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SEWER STUDY FOR THE NAKANO PROJECT IN THE CITY OF CHULA VISTA

November 15, 2023

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NAKANO PROJECT
IN THE CITY OF CHULA VISTA

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November 15, 2023 648-038

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Attention: Allen Kashani, P.E., Senior Project Manager

Subject: Sewer Study for the Nakano Project in the City of Chula Vista

Introduction

This report provides a sewer system analysis for the Nakano residential project currently in the City of Chula Vista and Otay Water District. The Nakano project is located in the southern portion of the City of Chula Vista. It is situated along Dennery Road immediately east of the Interstate 805 freeway approximately 1,500 feet north of Palm Avenue. See Figure 1 for the location of the project.

The Nakano project is proposing to develop the property with 67 detached condominiums, 84 duplexes and 70 multi-family dwelling units (221 total units) spread across 23.8 gross-acres. The Project does not have direct access to Chula Vista utilities and would need to be served by the City of San Diego and METRO. The Project will also simultaneously process to de-annex from the City of Chula Vista and Otay Water District and annex into the City of San Diego.

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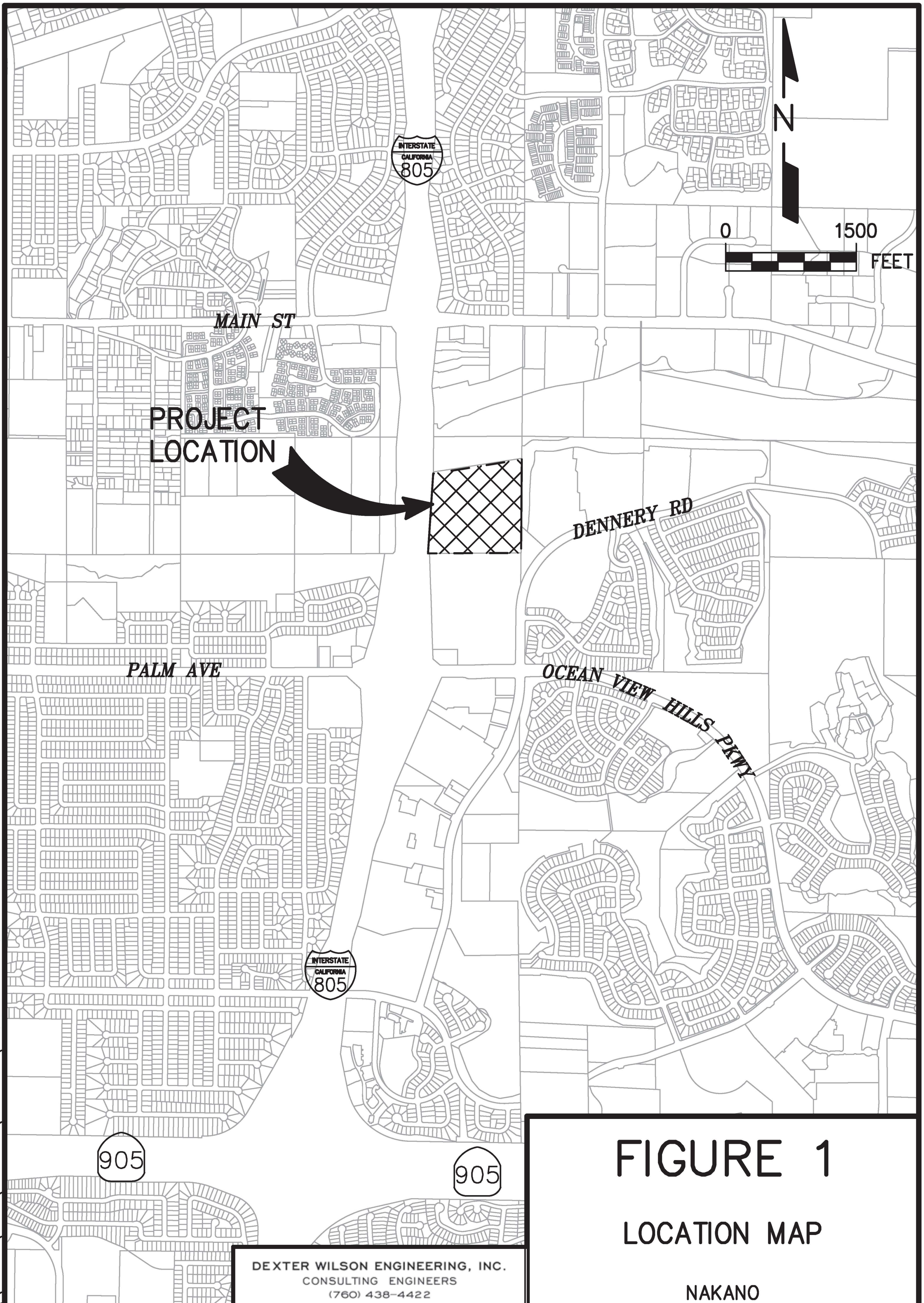

FIGURE 1

LOCATION MAP

NAKANO

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The Nakano project will receive sewer service via an onsite private collection system and will be located adjacent to the existing City of San Diego 27-inch diameter Otay Valley Trunk Sewer. The project will relocate and subsequently connect to the Otay Valley Trunk Sewer.

This report considers sewer service under two scenarios:

1) If the project remains in the City of Chula Vista, it would be served through connections to the City of San Diego's Otay Valley Trunk Sewer. The projects' wastewater generation would be added to the City of Chula Vista's existing Metro Flow share and allocation. This option would require an out of service agreement through LAFCO.

2) If the project is annexed to the City of San Diego, the City of San Diego would provide wastewater service and no out of service agreement for wastewater service would be required. Annexation to City of San Diego and de-annexation from City of Chula Vista and Otay Water District would be required for this option.

The sewer improvements would be the same under both scenarios, but the service provider and required LAFCO actions would differ.

Access to the project will be from Dennery Road. A private driveway will provide access to the project. The proposed pad elevations for the project range from 111 to 119 feet. Topography onsite slopes from south to north toward the Otay River and Otay Valley Trunk Sewer.

Purpose of Study

The purpose of this sewer study is to estimate sewer generation for the Nakano project, preliminarily determine the size of the onsite private sewer collection piping, and to assess the capacity of the public sewer system downstream of the project.

Sewer System Design Criteria

Sewer service to the Nakano project will be provided by an onsite private collection system. The design criteria used for the evaluation of the sewer system serving the Nakano project is based on the City of Chula Vista Wastewater Collection System Master Plan dated May 2014 as well as the Sewer Design Guide, Revised May 2015, City of San Diego Public Utilities Department. Pertinent sections of the City's Master Plan are included in Appendix A.

Sewage Generation Factor. Table 3-2 in the City of Chula Vista Wastewater Collection System Master Plan, dated May 2014, specifies a wastewater duty factor of 230 gpd per dwelling unit for single family land use and 182 gpd per dwelling unit for multifamily land use. These generation factors are utilized in case the City of Chula Vista requires the project to be added to its existing Metro Flow share and allocation.

Peaking Factors. Peaking factors are identified in the City of Chula Vista Wastewater Collection System Master Plan dated May 2014. Peaking factors for primarily residential developments are presented in Table 1.

TABLE 1
SEWAGE FLOW PEAKING FACTORS

Description	Peak Factor	Source[1]
ADF to PDWF	1.39	Figure 3-4
PDWF to PWWF	1.80	Section 3.3.6

[1] Sources listed are found in the City of Chula Vista Wastewater Collection System Master Plan dated May 2014.

Manning's "n". The gravity sewer analyses are made using the Manning Equation. The Manning's "n" used for calculations in this report is held as a constant for all depths in a circular conduit. The value of Manning's "n" used for this study is 0.013.

Depth and Velocity of Flow in Gravity Sewers. Gravity sewer lines are designed to convey peak wet weather flow. Existing pipes that are 12-inches in diameter and smaller are allowed to convey peak wet weather flow to a maximum depth-to-diameter (d/D) ratio of 0.50. Existing sewer lines that are larger than 12-inches in diameter are allowed to flow at a maximum d/D ratio of 0.75. Gravity sewer lines are designed to maintain a minimum velocity of 2.0 feet per second at peak wet flow to prevent the deposition of solids.

Private Onsite Sewer System Design Criteria

The onsite private sewer collection system will be sized based on the California Plumbing Code, Chapter 7, Sanitary Drainage. The total number of Drainage Fixture Units (DFUs) will be estimated for the project and used in combination with Table 703.2 in the Plumbing Code to determine the minimum sewer collection line size needed within the project site.

The City of Chula Vista and City of San Diego annexation procedures and ultimate determinations for the Nakano project will have no impact to the design and sizing of the proposed onsite private sewer collection system presented in this study.

Sewage Generation – Public System

Based on the sewage generation factors and the peaking factors presented in the City of Chula Vista Wastewater Collection System Master Plan, dated May 2014, the estimated sewage generation for the project is calculated using the proposed number of dwelling units.

The estimated sewage generation for the Nakano project is calculated below for 221 units:

Average Day Flow = (67 units x 230 gpd/DU) + (154 units x 182 gpd/DU) = 43,438 gpd
Peak Dry Weather = 43,438 gpd x 1.39 = 60,379 gpd
Peak Wet Weather Flow = 60,379 gpd x 1.8 = 108,682 gpd

Sewage Generation – Onsite Private Sewer

As noted earlier, the onsite private sewer system sizing is based on Drainage Fixture Units. Appendix B includes a summary of the preliminary estimate Drainage Fixture Units for the 221 units. The DFUs for the 221 units is 5,525 DFUs.

Existing Sewer System

Figure 2 presents the existing public sewer facilities in the vicinity of the Nakano project. The existing public sewer system includes City of San Diego Otay Valley Trunk Sewer facilities which consist of the primary 27-inch diameter gravity line and secondary 18-inch diameter gravity line which converge within the project site. The project will be partially relocating these existing Otay Valley Trunk Sewer facilities and consequently connecting to them as well. The City of San Diego Otay Valley Trunk 27-inch sewer crosses the Otay River downstream of the project and intercepts additional City of Chula Vista sewer flow before being further conveyed into the South Metro Sewer Interceptor System.

Offsite Public Sewer System Impact

The project proposes to connect to the relocated 27-inch diameter Otay Valley Trunk Sewer on the north side of the project as shown on Figure 2. Appendix C presents the existing flows and hydraulic calculations for each proposed reach in the proposed relocated public trunk sewers. All depths in proposed sewers remain below City design criteria.

The offsite sewer system impact encompasses the existing Otay Valley Trunk Sewer and overall City of San Diego's Metropolitan Wastewater Department (METRO) facilities. It is anticipated that the project's average wastewater flow of 43,438 gpd and peak wastewater flow of 108,682 gpd will be added onto the City of Chula Vista's existing METRO flow share and allocation.

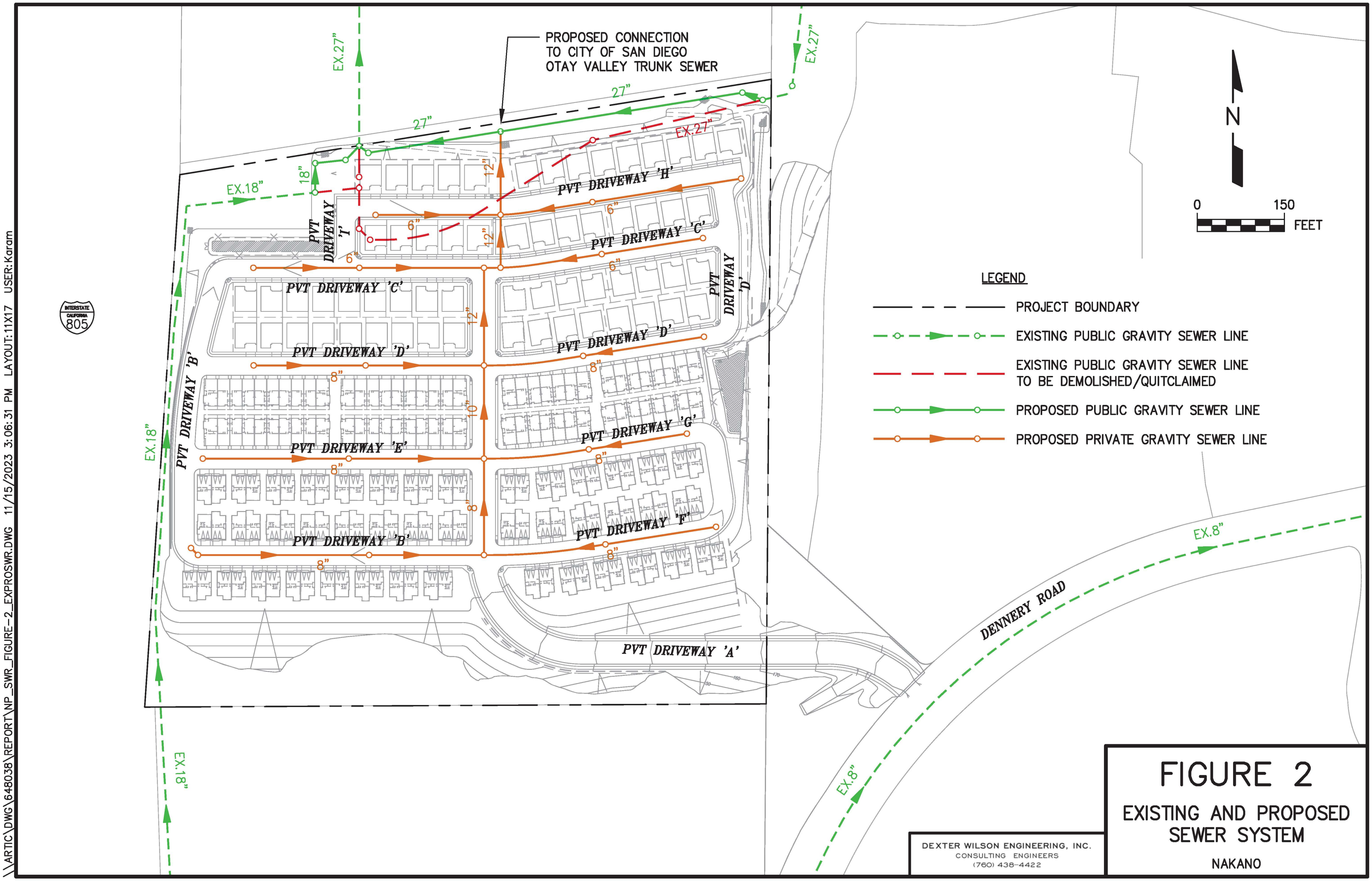

FIGURE 2

EXISTING AND PROPOSED SEWER SYSTEM

NAKANO

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\ARTIC\DWG\648038\REPORT\NP_SWR_FIGURE-2_EXPROSWR.DWG 11/15/2023 3:06:31 PM LAYOUT:11X17 USER:Karam

The Otay Valley Trunk Sewer is associated with the overall ongoing regionwide South Otay and Otay Mesa sewer analyses by the City of San Diego. Currently there is additional capacity in the Otay Valley Trunk Sewer. Out of basin flows are presently being conveyed into the Otay Valley Trunk Sewer from the southern Otay Mesa region via a temporary sewer lift station. Once capacity in the Otay Valley Trunk Sewer is reached then these out of basin flows will be redirected to the future Otay Mesa Trunk Sewer system leaving the Otay Valley Trunk Sewer with only in basin sewer flows.

Onsite Private Sewer System Analysis

The Nakano project proposes to construct an onsite private sewer collection system with a single sewer lateral/connection to the existing (relocated) 27-inch diameter Otay Valley Trunk Sewer in an easement immediately north of the project property. The onsite private sewer collection system will convey all 221 residential units via gravity. The sizing of the onsite private sewer line is based on Drainage Fixture Units and the California Plumbing Code.

The estimated number of Drainage Fixture Units was presented earlier in this report under the onsite sewage generation section. To recap:

221 Units	5,525 DFUs

Using Table 703.2 from the California Plumbing Code, these are the allowable DFUs for the following gravity sewer pipe sizes based on a slope of 2 percent:

4-inch	216 DFUs
6-inch	720 DFUs
8-inch	2,640 DFUs
10-inch	4,680 DFUs
12-inch	8,200 DFUs

Using Table 703.2 from the California Plumbing Code, these are the allowable DFUs for the following gravity sewer pipe sizes based on a slope of 1 percent:

4-inch	172 DFUs
6-inch	576 DFUs
8-inch	2,112 DFUs
10-inch	3,744 DFUs
12-inch	6,550 DFUs

Therefore, the private onsite sewer lateral/connection for the 221 residential units, a total of 5,525 DFUs, must be 12-inch at at least one percent.

The proposed private sewer collection system for the Nakano project is shown on Figure 2.

Conclusions and Recommendations

The following conclusions and recommendations are summarized based on the sewer study prepared for the proposed Nakano project.

1. Sewer service to the project will be provided by an onsite private collection system and connection to existing METRO sewer facilities.

2. Sewer generated by the Nakano project will gravity flow to the relocated 27-inch diameter Otay Valley Trunk Sewer immediately north of the project.

3. Based on current METRO regionwide Otay Mesa and Otay Valley sewer analyses, the Otay Valley Trunk Sewer, to which the project will connect, has available capacity for the proposed project's sewer flow.

4. The onsite private sewer collection system for the proposed project site will consist of a 12-inch sewer lateral connected to the existing (relocated) 27-inch diameter Otay Valley Trunk Sewer in an easement immediately north of the project by means of a new sewer manhole on the 27-inch sewer main.

5. The proposed private sewer collection system for the Nakano project is shown on Figure 2.

6. The Drainage Fixture Units for the project must be further evaluated and confirmed during the improvement plan review stage of this project.

Thank you for the opportunity to provide sewer system planning services for this project. Please feel free to contact us to further discuss any aspect of the information presented in this sewer service analysis for the Nakano project.

Dexter Wilson Engineering, Inc.

Steven Henderson, P.E.

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Attachments

APPENDIX A

CITY OF CHULA VISTA WASTEWATER COLLECTION SYSTEM MASTER PLAN EXCERPTS

3.3.3 LANDUSE AND WASTEWATER DUTY FACTORS

The wastewater ADWF duty factors were calculated using return-to-sewer-ratios (RTS) as described above. Wastewater duty factors for residential were expressed in gallons per day per dwelling unit (GPD/DU) and/or gallons per capita per day (GPCD), while duty factors for the remaining zoning classifications were expressed in GPD/acre. In order to calculate the GPCD, San Diego Association of Governments (SANDAG) Region Wide Growth Forecast of 2010 (version 12) data reports a population per household (pop/HH) factor of 3.31, however in order maintain consistency with the number of dweling units (DU) also collected from SANDAG resulting in 230 gpd/DU, IEC used a factor of 3.65 in for calculating gpcd. The City provided IEC population data for schools which includes the total number of students as well as employees for the 2011-2012 school years. This data was then used to calculate the GPCD for both elementary and middle/junior/senior/Jr. College.

The single and multi-family wastewater duty factor resulted in 63 and 55 GPCD, accordingly. The typical duty factors for residential households with 3-4 persons ranges between 41-71 GPCD. The calculated wastewater duty factor for elementary schools was 12 GPCD and 13 GPDC for all other schools. Industry standards range between 10-20 GPCD. Table 3-2 summarizes the duty factors used for future flow projections.

Approximately 77% of the City's calculated BWF can be attributed to single family and multi-family land use types. The remaining 23% can be attributed to schools, commercial, industrial, government/office/public inst, open space and Olympic training center facilities.

Table 3-2: Wastewater Duty Factors

Landuse	Recommended Wastewater Duty Factors based on 2009-2011 Water Demands			
	GPD/Capita	GPD/DU	gpd/acre	gpd/1000 sq-ft
Single Family	63	230	-	
Multi-Family	55	182	-	
Commercial	-	-	1,401	80
Industrial	-	-	712	80
Government/Office/Public Institution	-	-	1,313	80
Elementary School	12	-	1181	
Junior/Middle/High School	13	-	1080	
Olympic Training Center	-	-	582	
Open Space/Recreation	-	-	410	

1. GPD/1000-sq-ft has been used for new developments with known building square footage.

3.3.4 FUTURE AVERAGE DRY WEATHER WASTEWATER FLOWS (ADWF) PROJECTIONS

In this analysis, once the ADWF was established for 2012 conditions, flow projections for 2017, 2022, 2027, 2032, 2037, 2042 and 2050 were calculated based on the 2005 Approved General Plan and approved Amendments landuse projections. Proposed new development projections were anticipated to begin starting in 2017. Table 3-3 outlines the General Plan Landuse Code Designations with associated Code Names and duty factor. Based on the General Plans Dwelling Units per acre, a range of high to low values is identified in the General Plan, however, for the master plan update; the middle value was used for residential parcels. Those values are included in Table 3-3.

Figure 3-4: Normalized Diurnal Curve (Residential)

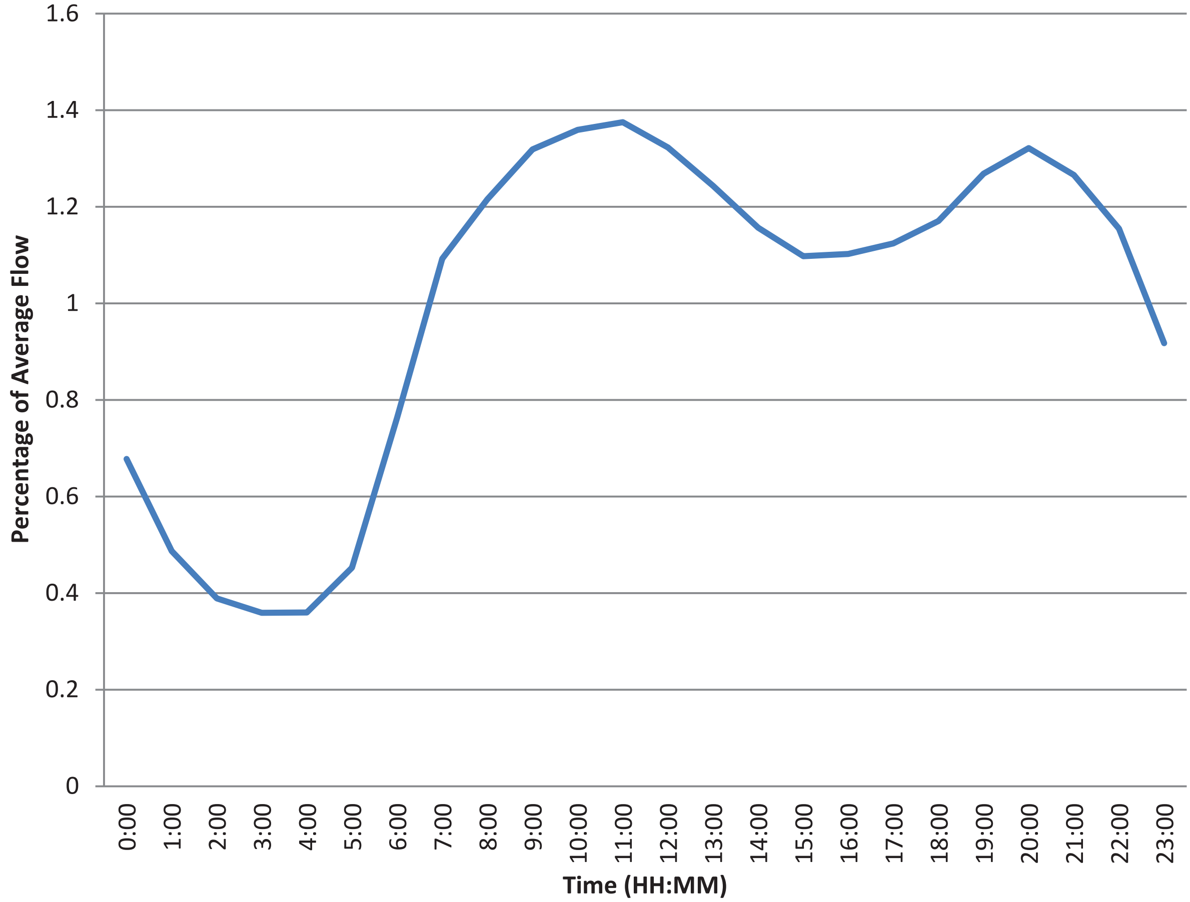
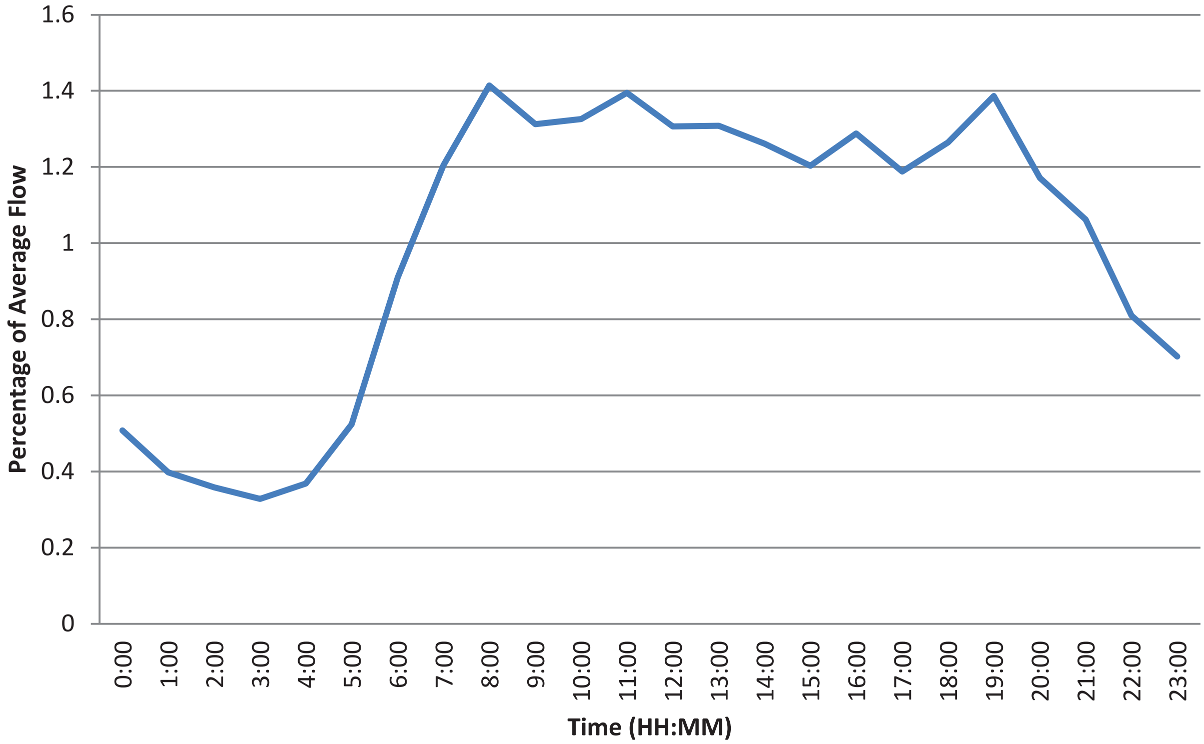


Figure 3-5: Normalized Diurnal Curve (Non-Residential)



3.3.6 Peak Wet Weather Wastewater Flow (PWWF)

Peak Wet Weather Wastewater Flow (PWWF) is estimated as Peak Dry Weather Flow (PDWF) plus Rainfall Dependent Infiltration/Inflow (RDI/I) and BWI, combined as Inflow/Infiltration (I/I) for this master plan due to the data available. RDI/I is storm water that enters the wastewater collection system in direct response to the intensity and duration of individual rainfall events. RDI/I may recede gradually after a storm; however, any residual flow is considered to be a general increase in GWI.

To create the PWWF scenarios, the model was loaded using PDWF values, and Rainfall Dependent Inflow and Infiltration (RDI/I), combined as I/I was added to the PDWF. Peak values were then evaluated based on consistency throughout the year from data gathered from the City's main outfalls, removing any inconsistent peaks, resulting in an average peaking factor for I/I of 1.85. The total volume of I/I was then averaged out across the city and multiplied accordingly to each pipeline based on its length-diameter. The respective I/I value was then added to the calculated BWF per time period for PWWFs.

CHAPTER 4. SEWER COLLECTION SYSTEM DESIGN CRITERIA

4.1 DESIGN CRITERIA BACKGROUND

A hydraulic model is the primary tool for evaluating the capacity of the pipes in a sewer collection system. An effective hydraulic model accurately represents collection system facilities and collection system flows for capacity analysis. This chapter describes the selection of system criteria, the development of collection system facilities, and the calculation of flows in the collection system model for the City.

In analyzing a wastewater system, it is necessary to derive standards regarding the amount of flow that may be efficiently conveyed by a given wastewater pipeline. In an effort to provide reliable gravity sewer service while minimizing excessive wear or energy usage through force mains and lift stations, sanitary sewers shall be designed according to the following criteria:

4.1.1 GRAVITY MAIN DESIGN CRITERIA

Sizing a new pipeline is based on the Manning's equation and the following design criteria shown in Table 4-1.

Table 4-1: Pipeline Design Criteria

Gravity Main Requirements	Design Criteria
[1]New Pipes 12-inches in diameter and smaller:	0.50 (50%) full at peak wet weather flow
[2]New Pipes over 12-inches in diameter:	0.75 full at peak wet weather flow
Minimum velocity:	2 feet per second (1/2 full or full)
Maximum velocity:	10 feet per second
Manning's n:	.013
New Pipe Minimum pipe diameter:	8 in
Force Main Requirements	Design Criteria
Minimum Force Main Diameter:	4 inches
Minimum Velocity:	3 feet per second
Maximum Velocity:	5 feet per second
Maximum allowable headloss:	10 feet/1000 feet of pipeline
Maximum desirable headloss:	5 feet/1000 feet of pipeline
Hazen-Williams C factor:	120

Notes:
(1) Design plans will be required when d/D reaches 0.60 for existing 12" diameter pipes or smaller, and improvements will be required once d/D reaches 0.70 at peak wet weather flows.
(2) Design plans will be required when d/D reaches 0.75 for existing pipes larger than 12" diameter, and improvements will be required once d/D reaches 0.85 at peak wet weather flows.

The National Clay Pipe Institute (NCPI) recommends that smaller pipelines (8" and smaller) be designed to flow at levels not exceeding half-full (d/D=0.50) during peak conditions. For larger pipelines, the tributary area is larger. Local deviation from design wastewater flows tend to balance one another for larger areas, resulting in a closer correlation of actual and design wastewater flows. Consequently, the NCPI recommends that these larger wastewater pipelines should be designed for a d/D not to exceed 0.75.

In analyzing the City's existing sewer gravity mains, it is unnecessary to allow for an excessive factor of safety. This is because the City's sewer basins are largely built out, and future development patterns are relatively certain. As new major wastewater users apply for wastewater service, they should be evaluated on a case-by-case basis, including estimated flow rates and impacts to City-owned sewer facilities. Therefore, City-owned sewer gravity mains may be flowing at levels above a d/D of 0.50 and still be operating satisfactorily.

Remaining pipeline capacity, above d/D = 0.75 has been reserved to handle emergency flows such as I&I beyond that planned for in a design storm, and to provide for ventilation within the pipe. This should not be considered a component of the pipeline capacity.

In an effort to account for the City being mostly built-out and ensure that gravity main segments are replaced due to capacity and flow constraints, the following describes the City's replacement criteria:

- Maximum Peak Wet Weather Flow for pipelines 12-inch or less, depth-to-Diameter d/D = 0.70
- Maximum Peak Wet Weather Flow for pipelines greater than 12-inches, depth-to Diameter d/D = 0.85

All pipes requiring replacement shall be designed in accordance with the City's design criteria. In the event that a gravity main satisfies these replacement criteria, but the pipeline immediately upstream requires upsizing, one (1) additional replacement stipulation may be applicable. The purpose of this replacement stipulation is to insure that pipe-reaches increase in diameter as they progress downstream, and prevent, wherever possible, pipe-reaches from fluctuating up and down in diameter. If a gravity main requires upsizing to a diameter larger than the diameter of the gravity main(s) immediately downstream in the same pipe-reach, and the downstream pipe(s) are less than 750 ft in length before conveying flow to a gravity main of equal or larger diameter than the diameter recommended for the deficient upstream gravity main, then the downstream gravity main(s) of less than 750 ft shall be upsized to the same diameter of the upstream pipe.

4.1.2 LIFT STATION DESIGN CRITERIA

Lift Stations should be sized for the peak wet weather flow rate plus an additional 20% capacity to account for wear, miscellaneous debris, etc. that may reduce pumping performance. Lift stations should be capable of meeting the following criteria with the largest capacity pump serving as standby:

- Manufacturers recommended cycling times for pumping equipment.
- All lift stations will incorporate dual force mains beginning from pumps and ending at gravity flows.
- 60 percent pump efficiency should be assumed, except where other information is available.
- 90 percent motor efficiency should be assumed, except where other information is available.
- Wet well sized to minimize retention time such that maximum pump cycling time (usually at ½ design inflow) is within manufacturer's recommendations.
- Separate from wet well operating volume, emergency storage volume shall be sufficient to accommodate storage of six-hour pumping volume at average ultimate flow.

APPENDIX B

DRAINAGE FIXTURE UNITS ESTIMATES

NAKANO PROJECT PRELIMINARY DRAINAGE FIXTURE UNIT COUNT FOR SANITARY SEWER
PER CPC TABLE 702.1 AND 703.2
215 RESIDENITAL UNITS

FIXTURE	QUANTITY	FU	SUB-TOTAL
BATHTUB/SHOWER	663	2	1326
CLOTHES WASHER	221	3	663
DISHWASHER	221	2	442
LAVATORY	663	1	663
KITCHEN SINK	221	2	442
TOILET	663	3	1989
			5525

PER TABLE 703.2, 10" SS CAPACITY OF 4680 DFU @ 1/4" (2%) PER FT SLOPE
PER TABLE 703.2, 10" SS CAPACITY OF 3744 DFU @ 1/8" (1%) PER FT SLOPE

PER TABLE 703.2, 12" SS CAPACITY OF 6560 DFU @ 1/8" (1%) PER FT SLOPE

TABLE 703.2
MAXIMUM UNIT LOADING AND MAXIMUM LENGTH OF DRAINAGE AND VENT PIPING

SIZE OF PIPE (inches)	1¼	1½	2	3	4	5	6	8	10	12
Maximum Units										
Drainage Piping[1]										
Vertical	1	2[2]	16[3]	48[4]	256	600	1380	3600	5600	8400
Horizontal	1	1	8[3]	35[4]	216[5]	428[5]	720[5]	2640[5]	4680[5]	8200[5]
Maximum Length										
Drainage Piping										
Vertical, (feet)	45	65	85	212	300	390	510	750	–	–
Horizontal (unlimited)										
Vent Piping										
Horizontal and Vertical[6]										
Maximum Units	1	8[3]	24	84	256	600	1380	3600	–	–
Maximum Lengths, (feet)	45	60	120	212	300	390	510	750		

For SI units: 1 inch = 25 mm, 1 foot = 304.8 mm

Notes:

1 Excluding trap arm.

2 Except for sinks, urinals, and dishwashers – exceeding 1 fixture unit.

3 Except for six-unit traps or water closets.

4 Only four water closets or six-unit traps allowed on a vertical pipe or stack, and not to exceed three water closets or six-unit traps on a horizontal branch or drain.

5 Based on ¼ inch per foot (20.8 mm/m) slope. For ⅛ of an inch per foot (10.4 mm/m) slope, multiply horizontal fixture units by a factor of 0.8.

6 The diameter of an individual vent shall be not less than 1¼ inches (32 mm) nor less than one-half the diameter of the drain to which it is connected. Fixture unit load values for drainage and vent piping shall be computed from Table 702.1 and Table 702.2(2). Not to exceed one-third of the total permitted length of a vent shall be permitted to be installed in a horizontal position. Where vents are increased one pipe size for their entire length, the maximum length limitations specified in this table do not apply. This table is in accordance with the requirements of Section 901.3.

705.2.1 Caulked Joints. Caulked joints shall be firmly packed with oakum or hemp and filled with molten lead to a depth of not less than 1 inch (25.4 mm) in one continuous pour. The lead shall be caulked thoroughly at the inside and outside edges of the joint. After caulking, the finished joint shall not exceed ⅛ of an inch (3.2 mm) below the rim of the hub. No paint, varnish, or other coatings shall be permitted on the joining material until after the joint has been tested and approved.

705.2.2 Mechanical Joints and Compression Joints. Mechanical joints for cast-iron pipe and fittings shall be of the elastomeric compression type or mechanical joint couplings. Compression type joints with an elastomeric gasket for cast-iron hub and spigot pipe shall comply with ASTM C564 and be tested in accordance with ASTM C1563. Hub and spigot shall be clean and free of dirt, mud, sand, and foreign materials. Cut pipe shall be free from sharp edges. Fold and insert gasket into the hub. Lubricate the joint following manufacturer's instructions. Insert spigot into hub until the spigot end of the pipe bottom out in the hub. Use the same procedure for the installation of fittings.

A mechanical joint shielded coupling type for hubless cast-iron pipe and fittings shall have a metallic shield that complies with ASTM A1056, ASTM C1277, ASTM C1540, or CISPI 310. The elastomeric gasket shall comply with ASTM C564. Hubless cast-iron pipe and fittings shall be clean and free of dirt, mud, sand, and foreign materials. Cut pipe shall be free from sharp edges. Gasket shall be placed on the end of the pipe or fitting and the stainless steel shield and clamp assembly on the end of the other pipe or fitting. Pipe or fittings shall be seated against the center stop inside the elastomeric sleeve. Slide the stainless steel shield and clamp assembly into a position centered over the gasket and tighten. Bands shall be tightened using an approved calibrated torque wrench specifically set by the manufacturer of the couplings.

705.3 Copper or Copper Alloy Pipe (DWV) and Joints. Joining methods for copper or copper alloy pipe and fittings shall be installed in accordance with the manufacturer's installation instructions and shall comply with Section 705.3.1 through Section 705.3.4.

705.3.1 Brazed Joints. Brazed joints between copper or copper alloy pipe and fittings shall be made with brazing alloys having a liquid temperature above 1000°F (538°C). The joint surfaces to be brazed shall be cleaned bright by either manual or mechanical means. Piping shall be cut square and reamed to full inside diameter. Brazing flux shall be applied to the joint surfaces where required by manufacturer's recommendation. Brazing filler metal shall conform to AWS A5.8 and shall be applied at the point where the pipe or tubing enters the socket of the fitting.

705.3.2 Mechanical Joints. Mechanical joints in copper or copper alloy piping shall be made with a mechanical coupling with grooved end piping or approved joint designed for the specific application.

705.3.3 Soldered Joints. Soldered joints between copper or copper alloy pipe and fittings shall be made in accordance with ASTM B828 with the following sequence of joint preparation and operation as follows: measuring and cutting, reaming, cleaning, fluxing, assembly and support, heating, applying the solder, cool-

APPENDIX C

SEWER ANALYSIS

1. Existing Flows – Existing Sewer
2. Existing Flows plus Project – Proposed Sewer

- Reference Exhibit A for Manhole Diagram

CITY OF SAN DIEGO
HYDRAULIC MODEL RESULTS TABLE
TRUNK SEWER 92 - OTAY VALLEY
2025 DWF AS-BUILT

FACILITY SEQUENCE NUMBER	PIPE ID	DOWNSTREAM MH ID	UPSTREAM MH INV. EL. (FT)	DOWNSTREAM MH INV. EL. (FT)	DOWNSTREAM MH RIM EL. (FT)	PIPE SLOPE (FT/FT)	PIPE DIAMETER (IN)	PIPE LENGTH (FT)	MAX. VELOCITY (FT/SEC)	MAX. DEPTH (IN)	MAX. d/D (%)	MAX. HGL EL. (FT)	MAX. EGL EL. (FT)	HGL DEPTH BELOW RIM (FT)	MAX. FLOW (MGD)	FULL CAPACITY (MGD)	MAX. Q/CAP (%)
5472707	N33S55.1	N33S54	113.44	112.27	120.27	0.025	27	46	4.81	8.33	30.9	112.96	113.33	7.30	3.25	31.92	10.2
5472705	N33S54.1	N33S53	112.27	108.93	116.49	0.006	27	527	4.78	8.37	31.0	109.63	109.98	6.86	3.25	15.93	20.4
5472701	N33S53.1	M33S187	108.93	104.05	112.41	0.006	27	782	3.51	10.52	39.0	104.93	105.12	7.49	3.25	15.81	20.5
5472698	M33S187.1	M33S185	104.05	103.48	112.47	0.006	27	95	2.15	15.36	56.9	104.76	104.83	7.71	3.25	15.50	20.9
5472697	M33S185.1	M33S186	103.48	103.43	112.80	0.000	27	397	4.22	9.16	33.9	104.19	104.47	8.61	3.25	2.25	144.5
5472695	M33S186.1	M33S184	103.43	99.18	106.89	0.011	27	397	4.49	9.03	33.4	99.93	100.25	6.96	3.38	20.71	16.3
5472685	M33S184.1	M33S183	99.18	96.84	104.13	0.005	27	445	4.49	9.02	33.4	97.59	97.91	6.54	3.38	14.51	23.3
5472684	M33S183.1	M33S182	96.84	96.27	103.65	0.006	27	96	4.48	9.04	33.5	97.02	97.33	6.63	3.38	15.42	21.9
5472665	M33S182.1	M33S181	96.27	95.41	104.88	0.005	27	159	3.73	10.35	38.3	96.27	96.49	8.61	3.38	14.72	23.0
5472690	M33S181.1	M33S16	95.41	95.33	103.33	0.016	27	5	3.40	11.10	41.1	96.26	96.44	7.07	3.38	25.32	13.3
64513	M33S16.1	M33S17	95.33	94.51	101.51	0.002	27	341	3.41	11.07	41.0	95.43	95.61	6.08	3.38	9.82	34.4
64531	M33S17.1	M33S26	94.51	93.48	99.38	0.002	27	428	4.25	9.40	34.8	94.26	94.54	5.12	3.38	9.82	34.4
64530	M33S26.1	M33S25	93.38	93.32	98.22	0.002	27	27	3.83	10.16	37.6	94.17	94.40	4.05	3.38	9.44	35.8
64527	M33S25.1	M33S152	93.22	93.05	99.05	0.002	27	67	3.13	11.88	44.0	94.04	94.19	5.01	3.38	10.08	33.5
64537	M33S152.1	M33S15	93.05	93.00	99.00	0.002	27	22	4.12	11.62	43.0	93.97	94.23	5.03	4.36	9.54	45.7
5530021	M33S15.1	M33S198	93.00	90.85	106.00	0.003	27	659	4.59	10.72	39.7	91.74	92.07	14.26	4.36	11.43	38.1
5530260	M33S198.1	M33S197	90.75	90.66	108.07	0.005	27	20	4.61	10.72	39.7	91.55	91.88	16.52	4.38	13.46	32.5
5530258	M33S197.1	M33S196	90.56	89.26	107.80	0.009	27	144	5.87	8.97	33.2	90.01	90.54	17.79	4.38	19.01	23.0
5530020	M33S196.1	M33S18	89.16	88.10	107.34	0.009	27	118	4.15	11.59	42.9	89.07	89.33	18.27	4.38	18.98	23.1
5530019	M33S18.1	M33S14	88.10	86.31	95.31	0.003	27	536	3.72	12.61	46.7	87.36	87.57	7.95	4.38	11.57	37.8
64523	M33S14.1	M33S7	86.31	85.79	100.79	0.002	27	215	3.95	12.04	44.6	86.79	87.04	14.00	4.38	9.84	44.5
64521	M33S7.1	M33S9	85.79	85.70	101.60	0.002	27	37	4.09	11.75	43.5	86.68	86.94	14.92	4.38	9.87	44.3
64526	M33S9.1	M33S10	85.60	85.15	97.15	0.002	27	186	3.39	13.55	50.2	86.28	86.46	10.87	4.38	9.84	44.5
64525	M33S10.1	M33S8	85.15	83.73	103.73	0.002	27	744	4.60	10.73	39.7	84.62	84.95	19.11	4.38	8.74	50.1
64524	M33S8.1	M33S13	83.73	83.10	104.00	0.009	27	71	4.18	11.58	42.9	84.07	84.34	19.93	4.38	18.85	23.2
64515	M33S13.1	M33S12	83.00	81.66	105.66	0.002	27	556	3.66	12.78	47.3	82.73	82.93	22.93	4.38	9.83	44.6
64516	M33S12.1	M33S11	81.66	80.11	99.01	0.002	27	646	4.60	10.74	39.8	81.01	81.33	18.00	4.38	9.80	44.6
64514	M33S11.1	M33S6	80.01	79.91	98.81	0.002	27	42	4.60	10.74	39.8	80.81	81.13	18.00	4.38	9.77	44.8
64519	M33S6.1	M33S4	79.81	79.62	97.52	0.002	27	79	4.60	10.74	39.8	80.51	80.84	17.01	4.38	9.82	44.6
64518	M33S4.1	M33S5	79.52	79.46	97.36	0.003	27	22	4.24	11.41	42.3	80.41	80.69	16.95	4.38	10.45	41.9
64517	M33S5.1	M33S2	79.36	78.54	91.44	0.002	27	339	4.60	10.74	39.8	79.43	79.76	12.01	4.38	9.84	44.5
64533	M33S2.1	M33S3	78.44	78.41	91.31	0.002	27	14	4.41	11.08	41.0	79.33	79.63	11.98	4.38	9.27	47.2
64535	M33S3.1	M33S1	78.31	77.86	94.76	0.002	27	186	4.60	10.74	39.8	78.76	79.08	16.00	4.38	9.84	44.5
64534	M33S1.1	M33S21	77.76	77.69	94.59	0.002	27	28	4.60	10.74	39.8	78.59	78.91	16.00	4.38	10.01	43.7
61269	M33S21.1	L33S2	77.59	74.96	87.86	0.004	27	598	4.59	10.76	39.8	75.86	76.18	12.00	4.38	13.27	33.0
61263	L33S2.1	L33S1	74.86	74.65	87.55	0.004	27	48	4.59	10.76	39.8	75.55	75.87	12.00	4.38	13.24	33.1
61262	L33S1.1	L33S4	74.55	73.00	84.90	0.005	27	328	4.70	10.56	39.1	73.88	74.22	11.02	4.38	13.76	31.8
61265	L33S4.1	L33S3	72.90	72.54	84.44	0.014	27	25	6.63	8.21	30.4	73.22	73.91	11.22	4.38	24.02	18.2
61264	L33S3.1	L33S18	72.44	71.52	82.42	0.014	27	65	6.59	8.24	30.5	72.21	72.88	10.22	4.38	23.81	18.4
61266	L33S18.1	L33S5	71.42	71.00	82.90	0.014	27	29	6.65	8.19	30.3	71.68	72.37	11.22	4.38	24.09	18.2

DATE: 11/15/2023

SEWER STUDY SUMMARY

FOR: Nakano City of Chula Vista (annexing to City of San Diego), Existing Flows Only, Existing Sewer — Model 1 OF 2

JOB NUMBER: 648-038 BY: Dexter Wilson Engineering — REFER TO PLAN SHEET: EXHIBIT A

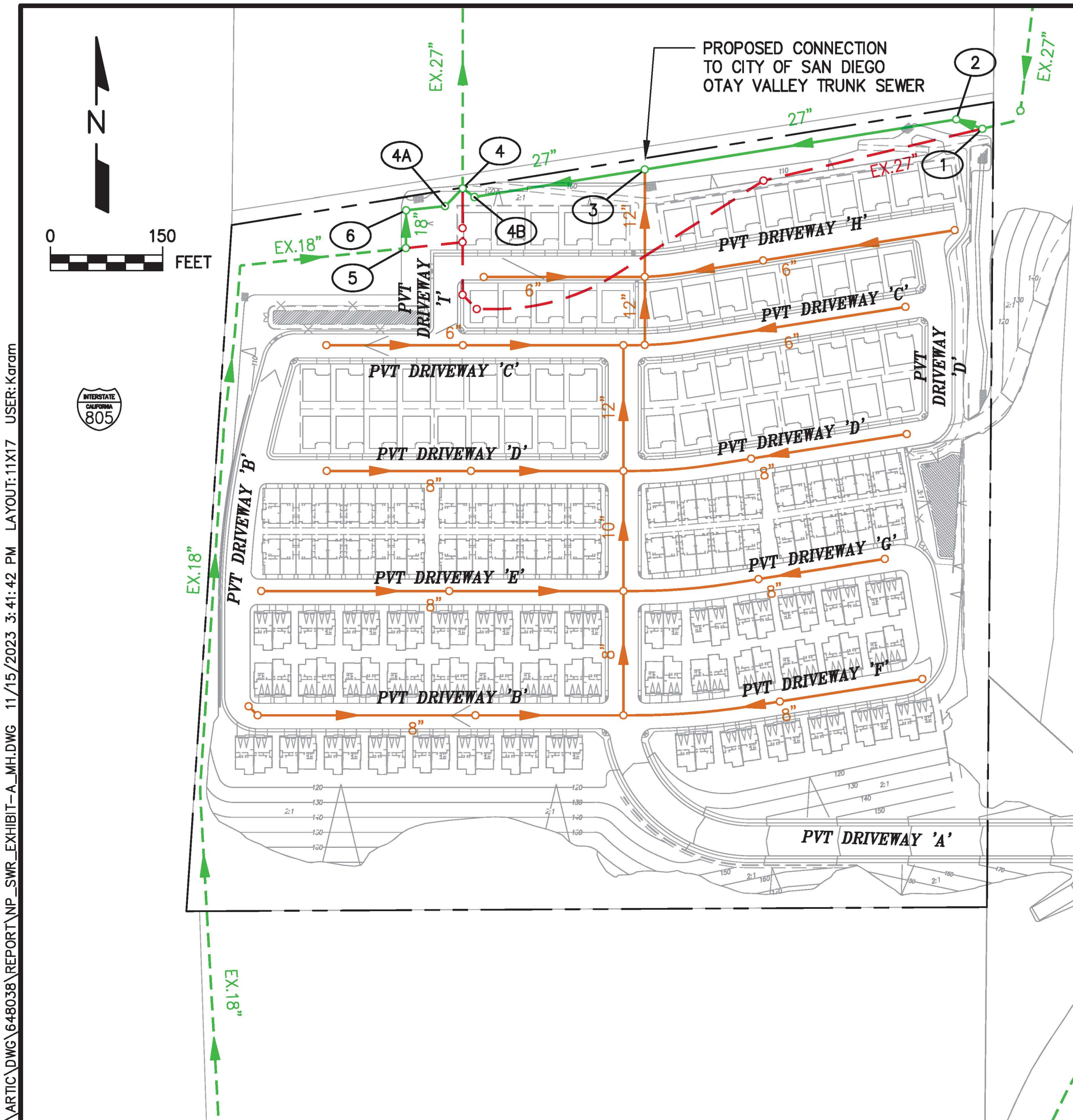
FROM	TO	IN-LINE FLOW	AVG. DRY WEATHER FLOW (gpd)	COMBINED PEAK FLOW (DESIGN FLOW)		LINE SIZE (inches)	DESIGN SLOPE (%)	DEPTH K' (1)	dn (feet)	dn/D(2)	C_a for Velocity(3)	VELOCITY (f.p.s.)	NOTES
				M.G.D.	C.F.S.								
1	2	3,380,000	3,380,000	3.380	5.230	27	0.20	0.174895	0.96750	0.43	0.3229	3.20	
2	3	0	3,380,000	3.380	5.230	27	0.20	0.174895	0.96750	0.43	0.3229	3.20	
3	4	0	3,380,000	3.380	5.230	27	0.20	0.174895	0.96750	0.43	0.3229	3.20	
5	6	980,000	980,000	0.980	1.516	18	0.40	0.105718	0.48000	0.32	0.2167	3.11	
6	4	0	980,000	0.980	1.516	18	0.28	0.126357	0.54000	0.36	0.2546	2.65	

FOR: Nakano City of Chula Vista (annexing to City of San Diego), Existing Flows plus Project Flows, Proposed Sewer — Model 2 OF 2

JOB NUMBER: 648-038 BY: Dexter Wilson Engineering — REFER TO PLAN SHEET: EXHIBIT A

FROM	TO	IN-LINE FLOW	MAX. FLOW (gpd)	COMBINED PEAK FLOW (DESIGN FLOW)		LINE SIZE (inches)	DESIGN SLOPE (%)	DEPTH K' (1)	dn (feet)	dn/D(2)	C_a for Velocity(3)	VELOCITY (f.p.s.)	NOTES
				M.G.D.	C.F.S.								
1	2	3,380,000	3,380,000	3.380	5.230	27	0.28	0.147813	0.87750	0.39	0.2836	3.64	
2	3	0	3,380,000	3.380	5.230	27	0.28	0.147813	0.87750	0.39	0.2836	3.64	
3	4B	108,682	3,488,682	3.489	5.398	27	0.28	0.152566	0.90000	0.40	0.2934	3.63	Project Point of Connection
4B	4	0	3,488,682	3.489	5.398	27	0.28	0.152566	0.90000	0.40	0.2934	3.63	
5	6	980,000	980,000	0.980	1.516	18	0.28	0.126357	0.54000	0.36	0.2546	2.65	
6	4A	0	980,000	0.980	1.516	18	0.28	0.126357	0.54000	0.36	0.2546	2.65	
4A	4	0	980,000	0.980	1.516	18	0.62	0.084914	0.43500	0.29	0.1890	3.57	

1 K' based on n = 0.013
2 dn/D using K' in Brater King Table 7-14
3 From Brater King Table 7-4 based on dn/D



MANHOLE INFORMATION			
NO.	RIM	INVERT	DEPTH
1	104.00	94.89	9.11
2	104.00	94.75	9.25
3	98.50	93.48	5.02
4	99.00	92.61	6.39
4A	108.00	92.89	15.11
4B	104.00	92.75	11.25
5	104.00	93.35	10.65
6	101.00	93.12	7.88

PIPE INFORMATION				
FROM	TO	SIZE	SLOPE	LENGTH
1	2	27	0.28 %	34.05
2	3	27	0.28 %	417.44
3	4B	27	0.28 %	226.41
4B	4	27	0.28 %	15.42
5	6	18	0.28 %	46.61
6	4A	18	0.28 %	48.38
4A	4	18	0.62 %	28.98

LEGEND

PROJECT BOUNDARY

EXISTING PUBLIC GRAVITY SEWER LINE

EXISTING PUBLIC GRAVITY SEWER LINE TO BE DEMOLISHED/QUITCLAIMED

PROPOSED PUBLIC GRAVITY SEWER LINE

PROPOSED PRIVATE GRAVITY SEWER LINE

(2) COMPUTER MODEL MANHOLE NUMBER

DEXTER WILSON ENGINEERING, INC.
CONSULTING ENGINEERS
(760) 438-4422

EXHIBIT A

MANHOLE DIAGRAM

NAKANO