DIXON INNOVATION CENTER (DIC)

TECHNICAL MEMORANDUM

Supplemental Water Capacity Analysis**

** This technical memo serves to identify the water 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 CAMPUS (Dixon 257) DRAFT WATER STUDY dated February 2024. This study was submitted back to the City of Dixon February 16th, 2024, and has been included for reference in this technical memo. The West Yost Technical Memorandum dated June 22, 2023 has also been reference in this memo.

TABLE OF CONTENTS

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.

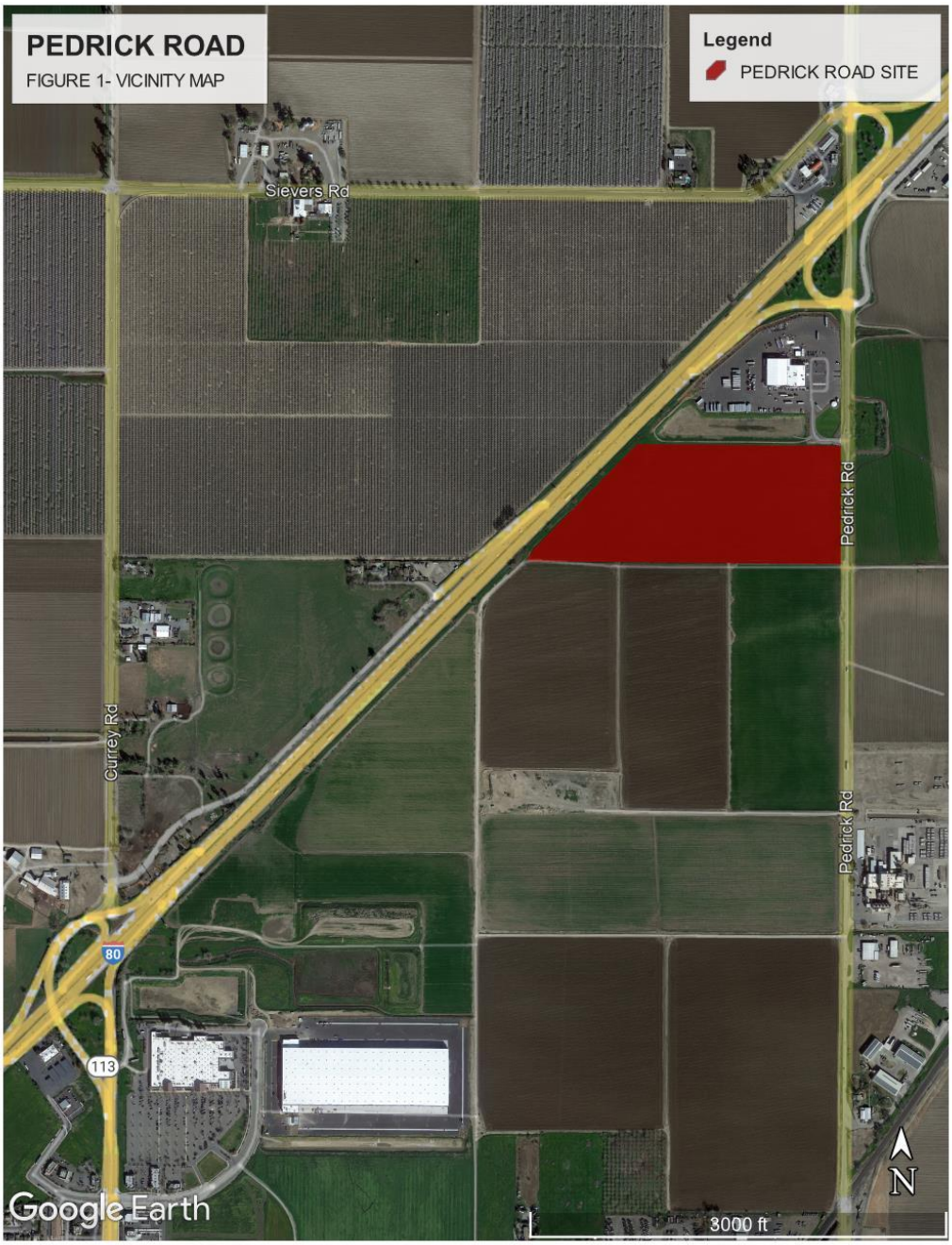

FIGURE 1- VICINITY MAP

II. PURPOSE

The main objective of this Technical Memo (TM) is to estimate design water demands produced by the proposed Dixon Innovation Center (DIC) project at full build-out. Additionally, this TM seeks to address preliminary sizing of the backbone water infrastructure required to serve the associated NEQSP shed area. To that end, and to minimize duplicate information between adjacent projects, this TM references the THE CAMPUS (Dixon 257) DRAFT WATER STUDY dated February 2024 which accounts for all of the existing and proposed off-site water demands as well as the proposed on-site Dixon Innovation Center (DIC) demands.

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. WATER INFRASTRUCTURE

EXISTING WATER FACILITIES:

There are currently no existing water facilities on or adjacent that serve the project. The existing facility adjacent to the north is currently on a well system with an additional on-site tank to meet fire demands. The adjacent project will be required to connect to the proposed water network when available.

PROPOSED WATER FACILITIES:

On-Site

With the future on-site Design Review application, the proposed on-site water 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.

Water Demands:

According to the WSMP, the City of Dixon's peak water supply capacity is sized to meet Maximum Day Demand for each of its zones. It must also be able to meet four hours of Peak Hour Demand with source capacity, storage capacity, and/or emergency source connections. To determine how the Dixon Innovation Center project will affect the City of Dixon's ability to meet these demand requirements, it is necessary to estimate the Maximum Day Demand and Peak Hour Demand for the site.

Maximum Day Demand and Peak Hour Demand for the Dixon Innovation Center (DIC) has been calculated based on the design criteria from Chapter 5 of the WSMP. Per Section 5.1.1 of the WSMP, Average Day Demand is calculated by multiplying area by the Unit Demand Factor, which is dependent

on land use. Per Section 5.1.2, Maximum Day Demand is 2.2 times Average Day Demand and Peak Hour Demand is 3.3 times Average Day Demand. **Table 1** shows the unit water demand factors used as part of this study. The table is based on Table 5-3 from Section 5.1.1 of the WSMP.

Water Unit Demand Factors	
Land Use	Unit Demand Factor, af/ac/yr
Industrial	1.5
Maximum Day Demand Factor: 2.2 times Average Day Demand Peak Hour Demand Factor: 3.3 times Average Day Demand	

Table 1 – Water Unit Demand Factors from the WSMP

Water demands were calculated based on the proposed Industrial land use (**Table 1)** Unit Demand Factors. The total on-site water supply shed area is 38 acres. Roadway areas were assumed to have no water demand. **Table 2** summarizes the results of the water demand calculation.

Project Water Demands				
Project Area (ac.)	Average Water Demand (af/yr)	Average Day Demand (mgd)	Maximum Day Demand (mgd)	Peak Hour Demand (mgd)
38	57	0.051	0.112	0.168

Table 2 – Project Water Demands

Based on this information, the proposed water demands for the Dixon Innovation Center (DIC), listed in Table 2 above, need to be accounted for in the off-site water network.

Off-Site

Based on the information provided in the West Yost Technical Memorandum date June 22, 2023 (attached), construction of the off-site water distribution system identified in The Campus Draft Water Study, with the construction of the new NEQ Water Well 1, will provide the necessary infrastructure and capacity to serve the Dixon Innovation Center (DIC).

Refer to Table 1, scenario 3 of the Technical Memo for reference to the Dixon Innovation Center (DIC) area, labeled as “Buzz Oates” in the memo.

V. CONCLUSION

Water 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 require a peak hour demand of 0.168 mgd (million gallons per day). A water well (NEQ Well 1) located south of the project along Professional Drive provide the required water system pressure and flow to serve the project. Preliminary sizing of the water main network is provided in The Campus (Dixon 257) Draft Water Study dated February 2024.

VI. THE CAMPUS (Dixon 257) DRAFT WAER STUDY dated January 2024

See Attached

VII. WEST YOST TECHNICAL MEMORANDUM dated June 22, 2023

NEQ Potable Water Hydraulic Evaluation

See Attached

CITY OF DIXON, CALIFORNIA

THE CAMPUS (Dixon 257)

M&P Project No. 20-0024-00 (v.3)

DRAFT WATER STUDY

February 2024

PREPARED BY:

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TABLE OF CONTENTS:

LIST OF FIGURES:

LIST OF TABLES:

LIST OF EXHIBITS:

1. BACKGROUND

This water study provides a preliminary water infrastructure plan and design standards for water facilities within the proposed Campus project. The project is located on approximately 259.7-acres within a portion of the City of Dixon in Solano County California (APNs 0111-040-010, -020, -030, -040, and 0111-080-050). The project is located within the City of Dixon's Northeast Quadrant and is part of the Northeast Quadrant Specific Plan (NQSP). The NQSP area is located south of I-80, north of Vaughn Road, east of N. First Street, and west of Pedrick Road. See **Figure 1** for the vicinity map.

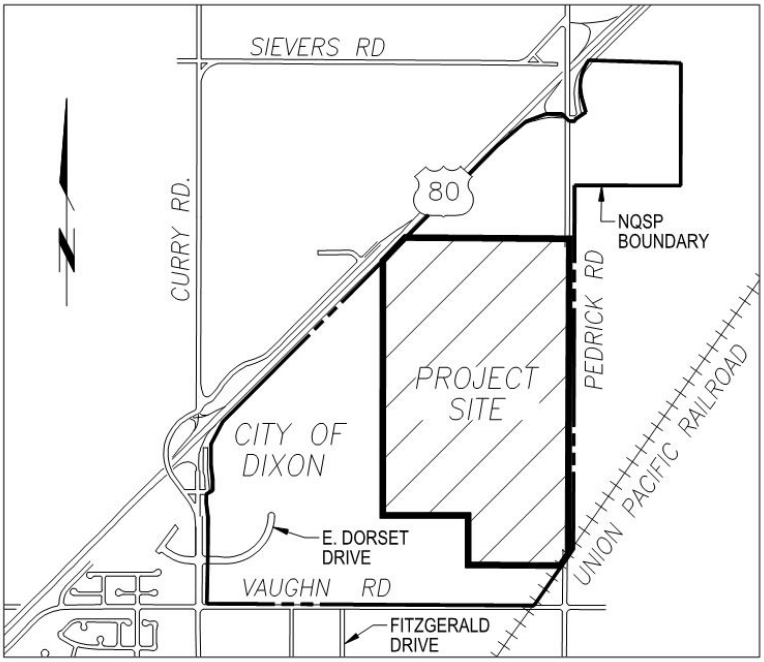


Figure 1 – Vicinity Map

2. PURPOSE

The main objective of this study is to determine the water demands of The Campus project. This study also seeks to determine the water infrastructure requirements based on the City of Dixon 2021 Water System Master Plan (WSMP) and to provide a preliminary water infrastructure plan that will meet the needs of the proposed site.

3. LAND USE

Historically, the Campus site has been used for farming. The majority 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.

The project site is zoned as Corridor Mixed Use (CMU). The site area will be broken up into multiple proposed land uses. The majority of the site, totaling 128.2 acres, will be single-family residential (SFR). The northern portion of the site will contain 46.7 acres of light industrial area (LI), 9.7 acres of multi-family residential (MFR), 2.0 acres of neighborhood commercial (CC),

and a proposed well site on 1.6 acres. The proposed well will be discussed in the following section. See **Exhibit 1** for the Proposed Land Use Mix.

4. CITY OF DIXON WATER SYSTEM MASTER PLAN

4.1. EXISTING INFRASTRUCTURE

The City of Dixon 2021 Water System Master Plan (WSMP) by West Yost Associates determined the existing conditions of the Dixon water system and recommended water system improvements to meet the needs future development. The City of Dixon's existing water system is broken up into three zones, the North, South and Core Zones and the Zones are hydraulically connected to each other. The Campus site lies within the North Zone. The Dixon water system relies completely on groundwater wells. The city has three existing wells, one of which is a standby well (Industrial Well) for the city, and two storage tanks serving the Core and North Zone service areas. The total capacity of the two operational wells is 3,300 gallons per minute and the total usable volume of the tanks is 1.8 million gallons. Two existing booster pump stations serve the Core and North Zones. Existing 12" water pipelines exist south-west of the project site in East Dorset Drive and to the south of the project in Vaughn Road. **Figure 2** is taken from Figure 2-3 of the WSMP and shows the existing water system in the North Zone near the project site.

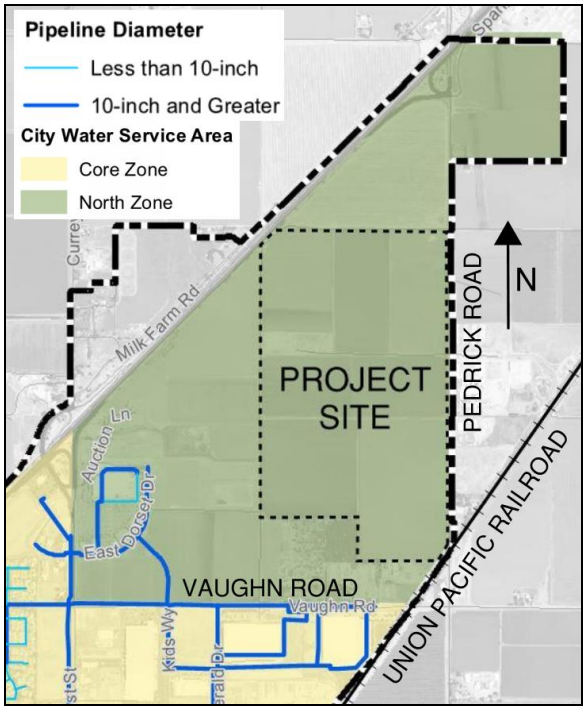


Figure 2 – Existing Water Infrastructure from WSMP

4.2. PROPOSED INFRASTRUCTURE

Figure 3 is taken from Figure 8-1 of the WSMP and shows proposed future water facilities in the North Zone. The WSMP proposes construction of a new 1,500 gallon per minute well in the Northeast Quadrant (North Zone) by 2030. In future buildout conditions, an additional well and 0.40 MG of useable storage are proposed within the Northeast Quadrant (North Zone). The

usable storage calculation does not take into consideration requirements for dead storage or overflow requirements. Construction of a new 1,500 gpm well is proposed as part of the Campus project and will be located in the northwest portion of the site. The proposed well site can accommodate a future storage tank and an additional well will be constructed within the Northeast Quadrant in future build-out conditions when deemed necessary by the City of Dixon. The future second well site will tentatively be located at the northeast edge of the specific plan. In addition to the proposed well, **Figure 3** shows proposed 12" water mains serving the site and the parcels north with two connections in East Dorset Drive and two connections in Vaughn Road.

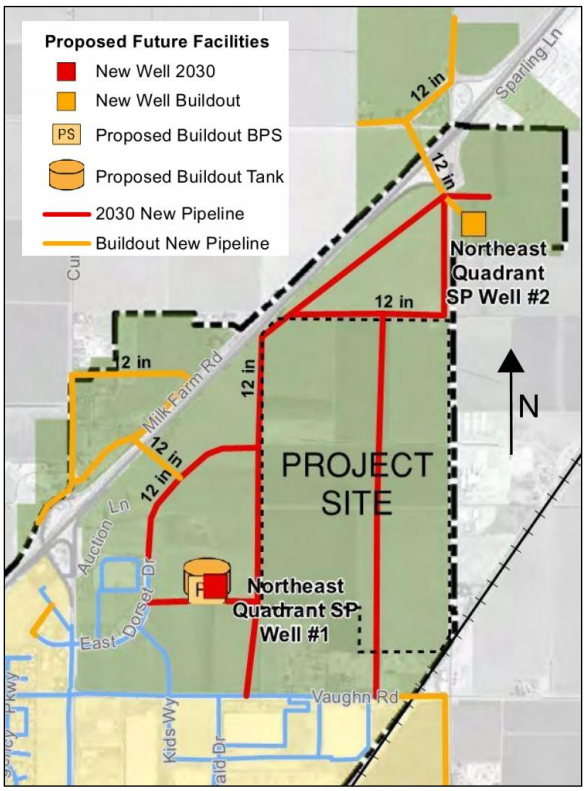


Figure 3 – Proposed Water Infrastructure per the WSMP

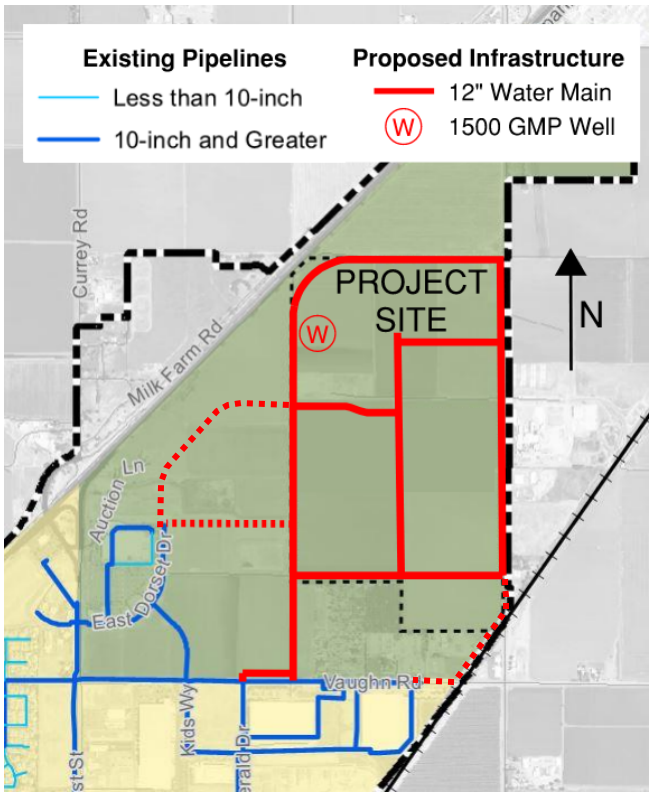


Figure 4 – Proposed Water Infrastructure for the The Campus Project

Figure 4 shows the water infrastructure proposed as part of the Campus project. Note that the proposed water main alignments and well location differ from **Figure 3**. The Campus project will follow the intention of the WSMP by providing a new well within the North Zone and extending the water distribution system up to the northern boundary of parcel. However, the water main alignments will differ from the WSMP slightly. One connection will be provided to Vaughn Road. A second connection will also be provided. Three options for the second connection are shown on Figure 4 (dashed red lines). To limit the impacts on the City's existing water system during construction, the new 1,500 gpm well and water pipelines included in The Campus project will be constructed and in operation prior to beginning construction of other buildings withing the project. Infrastructure that is not susceptible to fire (like roads and underground utilities) can be constructed prior to the well and water pipelines being fully

constructed and connected to the City's existing water system. In addition, construction water trucks will be limited to filling between the hours of 9 AM and 4 PM, which do not correspond to the other peak demands on the water system.

Exhibit 2 is the Water Plan and Shed Map. It shows the water infrastructure proposed as part of the Campus project in more detail than **Figure 4**, as well as the water supply sheds which will be discussed in Section 6. The proposed well will be based on Detail DF-6 from the Dixon Engineering Design Standards. This detail is provided as **Exhibit 3.**

5. DISTRIBUTION AND FIRE FLOW REQUIREMENTS

Exhibit 4 is a summary of water system performance and operational criteria taken directly from the WSMP. The WSMP provides requirements for fire flow, water supply capacity, water distribution system capacity, pumping facility capacity and water storage capacity. It also has requirements for system pressure, pipe diameter, pipe material and flow velocity. Pipelines serving multi-family residential, commercial, and industrial developments shall be a minimum of 12 inches in size. **Table 1** provides minimum and maximum distribution system pressures.

Distribution System Pressures	
Minimum Pressure – Normal Operating Conditions	50 psi
Minimum Pressure – Peak Hour Conditions	45 psi
Minimum Pressure – Fire Flow Conditions	20 psi
Maximum Pressure	80 psi

Table 1 – Distribution System Pressures

Table 2 provides the fire flow requirements that pertain to the Campus project, based on Table 5-4 from the WSMP. The project lies within the Northeast Quadrant (NEQ) which has larger fire flow requirements than other areas within the city. For planning purposes, fire flows are assumed to be met concurrently with a Maximum Day Demand condition, while maintaining a residual system pressure of 20 psi throughout the City of Dixon's service area. Calculation of Maximum Day Demand is discussed in Section 6.

Fire Flow Requirements for New Developments within the NEQ		
Land Use	**Flow, gpm**	**Duration, hours**
Single-Family Residential	1,000	3
Multi-Family Residential	2,500	3
Commercial in the Northeast Quadrant (NEQ)	4,000	3
Industrial in the NEQ and Future Areas East of Railroad Tracks	4,000	3
Note 1: Unique projects or projects with alternate materials may require higher fire flow and should be reviewed by the Fire Marshal on a case-by-case basis. Note 2: Fire flows are to be supplied at a minimum residual pressure of 20 psi.		

Table 2 – Fire Flow Requirements for New Development within the NEQ

6. WATER DEMANDS

According to the WSMP, the City of Dixon's peak water supply capacity is sized to meet Maximum Day Demand for each of its zones. It must also be able to meet four hours of Peak Hour Demand with source capacity, storage capacity, and/or emergency source connections. To determine how the Campus project will affect the City of Dixon's ability to meet these demand requirements, it is necessary to estimate the Maximum Day Demand and Peak Hour Demand for the site.

Maximum Day Demand and Peak Hour Demand have been calculated based on the design criteria from Chapter 5 of the WSMP. Per Section 5.1.1 of the WSMP, Average Day Demand is calculated by multiplying area by the Unit Demand Factor, which is dependent on land use. Per

Section 5.1.2, Maximum Day Demand is 2.2 times Average Day Demand and Peak Hour Demand is 3.3 times Average Day Demand. **Table 3** shows the unit water demand factors used as part of this study. The table is based on Table 5-3 from Section 5.1.1 of the WSMP.

Water Unit Demand Factors	
Land Use	**Unit Demand Factor, af/ac/yr**
Single-Family	2.7
Multi-Family	3.9
Commercial/Public	1.3
Industrial	1.5
Landscape	3.0
Maximum Day Demand Factor: 2.2 times Average Day Demand Peak Hour Demand Factor: 3.3 times Average Day Demand	

Table 3 – Water Unit Demand Factors from the WSMP

Water demands were calculated based on the land uses shown on the **Exhibit 1** Proposed Land Use Mix and the **Table 3** Unit Demand Factors. The total on-site water supply shed area is 259.6 acres. The proposed well site was assumed to have water demands similar to that of an industrial site. Roadway areas were assumed to have no water demand. **Exhibit 2** shows the water supply sheds as well as proposed water infrastructure. **Exhibit 5** provides the full water demand calculation. **Table 4** summarizes the results of the water demand calculation.

Project Water Demands				
Project Area (ac.)	Average Water Demand (af/yr)	Average Day Demand (mgd)	Maximum Day Demand (mgd)	Peak Hour Demand (mgd)
259.6	562.7	0.502	1.105	1.658

Table 4 – Project Water Demands

7. CONCLUSIONS

The Campus project will extend the City of Dixon's water system northeastward with connections in East Dorset Drive and Vaughn Road. The project will also provide a 1500 gallon per minute well in the northwest corner of the project. Using the methodology from the WSMP, this study estimated average annual water demand for the project to be 562.7 acre-feet. Maximum Day Demand and Peak Hour Demand were estimated to be 1.105 and 1.658 million gallons per day respectively. In the future, an additional well and 0.26 MG of storage will be constructed within Dixon's North Zone. The well site being proposed can accommodate a future tank. The future second well site will tentatively be located at the northeast edge of the specific plan.

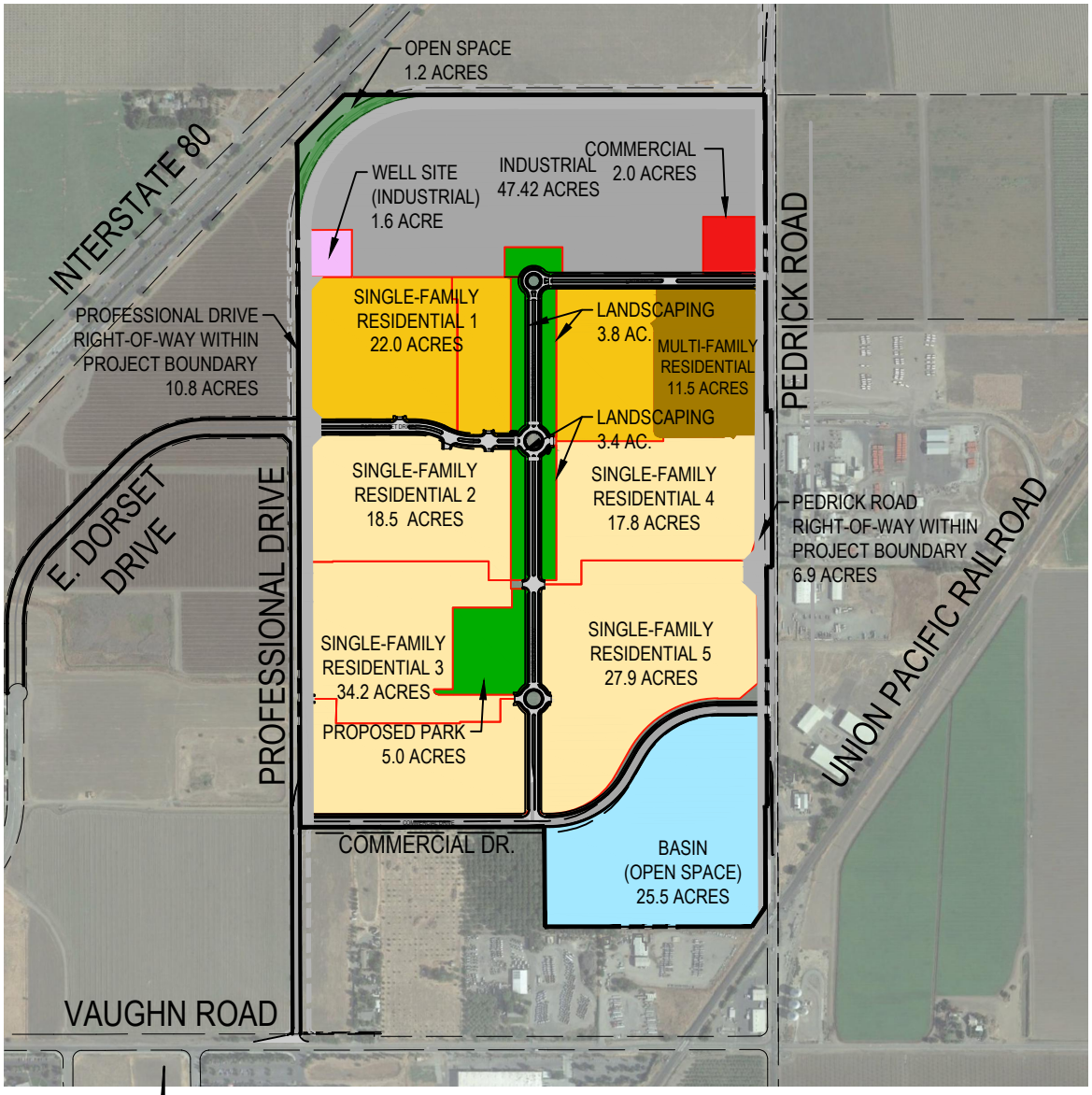
This is a preliminary study of proposed water infrastructure. Further analysis must be conducted to confirm that proposed water infrastructure improvements will meet the performance and operational criteria of the City of Dixon's Water System Master Plan. This includes modeling the proposed system to ensure that minimum system pressure is maintained during fire flow conditions.

8. REFERENCES

1. City of Dixon Engineering Design Standards, 2022

2. City Dixon – 2021 Water System Master Plan Update (Addendum to 2016 WSMP)

3. City of Dixon 2016 Water System Master Plan and Strategic Asset Management Plan, West Yost, 2016



LEGEND

EXISTING ROADWAYS

FUTURE ROADWAYS

PROJECT BOUNDARY

GRAPHIC SCALE

1000 500 0 1000

Scale

LAND USE TABLE

LAND USE	ACRES
SINGLE-FAMILY RESIDENTIAL	120.1
MULTI-FAMILY RESIDENTIAL	11.5
INDUSTRIAL	47.4
NEIGHBORHOOD COMMERCIAL	2.0
WELL SITE	1.6
ROADS, OPEN SPACE AND BASIN	63.6
PARK AND LANDSCAPING	13.4
TOTAL SITE AREA	**259.6**

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DRAWN:	DF	JOB NO:	20-0024-00
CHECKED:	GB	DATE:	JULY 2023
SCALE:		SHEET:	1 of 1

EXHIBIT 1

DIXON 257 WATER STUDY

PROPOSED LAND USE MIX

DIXON, CALIFORNIA

GRAPHIC SCALE

500 250 0 500

1 in = 500 ft

LEGEND

- SINGLE- FAMILY (SFR) LAND USE
- MULTI-FAMILY (MFR) LAND USE
- LIGHT INDUSTRIAL (LI) LAND USE
- COMMERCIAL (CC) LAND USE
- LANDSCAPING AND OPEN SPACE
- ROADWAYS
- EXISTING ROADWAYS
- FUTURE ROADWAYS
- PROJECT BOUNDARY
- WATER SUPPLY SHED BOUNDARY
- W — PROPOSED WELL SITE
- 12"W — PROPOSED WATER MAIN
- EX12"W — EXISTING WATER MAIN
- EX42"IRR — EXISTING IRRIGATION MAIN
- 12"W — ALTERNATIVE WATER MAIN

INTERSTATE 80 (I-80)

INTERSTATE 80

PEDRICK ROAD

PEDRICK ROAD

E. DORSET DRIVE

E. DORSET DRIVE

PROFESSIONAL DRIVE

COMMERCIAL DRIVE

ENTERPRISE DRIVE

VAUGHN ROAD

VAUGHN ROAD

BASIN

3237 LF ~ 12" WTR

1037 LF ~ 12" WTR

109 LF ~ 12" WTR

1294 LF ~ 12" WTR

76 LF ~ 12" WTR

892 LF ~ 12" WTR

904 LF ~ 12" WTR

1619 LF ~ 12" WTR

1324 LF ~ 12" WTR

727 LF ~ 12" WTR

1578 LF ~ 12" WTR

694 LF ~ 12" WTR

1298 LF ~ 12" WTR

1848 LF ~ 12" WTR

12"W

EX12"W

EX42"IRR

EX36"IRR

Dwg: X:\2020\20-0024-00 (MAGNA PARCEL-DIXON)\DWG\PLAN\EXHIBITS\THE CAMPUS TECHNICAL STUDY JANUARY 2024\DIXON 257 WATER PLAN 24.0216.DWG | Saved: 07-11-23 12:10pm GBARDINI

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DRAWN:	DF	JOB NO:	20-0024-00
CHECKED:		DATE:	JAN 2024
SCALE:	1" = 500'	SHEET:	1 of 1

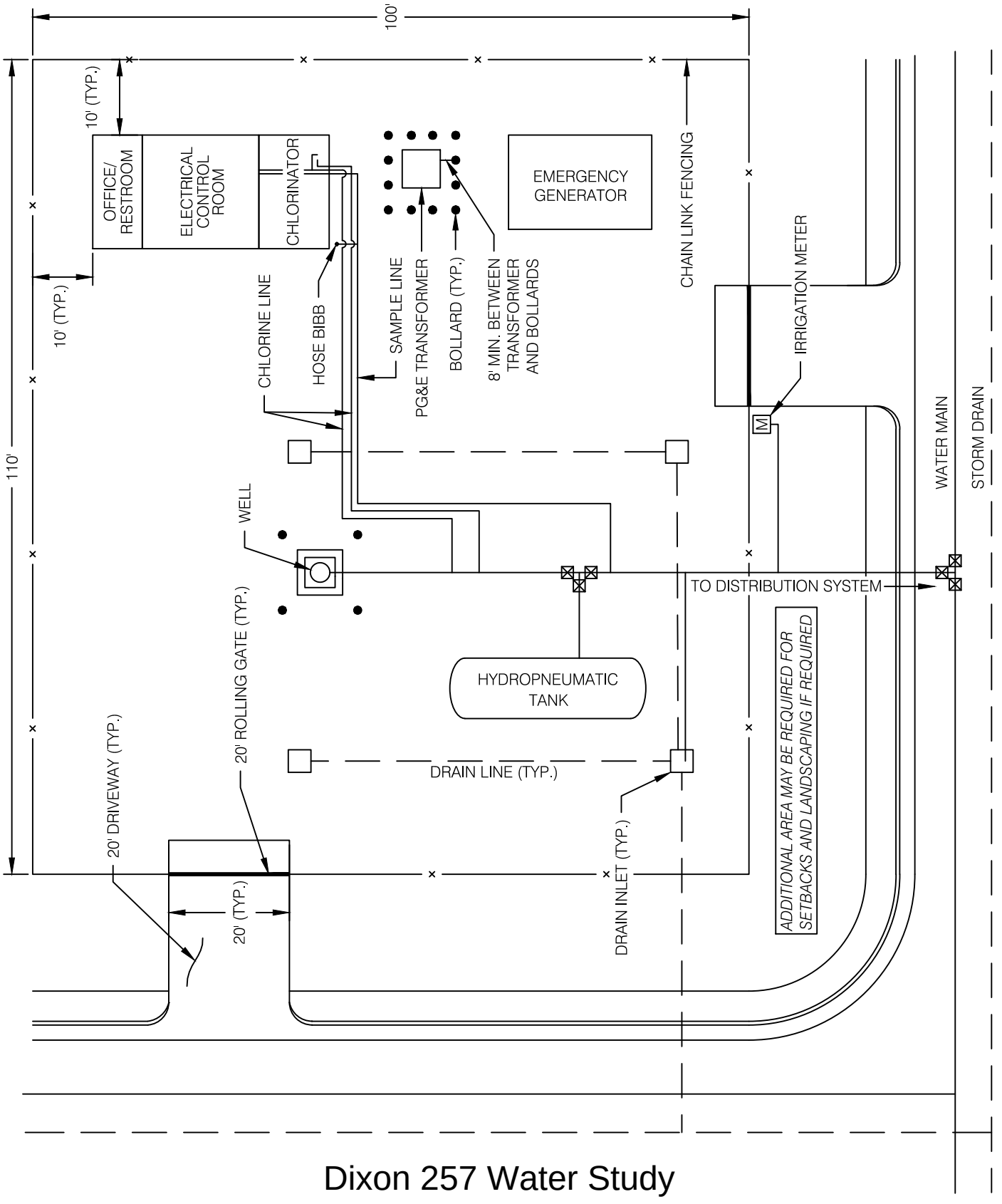
EXHIBIT FOR

DIXON 257 WATER STUDY

EXHIBIT 2

WATER PLAN

DIXON, CA



Dixon 257 Water Study
Exhibit 3 - Proposed Well Detail

DF-6	TYPICAL DIRECT FEED WELL FACILITY	APPROVED: MARCH 2022	CITY OF DIXON ENGINEERING STANDARD DETAIL

Table 3. Summary of Recommended Potable Water System Performance and Operational Criteria

Component	Criteria	Remarks / Issues
Fire Flow Requirements (flow [gpm] @ duration [hours])[a]		
Single Family Residential	1,000 gpm @ 3 hours	
Multi Family Residential	2,500 gpm @ 3 hours	
Commercial and Industrial	3,500 gpm @ 3 hours	Includes schools
Commercial and Industrial in Northeast Quadrant	4,000 gpm @ 3 hours	
Water Supply Capacity[b]		
Supply / Pumping Capacity	Provide firm supply capacity equal to maximum day demand	Firm groundwater supply capacity is defined as the largest facility out of service for maintenance
Water Distribution System Capacity[b]		
Maximum Day Demand plus Fire Flow	Provide firm capacity equal to maximum day demand plus fire flow	
Peak Hour Demand	Provide firm capacity equal to peak hour demand	
Pumping Facility Capacity[b]		
Pumping Capacity	Provide the greater of maximum day concurrent with fire flow or peak hour demand	Assumes firm pumping capacity. Firm pumping capacity is defined as the total booster pump station capacity with the largest pump out of service
Backup Power	Provide backup power at all wells and pump stations	
Water Storage Capacity[c]		
Operational	20 percent of maximum day demand	
Fire	Largest fire flow for each zone	North/Core Zone: 4000 gpm x 3 hrs = 0.72 million gallons (MG) South Zone: 3500 gpm x 3 hrs = 0.63 MG
Emergency	1 x average day demand (minimum)	Provided by the City's backup power at all pumping facilities
Total Water Storage Capacity	Operational + Fire + Emergency	
Distribution System Pressures[d]		
Minimum Pressure - Normal Operating Conditions	50 psi	
Minimum Pressure - Peak Hour Conditions	45 psi	
Maximum Pressure	80 psi	
Minimum Pressure - Fire Flow Conditions	20 psi	At all customer service connections
Water Transmission and Distribution Pipelines[a]		
Minimum Pipeline Diameter	6-inch; 12-inch for multi-family residential, commercial, and industrial developments with more than two units	Locate new distribution pipelines within designated utility corridors wherever possible
Maximum Velocity - Normal Operating Conditions	6 ft/s	Criteria based on requirements for new development. Existing distribution mains will be evaluated on case-by-case basis. Evaluation will include age, material, type, velocity, headloss and pressure
Maximum Velocity - Fire Flow Conditions	12 ft/s	
Hazen Williams "C" Factor	130	For consistency in hydraulic modeling
Pipeline Material	Polyvinyl chloride (PVC)	For consistency in hydraulic modeling

(a) Criteria based on the City's Engineering Design Standards, August 2014 Section 5.

(b) Criteria included in the City's 2000 Master Plan

(c) Water storage capacity fire component criteria updated to provide redundancy in the North/Core and South Zones

(d) Criteria based on SCADA data and actual system operation pressures.

Morton & Pitalo, Inc

Project: Dixon 257 Water Study
Job No. 20-0024-00
Date: 1/4/2023

References: *City of Dixon Engineering Design Standards (Mar. 2022),*
City of Dixon 2016 Water System Master Plan and Strategic Asset Management Plan

Assumptions:

1. Proposed well site is assumed to be part of the Industrial land use

Table 3-6. Recommended Unit Water Demand Factors	
Water Use Type	**Unit Demand Factor, af/ac/yr**
Single Family Residential (SFR)	2.7
Multi-Family Residential (MFR)	3.9
Commercial	1.3
Industrial	1.5
Landscape	3.0

*Table from page 3-12 of 2016 Water System Master Plan

Table 3-8 Peaking Factors	
Maximum Day Demand Factor	2.2 times average day demand
Peak Hour Demand Factor	3.3 times average day demand

*Table from page 3-13 of 2016 Water System Master Plan

Design Flows

Name of Proposed Land Use	Area (Ac.)	Unit Water Demand Factor (af/ac/yr)	Average Water Demand (af/yr)	Average Day Demand (mgd)	Maximum Day Demand (mgd)	Peak Hour Demand (mgd)
Industrial	**46.7**	1.5	70.1	0.063	0.138	0.206
Well Site	**0.3**	1.5	0.5	0.000	0.001	0.001
Commercial	**2.0**	1.3	2.6	0.002	0.005	0.008
SFR 1	**20.0**	2.7	54.0	0.048	0.106	0.159
SFR 2	**20.2**	2.7	54.5	0.049	0.107	0.161
SFR 3	**30.9**	2.7	83.4	0.074	0.164	0.246
SFR 4	**28.3**	2.7	76.4	0.068	0.150	0.225
SFR 5	**28.8**	2.7	77.8	0.069	0.153	0.229
MFR	**9.7**	3.9	37.8	0.034	0.074	0.111
Park	**5.5**	3.0	16.5	0.015	0.032	0.049
Landscaping	**9.0**	3.0	27.0	0.024	0.053	0.080
Basin & O. Space	**20.7**	3.0	62.1	0.055	0.122	0.183
Roadways	**37.5**	0	0	0	0	0
Totals:	**259.6**		**562.7**	**0.502**	**1.105**	**1.658**

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TECHNICAL MEMORANDUM

DATE: June 22, 2023

Project No.: 066-60-23-29
SENT VIA: EMAIL

TO: Deborah Barr, PE, City Engineer/Director of Utilities, City of Dixon

CC: Josh Hudson, Water Operations Supervisor, City of Dixon

FROM: Bonnie Robison, PE, RCE #85779

REVIEWED BY: Brenda Estrada, PE, RCE #67062
Roberto Vera, PE, RCE# 83500

SUBJECT: Northeast Quadrant Potable Water Hydraulic Evaluation

The City of Dixon (City) requested a water system evaluation for the City's Northeast Quadrant (NEQ), located within City limits. The purpose of this Technical Memorandum (TM) is to summarize West Yost's hydraulic evaluation of the City's existing water distribution system and its ability to support the NEQ. The following sections summarize the evaluation:

- Development Overview
- Hydraulic Evaluation
- Findings and Conclusions

DEVELOPMENT OVERVIEW

The NEQ encompasses approximately 643 acres of undeveloped land in the northeast portion of the City, within City limits. The Northeast Quadrant Specific Plan established policies and guidelines for the ultimate development of the NEQ. Planned growth for the NEQ includes a mix of commercial, light industrial, high-density residential, or mixed-use developments.

Within the NEQ, the Dixon 257 Development (Dixon 257) and the Buzz Oates Innovation Center are anticipated to be the next projects to be developed. Dixon 257 is a proposed mixed-use development totaling 259.7 acres, including 128.2 acres of single-family residential development, 9.7 acres of multi-family residential development, and 46.7 acres of light industrial development. The remainder will be a mix of neighborhood commercial, park and open space, and a designated well site.[1] Dixon 257 is bounded by Vaughn Road to the south, Pedrick Road to the east, and agricultural lands to the north and west. The Buzz Oates Innovation Center is a proposed industrial/business park to be located on a 37.6-acre

[1] Land use types provided in the *Draft Water Study* for the project dated January 2023, prepared by Morton Pitalo and provided by the City on April 13, 2023.

property immediately north of Dixon 257. Much of the remaining area within the NEQ outside of the Dixon 257 and the Buzz Oates Innovation Center projects are in preliminary stages of development.

The proposed Dixon Milk Farm Development (Milk Farm) is located on the north side of Interstate 80 across from the NEQ and would be a master-planned commercial center. The Milk Farm was evaluated individually in a prior hydraulic evaluation by West Yost but is also included in this evaluation.[2]

The backbone water pipelines serving the NEQ are planned to be 12 inches in diameter connecting to existing 12-inch diameter transmission pipelines and following Dixon 257's proposed road alignments. Figure 1 shows the NEQ location and evaluated pipelines.

HYDRAULIC EVALUATION

The City's potable water hydraulic model was used to evaluate if the existing system, with and without planned and proposed improvements would provide adequate pressures and flows while meeting adopted system performance criteria.

Existing maximum day demands allocated in the City's hydraulic model are based on 2019 consumption records, which were used to calibrate and validate the City's hydraulic model for the 2021 Water Master Plan Update (WMPU). For the purposes of this evaluation, the Homestead and Brookfield residential developments were assumed to be built out under baseline system conditions. Future backbone pipelines modeled in this evaluation are consistent with the pipelines identified and evaluated in the City's 2021 WMPU. The following sections provide additional details regarding the modeled scenarios, model assumptions, performance criteria, evaluation results, and recommendations for thresholds for when the proposed wells and tanks are needed (see page 10 for finding and conclusions).

Evaluated Scenarios

Table 1 summarizes the scenarios that were evaluated. Scenarios were developed and evaluated to determine what infrastructure needs to be online to adequately support planned developments. An extended period simulation (EPS) over a 7-day period was performed for Scenarios 1 through 6, to determine whether the City's distribution system could adequately serve planned and existing development under normal (i.e., maximum day demand or peak hour demand) conditions. Results shown do not include the first 24 hours of the simulation as the model scenario is influenced by initial setting and achieves equilibrium after the initial 24 hours. Scenarios 7 through 12 were evaluated under steady-state maximum day demand plus fire flow conditions, to determine if sufficient fire flow could be provided for the proposed land uses.

Table 2 summarizes the system demand assumptions for each scenario. The existing customer demands shown in Table 2 are the maximum day demands and do not reflect the peak hour demand which is equal to 1.67 times the maximum day demand. The peak demand occurs typically between 6 AM to 8 AM. The hydraulic evaluation addresses the peak demands as the EPS scenario applies the system's diurnal curve to the maximum day demands. These demands do not include construction water demands that will occur during the NEQ and Milk Farm construction.

[2] West Yost. *Dixon Milk Farm Development Water System Hydraulic Evaluation TM.* December 20, 2022.

Table 1. Summary of Evaluated Scenarios

Scenario	Name	Demand Condition	Evaluated Conditions	
			Developments	Facility Status
Normal Operations Scenarios				
1	Baseline	Existing maximum day	– Homestead and Brookfield areas are fully developed	– Homestead Well is online (assumed 1,500 gpm capacity) – Industrial Well is offline – Fitzgerald Booster Pump Station is on standby
2	Baseline + NEQ Growth	Existing + NEQ maximum day	– Northeast Quadrant (NEQ) is fully developed – Milk Farm is fully developed	– Same as Baseline
3	Baseline + NEQ Well 1	Existing + Partial NEQ maximum day	– NEQ is partially developed (Dixon 257, Buzz Oates) – Milk Farm is fully developed	– Same as Baseline – A new NEQ Well 1 is online (assumed 1,500 gpm capacity)
4	Scenario 3 + NEQ Growth	Existing + Partial NEQ maximum day	– NEQ is partially developed (Dixon 257, Buzz Oates, and additional growth) – Milk Farm is fully developed	– Same as Baseline – A new NEQ Well 1 is online (assumed 1,500 gpm capacity)
5	Scenario 4 + NEQ Tank	Existing + Partial NEQ maximum day	– NEQ is partially developed (Dixon 257, Buzz Oates, and additional growth) – Milk Farm is fully developed	– Same as Baseline – A new NEQ Well 1 is online (assumed 1,500 gpm capacity) – A new 0.4 MG NEQ tank is online
6	Scenario 2 + All NEQ Facilities	Existing + NEQ maximum day	– Northeast Quadrant (NEQ) is fully developed – Milk Farm is fully developed	– Same as Baseline – A new NEQ Well 1 is online (assumed 1,500 gpm capacity) – A new 0.4 MG NEQ tank is online – A new NEQ Well 2 is online (assumed 1,500 gpm capacity)
Fire Flow Scenarios				
7	Maximum day + fire flow		Same as Scenario 1	
8			Same as Scenario 2	
9			Same as Scenario 3	
10			Same as Scenario 4	
11			Same as Scenario 5	
12			Same as Scenario 6	

Table 2. Maximum Day Demand Assumptions

Demand Type	Demand, gpm					
	Scenario 1 and 7	Scenario 2 and 8	Scenario 3 and 9	Scenario 4 and 10	Scenario 5 and 11	Scenario 6 and 12
Existing Customers[(a)]	3,437	3,437	3,437	3,437	3,437	3,437
Milk Farm[(b)]	0	187	187	187	187	187
NEQ[(c)]						
Dixon 257	0	793	793	793	793	793
Buzz Oates Innovation Center	0	69	69	69	69	69
Additional NEQ Development	0	509	0	245	352	509
NEQ Subtotal	0	1,371	862	1,107	1,214	1,371
Totals	**3,437**	**4,995**	**4,486**	**4,731**	**4,838**	**4,995**

(a) Existing customer demands include maximum day demands for the existing City system with the Homestead and Brookfield residential areas fully developed.

(b) Milk Farm Development demands are based on the Dixon Milk Farm Development Water System Hydraulic Evaluation TM dated December 20, 2022, and include irrigation demands and non-revenue water.

(c) NEQ demands are calculated using demand factors presented in Table 3 of the City's 2021 Water Master Plan Update and include non-revenue water.

gpm = gallons per minute

Hydraulic Model Assumptions

The following are model updates and assumptions made for the purposes of this evaluation:

- The existing system assumes the Fitzgerald Facilities are on standby and the Industrial Well is out of service. The City is exploring options to drill a new well to replace the Industrial Well at the Fitzgerald Facilities site which would allow regular operation of the Fitzgerald Facilities. However, the replacement Industrial well is unlikely to be available within the timeframe of the NEQ development. Therefore, the Industrial Well was assumed to be offline under all scenarios and the Fitzgerald Facilities are assumed to be available only under fire flow conditions.
- The School Well was recently rehabilitated to lower the suction inlet and add a new variable frequency drive (VFD) pump. These updates are reflected in the hydraulic model. The modifications result in more reliable production capacity from the well.
- The Homestead Well is currently under construction to support development within the Southwest Dixon Specific Plan area. Therefore, the well is assumed to be operational prior to the timeframe of the NEQ development at a capacity of 1,500 gallons per minute (gpm). Actual capacity of the well may vary upon completion based on hydrologic conditions and final well design.
- The Valley Glen Well is currently used as a backup well to provide support as needed to maintain pressures. Typically, the Park Lane booster pump station maintains pressures in the southern part of the system without the Valley Glen Well running. Therefore, the Valley Glen Well was assumed to run only if the Park Lane booster pump station was unable to maintain system pressure within 2 pounds per square inch (psi) of its downstream pressure

set point. As development continues and demands increase, the Valley Glen Well will be expected to operate more often to help maintain pressure during peak hour demand conditions.

- The modeled demands do not account for any temporary use of water during construction of water facilities or development projects. During well construction, a constant well drilling demand of approximately 188 gpm can be expected. During construction of development projects, water trucks are regularly filled throughout the day using construction hydrant meters. The water trucks can increase system demands by up to 1,550 gpm depending on the number and size of trucks and the timing of the filling.

Performance Criteria

The criteria used to evaluate the City's water system model results are based on the planning and design criteria developed in the 2021 WMPU. The applicable water system performance and operational criteria are summarized below.

- Allowable Pressures Under Normal Operating Conditions[3]
  - Minimum System Pressure: 50 psi
  - Maximum System Pressure: 80 psi
- Minimum Pressure – Fire Flow Conditions
  - 20 psi minimum residual water pressure under a maximum day plus fire flow demand test condition at all customer service locations throughout the City's water system.
- Maximum Velocity – Fire Flow Conditions
  - 12 feet per second (fps) maximum velocity in the NEQ proposed pipelines.
  - Velocities more than 12 fps can dislodge accumulations in the pipes, scour or remove linings, and result in damage to facilities.
- Fire Flow Requirements
  - The required fire flow is based on land use corresponding to the City's 2021 Water Master Plan Update, as shown in Table 3.

Table 3. Summary of Required Fire Flow per Project Land Use[(a)]

Description	Fire Flow Land Use	Fire Flow Requirement, gpm
Single Family Residential	Single-Family Residential	1,000
Multi-Family Residential	Multi-Family Residential	2,500
Industrial	Commercial and Industrial in NEQ	4,000
Neighborhood Commercial	Commercial and Industrial in NEQ	4,000
Well Site	Commercial and Industrial in NEQ	4,000

(a) Additional proposed land uses identified within the NEQ and Dixon 257, including roads, open space, parks, and landscaping, do not have fire flow requirements.

Source: City of Dixon 2021 Water System Master Plan Update

[3] Table 3 from the City of Dixon's 2021 Water Master Plan Update. It should be noted the City typically operates between 55 psi and 65 psi throughout the system.

Hydraulic Evaluation Results

Scenarios 1 through 6, previously summarized in Table 1, were evaluated using the City's hydraulic model which was calibrated in 2021. For each scenario, the production capacity for the system's facilities were reviewed to confirm the flow produced is similar to what is observed during summer months, when maximum day demands typically occur. Table 4 summarizes the average production flow rate for each facility from the six-day model scenario results.

Table 4. Average Well Production[(a)]

Facility	Average Production, gpm					
	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Watson Ranch Well	820	965	825	835	785	845
Park Lane Well	2,155	2,160	2,155	2,145	2,155	2,155
School Well	960	1,310	1,170	1,330	1,310	1,330
Valley Glen Well	1,205	1,255	1,655	-	-	-
Homestead Well	445	1,280	610	725	665	730
Fitzgerald Well	-	-	-	-	-	-
NEQ Well 1	-	-	1,100	1,370	1,520	1,535
NEQ Well 2	-	-	-	-	-	380

(a) The average production for each facility is based on the average production from the six-day model scenario results only when the facility was active.

The following sections provide additional details for each of the evaluated scenarios.

Maximum Day Demand Conditions

The following sections summarize evaluation findings for Scenarios 1 through 6, which evaluate distribution system performance under normal demand conditions (i.e., maximum day demand, peak hour demand) under the varying demand/land use assumptions as summarized in Table 1.

Scenario 1 – Baseline

Conclusion: Existing water facilities can supply existing city demands. However, the Valley Glen Well is required for this scenario even though the Valley Glen Well is considered the City's backup well.

Figure 2 shows the minimum pressure results of the City's water system, including the existing system with the full buildout of the Homestead and Brookfield residential developments. Minimum pressures occur during peak hour demand. Model results indicate pressures are maintained above 53 psi throughout the whole system (achieving required design pressures) with pressures south of the railroad and around South Lincoln Avenue above 60 psi.

Average pressures within the system range between 56 to 68 psi with the overall system average pressure of 62 psi. The lowest pressure areas are located along the western border of City limits where the highest elevations are located and at the northern edge of the City, furthest from high production wells.

It should be noted that School Well and Homestead Well run continuously for the seven-day period. Watson Ranch Well and Park Lane Well cycle on to maintain the levels in the tanks. Valley Glen Well operates during peak morning demand periods.

Scenario 2 – Baseline Plus NEQ Growth

Conclusion: Existing water facilities cannot supply the NEQ demands, even using the Valley Glen Well (the City's backup well).

Figure 3 shows that the City's water system is unable to meet the maximum day demand condition for Scenario 2, which includes the addition of the Milk Farm and NEQ demands to baseline demands. Although the City's supply facilities appear to have adequate capacity to meet maximum day demands, there are not sufficient transmission pipelines to convey water throughout the system to meet demands in the northern part of the City and maintain minimum system pressures. Additional facility improvements will be necessary to support proposed NEQ development.

It should be noted that Scenario 2 hydraulic evaluation results assume Watson Ranch Well, School Well, and Homestead Well are all operating continuously, and Park Lane Well cycles on to maintain the levels in the tanks. Valley Glen Well operates during peak demand periods. The Watson Ranch Well is also operating above its typical summer capacity to try and meet demands; however, minimum system pressures are unable to be maintained.

Scenario 3 – Baseline Plus NEQ Well 1

Conclusion: Future NEQ Well 1 can supply Dixon 257, Buzz Oates Innovation Center, and Milk Farm demands. However, the Valley Glen Well is required for this scenario even though it is considered the City's backup well. Therefore, it is essential that the NEQ Well 1 be online prior to any of the Dixon 257, Buzz Oates Innovation Center, or Milk Farm water demands can be served (including construction water demands).

Figure 4 shows the minimum pressure results of the City's water system for Scenario 3 where the NEQ demands occur during maximum day demand condition with a new 1,500 gpm well in the NEQ online (NEQ Well 1). Although minimum pressures occur during peak hour demand, indicate pressures are maintained above 53 psi throughout the whole system (achieving required design pressures) with pressures south of the railroad and around South Lincoln Avenue above 60 psi. Average pressures within the system range between 56 to 68 psi with the overall system average pressure of 61 psi.

For this evaluation, School Well, Homestead Well, and NEQ Well 1 run continuously for the seven-day period. Watson Ranch Well and Park Lane Well cycle on to maintain levels in the tanks. Valley Glen Well operates during peak morning demand periods.

Scenario 4 – Scenario 3 Plus NEQ Growth

Conclusion: Future NEQ Well 1 can accommodate 245 gpm of additional demand beyond Scenario 3. An additional 245 gpm of demand represents 48 percent of the remaining NEQ development beyond Dixon 257, Buzz Oates Innovation Center, and Milk Farm. Any demands greater than the 245 gpm (including construction water demands) cannot be supported until a new NEQ Tank is constructed.

Figure 5 shows the minimum pressure results of the City's water system for Scenario 4 where the NEQ demands occur during maximum day demand condition, along with 245 gpm of additional maximum day demands in the NEQ. The additional demands were added to the model in the south and west areas of the NEQ and represent the estimated extent of additional development that can occur in the NEQ before a new water storage tank is needed. The need for a new water storage tank will be impacted by the location of future demands, so any additional proposed development should be evaluated on a case-by-case basis to determine if City criteria are met.

Although minimum pressures occur during peak hour demand, pressures are maintained above 52 psi throughout the whole system (achieving required design pressures) with pressures south of the railroad and around South Lincoln Avenue above 60 psi. Average pressures within the system range between 54 to 67 psi with the overall system average pressure of 59 psi.

For this evaluation, School Well, Homestead Well, and NEQ Well 1 run continuously for the seven-day period. Watson Ranch Well and Park Lane Well cycle on to maintain levels in the tanks. Valley Glen Well does not operate as the Park Lane booster pump station is able to maintain pressures in the southern part of the system.

Scenario 5 – Scenario 4 Plus NEQ Tank

Conclusion: The future 0.4 MG NEQ Tank and NEQ Well 1 can accommodate up to 107 gpm of additional demand beyond Scenario 4. The NEQ Tank must be constructed prior to serving any water demands more than 245 gpm in addition to Dixon 257, Buzz Oates Innovation Center, and Milk Farm. The additional 352 gpm of demand (245 gpm + 107 gpm = 352 gpm) represents 69 percent of the remaining NEQ development beyond Dixon 257, Buzz Oates Innovation Center, and Milk Farm. Any demands greater than the 352 gpm (including construction water demands) cannot be supported until a second NEQ Well is constructed.

Figure 6 shows the minimum pressure results of the City's water system for Scenario 5 where the NEQ demands occur during maximum day demand condition, along with 107 gpm of additional maximum day demands in the NEQ. A new 0.4 MG storage tank in the NEQ is online, fed by NEQ Well 1. The 0.4 MG storage tank provides a minimum of 0.26 MG of usable storage as recommended in the 2016 Water System Master Plan. The additional demands were added to the model in the western part of the NEQ and represent the estimated extent of additional development that can occur in the NEQ before a second well is needed. The need for a second well in the NEQ will be impacted by the location of future demands, so any additional proposed development should be evaluated on a case-by-case basis to determine if City criteria are met.

Although minimum pressures occur during peak hour demand, pressures are maintained above 50 psi throughout the whole system (achieving required design pressures) with pressures south of the railroad and around South Lincoln Avenue above 60 psi. Average pressures within the system range between 55 to 67 psi with the overall system average pressure of 59 psi.

For this evaluation, School Well, Homestead Well, Watson Ranch Well, and NEQ Well 1 run continuously for the seven-day period. Park Lane Well cycles on to maintain levels in the tanks. Valley Glen Well does not operate as the Park Lane booster pump station is able to maintain pressures in the southern part of the system.

Scenario 6 – Scenario 2 Plus All NEQ Facilities

Conclusion: The two future NEQ wells and the 0.4 MG NEQ tank can supply all NEQ and Milk Farm demands. The NEQ Well 2 must be constructed prior to serving any water demands more than 352 gpm in addition to Dixon 257, Buzz Oates Innovation Center, and Milk Farm.

Figure 7 shows the minimum pressure results of the City's water system for Scenario 6 where the NEQ demands occur during maximum day demand condition with the NEQ and Milk Farm fully developed. A new 1,500 gpm well in the NEQ is online (NEQ Well 2). Although minimum pressures occur during peak hour demand, pressures are maintained above 53 psi throughout the whole system (achieving required

design pressures) with pressures south of the railroad and around South Lincoln Avenue above 60 psi. Pressures in the NEQ are above 53 psi with a few areas near NEQ Well 2 above 60 psi. Average pressures within the system range between 54 to 67 psi with overall system the average pressure of 59 psi.

It should be noted that School Well, Homestead Well, and NEQ Well 2 run continuously for the seven-day period. Watson Ranch Well, Park Lane Well, and NEQ Well 1 cycle on to maintain levels in the tanks. Valley Glen Well does not operate as the Park Lane booster pump station is able to maintain pressures in the southern part of the system.

Maximum Day Demand plus Fire Flow Condition

The following sections summarize evaluation findings for Scenarios 7 through 12, which evaluate distribution system performance under maximum day demand plus fire flow conditions, under the varying demand/land use assumptions as summarized in Table 1. The hydraulic model results represent flow available from the water distribution system only and do not account for losses through a hydrant lateral, fire hydrant assembly, or other fire protection system appurtenances.

For fire flow evaluations, it is assumed that all 12-inch distribution pipelines within the NEQ will need to be capable of meeting the fire flow criteria of 4,000 gpm, to be able to support commercial and industrial requirements presented in Table 3. In-tract pipelines should be modeled once development plans are finalized to confirm that all pipelines meet the applicable criteria.

Scenario 7 – Baseline

Conclusion: Fire flow demands can be met at most locations within the existing City system.

Figure 8 shows the available fire flow results of the baseline system under maximum day demand plus fire flow demand conditions. Available fire flow results at most locations within the existing system exceed the required minimum fire flow while maintaining a minimum residual pressure of 20 psi at all customer service locations throughout the City's water system. Locations that do not meet the applicable fire flow requirements are typically located either at pipeline dead ends or within commercial developments where higher fire flow requirements would result in velocities greater than the maximum velocity criteria of 12 fps in existing 8-inch pipelines. Available fire flow ranges from 1,058 gpm to 7,291 gpm.

Scenario 8 – Baseline Plus NEQ Growth

Conclusion: Fire flow demands cannot be met.

Model results for Scenario 2 for the baseline condition with the Milk Farm and NEQ developments indicate that the system is unable to meet a maximum day demand condition without fire flow demands. Therefore, because the system is unable to meet normal operation criteria, it will also be unable to provide fire flow demands in addition to maximum day demands.

Scenario 9 – Baseline Plus NEQ Well 1

Conclusion: Fire flow demands can be met.

Figure 9 shows the available fire flow results within the NEQ under maximum day demand plus fire flow demand conditions. The model results at all locations within the NEQ exceed the required minimum fire flow while maintaining a minimum residual pressure of 20 psi at all customer service locations and without exceeding the velocity criterion of 12 fps in the proposed pipelines. Available fire flow in the NEQ ranges

from 4,444 gpm to 6,961 gpm. Available fire flow in the existing system is not negatively impacted compared to Scenario 7.

Scenario 10 – Scenario 9 Plus NEQ Growth

Conclusion: Fire flow demands can be met.

Figure 10 shows the available fire flow results within the NEQ under maximum day demand plus fire flow demand conditions. The model results at all locations within the NEQ exceed the required minimum fire flow while maintaining a minimum residual pressure of 20 psi at all customer service locations and without exceeding the velocity criterion of 12 fps in the proposed pipelines. Available fire flow in the NEQ ranges from 4,461 gpm to 7,142 gpm. Available fire flow in the existing system is not negatively impacted compared to Scenario 7.

Scenario 11 – Scenario 10 Plus NEQ Tank

Conclusion: Fire flow demands can be met.

Figure 11 shows the available fire flow results within the Project area under maximum day demand plus fire flow demand conditions. The model results at all locations within the NEQ exceed the required minimum fire flow while maintaining a minimum residual pressure of 20 psi at all customer service locations and without exceeding the velocity criterion of 12 fps in the proposed pipelines. Available fire flow in the NEQ ranges from 4,984 gpm to 8,170 gpm. Available fire flow in the existing system is not negatively impacted compared to Scenario 7.

Scenario 12 – Scenario 8 Plus All NEQ Facilities

Conclusion: Fire flow demands can be met.

Figure 12 shows the available fire flow results of the City's existing system under maximum day demand plus fire flow demand conditions. Available fire flow results at all locations within the NEQ exceed the required minimum fire flow while maintaining a minimum residual pressure of 20 psi at all customer service locations throughout the City's water system and without exceeding the velocity criterion of 12 fps in the proposed pipelines. Available fire flow in the NEQ ranges from 4,092 gpm to 8,535 gpm. Available fire flow in the existing system is not negatively impacted compared to Scenario 7.

FINDINGS AND CONCLUSIONS

West Yost's findings and conclusions are summarized for this hydraulic evaluation of the City's water system. The hydraulic evaluation performed for the NEQ is based on the assumptions listed in Table 1. If any of these items are changed or modified, other than described in this TM, additional hydraulic evaluation may be required.

- The NEQ will add a total of 1,371 gpm of maximum day demand to the City's water system at full build out.
- Full development of the NEQ, along with development of the Milk Farm, results in the existing City system being unable to support maximum day, peak hour, and fire flow demands within the system without additional supply being added in the NEQ area.
- A new well in the NEQ (NEQ Well 1) must be constructed before any construction can begin in the NEQ or at the Milk Farm. Assuming the well operates at a capacity of 1,500 gpm, this

new well will be able to support the development of Dixon 257, the Buzz Oates Innovation Center, the Milk Farm, and an additional 245 gpm of demand within the NEQ.

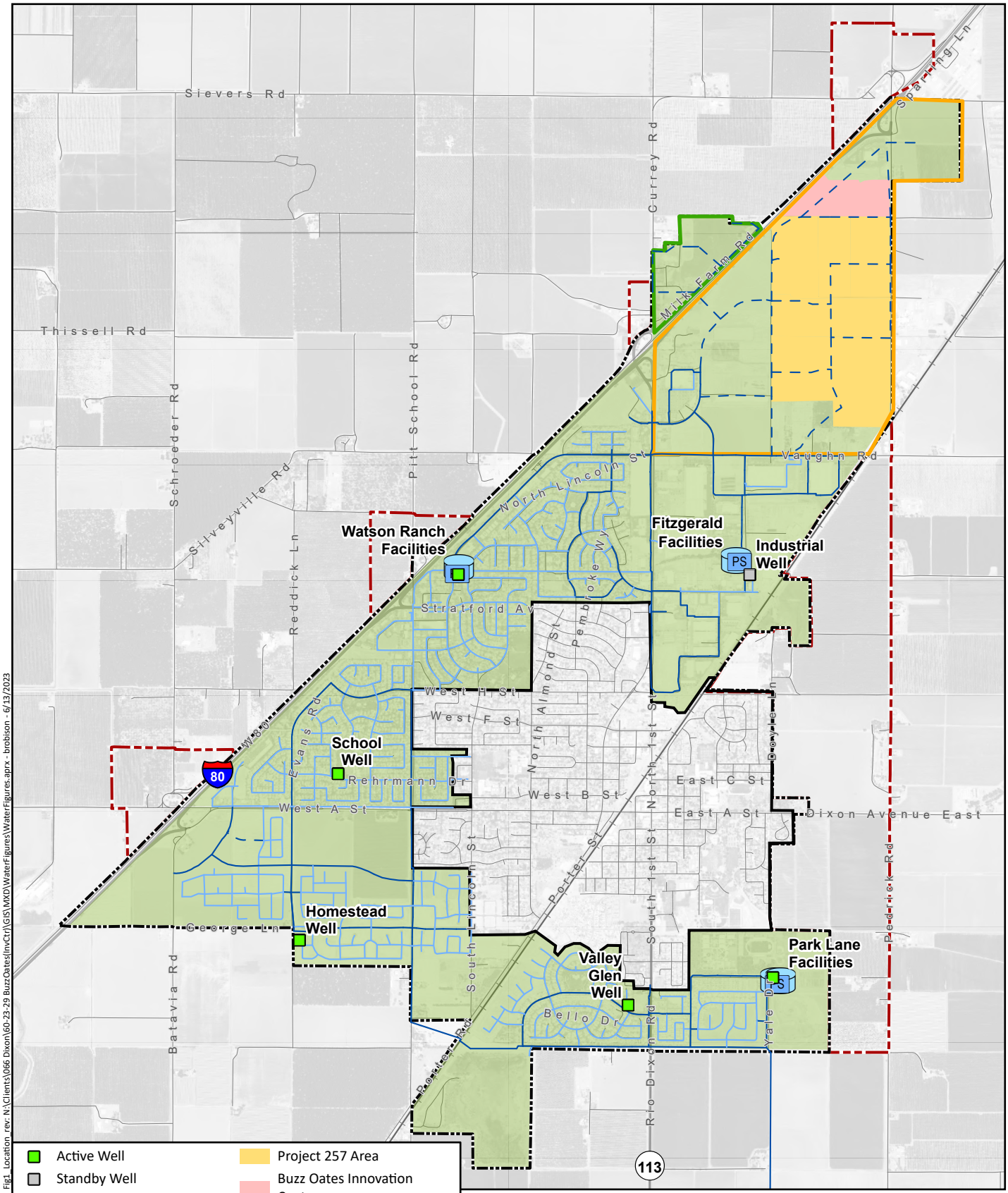
- In addition to NEQ Well 1, a new 0.4 MG storage tank in the NEQ must be constructed to support any future development that increases total NEQ demand above 1,107 gpm, including construction water demands, and the total City water demand to above 4,731 gpm.
- A second well in the NEQ (NEQ Well 2) must be constructed to support any future development that increases total NEQ demand above 1,214 gpm, including construction water demands, and the total City water demand to above 4,838 gpm.
- Full development of the NEQ, along with development of the Milk Farm, can be supported by NEQ Well 1, NEQ Well 2, and the 0.4 MG storage tank.

Recommended Facility Development Thresholds

- **NEQ Well 1:** NEQ Well 1 is needed prior to the start of construction of the Dixon 257, Milk Farm, and Buzz Oates Innovation Center projects.

- **NEQ Tank:** The NEQ Tank is needed prior to the start of any construction beyond Dixon 257, Milk Farm, Buzz Oates Innovation Center, and approximately 48 percent of the remaining NEQ development.

- **NEQ Well 2:** NEQ Well 2 is needed prior to the start of any construction beyond Dixon 257, Milk Farm, Buzz Oates Innovation Center, and approximately 68 percent of the remaining NEQ development.



Active Well
Standby Well
Future Well
Booster Pump Station
Storage Tank
Existing 6" to 10" Diameter Pipelines
Existing 12" and Greater Diameter Pipelines
Proposed Future 12-inch Diameter Pipelines
Project 257 Area
Buzz Oates Innovation Center
Milk Farm Development
Northeast Quadrant
City Water Service Area
California Water Service Area
City Limits
Sphere of Influence

N

0 3,000
US Feet

WEST YOST

Figure 1
Project Location

City of Dixon
Northeast Quadrant
Potable Water Evaluation

Fig1_Location_rev: N:\Clients\066 Dixon\60-23-29 BuzzOates(InvCtr)\GIS\MXD\WaterFigures\WaterFigures.aprx - brobison - 6/13/2023

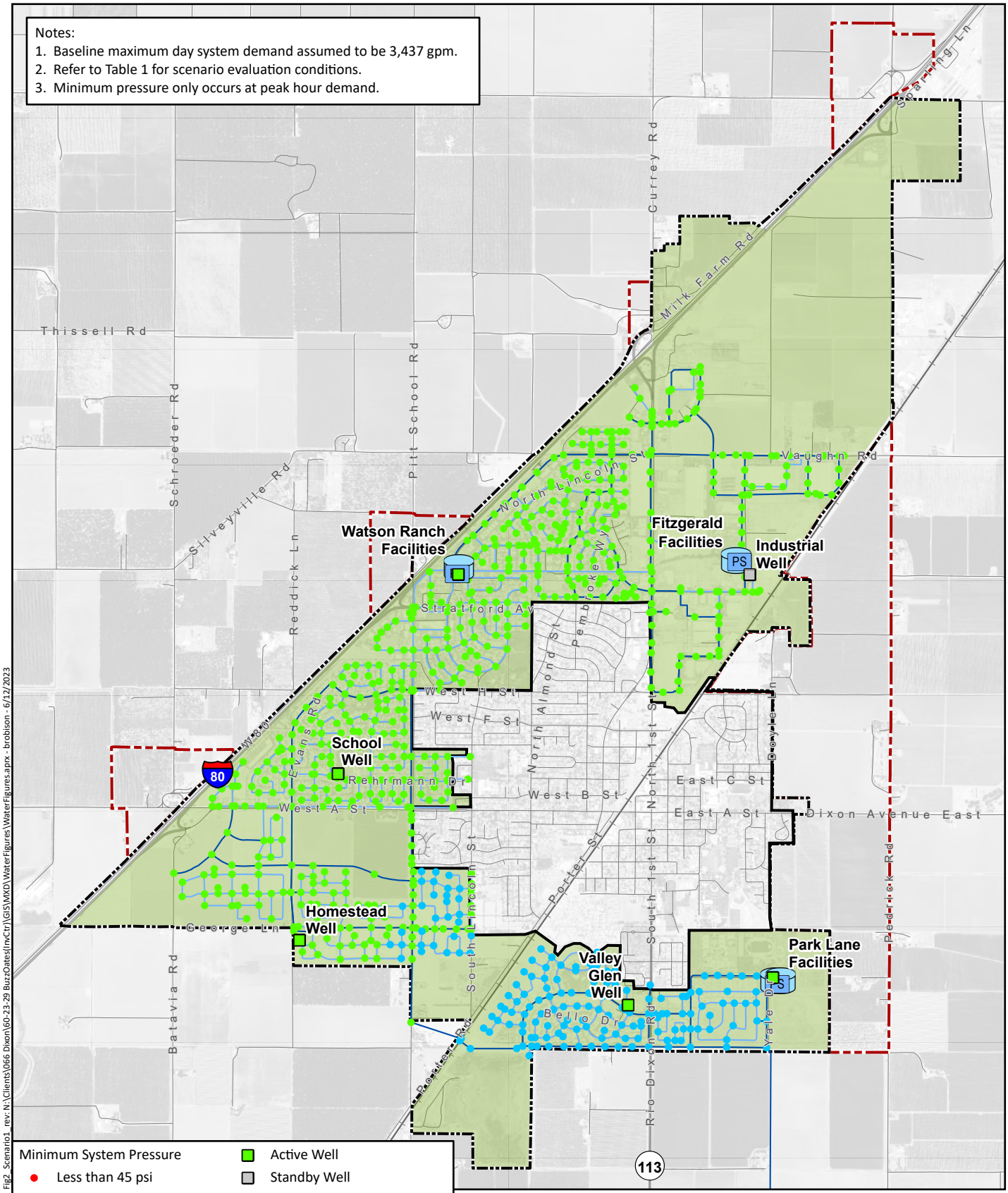


Fig2_Scenario1_rev: N:\Clients\066 Dixon\60-23-29 BuzzOates(InvCtr)\GIS\MXD\WaterFigures\WaterFigures.aprx - brobison - 6/12/2023

Figure 2
Scenario 1: Baseline
Minimum System Pressure

City of Dixon
Northeast Quadrant
Potable Water Evaluation

WEST YOST

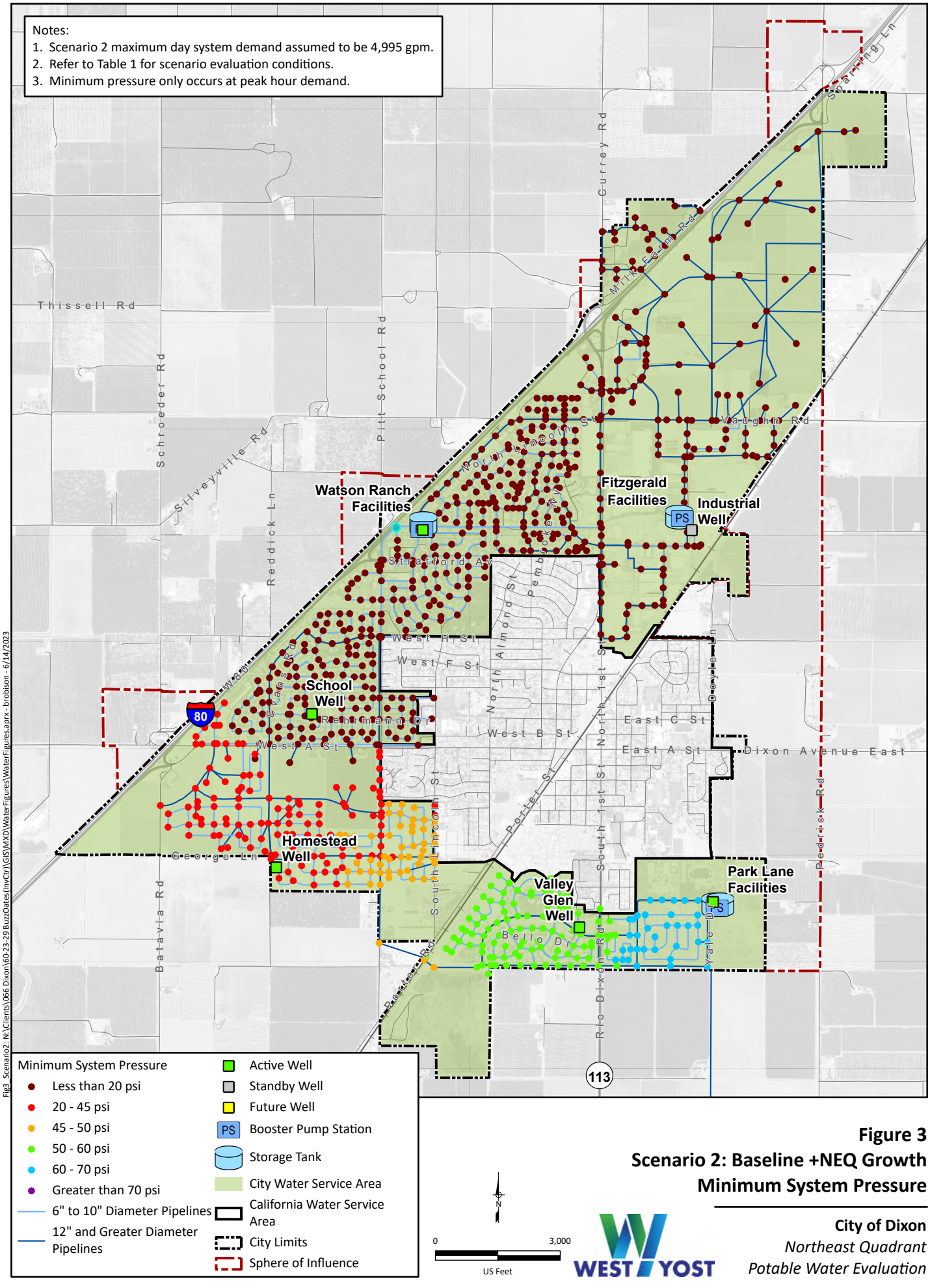


Figure 3
Scenario 2: Baseline +NEQ Growth
Minimum System Pressure

City of Dixon
Northeast Quadrant
Potable Water Evaluation

WEST YOST

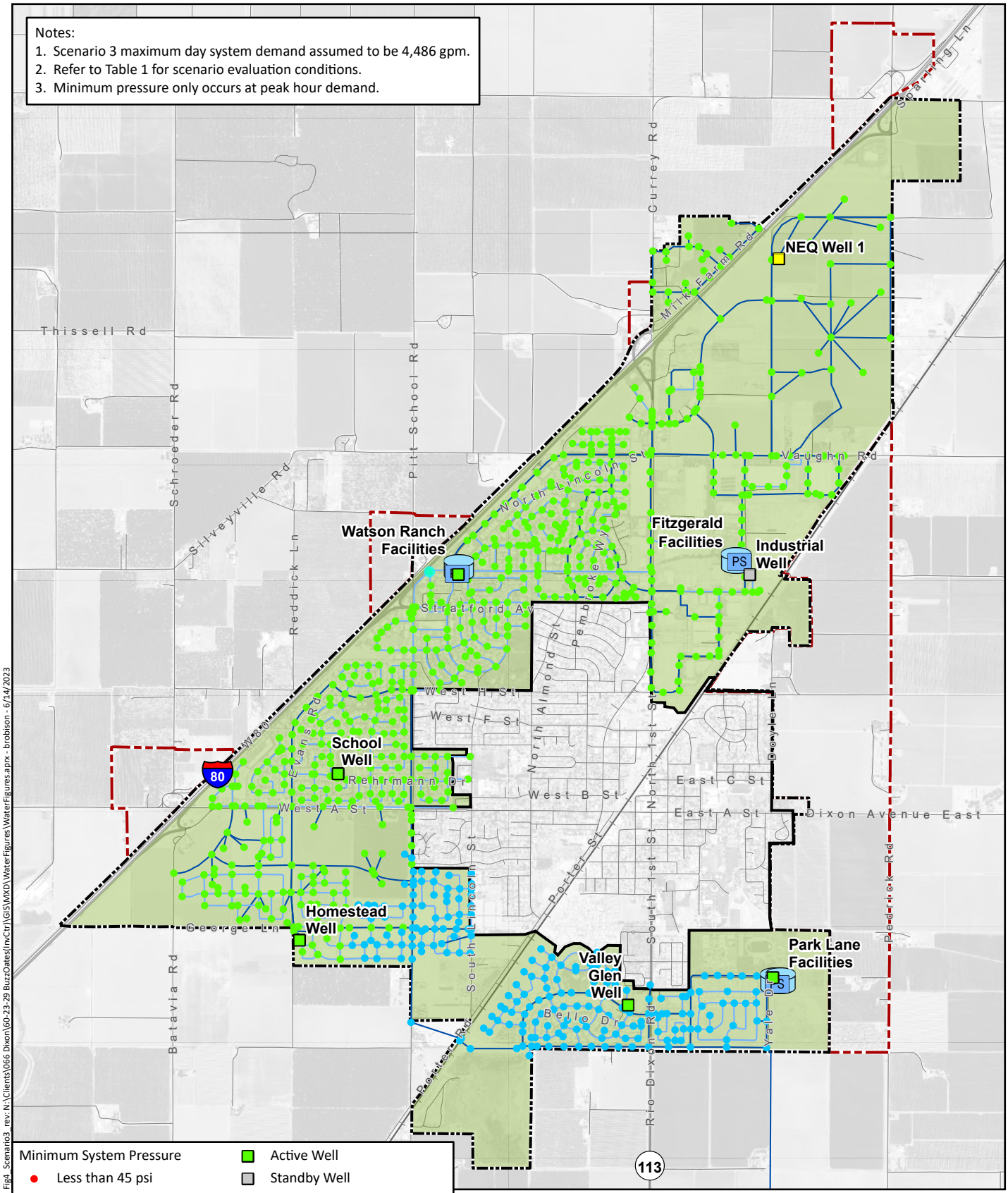


Fig4_Scenario3_rev: N:\Clients\066 Dixon\60-23-29 BuzzOates(InvCtr)\GIS\MXD\WaterFigures\WaterFigures.aprx - brobison - 6/14/2023

Figure 4
Scenario 3: Baseline + NEQ Well 1
Minimum System Pressure

City of Dixon
Northeast Quadrant
Potable Water Evaluation

WEST YOST

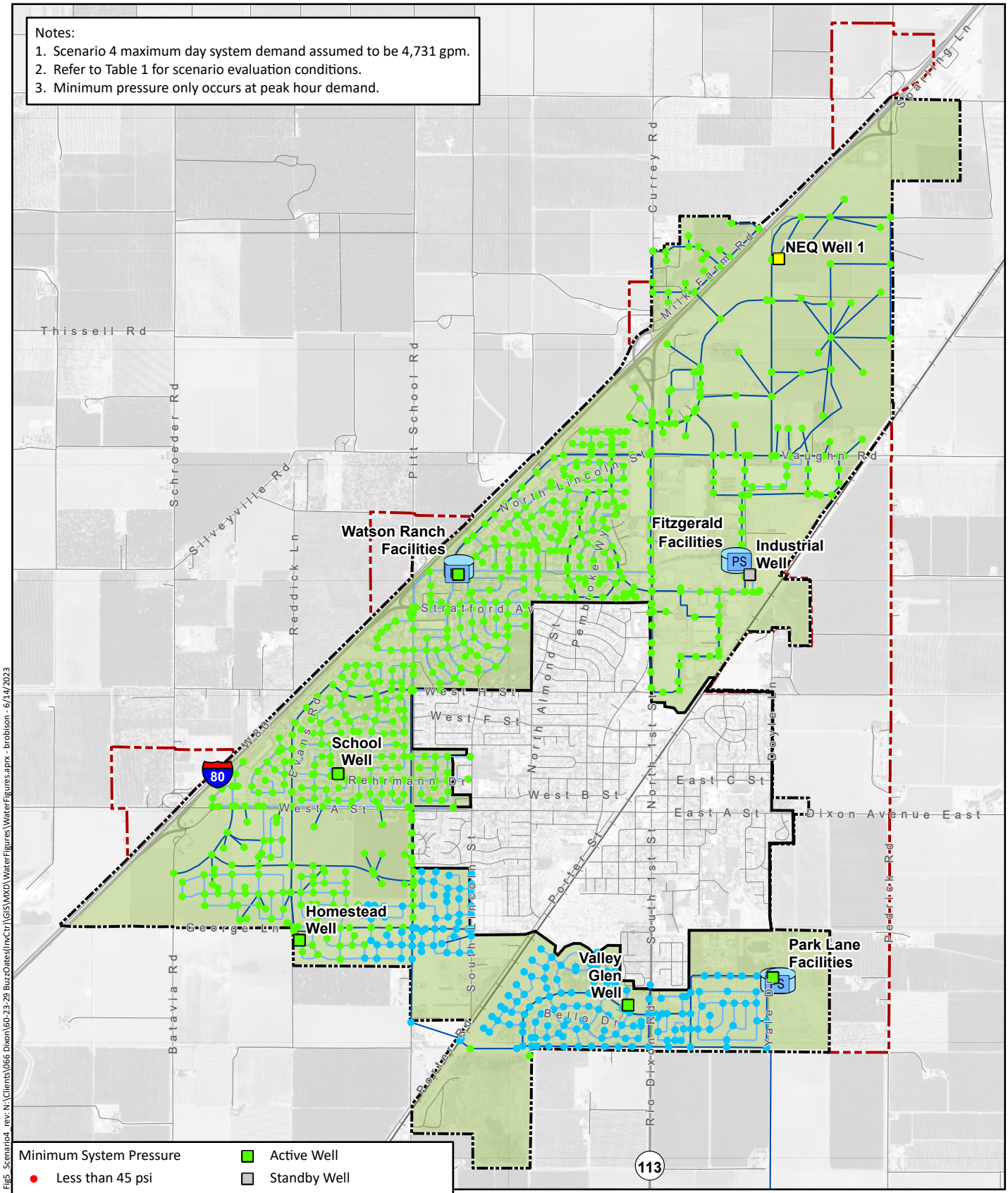


Fig5_Scenario4_rev: N:\Clients\066 Dixon\60-23-29 BuzzOates(InvCtr)\GIS\MXD\WaterFigures\WaterFigures.aprx - brobison - 6/14/2023

Figure 5
Scenario 4: Scenario 3 + NEQ Growth
Minimum System Pressure

City of Dixon
Northeast Quadrant
Potable Water Evaluation

WEST YOST

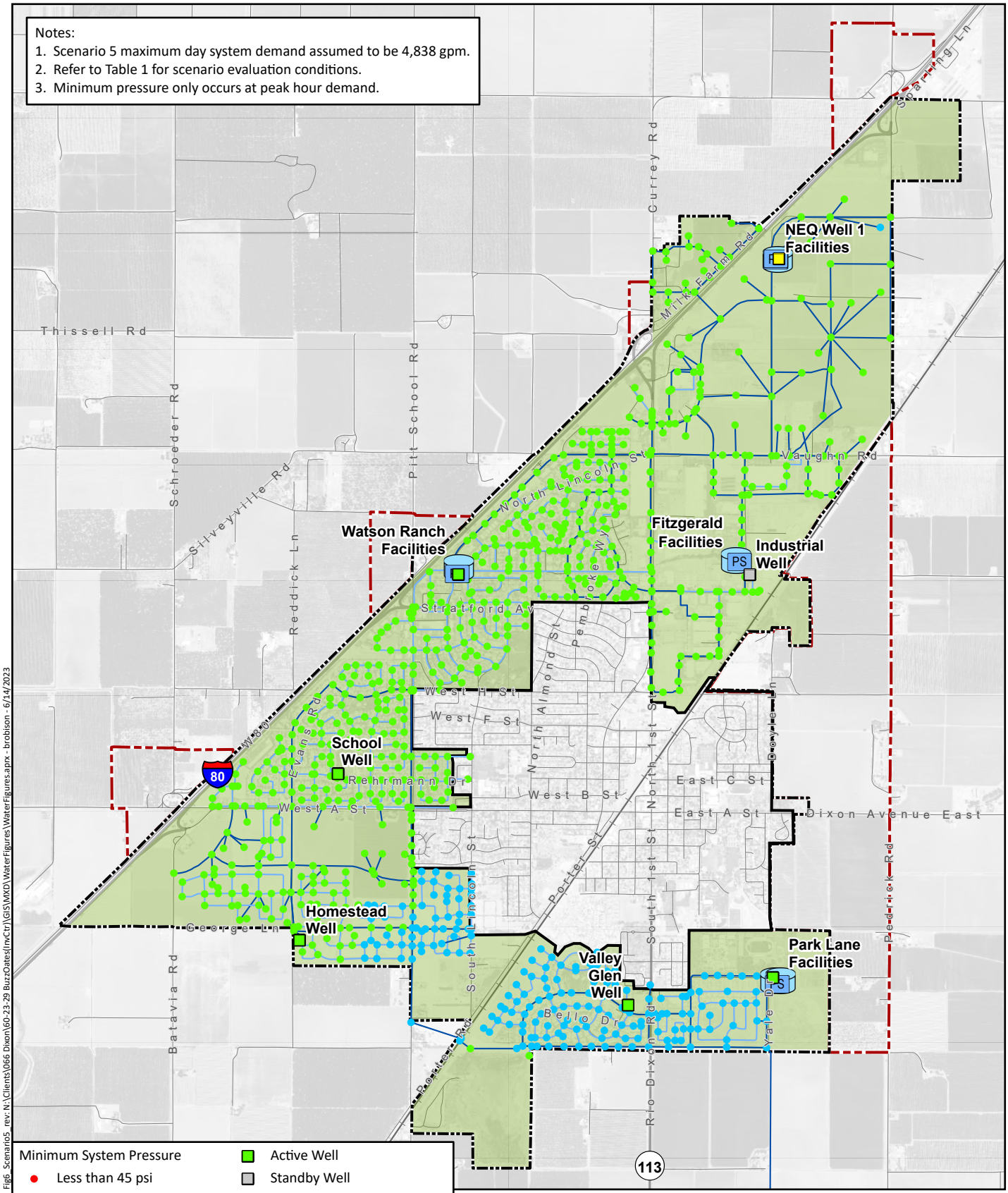


Fig6_Scenario5_rev: N:\Clients\066 Dixon\60-23-29 BuzzOates(nvCtr)\GIS\MXD\WaterFigures\WaterFigures.aprx - brobison - 6/14/2023

Figure 6
Scenario 5: Scenario 4 + NEQ Tank
Minimum System Pressure

City of Dixon
Northeast Quadrant
Potable Water Evaluation

WEST YOST

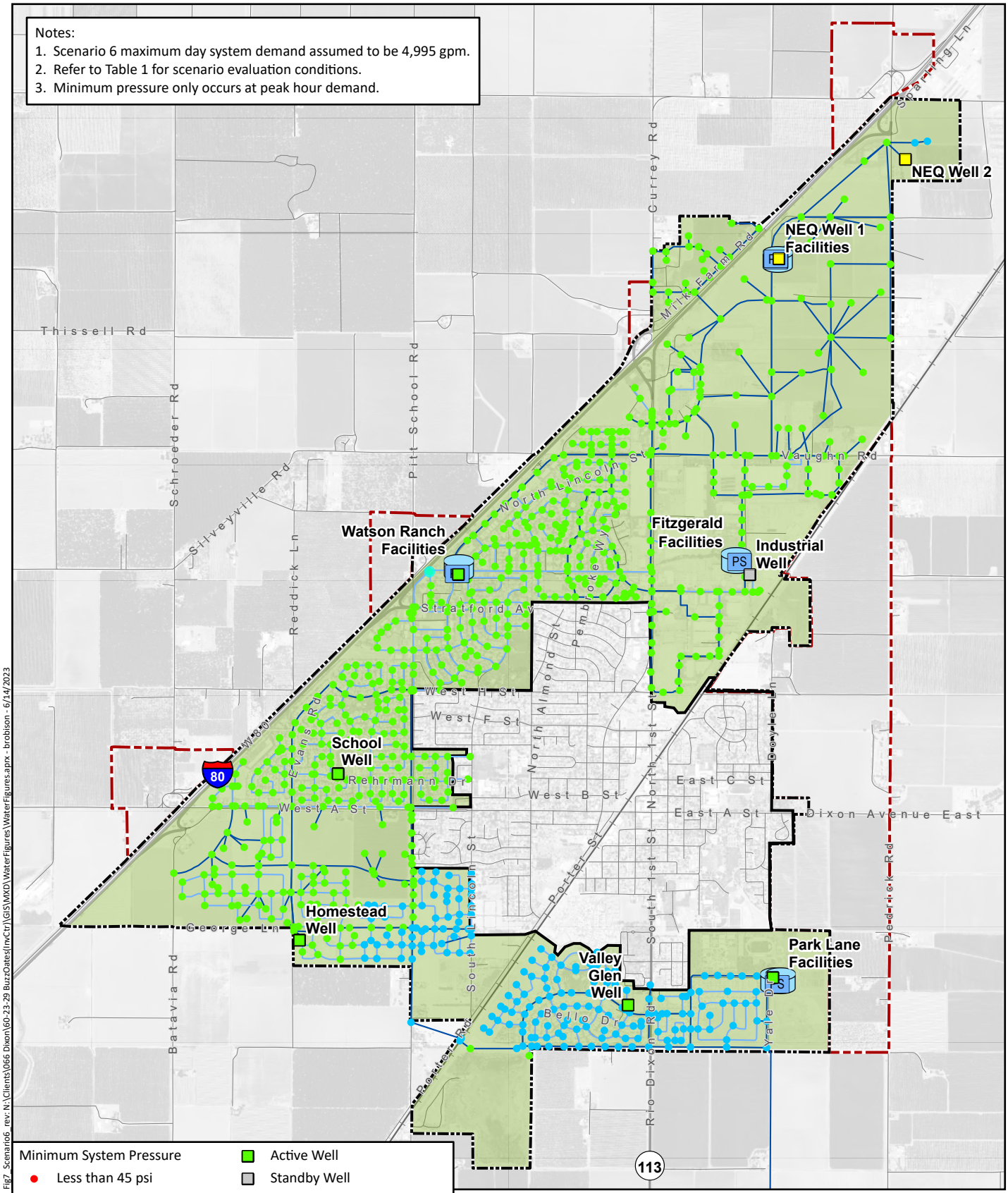


Fig7_Scenario6_rev: N:\Clients\066 Dixon\60-23-29 BuzzOates(nvCtr)\GIS\MXD\WaterFigures\WaterFigures.aprx - brobison - 6/14/2023

Figure 7
Scenario 6: Scenario 2 + All NEQ Facilities
Minimum System Pressure

City of Dixon
Northeast Quadrant
Potable Water Evaluation

WEST YOST

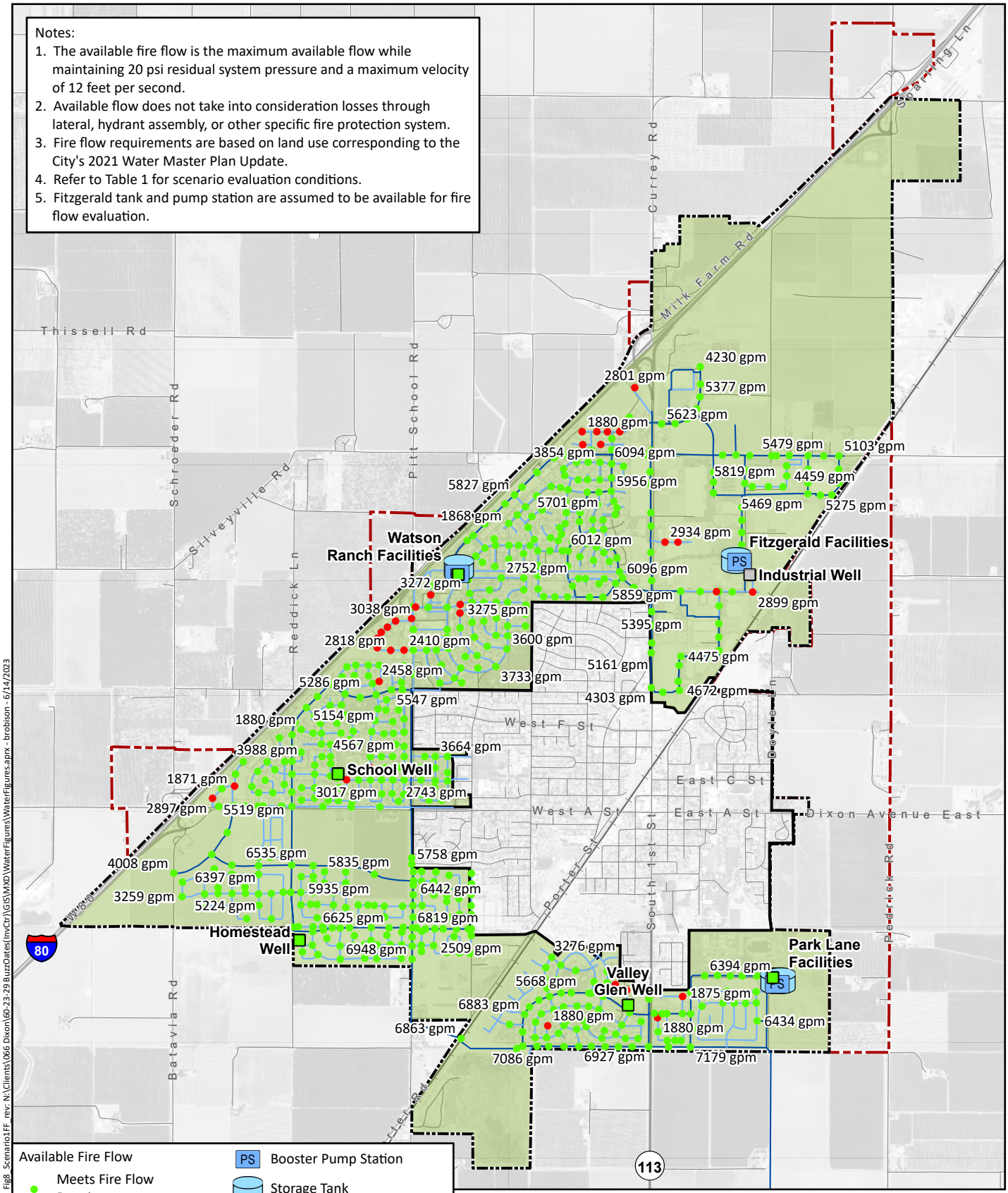


Figure 8
Scenario 7: Baseline Available Fire Flow

City of Dixon
Northeast Quadrant
Potable Water Evaluation

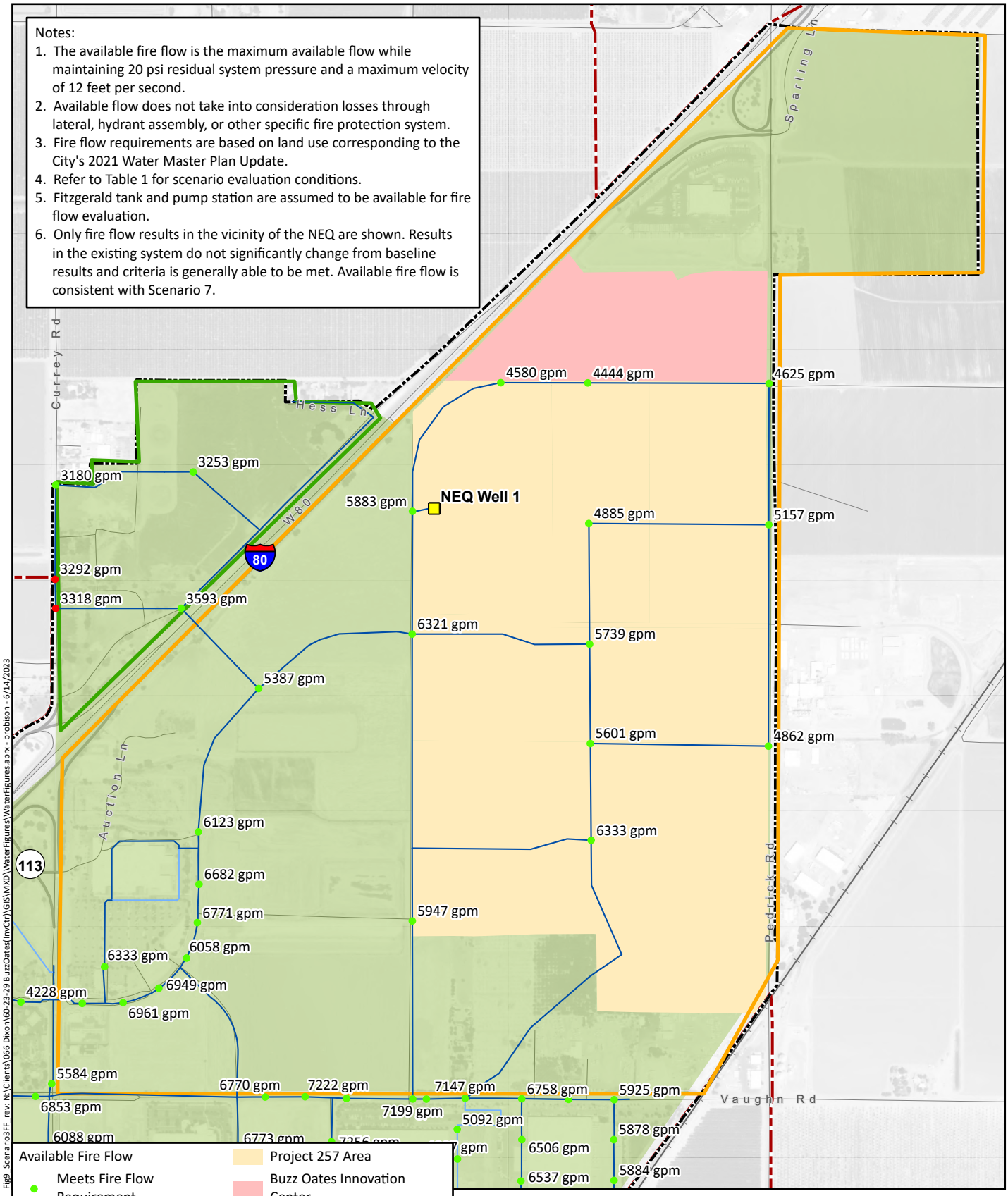


Figure 9
Scenario 9: Baseline + NEQ Well 1
Available Fire Flow

City of Dixon
Northeast Quadrant
Potable Water Evaluation

WEST YOST

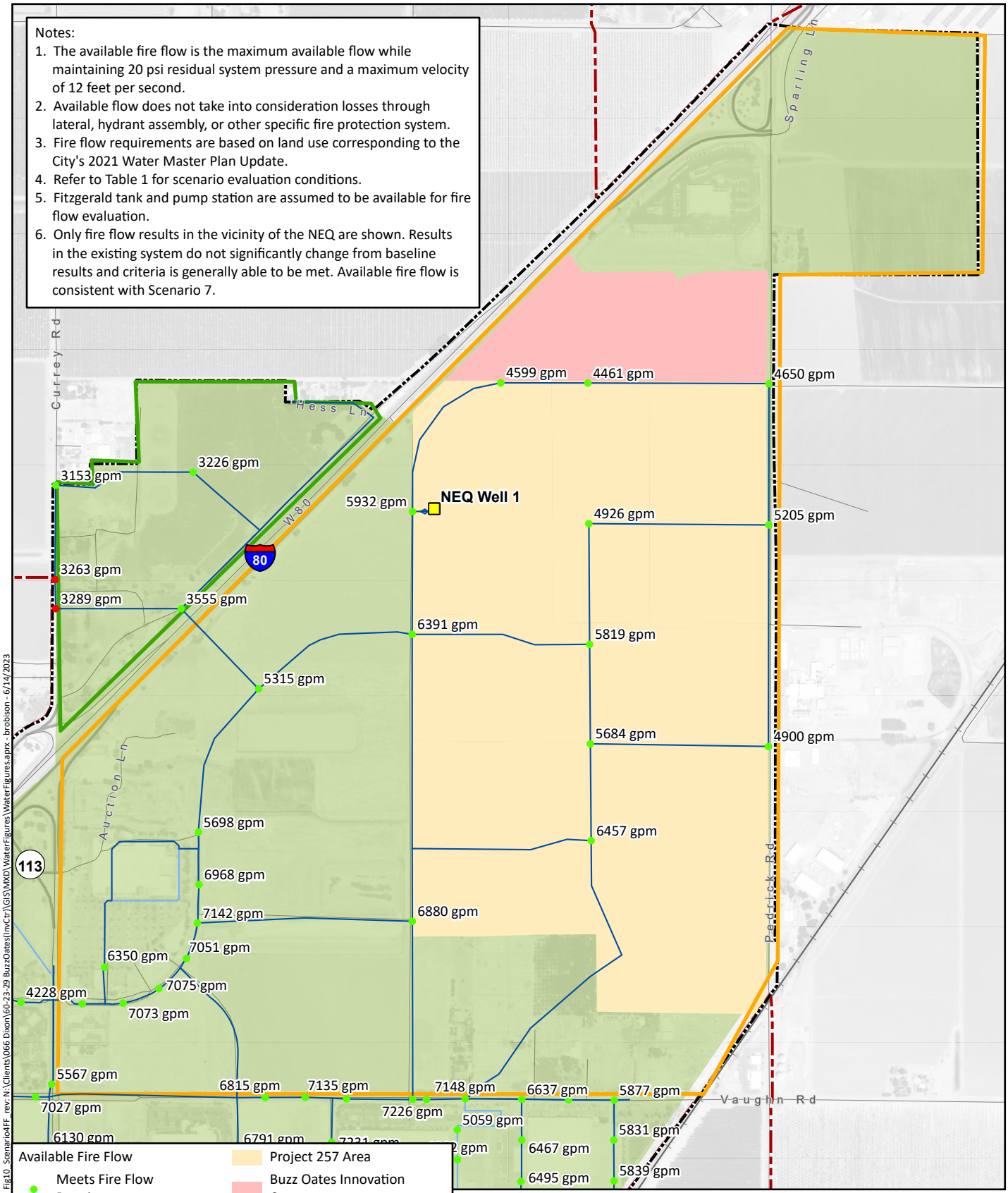


Figure 10
Scenario 10: Scenario 9 + NEQ Growth
Available Fire Flow

City of Dixon
Northeast Quadrant
Potable Water Evaluation

WEST YOST

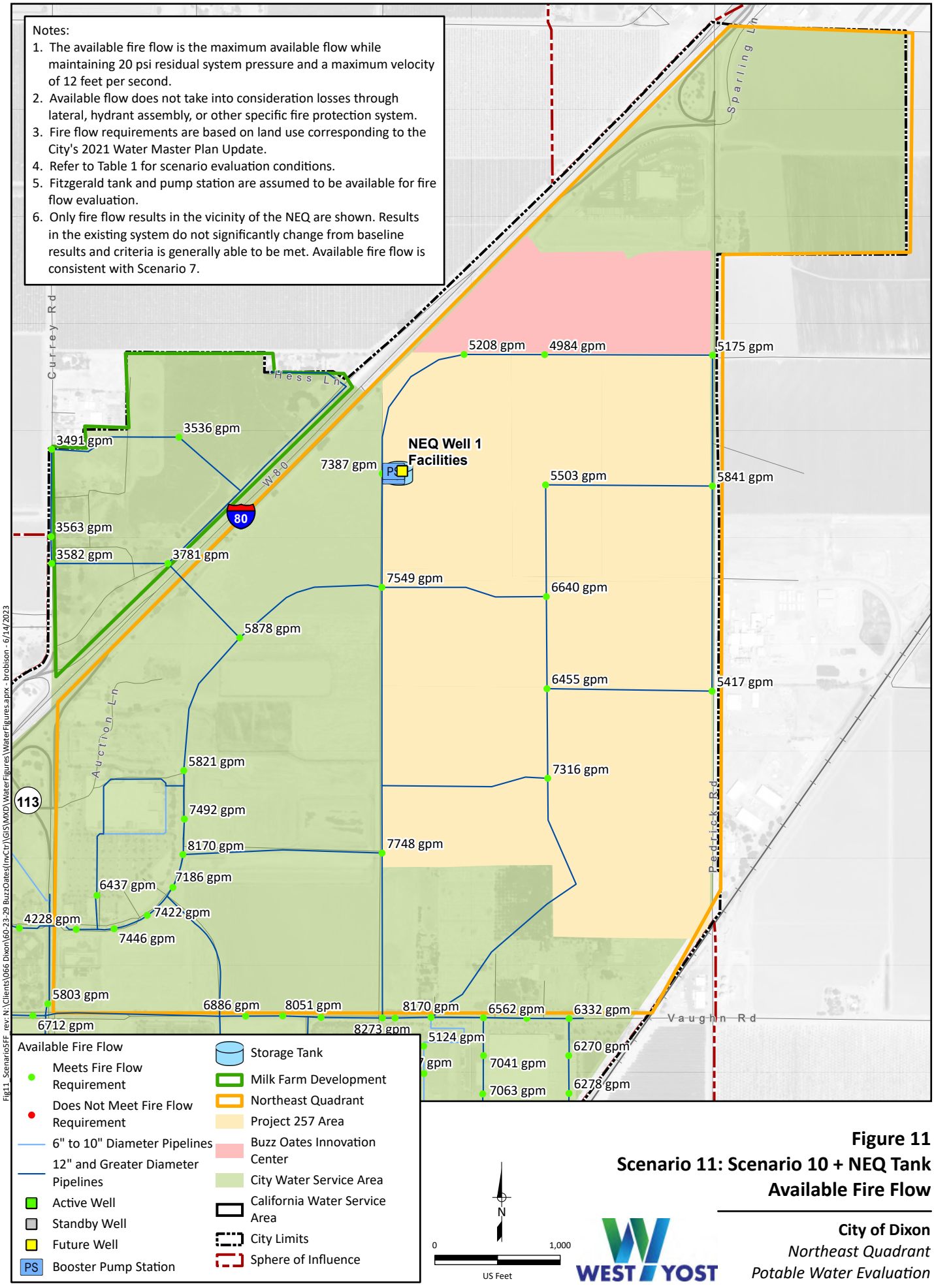


Figure 11
Scenario 11: Scenario 10 + NEQ Tank
Available Fire Flow

City of Dixon
Northeast Quadrant
Potable Water Evaluation

WEST YOST

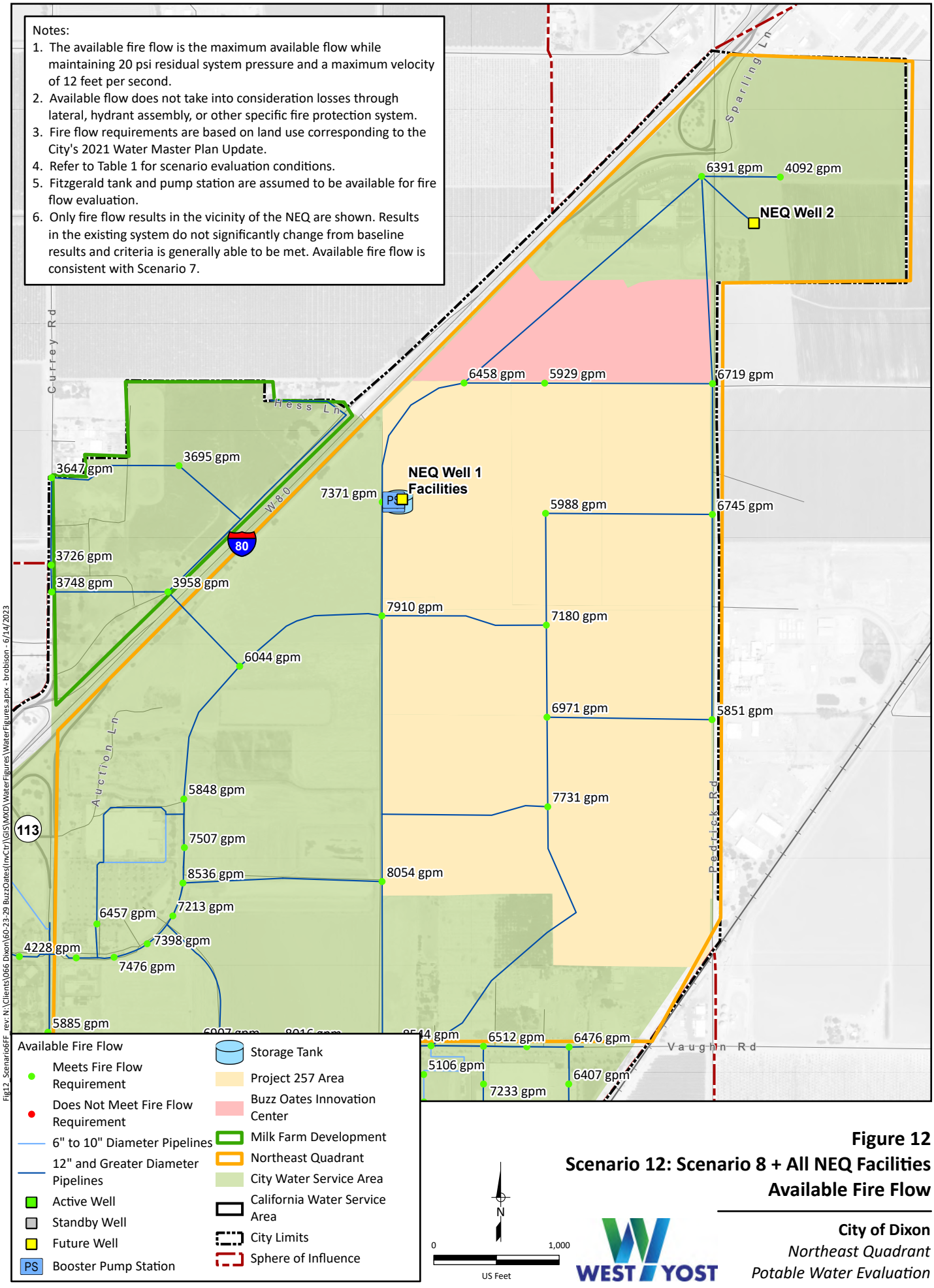


Figure 12
Scenario 12: Scenario 8 + All NEQ Facilities
Available Fire Flow

City of Dixon
Northeast Quadrant
Potable Water Evaluation

WEST YOST