City of Chula Vista

PRELIMINARY SEWER STUDY

For:

Nirvana Business Park
DR21-0024

821 Main Street
Chula Vista, CA 91911

APN: 644-050-13, 644-050-14 & 644-050-80
Project Permit # DR21-0024

Prepared By:

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3-4-2022

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CIVIL ENGINEERING + LAND PLANNING + LAND SURVEYING

Prepared for:

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March 4, 2022

PLSA Job No. 3668

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Section 1 – Introduction

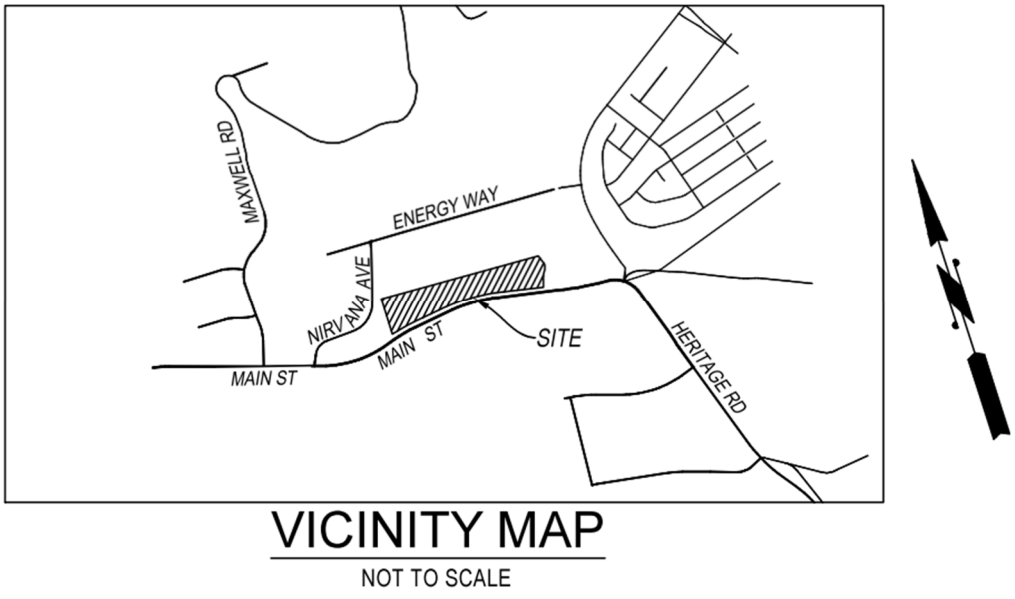
This report provides background data, analysis, and a summary of results as part of a preliminary sanitary sewer system study for the proposed Nirvana Business Park project. The purpose of this study is to ascertain the potential impact of the proposed project on the existing sanitary sewer system and to verify that sufficient capacity exists within the existing sewer facilities. The design for this sewer study was completed in accordance with the design criteria listed in the City of Chula Vista's Subdivision Manual (Revised 03-13-2012), the City of Chula Vista Wastewater Collection Master Plan (May 2014), and the Sewer System Management Plan (April 2021).

Section 2 – Project Description

2.1 Project Location:

The proposed Nirvana Business Park project is comprised of 13.31 acres, located at 821 Main Street in the City of Chula Vista, San Diego County, California (APN 644-050-13, 14 and a portion of 644-050-80). The property is defined as Parcel 1 and 2 of Parcel Map 21587 and a portion of Lot 2, Sec 20, T18S, R1E San Bernadino Meridian of ROS 16999. The site is bounded on the north by automobile salvage yards, on the west by commercial buildings, on the south by Main Street, and on the east by the Otay Ranch Village 3 development. The entire project site is currently undeveloped. See Figure 2.1 for vicinity map.

Figure 2-1
Vicinity Map



2.2 Proposed Project:

The proposed project at 821 Main Street will construct four buildings as follows:

- Building 1 – a 59,044 square-foot warehouse with office and mezzanine
- Building 2 – a 44,592 square-foot warehouse with office and mezzanine
- Building 3 – a 140,802 square-foot, 3-story self-storage building
- Building 4 – a 50,030 warehouse with office and mezzanine

  Total building square footage = 294,468 square-feet

The site is General Plan designated IL – Limited Industrial and Zoned (ILP) Limited Industrial. The proposed light industrial uses include primarily warehouse and manufacturing, assembly, storage, and warehouse distribution. The self-storage facility will feature interior and exterior accessible storage spaces, with surface loading and elevators for upper floors.

Hours of operation for the business park are planned to be Monday through Friday 6:00 a.m. to 6:00 p.m. and Saturday 6:00 a.m. to noon. The self-storage facilities will have 24/7 access.

Please refer to Figure 2-2 on the following page for schematic site layout.

2.3 Study Area:

The project's study area, shown in Figure 2-3, generally encompasses existing parcels abutting Energy Way and Nirvana Avenue as well as along Main Street between Heritage Road and Nirvana Avenue. The primary zoning in the area consists of limited industrial (IL) per the city's 2005 General Plan. In accordance with the requirements specified in the preliminary permit review submittal comments, the proposed project is required to prepare a sewer system study with manhole-to-manhole calculations performed from the upstream sewer system reach on Energy Way downstream to the connection to the existing 10-inch sewer in Main Street, south of Nirvana Avenue. Please refer to Figure 2-4 for Sanitary System Node Map.

The proposed project will connect to an existing 8-inch PVC gravity sewer located west of the project site in Nirvana Avenue (see Figure 2-5).

The 8-inch sewer main in Nirvana Avenue flows southwesterly and connects to an existing 10-inch sewer main in Main Street at an existing manhole located in the intersection of Nirvana Avenue and Main Street. There is no additional sanitary sewer flow from the east along Main Street at this manhole location. The existing 10-inch sanitary sewer main flows westerly in Main Street approximately 5,800 lineal feet to the intersection of I-805 and Main Street and then an additional 2,100 lineal feet to the intersection of Otay Valley Road and Main Street. Please refer to the City of Chula Vista's CV Mapper website for GIS wastewater systems.

The existing 8-inch sewer mains in both Energy Way and Nirvana Avenue and the existing 10-inch sewer main in Main Street were all constructed in during the 1970s and are generally comprised of PVC pipe. The systems were installed under Work Order No. EY026 (Drawing No. 75-105D through Drawing No. 75-111D). The existing branch connecting sewers along Main Street and west of Brandywine Avenue are generally comprised of vitrified clay pipe (VCP).

EX 8" PVC SEWER PER 75-107D

NIRVANA AVENUE

PROPOSED 6" PVC SEWER

CONNECT TO EX 8" PVC SEWER

EX 8" PVC SEWER PER 75-107D

BUILDING 1
WAREHOUSE
59,044 SF

BUILDING 2
WAREHOUSE
44,592 SF

PROPOSED 6" PVC SEWER

BUILDING 3
SELF-STORAGE
140,802 SF

BUILDING 4
WAREHOUSE
50,030 SF

PROPOSED 6" PVC SEWER

MAIN STREET

75' 0 150' 300'

SCALE: 1" = 150'

FIGURE 2-2

PROPOSED SITE LAYOUT
NIRVANA BUSINESS PARK

821 MAIN STREET
CHULA VISTA, CA 91911
PLSA JOB NO. 3668
SCALE 1"=150'

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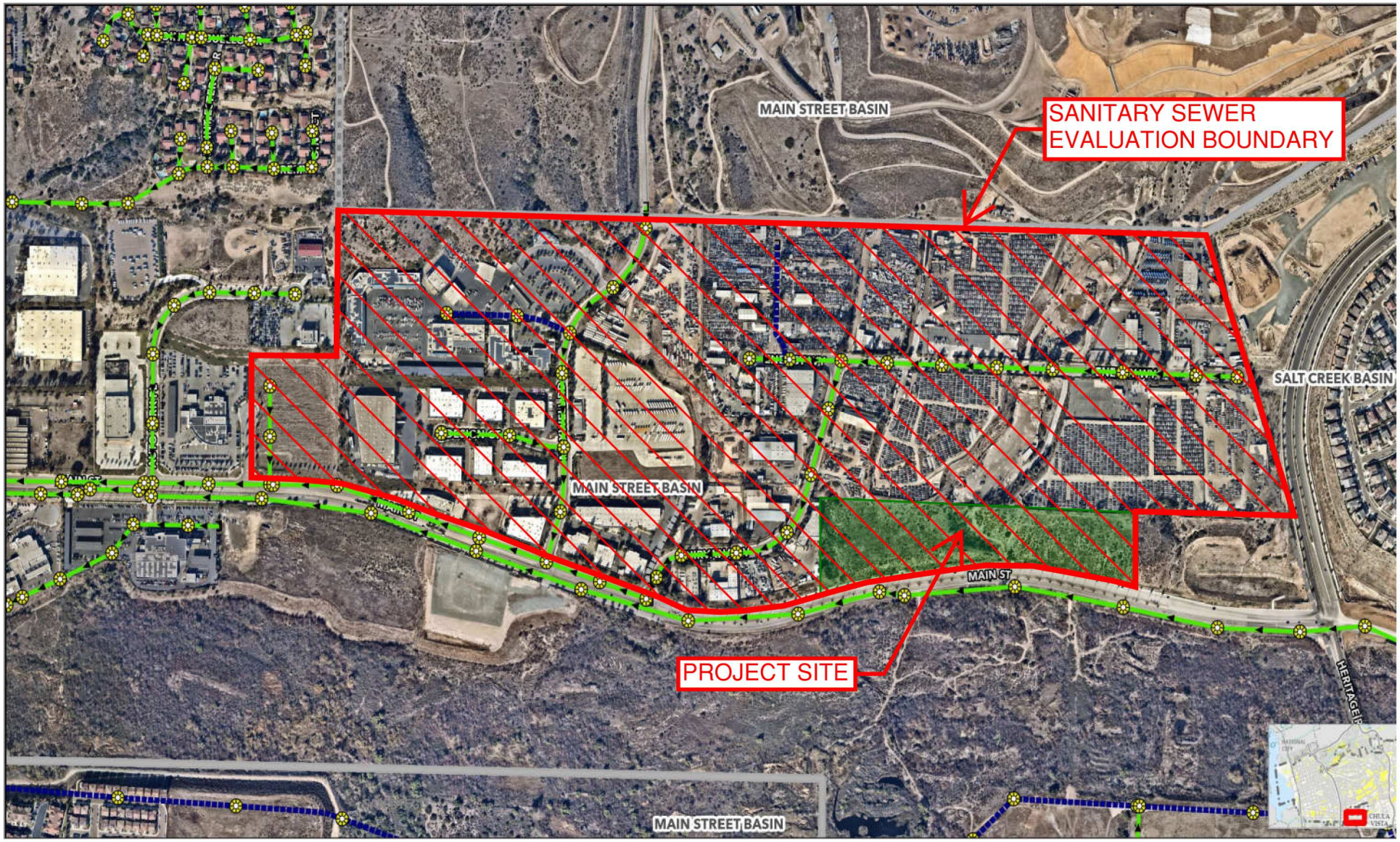
City of Chula Vista, CA



Map Scale
1 inch = 500 feet
12/13/2021

FIGURE 2-3
SANITARY SYSTEM MAP AND STUDY AREA

City of Chula Vista, CA

Disclaimer: Map and parcel data are believed to be accurate, but accuracy is not guaranteed. This is not a legal document and should not be substituted for a title search,appraisal, survey, or for zoning verification.

Map Scale
1 inch = 250 feet
12/13/2021

FIGURE 2-4
SANITARY SYSTEM NODE MAP
SHEET 1 OF 2

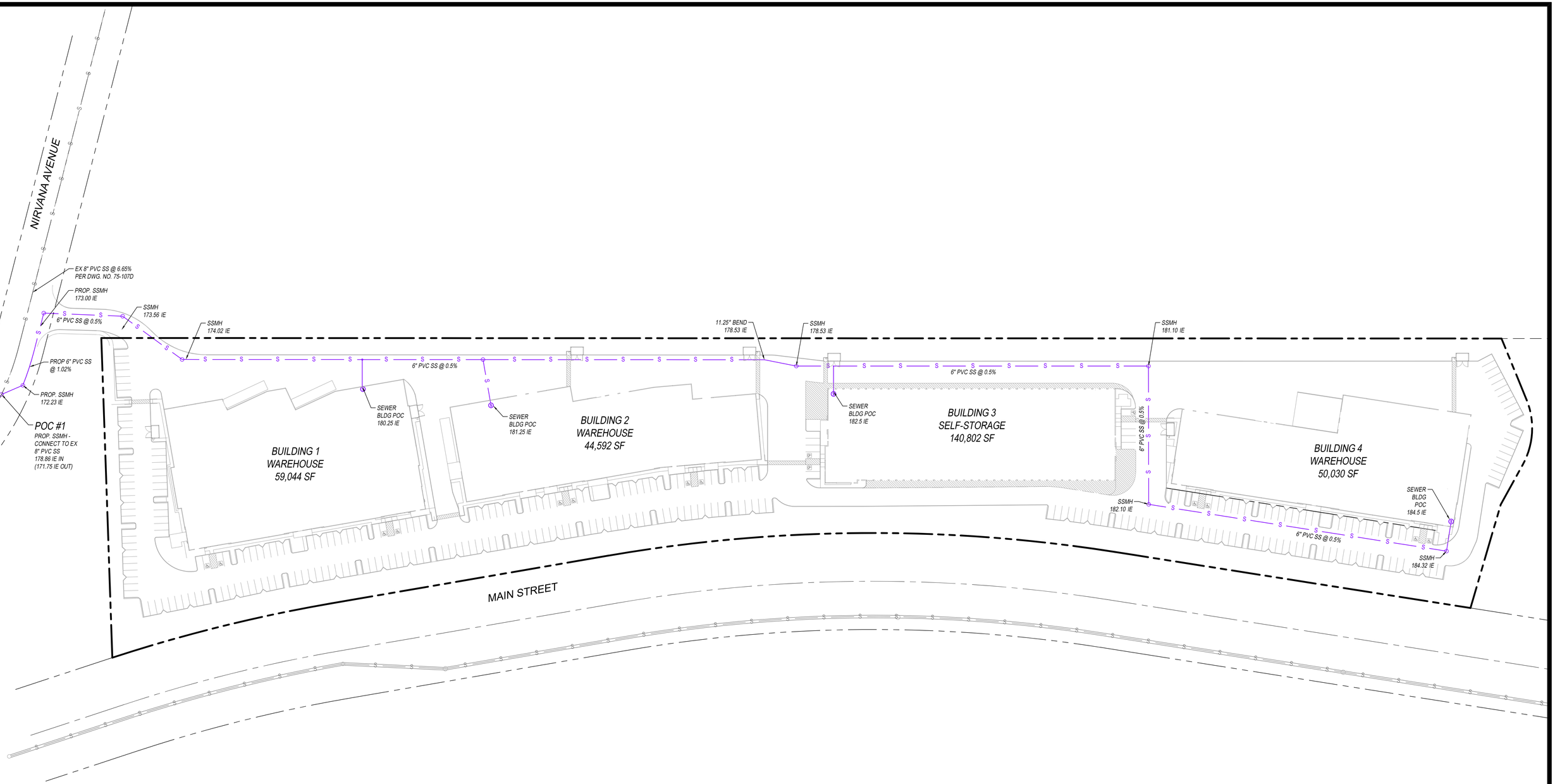
City of Chula Vista, CA

Disclaimer: Map and parcel data are believed to be accurate, but accuracy is not guaranteed. This is not a legal document and should not be substituted for a title search,appraisal, survey, or for zoning verification.

Map Scale
1 inch = 250 feet
12/13/2021

FIGURE 2-4
SANITARY SYSTEM NODE MAP
SHEET 2 OF 2

FIGURE 2-4
SANITARY SYSTEM NODE MAP
SHEET 3 OF 3



60' 30' 0 60' 120' 180'

SCALE: 1" = 60'

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FIGURE 2-5
SANITARY SEWER EXHIBIT
NIRVANA BUSINESS PARK
821 MAIN STREET
CHULA VISTA, CA 91911
PLSA JOB NO. 3668
SCALE 1"=60'

2.4 Sewer Generation Rates:

Preliminary sewer generation rates for the proposed development are based on the planning requirements provided in the City of Chula Vista Subdivision Design Manual and the City of Chula Vista Wastewater Collection System Master Plan, May 2014. The Wastewater Master Plan methodology calculates sanitary flows based on the current or planned parcel zoning, lot area, and duty factor demands obtained from Table 3-2 of the Wastewater Master Plan. The Average Dry Weather Flow (ADWF) was calculated for the proposed site as shown in Table 2-1 below. As a comparison, an alternative method for calculating the ADWF is provided in Table 2-2 on the following page. The alternative method utilizes a combination of duty factor demands and known building square footage. Proposed building areas were previously provided in Section 2.2.

Table 2-1
Sewer Generation Rates based on Lot Area

Net Acreage	=	13.31	ac
Duty Factor	=	712	gpd/ac
AVERAGE DRY WEATHER FLOW	=	Net Acreage (ac) * Duty Factor (gpd/ac)	
	=	13.31 ac * 712 gpd/ac	
	=	9,477	gpd

Table 2-2
Sewer Generation Rates based on Building Square Footage

Building Square Footage	=	294,468	sf
Duty Factor	=	80	gpd/1000 sf
ADWF	=	Building Square Footage (sf) * Duty Factor (gpd/1000 sf)	
	=	294,468 sf * 80 gpd/1000 sf	
AVERAGE DRY WEATHER FLOW	=	23,557	gpd

Based on the above methods of calculating the ADWF, the more conservative ADWF of 23,557 gpd will be utilized as the basis of determining equivalent population and sanitary flows from the proposed site during sewer modeling in Section 3 of this report.

Section 3 – Sanitary Sewer Analysis

This section of the study report discusses the hydraulic analysis of the existing sewer system with new flows from the proposed Nirvana Business Park project.

3.1 Model Methodology:

A Microsoft Excel spreadsheet was utilized to perform the hydraulic analysis of the existing sanitary sewer with the Study Area. Each reach or "Line" of the existing sanitary sewer system includes the upstream and downstream manhole designations, invert elevations, length, and diameter of the sewer. Sewer lengths and inverts were obtained from GIS sewer manhole and sewer main shape files used on the City of Chula Vista GIS website, and from as-built sewer data also obtained by the City of Chula Vista.

The Average Dry Weather Flow (ADWF) was calculated for each reach by the product of the cumulative sanitary flow rate. Peak Wet Weather Flow (PWWF) was calculated for each reach by multiplying the ADWF by the calculated Peaking Factor for Wet Weather Flow. In accordance with the direction received from the City of San Diego Public Utilities Department, the peaking factor used was 1.85, found from Chapter 3.3.6 of the City of Chula Vista Wastewater Collection System Master Plan (May 2014). The pipe capacity was calculated utilizing Manning's Equation and a Manning's "n" value of 0.013.

The ratio of actual depth to pipe diameter (d/D) was calculated by using an Excel algorithm to select the appropriate d/D (to the nearest 0.1 increment) based on the corresponding ratio of calculated ADWF to full pipe flow (Q/Qfull).

Existing wastewater flows for reach DD between manholes were found from Appendix 2 of the City of Chula Vista Wastewater Collection System Master Plan, May 2014. The Average Dry Weather Flow (ADWF), the Peak Wet Weather Flow (PWWF), and the Peak Wet Weather Flow d/D were input into the Microsoft Excel Spreadsheet.

The downstream system has been studied to the point in the system where the projected peak wet weather flow from the proposed development is less than 10% of the total flow, in accordance with Section 1.7.1 of the City of San Diego Sewer Design Guide (2013).

3.2 Hydraulic Analysis Results:

The results of the hydraulic analysis model are shown in the Sanitary Sewer Study Summary provided in Figure 3-1 at the end of this section. The results are summarized as follows:

1. The d/D ratios for existing peak flows along the 8-inch diameter Energy Way and Nirvana Avenue sanitary sewer, from just upstream of the project's point of connection (Line A through N) range from 0.04 to 0.24. Normal depth along the stretch of sewer ranges from 0.03 to 0.16.

2. The d/D ratios for proposed peak flows along the 8-inch diameter Nirvana Avenue and Main Street sanitary sewer, from just downstream of the project's point of connection (Line O through Z) range from 0.20 to 0.41. Normal depth along the stretch of sewer ranges from 0.13 to 0.34.

Section 4 – Conclusions

The analysis demonstrates that while there is an increase in the planned flow in the existing sewer main in Nirvana Avenue with the proposed project, the projected peak wet weather flows in the analyzed, existing sewer mains do not exceed a d/D of 0.7 as required per Table 4-1 of the City of Chula Vista Wastewater Collection System Master Plan (May 2014) and per Page 36 of the City of Chula Vista Sewer System Management Plan (April 2021).

Therefore, it is our opinion that the existing sewer infrastructure located in Nirvana Avenue and Main Street have sufficient capacity to convey the anticipated sewer flows from the proposed project per the criteria listed in the city's Wastewater Master Plan. Furthermore, the project should not be required to upsize the existing sewer mains in Nirvana Avenue since an impact to the existing sewer infrastructure does not occur in the area analyzed.

FIGURE 3-1
SANITARY SEWER STUDY SUMMARY
NIRVANA BUSINESS PARK

BY: PLSA
JOB NO. 3668
MANNING N : 0.013

DATE: 3/4/2022
PREPARED BY: MM
REFER TO FIGURE 2-4

ASSUMED IN-LINE AREA = DEVELOPABLE LOT AREA

PIPE REACH	From MH	To MH	In-Line Area Served	In-Line Area (Acres)	Land Use[1]	Duty Factor (gpd/ac)[2]	Avg. Dry Weather Flow (gpd)	Building Square Footage (sf)	Duty Factor (gpd/1000 sf)[3]	Dwelling Units	Duty Factor (gpd/DU)[3]	Avg. Dry Weather Flow (gpd)	Cum. Total Avg. Dry Weather Flow (ADWF)[6]	Wet Weather Peaking Factor[4]	Peak Wet Weather Flow (PWWF)			Line Size D (in)	Pipe Length (ft)	Design Slope (%)	Hydraulic Radius R_h (ft)	Normal Depth d_n (ft)	PWWF d_n/D	PWWF d_n/D	Velocity (ft/sec)	Remarks
													gpd		gpd	mgd	cfs									
A	5085	5084	Energy Way	7.43	Industrial	712	5,290	N/A	N/A	N/A	N/A	N/A	5,290	1.85	9,787	0.010	0.02	8	225	1.67	0.03	0.04	0.06		1.29	
B	5084	5083	Energy Way	13.68	Industrial	712	9,740	N/A	N/A	N/A	N/A	N/A	15,030	1.85	27,806	0.028	0.04	8	400	0.63	0.06	0.09	0.14		1.36	
C	5083	5082	Energy Way	11.79	Industrial	712	8,394	N/A	N/A	N/A	N/A	N/A	23,425	1.85	43,336	0.043	0.07	8	380	3.32	0.05	0.07	0.11		2.69	
D	5082	5081	Energy Way	5.30	Industrial	712	3,774	N/A	N/A	N/A	N/A	N/A	27,198	1.85	50,317	0.050	0.08	8	300	0.40	0.08	0.14	0.21		1.39	
E	5081	5078	Energy Way	9.45	Industrial	712	6,728	N/A	N/A	N/A	N/A	N/A	33,927	1.85	62,765	0.063	0.10	8	300	0.40	0.09	0.16	0.24		1.50	
F	5078	5077	Energy Way	8.89	Industrial	712	6,330	N/A	N/A	N/A	N/A	N/A	40,256	1.85	74,474	0.074	0.12	8	300	0.67	0.09	0.15	0.23		1.89	
G	5077	5076	Energy Way	5.19	Industrial	712	3,695	N/A	N/A	N/A	N/A	N/A	43,952	1.85	81,311	0.081	0.13	8	248	3.23	0.07	0.11	0.16		3.34	
H	5074	5073	Energy Way	2.42	Industrial	712	1,723	N/A	N/A	N/A	N/A	N/A	1,723	1.85	3,188	0.003	0.00	8	191	1.33	0.02	0.03	0.04		0.89	
I	5072	5073	Private Road	11.94	Industrial	712	8,501	N/A	N/A	N/A	N/A	N/A	8,501	1.85	15,727	0.016	0.02	6	568	2.00	0.04	0.06	0.12		1.82	
J	5073	5075	Energy Way	0.00	Industrial	712	0	N/A	N/A	N/A	N/A	N/A	10,224	1.85	18,915	0.019	0.03	8	24	2.48	0.03	0.05	0.08		1.90	
K	5075	5076	Energy Way	1.66	Industrial	712	1,182	N/A	N/A	N/A	N/A	N/A	55,358	1.85	102,412	0.102	0.16	8	282	2.48	0.08	0.13	0.19		3.25	
L	5076	5102	Nirvana Ave	3.00	Industrial	712	2,136	N/A	N/A	N/A	N/A	N/A	57,494	1.85	106,364	0.106	0.16	8	240	3.75	0.07	0.11	0.17		3.74	
M	5102	5120	Nirvana Ave	7.07	Industrial	712	5,034	N/A	N/A	N/A	N/A	N/A	62,528	1.85	115,677	0.116	0.18	8	320	6.72	0.07	0.11	0.16		4.82	
N	5120	5140	Nirvana Ave	3.77	Industrial	712	2,684	N/A	N/A	N/A	N/A	N/A	65,212	1.85	120,642	0.121	0.19	8	320	6.72	0.07	0.11	0.16		4.82	
Project Nirvana				13.31	Industrial	712	9,477	294,468	80	N/A	N/A	23,557	23,557	1.85	43,581	0.044	0.07									Project Nirvana
O	5140	5145	Nirvana Ave	0.92	Industrial	712	655	N/A	N/A	N/A	N/A	N/A	89,425	1.85	165,435	0.165	0.26	8	300	4.17	0.08	0.14	0.21		4.48	
P	5145	5146	Nirvana Ave	3.25	Industrial	712	2,314	N/A	N/A	N/A	N/A	N/A	91,739	1.85	169,716	0.170	0.26	8	300	4.17	0.09	0.15	0.22		4.60	
Q	5146	5151	Nirvana Ave	1.05	Industrial	712	748	N/A	N/A	N/A	N/A	N/A	92,486	1.85	171,099	0.171	0.26	8	181	1.40	0.11	0.19	0.29		3.12	
R	5151	5158	Nirvana Ave	0.00	Industrial	712	0	N/A	N/A	N/A	N/A	N/A	92,486	1.85	171,099	0.171	0.26	8	112	0.50	0.14	0.25	0.38		2.15	
S	5158	5152	Main Street	0.00	Industrial	712	0	N/A	N/A	N/A	N/A	N/A	92,486	1.85	171,099	0.171	0.26	10	254	0.25	0.15	0.28	0.33		1.64	
T	5152	5147	Main Street	0.00	Industrial	712	0	N/A	N/A	N/A	N/A	N/A	92,486	1.85	171,099	0.171	0.26	10	317	0.25	0.15	0.28	0.33		1.64	
U	5147	5148	Main Street	63.74	Industrial	712	45,383	N/A	N/A	N/A	N/A	N/A	137,869	1.85	255,058	0.255	0.39	10	317	0.25	0.18	0.34	0.41		1.83	
V	5148	7279	Main Street	1.81	Industrial	712	1,289	N/A	N/A	N/A	N/A	N/A	139,158	1.85	257,442	0.257	0.40	10	317	0.25	0.18	0.34	0.41		1.83	
W	7279	7281	Main Street	0.00	Industrial	712	0	N/A	N/A	N/A	N/A	N/A	139,158	1.85	257,442	0.257	0.40	10	317	0.25	0.18	0.34	0.41		1.83	
X	7281	7284	Main Street	0.00	Industrial	712	0	N/A	N/A	N/A	N/A	N/A	139,158	1.85	257,442	0.257	0.40	10	317	0.25	0.18	0.34	0.41		1.83	
Y	7284	7291	Main Street	0.00	Industrial	712	0	N/A	N/A	N/A	N/A	N/A	139,158	1.85	257,442	0.257	0.40	10	317	0.25	0.18	0.34	0.41		1.83	
Z	7291	7283	Main Street	8.51	Industrial	712	6,059	N/A	N/A	N/A	N/A	N/A	145,217	1.85	268,651	0.269	0.42	10	317	0.25	0.18	0.35	0.42		1.86	
AA	7283	7282	Main Street	0.00	Industrial	712	0	N/A	N/A	N/A	N/A	N/A	145,217	1.85	268,651	0.269	0.42	10	305	0.25	0.18	0.35	0.42		1.86	
BB	16681	7280	Main Street	29.00	Industrial	712	20,648	N/A	N/A	N/A	N/A	N/A	165,865	1.85	306,850	0.307	0.47	10	450	0.25	0.20	0.38	0.46		1.94	
CC	7280	7278	Main Street	0.00	Industrial	712	0	N/A	N/A	N/A	N/A	N/A	165,865	1.85	306,850	0.307	0.47	10	449	0.33	0.18	0.35	0.42		2.13	
DD	7278	7277	Main Street					N/A	N/A	N/A	N/A	N/A	288,042	2.00	576,629	0.577	0.89	10	384	0.33	0.24	0.52	0.62	0.523		PDWF provided from Appendix 2[5]

Notes
(1) Per 2005 General Plan, code designation IL
(2) Per Table 3-3: Landuse Zoning Designations of the City of Chula Vista Wastewater Collection System Master Plan May 2014
(3) Per Table 3-2: Wastewater Duty Factors of the City of Chula Vista Wastewater Collection System Master Plan May 2014
(4) Wet Weather Peaking Factor from Chapter 3.3.6 of the City of Chula Vista Wastewater Collection System Master Plan May 2014
(5) Appendix 2 of City of Chula Vista Wastewater Master Plan (May 2014)
(6) Uses the more conservative value of ADWF calculated from in-line area and building square footage

Section 5 – Appendices

1. City of Chula Vista Wastewater Collection System Master Plan, 2014 – Wastewater Duty Factors and Landuse Zoning Designations (Table 3-2 and Table 3-3, pages 3-9 and 3-10)

2. City of Chula Vista Wastewater Collection System Master Plan, 2014 – Pipeline Design Criteria (Table 4-1, page 4-1)

3. City of Chula Vista Sewer System Management Plan, April 2021 –Design Criteria (page 36)

4. City of San Diego Sewer Design Guide, 2013 – Chapter 1.7.1 Required Capacity Downstream of New Gravity Sewers (page 1-13)

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.

Table 3-3: Landuse Zoning Designations

Landuse Code Designation[1]	Landuse Code Name	Duty Factor[2]	Dwelling Units Per Acre[3]	Residential/Non-Residential Landuse Designations
CO	Commercial Office	1401	0	NR
CR	Commercial Retail	1401	0	NR
CV	Commercial Visitor	1401	0	NR
EUC	Eastern Urban Core	182	13.8	NR
FWC	Freeway Commercial	0	0	NR
FWY	Industrial	0	0	NR
I	Industrial Limited	712	0	NR
IL	Mixed-Use Commercial	712	0	NR
MUC	Mixed-Use Residential	1401	0	R
MUR	Open Space	182	14.5	NR
OS	Open Space Preserve	0	0	NR
OSP	Open Space Recreation	0	0	NR
PQ	Public_Quasi-Public	1313	0	NR
PRK	Park	410	0	NR
RH	Residential High	182	22.5	R
RL	Residential Low	230	1.5	R
RLM	Residential Low Medium	230	4.5	R
RM	Residential Medium	182	8.5	R
RMH	Residential Medium High	182	14.5	R
TC	Town Center	182	0	NR
TFA	Transit Focus Area	0	14.5	R
UCR	Urban Core Resort	182	44	R
WAT	Water	0	0	NR

1. Code Designations gathered from 2005 General Plan
2. DU/Acre based on the "Medium" range of values per the 2005 General Plan

Table 3-4 shows the anticipated developments per the 2005 Approved General Plan including General Plan Amendments in 2013, 2013 Otay Ranch General Development Plan Projections and the San Diego Association of Governments (SANDAG) population Projections and projected maximum flows (future development beyond the developments identified in this master plan will be required to develop a wastewater impact report to evaluate the impact to the system), and Table 3-5 summarizes the total flow detailed out from Table 3-4 for each development. Table 3-6 identifies the City's total projected flows through 2050. Growth/flow projections used a linear growth projection between 2012 and 2050.

It should be noted that this master plan update included estimated flows from a portion of the Bayfront development in the calculation of the City's flow projections, treatment capacity needs and Sewerage Capacity Charge. No existing conveyance system upsize was included in the CIP as a result of the projected Bayfront flows. Partial Bayfront flows were used only to define ultimate treatment capacity needs.

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.

Land Use	Unit Generation Rate
Residential (R-1 & R-2)	230 gpd per dwelling unit
Residential (R-3 & MHP)	182 gpd per dwelling unit
Commercial	1,401 gpd per acre
Industrial	712 gpd per acre
Parks	410 gpd per acre
Elementary School	12 gpd per capita
Junior High and High School	13 gpd per capita

The 2014 Wastewater Master Plan identifies criteria for evaluating existing pipe and includes design criteria for new pipelines, below is an excerpt from the document.

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
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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.

population for a given land use. These tabulated figures represent a general case analysis. When more accurate or detailed information, such as fixture unit counts, is available, Table 1-1 shall not be used. For more information on the requirements of the zones shown in Table 1-1, refer to Chapter 13 of the City of San Diego Municipal Code.

1.7 REQUIRED CAPACITY IN EXISTING SEWER SYSTEMS DOWNSTREAM OF NEW FACILITIES

1.7.1 Required Capacity Downstream of New Gravity Sewers

For a new development, the projected peak wet weather flow from the proposed system (ref. Subsection 1.3.2.2) will be added to the field measured maximum flow in the downstream sewer to determine if the projected d_n/D is in compliance with the depth criterion described in Subsection 1.3.3.3. If this criterion is not met, a comprehensive sewer study of the area shall be prepared.

The downstream system shall be studied to the point in the system where the projected peak wet weather flow from the proposed new development is less than 10% of the total flow. All sewers to this point are required to carry the total flow per the depth criterion described in the above paragraph. The existing system to be studied shall not be less than two pipe reaches (i.e. manhole to manhole) from the point of discharge of the new development into the existing system.

1.7.2 Required Capacity Downstream of New Pump Stations

In developed lands, the discharge of the pump station design capacity from the proposed new development will be added to the field measured maximum flow in the existing downstream sewer to determine if the projected d_n/D will comply with the depth criteria described in Subsection 1.3.3.3. If these criteria are not met, a comprehensive sewer study of the area shall be prepared.

The sewer system downstream of the pump station shall be designed for cyclical pumping operation (i.e. on-off pumping). Use the design discharge capacity of the pump station for the tributary area. As a rule of thumb, the cyclical effect in single family residential may be considered negligible when the pump station's discharge is less than 10% of the total flow. For other density types consult with the Senior Engineer. All sewers to this point are required to carry the total flow per the depth criterion described in the above paragraph. The proposed new system shall discharge at a point not less than two pipe reaches (i.e. manhole to manhole) away the existing system.