the capacity fee for Zone W-2 would be \$8,520 (\$21,300 x 0.4).

RECOMMENDATIONS

The District has the data required to prepare water development impact fees by zone. However, because the expected future water supply amounts are so insignificant in Zones W-5, W-7, and W-8 when compared to Zone W-2 supply, the water supply capacity fee tends to vary widely. If the District were interested in pursuing water supply capacity fees by zone, we would recommend further exploration of the cost allocations for Zones W-5, W-7, and W-8.

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Santa Clara Valley Water District

File No.: 26-0283

Agenda Date: 3/17/2026

Item No.: 4.2.

COMMITTEE AGENDA MEMORANDUM Board Policy and Monitoring Committee

Government Code § 84308 Applies: Yes No
(If "YES" Complete Attachment A - Gov. Code § 84308)

SUBJECT:

Provide Feedback for the Upcoming Audit of the Board Appointed Officers Complaint Process.

RECOMMENDATION:

Provide feedback for the upcoming audit of the Board Appointed Officers Complaint Process.

SUMMARY:

At the 2/9/2026 Board Policy and Monitoring Committee (Committee) meeting, the Committee directed that preliminary work be conducted to facilitate the upcoming audit of the Complaint Process for Board Appointed Officers (BAOs).

The purpose of today's discussion is to brainstorm ideas and to identify areas that could be helpful to the Chief Executive Auditor before they begin the audit of the complaint process for BAOs.

The following are questions to begin the discussion by the Committee. These are questions that arose during the most recent process.

General Questions:

1. The process is intended for the Board so should it be managed by the Board?
2. Who are the key participants that should be involved in this process as outlined in the process questions?
 - a. What are the roles and responsibilities of each participant?
 - b. What are the reporting relationships of each participant?

Procedural Questions:

To facilitate Committee discussion, the procedural questions are organized into four stages: pre-investigation, management of investigation, review deliverables, and post-investigation. Identifying who receives information and by what means is critical to maintaining impartiality and confidentiality

throughout stages of this process.

Pre-Investigation - Intake of complaint to potential investigation

| | |
|--------------------------|---|
| Complaint received. | <i>Who receives the complaint?</i> |
| Complaint intake. | <i>Who does the intake of the complaint?</i> |
| Complaint reviewed. | <i>Who determines if an investigation is needed?</i> |
| Investigation Warranted. | <i>Is the BAO placed on paid administrative leave?</i> |
| Investigation Begins | <i>Who selects the investigator? Who negotiates scope, schedule, costs, and identifies deliverables? Who approves the contract?</i> |

Management of Investigation - Initial meeting to submittal of deliverables

| | |
|-----------------------------|--|
| Initial Meeting | <i>Who attends?</i> |
| Ongoing Management | <i>Who oversees the management of progress per the approved scope, manages the budget and tracks payment?</i> |
| Potential Scope Changes | <i>Who reviews and approves necessary changes (change management) and develops revised scope, schedule and costs?</i> |
| Ongoing Communication | <i>What regular communication is provided and how often? How are updates provided and to whom?</i> |
| Completion of Investigation | <i>What determines the completion of the investigation? Is it data completion, completion of any deliverables or a final report?</i> |
| Submission of Deliverables | <i>Who receives the deliverables? Is there an initial draft followed by a final report on deliverables?</i> |

Review of Deliverables - Review of deliverables to close out of investigation and contract

| | |
|-------------------|---|
| Deliverables | <i>Who reviews? Are there other reviewers besides Board members?</i> |
| Purpose of Review | <i>Is the review for information, comments, questions?</i> |
| Board Action | <i>Does the Board need to accept the completion of the data, completion of the deliverables or a final report? If so, in what format?</i> |

| | |
|-----------------------------|---|
| Communication on Outcomes | <i>How are results communicated and to whom? Is there a need for a Communications Plan? What documents are released? What is the timing and methodology of the release?</i> |
| Completion of Investigation | <i>What determines the final completion of the investigation? Who closes out the contract with the investigator?</i> |

Post-Investigation

| | |
|--------------------|---|
| Communication Plan | <i>Who implements the communication plan?</i> |
|--------------------|---|

ENVIRONMENTAL JUSTICE IMPACT:

There are no environmental justice impacts associated with this item.

ATTACHMENTS:

None.

UNCLASSIFIED MANAGER:

Wendy Ho, 408-630-3874



Santa Clara Valley Water District

File No.: 26-0216

Agenda Date: 3/17/2026

Item No.: 4.3.

COMMITTEE AGENDA MEMORANDUM Board Policy and Monitoring Committee

Government Code § 84308 Applies: Yes No
(If "YES" Complete Attachment A - Gov. Code § 84308)

SUBJECT:

Receive and Discuss Board Member Travel Policy.

RECOMMENDATION:

- A. Receive and discuss Board Member travel policies to determine if additional language is necessary related to cancellations.
- B. Provide direction to staff as needed;
- C. Recommend additions to GP-10 be presented to the full board for approval.

SUMMARY:

At the December 9, 2025 Board Meeting, Director Ballard requested that the Board Policy and Monitoring Committee review the Board's travel policy to determine if language should be included related to cancellations.

While the Board does not have a separate travel policy, Governance Policy 10.6.1 Per Diem Meetings, Events, and Activities Compensation describes travel reimbursements associated with board members attending meetings, events, conferences and training.

The current board governance policies do not have a reference to cancellations. Below is sample language for consideration from research conducted on cancellations related to events and travel. Staff recommends all language be added to GP-10.

Cancellations for event registrations and travel

- Board members shall provide adequate notice for the cancellation of events and travel reservations, unless there is an extenuating circumstance.
- If a Board member cancels a reservation for personal reasons or convenience, they may be responsible for costs of any non-refundable expenses.

- If a cancellation is due to circumstances beyond control such as illness or personal emergency, or to accommodate District needs, the District will cover the costs. Documentation supporting the reason for cancellation may be requested.

ENVIRONMENTAL JUSTICE IMPACT:

There are no environmental justice impacts associated with this item.

ATTACHMENTS:

Attachment 1: Board Governance Policy GP-10

UNCLASSIFIED MANAGER:

Candice Kwok-Smith, 408-630-3193

Governance Policies of the Board

Title: Cost of Governance
Category: Governance Process

Policy No. GP-10

Adopted: September 28, 1999
Chair: Larry Wilson

Latest Revision: January 8, 2019
Chair: Linda J. LeZotte

The Board of Directors revised and adopted this policy at its public meeting on the latest revision date.

The Board will invest in its governance capacity.

Accordingly:

- 10.1. Board skills, methods, and supports will be sufficient to assure governing with excellence.
 - 10.1.1. Training and education will be used by Board members to maintain and increase governance skills and understanding.
 - 10.1.2. Outside monitoring assistance will be arranged so that the Board can exercise confident control over organizational performance. This includes, but is not limited to, fiscal audit.
 - 10.1.3. Outreach mechanisms will be used as needed to ensure the Board's ability to listen to public viewpoints and values.
- 10.2. Adequate funds will be proposed by the COB and budgeted annually by the CEO for support of the Board.
- 10.3. Board members will prepare and submit Director's Expense Claim Forms to request per diem and expense reimbursement in accordance with this policy. Board members will include receipts and any other information necessary to demonstrate that reimbursement is consistent with this policy and with Ch. 700, Stats. 2005 (AB 1234). Expense claims must be submitted within a reasonable time after the expense is incurred.
- 10.4. Board members will briefly report on meetings attended at District expense at the next regular Board meeting following the event at which the member is in attendance. On a quarterly basis, a report of the per diem and expense reimbursements of each Board member shall be placed on an open session Board meeting agenda for review and a determination by the Board whether the reimbursements comply with the Board's reimbursement policies adopted pursuant to Section 53232.3 of the Government Code. Only expenses in compliance with those policies may be reimbursed by the District. Directors Quarterly Expense Reimbursement Reports will be placed on the Directors District web page for public viewing.

Governance Policies of the Board

- 10.5 Adequate liability insurance will be provided by the CEO at all times for Board members.
- 10.6. It is the policy of the Board that each Board member attend such meetings, events, conferences, and training as each Board member determines will best enable them to serve the District, including such compensation per day and reimbursement for actual and necessary expenses as may be allowed by law and as authorized by this policy. Board members may only receive compensation for one meeting, per day, regardless of the number of meetings attended.

10.6.1. Per Diem Meetings, Events, and Activities Compensation

After annually making a finding based on substantial evidence that there is an operational need for Board members to be paid for more than 10 meetings in a calendar month, Board members are eligible to receive compensation per day, up to 15 days per calendar month, in accordance with Section 33(c) of the Santa Clara Valley Water District Act, for the meetings, events, and activities listed below, all of which are hereby deemed by the Board to constitute the performance of official duties. For the purpose of making a finding, substantial evidence shall include, but is not limited to, such things as the number of meetings in the prior year that were qualified for compensation pursuant to this policy, and how many and how frequently committee meetings of the Board of Directors occur.

- 10.6.1.1. Regular and Special Meetings of the Board of Directors.
- 10.6.1.2. Regular and Special Meetings of any Standing or Ad Hoc committee of the Board of Directors in accordance with Governance Process Policy 9.2.1, when the attending member is a member of the committee.
- 10.6.1.3. Regular and Special Meetings of any public entity legislative or advisory body of which the District is a member, or at which an agenda item related to the District's business is discussed.
- 10.6.1.4. Meetings with local, state, and federal legislators and/or officials to discuss matters of District concern.
- 10.6.1.5. Meetings of associations of governmental agencies, water policy organizations, and any other body of which the District is a member or which concerns water supply, flood protection, and/or natural resources.
- 10.6.1.6. Conferences and educational workshops open to the public and/or to public agencies such as the District or concern water supply, flood protection, and/or natural resources. Preference should be given to conferences and educational workshops in California in order to minimize out of state travel.

Governance Policies of the Board

- 10.6.1.7. Community events sponsored by or featuring the District, or which concern water supply, flood protection, and/or natural resources, or which concern the relationship of the District to the communities it serves.
 - 10.6.1.8. Community meetings at which District projects or programs are presented, featured, or discussed.
 - 10.6.1.9. Meetings with District employees and/or District constituents concerning District business.
 - 10.6.1.10. Media appearances to discuss District issues (including but not limited to interviews and editorial board meetings).
 - 10.6.1.11. Activities constituting direct Board inspection of District operations in accordance with Board-BAO Linkage Policy BL-5.
 - 10.6.1.12. Participation in and completion of an approved online ethics course to meet the requirements of Government Code Sections 53234-53235.5, which shall constitute a single meeting.
 - 10.6.1.13. Any other meeting, event, or activity approved in advance by the Board.
- 10.6.2. Per Diem Meetings, Events, and Activities Compensation Exclusions
- 10.6.2.1. No Board member shall be compensated for attendance at a community/business event as a guest of the District, where the District has purchased a seat or table at said event.
- 10.6.3. Per Diem Meetings, Events, and Activities Expenses **Reimbursements**

Board members are eligible for reimbursement for actual and necessary expenses incurred by the Board member for travel/transportation, meals, registration fees, lodging and incidental expenses reasonably incurred by the Board member in connection with meetings, events, and activities described in GP-10.6.1.

- 10.6.3.1. Travel reimbursement expenses will not exceed the government or group rate for airline, ground transportation, and rental cars where such rate is available. Air transportation will be economy/coach class. Reimbursement for rental cars will be at the midsize level, unless a group of District officials/personnel are traveling together and choose to use a larger vehicle to accommodate the

Governance Policies of the Board

group. Shuttles, taxis, and car services are reimbursable in lieu of car rental. Board members wishing to upgrade flight or rental car class for personal convenience, or to combine personal with business travel thereby resulting in an increased fare, must pay the increased cost over the rates set forth in this policy.

- 10.6.3.2. Mileage reimbursement expenses for use of the Board member’s own vehicle will be at the rate established for District employees and in accordance with policies applicable to District employees.
- 10.6.3.3. Lodging reimbursement expenses will not exceed the government or group rate for lodging where such rate is available. Reimbursement for lodging at conferences and organized educational activities will not exceed the maximum group lodging rate published by the activity sponsor if that rate is available at time of booking. Board members wishing to upgrade rooms and/or hotels or to incur additional guest charges will not be reimbursed for the cost difference.
- 10.6.3.4. Meal reimbursement expenses will be provided up to \$60 per day (\$14 for breakfast, \$16 for lunch and \$30 for dinner) for Board members who provide receipts. In addition to the \$60 per day, Board members will be entitled to an additional \$15 per day, with receipts, when traveling to the cities identified by the US General Services Agency as “high cost of living areas” listed below. Board members who do not have receipts may be reimbursed up to \$39 (\$9 for breakfast, \$10 for lunch and \$20 for dinner) per day for meal expenses.

| | | |
|-------------------|--------------------------|-------------------|
| Los Angeles, CA | Boston, MA | New York City, NY |
| San Francisco, CA | Baltimore, MD | Cincinnati, OH |
| Denver, CO | Detroit, MI | Pittsburgh, PA |
| Washington, DC | St. Paul/Minneapolis, MN | Philadelphia, PA |
| Miami, FL | St. Louis, MO | Dallas, TX |
| Chicago, IL | Atlantic City, NJ | Arlington, VA |
| New Orleans, LA | Santa Fe, NM | Seattle, WA |

- 10.6.3.5. Incidental expenses, including public transportation to/from airport; parking expenses; fuel for rental cars; tipping in accordance with policies applicable to District employees; expenses related to conducting District business while traveling (such as charges for phone, internet, or facsimile communication), will be reimbursed.

Governance Policies of the Board

10.6.3.6. Cancellations for event registrations and travel

10.6.3.6.1.1 Board members shall provide adequate notice for the cancellation of events and travel reservations, unless there is an extenuating circumstance.

10.6.3.6.1.2 If a Board member cancels a reservation for personal reasons or convenience, they may be responsible for the costs of any non-refundable expenses.

10.6.3.6.1.3 If a cancellation is due to circumstances beyond control, such as illness or personal emergency or to accommodate District needs, the District will cover the costs. Documentation supporting the reason for cancellation may be requested.

10.7. Business-Related Expense Reimbursements

Board members are eligible for reimbursement for actual and necessary expenses incurred by the Board member for the following business-related expenses: communication devices (cell phones/batteries/chargers), third party charge for internet/phone/fax lines and plans, office equipment and business cards.

10.7.1. Office equipment eligible for reimbursement under GP-10.7. includes:

- Fax/printers
- Fax/printer ink cartridges
- Individual office supplies (pens, day planners, etc);
- Personal digital assistant (PDA) equipment

10.8. Allocated Expense Reimbursements

Board members are eligible for reimbursement for office equipment, communication devices, supplies, publication subscriptions, membership dues, and educational materials utilized by the member for performance of Board duties, up to the amount identified in the Board Resolution Setting Annual Limit of Reimbursement of Directors' Annual and Necessary Expenses.

10.8.1. Publication subscriptions eligible for reimbursement under GP-10.8. include:

- Newspaper/ magazine subscriptions
- Periodicals

10.8.2. Membership dues eligible for reimbursement under GP-10.8. include:

- Organization and association memberships relevant to District business/mission (excludes professional memberships, certifications, licenses, etc)

Governance Policies of the Board

10.8.3. Educational material eligible for reimbursement under GP-10.8. includes:

- Books, videos, DVDs, computer programs (used in course of District business)

10.8.4. Other expenses eligible for reimbursement under GP-10.8. include:

- Business meal overage reimbursement
- District apparel

10.9 Board member compensation and benefits settlement agreements are not confidential.



Santa Clara Valley Water District

File No.: 26-0240

Agenda Date: 3/17/2026
Item No.: 4.4.

COMMITTEE AGENDA MEMORANDUM Board Policy and Monitoring Committee

Government Code § 84308 Applies: Yes No
(If "YES" Complete Attachment A - Gov. Code § 84308)

SUBJECT:

Review and Discuss the 2026 Board Policy and Monitoring Committee (BPMC) Work Plan and Make Adjustments as Necessary.

RECOMMENDATION:

Review and discuss the 2026 BPMC Work Plan and make adjustments as necessary.

SUMMARY:

Work Plans are created and implemented by all Board Committees to increase Committee efficiency, provide increased public notice of intended Committee discussions, and enable improved follow-up by staff. Work Plans are dynamic documents managed by Committee Chairs and are subject to change. Committee

Work Plans also serve to assist in preparing an Annual Committee Accomplishments Reports.

Discussion of topics as stated in the Plan have been described based on information from the following sources:

- Items referred to the Committee by the Board;
- Items requested by the Committee to be brought back by staff;
- Items scheduled for presentation to the full Board of Directors and
- Items identified by staff.

The BPMC Work Plan contained in Attachment 1 is presented for the Committee's review to determine topics for discussion in 2026. This work plan is subject to change.

Establishing a work plan is necessary to provide staff with a basis for meeting planning, logistics coordination, and agenda item preparation.

ENVIRONMENTAL JUSTICE IMPACT:

There are no environmental justice impacts associated with this item. This action is unlikely to or will

not result in human health or environmental effects.

ATTACHMENTS:

Attachment 1: 2026 BPMC Committee Work Plan

UNCLASSIFIED MANAGER:

Wendy Ho, 408-630-3874

Board Policy and Monitoring Committee 2026 Work Plan March 2026

| Subject | Task | January | February | March | April | May | June | July | August | September | October | November | December |
|--|---|---------|----------|-------|-------|-----|------|------|--------|-----------|---------|----------|----------|
| | | | | | | | | | | | | | |
| Board Planning Process & Policy Review | FY26-27 Board Work Plan - Review existing Board Work Plan for Improvement - April - Review Draft FY26-27 Board Work Plan - timing TBD? | | | | X | | | | | | | | |
| | Update on Watershed Master Plans | | | | ✘ | X | | | | | | | |
| | Development Impact Fee Study | | | X | | | | | | | | | |
| Other Assignments Requested by the Board | Develop Complaint Process for Board Appointed Officers (BAOs) - Identify potential issues for input to the Board auditor - March & April - Development of Complaint Process for BAOs - schedule TBD after audit is complete | | | X | X | | | | | | | | |
| | Board Member Roles/Responsibilities when serving on JPAs. | | | ✘ | | | | X | | | | | |
| | Review potential changes to SCW Program KPIs based on SCW Program Audit Findings #s: 2, 3, 6, 7 and 9. | | | ✘ | X | | | | | | | | |
| | Review and discuss existing policies regarding Board Member expenditures, including travel cancelation policies. | | | X | | | | | | | | | |

*Red item added.

✘ - Item Moved or Deleted