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March 17, 2015

Letter Report

Michael Lindquist
City of Davis
23 Russell Boulevard
Davis, California 95616

147354

Subject: Hydraulic Model Analysis of Existing System Impacts from Davis Innovation Center, Mace Innovation Center, and Nishi Property Water Demands

Dear Mr. Lindquist,

At your request, Brown and Caldwell performed a hydraulic model analysis of the impacts on the City's existing water system from the three new future developments: Davis Innovation Center (IC), Mace IC (including the Triangle), and the Nishi Property. The peak hour pressures and maximum velocities in the system were evaluated with the City's current service area at buildout and with the addition of the buildout demands for the three developments.

Analysis Inputs and Assumptions

1. Table 1 summarizes the buildout maximum day demands for each of these areas used in this analysis. A fire flow of 4,000 gpm was assumed as worst case for the fire flow model runs for the Davis IC and Mace IC. A fire flow of 2,000 gpm was assumed for the Nishi Property due to the use of sprinklered buildings.

Table 1. Summary of Buildout Maximum Day Demands

	mgd	gpm
Existing City service area	21.3	14,792
Davis IC	0.8	574
Mace IC plus triangle	0.3	228
Nishi	0.2	124
Total	22.6	15,717

2. The active water supply sources in the hydraulic model are the surface water supply and the five Davis deep wells (DDW) 30, 31, 32, 33, and 34 (firm capacity with 4 wells).
3. Source water quality settings in the hydraulic model for Hardness and total dissolved solids (TDS) are shown in Table 2. The water quality goals set forth in the optimization study are 110 mg/l for hardness and 300 mg/l for TDS.

Table 2. Source Water Quality Settings		
Source	Hardness, mg/l	TDS, mg/l
SWTP	85	100
DDW-30	100	340
DDW-31	120	340
DDW-32	90	300
DDW-33	71	310
DDW-34	85	300

4. The backbone piping within each of the new developments was added to the hydraulic model in order to analyze the maximum day/peak hour and fire flow impacts on the existing system. The distribution system within each of the future developments was not analyzed and is not presented in the results of this analysis. The connection points of the new developments to the City's existing service area are illustrated on the figures discussed below.

Analysis Results

Figures 1 through 6 in Attachment A illustrate the results of this modeling analysis. The analysis results are summarized by figure below.

Figure 1. Peak Hour Pressure – The peak hour pressure over a 24-hour period is illustrated in the existing service area with the buildout demands for all of the developments on the system. Peak hour pressures are maintained above 35 psi throughout the system which meets the City's performance criteria.

Figure 2. Maximum Hardness – The maximum hardness in the system with the addition of the future development demands ranges from up to 110 mg/l in the west area of the system, up to 100 mg/l in the east area of the system and below 85 mg/l in the central north area of the system. These levels are consistent with the water quality goals.

Figure 3. Maximum TDS – The maximum TDS in the system with the addition of the future development demands ranges from 250 to 300 mg/l in the west and east area of the system and ranges from 150 to 250 in the center of the system. These levels are also consistent with the water quality goals.

Figure 4. Pressures and Velocities during Davis Innovation Center Fire Flow – A 4,000 gpm fire flow within the Davis IC is applied. The backbone water pipelines in the Davis IC were added to the model (not shown on the figure because the distribution system within the Davis IC is not evaluated in this analysis) to better hydraulically simulate the fire flow demand impact on the existing system. The Davis IC will connect to the existing distribution system at four locations as shown on the figure. No adverse pressure or velocity impacts as a result of this simulated fire flow within the Davis IC were observed.

Figure 5. Pressures and Velocities during Mace Innovation Center Fire Flow – A 4,000 gpm fire flow within the Mace IC was applied. The backbone water pipelines in the Mace IC are added to the model (not shown on the figure because the Mace IC distribution system is not evaluated in this analysis) to better hydraulically simulate the fire flow demand impact on the existing system. The Mace IC will connect to the existing distribution system at two locations as shown on the figure. No adverse pressure or velocity impacts as a result of this simulated fire flow within the Mace IC were observed.

Figure 6. Pressures and Velocities during Nishi Fire Flow – A 2,000 gpm fire flow within the Nishi Property was applied. The backbone water pipelines in the Nishi are added to the model (not shown on the figure because the Nishi property distribution system is not evaluated in this analysis) to better hydraulically simulate the fire flow demand impact on the existing system. The Nishi property is currently modeled to connect to the existing distribution system at one location as shown on the figure. The development can be served by the existing 12-in diameter water line in Richards Blvd. from the downtown area with no limitations, including fire flow. This will provide 100 percent of the demands but does not provide any redundancy.

The model was also analyzed with the existing piping in Olive Dr. and increasing the existing 6-in diameter pipeline to a 12-in diameter pipeline to provide the full supply. This will provide 100 percent redundancy. The improvement needed to accomplish this is the replacement of approximately 3,000 feet of existing 6-in and 10-in diameter pipeline along Olive Dr. with a new 12-in diameter pipeline, from the point of connection at Nishi extending east.

Figure 7. Pressures and Velocities during Davis Innovation Center Fire Flow – Phase 1 – A 4,000 gpm fire flow within the Phase 1 Davis IC was applied. Phase 1 consists of three points of the connection to the existing system rather than the ultimate four points of connection. No adverse pressure or velocity impacts as a result of this simulated fire flow within Phase 1 of the Davis IC were observed.

Brown and Caldwell appreciates that the City has requested our services in assisting with this project. Should you have any questions, please do not hesitate to call me at 916-853-5392.

Very truly yours,

Brown and Caldwell

Jeff Lawrence
Project Manager

MH:ds

cc: Melanie Holton, Brown and Caldwell

Attachments (1)

1. Attachment A: Figures 1 through 7

Limitations:

This document was prepared solely for the City of Davis in accordance with professional standards at the time the services were performed and in accordance with the contract between the City of Davis and Brown and Caldwell dated December 18, 2014. This document is governed by the specific scope of work authorized by the City of Davis; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by the City of Davis and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

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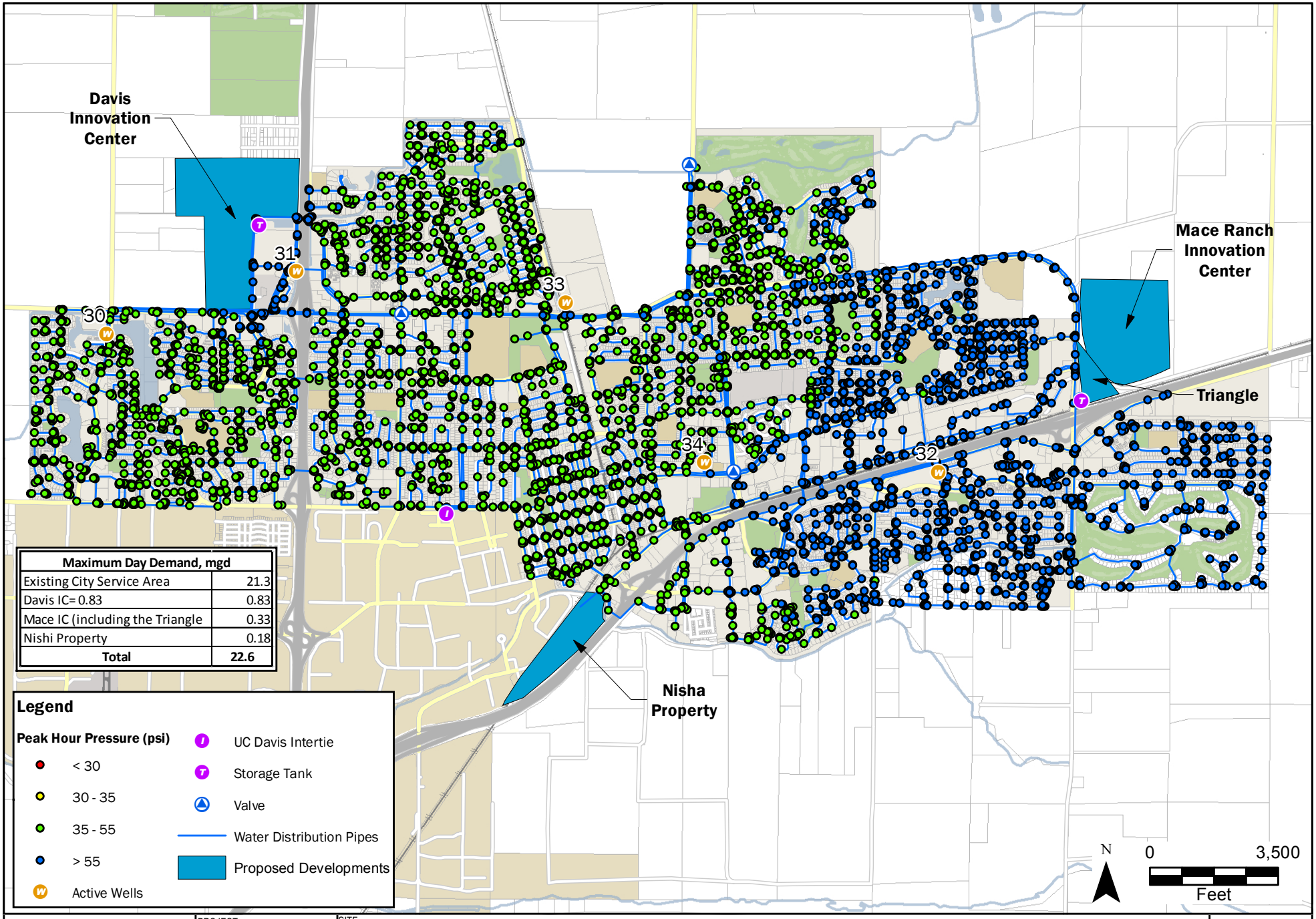

Maximum Day Demand, mgd	
Existing City Service Area	21.3
Davis IC= 0.83	0.83
Mace IC (including the Triangle	0.33
Nishi Property	0.18
Total	**22.6**

Legend

Peak Hour Pressure (psi)

- < 30
- 30 - 35
- 35 - 55
- > 55
- Active Wells
- UC Davis Intertie
- Storage Tank
- Valve
- Water Distribution Pipes
- Proposed Developments

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PROJECT	SITE	
147354	Surface Water Supply with UC Davis Demand	Figure 1
DATE	TITLE	
2/12/2015	Peak Hour Pressure	

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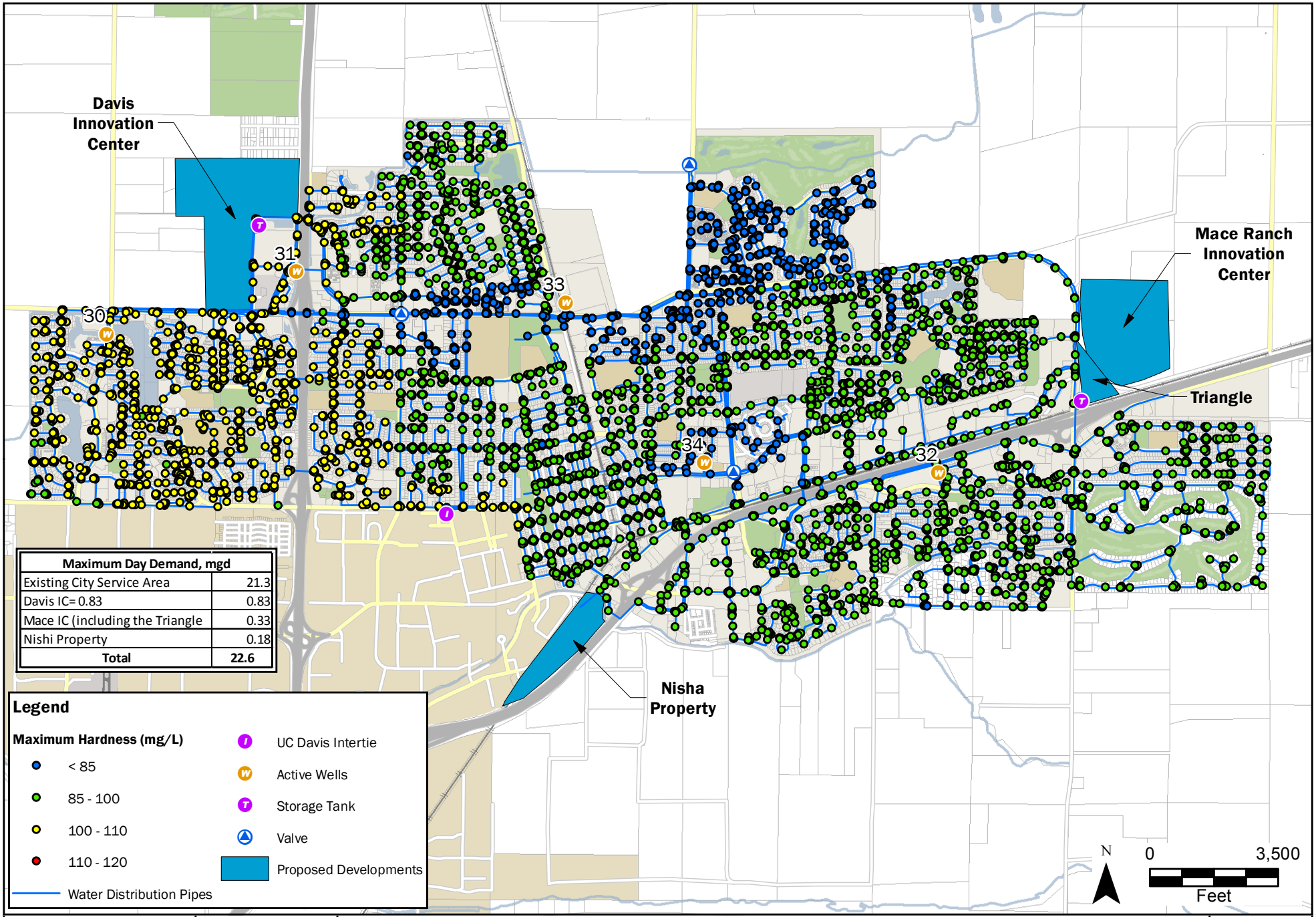

Brown AND Caldwell / Davis California	PROJECT 147354	SITE Surface Water Supply with UC Davis Demand	Figure 2
	DATE 2/12/2015	TITLE Maximum Hardness	

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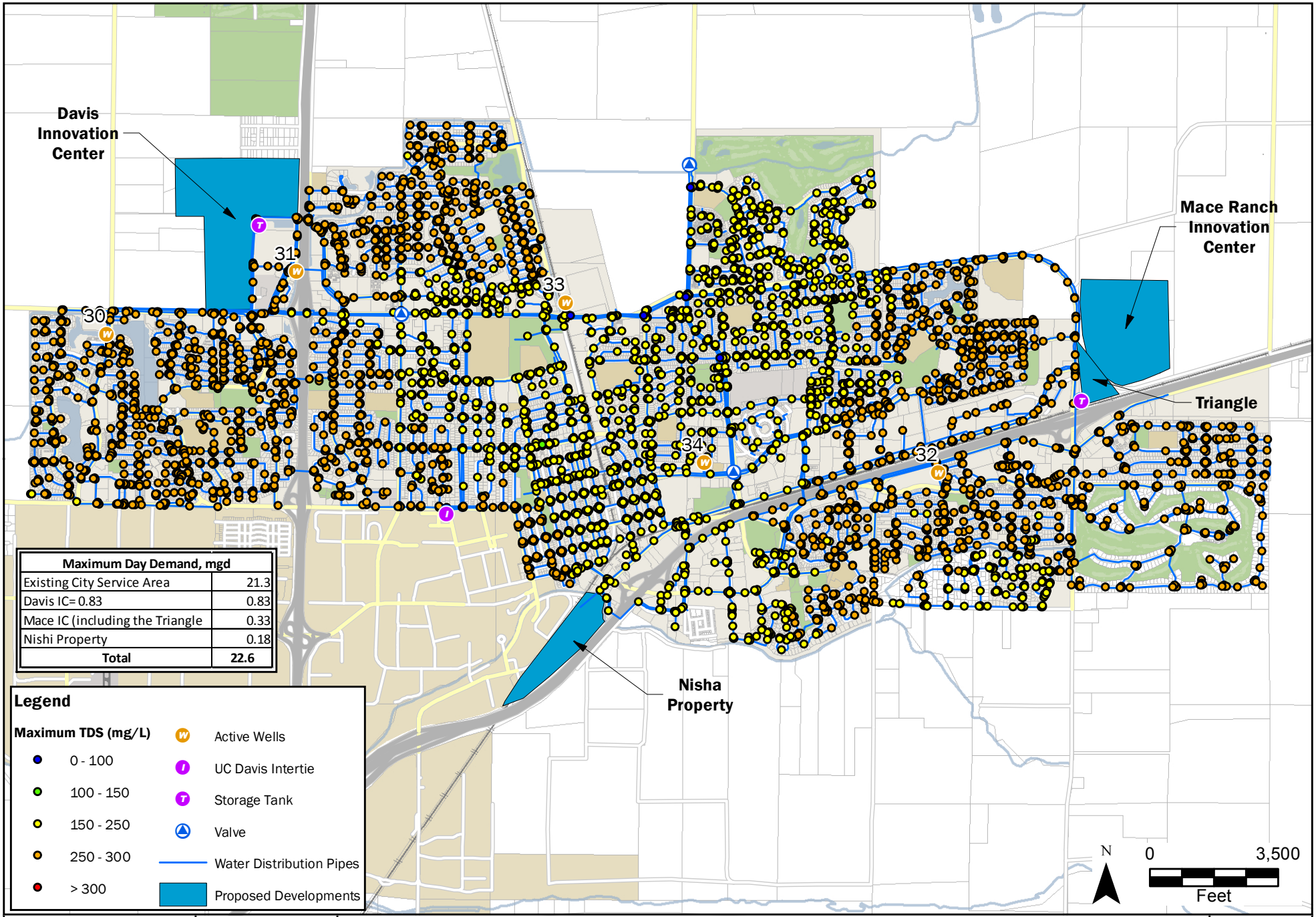

Brown AND Caldwell / Davis California	PROJECT 147354	SITE Surface Water Supply with UC Davis Demand	Figure 3
	DATE 2/12/2015	TITLE Maximum TDS	

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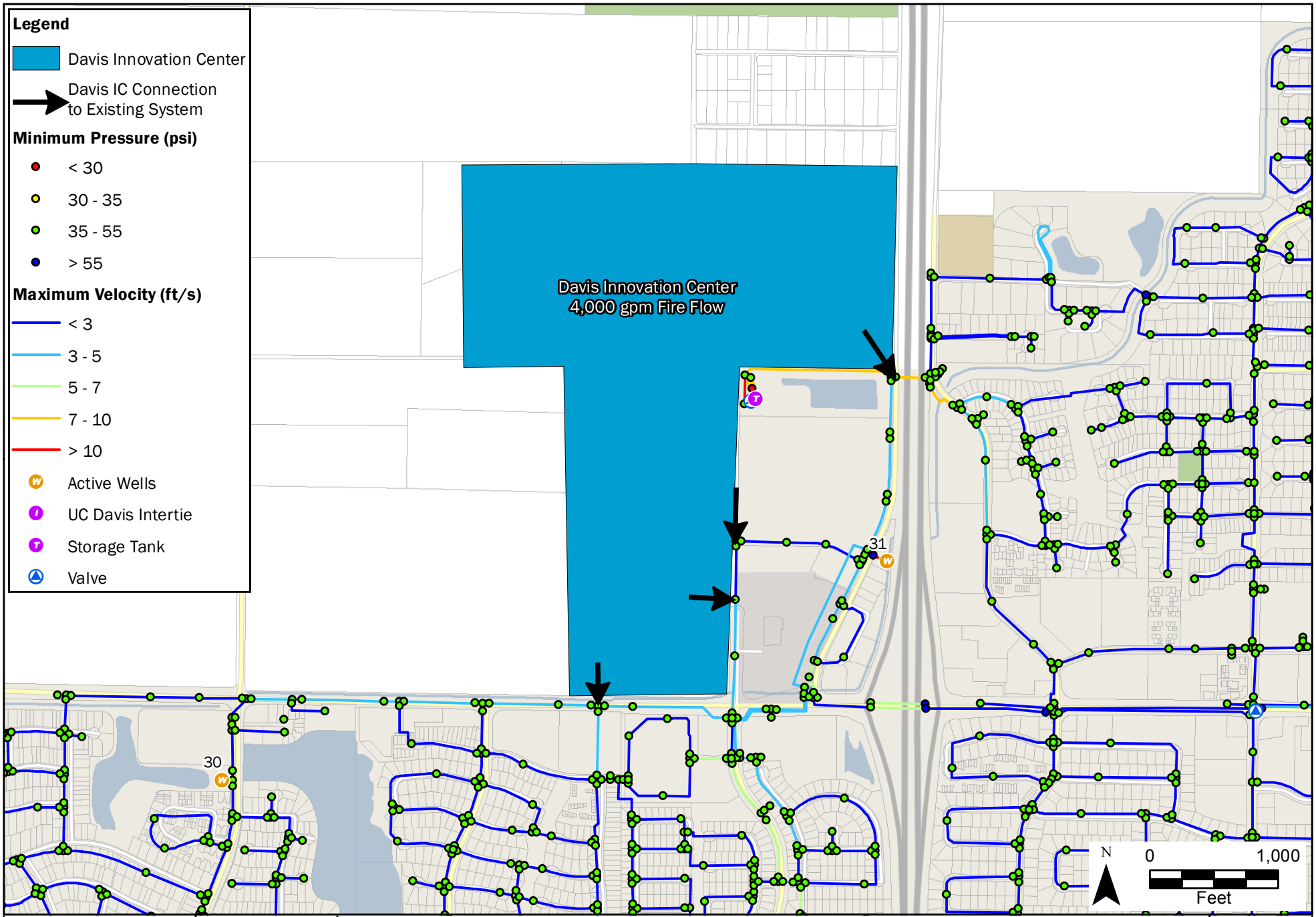

Brown AND Caldwell : Davis California	PROJECT 147354	SITE **Surface Water Supply with UC Davis Demand**	**Figure 4**
	DATE 2/12/2015	TITLE **Pressures and Velocities during Davis Innovation Center Fire Flow**	

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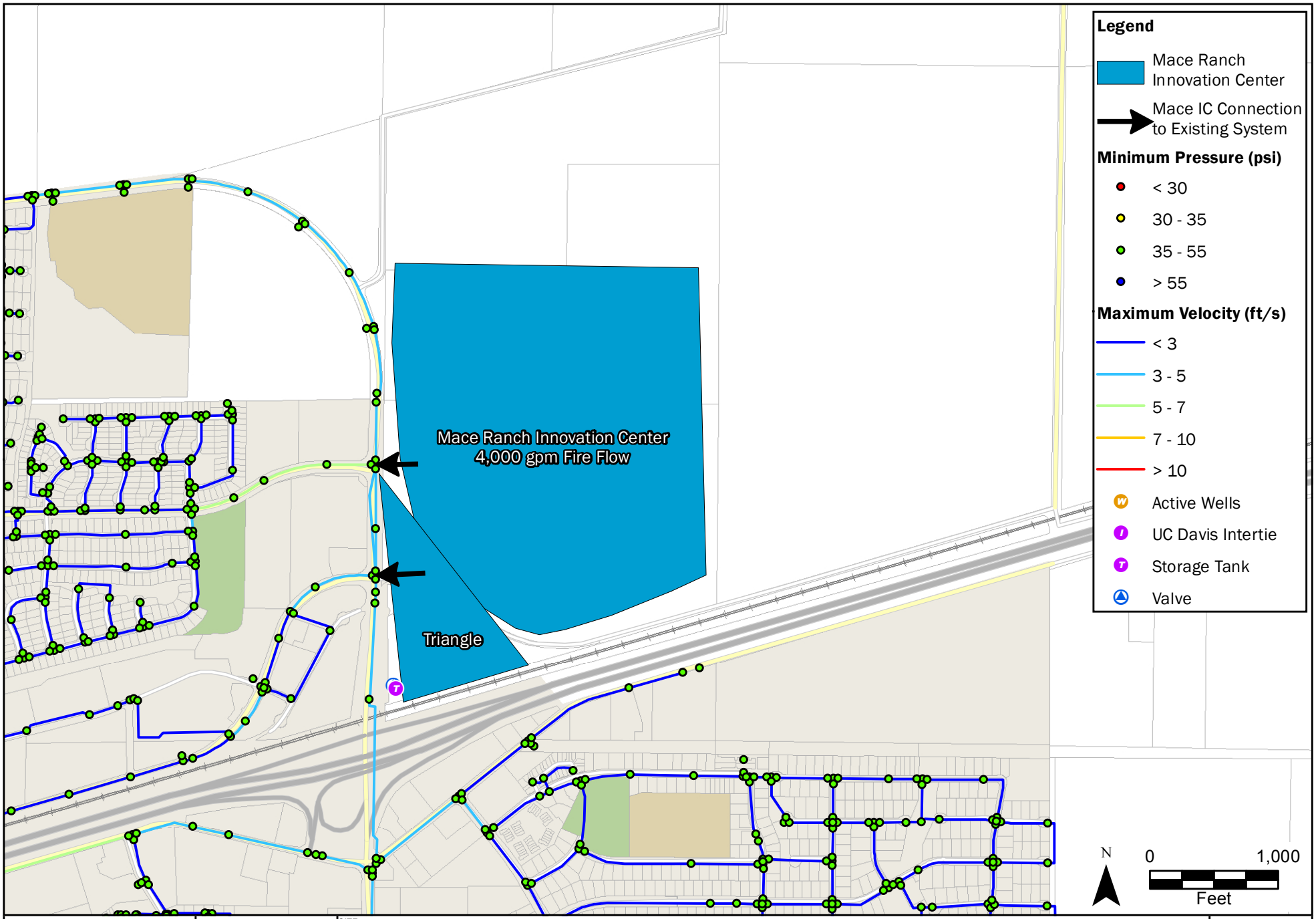

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PROJECT 147354	SITE: Surface Water Supply with UC Davis Demand
DATE 2/12/2015	TITLE: Pressures and Velocities during Mace Innovation Center Fire Flow

Figure 5

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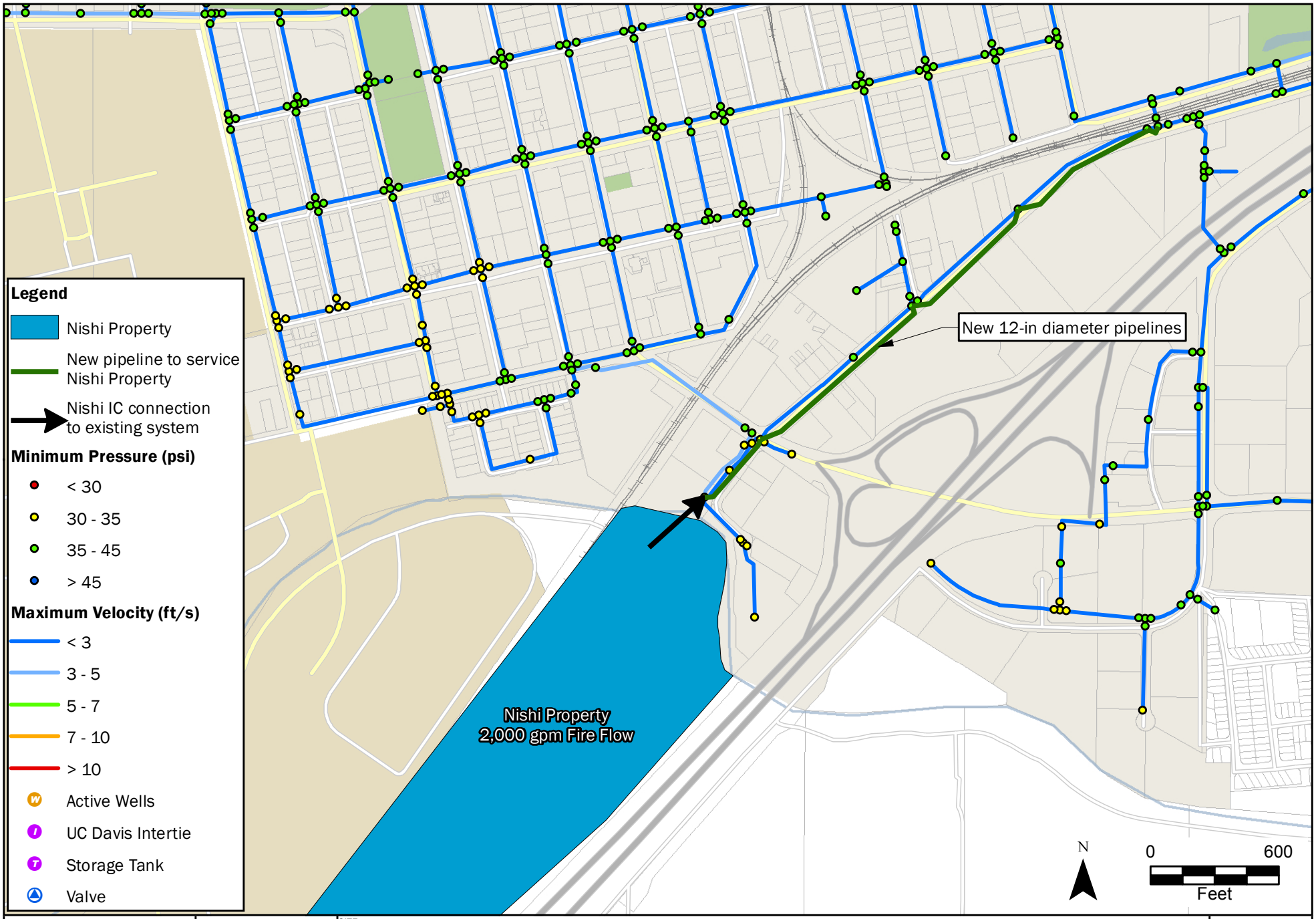

Brown AND Caldwell : Davis California	PROJECT 147354	SITE **Surface Water Supply with UC Davis Demand**	**Figure 6**
	DATE 3/16/2015	TITLE **Pressures and Velocities during Nishi Fire Flow**	

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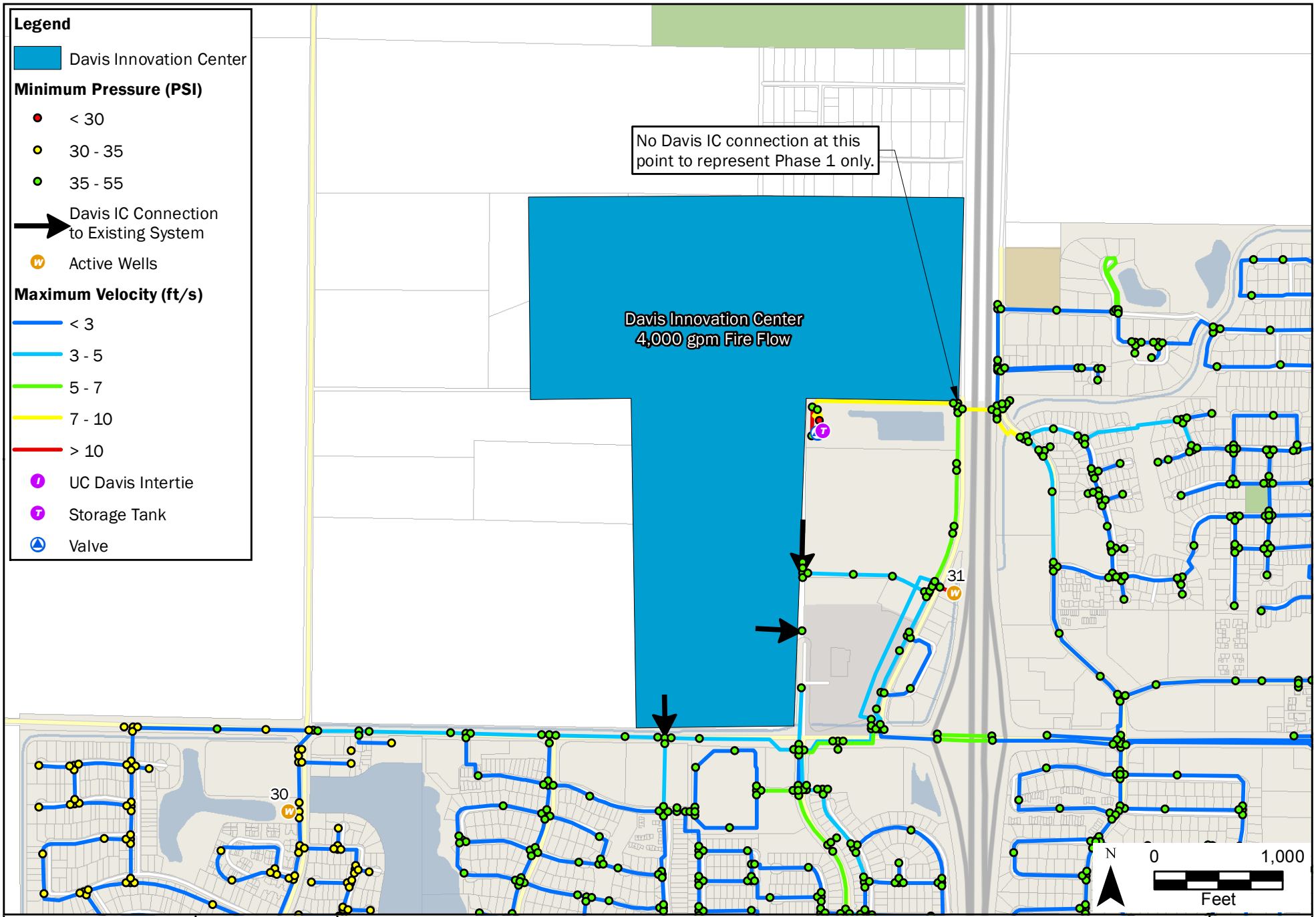

Brown AND Caldwell : Davis California	PROJECT 147354	SITE **Surface Water Supply with UC Davis Demand**	**Figure 7**
	DATE 3/3/2015	TITLE **Pressures and Velocities during Davis Innovation Center Fire Flow - Phase 1**	