

APPENDIX A

Dixon Hydrant Test Plan

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MEMORANDUM

DATE: June 3, 2016 Project No.: 066-12-16-13
SENT VIA: EMAIL

TO: Joe Leach, City of Dixon

CC: Jason Riley, City of Dixon

FROM: Patrick Johnston, RCE #59028

REVIEWED BY: Brenda Estrada, RCE #67062

SUBJECT: City of Dixon – Water Master Plan
Hydrant Testing for Hydraulic Model Calibration

This memorandum summarizes the proposed hydrant tests and testing procedures required to calibrate the hydraulic model of the City of Dixon's (City) existing water distribution system. This work is being conducted as part of the Water Master Plan project, and provides a plan for the collection of the necessary field data. West Yost Associates' (West Yost) recommended program for hydrant testing is summarized below and provided for your review and comment.

HYDRANT TESTING PROGRAM

The hydrant testing program will be used to confirm and "spot-check" the roughness factors (C-factors) that are assigned to pipelines in the City's hydraulic model. West Yost will use data collected directly through hydrant testing to verify if the current pipeline C-factors assigned in the City's hydraulic model are appropriate. Depending on this field testing to determine representative C-factors by pipeline material type and pipeline age, pipeline C-factors may be adjusted in the hydraulic model to better reflect field conditions.

Details related to the hydrant testing program are divided into the following four separate categories and are discussed in more detail below:

- Personnel and System Data Requirements
- Hydrant Testing Schedule
- Testing Requirements and Procedure
- City Responsibilities

Personnel and System Data Requirements

West Yost would like to request the following City personnel, system data, and supporting documents to accomplish the recommended hydrant testing program under West Yost's direction:

- A minimum of four City staff members (with vehicles and radio communications) that will be available during regular working hours to assist with, but not limited to, the following:
 - Closing and re-opening valves, as needed before and after hydrant testing,
 - Reading and recording hydrant pressure data,
 - De-chlorination at the flowing test hydrant,
 - Flowing the test hydrant,
 - Directing and controlling traffic, and hydrant flows, as necessary, to ensure safety during these hydrant flow tests, and collect this discharged water into a vac truck during each test, and
 - Public outreach and interface, as necessary.
- System information before and during the hydrant testing period that includes the following:
 - City's SCADA system information for:
 - Tank levels (water surface elevations),
 - Booster Pump Stations (pump operational status, speed settings, discharge pressures, and flows),
 - Well Status (discharge pressure, flow, and speed settings, where applicable).
 - If the City's SCADA system does not provide for historical archiving of these data, or it is not possible to get this information in digital format, then manual readings at key zone facilities that affect zone supply will need to be taken before, during, and immediately after each hydrant test.
- One copy of the City's Health and Safety Plan for testing hydrants.

It should also be noted that the City's Fire Department conducts hydrant testing for their own use. City staff has reached out to the City's Fire Department to invite them to participate in the hydrant testing. The City's Fire Chief has indicated they will be present to observe the hydrant testing. The Fire Chief hopes to develop a hydrant testing process that is able to capture the discharge flow in future new hydrant tests.

Hydrant Testing Schedule

The hydrant testing is scheduled to occur over a two-day period on June 15th and 16th. The testing period is to occur between 8:30 AM and 12:30 PM. West Yost will meet with City staff at 8:00 AM at the City's Corporation Yard to have a brief field coordination meeting to review hydrant testing procedures and protocol (*i.e.*, where to go and what to do). West Yost will also use this coordination meeting to distribute pressure gauges (hydrant wrenches to be provided by the City) necessary to complete the hydrant testing program. **Hydrant testing should continue until completion of the proposed 6 hydrant tests.**

Testing Requirements and Procedure

West Yost would like to conduct approximately six (6) hydrant flow tests within the City's existing service area, along with two (2) alternative locations, if time permits, for a total of eight (8) proposed hydrant tests. Table 1 lists the 8 proposed hydrant test locations, which are also illustrated on Figure 1. As shown on Figure 1, the selected hydrants are distributed throughout the existing water service area and were selected based on a specific pipeline diameter, age, and material type, as summarized in Table 1. Table 1 also includes additional details specific to each hydrant test related to the number of closed valves required to conduct the test.

Each hydrant test will involve maintaining flow from a single hydrant, while monitoring the residual pressures at three to four observation hydrants located near the flowing hydrant. The field observed static and residual pressure readings will then be used to confirm or adjust pipeline C-factors to calibrate the hydraulic model to observed field conditions. Hydrant test locations have been selected to isolate pipelines of a particular material type, diameter, and age and some tests will require that City personnel close one or more isolation valves prior to the test and re-open these isolation valves following the test.

The general testing procedure at each of the hydrant test locations is outlined below and illustrated on Figure 2. In addition, if GPS equipment is available, provided either by the City or by West Yost, record the spatial location (XY coordinates and elevation) at the base (*i.e.* ground elevation) of the flowing hydrant. Spatial location is important during the calibration effort because it confirms the location and elevation at the flowing hydrant.

- Step 1.** Before the test, flush the test (flowing) hydrant and each observation hydrant before attaching the pressure gage. (This allows sediments, which might damage the gage or cause faulty readings, to be flushed out from the hydrant.)
- Step 2.** Attach the pressure gage to the hydrant with the gage's test cock valve **open**. Slowly open the hydrant and bleed off the gage with the gage's test cock until the hydrant is fully pressurized.
- Step 3.** Close the gage test cock valve, and then measure the static pressures at the designated test hydrant and each observation hydrant.
- Step 4.** Flow the designated test hydrant and measure the discharge flow and pressure.
- Step 5.** Measure the residual pressures at the designated test hydrant and at each observation hydrant while the test hydrant is flowing.

- Step 6.** Continue monitoring pressure until the “all clear” is given by a West Yost employee. Record the static pressure and then detach the pressure gage.
IMPORTANT: Before closing the hydrant, be sure the gage’s test cock valve is open and bleeding while the hydrant is being closed.

At least one City staff member will be required at the flowing test hydrant and up to three (3) additional City personnel will be required in the field to measure static and residual pressures at the observation hydrants (refer to Attachment A). West Yost will provide three staff members to direct, oversee, and assist in the field data collection work effort.

It is anticipated that each hydrant test will take approximately one half hour and that each hydrant will be flowing for no more than 10 minutes during a test.

Testing Equipment

West Yost will provide 2.5-inch and 4.5-inch diameter Swivel Piezo Diffusers and pressure gages during the hydrant testing program. It is our recommendation that the 4.5-inch diameter Swivel Piezo Diffuser be used for all proposed hydrant tests. For any hydrant test where it is not possible to use this type of diffuser due to drainage or traffic control issues, an alternative method will need to be further evaluated and confirmed before the day of field testing.

City Responsibilities

The City will be responsible for providing the following hydrant testing equipment:

- Hydrant wrenches, and
- Two-way portable communication for each of the testing personnel.

The City is also responsible for notifying other City staff and residents about the scheduled hydrant testing, obtaining any approvals that may be required, providing proper drainage of the hydrant flow, and providing equipment for de-chlorinating¹ test water and personnel for traffic control, if required.

West Yost requests that City Ops staff review and inspect each of the proposed test locations before the testing date to identify any potential problems or hazards with the selected locations. Of particular concern will be the potential for flooding landscaping, building basements, or creating hazardous traffic conditions. Location and status of valves that will be closed during the hydrant testing should be checked. In addition, the City will develop a plan to capture the discharge flow from the test hydrant to minimize flow to the drainage system. The City will use the captured discharge water for other beneficial purposes. Detailed figures, which illustrate the flowing hydrant, observation hydrants and valves to be closed are provided in Attachment A.

The City will coordinate with collections staff to develop the plan.

¹ Handling of water released from each hydrant test will need to comply with the City Operations procedures and be consistent with the City’s NPDES permit for planned releases from hydrant tests.

SUMMARY OF HYDRANT TESTING PROGRAM

Hydrant testing will be performed as described above during regular operations staff working hours. The City is responsible for notifying other City staff and local residents/businesses about the hydrant testing program and coordinating with the City’s Fire Department, as needed.

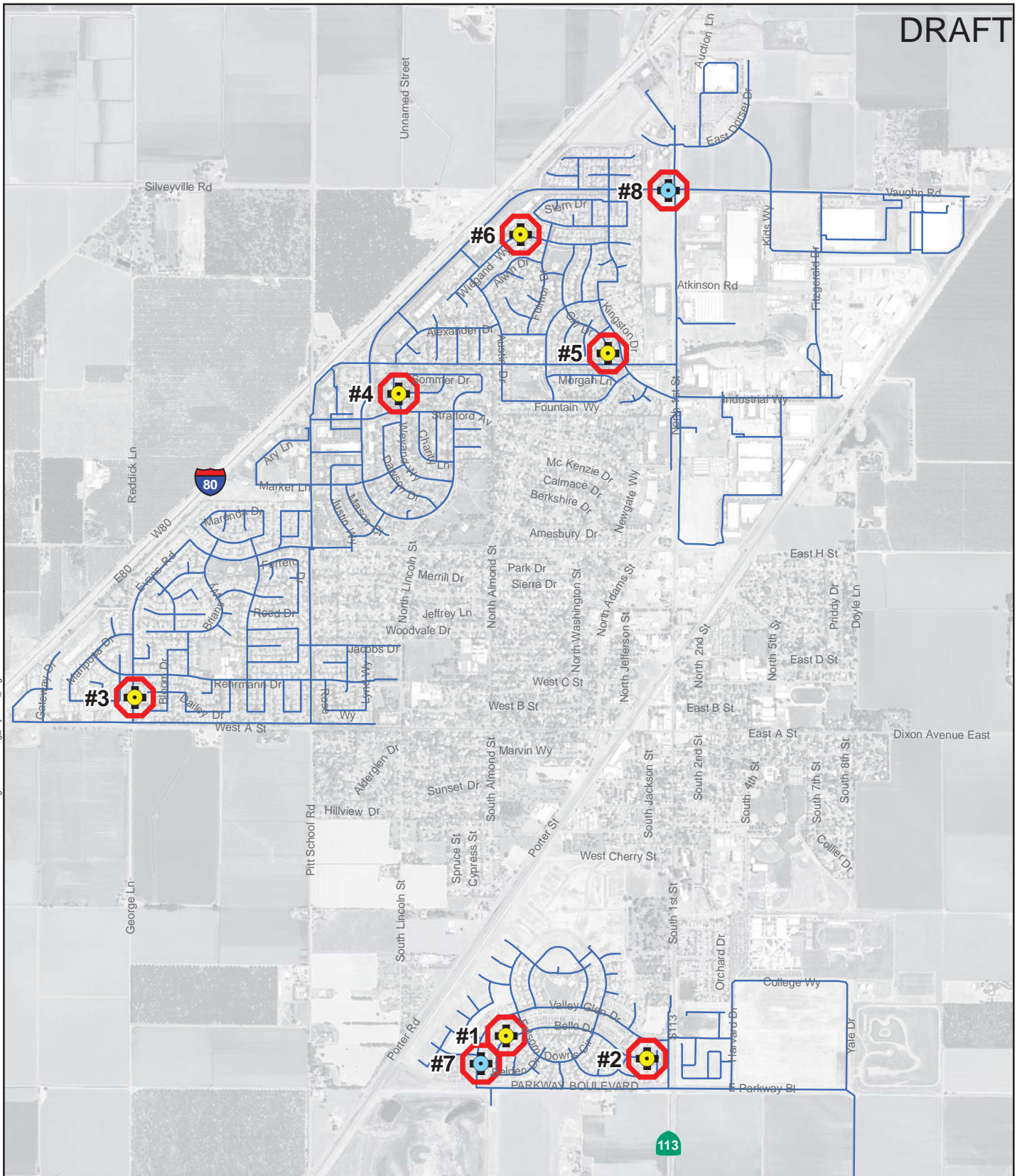
West Yost requests a conference call or meeting with City staff approximately one week before the scheduled testing day to review and identify any potential issues that may occur during hydrant testing such as unavailable SCADA system data. An Outlook meeting request will be sent to City staff to schedule a suitable meeting date and time. In the meantime, please feel free to contact Patrick Johnston at 925-949-5818 if you have any questions or comments.

Table 1. Hydrant Test Locations^(a)




Test No.	Pipeline Material	Installation Year	Pipeline Diameter, inches	Location	No. of Residual Hydrants	No. of Closed Valves	Comments
1	PVC	Assume 2000’s or later	8	Along Belden Dr. and Bello Dr.	3	1	-
2	PVC	Assume 2000’s or later	8	Along Bello Dr., Griffith Ct., Griffith Dr. and Revelle Dr.	3	2	-
3	PVC	Assume 1980’s or later	8	Along West A St.	4	1	-
4	ACP	Assume 1970’s	8	Along Weyand Way, Monique Way, Sommer Dr. and Park Green Dr.	3	3	-
5	PVC	Assume 1980’s or later	8	Along Gill Dr.	3	4	-
6	PVC	Assume 1980’s or later	8	Along Wiegand Way and Austin Dr.	4	3	-
7A	PVC	Assume 2000’s or later	12	Along Valley Glen Dr. and Parkway Blvd.	3	2	Alternate
8A	C-900	Assume 1980’s or later	12	Along North First St.	3	1	Alternate

^(a) 6 Test Locations and 2 Alternate Test Locations.

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Symbology

-  Hydrant Test Location
-  Hydrant Test Location
-  Pipeline

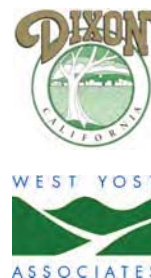
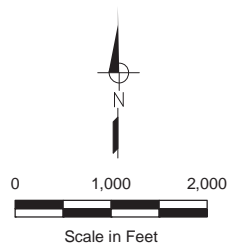
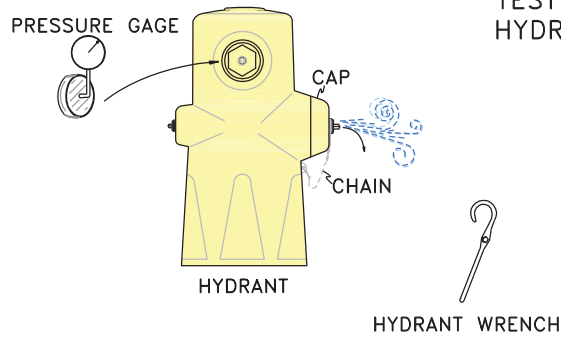


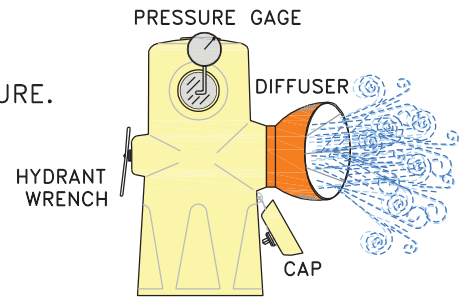
Figure 1
Proposed Hydrant Test
Location Map

City of Dixon
 Water Master Plan
 Hydrant Test Plan

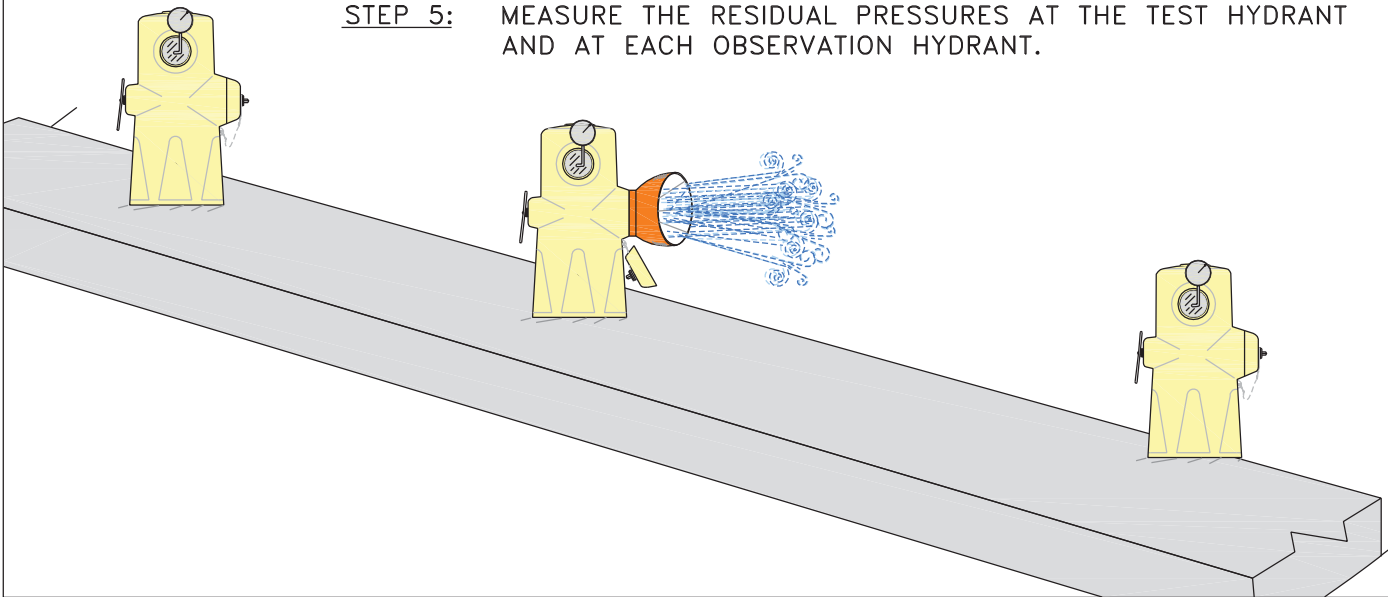
STEPS 1, 2 & 3: REMOVE HYDRANT CAP, FLUSH OUT HYDRANT AND MEASURE THE STATIC PRESSURES AT THE TEST HYDRANT AND AT EACH OBSERVATION HYDRANT.



STEP 4: FLOW THE DESIGNATED TEST HYDRANT AND MEASURE THE DISCHARGE FLOW AND PRESSURE.



STEP 5: MEASURE THE RESIDUAL PRESSURES AT THE TEST HYDRANT AND AT EACH OBSERVATION HYDRANT.



LEGEND:

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**CITY OF DIXON
WATER MASTER PLAN**

**FIGURE 2
HYDRANT
TEST PROCEDURE**

6800 Koll Center Parkway, Suite 150
Pleasanton, California 94566
(925) 426-2580
FAX (530) 756-5991



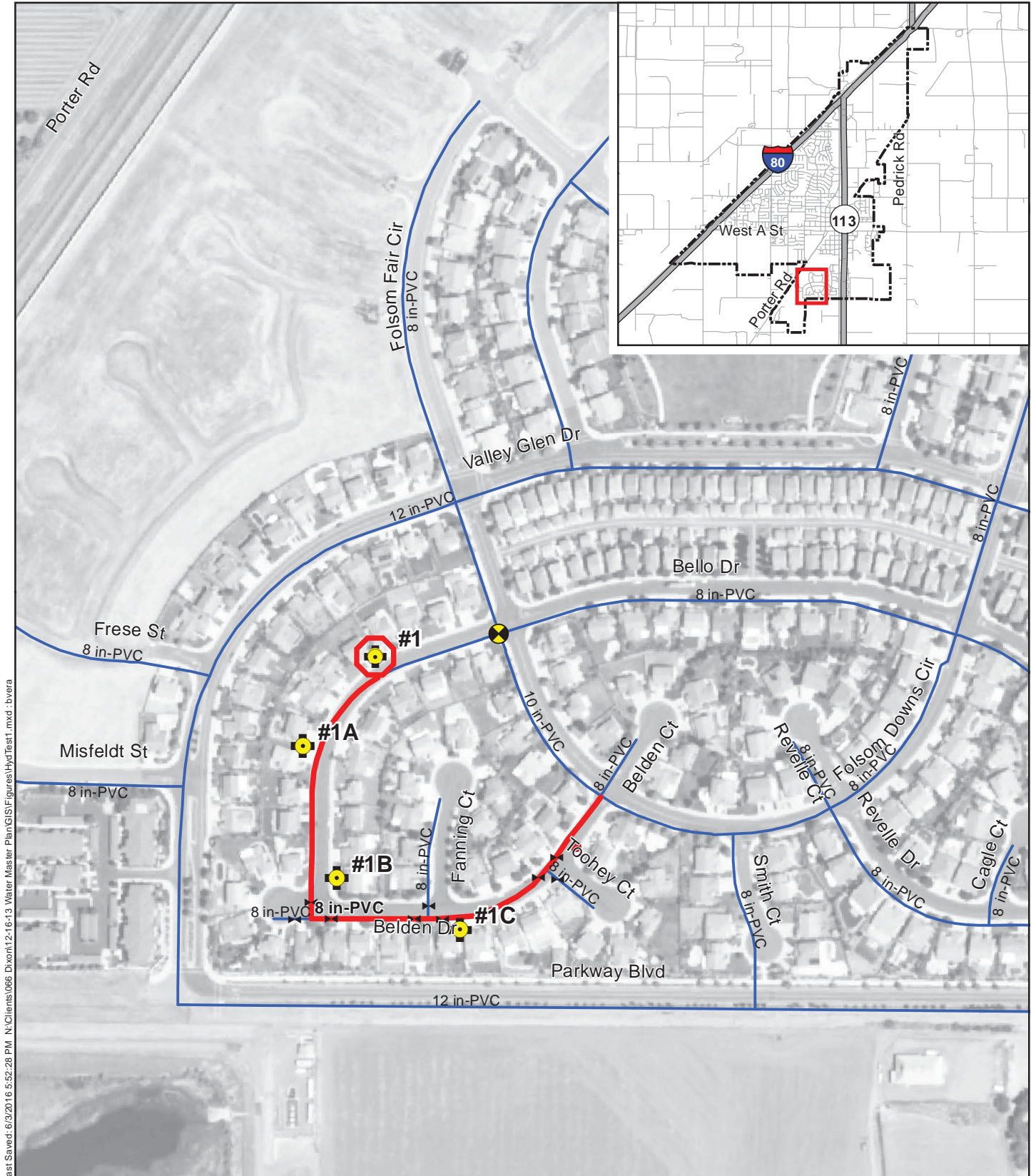
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ATTACHMENT A

Hydrant Test Location Sheets











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Symbology

-  Flow Hydrant
-  Observed Hydrant
-  Hydrant
-  Closed Valve
-  Valve
-  Test Pipeline
-  Pipeline
-  Emergency Intertie
-  Well
-  Tank

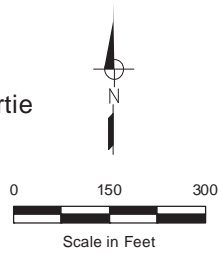
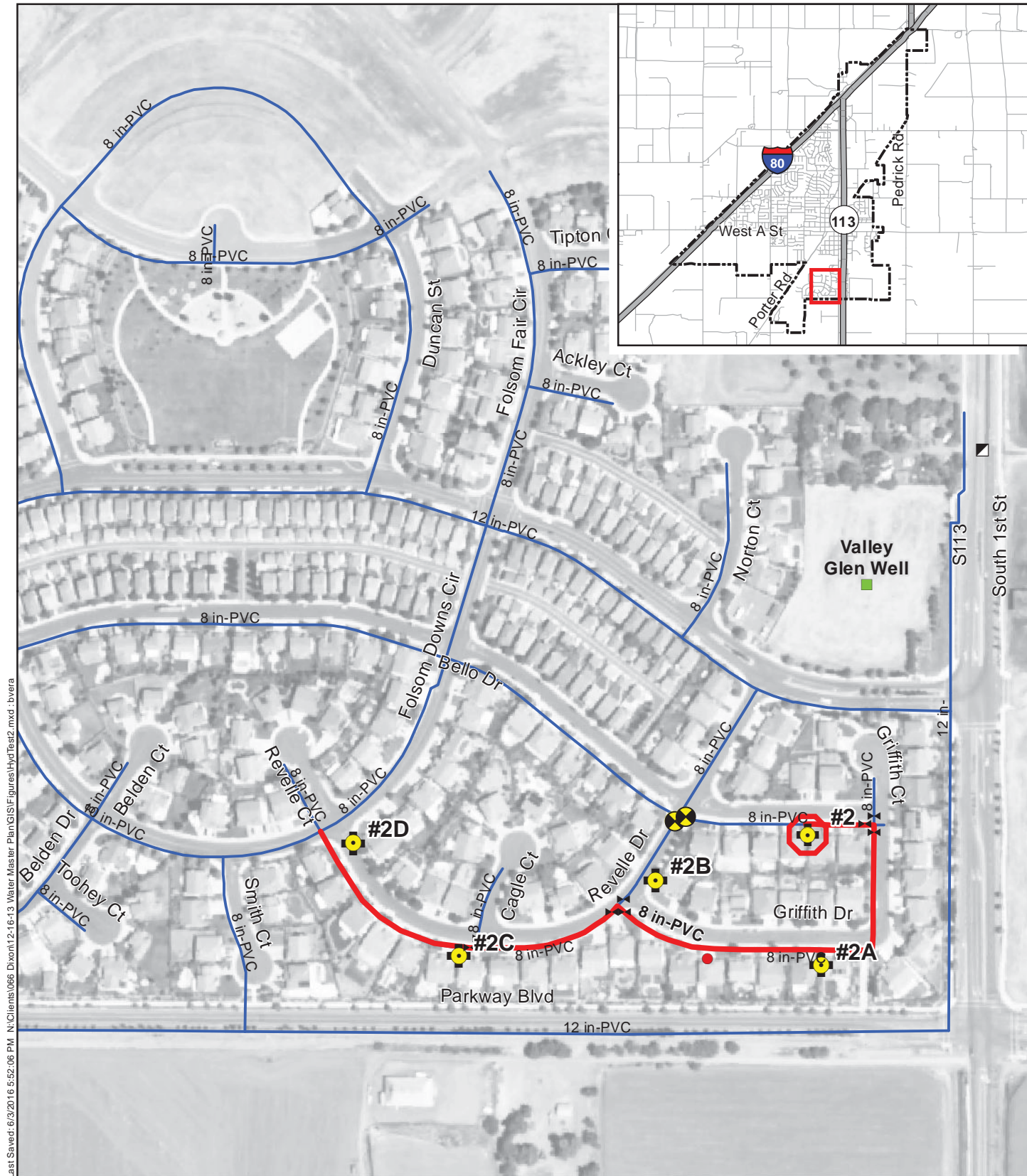












Figure A-1
Test 1

City of Dixon
Water Master Plan
Hydrant Test Plan



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Symbology

-  Flow Hydrant
-  Observed Hydrant
-  Hydrant
-  Closed Valve
-  Valve
-  Test Pipeline
-  Pipeline
-  Emergency Intertie
-  Well
-  Tank

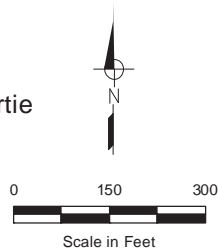
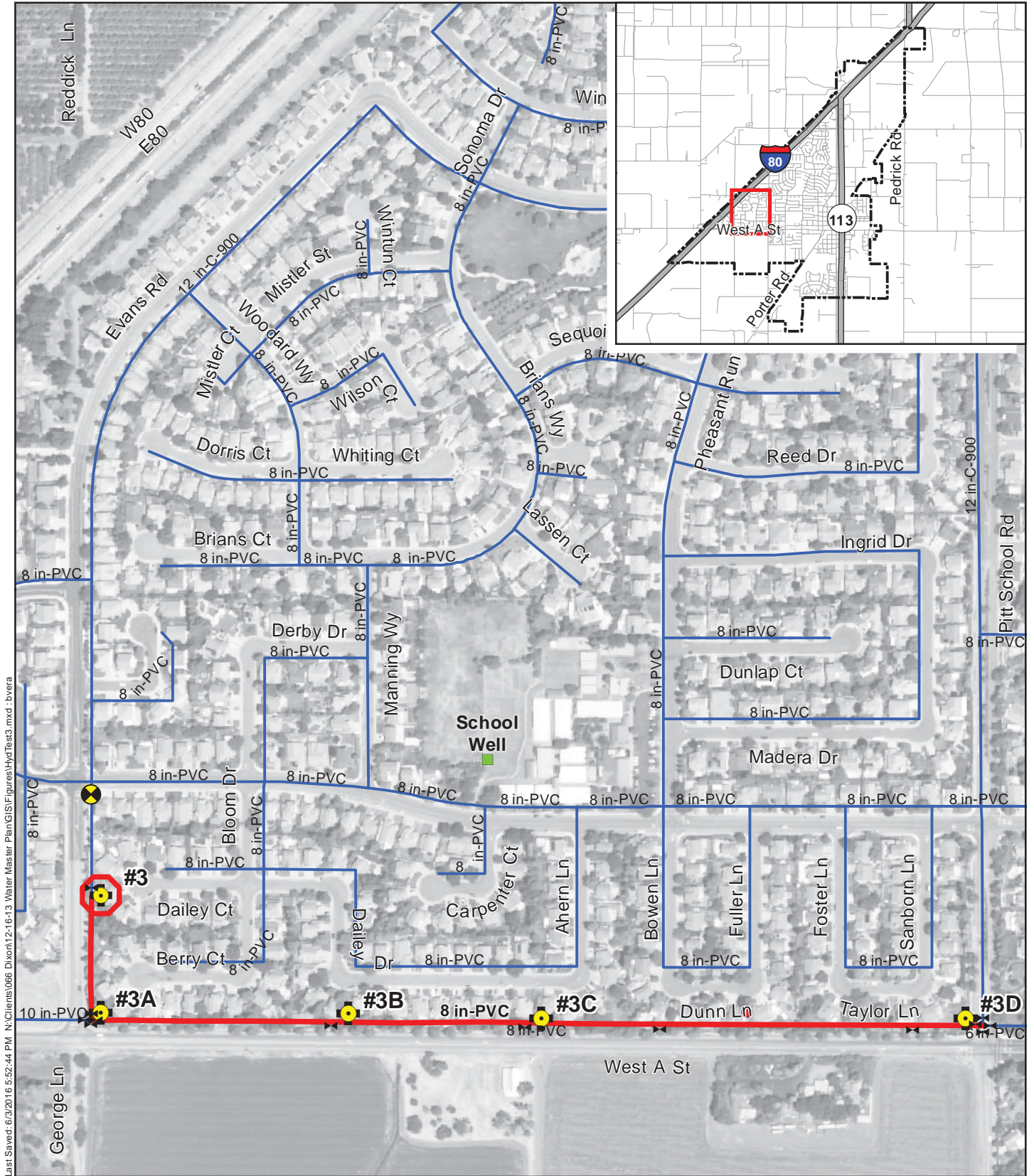












Figure A-2
Test 2

City of Dixon
Water Master Plan
Hydrant Test Plan



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Symbology

-  Flow Hydrant
-  Observed Hydrant
-  Hydrant
-  Closed Valve
-  Valve
-  Test Pipeline
-  Pipeline
-  Emergency Intertie
-  Well
-  Tank

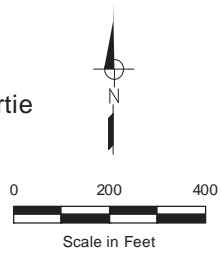
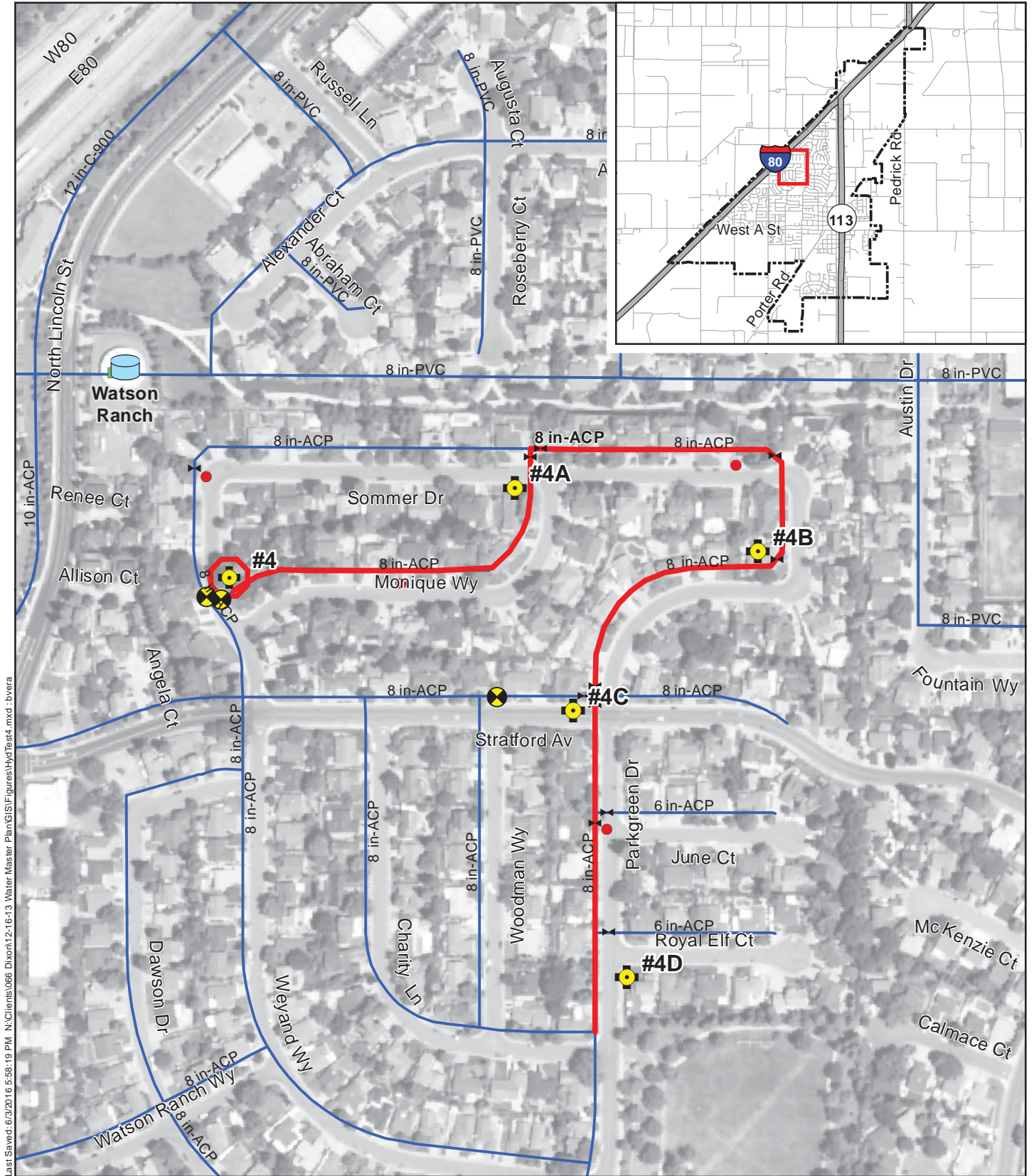












Figure A-3
Test 3

City of Dixon
Water Master Plan
Hydrant Test Plan



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Symbology

-  Flow Hydrant
-  Observed Hydrant
-  Hydrant
-  Closed Valve
-  Valve
-  Test Pipeline
-  Pipeline
-  Emergency Intertie
-  Well
-  Tank

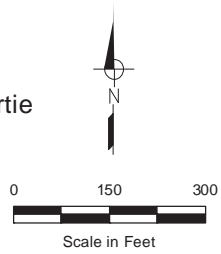
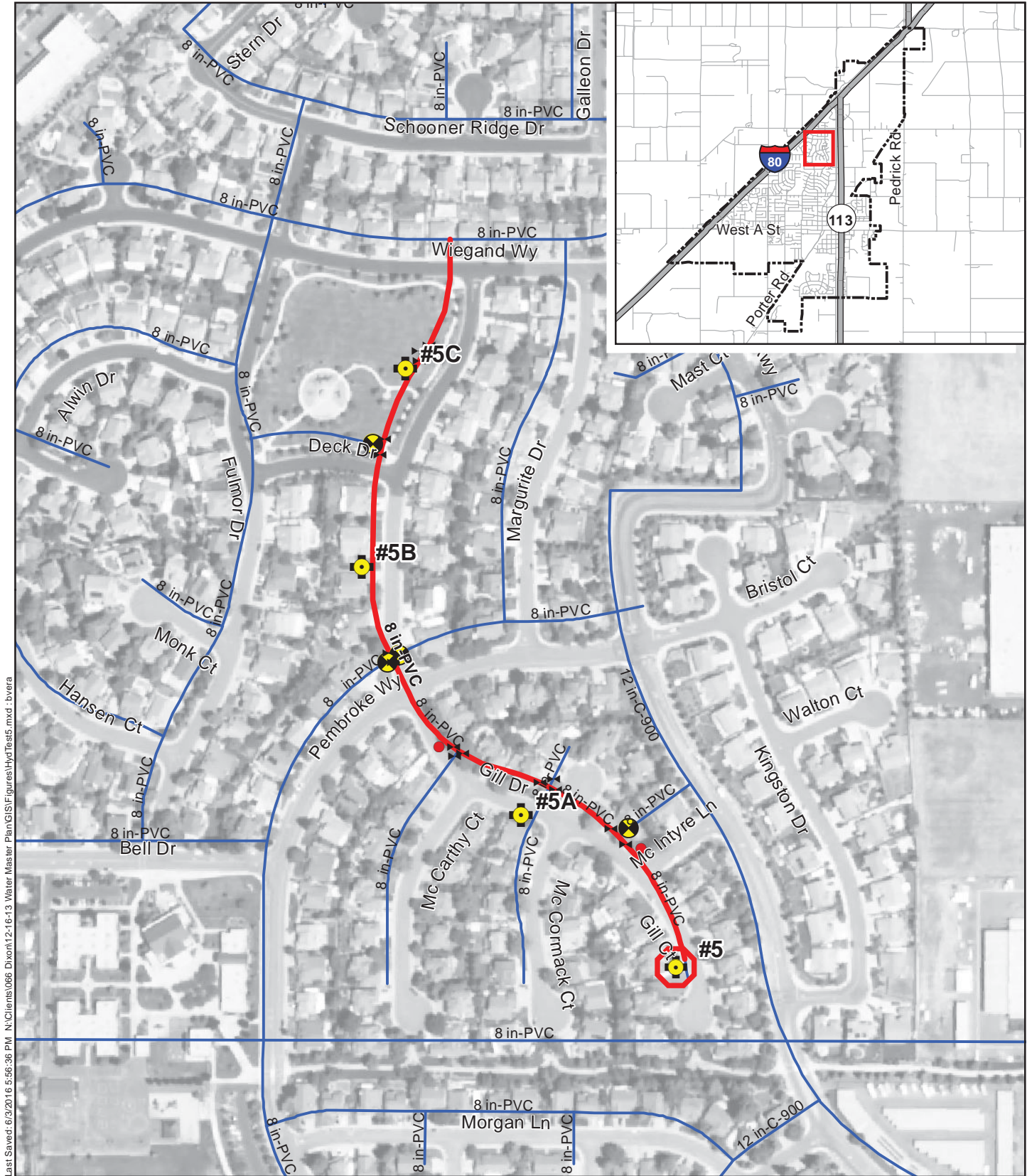












Figure A-4
Test 4

City of Dixon
Water Master Plan
Hydrant Test Plan



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Symbology

-  Flow Hydrant
-  Observed Hydrant
-  Hydrant
-  Closed Valve
-  Valve
-  Test Pipeline
-  Pipeline
-  Emergency Intertie
-  Well
-  Tank

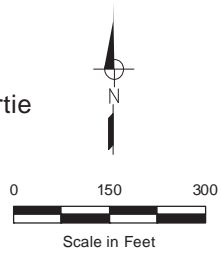
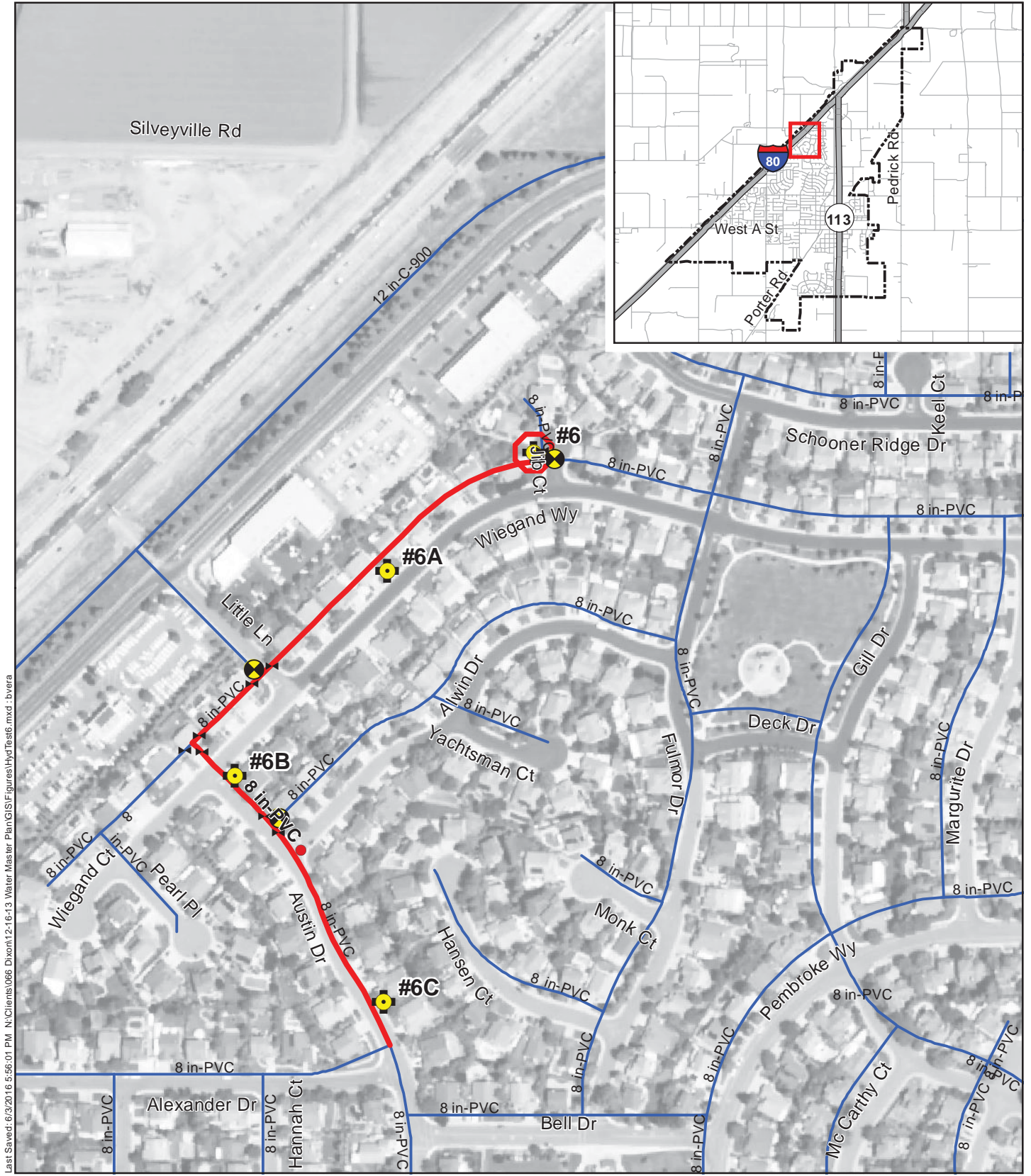












Figure A-5
Test 5

City of Dixon
Water Master Plan
Hydrant Test Plan



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Symbology

-  Flow Hydrant
-  Observed Hydrant
-  Hydrant
-  Closed Valve
-  Valve
-  Test Pipeline
-  Pipeline
-  Emergency Intertie
-  Well
-  Tank

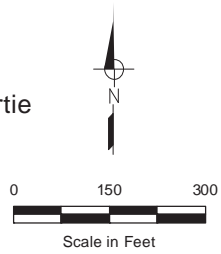
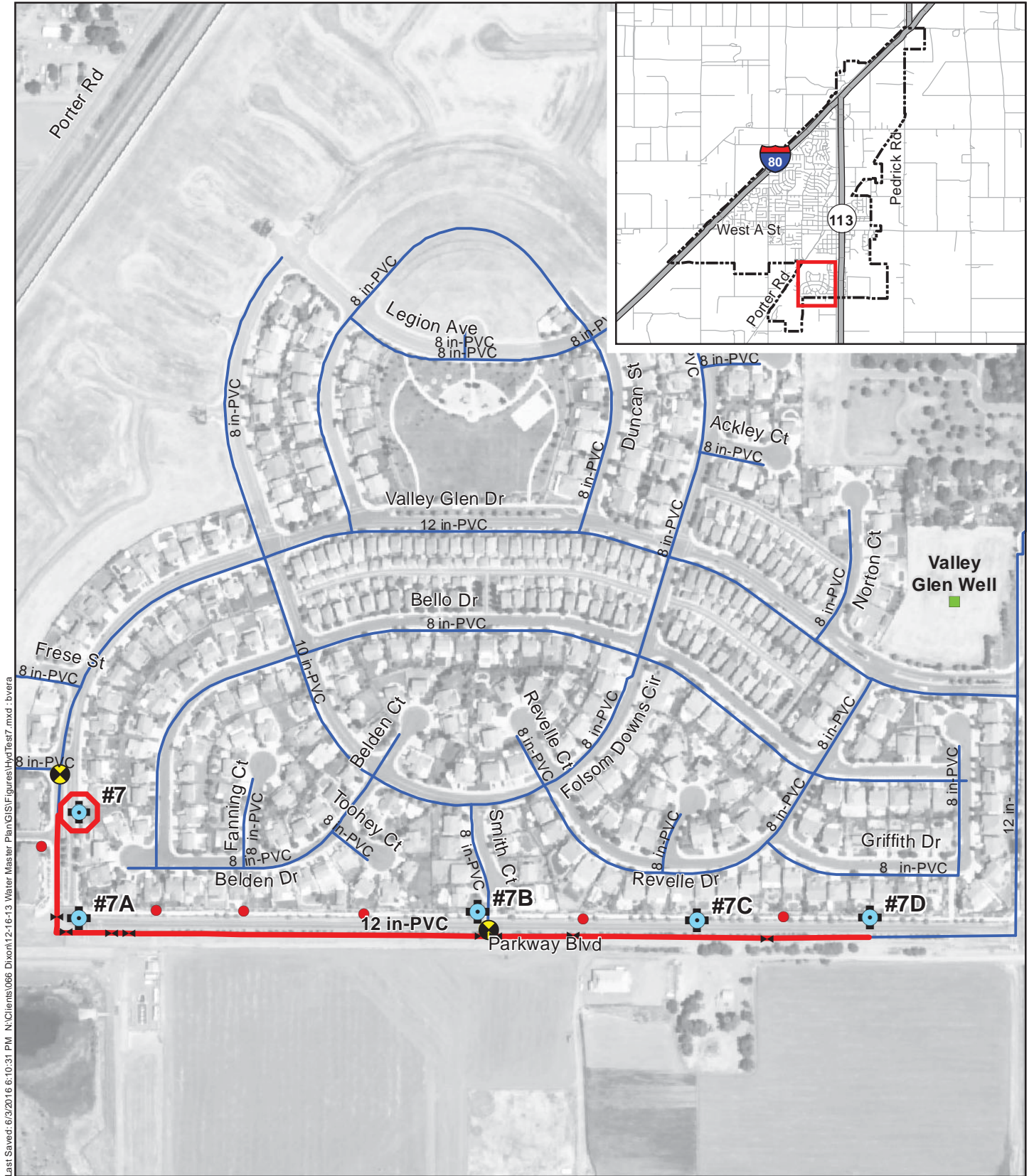












Figure A-6
Test 6

City of Dixon
Water Master Plan
Hydrant Test Plan



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Symbology

-  Flow Hydrant
-  Observed Hydrant
-  Hydrant
-  Closed Valve
-  Valve
-  Test Pipeline
-  Pipeline
-  Emergency Intertie
-  Well
-  Tank

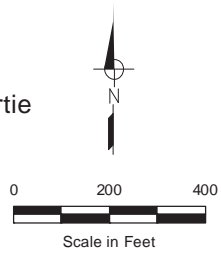
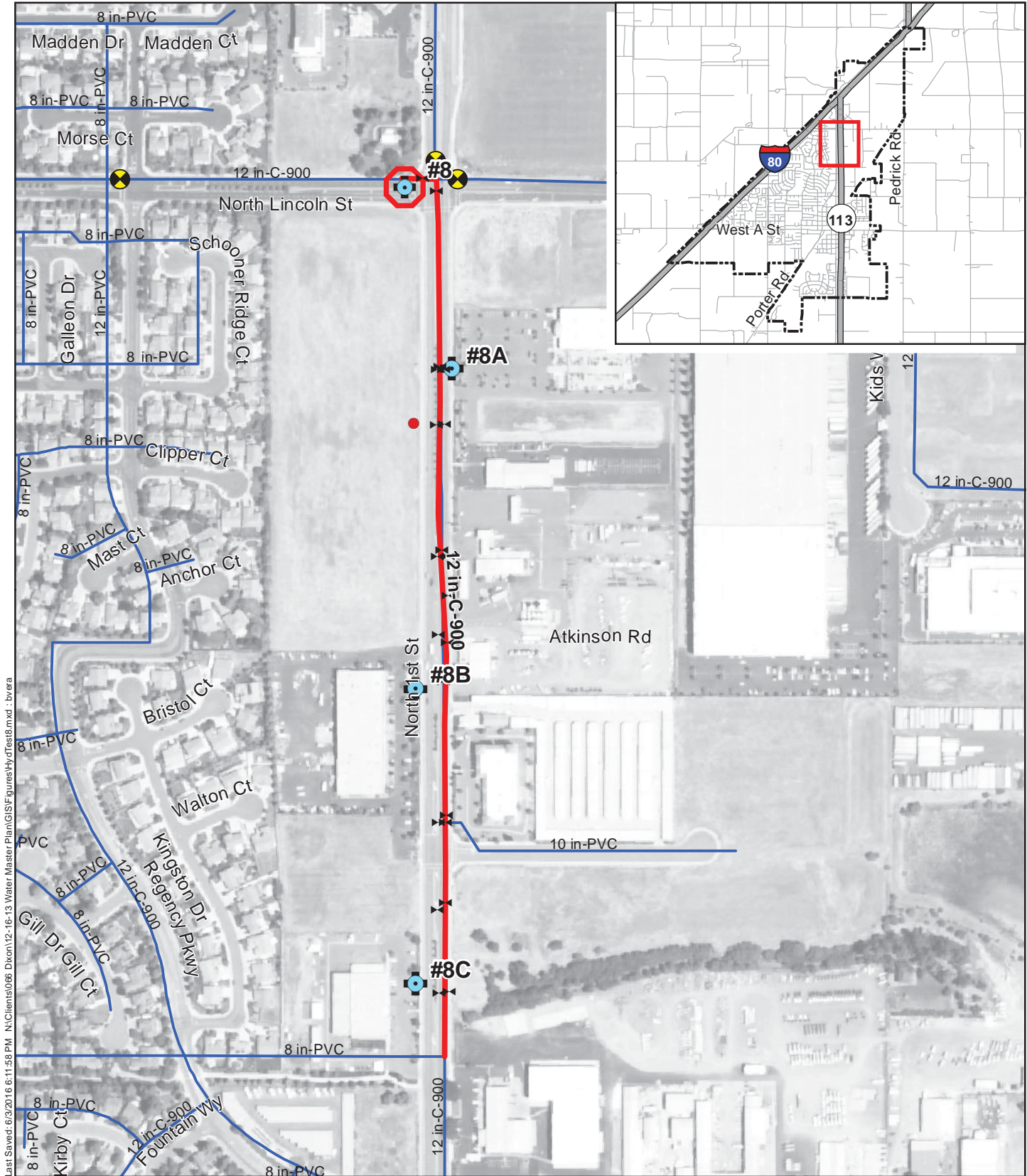












Figure A-7
Test 7A

City of Dixon
Water Master Plan
Hydrant Test Plan



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Symbology

-  Flow Hydrant
-  Observed Hydrant
-  Hydrant
-  Closed Valve
-  Valve
-  Test Pipeline
-  Pipeline
-  Emergency Intertie
-  Well
-  Tank

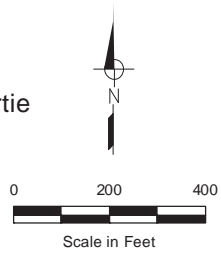


Figure A-8
Test 8A
 City of Dixon
 Water Master Plan
 Hydrant Test Plan

APPENDIX B

Hydraulic Model Calibration Results

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Summary of Hydrant Test Calibration Results

Hydrant ^(a)	Field Data			Modeled Data			Comparison of Differential Pressures between Field and Modeled Data ^(b)
	Static Pressure, psi	Residual Pressure, psi	Differential Pressure, psi (Static - Residual)	Static Pressure, psi	Residual Pressure, psi	Differential Pressure, psi (Static - Residual)	
Hydrant Flow Test No. 1 [Belden Drive and Bello Drive - South Zone]							
Flowing 1	60	15	N/A	58	N/A	N/A	N/A
1A	59	22	37	58	22	37	1
1B	59	25	34	58	27	31	3
1C	61	33	28	59	32	27	1
Hydrant Flow Test No. 2 [Bello Drive west of Griffith Court - South Zone]							
Flowing 2	60	13	N/A	59	N/A	N/A	N/A
2A	60	27	33	59	39	20	4
2B	60	32	28	59	44	14	4
2C	62	41	21	0	0	0	1
2D	61	44	17	0	0	0	3
Hydrant Flow Test No. 3 [Evans Road north of West A Street - Core Zone]							
Flowing 3	55	16	N/A	55	N/A	N/A	N/A
3A	55	25	30	55	12	43	-13
3B	54	25	29	54	22	32	-3
3C	58	30	28	54	32	22	6
3D	58	36	22	55	43	13	9
Hydrant Flow Test No. 4 [Monique Way west of Weyand Way - Core Zone]							
Flowing 4	58	10	N/A	56	N/A	N/A	N/A
4A	57	25	32	56	22	34	-2
4B	58	34	24	56	32	24	0
4C	60	42	18	56	39	17	1
4D	61	50	11	56	46	10	0
Hydrant Flow Test No. 5 [End of Gill Court - Core Zone]							
Flowing 5	60	18	N/A	58	N/A	N/A	N/A
5A	59	37	22	58	38	20	2
5B	58	47	11	58	51	7	4
5C	60	50	10	58	52	6	4
Hydrant Flow Test No. 6 [Wiegand Way west of Jib Court - Core Zone]							
Flowing 6	60	15	N/A	59	N/A	N/A	N/A
6A	59	26	33	57	24	33	0
6B	58	38	20	58	37	21	-1
6C	61	52	9	58	51	7	2
Hydrant Flow Test No. 7 [Valley Glen Drive north of Parkway Boulevard - South Zone]							
Flowing 7	60	21	N/A	58	N/A	N/A	N/A
7A	59	30	29	57	30	28	1
7B	59	33	26	58	33	25	1
7C	62	37	25	58	34	24	1
7D	62	42	20	59	36	23	-3

^(a) Location of hydrants can be found in Appendix K or Chapter 6.

^(b) The goal of the calibration effort is to achieve a differential pressure comparison within 5 psi for observed hydrants.

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