DIXON INNOVATION CENTER (DIC)

TECHNICAL MEMORANDUM

Supplemental Sewer Capacity Analysis**

** This technical memo serves to identify the sewer facilities required based on the anticipated build-out of the Dixon Innovation Center (DIC) and to show that those off-site facilities have been accounted for in the DRAFT SEWER STUDY FOR THE CAMPUS dated January 2024. This study was submitted back to the City of Dixon February 16th, 2024 and has been included for reference in this technical memo

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I. BACKGROUND

The Dixon Innovation Center project site is approximately 38 acres and is located in Dixon, CA, in the Central Valley region of Northern California, along the Interstate 80 (I-80) freeway corridor (APNs 0111-010-080). The project is located within the City of Dixon's Northeast Quadrant Specific Plan (NQSP). The project site is located within the area of land bounded by existing industrial to the north, Pedrick Road to the east, Interstate 80 to the west and undeveloped property to the south (future Professional Drive alignment). See **Figure 1** below for the vicinity map.

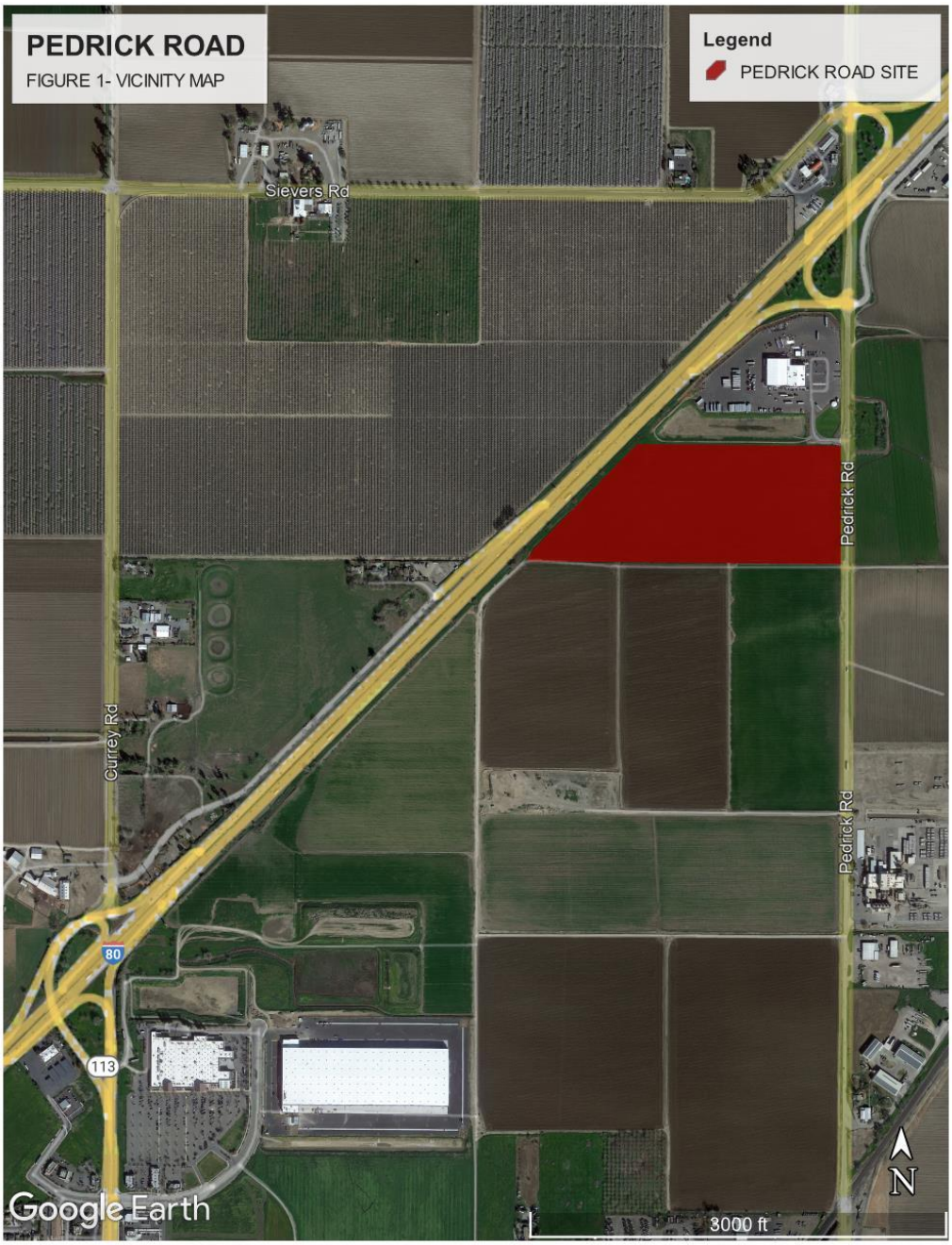

FIGURE 1- VICINITY MAP

II. PURPOSE

The main objective of this Technical Memo (TM) is to estimate design sewer flows produced by the proposed Dixon Innovation Center (DIC) project and future contributing sewer shed areas up/downstream at full build out conditions and provide preliminary sizing of the backbone sanitary sewer infrastructure required to serve the shed area. To that end, and to minimize duplicate information between adjacent projects, this TM references the DRAFT SEWER STUDY FOR THE CAMPUS dated January 2024 which accounts for all of the existing and proposed off-site sewer flows as well as the proposed on-site Dixon Innovation Center (DIC) flows through the shed area down to the treatment plant.

III. LAND USE

PRE-DEVELOPMENT CONDITIONS:

Historically, this site has been used for farming. The existing topography of the site is very flat and generally drains from the west to the east.

POST-DEVELOPMENT CONDITIONS:

The 38-acre Dixon Innovation Center project site is currently zoned Highway Commercial (2018 Zoning Map, CH-PUD) and has a General Plan designation of Industrial. It is understood the City is of Dixon is considering a Zoning Ordinance and Zoning Map update under which the project site would be zoned IG-NESP. The updated General Plan designation would remain Industrial. The site is proposed to be developed for Industrial uses.

IV. SEWER INFRASTRUCTURE

EXISTING SEWER FACILITIES:

There are currently no existing sewer facilities on or adjacent to the project.

PROPOSED SEWER FACILITIIES:

On-Site

With the future on-site Design review application, the proposed on-site sewer network will be designed to meet the design criteria set forth in the City of Dixon Engineering Standards & Specifications (March 2022). To ensure off-site infrastructure provides for the full build-out of the DIC project, the following on-site design calculations have been provided.

Design Flows:

To evaluate the proposed off-site sanitary sewer main required to support the development of the Dixon Innovation Center project, the site was modeled using the City's Industrial design standards. Section DS6-03.A of the standards provides the following equation for calculation of design sewer flow:

$Q_d = Q_p + I\&I$, where

Q_d = Design flow

Q_p = Peak flow = Average Daily Flow x Peaking Factor

I&I = Infiltration & Inflow Factor

Section DS6-03.A in the standards provides the following design flows per land use:

Design Flows from City of Dixon Engineering Standards		
Land Use	**Average Daily Flow**	**I+ I Factor**
Industrial	1,400 gpd per net acre	500 gpd per gross ac.

The DIC project area contributing to the ultimate sewer network is based on the following:

Project Area Inputs		
Land Use	**Gross Area (Ac.)**	**Net Area (Ac.)**
Industrial	37.0	29.6

*Note: Net Acres is assumed as 80% of Gross Acres

Based on this information, the proposed design flows from the on-site DIC project that need to be accounted for in the off-site sewer network are as shown below. Since the total shed area being analyzed in the overall study is roughly 500-acres, a peaking factor of 2.5 has been used to determine required sewer flows (Section DS6-03.A). See Exhibit 3 in The Campus Draft Sewer Report

Design Sewer Flows Summary			
Shed Name from The Campus Draft Sewer Report	**Total Gross Shed Area (Ac.)**	**Q_d (mgd)**	**Q_d (cfs)**
A6 (DIC Site)	37	0.1499	0.2319

Off-Site

Pipe sizing and routing information is provided in The Campus Draft Sewer Report dated January 2024. The design flows required to serve the DIC project have been accounted for in the sewer report analysis as shown in Exhibit 1 & 3 of the report (see attached).

V. CONCLUSION

Sanitary Sewer Capacity:

The Dixon Innovation Center project is a 38-acre industrial project in northern Dixon along Highway 80. Based on the proposed land use, it is anticipated to generate a total design sanitary sewer flow of 0.1499 mgd (million gallons per day) including a peaking factor of 2.5. A sanitary lift station located at the southwest corner of the site will lift project and up-shed sewer flows to allow gravity flow south from the project site. The proposed sanitary sewer main in the future Professional Drive alignment, will route project/up-shed and adjacent industrial, commercial, SFR & MFR parcels southward to the existing 18" sewer main in Vaughn Road, where it will be carried to the existing wastewater treatment plant south of the site. Preliminary sizing of the sewer trunk main is provided in The Campus Draft Sewer Report dated January 2024.

VI. DRAFT SEWER STUDY FOR THE CAMPUS dated January 2024

See Attached

CITY OF DIXON, CALIFORNIA

THE CAMPUS

M&P Project No. 20-0024-00 (v.4)

DRAFT SEWER STUDY

January 2024

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1. BACKGROUND

The Campus project site is approximately 259.7 acres and is in Dixon, CA, in the Central Valley region of Northern California, along the Interstate 80 (I-80) freeway corridor (APNs 0111-040-010, -020, -030, -040, and 0111-080-050). The project is located within the City of Dixon's Northeast Quadrant Specific Plan (NQSP). The project site is located within the area of land bounded by Pedrick Road to the east, Interstate 80 to the northwest and undeveloped property to the south, west and north. See **Figure 1** below for the vicinity map.

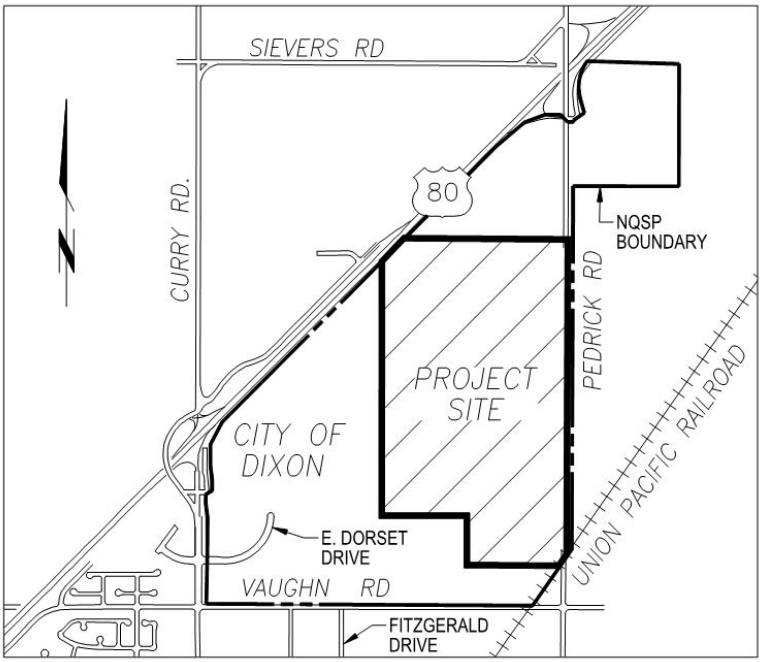


Figure 1 – Vicinity Map

2. PURPOSE

The main objective of this study is to estimate design sewer flows produced by The Campus project and upstream tributary areas at full build out conditions and provide preliminary sizing of the backbone sanitary sewer infrastructure. To ensure compliance, the proposed on-site sewer system will be designed such that it meets the design criteria previously set forth in the City of Dixon Engineering Standards & Specifications (March 2022).

Note: This study does not evaluate downstream impacts on the existing sewer mains in Vaughn Road and Fitzgerald Drive since the properties participated in the North First Street Assessment District to have the sewer oversized from Vaughn Road to Hall Park. The allocation of capacity for the NEQSP was approximately 2.85 mgd.

3. LAND USE

3.1. PRE-DEVELOPMENT CONDITIONS

Historically, the site has been used for farming. Most of the site is presently under cultivation with field and row crops with a small portion of the site uncultivated due to the presence of old, concrete building foundations. The existing topography of the site is very flat and generally drains from the west to the east at one-third percent.

Figure 2 shows the existing sanitary infrastructure near the project site. The image is from the Dixon Sewer System Map. The existing 18" sewer main in Vaughn Road, south of the site, will be used as the tie-in for the project. Sewer flows in Vaughn Road are carried by the 21" sewer main in Fitzgerald Drive southward towards the existing wastewater treatment facility south of the city.

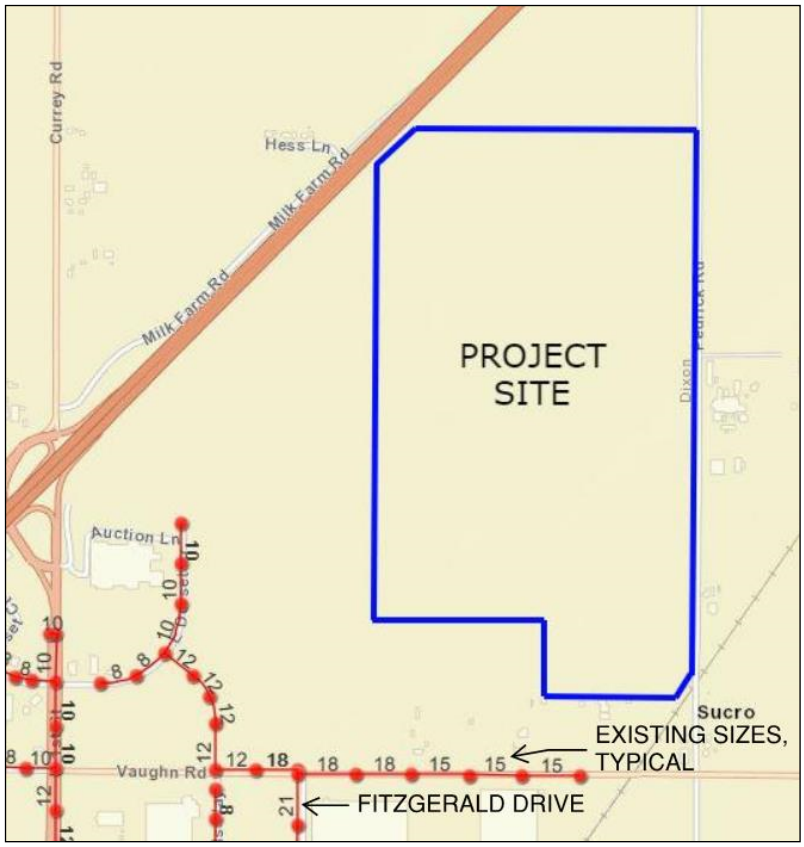


Figure 2 – Existing Sanitary Sewer

3.2. POST-DEVELOPMENT CONDITIONS

The project site is zoned as Corridor Mixed Use (CMU). The site area will be broken up into multiple proposed land uses. Approximately 55% of the site will be single-family residential of varying densities (816 units). The northern portion of the site will contain 50 acres of light industrial area, 10.0 acres of multi-family residential (225 Units), and approximately 2.0 acres of neighborhood commercial. The remainder of the site will be comprised of roads, parks, and a detention basin. See **Exhibit 1** for the Proposed Land Use Mix map.

A sanitary sewer trunk main is proposed to serve the project, and approximately 288 offsite acres north and northwest of the project. The 288-acres parcels are comprised of approximately 121-acres (zoned light industrial) located within the NQSP, and two additional sewer shed areas on the north side of Interstate 80 that are located within the existing city limits and/or sphere of influence. These area are zoned for commercial development. Due to elevation restrictions, these offsite shed areas along with the parcels north the The Campus site will drain via gravity sewers to a future sewer lift station located at the northern end of the The Campus project.

The sanitary sewer trunk main will run from the north boundary line of The Campus southward within the future Professional Drive right-of-way. The proposed sewer main will continue southward along Professional Drive and tie into the existing 21" sewer main in Fitzgerald Way. See **Figure 3** for the approximate alignment of the proposed sanitary sewer main. The proposed sewer main with sizes and contributing sewer sheds are shown in **Exhibit 2**, the Sewer Plan and Shed Map.

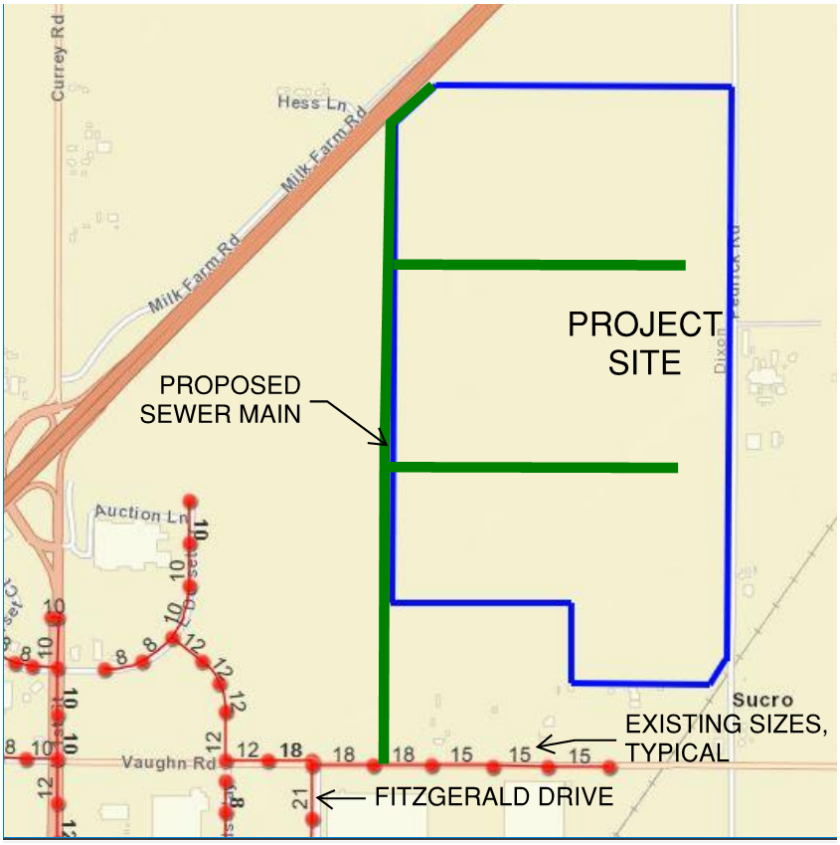


Figure 3 – Proposed Sanitary Sewer

Figure 4 – Proposed Land Use Table

CAMPUS CENTER, DIXON, CA LAND USE SUMMARY - DECEMBER 2023						
				Dwelling Units (du)		
VILLAGE / PARCEL	LAND USE	ZONING	GROSS AREA (acres)	DENSITY (du/ac)	DU's (units)	CAMU LAND USE
RESIDENTIAL						
VILLAGE 1	CAMU	CAMU-PD	27.90	4.6	128	LDR
VILLAGE 2	CAMU	CAMU-PD	18.05	5.3	95	LDR
VILLAGE 3	CAMU	CAMU-PD	11.23	8.7	98	MDR
VILLAGE 4	CAMU	CAMU-PD	6.46	9.3	60	MDR
VILLAGE 5	CAMU	CAMU-PD	15.80	7.6	120	MDR
VILLAGE 6	CAMU	CAMU-PD	18.80	6.9	130	LDR
VIILAGE 7	CAMU	CAMU-PD	18.89	5.1	96	LDR
VILLAGE 8	CAMU	CAMU-PD	15.60	5.7	89	LDR
VILLAGE 9	CAMU	CAMU-PD	11.54	19.5	225	HDR
Residential Total:			**144.27**	**7.2**	**1041**	
COMMERCIAL AND EMPLOYMENT USES						
COMMERCIAL						
PARCEL 11	CAMU	CAMU-PD	2.49			CC
Sub-Total:			**2.49**			
LIGHT INDUSTRIAL (TECH / BUSINESS PARK)						
PARCEL 12	CAMU	CAMU-PD	47.87			T/BP-LI
Sub-Total:			**47.87**			
Commercial and Employment Total:			**50.36**			
PUBLIC						
PARCEL 10 (Detention Po	CAMU	CAMU-PD	25.14			P/QP
PARCEL 13 (Well Site)	CAMU	CAMU-PD	1.58			P/QP
PARCEL 20 (Drainage Ch	CAMU	CAMU-PD	1.18			P/QP
Public / Quasi-Public Total:			**27.9**			
PARKS, OPEN SPACE & PUBLIC USES						
PARKS AND OPEN SPACE						
PARCEL 14	CAMU	CAMU-PD	2.36			P/R
PARCEL 15	CAMU	CAMU-PD	1.64			P/R (Paseo)
PARCEL 16	CAMU	CAMU-PD	1.58			P/R (Paseo)
PARCEL 17	CAMU	CAMU-PD	1.42			P/R (Paseo)
PARCEL 18	CAMU	CAMU-PD	1.42			P/R (Paseo)
PARCEL 19	CAMU	CAMU-PD	5			P/R
Parks and Open Space Total:			**13.42**			
ROADS / R.O.W.		CAMU-PD	**23.66**			
Campus Center Total:			**259.61**			

4. SEWER ANALYSIS

4.1. DESIGN FLOWS

To evaluate the proposed on-and off-site sanitary sewer main required to support the development of the The Campus project, the site was split into twelve sewer sheds, nine on-site and three off-site representing the 288-acres to the north. Design sewer flows for each shed were calculated based on the City of Dixon Engineering Design Standards. Section DS6-03.A of the standards provides the following equation for calculation of design sewer flow:

$$Q_d = Q_p + I\&I, \text{ where}$$

Q_d = Design flow
Q_p = Peak flow = Average Daily Flow x Peaking Factor
I&I = Infiltration & Inflow Factor

Section DS6-03.A in the standards provides the following design flows per land use:

Design Flows from City of Dixon Engineering Standards		
Land Use	**Average Daily Flow**	**I+ I Factor**
Single-Family	250 gpd per unit	500 gpd per gross ac.
Multi-Family	3,600 gpd per net acre	500 gpd per gross ac.
Commercial/Public	1,100 gpd per net acre	500 gpd per gross ac.
Industrial	1,400 gpd per net acre	500 gpd per gross ac.

*Note: Net Acres is assumed as 80% of Gross Acres

Table 1 – Design Flows from City of Dixon Engineering Standards

The following is assumed for the sewer design flows for the Park Land Use areas: no contribution to the average flow; I+I Factor of 500 gpd per gross acres.

Since the east and west sheds being analyzed are less than 500-acres, a peaking factor of 2.5 is used per Section DS6-03.A. The total shed discharge into the Fitzgerald sewer is 796 acres with a corresponding peaking factor of 2.2.

Exhibit 2 shows the twelve sewer sheds on the east sewer trunk line. **Table 2** summarizes each sewer shed, land use, and area (gross and net). The total on-site sewer shed area is 490 acres.

Sewer Shed Summary			
Shed Name	**Land Use**	**Gross Area (Ac.)**	**Net Area (Ac.)**
G2	RC	83.0	66.4
A8	LI	59.0	59.8
A7	LI	24.0	19.2
A6	LI	37.0	29.6
G1	RC	84.0	67.2
A4	LI	61.4	49.1
A10	SFR/MFR	84.1/12.2	67.28/10.37
A3	SFR	76.0	64.6
A1	LI	57.0	45.6
A1.1	LI	13.0	10.4
A0	NEQSP	796	
SFR – Single-Family Residential MFR – Multi-Family Residential LI – Light Industrial CC - Commercial			

Table 2 – Sewer Shed Summary

Exhibit 3 provides design flow calculations for each sewer shed. Average daily flows for each shed and Infiltration & Inflow factors were based on Table 1, with Net Acres assumed to be 80% of Gross Acres. Resulting design flows are provided in **Table 3** on the following page.

Design Sewer Flows Summary			
Shed Name	**Total Gross Shed Area (Ac.)**	**Q_d (mgd)**	**Q_d (cfs)**
G2	83.0	0.224	0.35
A8	59.0	0.389	0.60
A7	24.0	0.469	0.72
A6	37.0	0.591	0.91
G1	84.0	0.227	0.35
A4	61.4	1.012	1.56
A10	75	0.445	0.69
A3	97	1.701	2.63
A1	57.0	1.870	2.89
A1.1	13.0	0.078	0.12
A0	796	2.538	3.93
Design Flow (NFSAD) = 2.85 mgd (4.41 cfs)			

Table 3 – Design Sewer Flows Summary

4.2. CAPACITY ANALYSIS

Sewer pipes were sized per Section DS6-03.B of the standards based upon the sewer mains flowing at 70% capacity using Manning's formula:

$$Q=A(1.49/n)(R^{2/3})(S^{1/2}), \text{ where}$$

Q = Flow, in cubic feet per second (cfs)
A = Area of pipe in square feet (sf)
R = Hydraulic Radius (Area/Wetted Perimeter)
S = Slope of pipe
n = Manning's roughness coefficient of 0.013

Per Section DS6-03.C, sewer pipes were designed such that sewer velocity is greater or equal to 2 feet per second (fps) when flowing full with a maximum velocity of 10 feet per second for pipes flowing greater than 50% of capacity. Sewer flowing less than 50% of capacity area designed to have a slope that allows for a velocity of 2.5 fps when flowing full.

For simplicity, the proposed sanitary sewer main was broken into six sewer pipe sections and seven sewer nodes. It was assumed that sewer flows from each shed enter the system at the sewer nodes. The pipe sections and sewer nodes are shown in **Exhibit 2**. The sewer nodes for this study may or may not correspond to true sanitary sewer manhole locations. Actual manhole locations will be determined later on in the design process.

Exhibit 3 provides pipe sizing calculations and shows that all sewer pipes carry design flows at less than or equal to 70% pipe capacity. It has been assumed that the standard requiring sewers which will not exceed 50% capacity to have a design velocity of 2.5 feet per second will be waived. The minimum velocity flowing full equal to 2 feet per second for each pipe section. Pipe slopes vary between 0.11% and 0.25% and must remain low due to the flatness of the site and the ability to serve areas within the City of Dixon sphere of influence north of Interstate 80. A Manning's n of 0.013 was used for all pipes. A summary of the capacity analysis is provided in **Table 4**.

Table 4 – Sewer Capacity Analysis Summary

		DESIGN FLOW			PIPE DATA							70%	%
		PWWF	PWWF	Pipe	Manning's	Pipe U/S	Pipe D/S		Pipe	Calc.	Full Pipe	Full Pipe	of pipe
Node	Node	Q_{PWWF}	Q_{PWWF}	Dia.	'n' Value	Flowline	Flowline	Length	Slope	Velocity	Flow	Flow	capacity
U/S	D/S	(mgd)	(cfs)	(in.)	(n)	(feet)	(feet)	(ft.)		(FPS)	(CFS)	(CFS)	
G2	**A8**	0.2241	0.35	**8.00**	0.013	57.84	48.22	1850.0	***0.0052***	2.34	0.87	0.61	40%
A8	**A7**	0.3893	0.60	**8.00**	0.013	48.22	43.70	870.0	**0.0052**	2.65	0.87	0.61	69%
A7	**A6**	0.4685	0.72	**10.00**	0.013	43.53	41.35	870.0	0.0025	2.11	1.10	0.77	66%
A6	**A5**	0.5906	0.91	**12.00**	0.013	41.18	36.00	2100.0	0.0025	2.13	1.78	1.25	51%
G1	**A5**	0.2268	0.35	**8.00**	0.013	42.24	36.00	1200.0	***0.0052***	2.34	0.87	0.61	40%
A5	**A4**	0.8174	1.26	**15.00**	0.013	55.65	54.07	930.0	0.0017	2.11	2.66	1.86	47%
A4	**A9**	1.0115	1.56	**15.00**	0.013	54.07	52.17	1120.0	0.0017	2.25	2.66	1.86	59%
A10	**A9**	0.4454	0.69	**12.00**	0.013	55.66	52.42	1620.0	0.0020	1.94	1.59	1.12	43%
A9	**A3**	1.4569	2.25	**18.00**	0.013	51.92	49.37	1500.0	0.0017	2.43	4.33	3.03	52%
A3	**A2**	1.7010	2.63	**18.00**	0.013	49.37	48.47	670.0	0.0013	2.31	3.85	2.70	68%
A2	**A1**	1.7010	2.63	**18.00**	0.013	48.47	47.09	1250.0	0.0011	2.15	3.49	2.44	75%
A1.1	**A1**	0.0780	0.12	15.00	0.013	51.34	47.89	2300.0	0.0015	1.05	2.50	1.75	5%
A1	**A0**	**1.8699**	**2.89**	**18.00**	**0.013**	**46.99**	**46.30**	**625.0**	**0.0011**	**2.18**	**3.49**	**2.44**	**83%**
B6	**B5**	0.0891	0.14	**8.00**	0.013	61.26	58.46	800.0	***0.0035***	1.53	0.71	0.50	19%
B5	**B4**	0.1452	0.22	10.00	0.013	58.29	55.21	1140.0	*0.0027*	1.60	1.14	0.80	20%
B4	**B3**	0.3084	0.48	10.00	0.013	55.21	53.28	715.0	0.0027	2.00	1.14	0.80	42%
B3	**B2**	0.4188	0.65	10.00	0.013	53.28	52.10	438.0	0.0027	2.16	1.14	0.80	57%
B2.1	**B2**	0.0270	0.04	8.00	0.013	55.63	52.26	612.0	0.0055	1.27	0.90	0.63	5%
B2	**B1**	0.4944	0.76	12.00	0.013	51.93	48.86	1137.0	0.0027	2.23	1.85	1.30	41%
B1	**A0**	0.5901	0.91	12.00	0.013	48.66	48.06	674.0	0.0009	1.54	1.06	0.74	86%
A0	**Outfall**	2.5380	3.93	21.00	0.013	45.86	44.97	990.0	0.0009	2.22	4.75	3.33	83%

*Note: Manning's n = 0.013

5. CONCLUSIONS

The Campus project is a large mixed-use project in northern Dixon along Highway 80. Based on the proposed land use, it is anticipated to generate a total design sanitary sewer flow of 1.0 million gallons per day. A sanitary sewer main is proposed to route sewer flows from the project site and adjacent industrial parcels southward to the existing 21" sewer main in Fitzgerald Drive, where it well be carried to the existing wastewater treatment plant south of the city. Preliminary sizing of the sewer trunk main is provided in **Table 4** of this study.

6. REFERENCES

1. “City of Dixon Engineering Standards & Specifications”, City of Dixon, City Engineer / Public Works Department, August 26, 2014.
2. “Sewer System Map for the City of Dixon, California”, Dixon Engineering, ArcGIS.com, dixonca.maps.argis.com
3. City of Dixon Sewer Collection System Master Plan, City of Dixon / Stantec Consulting Services, March 2023

CITY OF DIXON
NORTHEAST QUADRANT SPECIFIC PLAN
WASTEWATER SYSTEM
DIXON, CALIFORNIA
JANUARY 2024
SEWER PLAN & SHED MAP

NOT TO SCALE

PROJECT BOUNDARY

LI 59.0 Ac

8" SS 57.84 (G2)

8" SS 48.22 (A8)

8" 43.70 (N) (A7)
10" 43.53 (S)

10" 41.35 (N) (A6)
12" 41.18 (W)

1,850LFx8"SS S=0.0052

870LFx8"SS S=0.0052

870LFx10"SS S=0.0025

PEDRICK ROAD

RC 83.0 Ac

LI 24.0 Ac

LI 37.0 Ac

LI 61.4 Ac

MFR 12.2 Ac 225 du

BASIN 28.3 Ac

LI 13.0 Ac

COMMERCIAL DRIVE

8" 36.00 (W)
12" 36.00 (E)
15" 55.65

A5 LIFT STATION

2100LFx12"SS S=0.0025

12" SS 55.66 (A10)

51.34 (E) 15" SS (A1.1)

SFR 76.0 313 du

SFR 84.1 Ac 503 du

1620LFx12"SS S=0.0020

12" SS 52.42(E)
12" SS 52.17(N)
18" SS 51.92(S) (A9)

18" SS 49.37
18" SS 49.37 (A3)

18" SS 48.47
18" SS 48.47 (A2)

LI 37.0 Ac

18" 47.09 (N)
18" 46.99 (W) (A1)

VAUGHN ROAD

2300LF (E) 15"SS S=0.0015

15" SS(N) 54.07
15" SS 54.07 (A4)

930LFx15"SS S=0.0017

1120 LFx 15" SS S=0.0017

1500 LFx 18" SS S=0.0017

670 LFx 18" SS S=0.0013

1230LFx 18" SS S=0.0011

(E) 15"S S=0.0015

625LF x 18"SS S=0.0011

1200LFx8"SS S=0.0052

PROFESSIONAL DRIVE

LI 33.0 Ac

8" 61.26 (B6)

LI 17.0 Ac

LI 29.0 Ac

LI 20.0 Ac

18" 46.10 (S)
18" 46.30 (E)

N. FITZGERALD

800LFx 8" SS S=0.0038

8" 58.46 (B5)
10" 58.29

LI 22.0 Ac

LI 29.0 Ac

(E) 21" SS

10" 55.21 (S) (B4)

10" 53.28 (B3)

8" 52.26 (SW) (B2)
10" 52.10 (NE)
12" 51.93 (SE)

18" 46.01 (N) (E)
15" 47.89 (E)
21" 45.86 OUT

DORSET DRIVE

1140LFx10"S S=0.0027

(E) 10"SS

EXIST 10" SS

ROAD

(E) 12" SS

UNNAMED

RC 25.0 Ac

RC 84.0 Ac

RC 14.0 Ac

RC 11.0 Ac

RC 7.0 Ac

RC 10.0Ac

(E) 8"SS S=0.0055

8"55.63 (B2.1)

12" 48.66 (N)
12" 48.86 (E) (B1)

18" 42.24 (N) (G1)

PROJECT BOUNDARY

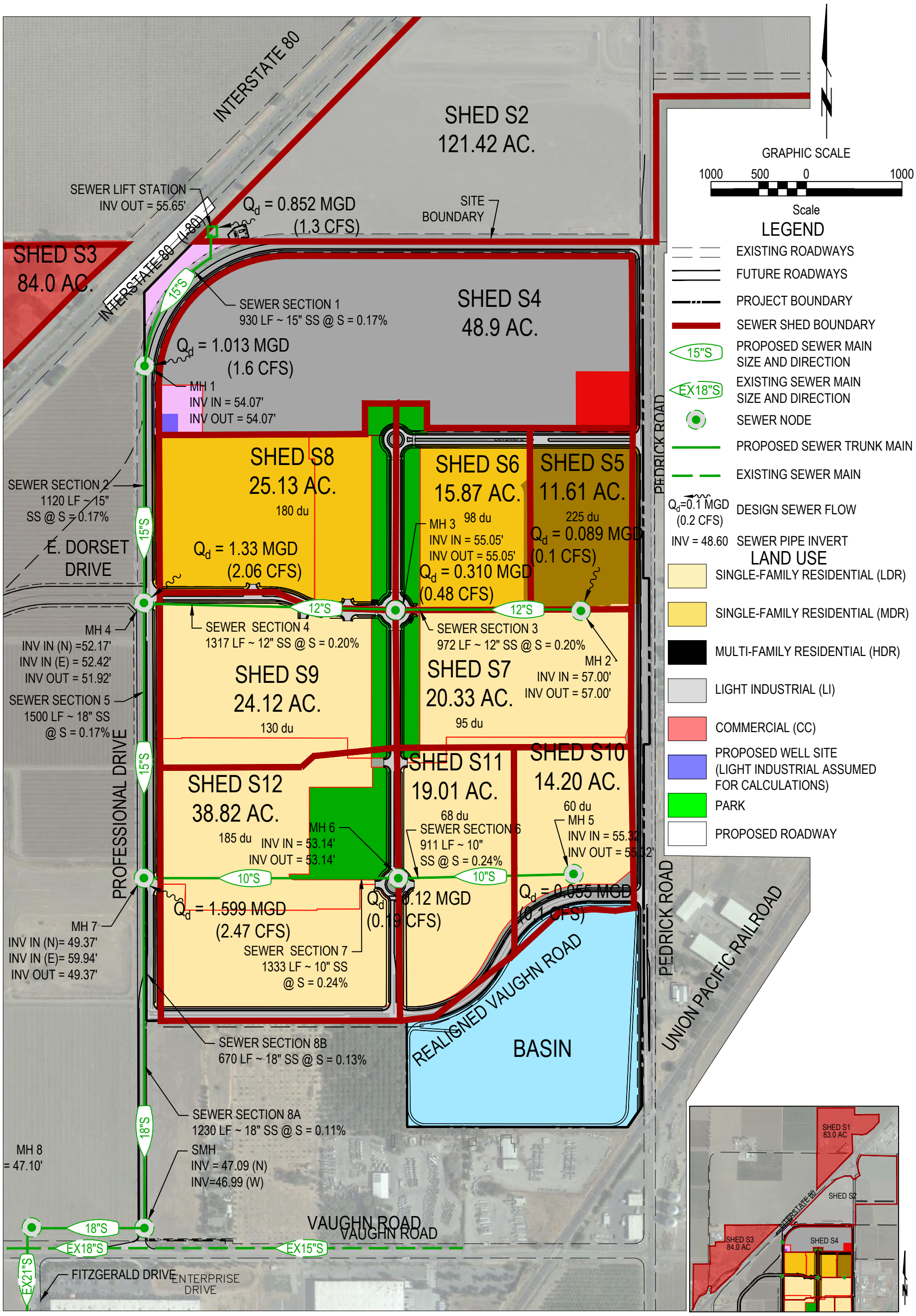
INTERSTATE 80

Legend

Sewer Main & Manhole	
Lift Station	
Sewer Shed Boundary	
Exist Sewer Line	
Land Use	RC / MUA / LI
Gross Sewer Tributary Area	33.0 Ac
Sewer Size and Invert	8" 50.50 (N) / 10" 50.30 (W)
Approx Lenth, Pipe Diameter, Slope	2000LFx 12" SS S=0.0015
Sewer Node	(A3)

UPDATE, JULY 2023

EXHIBIT ___



BENCHMARK:
COUNTY OF SOLANO BM SOL 50; ELEVATION 66.52 (NAVD 88)

OFFSITE SHED
SCALE - 1" = 3500'

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DRAWN:	DF	JOB NO:	20-0024-00
CHECKED:		DATE:	JANUARY 20204
SCALE:	1" = 500'	SHEET:	1 of 1

EXHIBIT FOR

THE CAMPUS SEWER STUDY

EXHIBIT 2

SEWER PLAN AND SHED MAP

DIXON, CA

EXHIBIT 3 - SANITARY SEWR DESIGN CALCULATIONS

NQSP MASTER SEWER PLAN

January 30, 2024

		Comments	AVERAGE DAILY SEWER FLOWS													INFILTRATION	
			Land Use		Land Use			Land Use		Land Use		Added	Peaking	Added	Cumu.	I & I	I&I
Node	Node		(RC)	Av. Daily Flow	(SFR)	(SFR)	Av. Daily Flow	(MFR)	Av. Daily Flow	(LI / MU)	Av. Daily Flow	Flows	Factor	Area	Area	Rate	Δ
U/S	D/S		Area (Acres)	(GPD / Acre)	Area (Acres)	Dwelling Units	(GPD / DU)	Area (Acres)	(GPD / Acre)	Area (Acres)	(GPD / Acre)	(MGD)		(Acres)	(Acres)	(gpd/acre)	(mgd)
G2	A8	GP Area 4	83.00	1100.00								0.0730	2.50	83	83	500	0.0415
A8	A7									59.00	1400.00	0.0661	2.50	0	83	500	0.0000
A7	A6									24.00	1400.00	0.0269	2.50	24	107	500	0.0120
A6	A5									37.00	1400.00	0.0414	2.50	37	144	500	0.0185
G1	A5	GP Area 3	84.00	1100.00								0.0739	2.50	84	84	500	0.0420
		LIFT STATION										0.0000					
A5	A4											0.0000	2.50	0	228	500	0.0000
A4	A9		*2.00*	1100.00						46.90	1400.00	0.0679	2.50	49	277	500	0.0245
A10	A9				63.10	503	250.00	12.20	3600.00			0.1631	2.50	75	75	500	0.0377
A9	A3											0.0000	2.50	0	352	500	0.0000
A3	A2				97.00	313	250.00					0.0783	2.50	97	449	500	0.0485
A2	A1											0.0000	2.50	0	449	500	0.0000
A1.1	A1	(Exist. 15" sewer in Vaughn Road)	13.00	1100.00						13.00	1400.00	0.0260	2.50	26	26	500	0.0130
A1	A0	Dual sewer in Vaughn Road								**57.00**	**1400.00**	**0.0638**	**2.20**	**57**	**532**	**500**	**0.0285**
B6	B5	(Future Sewer Main)	33.00	1100.00								0.0290	2.50	33	33	500	0.0165
B5	B4	(Future Sewer Main)								17.00	1400.00	0.0190	2.50	17	50	500	0.0085
B4	B3	(Existing Sewer)	25.00	1100.00						29.00	1400.00	0.0545	2.50	54	104	500	0.0270
B3	B2	(Existing Sewer)	14.00	1100.00						22.00	1400.00	0.0370	2.50	36	140	500	0.0180
B2.1	B2	(Existing Sewer)	10.00	1100.00								0.0088	2.50	10	10	500	0.0050
B2	B1	(Existing Sewer)	18.00	1100.00								0.0158	2.50	18	168	500	0.0090
B1	A0	(Existing Sewer)								29.00	1400.00	0.0325	2.50	29	197	500	0.0145
A0	Outfall											0.0000	2.20	0	755	500	0.0000

Note:

1. The peaking factor is 2.5 for area less than 500. Peaking Facor is 2.2 for area between 500-1500acres.
2. The Net developed area is assumed to be 80% of the gross area.
3. Elevations are on NAVD88 Datum. Conversion to NGVD29 is -2.467 feet.

Q_a=Qp + Inflow and Infiltration (I & I)

Qp = Average daily flow x Peaking Factor
Inflow and Infiltration is 500gpd per acre.

Average Daily Flow:			
Land Use		**Average Daily Flow**	**I & I**
		(GPD)/ Acre	(GPD)/ Acre
Single Family		250	500 per DU
Multi Family		3600	500
Commercial/ Public		1100	500
Mixed Use Area		2030	500
Industrial		1400	500
Schools		5000	500

EXHIBIT 3 - SANITARY SEWR DESIGN CALCULATIONS

		Comments		DESIGN FLOW			PIPE DATA													
			Added Flow	PWWF	PWWF	Pipe	Manning's	Pipe U/S	Pipe D/S		Pipe	Apprx.	Crown	Manhole	HGL at	Calc.	Full Pipe	70% Full Pipe	% of pipe	Full Pipe
Node U/S	Node D/S		Δ (MGD)	Q_{PWWF} (mgd)	Q_{PWWF} (cfs)	Dia. (in.)	'n' Value (n)	Flowline (feet)	Flowline (feet)	Length (ft.)	Slope	Rim Elev. Elev (ft)	Elev (ft)	Depth (ft)	Upstrm Structure	Velocity (FPS)	Flow (CFS)	Flow (CFS)	capacity	Velocity (Ft/S)
G2	**A8**	**GP Area 4**	0.2241	0.2241	0.35	**8.00**	0.013	57.84	48.22	1850.0	***0.0052***	**62.00**	58.51	4.2	**54.55**	2.34	0.87	0.61	40%	2.5
A8	**A7**		0.1652	0.3893	0.60	**8.00**	0.013	48.22	43.70	870.0	**0.0052**	**62.00**	48.89	13.8	**54.55**	2.65	0.87	0.61	69%	2.5
A7	**A6**		0.0792	0.4685	0.72	**10.00**	0.013	43.53	41.35	870.0	0.0025	**60.00**	44.36	16.5	**51.75**	2.11	1.10	0.77	66%	2.0
A6	**A5**		0.1221	0.5906	0.91	**12.00**	0.013	41.18	36.00	2100.0	0.0025	**60.00**	42.18	18.8	**51.75**	2.13	1.78	1.25	51%	2.3
G1	**A5**	**GP Area 3**	0.2268	0.2268	0.35	**8.00**	0.013	42.24	36.00	1200.0	***0.0052***	**65.50**	42.91	23.3	**36.44**	2.34	0.87	0.61	40%	2.5
		LIFT STATION																		
A5	**A4**		0.0000	0.8174	1.26	**15.00**	0.013	55.65	54.07	930.0	0.0017	66.00	56.90	10.4		2.11	2.66	1.86	47%	1.0
A4	**A9**		0.1941	1.0115	1.56	**15.00**	0.013	54.07	52.17	1120.0	0.0017	**65.52**	55.32	11.4	**58.65**	2.25	2.66	1.86	59%	2.2
A10	**A9**		0.4454	0.4454	0.69	**12.00**	0.013	55.66	52.42	1620.0	0.0020	64.30	56.66	8.6	**57.89**	1.94	1.59	1.12	43%	2.0
A9	**A3**		0.0000	1.4569	2.25	**18.00**	0.013	51.92	49.37	1500.0	0.0017	62.70	53.42	10.8	**57.89**	2.43	4.33	3.03	52%	2.5
A3	**A2**		0.2441	1.7010	2.63	**18.00**	0.013	49.37	48.47	670.0	0.0013	59.80	50.87	10.4	**53.81**	2.31	3.85	2.70	68%	2.2
A2	**A1**		0.0000	1.7010	2.63	**18.00**	0.013	48.47	47.09	1250.0	0.0011	63.00	49.97	14.5	**51.56**	2.15	3.49	2.44	75%	2.0
A1.1	**A1**	**(Exist. 15" sewer in Vaughn Road)**	0.0780	0.0780	0.12	15.00	0.013	51.34	47.89	2300.0	0.0015	61.00	52.59	9.7	**50.65**	1.05	2.50	1.75	5%	2.0
A1	**A0**	**Dual sewer in Vaughn Road**	**0.1689**	**1.8699**	**2.89**	**18.00**	**0.013**	**46.99**	**46.30**	**625.0**	**0.0011**	**61.50**	**48.49**	**14.5**	**48.10**	**2.18**	**3.49**	**2.44**	**83%**	**2.0**
B6	**B5**	**(Future Sewer Main)**	0.0891	0.0891	0.14	**8.00**	0.013	61.26	58.46	800.0	***0.0035***	68.00	61.93	6.7	**60.38**	1.53	0.71	0.50	19%	2.0
B5	**B4**	**(Future Sewer Main)**	0.0561	0.1452	0.22	10.00	0.013	58.29	55.21	1140.0	*0.0027*	66.00	59.12	7.7	**56.28**	1.60	1.14	0.80	20%	2.1
B4	**B3**	(Existing Sewer)	0.1632	0.3084	0.48	10.00	0.013	55.21	53.28	715.0	0.0027	65.00	56.05	9.8	**53.34**	2.00	1.14	0.80	42%	2.1
B3	**B2**	(Existing Sewer)	0.1104	0.4188	0.65	10.00	0.013	53.28	52.10	438.0	0.0027	65.00	54.12	11.7	**51.63**	2.16	1.14	0.80	57%	2.1
B2.1	**B2**	(Existing Sewer)	0.0270	0.0270	0.04	8.00	0.013	55.63	52.26	612.0	0.0055	64.00	56.29	8.4	**53.55**	1.27	0.90	0.63	5%	2.6
B2	**B1**	(Existing Sewer)	0.0486	0.4944	0.76	12.00	0.013	51.93	48.86	1137.0	0.0027	64.00	52.93	12.1	**50.30**	2.23	1.85	1.30	41%	2.4
B1	**A0**	(Existing Sewer)	0.0957	0.5901	0.91	12.00	0.013	48.66	48.06	674.0	0.0009	65.00	49.66	16.3	**48.00**	1.54	1.06	0.74	86%	1.4
A0	**Outfall**		0.0000	2.5380	3.93	21.00	0.013	45.86	44.97	990.0	0.0009	62.50	47.61	16.6	**44.60**	2.22	4.75	3.33	83%	2.0
															44.14					

Note:

1. The peaking factor is 2.5 for are
2. The Net developed area is assu
3. Elevations are on NAVD88 Datu

Q_a=Qp + Inflow and Infiltration (I &

Qp = Average daily flow x Peaking
Inflow and Infiltration is 500gpd per

Land Use: (Based on NQSP Land Use Changes)

CH- HIGHWAY COMMERCIAL
CC- COMMUNITY COMMERCIAL
PAO - PROFESSIONAL AND ADMINISTRATIVE OFFICE
ML - LIGHT INDUSTRIAL
MU - MIXED USE AREA
AG - AGRICULTURE/ PARK