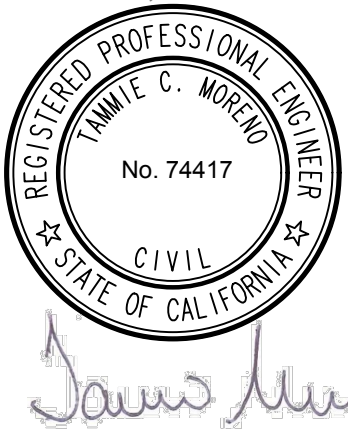
AVA PACIFIC BEACH

Water System Analysis

3823, 3863, 3913 Ingraham St & 3952 Jewell St,
SAN DIEGO, CA 92109

November 2024

Project Applicant:
AvalonBay Communities, Inc.
2050 Main Street #1200
Irvine, CA 92614



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Tables

1 INTRODUCTION

This analysis provides a summary of an impact of the AVA Pacific Beach Redevelopment on the existing water system. The project is located in the Pacific Beach community, **Figure 1** provides a vicinity map for the project. The project proposes to redevelop underutilized parking areas within a 12.96-acre site occupied by 564 multi-family dwelling units, resident amenities and five acres of surface parking with an additional 138 units, located at 3823, 3863, 3913 Ingraham Street and 3952 Jewell Street in the Pacific Beach Community Plan area. Two additional parking structures are proposed to accommodate the majority of project parking spaces.

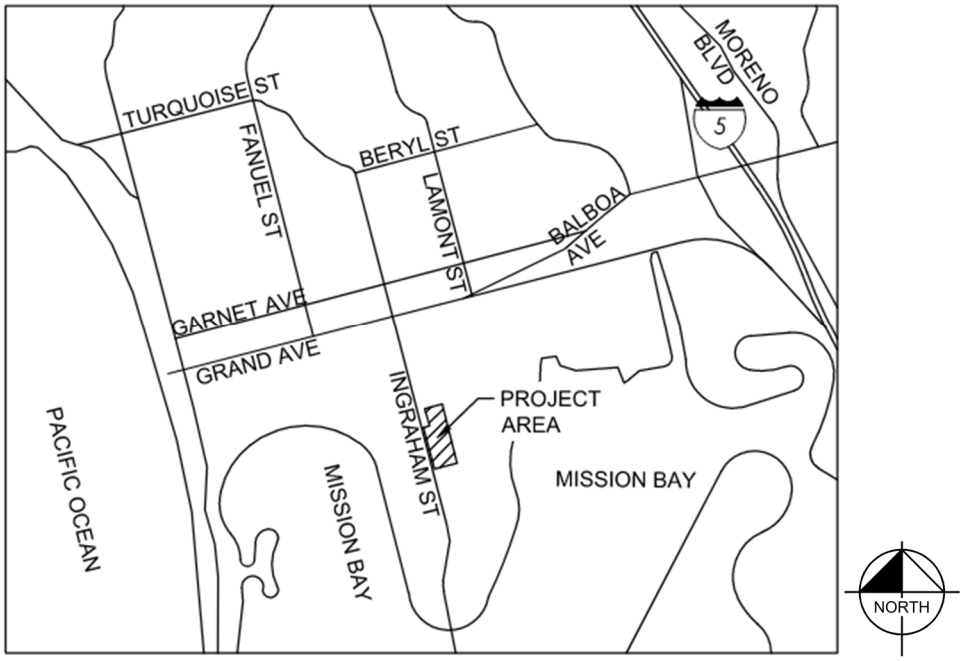


Figure 1 – Vicinity Map

2 PURPOSE OF STUDY

The purpose of this study is to analyze and determine if the existing public water system is able to provide adequate domestic water and fire protection service for the AVA Pacific Beach Redevelopment. This report will address if any offsite (public) water system improvements are needed for the development of the project so that the offsite water system will be in conformance with the City of San Diego Public Utilities water system design standards.

3 PROJECT WATER DEMAND

The water demands were developed in accordance with the City of San Diego Design Guidelines and Standards. Multi-family residential water demand is estimated based on density and a unit water demand of 150 gpd/person. The AVA Pacific Beach Redevelopment proposes a total of 702 residential units, including 564 existing and 138 proposed residential units over 12.96 net acres equaling 54 units per acre. Table 2-1 in the City of San Diego Design Guidelines and Standards, attached as Attachment D, indicates that 54 units per acre falls in the range of approximately 2.2 persons per dwelling unit. A dwelling unit density of 2.2 persons per dwelling unit and a unit water demand of 161 gpd/person results in a water demand rate of 354.2 gpd per multi-family dwelling unit at the project. **Table 1** presents the projected potable water demand for the proposed buildings for the AVA Pacific Beach Redevelopment.

Table 1: Proposed Potable Water Demand							
Land Use	Building#	Quantity	Demand Factor	Average Water Demand (gpd)	Average Water Demand (gpm)	Max Day Demand (gpm)	Peak Hour Demand (gpm)
Multi-Family Residential	1	69	354.2gpd/DU	24,440	17	19	31
	2	21	354.2gpd/DU	7,440	5	6	9
	3	48	354.2gpd/DU	17,000	12	13	21
Total				48,880	34	37	61

Table 2: Existing Potable Water Demand							
Land Use	Building	Quantity	Demand Factor	Average Water Use, gpd	Average Water Demand (gpm)	Max Day Demand (gpm)	Peak Hour Demand (gpm)
Multi-Family Residential	R/S	66	354.2gpd/DU	23,377	16	18	29
	T/P	63	354.2gpd/DU	22,315	15	17	28
	M/N	60	354.2gpd/DU	21,252	15	16	27
	U/V	54	354.2gpd/DU	19,127	13	15	24
	G/H	66	354.2gpd/DU	23,377	16	18	29
	K/L	66	354.2gpd/DU	23,377	16	18	29
	D/E	51	354.2gpd/DU	18,064	13	14	23
	C/F	87	354.2gpd/DU	30,815	21	24	39
	A/B	51	354.2gpd/DU	18,064	13	14	23
	Recreation	-	(record drawing)[1]	84,960	59	65	106
	Equipment Room	-	(record drawing)[1]	67,680	47	52	85
	Pro Shop	-	(record drawing)[1]	27,360	19	21	34
Total				379,768	264	290	475

[1] See Record Drawing "On-Site Water Service ~ Crown Point Country Club", included in Attachment E

The total water demand expected from the project, including existing and proposed demand, is equal to 474,527 gpd (330 gpm). From the City of San Diego Guidelines and Standards, Figure 2-2, the Peak Day Factor (maximum day demand to average annual demand ratio) is approximately 1.1 based on the RM residential zoning peaking curve, resulting in an estimated maximum day demand of 522,000 gpd (362 gpm) (MDD = ADD * Peak Day Factor). From the City of San Diego Guidelines and Standards, Figure 2-1, the peak hour demand to average annual demand ratio is approximately 1.2 based on the RM residential zoning peaking curve, resulting in an estimated peak hour demand of 854,150 gpd (593 gpm) (PHD = ADD * Peak Day Factor*1.5).

Attachment D of this report presents the backup data for determining these peaking factors. For estimating the peaking factors, average demand was based on the project's average demand.

An irrigation water demand for the project is estimated to be 948 gpd based on the current landscape plan.

4 CITY OF SAN DIEGO DESIGN CRITERIA

City of San Diego Design Criteria Book 2 of the City of San Diego Guidelines and Standards was used to analyze the existing water system. A summary of the design criteria from Book 2 is presented as **Table 3**. The system is designed to provide minimum residual pressure under (1) Maximum day demand plus fire demand conditions.

Design Pressures:

Table 3: City of San Diego Water System Design Criteria	
Criteria	Design Requirement
Multi-Family Residential Fire Flow	3,000 gpm
Minimum Static Pressure	65 psi
Maximum Static Pressure	120 psi
Maximum Pressure Drop – Reservoir Out of Service	40 psi
Maximum Pressure Drop – Peak Hour & Max Day plus Fire	25 psi
Minimum Pressure – Peak Hour	40 psi
Minimum Pressure – Max Day plus Fire	20 psi
Maximum Pipeline Velocity (Fire Flow)[1]	15 psi
Maximum Pipeline Velocity (Normal Operating Conditions)[2]	5fps

[1] Section 3.3.1 E
[2] Section 3.10.1

5 STATIC AND WORKING PRESSURES

Maximum static pressures within the AVA Pacific Beach Redevelopment are calculated based on the Pacific Beach 307 Water Service Pressure Zone. Using the static pressure data from the City's hydrant flow test (102.5 psi at 45 feet equates to 281.8 HGL static), maximum static pressures within the project during Peak Hour Conditions will range between 58 psi and 111 psi**,** which is within the City of San Diego Water System Design Guidelines maximum allowable pressure of 120 psi. The water system was analyzed using Bentley's WaterCAD v8i simulation model. See **Attachment C** for water calculations.

Hydrant Flow data was collected at three locations adjacent to the project location. Hydrants were tested between 1468 and 1504 GPM, with residual pressures ranging between 90.2 and 106.4 PSI, showing the public water system has capacity to provide fire protection to the proposed project. See **Attachment F** for Hydrant Flow Data provided by the City of San Diego.

Due to the elevation and the relatively high static pressures at the AVA Pacific Beach project site, individual pressure regulators will be installed for building services in order to comply with the California Plumbing Code which limits pressure inside a dwelling unit to a maximum of 80 psi.

6 EXISTING AND PROPOSED WATER SYSTEM

There are existing public water facilities directly adjacent to the AVA Pacific Beach Redevelopment site. The existing facilities are part of the Pacific Beach 307 Zone. There is an 8-inch diameter public water line in Jewell Street to the east of the project, an 8-inch diameter public water line in La Playa Avenue, and an additional 12-inch public water line in Ingraham Street. The existing and proposed public and private water facilities in the vicinity of the project are shown on Attachment A – Existing and Proposed Water Exhibit. Attachment B – Water Systems HGL Zones, shows existing water service areas and pressure zones in the vicinity of the proposed project.

7 CONCLUSIONS

Maximum static pressures within the AVA Pacific Beach project will range between 58 and 111 psi under Peak Hour Demand Conditions, which is within the allowable range as defined by the City of San Diego Guidelines and Standards. Private domestic service for the proposed buildings will be supplied by two existing 4-inch lines with two 4-inch reduced pressure principle backflow preventers, which combine into a single 6-inch line on site. A portion of the existing 4-inch domestic water line will be re-routed to avoid the proposed improvements associated with Building 2. The recommended material specification for all new potable water lines is AWWA C900 PVC DR18 Class 235.

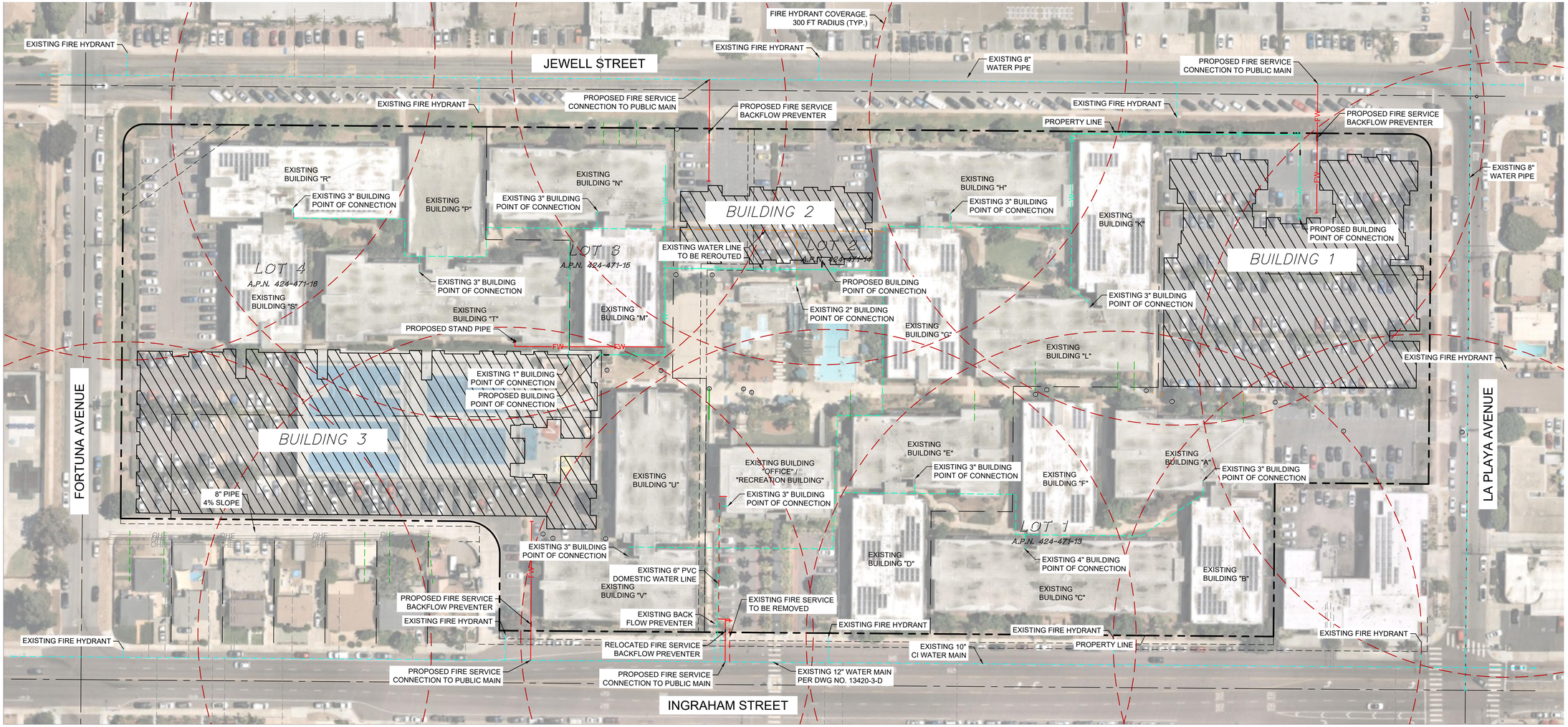
We are available to discuss any questions that you may have concerning this study.

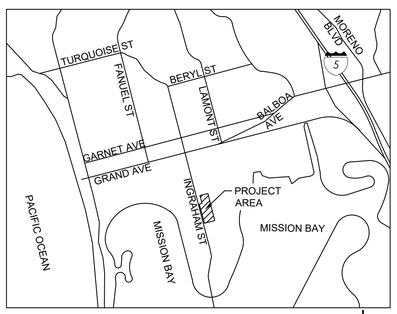
Kimley-Horn and Associates, Inc.

Tammie Moreno, P.E.

Attachment A

Existing and Proposed Water Exhibit





VICINITY MAP

NTS

NORTH

LEGEND

- EXISTING DOMESTIC WATER
- EXISTING WATER LINE TO BE RELOCATED
- PROPOSED PRIVATE WATER (W)
- EXISTING FIRE LINE
- PROPOSED FIRE LINE (FW)
- FIRE COVERAGE (300FT RADIUS)

GRAPHIC SCALE IN FEET

0 25 50 100

NORTH

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EXISTING AND PROPOSED WATER EXHIBIT
AVA PACIFIC BEACH
SAN DIEGO, CALIFORNIA

Attachment B

Public Utilities Department Water Systems HGL Zones

PUBLIC UTILITIES DEPARTMENT
WATER SYSTEM HGL ZONES

City of San Diego
PUBLIC UTILITIES
Water & Wastewater

PRESSURE ZONE NAME	ZONE ELEVATION
ALLIED GARDENS	355
ALVARADO	536
ALVARADO	536
ALVARADO	536
ALVARADO	536
ALVARADO	536
ALVARADO	536
ARCHER	330
ARNOLD HILLS	358
ARROYO SORRENTO	470
BAY TERRACE	490
BAYVIEW	463
BERNARDO HEIGHTS	1020
BERNARDO OAKS	680
BERNARDO OAKS	680
BERNARDO TRAILS	800
BLACK MTN RANCH	520
CABRILLO PALISADES	635
CARMEL COUNTRY	495
CARMEL MALL	920
CARMEL VALLEY	330
CARMEL VIEW	346
CARROLL RIDGE	610
CATALINA	462
CLIMAX	910
COLLEGE CANYON	468
CORNISH HILL	360
COUNTRY CASUAL	925
DEL CERRO	656
DEL MAR HILLS	435
DEL MAR TERRACE	328
DENNERY RD	365
EAGLE RIDGE	940
EL CAMINO	470
FLORAL TERRACE	295
GLIDDEN	320
GOLF COURSE	1130
GOLF COURSE	1130
HILLSBOROUGH	550
IMPERIAL	240
KEARNY MESA	600
LA JOLLA GARDENS	500
LA JOLLA HERMOSA	370
LA JOLLA MESA VISTA	495
LA JOLLA PACIFICA	594
LA JOLLA SHORES	241
LA JOLLA SOLEDAD W	925
LA JOLLA TOWNE	270
LA MIRAGE	500
LIBERTY STATION	175
LOWER DEL MAR TERR	196
LUSK PARK	470
LUSK PARK	470
LUSK PARK	470
MAR VILLA	378
MERCY HIGH	750
MIRA MESA	625
MIRA MESA	625
MIRAMAR	712
MIRAMAR BOOSTED	1150
MISSION CITY	430
MONTE VERDE	685
MURPHY CANYON	500
NORMAL HEIGHTS	536
NORTH CITY	610
NORTH CITY	610
NORTH CITY	610
NORTH CITY	610
NORTH VILLAGE	730
NORTHWEST MESA	559
OAKS NORTH	865
OTAY MESA	680
OTAY REGULATED	270
PACIFIC BEACH	307
PACIFICA	340
PARADISE HILLS #1	472
PARADISE HILLS #2	590
PARADISE MESA	610
PARKVIEW	600
PENASQUITOS	920
PENASQUITOS PARK VW	470
PINNACLE	470
POINT LOMA	260
POINT LOMA	260
POMERADO PARK	920
PRESTWICK ESTATES	355
PRINCESS DEL SOL	390
PRINCESS GARDENS	345
PRINCIPAL DOWNTOWN	231
RANCHO BERNARDO	793
RANCHO BERNARDO	793
RANCHO DEL SOL	470
RANCHO SANTA FE	284
REDWOOD VILLAGE	645
REMINGTON HILLS	543
RIDGEGATE LA JOLLA	575
RIDGEGATE REDUCED	425
RIVIERA DEL SOL	550
RIVIERA SHORES	440
ROBINHOOD RIDGE	580
RODEFER	370
ROSECRANS	225
SAN ANDRES	440
SAN CARLOS	849
SAN CARLOS ESTATES	930
SAN CARLOS REDUCED	692
SANTA LUZ	950
SCRIPPS EASTVIEW	890
SCRIPPS HILLS	1200
SCRIPPS MESA VISTA	892
SCRIPPS RANCH	1020
SCRIPPS RANCH	1020
SCRIPPS RANCH BSTD	1150
SCRIPPS RANCH NORTH	890
SCRIPPS VALLEY	850
SO LA JOLLA CLIFFS	447
SO SAN DIEGO RESV	490
SOLEDAD MURLANDS	725
SOUTH CREEK	815
STALLIONS CROSSING	263
STOCKWOOD	925
STONEBRIDGE	1135
SYCAMORE ESTATES	1250
SYCAMORE HILLS	1050
TIERRASANTA	752
TIERRASANTA NORTE	900
TIERRASANTA SUR	450
TORREY PINES	330
UNIVERSITY HEIGHTS	390
UNIVERSITY HEIGHTS	390
WABASH MESA	355

PROJECT LOCATION

LEGEND

- Municipal City Boundary
- HGL Zone
- Freeways and State Routes
- Major Roads
- Thomas Brothers Grid
- Lakes

SanGIS

N W E S

0 0.5 1 2 3 4 Miles

Path: Y:\EPM\wzEPM_ManagedShare\Design\MstrPlan\Nancy\HGL Zone Map\HGL_Zones.mxd

Date: 7/22/2013

Attachment C

Water Calculations

FlexTable: Junction Table

Label	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
BLDG - Pro Shop	34	172.47	58
J-13	0	260.83	96
J-12	0	260.85	96
BLDG T/P	28	260.85	96
J-15	0	260.86	96
BLDG S/R	29	260.75	96
J-14	0	260.77	96
J-11	0	260.99	96
J-10	0	261.05	96
J-49	0	261.22	97
BLDG M/N	27	261.32	97
J-9	0	261.35	97
J-16	0	261.85	98
BLDG 1	31	261.62	98
J-19	0	261.67	98
J-18	0	261.72	98
J-17	0	261.76	98
J-22	0	261.84	98
J-21	0	261.84	98
BLDG 2	9	261.83	99
J-47	0	263.59	99
BLDG K/L	29	265.74	101
J-28	0	265.79	101
J-25	0	265.93	101
J-29	0	265.93	101
BLDG G/H	29	265.97	101
J-24	0	266.00	101
J-8	0	266.14	101
BLDG U/V	24	278.03	103
J-34	0	278.04	103
J-5	0	276.96	103
J-32	0	277.00	103
J-36	0	276.41	104
J-30	0	265.93	104
J-4	0	278.05	104
BLDG - REC	106	276.79	104
J-6	0	275.94	104
J-7	0	274.06	104
BLDG D/E	23	276.07	104
J-45	0	276.08	104
BLDG C/F	39	275.72	105
J-42	0	275.73	105
J-38	0	275.75	105
J-37	0	275.85	105
J-31	0	265.93	105
BLDG A/B	23	275.42	105
J-40	0	275.44	105
J-39	0	275.56	105

FlexTable: Junction Table

Label	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
EQPMT BLDG	85	256.52	111

Attachment D

City of San Diego Design Guidelines and Standards (Excerpts)

Chapter 2

WATER DEMANDS AND SERVICE CRITERIA

2.1 General

This chapter outlines planning procedures to estimate water demands and fire flows. Water system service requirements are also defined in terms of water pressure and reservoir storage.

2.2 Service Area

The DESIGN CONSULTANT defines the project's service area and identifies the pressure zones in which it is located. The Senior Civil Engineer in charge of either Water Planning or new development approves the service area boundaries.

2.3 Land Use and Residential Population

The DESIGN CONSULTANT develops present and future land use maps for the service area to define the following land use categories: residential (by zone in accordance with **Table 2-1**), central business district, commercial and institutional, parks, hospitals, hotels, industrial, office, and schools.

The DESIGN CONSULTANT estimates the residential population in the service area based on present and future allowable land use. Unless more accurate population density estimates are available, the residential population in the service area is estimated based on the figures presented in **Table 2-1**.

Table 2-1
Residential Population Density

Zone	Dwelling Unit Density (dwelling unit/ net acre)	Unit Density (persons/ dwelling unit)	Population Density (persons/ net acre)
AR-1-1	0.1	3.5	0.4
AR-1-1	0.2	3.5	0.7
AR-1-2	1	3.5	3.5
RS-1-1/RS-1-8	1	3.5	3.5
RS-1-2/RS-1-9	2	3.5	7.0
RS-1-4/RS-1-11	4	3.5	14

Zone	Dwelling Unit Density (dwelling unit/ net acre)	Unit Density (persons/ dwelling unit)	Population Density (persons/ net acre)
RS-1-7/RS-1-14	9	3.5	32
RM-1-1	14	3.2	45
RM-2-5	29	3.0	87
RM-3-7	43	2.6	112
RM-3-9	73	2.2	161
RM-4-10	109	1.8	196
RM-4-11	218	1.5	327

Dwelling unit density in **Table 2-1** is based on net area. The net area is measured in acres, and is 80% of the gross area for each residential zone.

2.4 Average Annual Water Demands

For most projects, average annual water demands are determined based on the unit water demand criteria presented in **Table 2-2**.

Table 2-2
Unit Water Demands

Land Use Category	Unit Water Demand
Residential	150 gallons/person-day
Central Business District	6000 gallons/net acre-day
Commercial and Institutional	5000 gallons/net acre-day
Fully Landscaped Park	4000 gallons/net acre-day
Hospitals	22500 gallons/net acre-day
Hotels	6555 gallons/net acre-day
Industrial	6250 gallons/net acre-day
Office	5730 gallons/net acre-day
Schools	4680 gallons/net acre-day

Average annual water demands are calculated as the sum of: (1) the residential water demand, and (2) other water demands for each land use category as follows:

Residential Water Demand (gallons/day) = Residential Population x 150 gallons/person-day

Other Water Demand (gallons/day) = Land Use Area by Category (net acres) x Unit Water Demand for Each Land Use Category (gallons/net acre-day)

Average Annual Water Demand (gallons/day) = Residential Water Demand + Other Water Demands

On some projects, particularly large residential developments, using the unit water demands in **Table 2-2** may generate unrealistically high estimates of water requirements. For these large projects, the DESIGN CONSULTANT or developer may request that the Senior Civil Engineer consider an alternative approach, making use of the City's water demand distribution data developed for macroscale planning purposes. Similarly, the Senior Civil Engineer may also consider alternative unit water demand estimates for specific land use types where such estimates are based on detailed demand evaluations. Recent projects of similar size, nearby location and similar character may be used for comparative demand analysis.

2.5 Peak Water Demands

Unless the project involves a large development that calls for an alternative approach, peak hour and maximum day water demands are estimated using the peaking factors presented in **Figures 2-1 and 2-2**. Peaking day factors correspond to the zones identified in the Public Utilities Department Water System HGL Zones.

Peak water demands are estimated as follows:

Peak Hour Demand = Average Annual Water Demand * Peak Day Factor * 1.5

Maximum Day Demand = Average Annual Water Demand * Peak Day Factor

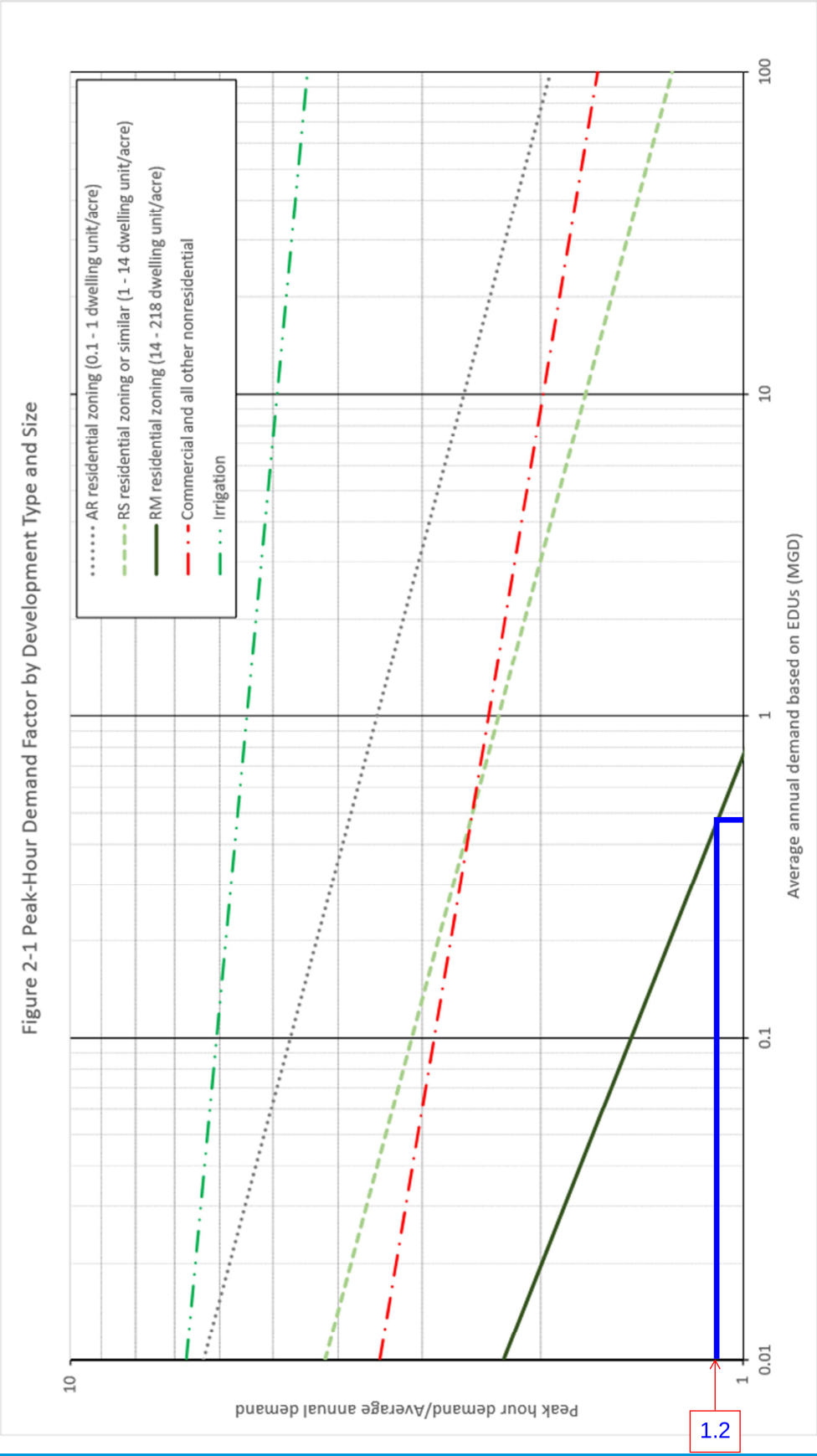


Figure 2-1 Peak-Hour Demand Factor by Development Type and Size

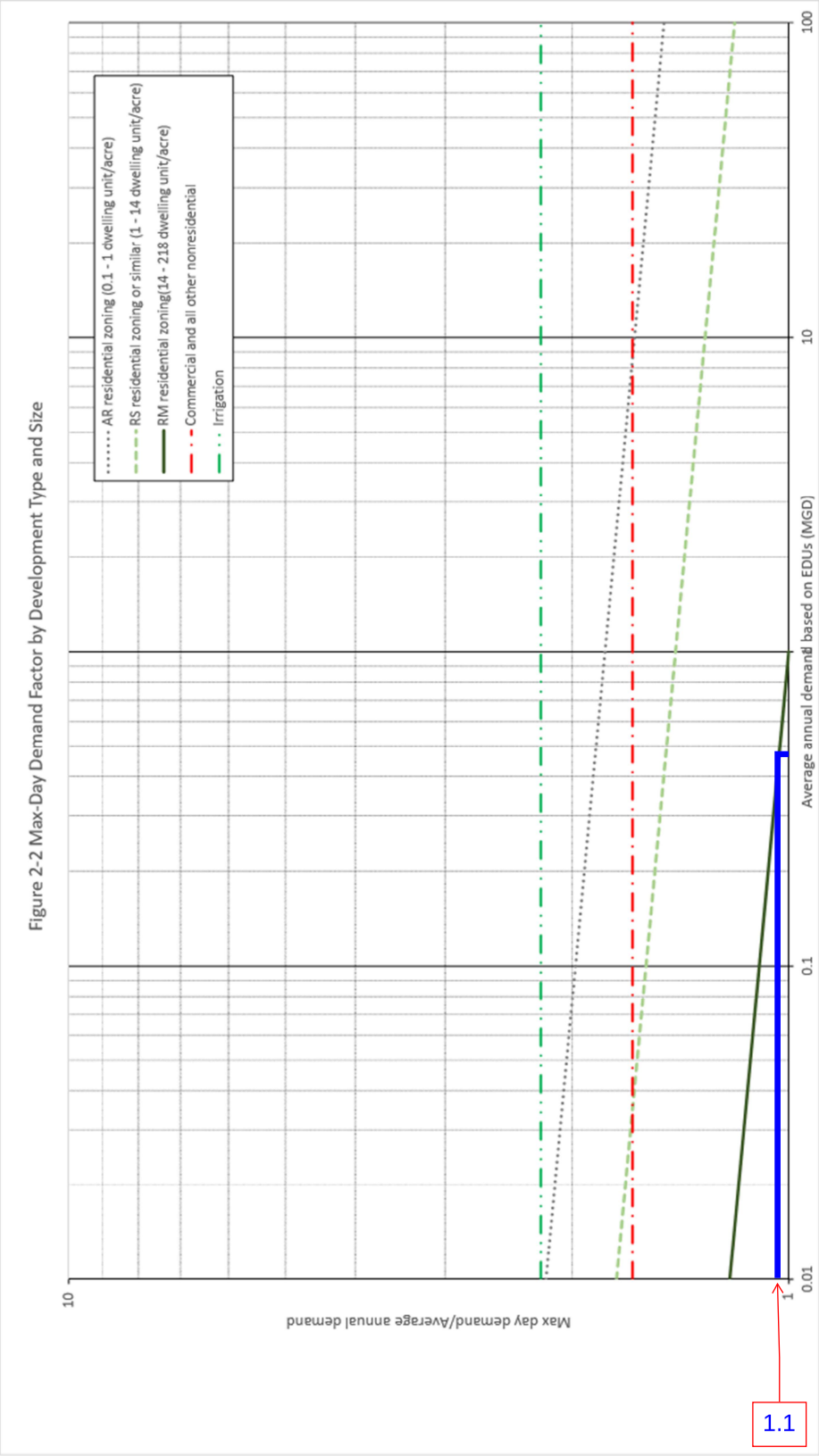


Figure 2-2 Max-Day Demand Factor by Development Type and Size

2.6 Fire Demands

The DESIGN CONSULTANT shall use the minimum required fire demands for design shown in **Table 2-3**. The fire flow duration for planning purposes is at least five hours. Note that the values in **Table 2-3** are the minimum design criteria for public infrastructure. Privately owned facilities shall follow the guidelines described in Appendix B of the California Fire Code (CFC).

Table 2-3
Fire Demands for Design Purposes

Development Type	Fire Demand (gpm)
Single family residential up to Fourplexes	1,500
Condominiums and apartments	3,000
Commercial	4,000
Industrial	6,000

Should application of the CFC Appendix B result in figures lower than those shown in **Table 2-3**, the firm or Civil Engineer, in consultation with the fire department, CIP City Project Manager may approve the CFC figures on a case-by-case basis following submittal of supporting calculations. In no case shall the approved fire flow rate and flow duration be less than the flow rate and duration values required by Appendix B of the CFC based on the anticipated or proposed type of building construction and total building floor area.

The required fire demand must be supplied from public and private on-site fire hydrants located as required by CFC Appendix C.

2.7 Pressure Criteria

2.7.1 Design Pressures

Water systems must be designed to provide the minimum residual pressures under:

- Maximum day demands plus fire demand conditions, or
- Peak hour demand conditions.

In analyzing the supply to a pressure zone, the minimum hydraulic grade line elevation available from the water source is used, a level that typically occurs during dry weather conditions. A water supply source is defined as a treatment plant clearwell, flow control facility, pump station, pressure regulating station or reservoir. Supply sources occur at discrete points in a system of

water mains and control both flow and pressure at the supply point. Water mains are not supply sources but rather conveyance facilities. The maximum static pressure in gravity systems is determined from reservoir overflow elevations and/or the discharge control setting on pressure reducing valves, whichever is greater. The maximum static pressure in pumped systems is determined from reservoir overflow elevations or pump shutoff levels, whichever is greater. There are two important pressure criteria used in water system design: Domestic Pressure and Fire Pressure. For systems supplying only domestic demand, only the Domestic Pressure criteria will apply. Similarly, for systems providing only fire demand, only the Fire Pressure criteria will apply. Systems supplying both types of demand, both criteria will apply and must be independently checked.

2.7.2 Domestic Pressure Criteria

The domestic pressure criteria for water system design are shown in **Figure 2-3**. Every water main in each pressure zone must be capable of supplying a minimum static pressure of 65 psi. Domestic pressures must fall no more than 25 psi below the static pressure, and residual water main pressure must be at least 40 psi. Domestic pressures are determined in the distribution system pipelines, excluding losses through service connections and building plumbing, and are measured relative to adjacent building pad elevations.

When analyzing a system with one source of supply out of service, domestic pressures may fall more than 25 psi below static pressure, but the domestic pressure shall not fall below 40 psi.

2.7.3 Pressure Requirements During Fires

For the simulation of fire conditions, a minimum operating pressure of 20 psi is required at the fire hydrant locations.. The residual pressure is determined given the fire demand among one or more hydrants and with the simultaneous water consumption occurring at the maximum day demand. The hydrants considered in this simulation must be sufficiently near to the fire location to be classified as "available" to that location as defined by the California Fire Code.

For water systems with available storage, the residual pressures in the distribution system during a fire are maintained given the following conditions:

- The water level in the storage facility at the time of the fire is at or near the minimum operating level
- The prescribed fire duration set by the California Fire Code, occurring under maximum day conditions.

2.8 System Reliability

Water systems must be designed to meet the operating pressure criteria with one critical source

out of service. Water mains must be designed so that no more than one, average-sized city block (approximately 30 homes) is out of service at any time, and no more than two fire hydrants (excluding fire services) are on a dead end or are out of service at any time. These provisions do not apply under earthquake conditions.

Water mains serving more than two hydrants or more than 30 homes must be looped, fed from two sources, or provided with a reservoir of sufficient capacity to supply the emergency needs (contingency and fire storage) as described below in **subsection 2.9**.

All water mains relied upon for looping and source redundancy shall be in separate streets. Dual mains in the same street or alignment require the DESIGN ENGINEER to prepare a request for deviation using the format of ATTACHMENT 1, which is included as a part of this document. Where dual mains are relied upon for looping or source redundancy, the mains shall be spaced at least 10 feet apart from outer edge to outer edge.

For City CIP work in already-built-out areas, where looping of mains or connection to two sources of supply is not feasible, water mains may be constructed require the DESIGN ENGINEER to prepare a request for deviation using the format of ATTACHMENT 1, which is included as a part of this document. Additional design considerations shall be made to minimize the chance of pipe breakage, such as use of a higher class of pipe.

Chapter 3

TRANSMISSION AND DISTRIBUTION PIPELINES

3.1 General

The Capital Improvements Program and private developments require the design and construction of new transmission and distribution pipelines. This chapter provides uniform standards on the following for both transmission and distribution pipelines:

- Pipe materials
- Fittings
- Valves and associated structures
- Fire hydrants and services
- Water services
- Water meters
- Flow meters
- Backflow preventers
- Pipe design criteria
- Hydraulic and surge analysis
- Thrust restraint
- Special crossings
- Trenchless construction
- Pipe trench width, bedding and backfill
- Communications

In addition, **Chapter 7** of these guidelines describes the corrosion control design criteria for pipelines and appurtenances.

3.2 Project Presentation

This section on project presentation describes the standards, relevant guidelines and information required to maintain consistency and quality in the drawings and specifications for future water infrastructure.

3.2.1 Preliminary Alignment

Preliminary alignments are generally developed by the City or private developers during a project conceptual or predesign phase and are presented in the Planning Study or Predesign Report. The format used for the preliminary drawings may not necessarily represent the format required for the final design drawings.

For most CIP projects, topographic mapping is provided by the City of San Diego, Engineering & Capitol Projects Department, Survey Section. If the DESIGN CONSULTANT provides the topographic mapping, the survey data will be in U.S. Customary Units. The DESIGN CONSULTANT updates the topographic base to include any development or physical changes that have occurred after the date of survey. If a preliminary horizontal alignment is provided, the DESIGN CONSULTANT reviews and recommends changes in the design to accommodate utility conflicts, the design's constructability, permitting requirements, or easement/right-of-way needs. The proposed horizontal alignment changes must be submitted in writing prior to any design work being performed, or presented in the Basis of Design Report (BODR) but before the 30% submittal.

The vertical alignment is established by the DESIGN CONSULTANT in the design to accommodate utility and permitting requirements, pipe installation criteria, geotechnical requirements, and local, state, and federal standards.

3.2.2 Contract Specifications

The standard specifications used for water infrastructure projects are the latest adopted edition of the GREENBOOK Standard Specifications for Public Works Construction, and the WHITEBOOK – Standard Specifications for the City of San Diego. The DESIGN CONSULTANT also prepares special provisions as necessary to meet the additional requirements of the project as needed.

3.2.3 Contract Drawings

The DESIGN CONSULTANT develops contract drawings to meet the specific needs of a project. Preliminary drawings, when provided to the DESIGN CONSULTANT, are used initially as the basis of design and are amended as necessary. The contract drawings must conform to the requirements of the Citywide Drafting Standards.

3.3 Sizing, Alignment, Easements, and Landscaping

3.3.1 Sizing and Alignment Criteria

Generally, water mains are located 10 feet southerly or easterly of the centerline of streets. For alleys, narrow streets, and private driveways (less than 36 feet curb to curb), water mains may be located less than 10 feet, but not less than 6 feet, from the centerline. When there is a raised center median with curb, water mains are located a minimum of 5 feet from the face of the median curb but within the center 6 feet of a traffic lane (see City of San Diego Standard Drawing SDM-111).

3.3.1.1 Horizontal and Vertical Curves

Curves for smaller diameter jointed pipe are accomplished using straight lengths of pipe with selected bends and fittings. Curves for larger diameter welded steel pipe are accomplished using beveled joints. Curves are based on industry standards for minimum radius of curvature.

3.3.1.2 Utility Separations

A minimum of 5-foot horizontal separation is recommended between water mains and other utilities except for sewer mains. Parallel water and sewer mains require a minimum of 10-foot horizontal separation (edge to edge), in accordance with State Water Resources Control Board, Division of Drinking Water criteria. Reclaimed water mains, are considered as sewer mains for separation purposes. Review and written approval shall be required from the California State Water Resources Control Board, Division of Drinking Water, for separation deviations between water, sewer or reclaimed water.

For parallel water mains, lines should be located in lanes on opposite sides of the street. Separations less than 10 feet apart shall be preapproved by Public Utilities Department, Water System Operations.

3.3.1.3 Water Main Abandonment

The abandonment of existing water mains and appurtenant structures should be in accordance with the construction drawings and the most current approved edition of the Standard Specifications for Public Works Construction (SSPWC or GREENBOOK) and WHITEBOOK, as adopted by the City.

3.3.1.4 Transmission Mains

Transmission water mains (16-inch in diameter and larger) are sized to provide all current water needs of the area they supply, with sufficient reserve capacity to allow future expansion and development. When possible, transmission mains should be planned so that each area is supplied by a minimum of two transmission lines, each capable of providing the water needs of the area being served, under the 25% emergency water conservation mandate.

Acceptable sizes for transmission mains are 16-inch, 20-inch, 24-inch, 30-inch, 36-inch and larger (increasing in 6-inch increments).

Transmission water mains shall not be tapped directly for water services (domestic or irrigation) or fire services (including hydrants), except for 16-inch or the DESIGN ENGINEER prepares a request for deviation using the format of ATTACHMENT 1, which is included as a part of this document. To receive water from a transmission main, a connection to a distribution main must be tapped or built into the transmission main.

3.3.1.5 Distribution Pipelines

Distribution water mains (16-inch in diameter and smaller) should be sized to meet the pressure criteria and the required fire flow plus maximum day demand at a maximum velocity of 15 fps. In lieu of specific calculations for minor losses, calculated head losses are increased by 10% for fittings and other minor losses.

Acceptable sizes for distribution mains are 8-inch, 12-inch, and 16-inch only.

Water mains in commercial and industrial areas are a minimum of 12 inches in diameter.

3.3.1.6 Prohibited Locations

Water mains shall not be installed within 10 feet of trees or shrubs that mature naturally to a height of over 3 feet. If that cannot be avoided, then the trees shall have root barriers installed or replanted in above ground planters.

Water mains shall be installed in paved city streets. Water mains installed in unpaved streets require the DESIGN ENGINEER to prepare a request for deviation using the format of ATTACHMENT 1, which is included as a part of this document.

3.3.2 Pipeline Profile Criteria

The DESIGN CONSULTANT develops the pipeline profile to minimize costs while still meeting the needs of the project. Factors to be considered include:

- Pipe material, fabrication, and installation costs
- Potential conflicts with existing and future utilities or other improvements
- The safety and security of the pipeline
- Geotechnical conditions
- The requirements of governing agencies
- Maintenance requirements

The profile of water mains should include stations and elevations at grade breaks. Abrupt vertical grade breaks resulting in upward thrust should be avoided. Profile requirements for special crossings are discussed in **subsection 3.13**.

For a pipe diameter of less than 12 inches, only the pipe invert need be shown in the profile. For pipes 12 inches in diameter and larger, the pipe invert and the top of the pipe should be shown, and the pipeline stationing should be the centerline of the pipe.

Minimum cover for pipelines is described in **paragraph 3.8.3**, or as shown in the City of San Diego standard drawings.

3.3.3 Easements

Permanent easements, where the pipe is located outside the right-of-way are not allowed unless there are no public right of way (public street) options. Water easements, if approved, shall be located entirely within one lot or parcel and adjacent to the property line.

Sixteen-inch diameter and smaller water mains require a minimum 15-foot wide easement. The main should be positioned 5 feet from the property line. A minimum 20-foot wide easement is required for 20-inch to 36-inch diameter mains and a minimum 25-foot wide easement is required for larger than 36-inch diameter mains. Wider easements may be required when the pipe is placed at depths greater than normal (3 to 5 feet to the top of the pipe for water mains). All existing substandard easements must be brought up to current standards prior to the approval of any new improvement permit by the Public Utilities or Development Services Departments.

A minimum of 5 feet of additional easement width (beyond that described above) is required for water mains located in canyons, "open space" areas, and other areas that are difficult to access such as between buildings.

Water service taps are not allowed on easement water mains except where the easement is a paved traveled way and is at least 24 feet wide.

Easements serving more than one utility require a minimum of 5 feet of additional width for each additional utility.

3.3.3.1 Private Street Easements

Easements located in private streets, private driveways, industrial complexes, apartment complexes, and condominiums that are required for access of water vehicles, water meter readers and fire protection equipment, must be a minimum of 24 feet wide and paved the full width of the easement are approved on a case-by-case basis. Easements for fire service mains may be unpaved with a minimum 15-foot width, provided there are no metered water services connected to the fire service main. A separate 24-foot minimum width paved access easement to any connected hydrant must be provided.

3.3.3.2 Access Easements

Vehicular access easements for water meter readers and fire protection equipment must be a minimum of 24 feet wide.

Access roads must be provided to all water main appurtenances (blow-offs, air valves, gate and butterfly valves, manholes, etc.). Access roads must be a minimum of 20 feet wide with a maximum 8% slope, and have a minimum 4-inch decomposed granite surfacing. Access roads with slopes of 8% to 15% require the DESIGN ENGINEER to prepare a request for deviation using

the format of ATTACHMENT 1, which is included as a part of this document and, if approved, must have a minimum 3-inch, asphaltic-concrete surfacing.

Easements secured by fencing must have a locked vehicular access gate. Keys to the lock must be provided to the various utility agencies with facilities inside the fenced area.

3.3.3.3 Fire Hydrant Easements

Fire hydrants must be provided with a minimum 24-foot paved access easement. Access to onsite and easement fire hydrants shall be approved by the Fire Department.

3.3.3.4 Abandonment of Water Easements

In cases where water facilities are proposed to be completely relocated or abandoned from any existing water easement, and there are no other water facilities using or contemplated in the future for the easement, the water easement shall be abandoned per Section 125.1001 of the Municipal Code as part of the work to be done. Where water facilities are to be completely relocated or abandoned from any mixed-use or general utility easement, the easement shall be abandoned per Section 125.1001 of the Municipal Code as part of the work to be done if it is determined that there are no other utilities using or contemplated in the future for the easement. This requirement for easement abandonment shall apply to all private development projects and Capital Improvement Projects.

All easements required to be abandoned shall be accomplished through a Process 5 easement abandonment application with the Development Services Department pursuant to the State of California Streets and Highways Code or, if applicable, pursuant to the Subdivision Map Act.

As part of the easement abandonment process, the proposed abandonment shall require the approval of the Senior Civil Engineer of Water Systems Operations Division, Public Utilities Department.

3.3.4 Landscaping

New trees should not be planted within 10 feet of existing water pipes. If that cannot be avoided, then the trees should be planted with root barrier or installed in above ground planters.

3.4 Pipeline Materials, Linings, and Coatings

This section references pipe materials, linings, and protective coatings for water pipelines. For specific corrosion control design criteria, refer to **Chapter 7**. For general seismic criteria, see **Chapter 8**.

temperature. The specifications must state the maximum allowable temperature of the steel when the closure joints are welded. The minimum temperature of the steel shall be considered 50°F. The force due to a drop in temperature, between the time the joints are welded and the pipe is placed in service, always creates tension in the pipe wall.

3.9.3.7 Longitudinal Force Due to Effect of Poisson's Ratio

Should the pipe be restrained from contracting, the maximum magnitude of the longitudinal stress induced by internal pressure is given by the formula:

Longitudinal Stress = (Hoop Stress) x Poisson's Ratio

For steel, Poisson's ratio is assumed to be 0.303. The longitudinal stress resulting from the effect of Poisson's ratio should be added to the stress caused by any change in temperature. The DESIGN CONSULTANT is advised that situations may occur where the total longitudinal stress includes the temperature stress, Poisson's stress, and bulkhead thrust stresses.

3.9.3.8 Earthquake Loads

See **Chapter 8, Section 8.4** for design guidelines for buried pipes under earthquake loading.

3.9.3.9 PVC Pipes

The minimum pipe rating shall be DR18, Class 235, unless otherwise shown on the plans. For Design-Build contracts, the operating pressure, depth of cover, soil and groundwater conditions determine the class of pipe required in conformance with the applicable AWWA requirements for the type of pipe selected.

3.9.3.10 Ductile Iron Pipes

The minimum pipe rating shall be Class 150, unless otherwise shown on the plans. For Design-Build contracts, the operating pressure, depth of cover, soil and groundwater conditions determine the class of pipe required in conformance with the applicable AWWA requirements for the type of pipe selected.

3.10 Hydraulic and Surge Analysis

3.10.1 Hydraulic Analysis

The City Project Manager supplies the DESIGN CONSULTANT with available information regarding system and project hydraulics. The information covers design capacity, sizing criteria, system head

losses, and design assumptions. The DESIGN CONSULTANT reviews this information for completeness and adequacy.

Typically, transmission pipelines are designed using Hazen-Williams equation with C = 135. Calculations should include minor losses for valves and bends on the pipeline. For transmission lines, typical maximum pipeline velocity is 8 fps for 60-inch and larger pipeline, and 5 fps for pipelines smaller than 60-inch diameter.

Distribution water mains (16 inches in diameter and smaller) should be designed to meet the pressure criteria and required fire flow plus maximum day demand at a maximum velocity of 15fps. Calculations should be based on C = 120 in the Hazen-Williams equation. In lieu of specific calculations for minor losses, calculated head losses are increased by 10% for fittings and other minor losses.

The DESIGN CONSULTANT shall request any additional information necessary for the complete design before beginning the final design. The City Project Manager is notified of any conflicts or necessary changes that may affect the validity or accuracy of the hydraulic information provided.

The DESIGN CONSULTANT prepares the final design hydraulic calculations to verify that the final design is in conformance with the information provided.

3.10.2 Surge Analysis

A surge analysis is normally performed by the DESIGN CONSULTANT in the early design stages. This surge analysis is considered preliminary because certain assumptions must be made to perform the surge analysis. As the final design progresses, some of those assumptions may require modification and the surge analysis must be updated.

The DESIGN CONSULTANT reviews the surge analysis information and coordinates with other designers responsible for pumping stations and reservoirs. Should additional information be necessary or should the assumptions made in performing the surge analysis be modified by final design decisions, the DESIGN CONSULTANT must notify the Senior Civil Engineer of the need for additional information and/or the need to update the surge analysis.

The pipeline DESIGN CONSULTANT verifies that the final design is consistent with the information provided with the surge analysis.

3.11 Thrust Restraint

Thrust at all bends, tees, dead-ends, and reducers must be resisted by thrust blocks, in accordance with SDRSD SDW-151, or a combination of restrained joints and thrust blocks.

Attachment E

On-Site Water Service ~ Crown Point Country Club

INGRAHAM ST.

JEWELL ST.

LA PLAYA

FORTUNA

WATER METER

PT. "H"

PT. "K"

WATER SOFTENERS

PT. "I"

PT. "G"

PRV TYP

PT. "F"

PT. "E"

PT. "C"

PT. "D"

PT. "A"

PT. "B"

RECREATION BUILDING

EQUIP. ROOM

A — 535 FU = 132 GPM

B — 805 FU = 181 GPM

C — 13 FU = 47 GPM

D — 739 FU = 1086 GPM

E — 535 FU = 132 GPM

F — 625 FU = 150 GPM

G — 637 FU = 152 GPM

H — 673 FU = 158 GPM

K — 673 FU = 158 GPM

L — 673 FU = 158 GPM

M — 41 FU = 47 GPM

N — 625 FU = 150 GPM

P — 637 FU = 152 GPM

S — 637 FU = 152 GPM

T — 739 FU = 1086 GPM

U — 15 FU = 47 GPM

V — 13 FU = 47 GPM

3" CW

4" CW

WATER DISTRIBUTION CALCULATIONS

POINTS	SIZE	DEVELOPED FT. / PIPE	GPM	PSI / DROP PER 100'	PSI / DROP PER DEVELOPED LENGTH OF PIPE	REMARKS
A-B	3"	166	132	6.4	3.61	
B-C	4"	181	255	8.33	2.7	
C-D	4"	24	256	.84	.36	
D-E	4"	214	829	12.0	6.16	
E-F	4"	91	835	8.27	2.32	
F-G	6"	301	460	4.33	1.86	
G-H	8"	169	610	4.09	1.7	
H-I	8"	44	645	1.17	.50	
WATER SOFTENERS	8"		645		1.0	
X-METER	12"	12	645	2.26	.27	
METER	2-4" COMP.		705		50 METER	50 GPM LANDSCAPE 655 GPM X-METER

TOTAL 69.42 PSI

SUMMARY

1054 F.U.	645 GPM	
	10 GPM	POOL MAKE UP
	50 GPM	LANDSCAPE
	705 GPM	TOTAL

CITY PRESSURE @ MIN. 104.00 PSI
PRESSURE LOSSES 43.42 PSI
RESIDUAL 60.58 PSI

DEVELOPED LENGTH OF LONGEST RUN = 1480 FEET
LOSSES CALCULATED ON USE OF TRANSITE PIPE

NOTE: 1. EACH APARTMENT PIPING IS SIZED FOR ~~[illegible]~~ Table M Water Cond.
~~[illegible]~~
~~[illegible]~~

2. WATER PRESSURE REGULATOR SIZES ARE SHOWN ON DETAIL 2 SHEET P-2.

3. THE RECREATION BUILDING WATER SYSTEM WILL BE SIZED FROM ~~[illegible]~~ CURVE FOR FLUSH VALVES. Table M Water Cond.

NO.	DATE	REVISION	BY
1	5-27-68	CHANGE CROSS #1	H.H.

WARREN STEELE AND ASSOCIATES
MECHANICAL ENGINEERS
TEL. 465-6186
3515 OVERLAND BLVD. WEST
LOS ANGELES, CALIFORNIA 90064

ON-SITE WATER SERVICE - CROWN POINT COUNTRY CLUB
SCALE 1/32" = 1'-0"
SAN DIEGO, CALIF. 10-11-68

C2856

W-1

145

Attachment F

Hydrant Flow Data

City of San Diego
Development Services
Attention: **Hydrant Flow Request**
1222 First Ave., MS-401
San Diego, CA 92101
(619) 446-5000

Hydrant Flow Request

FORM DS-160
OCTOBER 2016

Fill out the information below completely for all sprinkler system flow requests, including NFPA 13, 13D and 13R systems. E-mail form to: DSDHydrantFlow@sandiego.gov, or mail request to the above address.

Please print or type legibly.

Company Requesting Hydrant Flow:
Kimley-Horn

Telephone No: 619-744-0115
Fax No:
E-mail Address: tammie.moreno@kimley-horn.com

Project Number for the Building Permits:

Location of Hydrants:
Ingraham St

Cross Street: Fortuna Ave
City: San Diego
State: CA
ZIP Code: 92109

FOR CITY USE ONLY

Facility Sequence Number: (FSN): 518655

Static: 93.8 PSI
Elevation: 36' FEET

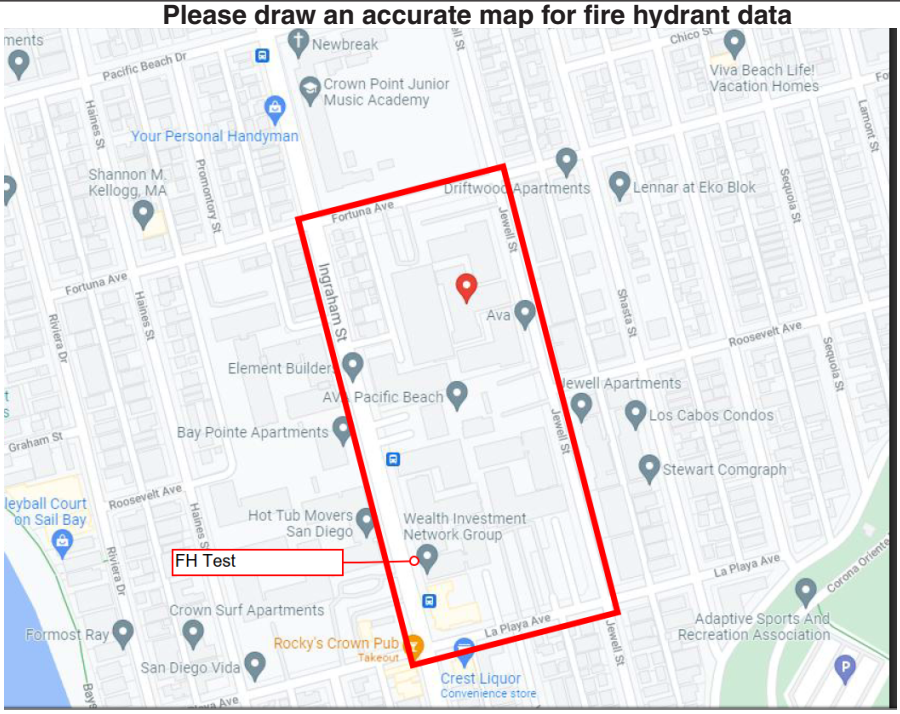
Pitot: model PSI
Residual: 106.4 PSI

Date: 10/20/2021
Flow: 1495 GPM

Researched in database by: O. Paraiso

The information provided above is based upon a water model. It is the contractor's responsibility to confirm the available static pressure at the system point of connection. If a discrepancy is noticed at that time, notify DSDHydrantFlow@sandiego.gov as soon as possible.

Please draw an accurate map for fire hydrant data



City of San Diego
Development Services
Attention: **Hydrant Flow Request**
1222 First Ave., MS-401
San Diego, CA 92101
(619) 446-5000

Hydrant Flow Request

FORM DS-160
OCTOBER 2016

Fill out the information below completely for all sprinkler system flow requests, including NFPA 13, 13D and 13R systems. E-mail form to: DSDHydrantFlow@sandiego.gov, or mail request to the above address.

Please print or type legibly.

Company Requesting Hydrant Flow:
Kimley-Horn

Telephone No: 619-744-0115
Fax No:
E-mail Address: tammie.moreno@kimley-horn.com

Project Number for the Building Permits:

Location of Hydrants:
Ingraham St

Cross Street: Fortuna Ave
City: San Diego
State: CA
ZIP Code: 92109

FOR CITY USE ONLY

Facility Sequence Number: (FSN): H518658

Static: 102.5 PSI
Elevation: 45' FEET

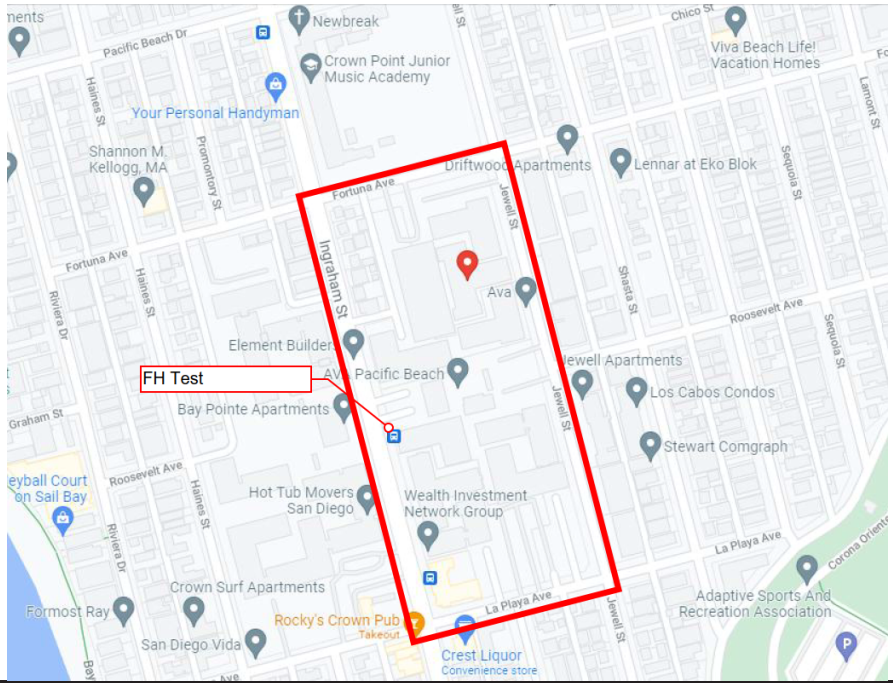
Pitot: model PSI
Residual: 90.2 PSI

Date: 10/20/2021
Flow: 1468 GPM

Researched in database by: O. Paraiso

The information provided above is based upon a water model. It is the contractor's responsibility to confirm the available static pressure at the system point of connection. If a discrepancy is noticed at that time, notify DSDHydrantFlow@sandiego.gov as soon as possible.

Please draw an accurate map for fire hydrant data



City of San Diego
Development Services
Attention: **Hydrant Flow Request**
1222 First Ave., MS-401
San Diego, CA 92101
(619) 446-5000

Hydrant Flow Request

FORM DS-160
October 2016

Fill out the information below completely for all sprinkler system flow requests, including NFPA 13, 13D and 13R systems. E-mail form to: DSDHydrantFlow@sandiego.gov, or mail request to the above address.

Please print or type legibly.

Company Requesting Hydrant Flow: Kimley-Horn

Telephone No: 619-744-0115 | Fax No: | E-mail Address: tammie.moreno@kimley-horn.com

Project Number for the Building Permits:

Location of Hydrants: Jewell Street

Cross Street: Fortuna Ave | City: San Diego | State: CA | ZIP Code: 92109

FOR CITY USE ONLY

Facility Sequence Number: (FSN): H518652

Static: 107.7 PSI | Elevation: 33' FEET

Pitot: model PSI | Residual: 95.0 PSI

Date: 10/20/2021 | Flow: 1504 GPM

Researched in database by: O. Paraiso

The information provided above is based upon a water model. It is the contractor's responsibility to confirm the available static pressure at the system point of connection. If a discrepancy is noticed at that time, notify DSDHydrantFlow@sandiego.gov as soon as possible.

Please draw an accurate map for fire hydrant data