Appendix K

Potable Water Demand Projections; and
Cooke Property Sewer Evaluation; and
Sanitary Sewer Capacity Calculations

WEST YOST ASSOCIATES
Consulting Engineers

TECHNICAL MEMORANDUM

DATE: January 31, 2019 Project No.: 021-60-18-07
SENT VIA: EMAIL

TO: Jim Templeton, PE, MacKay & Somps

CC: Jeb Elmore, Lewis Management Corp.

FROM: Jim Connell, PE, RCE #63052

REVIEWED BY: Amy Kwong, PE, RCE #73213

SUBJECT: Fairview at Northgate – Potable Water Demand Projections

The purpose of this technical memorandum (TM) is to summarize the findings and conclusions of an evaluation of the potable water demands for the Fairview at Northgate development project (Project). The evaluation is described through the following sections:

- Background
- Estimated Water Demands
- Determination of WSA Requirement

BACKGROUND

The proposed Project is located within a suburban and urban environment in the City of Vallejo (City). The proposed Project is bound on the north by Turner Parkway, to the east by Foothill Drive with a residential area, to the south by Sundance Apartments and Avery Greene Honda, and to the west by Admiral Callaghan Lane and I-80. Currently the proposed Project area encompasses approximately 51.3 acres of undeveloped vacant land. The site location and proposed land uses are shown in Figure 1.

The Project is planned to include commercial, residential, parks, and open space land uses. The commercial area, to be located on the western side of the site, will be approximately 21.8 acres. The commercial area will consist of four buildings to the north and a Costco to the south. The residential area, to be located on the eastern side of the site, will be approximately 22.6 acres. The residential area will consist of 178 single family residential dwelling units (DU). Through the middle of the site there will be approximately 5.6 acres of open space. The park areas will total approximately 1.3 acres and be located in the middle of the site and interspersed through the residential area. The proposed land uses and the number of DU or meters for the Project are shown in Table 1.

Table 1. Proposed Land Uses for the Project[a]

Proposed Land Use	Approximate Area, acres	Number of Dwelling Units or Meters
Single Family Residential	22.6	178 DU
Commercial	21.8	5 Meters
Park[b]	1.3	2 Meters
Open Space	5.6	0 Meters
Total	51.3	

(a) Land use area data based on OverallSitePlan, dated September 2018.
(b) Park area based on Project Description, received November 20, 2018.

ESTIMATED WATER DEMANDS

The demands for the proposed Project were projected using two methods. The first method was based on the water demand projection method documented in Appendix B of the City's 2015 Urban Water Management Plan (2015 UWMP)[1]. The second method substituted customized projections for Costco and irrigation as described below, but otherwise used the 2015 UWMP demand projection method for the other remaining land uses.

Method 1

Method 1 water demand projections were based on the method documented in Appendix B of the City's 2015 UWMP. West Yost Associates (West Yost) made some assumptions of the projected number of water meters for the commercial, park, and open space land uses. These assumptions should be confirmed.

West Yost adjusted the land use-based water demand factors listed 2015 UWMP Appendix B to account for water savings and other factors that were accounted for in the 2015 UWMP Appendix B after the initial demand projection. This adjustment was completed by adjusting weather normalized values using the 2040 adjusted baseline values, as documented in 2015 UWMP Appendix B. After the adjusted demands were calculated, an unaccounted-for water value of 10 percent was added, as documented in the 2015 UWMP Appendix B. The Method 1 water demand projection is summarized in Table 2.

[1] 2nd Draft City of Vallejo Retail Water Demand Forecast, M.CUBED, July 28, 2015.

Table 2. Proposed Project Demands - 2015 UWMP (Method 1)

Proposed Land Use	Quantity, units[a]	Adjusted Annual Demand Factor, units[b]	Projected Water Demand, AFY[c]
Single Family Residential	178 DU	84 CCF/DU	34.3
Commercial	5 Meters	449 CCF/meter	5.2
Park	2 Meters	1,230 CCF/meter	5.6
Open Space	0 Meters	-	-
		Losses[d]	5
		Total	50
Single Family Residential[e]	500 (DU)	84	107

(a) Land use data based on OverallSitePlan, dated September 2018.
(b) From City's 2015 UWMP Appendix B. Baseline Demands are adjusted for plumbing code and appliance standards; implementation of demand management measures, real cost of water, and water loss management.
(c) AFY = Acre-feet per year.
(d) Losses assumed to be 10 percent based on Table 26 in 2015 UWMP Appendix B.
(e) Includes unaccounted-for water at 10 percent of supply.

The projected water demand using Method 1 is approximately 50 acre-feet per year (AFY), which is less than half of the 107 AFY demand projection for a 500-single family residential unit development.

Method 2

Method 2 water demand projections used the same assumptions and methodology as above, but with some refined assumptions for Costco and irrigation demands. Projecting commercial and irrigation demands based on CCF/meter may work for City-wide demand projections, but can be inaccurate for individual parcels. For example, commercial land use water demand factors are typically in the range of 0.1 to 0.3 gallons per day per square foot (gpd/SF) depending on the proposed use. The City's water demand factor of 449 CCF/meter works well for the Project's smaller buildings that range in size from 3,000 SF (0.3 gpd/SF) to 9,400 SF (0.1 gpd/SF), but does not work well for the proposed Costco building at 152,138 SF (0.006 gpd/SF). Therefore, instead of assuming one meter for the Costco water demand projection, historical water demands were received from a Costco representative for an existing warehouse to help refine demand projections for this Project.

For irrigation, it was assumed that 15 percent of the commercial land and all of the parks would be irrigated. To calculate the unit water demands for irrigation, the Model Water Efficient Landscape Ordinance (MWELO) AB 1881 was used, since that is the City's standard for landscape design. Using MWELO, the Maximum Applied Water Allowance (MAWA) for non-residential (commercial) and special landscape (park) areas per acre were calculated and are shown in Attachment A. The MAWA was then used to calculate the maximum water demands for commercial and park irrigation demands. The Method 2 water demand projection is summarized in Table 3.

Table 3. Proposed Project Demands - 2015 UWMP with Refined Costco and Irrigation Demands (Method 2)

Proposed Land Use	Quantity, Units[a]	Adjusted Annual Demand Factor, Units	Projected Water Demand, AFY[c]
Single Family Residential	178 DU	84 CCF/DU[b]	34.3
Commercial	4 Meter	449 CCF/Meter[b]	4.1
Costco[d]	1 Warehouse	4,027,820 gal/warehouse	12.4
Commercial Irrigation[e]	3.3 Acres	1.55 ac-ft/Acre	5.1
Park Irrigation[f]	1.3 Acres	3.44 ac-ft/Acre	4.5
Open Space	0 Meter	-	-
		Losses[g]	7
		Total	67
Single Family Residential[h]	500 DU	84 CCF/DU[b]	107

(a) Land use data based on OverallSitePlan, dated September 2018.
(b) From City's 2015 UWMP Appendix B. Baseline Demands are adjusted for plumbing code and appliance standards; implementation of demand management measures, real cost of water, and water loss management.
(c) AFY = Acre-feet per year.
(d) Provided by Costco on January 14, 2019.
(e) Assumes irrigation of 15 percent of commercial area will be irrigated and used MAWA non-residential values from Attachment A.
(f) Used MAWA special landscape values from Attachment A.
(g) Losses assumed to be 10 percent of supply based on Table 26 in 2015 UWMP Appendix B.
(h) Includes unaccounted-for water at 10 percent of supply.

The projected water demand using Method 2 is approximately 67 AFY, which is also less than the 107 AFY demand projection for a 500-single family residential unit development.

DETERMINATION OF WSA REQUIREMENT

Water Code section 10910(a) lists the definition of a "Project" that would require preparation of a Water Supply Assessment (WSA) as follows.

> *Any city or county that determines that a project, as defined in Section 10912, is subject to the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) under Section 21080 of the Public Resources Code shall comply with this part.*
>
> *10912 (a) "Project" means any of the following:*
>
> *(1) A proposed residential development of more than 500 dwelling units.*
>
> *(2) A proposed shopping center or business establishment employing more than 1,000 persons or having more than 500,000 square feet of floor space.*
>
> *(3) A proposed commercial office building employing more than 1,000 persons or having more than 250,000 square feet of floor space.*
>
> *(4) A proposed hotel or motel, or both, having more than 500 rooms.*
>
> *(5) A proposed industrial, manufacturing, or processing plant, or industrial park planned to house more than 1,000 persons, occupying more than 40 acres of land, or having more than 650,000 square feet of floor area.*
>
> *(6) A mixed-use project that includes one or more of the projects specified in this subdivision.*
>
> *(7) A project that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500-dwelling unit project.*

As indicated by the demand evaluation performed above, the Project does not meet the Water Code definition of a "Project" listed in numbers 1 through 7. Therefore, a WSA would not be required for the Project under California Water Code section 10910(a).

The water demand evaluation performed for the Project is based on the various assumptions stated above. If any of these items are changed or modified in any way, other than as described in this TM, additional evaluation may be required. In particular, assumptions were made regarding the number of water meters assigned to the commercial and irrigation uses within this Project. Those assumptions should be verified; however, such verification is unlikely to reverse the findings of this TM.

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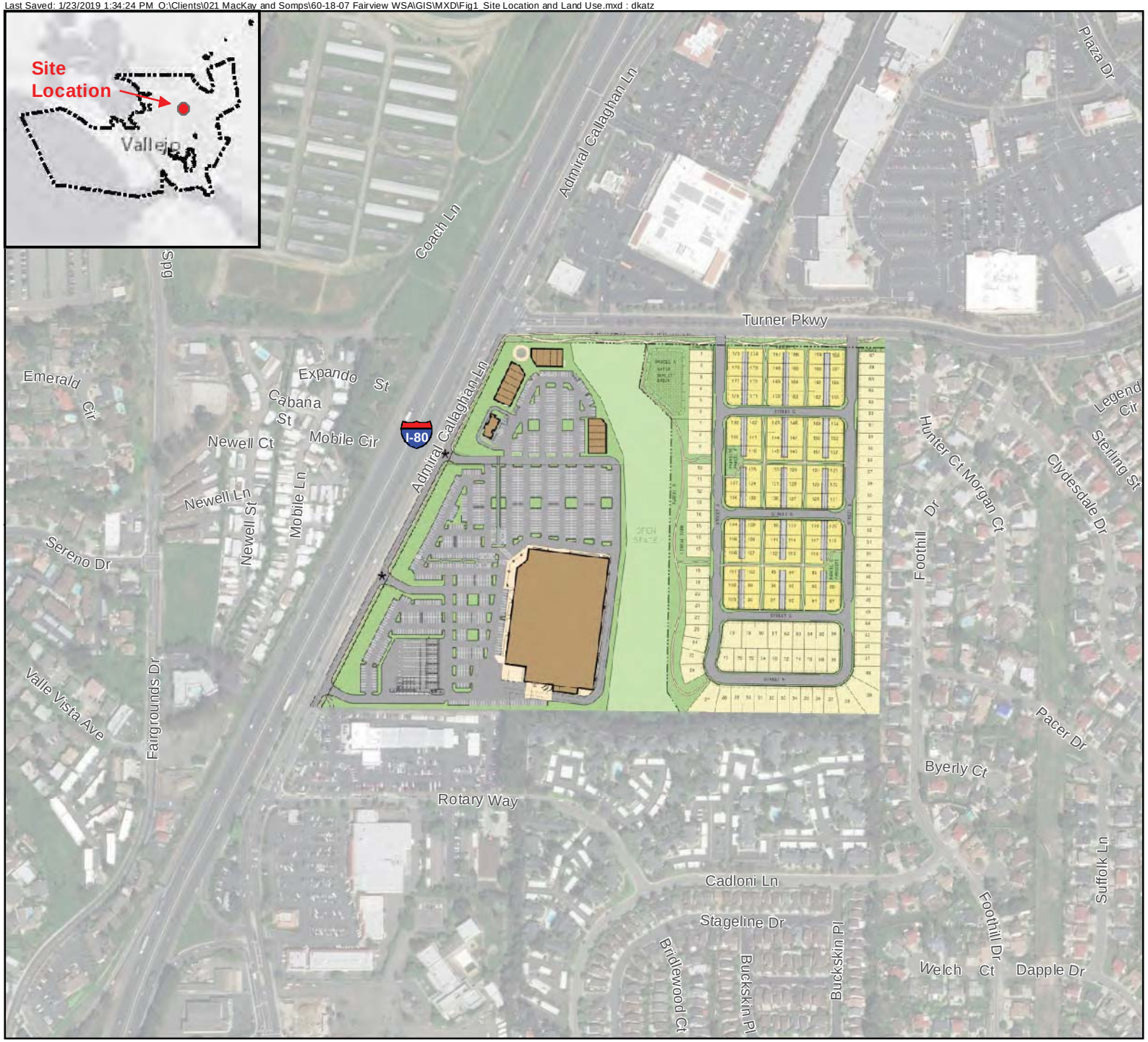

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0 250 500

Scale in Feet

Symbology

- Commercial
- Single Family Residential
- Single Family Residential
- Open Space
- Park

Notes:
1. Single family residential housing densities vary.
2. Land use image of Overall Site Plan dated September 2018 from MacKay & Somps on November 2018.

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Figure 1

Site Location and Land Use

MacKay & Somps
Fairview Water
Supply Assessment

ATTACHMENT A

Table A-1. Projected Unit Irrigation Demand for City of Vallejo[a]

Month	ETo,[b] in/mo	Rainfall,[b] in/mo	Eppt, in/mo	MAWA, Non-Residential[c]		MAWA, Special Landscape Areas[d]	
				MGY/acre	ac-ft/acre	MGY/acre	ac-ft/acre
January	1.4	1.87	0.47	0.01	0.04	0.03	0.08
February	1.9	2.91	0.73	0.01	0.04	0.03	0.10
March	3.1	1.99	0.50	0.03	0.10	0.07	0.21
April	4.5	1.18	0.30	0.05	0.16	0.11	0.35
May	5.6	0.65	0.16	0.07	0.20	0.15	0.45
June	6.0	0.05	0.01	0.07	0.22	0.16	0.50
July	6.2	0.00	0.00	0.08	0.23	0.17	0.51
August	5.5	0.01	0.00	0.07	0.21	0.15	0.46
September	4.5	0.07	0.02	0.05	0.17	0.12	0.37
October	3.2	0.40	0.10	0.04	0.12	0.08	0.26
November	1.8	1.60	0.40	0.02	0.05	0.04	0.11
December	1.2	2.51	0.63	0.01	0.02	0.01	0.04
Total	44.8	13.2	3.3	0.50	1.55	1.12	3.44

(a) Based on the California Code of Regulations, Title 23 Waters, Division 2 DWR, Chapter 2.7 Model Water Efficient Landscape Ordinance (MWELO), updated 2015.

(b) ETo and Average monthly rainfall based on City's 2015 UWMP, Table 3-1.

(c) Assumes the maximum allowable ETAF of 0.45 for non-residential areas.

(d) Assumes the maximum allowable ETAF of 1.0 for special landscape areas.

Notes:

Eppt = Effective Precipitation = 0.25 x Rainfall

ETo = Reference Evapotranspiration

ETAF = Evapotranspiration Adjustment Factor = (PF)/(Irrigation Efficiency)

LA = Landscape Area

MAWA = Maximum Applied Water Allowance, (ETo - Eppt) x 0.62 x [(ETAF x LA)]

PF = Plant Factor based on Hydrozone Area

WEST YOST ASSOCIATES

TECHNICAL MEMORANDUM

DATE: May 10, 2019

Project No.: 021-60-19-08
SENT VIA: EMAIL

TO: Jim Templeton, McKay & Somps Civil Engineers

FROM: Doug Moore, PE, RCE #58122

REVIEWED BY: Mark Kubik, PE, RCE #50963

SUBJECT: Cooke Property Sewer Evaluation

MacKay & Somps Civil Engineers, Inc. (Client) has requested that West Yost Associates (West Yost) evaluate the sanitary sewer impacts from the Cooke Property development (Project). The following sections summarize the technical evaluation performed by West Yost:

- Project Description
- Performance and Design Criteria
- Hydraulic Performance Evaluation
- Conclusions and Recommendations

PROJECT DESCRIPTION

The Project is in Vallejo, California and is located east of Interstate 80, near the intersection of Turner Parkway and Admiral Callaghan Lane. The Project will tie into the existing sanitary sewer system, which is owned and operated by Vallejo Flood and Wastewater District (District). The Project will have both commercial and residential land uses. The commercial land use is approximately 18 acres and will include a Costco and various other retail stores. The sewer lines for the commercial buildings will tie into the existing 18-inch diameter pipeline running through the property at sewer maintenance hole 203127. A portion of the existing sewer will be rerouted around the Costco building. The Project will also have approximately 24 acres of residential land use with 175 dwelling units. The proposed residential area sewer and will connect to the existing 12-inch diameter sewer along Turner Parkway, north of the Project (sewer maintenance hole 203071).

PERFORMANCE AND DESIGN CRITERIA

Per the District's Engineering Design Standards and Policies, the peak water surface elevation shall not exceed the ground surface elevation (to prevent sanitary sewer overflows).

HYDRAULIC PERFORMANCE EVALUATION

West Yost used the District's sanitary sewer model to evaluate the sewer impacts of the Project. The Client provided West Yost with sewer flow rates for the Project as summarized below:

- Residential Area Wastewater Flow Estimate:
  - Residential Average Dry Weather Flow (ADWF) = 37,800 gallons per day (gpd) (based on District's standards)
  - Peak Sanitary Flow (PSF) = 102,752 gpd (based on the District's peaking factor equation)
  - Peak Infiltration and Inflow (I&I) = 14,280 gpd (based on the District's I&I factor of 600 gpd per acre)
  - Peak Wet Weather Flow (PWWF) = 117,032 gpd (0.18 cubic feet per second (cfs))
- Commercial Area Wastewater Flow Estimate:
  - Costco ADWF = 7,824 gpd
  - Other commercial buildings ADWF = 2,443 gpd
  - Total commercial ADWF = 10,267 gpd
  - PSF = 27,909 gpd (based on the District's peaking factor equation)
  - Peak I&I = 10,608 gpd (based on the District's I&I factor of 600 gpd per acre)
  - PWWF = 38,517 gpd (0.06 cfs)

West Yost verified the residential flow estimate was consistent with the District's flow estimating standards. However, the District does not have an ADWF flow factor for commercial areas. Consequently, the Client's flow estimate was checked using a commercial area flow factor of 900 gpd per acre (from Dublin San Ramon Services District 2017 Collection System Master Plan), as summarized below:

- Commercial Area Wastewater Flow Estimate:
  - Total commercial area ADWF = 15,912 gpd (17.68 acres times 900 gpd per acre)
  - PSF = 43,253 gpd (based on the District's peaking factor equation)
  - Peak I&I = 10,608 (based on the District's I&I factor of 600 gpd per acre)
  - PWWF = 53,861 gpd (0.08 cfs)

For the model evaluation of potential sewer impacts, the residential flow estimate and the more conservative commercial flow estimate of 53,861 gpd were used.

West Yost selected key locations, shown on Figure 1, in the District's model with the highest chance of a sanitary sewer overflow to evaluate and assess if the District's criteria is violated with the addition of the Project's wastewater flows.

Hydraulic Model Update

Using a wastewater and I&I flow distribution spreadsheet developed by West Yost, sanitary flow and I&I hydrographs for the residential and commercial areas were developed, as shown on Figures 2 and 3. West Yost applied the Project's hydrographs to the connection points for the Project. West Yost increased the length of the on-site 18-inch sewer by 160 feet to account for rerouting the sewer around the Costco building.

Hydraulic Analysis

Table 1 summarizes Pre-Project and Post-Project WSEs, sewer invert elevations, and maintenance hole rim elevations at key locations in the model. The model results have typically (in past studies) shown variations in maximum water levels of 0.1 to 0.2 feet that appear to be due to minor changes in the timing of peak flows or are model anomalies. The decrease in water levels shown in Table 1 are attributed to the changes in peak flow timing or model anomalies. The key locations are areas with the highest probability of a sanitary sewer overflow (where the sewer is relatively shallow compared to the sewer depths upstream and downstream of the key locations). Nodes 103053, 301174, and 104024 show the water level exceeding the ground level both before and after the Project (shaded yellow in Table 1). However, at maintenance hole 301174, the maintenance hole lid is bolted to the maintenance hole with water tight lid, so there would be no overflow at this location. The sewer maintenance hole lids are not bolted at maintenance hole 104024, so there is risk of an overflow; however, the Project does not cause an increase in the WSE at these locations.

Table 1. Water Surface Elevation (WSE) Summary

Node ID	Location	Sewer Invert Elevation, feet	Maintenance Hole Rim Elevation, feet	Pre-Project WSE, feet	Post-Project WSE, feet	Change in WSE[(a)], feet	Freeboard, feet
401126	Upstream of Project. Redwood Parkway, just east of Skyline Drive	116.5	120.9	117.0	117.0	0.0	3.8
203127	At Project Site where Costco to connect	84.9	99.2	86.1	86.1	0.0	13.1
203100	Middle of the Project; Downstream of Costco Tie-In	82.4	89.6	83.4	83.4	0.0	6.2
104069	North end of Lake Chabot, to the west of the theme park	45.9	52.0	47.5	47.6	0.1	4.4
103053	Ifland Way, between Broadway Street and Sonoma Boulevard	0.2	8.6	10.0	9.7	-0.2	-1.1
3016603	Upstream of the Pump Station; South of Austin Creek	-12.2	6.2	3.1	2.9	-0.2	3.4
301095	Downstream of the Pump Station	23.2	40.6	25.9	25.9	0.0	14.7
301174[(b)]	Intersection of Lighthouse Drive and Wilson Avenue	13.9	18.7	19.4	19.4	0.0	-0.7
502923	At Treatment Plant	-11.1	6.7	-4.3	-4.3	0.0	11.0
203071	Turner Parkway, between I-80 and Foothill Drive. Location of Residential Connection	90.8	101.9	91.7	92.0	0.3	10.0
203056	Along Admiral Callaghan Lane, north of Turner Parkway	87.4	96.7	88.0	88.1	0.1	8.6
203084	North of Coach Lane and Newell Street	81.3	86.0	81.8	81.8	0.0	4.2
203024	West of Griffith Drive and Sage Street	88.7	96.6	89.6	89.6	0.0	7.0
104024	Near Intersection of Railroad and Lewis Brown Drive	12.5	18.3	20.4	20.4	0.0	-2.1
104256	Hobbs Ave and Diamond Ave	13.2	24.7	17.5	17.3	-0.2	7.3
1036618	Lewis Brown Drive, near the Sonoma Boulevard Overpass	-8.6	10.7	7.5	7.2	-0.3	3.5
301082P	Along Sacramento Street, southeast of Daniels Avenue and Sacramento Street	-7.6	7.5	4.2	4.0	-0.2	3.5

Note: Yellow shading indicates WSE exceeds the maintenance hole rim.
(a) Change in WSE = Post-Project WSE – Pre-Project WSE
(b) This maintenance hole is sealed so the negative freeboard does not represent a sewer overflow.

Table 2 summarizes the Pre-Project and Post-Project PWWFs at six locations in the model. In general, the discharge through each pipeline increases due to the Project.

Table 2. PWWF Summary

Link ID	Location	Pre-Project PWWF, cfs	Post-Project PWWF, cfs	Change in PWWF[(a)], cfs
203074l1	Downstream of Project, east of intersection of Admiral Callaghan Lane and Turner Parkway	6.36	6.58	0.22
104069l1	Downstream of Node 104069 at Lake Chabot	10.49	10.66	0.17
104084l1	Along railroad track, parallel to intersection of Encerti Avenue and Lofas Place	17.15	17.42	0.27
3016603l1	Upstream of pump station, parallel to Austin Creek	32.68	32.59	-0.10
301921l1	Along Wilson Avenue, between Lighthouse Drive and Sims Avenue	26.35	26.35	0.00
502967l2	Along Ryder Street, directly upstream of the treatment plant	134.55	134.69	0.14

(a) Change in Discharge = Post-Project Discharge – Pre-Project Discharge

CONCLUSIONS AND RECOMMENDATIONS

The Project is expected to increase the District's ADWF by 53,712 gpd, PSF by 146,005 gpd, and PWWF by 24,888 gpd. Results from the hydraulic performance indicate that the Project will not result in new or increased sanitary sewer overflows within the District's modeled system.

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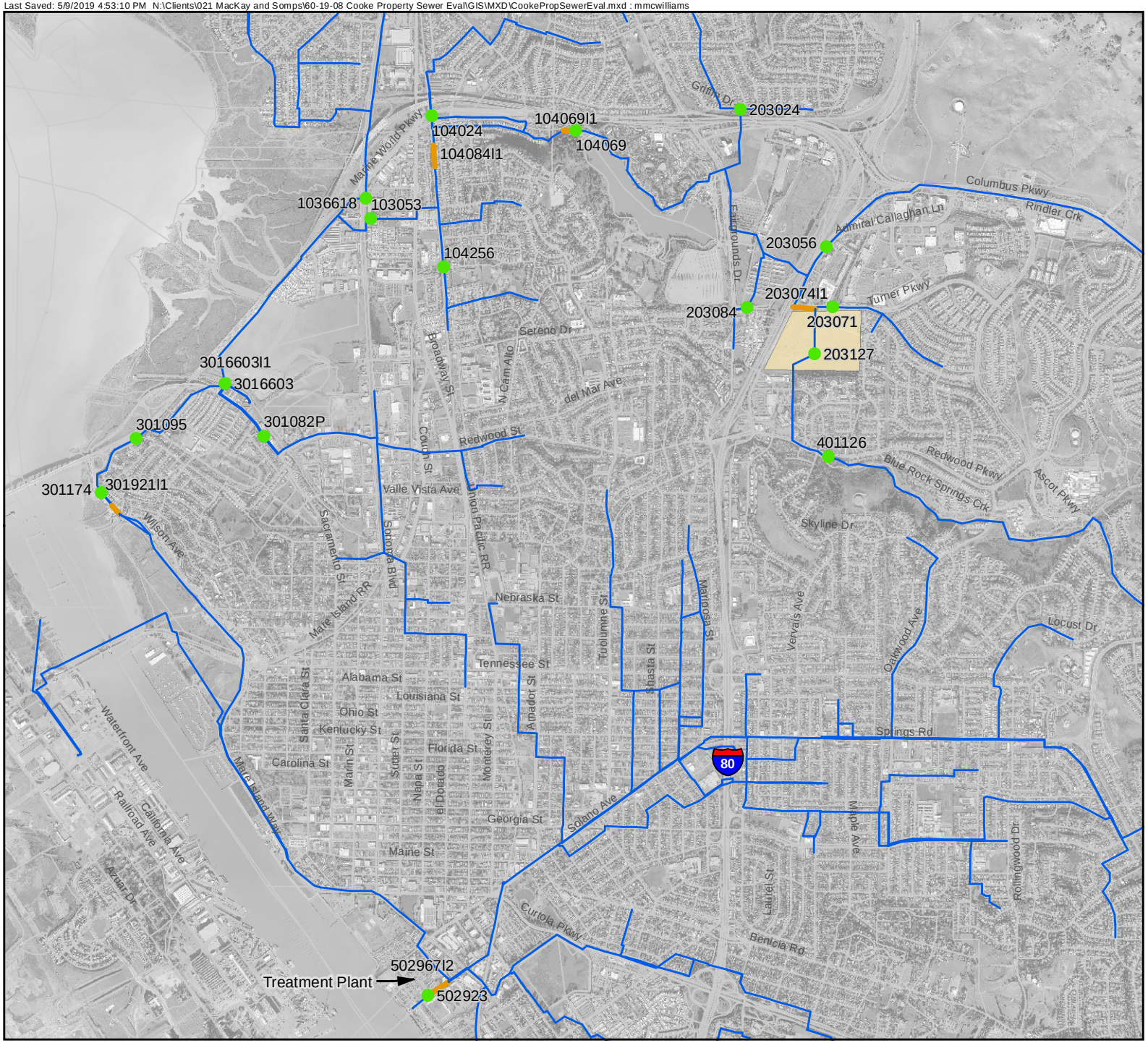

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0 1,500 3,000

Scale in Feet

Symbology

- Manholes with Summarized WSE (Table 1)
- Pipeline
- Pipeline with Summarized Flow (Table 2)
- Cooke Property

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Figure 1

Key Locations

MacKay & Somps
Civil Engineers, Inc
Cooke Property
Sewer Evaluation

Figure 2. Cooke Property Residential Hydrographs

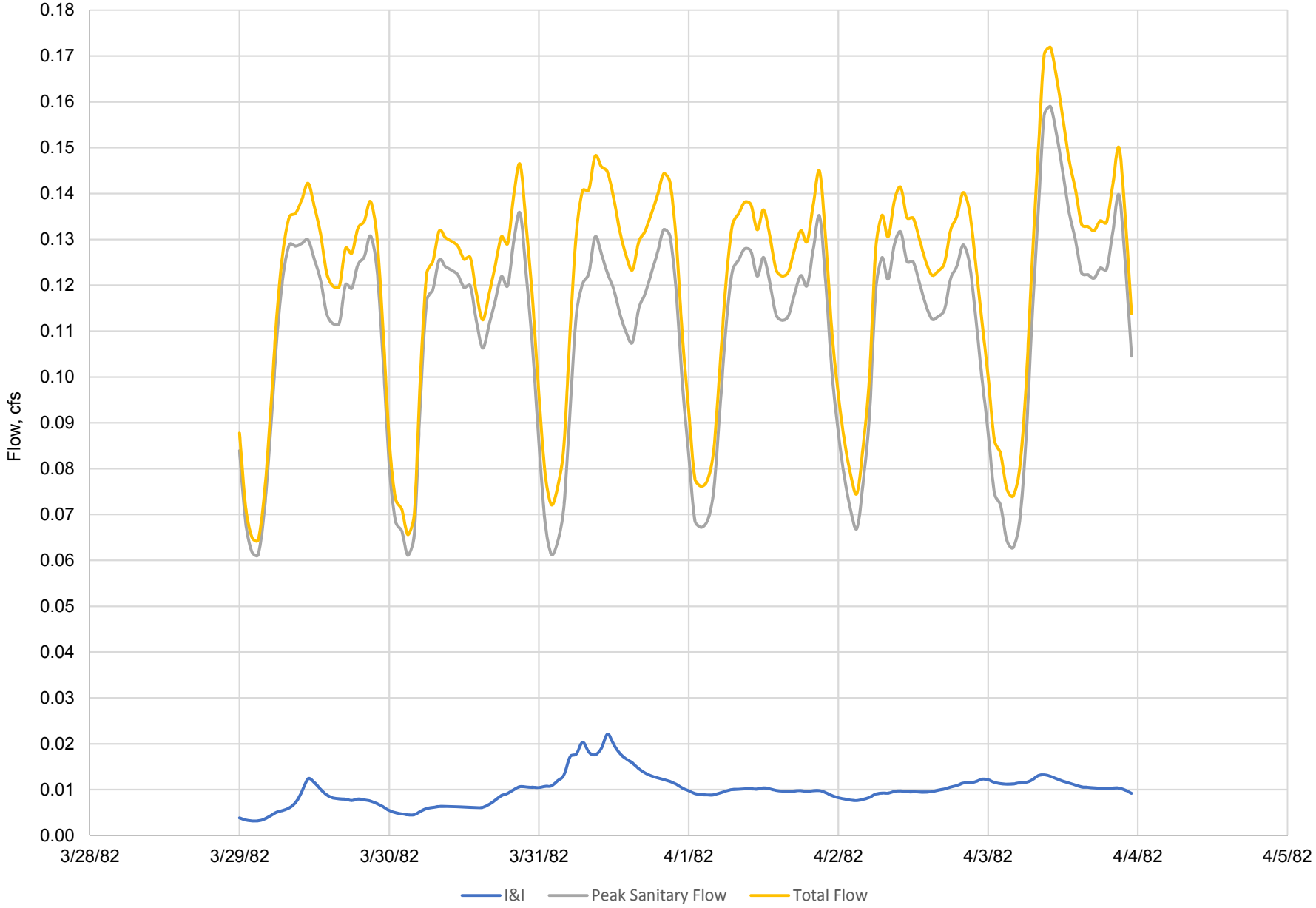
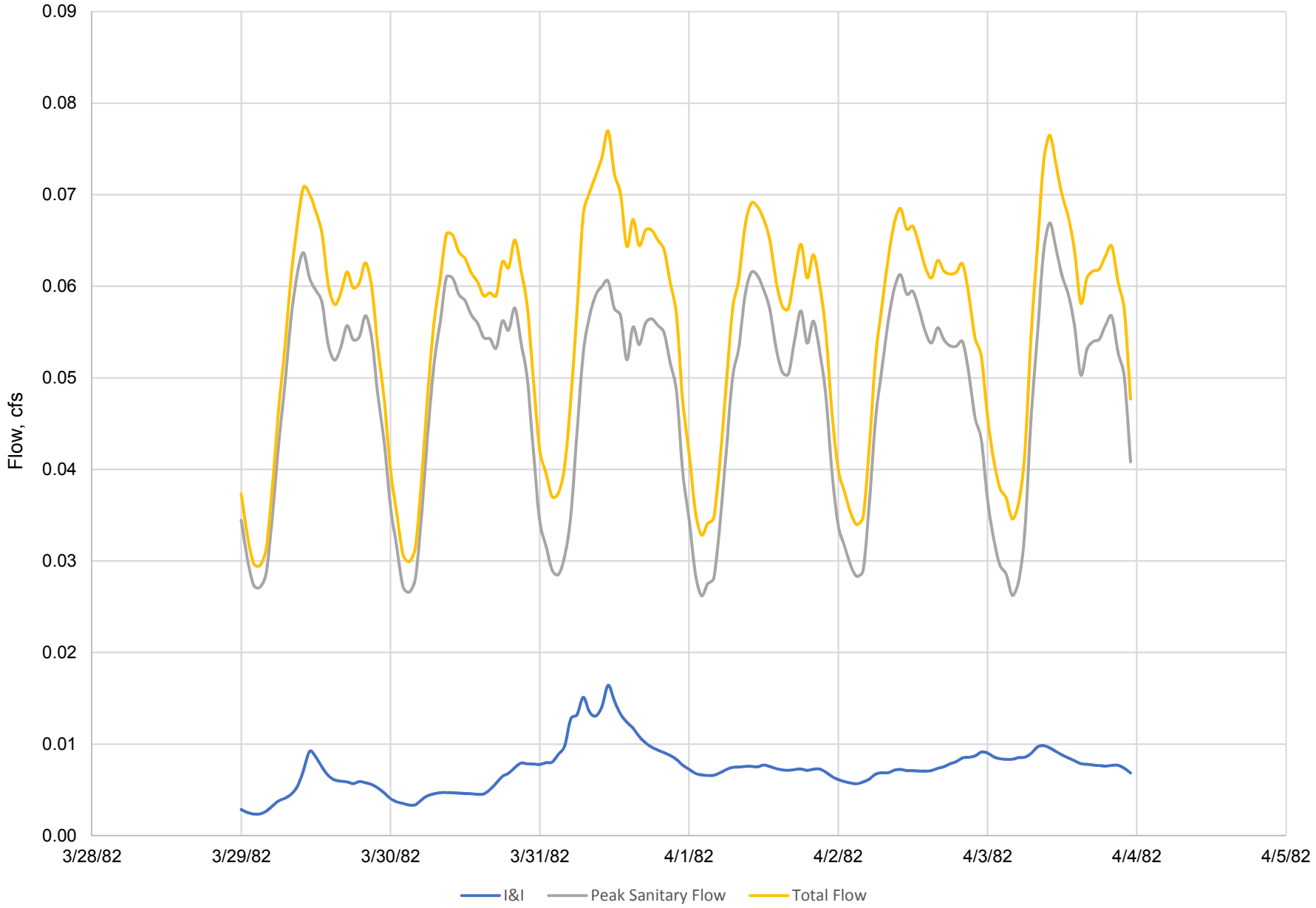


Figure 3. Cooke Property Commercial Hydrographs



SANITARY SEWER CAPACITY CALCULATIONS

Sanitary Sewer Capacity Analysis:

Per Vallejo Sanitation and Flood Control District Engineering Design Standards and Policies, dated May, 2002 Peak Sanitary Flow (PSF) is calculated by the following formula (See Exhibit A):

(1) $PSF = (SF)^{0.97}\ (e)^{0.33}$ for average sanitary flow $\geq$ 0.1 mgd

(2) PSF = (SF) (e) Average sanitary flow $\leq$ 0.1 mgd

Where PSF = peak sanitary flow, mgd or gd

SF = average sanitary flow, mgd or gd

e = natural log (2.7183)

For Commercial Use:

A. COSTCO Building –

Average daily flow = 7,824 gd (Information provided by Shay Reed with COSTCO Wholesale, via e-mail dated 1/14/19, per Exhibit B)

Since 7,824 gd < 0.1 mgd

PSF = (SF) (e)

PSF = (7,824) (2.7183)

PSF = 21,267.98 gd use 21,268 gd

B. Shops and Retail Buildings, see Exhibit D

The building area is = 27,490 SF

Assumed land use co-efficient of 0.006 cfs/acre (per National Clay Pipe Institute Manual) for general commercial (per Exhibit C).

Average daily flow = (0.006 ck/26) (27,490 sf) (1ac/43560 sf) (1mgd/1.55 cfs)
(1,000,000 gd/1mgd)

Average daily flow = 2,442.90 gd < 0.1 mgd

PSF = (SF) (e)

PSF = (2,442.90) (2.7183)

PSF = 6,640.54 gd, use 6,641 gd

Since all the buildings are clustered on one site,

PSF total = PSF for COSTCO + PSF for Shops and Retail + Infiltration

Infiltration = 600 gpd/acre per Exhibit A

Commercial site area = 769,980 sf = 17.68 acre (per Exhibit D)

Infiltration = (600 gpd) (17.68 acre) = 10,608 gd acre = 10,608 gd (Exhibit A)

Therefore, PSF Total = 21,268 + 6,641 + 10,608 = 38,517 gd

For Residential Use:

No. of Planner Residential Units (RI) = 175 units, (per Exhibit B)

Average Daily Discharge = 80 gallons/person/day (per Exhibit A)

Average day for residential = 20 gallons/person/day for commercial (per Exhibit A)

Where average family unit = 2.7 persons/unit (per Exhibit A)

Average daily discharge = (175 units) (2.7 person/unit) (80 gallons/person/day)

Average daily discharge = 37,800 gd < 0.1 mgd

PSF = (SF) (e)

PSF = (37,800) (2.7183)

PSF = 102,751.74 gd day use 102,752 gd

PSF Total = PSF Residential + Infiltration

Infiltration = 600 gpd/acre (per Exhibit A)

Residential site area = 23.8 acre

Infiltration = (600 gd/acre) (28.8 acre)

Therefore, PSF total = PSF Residential + Infiltration

PSF Total = 102,752 + 14,280

PSF Total = 117,032 gd. day

Final Result for Peak Sanitary Flow (PSF):

PSF for Commercial site = 30,381 gd

PSF for Residential site = 117,032 gd

(6) In flood hazard areas, new and/or rehabilitated sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters into the systems and discharge from the systems into floodwaters.

(E) **General Sanitary Sewer Hydraulic and Capacity Design**

(1) Population density for computing contributing sewage to the system shall be based on predicted population densities determined and zoned by the City of Vallejo Planning Department and/or Solano County Planning Department.

(2) Average family unit = 2.7 persons per unit

(3) Average daily discharge = 80 gallons per person per day (residential); 20 gallons per person per day (employment, commercial)

(4) Peak sanitary flow is calculated by the following formula:
If the average sanitary flow is equal to or greater than 0.1 mgd, then the following formula should be used:

$$PSF = (SF)^{0.97} \times (e)^{0.33}$$

If the average sanitary flow is less than 0.1 mgd, then the following formula should be used:

$$PSF = (SF) \times (e)$$

where:

PSF = Peak Sanitary Flow, mgd
SF = Average Sanitary Flow, mgd
e = Natural log (2.7183)

Design flow shall be the Peak Sanitary Flow as derived above.

(5) Infiltration allowances shall be calculated as follows:
Areas sewered as of January 1970 - 4,000 gpd/acre.
New developments: 600 gpd/acre.

(6) Sewers shall be sized to provide a minimum velocity of two and one-half (2-1/2) feet per second when the sewer is flowing half full.

(7) Minimum slope requirements are necessary to assure self-cleaning and self-oxidizing velocities to avoid significant generation of hazardous odorous, and corrosive sulfur compounds. Where possible, use of the minimum slopes should be avoided and should not be construed as guidelines for system design. However, the District will accept the standard minimum slope. Standard minimum slopes used for sizing sewers shall be as follows:

Exhibit A

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From: Mike Okuma <mokuma@costco.com>
Sent: Monday, January 14, 2019 4:04 PM
To: Walt Mitchell <Walt.Mitchell@lewismc.com>
Subject: Fwd: Costco Vallejo

Walt

The following is the water

Sent from my iPhone

Begin forwarded message:

> **From:** Shay Reed <sreed@costco.com>
> **Date:** January 14, 2019 at 8:53:23 AM PST
> **To:** Mike Okuma <mokuma@costco.com>
> **Subject: Re: Costco Vallejo**

Water

Annual Water Consumption		
00028 - Laguna Niguel, 27972 Cabot Road		
	Consumption (US Gallons)	
Month		
September 2017	335,960	
October 2017	366,300	
November 2017	335,220	
December 2017	338,180	
January 2018	315,980	
February 2018	317,460	
March 2018	321,160	
April 2018	249,380	
May 2018	324,860	
June 2018	367,040	
July 2018	409,960	
August 2018	346,320	
	4,027,820	
Daily average	11,035	

SEWER

Date Date Flags Gallons

Exhibit B

9/5/2017	10/3/2017	ID	194,620
10/3/2017	11/7/2017	ID	250,120
11/7/2017	12/4/2017	ID	207,940
12/4/2017	1/2/2018	ID	229,400
1/2/2018	2/6/2018	ID	273,800
2/6/2018	3/6/2018	ID	231,620
3/6/2018	4/2/2018	ID	214,600
4/2/2018	5/1/2018	ID	242,720
5/1/2018	6/4/2018	ID	259,000
6/4/2018	7/3/2018	ID	235,320
7/3/2018	8/1/2018	ID	239,020
8/1/2018	9/5/2018	ID	277,500
	Total Sewer		2,855,660
	Daily		7,824

Shay Reed
Buyer: Energy, Utilities & Environmental Reporting
Costco Wholesale
425-313-6935

On Fri, Jan 4, 2019 at 2:58 PM Mike Okuma <mokuma@costco.com> wrote:

> Shay,
>
> Can you send send me the water and sewer demand for the existing warehouse? I need to get this to the developer for the DEIR
>
> ---------- Forwarded message ---------
> From: **Walt Mitchell** <Walt.Mitchell@lewismc.com>
> Date: Fri, Jan 4, 2019 at 8:08 AM
> Subject: Costco Vallejo
> To: Michael Okuma (mokuma@costco.com) <mokuma@costco.com>
> Cc: Jeb Elmore <Jeb.Elmore@lewismc.com>
>
> Michael, need to get the below info from you asap. We are trying to get all of the reports done for final acceptance of the applications from the City.
>
> Any questions please call.

NCPI

NATIONAL CLAY PIPE INSTITUTE

QUALITY • RESEARCH

CLAY PIPE
ENGINEERING MANUAL

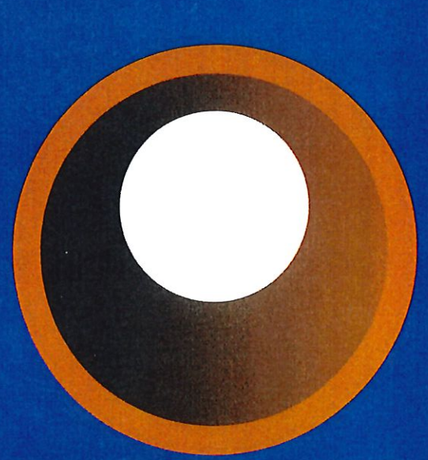


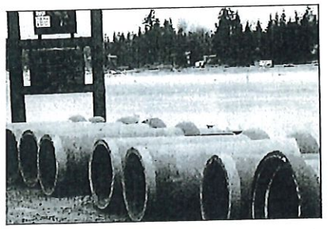
Exhibit C

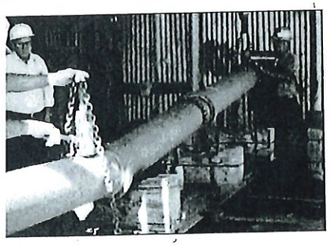
ınd or connections and improperly ›use laterals. Laterals frequently a total length greater than the ing system and may contribute ch as 90% of infiltration. House :tions should receive the same .cations, construction and inspec- ; public sewers.

e past, sewer designers allowed : amounts of infiltration to aid in ›orting solids. Infiltration must e kept to a minimum.

ıntages of Flexible pression Joints

›le compression joints conforming TM C 425 *Compression Joints for ied Clay Pipe and Fittings* have :ed all other forms of joining ed clay pipe. Obsolete field joining ns can be major contributors to :ation. The advantages of limiting :ation, exfiltration and roots while ding flexibility and durability have widely demonstrated. A tight and le joint is clearly desirable whether ;ewer is above or below ground :.





Summations of Flow

Starting at the upper end of the sewer under review, add projected average flows for 50 or more years in the future. As the projected average flows from each drainage area are totaled, multiply by the appropriate peak factor (page 17) to determine the peak flow for each reach of the line. These values are the design capacities for the proposed sewer (page 15).

Flow Monitoring

A sewer flow monitoring program is necessary to determine when existing sewers will reach hydraulic design capacity. Monitoring methods vary from high water markers that record maximum depths to gaging with hand held mechanical tools or electronic devices. With a history of flow data, projections can forecast the year the peak flow will reach the design capacity of the sewer.

Check adjacent population, gagings, water consumption, rainfall and any other available data to determine if the measured quantity of flow is reasonable. If adjacent measurements or the estimate is greatly different from the gaged amount, the cause should be identified and corrected before proceeding with a relief sewer. With a long range projection of peak flow based on population and a short range projection based on past gagings, a reasonable estimate utilizing both can be made. As new or more reliable information becomes available, the projection should be updated. Planning for relief sewers must begin with sufficient lead time before the projection reaches the design capacity of the sewer.

Sewer line modeling computer programs are available to analyze existing systems and establish quantities for the design of relief sewers.

LAND USE COEFFICIENTS

LAND USE	ABR.	AVERAGE COEFFICIENTS		
High Density R4, R5	H.D.	140 People/Acre	(100 gcd)	.0217 cfs/Acre
Medium Density R3	M.D.	75 People/Acre	(100 gcd)	.0116 cfs/Acre
Low Density RS, R1, R2	L.D.	20 People/Acre	(100 gcd)	.0031 cfs/Acre
Suburban RA, RE	Sub	10 People/Acre	(100 gcd)	.0016 cfs/Acre
Hillside	H.S.	7 People/Acre	(100 gcd)	.0011 cfs/Acre
Agriculture A1, A2	Agr	2.5 People/Acre	(100 gcd)	.0004 cfs/Acre
Light Industry CM, M1, M2	Lt	0.008 cfs/Acre		
Heavy Industry M3	Hvy	0.008 cfs/Acre		
General Commercial 2, 3, 5	Gen	0.006 cfs/Acre		
Limited Commercial CR, 1, 2	Ltd	0.006 cfs/Acre		
Hospital	H	500 gal/day/hosp. bed		
School	S	0.062 cfs/School		
University or College	U	0.371 cfs/Univ.		
Civic or Admin. Center	C.C.	0.006 cfs/Acre		
Airport	A	0.001 cfs/Acre		
Park	P	0.0003 cfs/Acre		
Future Park	F.P.	0.0003 cfs/Acre		
Golf	G	0.0003 cfs/Acre		
Cemetery	C	0		
Reservoir	R	0		
Public Works	W	0		
Open Space	O.S.	0		

Values should be verified or adjusted based on flow studies of the area if available.

PROJECT SUMMARY:

LAND USE:
RESIDENTIAL - 23.8± AC
COMMERCIAL - 21.8± AC
OPEN SPACE - 5.7± AC
TOTAL - 51.3± AC

RESIDENTIAL SUMMARY:

LOT COUNT:
86 - 42'x85' SINGLE FAMILY LOTS
92 - 50'x60' ALLEY-LOADED LOTS
~~178~~ 175 - TOTAL LOTS

COMMERCIAL SUMMARY:

MAJOR RETAILER: 152,138± SF
SHOPS & RETAIL: 27,490± SF

* SIGNALIZED INTERSECTION

FOR COMMERCIAL SITE AREA (FOR INFILTRATION)

$A_I = (21.8\ AC)\left(\frac{43,560\ SF}{1\ AC}\right) - 152,138\ SF$

$- 27,490\ SF$

$A_I = 769,980\ SF$

$A_I = 17.68\ ACRES$

NORTH
0 50 100 200
SCALE: 1"=100'

Exhibit D

OVERALL SITE PLAN
FAIRVIEW at NORTHGATE
Vallejo, California

C.1
SEPTEMBER 2018

GATEWAY PLAZA PHASE III
59 SD 44

TURNER PARKWAY

PARCEL E

PARCEL D

PARCEL F

PARCEL G

PARCEL C

PARCEL A

WATER QUALITY BASIN

LINIER PARK

OPEN SPACE

195

982'

179

158'

150'

QUAIL RIDGE CONDOMINIUMS LOT 1
44 SD 88

0 30 60 120
SCALE: 1"=60'

NORTH

Exhibit E

DIMENSIONED SITE PLAN
FAIRVIEW at NORTHGATE
Vallejo, California

C.2.1